

Computer Algebra Independent Integration Tests

Summer 2023 edition

11-MIT

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CHAPTER 1

INTRODUCTION

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This report gives the result of running the computer algebra independent integration test. The download section in on the main webpage contains links to download the problems in plain text format used for all CAS systems. The number of integrals in this report is [321]. This is test number [211].

1.1 Listing of CAS systems tested

The following are the CAS systems tested:

1. Mathematica 13.3.1 (August 16, 2023) on windows 10.
2. Rubi 4.16.1 (Dec 19, 2018) on Mathematica 13.3 on windows 10
3. Maple 2023.1 (July, 12, 2023) on windows 10.
4. Maxima 5.47 (June 1, 2023) using Lisp SBCL 2.3.0 on Linux via sagemath 10.1 (Aug 20, 2023).
5. FriCAS 1.3.9 (July 8, 2023) based on sbcl 2.3.0 on Linux via sagemath 10.1 (Aug 20, 2023).
6. Giac/Xcas 1.9.0-57 (June 26, 2023) on Linux via sagemath 10.1 (Aug 20, 2023).
7. Sympy 1.12 (May 10, 2023) Using Python 3.11.3 on Linux.
8. Mupad using Matlab 2021a with Symbolic Math Toolbox Version 8.7 on windows 10.

Maxima and Fricas and Giac are called using Sagemath. This was done using Sagemath `integrate` command by changing the name of the algorithm to use the different CAS systems.

Sympy was run directly in Python not via sagemath.

1.2 Results

Important note: A number of problems in this test suite have no antiderivative in closed form. This means the antiderivative of these integrals can not be expressed in terms of elementary, special functions or `Hypergeometric2F1` functions. `RootSum` and `RootOf` are not allowed. If a CAS returns the above integral unevaluated within the time limit, then the result is counted as passed and assigned an A grade.

However, if CAS times out, then it is assigned an F grade even if the integral is not integrable, as this implies CAS could not determine that the integral is not integrable in the time limit.

If a CAS returns an antiderivative to such an integral, it is assigned an A grade automatically and this special result is listed in the introduction section of each individual test report to make it easy to identify as this can be important result to investigate.

The results given in in the table below reflects the above.

| System | % solved | % Failed |
|-------------|---------------|--------------|
| Mathematica | 99.38 (319) | 0.62 (2) |
| Fricas | 96.26 (309) | 3.74 (12) |
| Maple | 95.33 (306) | 4.67 (15) |
| Rubi | 94.08 (302) | 5.92 (19) |
| Maxima | 92.52 (297) | 7.48 (24) |
| Giac | 91.90 (295) | 8.10 (26) |
| Mupad | 90.03 (289) | 9.97 (32) |
| Sympy | 82.55 (265) | 17.45 (56) |

Table 1.1: Percentage solved for each CAS

The table below gives additional break down of the grading of quality of the antiderivatives generated by each CAS. The grading is given using the letters A,B,C and F with A being the best quality. The grading is accomplished by comparing the antiderivative generated with the optimal antiderivatives included in the test suite. The following table describes the meaning of these grades.

| grade | description |
|-------|---|
| A | Integral was solved and antiderivative is optimal in quality and leaf size. |
| B | Integral was solved and antiderivative is optimal in quality but leaf size is larger than twice the optimal antiderivatives leaf size. |
| C | Integral was solved and antiderivative is non-optimal in quality. This can be due to one or more of the following reasons <ol style="list-style-type: none"> 1. antiderivative contains a hypergeometric function and the optimal antiderivative does not. 2. antiderivative contains a special function and the optimal antiderivative does not. 3. antiderivative contains the imaginary unit and the optimal antiderivative does not. |
| F | Integral was not solved. Either the integral was returned unevaluated within the time limit, or it timed out, or CAS hanged or crashed or an exception was raised. |

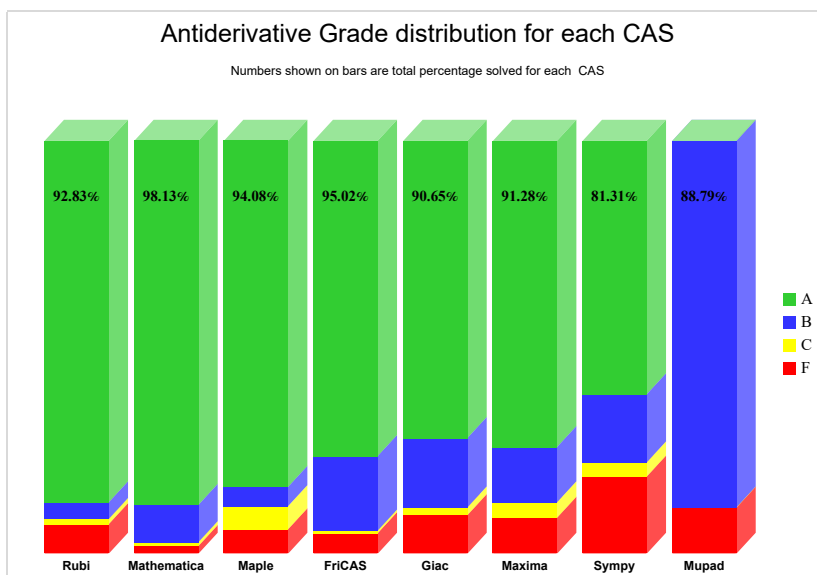
Table 1.2: Description of grading applied to integration result

Grading is implemented for all CAS systems. Based on the above, the following table summarizes the grading for this test suite.

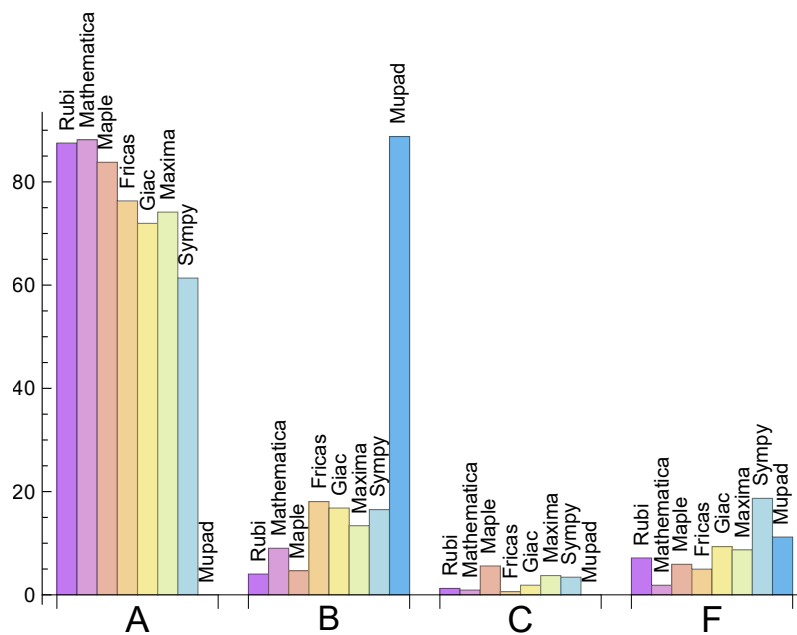
| System | % A grade | % B grade | % C grade | % F grade |
|-------------|-----------|-----------|-----------|-----------|
| Mathematica | 88.162 | 9.034 | 0.935 | 1.869 |
| Rubi | 87.539 | 4.050 | 1.246 | 7.165 |
| Maple | 83.801 | 4.673 | 5.607 | 5.919 |
| Fricas | 76.324 | 18.069 | 0.623 | 4.984 |
| Maxima | 74.143 | 13.396 | 3.738 | 8.723 |
| Giac | 71.963 | 16.822 | 1.869 | 9.346 |
| Sympy | 61.371 | 16.511 | 3.427 | 18.692 |
| Mupad | 0.000 | 88.785 | 0.000 | 11.215 |

Table 1.3: Antiderivative Grade distribution of each CAS

The following is a Bar chart illustration of the data in the above table.



The figure below compares the grades of the CAS systems.



The following table shows the distribution of the different types of failures for each CAS. There are 3 types failures. The first is when CAS returns the input within the time limit, which means it could not solve it. This is the typical failure and given as **F**.

The second failure is due to time out. CAS could not solve the integral within the 3 minutes time limit which is assigned. This is assigned **F(-1)**.

The third is due to an exception generated, indicated as **F(-2)**. This most likely indicates an interface problem between sagemath and the CAS (applicable only to FriCAS, Maxima

and Giac) or it could be an indication of an internal error in the CAS itself. This type of error requires more investigation to determine the cause.

| System | Number failed | Percentage normal failure | Percentage time-out failure | Percentage exception failure |
|-------------|---------------|---------------------------|-----------------------------|------------------------------|
| Mathematica | 2 | 100.00 | 0.00 | 0.00 |
| Fricas | 12 | 41.67 | 25.00 | 33.33 |
| Maple | 15 | 86.67 | 13.33 | 0.00 |
| Rubi | 19 | 100.00 | 0.00 | 0.00 |
| Maxima | 24 | 91.67 | 4.17 | 4.17 |
| Giac | 26 | 96.15 | 3.85 | 0.00 |
| Mupad | 32 | 0.00 | 100.00 | 0.00 |
| Sympy | 56 | 87.50 | 12.50 | 0.00 |

Table 1.4: Failure statistics for each CAS

1.3 Time and leaf size Performance

The table below summarizes the performance of each CAS system in terms of time used and leaf size of results.

Mean size is the average leaf size produced by the CAS (before any normalization). The Normalized mean is relative to the mean size of the optimal anti-derivative given in the input files.

For example, if CAS has **Normalized mean** of 3, then the mean size of its leaf size is 3 times as large as the mean size of the optimal leaf size.

Median size is value of leaf size where half the values are larger than this and half are smaller (before any normalization). i.e. The Middle value.

Similarly the **Normalized median** is relative to the median leaf size of the optimal.

For example, if a CAS has Normalized median of 1.2, then its median is 1.2 as large as the median leaf size of the optimal.

| System | Mean time (sec) |
|-------------|-----------------|
| Rubi | 0.06 |
| Mathematica | 0.18 |
| Maxima | 0.25 |
| Fricas | 0.27 |
| Giac | 0.41 |
| Maple | 0.47 |
| Sympy | 1.58 |
| Mupad | 9.08 |

Table 1.5: Time performance for each CAS

| System | Mean size | Normalized mean | Median size | Normalized median |
|-------------|-----------|-----------------|-------------|-------------------|
| Mupad | 20.48 | 1.23 | 13.00 | 0.86 |
| Fricas | 25.39 | 1.61 | 17.00 | 1.00 |
| Rubi | 27.19 | 1.69 | 17.00 | 1.00 |
| Maple | 88.41 | 4.21 | 14.00 | 0.92 |
| Mathematica | 97.55 | 4.50 | 18.00 | 1.00 |
| Maxima | 106.78 | 5.75 | 15.00 | 0.97 |
| Giac | 112.05 | 6.80 | 16.00 | 1.00 |
| Sympy | 132.82 | 6.21 | 15.00 | 0.94 |

Table 1.6: Leaf size performance for each CAS

1.4 Performance based on number of rules Rubi used

This section shows how each CAS performed based on the number of rules Rubi needed to solve the same integral. One diagram is given for each CAS.

On the y axis is the percentage solved which Rubi itself needed the number of rules given the x axis. These plots show that as more rules are needed then most CAS system percentage of solving decreases which indicates the integral is becoming more complicated to solve.

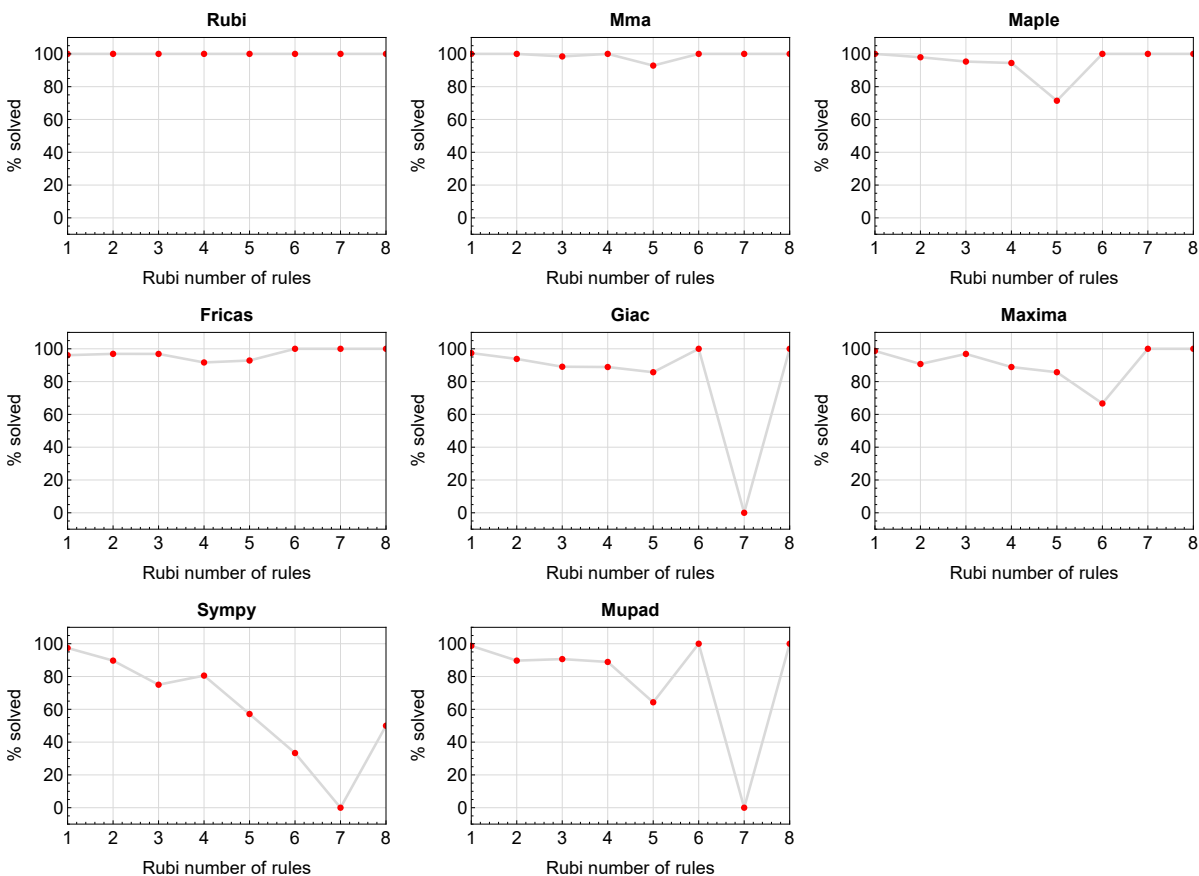


Figure 1.1: Solving statistics per number of Rubi rules used

1.5 Performance based on number of steps Rubi used

This section shows how each CAS performed based on the number of steps Rubi needed to solve the same integral. Note that the number of steps Rubi needed can be much higher than the number of rules, as the same rule could be used more than once.

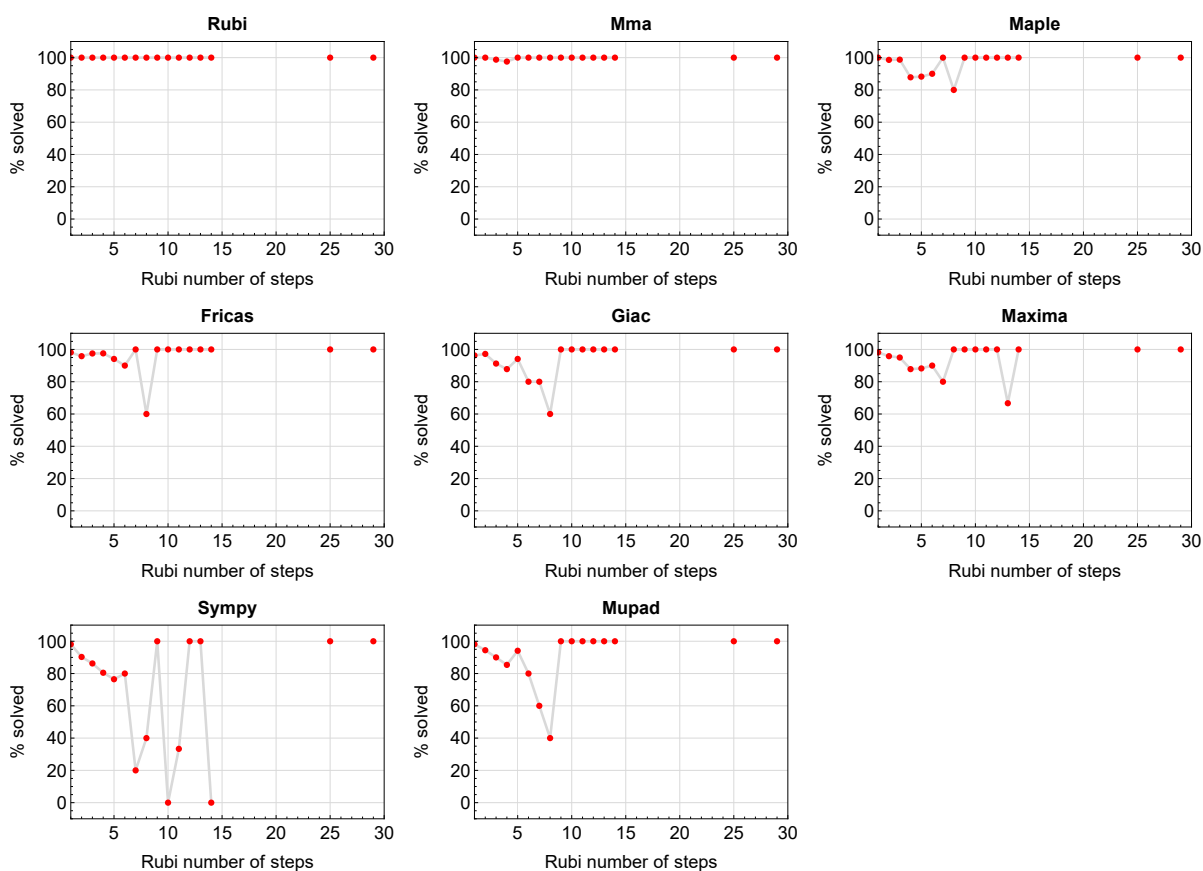


Figure 1.2: Solving statistics per number of Rubi steps used

The above diagram shows that the percentage of solved integrals decreases for most CAS systems as the number of steps increases. As expected, for integrals that required less steps by Rubi, CAS systems had more success which indicates the integral was not as hard to solve. As Rubi needed more steps to solve the integral, the solved percentage decreased for most CAS systems which indicates the integral is becoming harder to solve.

1.6 Solved integrals histogram based on leaf size of result

The following shows the distribution of solved integrals for each CAS system based on leaf size of the antiderivatives produced by each CAS. It shows that most integrals solved produced leaf size less than about 100 to 150. The bin size used is 40.

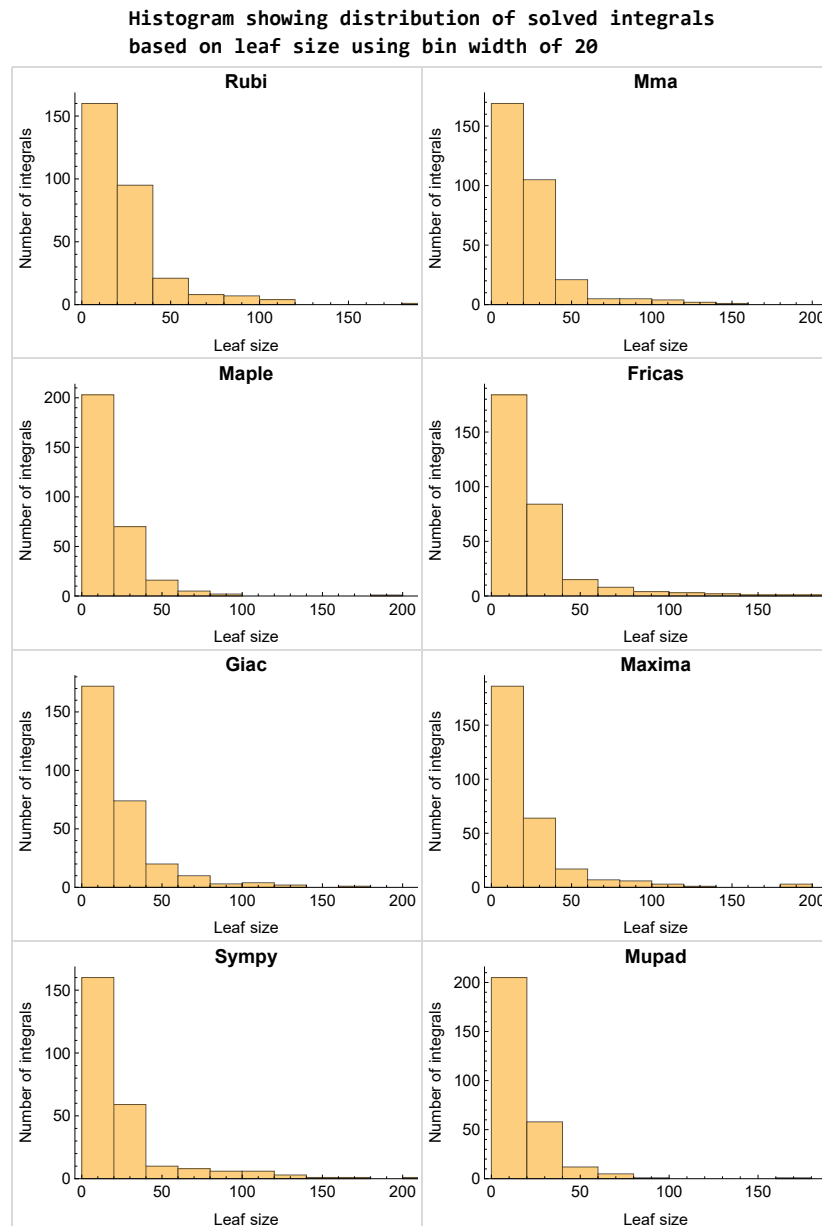


Figure 1.3: Solved integrals based on leaf size distribution

1.7 Solved integrals histogram based on CPU time used

The following shows the distribution of solved integrals for each CAS system based on CPU time used in seconds. The bin size used is 0.1 second.

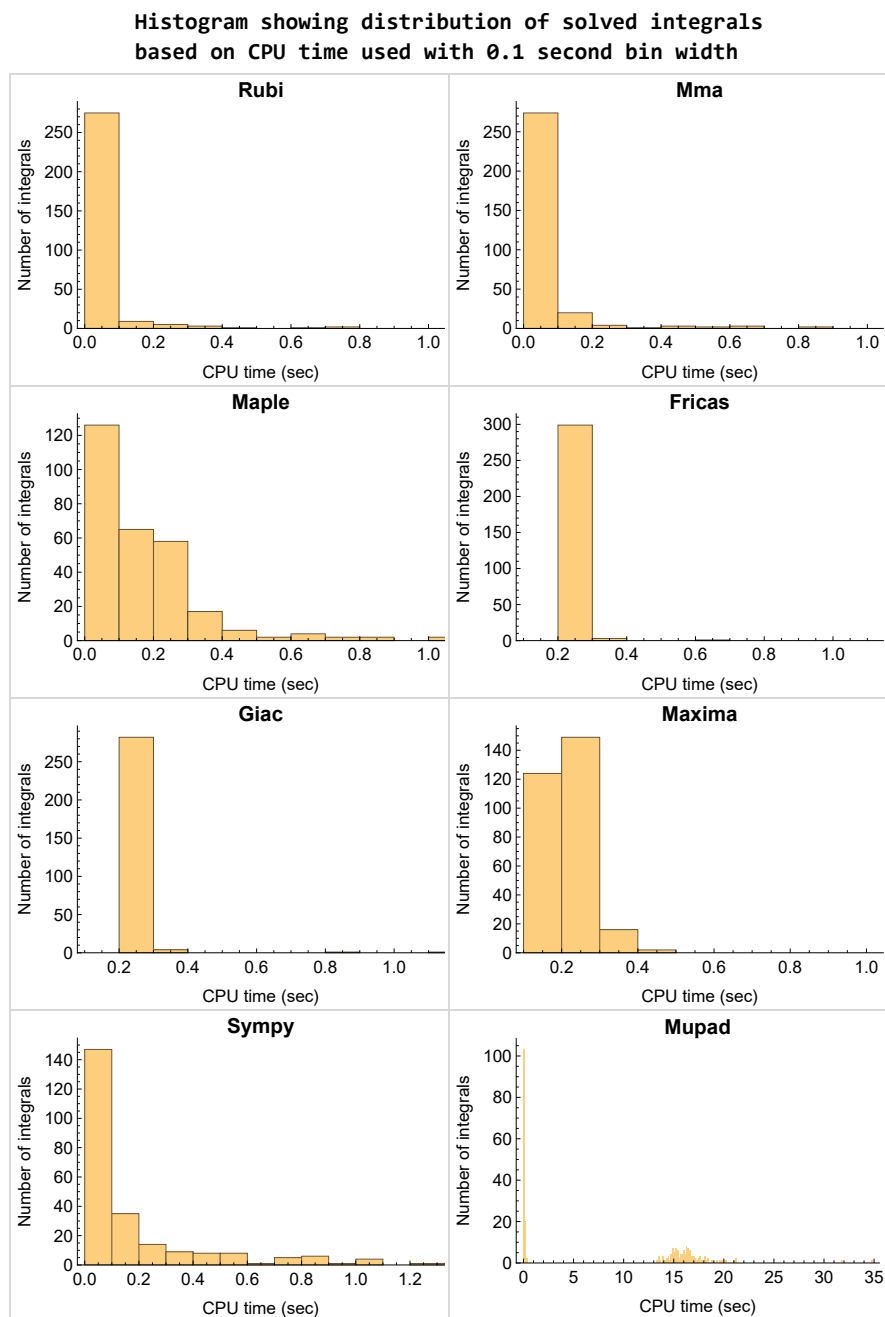


Figure 1.4: Solved integrals histogram based on CPU time used

1.8 Leaf size vs. CPU time used

The following shows the relation between the CPU time used to solve an integral and the leaf size of the antiderivative.

The result for Fracas, Maxima and Giac is shifted more to the right than the other CAS system due to the use of sagemath to call them, which causes an initial slight delay in the timing to start the integration due to overhead of starting a new process each time. This should also be taken into account when looking at the timing of these three CAS systems. Direct calls not using sagemath would result in faster timings, but current implementation uses sagemath as this makes testing much easier to do.

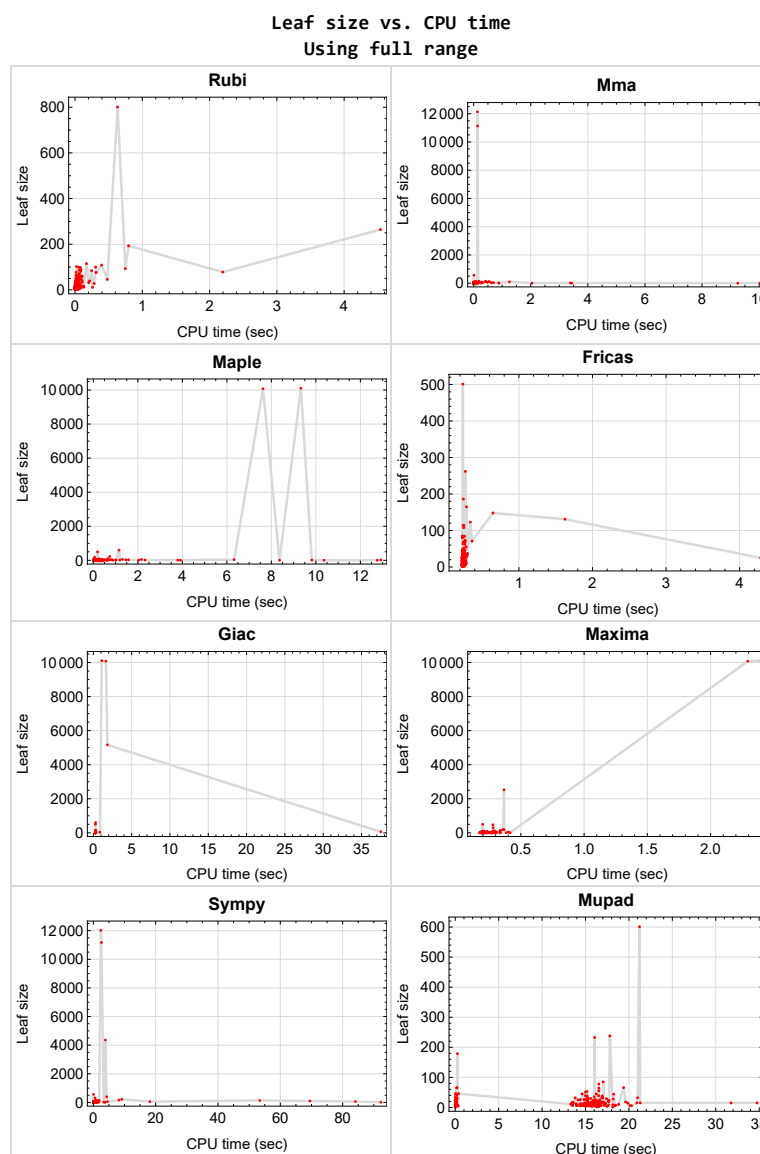


Figure 1.5: Leaf size vs. CPU time. Full range

1.9 list of integrals with no known antiderivative

{194, 225, 226, 236}

1.10 List of integrals solved by CAS but has no known antiderivative

Rubi {}

Mathematica {}

Maple {}

Maxima {}

Fricas {}

Sympy {}

Giac {}

Mupad {}

1.11 list of integrals solved by CAS but failed verification

The following are integrals solved by CAS but the verification phase failed to verify the anti-derivative produced is correct. This does not necessarily mean that the anti-derivative is wrong as additional methods of verification might be needed, or more time is needed (3 minutes time limit was used). These integrals are listed here to make it possible to do further investigation to determine why the result could not be verified.

Rubi {}

Mathematica {}

Maple {81, 276}

Maxima Verification phase not currently implemented.

Fricas Verification phase not currently implemented.

Sympy Verification phase not currently implemented.

Giac Verification phase not currently implemented.

Mupad Verification phase not currently implemented.

1.12 Timing

The command `AbsoluteTiming[]` was used in Mathematica to obtain the elapsed time for each integrate call. In Maple, the command `Usage` was used as in the following example

```
cpu_time := Usage(assign ('result_of_int',int(expr,x)),output='realtime')
```

For all other CAS systems, the elapsed time to complete each integral was found by taking the difference between the time after the call completed from the time before the call was made. This was done using Python's `time.time()` call.

All elapsed times shown are in seconds. A time limit of 3 CPU minutes was used for each integral. If the integrate command did not complete within this time limit, the integral was aborted and considered to have failed and assigned an F grade. The time used by failed integrals due to time out was not counted in the final statistics.

1.13 Verification

A verification phase was applied on the result of integration for Rubi and Mathematica.

Future version of this report will implement verification for the other CAS systems. For the integrals whose result was not run through a verification phase, it is assumed that the antiderivative was correct.

Verification phase also had 3 minutes time out. An integral whose result was not verified could still be correct, but further investigation is needed on those integrals. These integrals were marked in the summary table below and also in each integral separate section so they are easy to identify and locate.

1.14 Important notes about some of the results

Important note about Maxima results

Since tests were run in a batch mode, and using an automated script, then any integral where Maxima needed an interactive response from the user to answer a question during the evaluation of the integral will fail.

The exception raised is `ValueError`. Therefore Maxima results is lower than what would result if Maxima was run directly and each question was answered correctly.

The percentage of such failures were not counted for each test file, but for an example, for the `Timofeev` test file, there were about 14 such integrals out of total 705, or about 2 percent. This percentage can be higher or lower depending on the specific input test file.

Such integrals can be identified by looking at the output of the integration in each section for Maxima. The exception message will indicate the cause of error.

Maxima integrate was run using SageMath with the following settings set by default

```
'besselexpand : true'
'display2d : false'
'domain : complex'
'keepfloat : true'
'load(to_poly_solve)'
'load(simplify_sum)'
'load(abs_integrate)' 'load(diag)'
```

SageMath automatic loading of Maxima `abs_integrate` was found to cause some problems. So the following code was added to disable this effect.

```
from sage.interfaces.maxima_lib import maxima_lib
maxima_lib.set('extra_definite_integration_methods', '[]')
maxima_lib.set('extra_integration_methods', '[]')
```

See <https://ask.sagemath.org/question/43088/integrate-results-that-are-different-from-using-maxima/> for reference.

Important note about FriCAS result

There were few integrals which failed due to SageMath interface and not because FriCAS system could not do the integration.

These will fail With error `Exception raised: NotImplementedError`.

The number of such cases seems to be very small. About 1 or 2 percent of all integrals. These can be identified by looking at the exception message given in the result.

Important note about finding leaf size of antiderivative

For Mathematica, Rubi, and Maple, the builtin system function `LeafSize` was used to find the leaf size of each antiderivative.

The other CAS systems (SageMath and Sympy) do not have special builtin function for this purpose at this time. Therefore the leaf size for Fricas and Sympy antiderivative was determined using the following function, thanks to user `slelievre` at https://ask.sagemath.org/question/57123/could-we-have-a-leaf_count-function-in-base-sagemath/

```
def tree_size(expr):
    r"""
    Return the tree size of this expression.
    """
    if expr not in SR:
        # deal with lists, tuples, vectors
        return 1 + sum(tree_size(a) for a in expr)
    expr = SR(expr)
```

```
x, aa = expr.operator(), expr.operands()
if x is None:
    return 1
else:
    return 1 + sum(tree_size(a) for a in aa)
```

For Sympy, which was called directly from Python, the following code was used to obtain the leafsize of its result

```
try:
    # 1.7 is a fudge factor since it is low side from actual leaf count
    leafCount = round(1.7*count_ops(anti))

except Exception as ee:
    leafCount =1
```

Important note about Mupad results

Matlab's symbolic toolbox does not have a leaf count function to measure the size of the antiderivative. Maple was used to determine the leaf size of Mupad output by post processing Mupad result.

Currently no grading of the antiderivative for Mupad is implemented. If it can integrate the problem, it was assigned a B grade automatically as a placeholder. In the future, when grading function is implemented for Mupad, the tests will be rerun again.

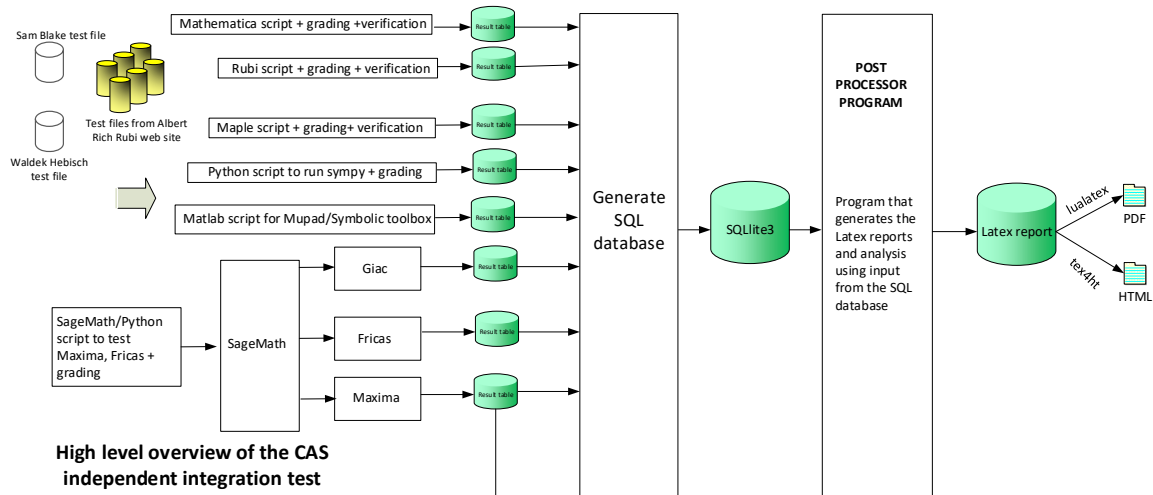
The following is an example of using Matlab's symbolic toolbox (Mupad) to solve an integral

```
integrand = evalin(symengine, 'cos(x)*sin(x)')
the_variable = evalin(symengine, 'x')
anti = int(integrand, the_variable)
```

Which gives $\sin(x)^2/2$

1.15 Design of the test system

The following diagram gives a high level view of the current test build system.



High level overview of the CAS independent integration test build system

One record (line) per one integral result. The line is CSV comma separated. This is description of each record

1. integer. the problem number.
2. integer. 0 for failed, 1 for passed, -1 for timeout, -2 for CAS specific exception. (this is not the grade field)
3. integer. Leaf size of result.
4. integer. Leaf size of the optimal antiderivative.
5. number. CPU time used to solve this integral. 0 if failed.
6. string. The integral in Latex format
7. string. The input used in CAS own syntax.
8. string. The result (antiderivative) produced by CAS in Latex format
9. string. The optimal antiderivative in Latex format.
10. integer. 0 or 1. Indicates if problem has known antiderivative or not
11. String. The result (antiderivative) in CAS own syntax.
12. String. The grade of the antiderivative. Can be "A", "B", "C", or "F"
13. String. Small string description of why the grade was given.
14. integer. 1 if result was verified or 0 if not verified. (For mma, rubi and maple only)

The following fields are present only in Rubi Table file

15. integer. Number of steps used.
16. integer. Number of rules used.
17. integer. Integrand leaf size.
18. real number. Ratio. Field 16 over field 17
19. String of form "{n,n,...}" which is list of the rules used by Rubi
20. String. The optimal antiderivative in Mathematica syntax

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June 27, 2023
Design-vide

CHAPTER 2

DETAILED SUMMARY TABLES OF RESULTS

| | | |
|-----|---|----|
| 2.1 | List of integrals sorted by grade for each CAS | 22 |
| 2.2 | Detailed conclusion table per each integral for all CAS systems | 27 |
| 2.3 | Detailed conclusion table specific for Rubi results | 92 |

2.1 List of integrals sorted by grade for each CAS

| | |
|------------------|----|
| Rubi | 22 |
| Mma | 23 |
| Maple | 23 |
| Fricas | 24 |
| Maxima | 24 |
| Giac | 25 |
| Mupad | 25 |
| Sympy | 26 |

Rubi

A grade { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 141, 142, 143, 144, 145, 146, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 195, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 208, 209, 210, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 227, 228, 229, 230, 231, 232, 233, 234, 235, 237, 238, 239, 240, 241, 247, 248, 249, 251, 252, 253, 255, 256, 259, 260, 261, 262, 263, 264, 267, 268, 269, 270, 271, 273, 274, 278, 279, 280, 281, 282, 283, 284, 285, 286, 289, 290, 291, 292, 295, 296, 297, 299, 300, 301, 302, 303, 304, 305, 306, 308, 309, 310, 311, 312, 314, 315, 316, 318, 319, 321 }

B grade { 46, 78, 118, 119, 196, 207, 242, 244, 254, 266, 272, 276, 287 }

C grade { 246, 258, 288, 294 }

F normal fail { 20, 77, 140, 147, 180, 211, 243, 245, 250, 257, 265, 275, 277, 293, 298, 307, 313, 317, 320 }

F(-1) timedout fail { }

F(-2) exception fail { }

Mma

A grade { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 56, 58, 59, 60, 61, 62, 63, 65, 66, 68, 69, 70, 72, 73, 74, 75, 76, 77, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 90, 91, 92, 93, 95, 96, 98, 99, 100, 101, 103, 104, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 169, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 184, 185, 186, 187, 188, 189, 190, 191, 192, 195, 198, 199, 200, 201, 202, 203, 204, 205, 206, 208, 210, 211, 212, 214, 215, 216, 217, 218, 219, 221, 222, 223, 224, 228, 229, 230, 231, 232, 233, 234, 235, 237, 239, 240, 241, 242, 243, 244, 245, 246, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 259, 260, 261, 262, 263, 264, 265, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 291, 292, 293, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 311, 312, 313, 314, 316, 317, 318, 319, 320, 321 }

B grade { 20, 43, 55, 57, 64, 67, 71, 78, 89, 94, 97, 105, 129, 168, 170, 183, 193, 196, 197, 207, 213, 220, 227, 238, 247, 258, 290, 310, 315 }

C grade { 102, 147, 209 }

F normal fail { 266, 294 }

F(-1) timedout fail { }

F(-2) exception fail { }

Maple

A grade { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 68, 69, 70, 72, 73, 74, 75, 76, 77, 78, 79, 80, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 133, 134, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 174, 176, 177, 178, 179, 181, 182, 183, 184, 185, 186, 187, 189, 190, 191, 192, 193, 195, 197, 198, 199, 200, 201, 202, 203, 204, 206, 208, 209, 210, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 228, 229, 230, 231, 232, 233, 234, 235, 237, 238, 239, 240, 241, 242, 243, 245, 246, 247, 248, 249, 251, 252, 253, 254, 255, 256, 260, 262, 264, 267, 269, 271, 272, 273, 274, 275, 277, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 292, 295, 296, 297, 298, 299, 300, 301, 303, 305, 306, 308, 310, 311, 314, 316, 321 }

B grade { 19, 46, 52, 64, 71, 105, 135, 180, 196, 211, 227, 304, 309, 312, 319 }

C grade { 20, 81, 116, 131, 132, 205, 207, 244, 257, 258, 261, 263, 268, 276, 278, 293, 313, 317 }

F normal fail { 173, 175, 250, 259, 265, 266, 270, 294, 302, 307, 315, 318, 320 }

F(-1) timeout fail { 188, 291 }

F(-2) exception fail { }

Fricas

A grade { 1, 2, 3, 4, 5, 6, 8, 9, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 28, 29, 31, 32, 33, 34, 35, 37, 38, 39, 40, 41, 42, 44, 45, 47, 48, 49, 50, 51, 54, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 68, 69, 70, 72, 73, 74, 75, 76, 77, 79, 81, 82, 83, 84, 85, 86, 87, 88, 90, 91, 92, 93, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 122, 123, 124, 125, 126, 127, 128, 130, 131, 132, 133, 134, 136, 138, 139, 141, 142, 143, 144, 145, 146, 147, 148, 150, 151, 152, 153, 154, 155, 157, 158, 160, 161, 162, 163, 164, 165, 166, 167, 171, 172, 173, 174, 175, 176, 177, 179, 181, 183, 184, 185, 187, 188, 189, 191, 192, 195, 198, 201, 202, 203, 204, 206, 208, 209, 210, 212, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 229, 230, 231, 232, 233, 235, 237, 240, 241, 242, 244, 245, 246, 248, 249, 250, 251, 252, 254, 256, 258, 260, 261, 262, 263, 264, 265, 267, 269, 271, 272, 273, 274, 276, 277, 278, 279, 281, 282, 283, 284, 285, 286, 287, 288, 289, 293, 295, 296, 298, 299, 300, 301, 303, 305, 306, 307, 308, 309, 311, 314, 315, 316, 317, 319, 320, 321 }

B grade { 7, 27, 30, 36, 43, 52, 53, 55, 64, 71, 78, 80, 89, 94, 121, 129, 135, 137, 140, 149, 156, 159, 168, 169, 170, 178, 180, 182, 186, 190, 193, 196, 197, 200, 207, 211, 213, 224, 228, 234, 238, 239, 243, 247, 253, 255, 257, 275, 280, 290, 292, 294, 297, 304, 310, 312, 313, 318 }

C grade { 10, 20 }

F normal fail { 11, 205, 266, 268, 270 }

F(-1) timeout fail { 46, 199, 291 }

F(-2) exception fail { 105, 227, 259, 302 }

Maxima

A grade { 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 21, 22, 24, 25, 28, 31, 33, 34, 35, 37, 38, 39, 40, 41, 44, 45, 47, 48, 49, 50, 51, 53, 54, 55, 56, 57, 60, 61, 62, 63, 65, 66, 67, 68, 69, 70, 72, 73, 75, 76, 77, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 91, 92, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 106, 107, 108, 109, 110, 111, 112, 114, 115, 117, 118, 120, 121, 122, 123, 124, 125, 126, 127, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 146, 148, 149, 151, 152, 153, 154, 155, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 168, 169, 171, 172, 174, 175, 176, 177, 178, 179, 181, 182, 183, 185, 186, 189, 190, 192, 195, 198, 199, 200, 201, 202, 203, 204, 205, 206, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 228, 229, 230, 231, 232, 233, 234, 237, 241, 242, 243, 245, 247, 248, 249, 250, 251, 252, 253, 260, 262, 263, 264, 265, 267, 269, 271, 272, 273, 274, 275, 276, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 291, 292, 295, 296, 298, 300, 304, 306, 308, 310, 311, 312, 314, 316, 317, 318, 319, 321 }

B grade { 7, 19, 26, 27, 29, 30, 32, 36, 43, 64, 71, 74, 78, 89, 90, 93, 94, 105, 113, 128, 145, 156, 180, 184, 187, 193, 196, 197, 207, 208, 227, 238, 239, 244, 254, 255, 258, 261, 290, 293, 297, 301, 303 }

C grade { 23, 119, 147, 150, 167, 173, 246, 256, 277, 289, 302, 309 }

F normal fail { 20, 42, 52, 58, 59, 116, 170, 188, 191, 235, 240, 257, 259, 266, 268, 270, 294, 299, 307, 313, 315, 320 }

F(-1) timedout fail { 305 }

F(-2) exception fail { 46 }

Giac

A grade { 1, 2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 17, 18, 21, 22, 23, 24, 25, 26, 27, 28, 31, 33, 34, 35, 37, 39, 40, 41, 42, 44, 45, 47, 48, 49, 50, 51, 52, 53, 54, 56, 57, 60, 61, 62, 63, 65, 66, 67, 68, 69, 70, 72, 73, 75, 76, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 90, 91, 92, 93, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 106, 107, 108, 109, 110, 111, 112, 114, 115, 118, 120, 122, 123, 124, 125, 126, 127, 130, 131, 132, 133, 134, 135, 136, 138, 139, 140, 141, 142, 143, 144, 146, 147, 148, 149, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 169, 171, 173, 174, 176, 177, 178, 179, 182, 183, 184, 185, 186, 188, 189, 190, 191, 192, 195, 198, 199, 200, 202, 203, 204, 206, 210, 212, 214, 215, 216, 218, 219, 220, 221, 222, 223, 224, 229, 230, 231, 233, 234, 235, 237, 241, 242, 243, 245, 248, 249, 251, 253, 254, 256, 260, 261, 262, 263, 264, 267, 269, 272, 273, 274, 276, 277, 279, 280, 281, 282, 283, 284, 286, 288, 289, 291, 292, 295, 296, 299, 300, 301, 303, 305, 306, 307, 308, 310, 311, 312, 314, 316, 317, 318, 319, 321 }

B grade { 4, 16, 19, 20, 29, 30, 36, 43, 46, 55, 58, 64, 71, 77, 78, 89, 94, 105, 113, 117, 121, 129, 137, 145, 168, 170, 180, 181, 187, 193, 196, 197, 207, 208, 209, 213, 217, 227, 228, 232, 238, 239, 244, 247, 255, 257, 258, 265, 285, 290, 293, 298, 304, 313 }

C grade { 119, 150, 246, 287, 302, 309 }

F normal fail { 11, 32, 38, 59, 74, 116, 128, 172, 175, 201, 205, 211, 240, 252, 259, 266, 268, 270, 271, 275, 278, 294, 297, 315, 320 }

F(-1) timedout fail { 250 }

F(-2) exception fail { }

Mupad

A grade { }

B grade { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 48, 49, 50, 51, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 192, 193, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 224, 227, 228, 229, 230, 231, 232, 234, 235, 237, 238, 239,

240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 251, 252, 253, 254, 255, 256, 257, 260, 261, 263, 264, 267, 269, 272, 273, 274, 276, 277, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 292, 293, 295, 296, 298, 299, 300, 301, 302, 303, 304, 305, 306, 308, 310, 311, 312, 313, 314, 316, 317, 319, 321 }

C grade { }

F normal fail { }

F(-1) timedout fail { 11, 42, 52, 63, 81, 93, 115, 116, 172, 191, 205, 223, 233, 250, 258, 259, 262, 265, 266, 268, 270, 271, 275, 278, 291, 294, 297, 307, 309, 315, 318, 320 }

F(-2) exception fail { }

Sympy

A grade { 4, 5, 6, 7, 9, 13, 15, 17, 19, 22, 23, 25, 26, 27, 28, 33, 34, 35, 40, 41, 44, 45, 47, 48, 50, 54, 55, 56, 57, 60, 61, 62, 63, 65, 66, 67, 68, 69, 72, 73, 75, 76, 77, 79, 80, 82, 83, 84, 85, 86, 88, 90, 91, 92, 95, 96, 97, 99, 100, 101, 102, 104, 106, 107, 108, 109, 110, 111, 114, 116, 117, 120, 123, 124, 125, 126, 127, 129, 130, 131, 133, 134, 135, 136, 138, 139, 140, 141, 143, 144, 145, 146, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 160, 162, 164, 165, 166, 167, 168, 171, 174, 176, 177, 178, 179, 180, 181, 182, 183, 185, 186, 187, 190, 192, 195, 198, 199, 200, 201, 202, 203, 205, 206, 208, 209, 210, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 224, 229, 230, 231, 232, 237, 240, 242, 245, 247, 248, 249, 251, 253, 254, 255, 256, 261, 262, 263, 264, 265, 269, 273, 274, 279, 281, 282, 283, 285, 286, 287, 289, 293, 295, 296, 298, 300, 301, 305, 306, 308, 309, 310, 311, 312, 314, 316, 321 }

B grade { 1, 2, 14, 16, 18, 29, 30, 31, 36, 38, 39, 43, 51, 53, 64, 70, 71, 78, 87, 89, 93, 94, 103, 105, 118, 119, 121, 137, 142, 159, 189, 193, 197, 204, 211, 227, 228, 234, 238, 239, 244, 260, 268, 272, 280, 284, 288, 292, 294, 302, 303, 304, 315 }

C grade { 3, 8, 24, 98, 112, 161, 223, 241, 252, 267, 278 }

F normal fail { 10, 11, 12, 20, 21, 32, 37, 42, 49, 52, 58, 59, 74, 81, 113, 115, 122, 128, 147, 163, 169, 170, 172, 173, 175, 184, 191, 233, 235, 243, 246, 250, 257, 258, 259, 266, 270, 271, 275, 276, 277, 290, 297, 299, 307, 313, 317, 318, 320 }

F(-1) timedout fail { 46, 132, 188, 196, 207, 291, 319 }

F(-2) exception fail { }

2.2 Detailed conclusion table per each integral for all CAS systems

Detailed conclusion table per each integral is given by the table below. The elapsed time is in seconds. For failed result it is given as **F(-1)** if the failure was due to timeout. It is given as **F(-2)** if the failure was due to an exception being raised, which could indicate a bug in the system. If the failure was due to integral not being evaluated within the time limit, then it is given as **F**.

In this table, the column **N.S.** means **normalized size** and is defined as $\frac{\text{antiderivative leaf size}}{\text{optimal antiderivative leaf size}}$. To make the table fit the page, the name **Mathematica** was abbreviated to **MMA**.

| Problem 1 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 25 | 25 | 25 | 20 | 19 | 17 | 114 | 13 | 14 |
| N.S. | 1 | 1.00 | 1.00 | 0.80 | 0.76 | 0.68 | 4.56 | 0.52 | 0.56 |
| time (sec) | N/A | 0.037 | 0.008 | 1.017 | 0.192 | 0.278 | 1.041 | 0.270 | 16.607 |

| Problem 2 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 17 | 31 | 24 | 23 | 13 | 65 | 13 | 14 |
| N.S. | 1 | 1.00 | 1.82 | 1.41 | 1.35 | 0.76 | 3.82 | 0.76 | 0.82 |
| time (sec) | N/A | 0.045 | 0.021 | 0.212 | 0.185 | 0.272 | 0.591 | 0.266 | 0.056 |

| Problem 3 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | C | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 21 | 32 | 21 | 18 | 22 | 22 | 144 | 22 | 19 |
| N.S. | 1 | 1.52 | 1.00 | 0.86 | 1.05 | 1.05 | 6.86 | 1.05 | 0.90 |
| time (sec) | N/A | 0.007 | 0.023 | 0.276 | 0.192 | 0.249 | 0.856 | 0.260 | 16.727 |

| Problem 4 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 27 | 27 | 27 | 22 | 21 | 23 | 20 | 60 | 31 |
| N.S. | 1 | 1.00 | 1.00 | 0.81 | 0.78 | 0.85 | 0.74 | 2.22 | 1.15 |
| time (sec) | N/A | 0.013 | 0.012 | 0.069 | 0.188 | 0.259 | 0.044 | 0.269 | 16.963 |

| Problem 5 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 27 | 27 | 26 | 18 | 20 | 21 | 37 | 21 | 24 |
| N.S. | 1 | 1.00 | 0.96 | 0.67 | 0.74 | 0.78 | 1.37 | 0.78 | 0.89 |
| time (sec) | N/A | 0.006 | 0.012 | 0.276 | 0.197 | 0.254 | 0.194 | 0.262 | 16.198 |

| Problem 6 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 15 | 10 | 11 | 11 | 8 | 11 | 11 |
| N.S. | 1 | 1.00 | 1.25 | 0.83 | 0.92 | 0.92 | 0.67 | 0.92 | 0.92 |
| time (sec) | N/A | 0.011 | 0.018 | 0.023 | 0.184 | 0.272 | 0.033 | 0.267 | 0.062 |

| Problem 7 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 30 | 30 | 31 | 33 | 50 | 69 | 46 | 46 | 30 |
| N.S. | 1 | 1.00 | 1.03 | 1.10 | 1.67 | 2.30 | 1.53 | 1.53 | 1.00 |
| time (sec) | N/A | 0.037 | 0.028 | 0.290 | 0.200 | 0.270 | 0.076 | 0.269 | 15.254 |

| Problem 8 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | C | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 14 | 14 | 14 | 11 | 10 | 10 | 24 | 10 | 10 |
| N.S. | 1 | 1.00 | 1.00 | 0.79 | 0.71 | 0.71 | 1.71 | 0.71 | 0.71 |
| time (sec) | N/A | 0.008 | 0.005 | 0.383 | 0.304 | 0.249 | 0.445 | 0.260 | 15.308 |

| Problem 9 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 12 | 15 | 11 | 10 | 13 | 11 |
| N.S. | 1 | 1.00 | 1.00 | 0.92 | 1.15 | 0.85 | 0.77 | 1.00 | 0.85 |
| time (sec) | N/A | 0.006 | 0.004 | 0.141 | 0.196 | 0.251 | 0.040 | 0.266 | 0.080 |

| Problem 10 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|----------|-------|-------|
| grade | N/A | A | A | A | A | C | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 71 | 98 | 40 | 49 | 80 | 73 | 0 | 80 | 65 |
| N.S. | 1 | 1.38 | 0.56 | 0.69 | 1.13 | 1.03 | 0.00 | 1.13 | 0.92 |
| time (sec) | N/A | 0.077 | 0.049 | 0.125 | 0.283 | 0.270 | 0.000 | 0.270 | 0.154 |

| Problem 11 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|----------|----------|----------|--------------|
| grade | N/A | A | A | A | A | F | F | F | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 89 | 89 | 89 | 70 | 56 | 0 | 0 | 0 | 0 |
| N.S. | 1 | 1.00 | 1.00 | 0.79 | 0.63 | 0.00 | 0.00 | 0.00 | 0.00 |
| time (sec) | N/A | 0.087 | 0.013 | 0.224 | 0.298 | 0.000 | 0.000 | 0.000 | 0.000 |

| Problem 12 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|----------|-------|-------|
| grade | N/A | A | A | A | A | A | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 53 | 53 | 51 | 36 | 35 | 35 | 0 | 36 | 35 |
| N.S. | 1 | 1.00 | 0.96 | 0.68 | 0.66 | 0.66 | 0.00 | 0.68 | 0.66 |
| time (sec) | N/A | 0.029 | 0.027 | 0.185 | 0.185 | 0.240 | 0.000 | 0.286 | 0.063 |

| Problem 13 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 4 | 3 | 3 | 2 | 3 | 3 |
| N.S. | 1 | 1.00 | 1.00 | 1.33 | 1.00 | 1.00 | 0.67 | 1.00 | 1.00 |
| time (sec) | N/A | 0.041 | 0.014 | 0.020 | 0.216 | 0.260 | 0.050 | 0.269 | 16.258 |

| Problem 14 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|--------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 29 | 46 | 29 | 36 | 28 | 31 | 66 | 28 | 25 |
| N.S. | 1 | 1.59 | 1.00 | 1.24 | 0.97 | 1.07 | 2.28 | 0.97 | 0.86 |
| time (sec) | N/A | 0.015 | 0.060 | 0.182 | 0.194 | 0.296 | 84.094 | 0.277 | 16.617 |

| Problem 15 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 19 | 19 | 16 | 16 | 15 | 19 | 12 | 15 | 16 |
| N.S. | 1 | 1.00 | 0.84 | 0.84 | 0.79 | 1.00 | 0.63 | 0.79 | 0.84 |
| time (sec) | N/A | 0.003 | 0.008 | 0.207 | 0.263 | 0.253 | 0.045 | 0.278 | 0.037 |

| Problem 16 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 21 | 21 | 37 | 26 | 25 | 25 | 26 | 29 | 13 |
| N.S. | 1 | 1.00 | 1.76 | 1.24 | 1.19 | 1.19 | 1.24 | 1.38 | 0.62 |
| time (sec) | N/A | 0.006 | 0.006 | 0.023 | 0.194 | 0.253 | 0.078 | 0.273 | 15.978 |

| Problem 17 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 11 | 11 | 12 | 11 | 11 | 10 | 11 | 8 |
| N.S. | 1 | 1.00 | 1.00 | 1.09 | 1.00 | 1.00 | 0.91 | 1.00 | 0.73 |
| time (sec) | N/A | 0.009 | 0.001 | 0.026 | 0.197 | 0.270 | 0.064 | 0.284 | 15.865 |

| Problem 18 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 14 | 15 | 11 | 15 | 16 | 14 |
| N.S. | 1 | 1.00 | 1.00 | 1.75 | 1.88 | 1.38 | 1.88 | 2.00 | 1.75 |
| time (sec) | N/A | 0.025 | 0.135 | 0.062 | 0.206 | 0.286 | 0.084 | 0.279 | 16.238 |

| Problem 19 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | B | B | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 11 | 10 | 25 | 65 | 10 | 8 | 79 | 10 |
| N.S. | 1 | 1.00 | 0.91 | 2.27 | 5.91 | 0.91 | 0.73 | 7.18 | 0.91 |
| time (sec) | N/A | 0.260 | 0.161 | 0.206 | 0.296 | 0.265 | 0.072 | 0.286 | 0.104 |

| Problem 20 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|----------|-------|-------|----------|--------|----------|-------|--------|
| grade | N/A | F | B | C | F | C | F | B | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 28 | 0 | 93 | 57 | 0 | 165 | 0 | 81 | 233 |
| N.S. | 1 | 0.00 | 3.32 | 2.04 | 0.00 | 5.89 | 0.00 | 2.89 | 8.32 |
| time (sec) | N/A | 0.000 | 1.251 | 0.213 | 0.000 | 0.288 | 0.000 | 0.294 | 16.058 |

| Problem 21 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|----------|-------|--------|
| grade | N/A | A | A | A | A | A | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 26 | 26 | 23 | 20 | 18 | 37 | 0 | 37 | 21 |
| N.S. | 1 | 1.00 | 0.88 | 0.77 | 0.69 | 1.42 | 0.00 | 1.42 | 0.81 |
| time (sec) | N/A | 0.025 | 0.098 | 0.028 | 0.280 | 0.259 | 0.000 | 0.286 | 16.079 |

| Problem 22 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 22 | 22 | 14 | 12 | 11 | 11 | 10 | 11 | 11 |
| N.S. | 1 | 1.00 | 0.64 | 0.55 | 0.50 | 0.50 | 0.45 | 0.50 | 0.50 |
| time (sec) | N/A | 0.022 | 0.026 | 0.024 | 0.188 | 0.257 | 0.033 | 0.279 | 15.787 |

| Problem 23 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | C | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 6 | 7 | 12 | 6 | 3 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 1.17 | 2.00 | 1.00 | 0.50 | 1.00 | 1.00 |
| time (sec) | N/A | 0.008 | 0.003 | 0.014 | 0.245 | 0.252 | 0.036 | 0.276 | 15.230 |

| Problem 24 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | C | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 53 | 51 | 53 | 61 | 38 | 52 | 124 | 42 | 41 |
| N.S. | 1 | 0.96 | 1.00 | 1.15 | 0.72 | 0.98 | 2.34 | 0.79 | 0.77 |
| time (sec) | N/A | 0.014 | 0.118 | 0.217 | 0.284 | 0.251 | 1.886 | 0.287 | 0.122 |

| Problem 25 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 16 | 16 | 16 | 13 | 12 | 12 | 10 | 12 | 13 |
| N.S. | 1 | 1.00 | 1.00 | 0.81 | 0.75 | 0.75 | 0.62 | 0.75 | 0.81 |
| time (sec) | N/A | 0.013 | 0.001 | 0.015 | 0.199 | 0.254 | 0.023 | 0.271 | 0.029 |

| Problem 26 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 6 | 7 | 21 | 6 | 5 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 1.17 | 3.50 | 1.00 | 0.83 | 1.00 | 1.00 |
| time (sec) | N/A | 0.007 | 0.001 | 0.009 | 0.195 | 0.261 | 0.033 | 0.276 | 14.715 |

| Problem 27 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 4 | 4 | 4 | 5 | 16 | 18 | 20 | 4 | 14 |
| N.S. | 1 | 1.00 | 1.00 | 1.25 | 4.00 | 4.50 | 5.00 | 1.00 | 3.50 |
| time (sec) | N/A | 0.004 | 0.133 | 0.223 | 0.274 | 0.253 | 0.461 | 0.267 | 14.897 |

| Problem 28 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 17 | 18 | 16 | 15 | 15 | 12 | 16 | 15 |
| N.S. | 1 | 1.00 | 1.06 | 0.94 | 0.88 | 0.88 | 0.71 | 0.94 | 0.88 |
| time (sec) | N/A | 0.010 | 0.005 | 0.182 | 0.203 | 0.255 | 0.028 | 0.265 | 0.035 |

| Problem 29 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | A | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 17 | 31 | 12 | 301 | 29 | 162 | 39 | 39 |
| N.S. | 1 | 1.00 | 1.82 | 0.71 | 17.71 | 1.71 | 9.53 | 2.29 | 2.29 |
| time (sec) | N/A | 0.101 | 0.081 | 0.135 | 0.281 | 0.259 | 8.203 | 0.276 | 14.988 |

| Problem 30 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 4 | 4 | 4 | 5 | 10 | 20 | 15 | 10 | 4 |
| N.S. | 1 | 1.00 | 1.00 | 1.25 | 2.50 | 5.00 | 3.75 | 2.50 | 1.00 |
| time (sec) | N/A | 0.008 | 0.004 | 0.226 | 0.191 | 0.235 | 0.228 | 0.254 | 0.019 |

| Problem 31 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 17 | 27 | 14 | 13 | 20 | 29 | 13 | 13 |
| N.S. | 1 | 1.00 | 1.59 | 0.82 | 0.76 | 1.18 | 1.71 | 0.76 | 0.76 |
| time (sec) | N/A | 0.028 | 0.045 | 1.000 | 0.189 | 0.262 | 0.021 | 0.272 | 14.958 |

| Problem 32 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | A | F | F | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 12 | 188 | 19 | 0 | 0 | 15 |
| N.S. | 1 | 1.00 | 1.00 | 0.92 | 14.46 | 1.46 | 0.00 | 0.00 | 1.15 |
| time (sec) | N/A | 0.059 | 0.029 | 0.598 | 0.367 | 0.265 | 0.000 | 0.000 | 15.457 |

| Problem 33 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 34 | 34 | 30 | 23 | 24 | 25 | 36 | 22 | 22 |
| N.S. | 1 | 1.00 | 0.88 | 0.68 | 0.71 | 0.74 | 1.06 | 0.65 | 0.65 |
| time (sec) | N/A | 0.022 | 0.003 | 0.256 | 0.183 | 0.280 | 0.018 | 0.265 | 0.054 |

| Problem 34 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 19 | 19 | 16 | 16 | 15 | 19 | 12 | 15 | 16 |
| N.S. | 1 | 1.00 | 0.84 | 0.84 | 0.79 | 1.00 | 0.63 | 0.79 | 0.84 |
| time (sec) | N/A | 0.003 | 0.006 | 0.019 | 0.280 | 0.252 | 0.041 | 0.265 | 0.033 |

| Problem 35 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 17 | 17 | 11 | 10 | 13 | 15 | 13 | 13 |
| N.S. | 1 | 1.00 | 1.00 | 0.65 | 0.59 | 0.76 | 0.88 | 0.76 | 0.76 |
| time (sec) | N/A | 0.004 | 0.007 | 0.039 | 0.186 | 0.265 | 0.112 | 0.262 | 14.864 |

| Problem 36 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 7 | 15 | 17 | 15 | 17 | 11 |
| N.S. | 1 | 1.00 | 1.00 | 2.33 | 5.00 | 5.67 | 5.00 | 5.67 | 3.67 |
| time (sec) | N/A | 0.003 | 0.001 | 0.053 | 0.212 | 0.257 | 0.058 | 0.266 | 0.055 |

| Problem 37 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 24 | 24 | 11 | 8 | 7 | 21 | 0 | 20 | 16 |
| N.S. | 1 | 1.00 | 0.46 | 0.33 | 0.29 | 0.88 | 0.00 | 0.83 | 0.67 |
| time (sec) | N/A | 0.021 | 0.089 | 0.320 | 0.305 | 0.260 | 0.000 | 0.272 | 15.662 |

| Problem 38 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | F | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 14 | 14 | 14 | 13 | 12 | 12 | 22 | 0 | 12 |
| N.S. | 1 | 1.00 | 1.00 | 0.93 | 0.86 | 0.86 | 1.57 | 0.00 | 0.86 |
| time (sec) | N/A | 0.003 | 0.004 | 0.175 | 0.200 | 0.269 | 0.325 | 0.000 | 15.016 |

| Problem 39 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 31 | 31 | 31 | 24 | 23 | 30 | 66 | 23 | 27 |
| N.S. | 1 | 1.00 | 1.00 | 0.77 | 0.74 | 0.97 | 2.13 | 0.74 | 0.87 |
| time (sec) | N/A | 0.037 | 0.024 | 0.698 | 0.194 | 0.263 | 0.831 | 0.271 | 15.136 |

| Problem 40 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 5 | 5 | 6 | 5 | 5 | 5 | 5 | 5 |
| N.S. | 1 | 1.00 | 1.00 | 1.20 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| time (sec) | N/A | 0.006 | 0.003 | 0.019 | 0.229 | 0.259 | 0.085 | 0.269 | 15.168 |

| Problem 41 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 16 | 8 | 12 | 11 | 11 | 10 | 11 | 11 |
| N.S. | 1 | 2.00 | 1.00 | 1.50 | 1.38 | 1.38 | 1.25 | 1.38 | 1.38 |
| time (sec) | N/A | 0.008 | 0.017 | 0.014 | 0.210 | 0.255 | 0.029 | 0.260 | 0.052 |

| Problem 42 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|----------|--------|----------|-------|--------------|
| grade | N/A | A | A | A | F | A | F | A | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 41 | 41 | 48 | 43 | 0 | 33 | 0 | 16 | 0 |
| N.S. | 1 | 1.00 | 1.17 | 1.05 | 0.00 | 0.80 | 0.00 | 0.39 | 0.00 |
| time (sec) | N/A | 0.024 | 0.277 | 0.784 | 0.000 | 0.278 | 0.000 | 0.272 | 0.000 |

| Problem 43 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 25 | 7 | 15 | 15 | 12 | 16 | 6 |
| N.S. | 1 | 1.00 | 4.17 | 1.17 | 2.50 | 2.50 | 2.00 | 2.67 | 1.00 |
| time (sec) | N/A | 0.004 | 0.005 | 0.203 | 0.204 | 0.242 | 0.037 | 0.264 | 0.064 |

| Problem 44 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 4 | 3 | 3 | 2 | 3 | 3 |
| N.S. | 1 | 1.00 | 1.00 | 1.33 | 1.00 | 1.00 | 0.67 | 1.00 | 1.00 |
| time (sec) | N/A | 0.038 | 0.003 | 0.000 | 0.232 | 0.250 | 0.051 | 0.260 | 0.003 |

| Problem 45 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 29 | 35 | 47 | 27 | 36 | 35 | 26 | 25 | 26 |
| N.S. | 1 | 1.21 | 1.62 | 0.93 | 1.24 | 1.21 | 0.90 | 0.86 | 0.90 |
| time (sec) | N/A | 0.011 | 0.076 | 0.342 | 0.286 | 0.254 | 0.203 | 0.271 | 14.398 |

| Problem 46 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | B | A | B | F(-2) | F(-1) | F(-1) | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 801 | 12 | 602 | 0 | 0 | 0 | 601 | 601 |
| N.S. | 1 | 66.75 | 1.00 | 50.17 | 0.00 | 0.00 | 0.00 | 50.08 | 50.08 |
| time (sec) | N/A | 0.632 | 0.008 | 1.155 | 0.000 | 0.000 | 0.000 | 0.286 | 21.211 |

| Problem 47 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 10 | 11 | 7 | 7 | 7 | 7 | 7 |
| N.S. | 1 | 1.00 | 1.00 | 1.10 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| time (sec) | N/A | 0.038 | 0.022 | 0.046 | 0.220 | 0.249 | 0.656 | 0.263 | 0.067 |

| Problem 48 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 28 | 28 | 24 | 22 | 32 | 46 | 29 | 23 | 21 |
| N.S. | 1 | 1.00 | 0.86 | 0.79 | 1.14 | 1.64 | 1.04 | 0.82 | 0.75 |
| time (sec) | N/A | 0.032 | 0.016 | 0.024 | 0.206 | 0.254 | 0.040 | 0.273 | 0.064 |

| Problem 49 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|----------|-------|-------|
| grade | N/A | A | A | A | A | A | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 38 | 38 | 64 | 39 | 43 | 32 | 0 | 29 | 43 |
| N.S. | 1 | 1.00 | 1.68 | 1.03 | 1.13 | 0.84 | 0.00 | 0.76 | 1.13 |
| time (sec) | N/A | 0.017 | 0.107 | 0.118 | 0.308 | 0.242 | 0.000 | 0.268 | 0.057 |

| Problem 50 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 20 | 18 | 15 | 15 | 14 | 15 | 15 | 14 |
| N.S. | 1 | 1.00 | 0.90 | 0.75 | 0.75 | 0.70 | 0.75 | 0.75 | 0.70 |
| time (sec) | N/A | 0.008 | 0.015 | 0.151 | 0.213 | 0.240 | 0.049 | 0.271 | 0.071 |

| Problem 51 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 21 | 21 | 15 | 14 | 13 | 14 | 105 | 13 | 9 |
| N.S. | 1 | 1.00 | 0.71 | 0.67 | 0.62 | 0.67 | 5.00 | 0.62 | 0.43 |
| time (sec) | N/A | 0.007 | 0.006 | 0.054 | 0.186 | 0.244 | 1.661 | 0.267 | 15.093 |

| Problem 52 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|----------|--------|----------|-------|--------------|
| grade | N/A | A | A | B | F | B | F | A | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 32 | 21 | 41 | 0 | 37 | 0 | 21 | 0 |
| N.S. | 1 | 1.60 | 1.05 | 2.05 | 0.00 | 1.85 | 0.00 | 1.05 | 0.00 |
| time (sec) | N/A | 0.203 | 0.121 | 0.155 | 0.000 | 0.260 | 0.000 | 0.279 | 0.000 |

| Problem 53 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|--------|-------|--------|
| grade | N/A | A | A | A | A | B | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 27 | 27 | 22 | 20 | 19 | 186 | 138 | 16 | 53 |
| N.S. | 1 | 1.00 | 0.81 | 0.74 | 0.70 | 6.89 | 5.11 | 0.59 | 1.96 |
| time (sec) | N/A | 0.012 | 0.031 | 0.157 | 0.200 | 0.246 | 53.393 | 0.276 | 15.164 |

| Problem 54 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 23 | 23 | 37 | 18 | 17 | 31 | 15 | 17 | 17 |
| N.S. | 1 | 1.00 | 1.61 | 0.78 | 0.74 | 1.35 | 0.65 | 0.74 | 0.74 |
| time (sec) | N/A | 0.003 | 0.064 | 0.260 | 0.277 | 0.248 | 0.070 | 0.277 | 0.032 |

| Problem 55 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | B | A | A | B | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 23 | 10 | 11 | 21 | 10 | 29 | 11 |
| N.S. | 1 | 1.00 | 2.30 | 1.00 | 1.10 | 2.10 | 1.00 | 2.90 | 1.10 |
| time (sec) | N/A | 0.015 | 0.089 | 0.216 | 0.300 | 0.244 | 0.251 | 0.272 | 14.487 |

| Problem 56 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 9 | 7 | 8 | 7 | 7 | 8 |
| N.S. | 1 | 1.00 | 1.00 | 1.12 | 0.88 | 1.00 | 0.88 | 0.88 | 1.00 |
| time (sec) | N/A | 0.001 | 0.001 | 0.010 | 0.191 | 0.252 | 0.035 | 0.271 | 0.021 |

| Problem 57 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 23 | 11 | 15 | 18 | 8 | 10 | 10 |
| N.S. | 1 | 1.00 | 2.30 | 1.10 | 1.50 | 1.80 | 0.80 | 1.00 | 1.00 |
| time (sec) | N/A | 0.008 | 0.007 | 0.039 | 0.184 | 0.249 | 0.171 | 0.271 | 0.026 |

| Problem 58 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|----------|--------|----------|-------|--------|
| grade | N/A | A | A | A | F | A | F | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 53 | 53 | 70 | 53 | 0 | 64 | 0 | 117 | 64 |
| N.S. | 1 | 1.00 | 1.32 | 1.00 | 0.00 | 1.21 | 0.00 | 2.21 | 1.21 |
| time (sec) | N/A | 0.053 | 0.208 | 0.022 | 0.000 | 0.240 | 0.000 | 0.308 | 16.545 |

| Problem 59 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|----------|--------|----------|----------|-------|
| grade | N/A | A | A | A | F | A | F | F | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 46 | 46 | 46 | 18 | 0 | 18 | 0 | 0 | 179 |
| N.S. | 1 | 1.00 | 1.00 | 0.39 | 0.00 | 0.39 | 0.00 | 0.00 | 3.89 |
| time (sec) | N/A | 0.480 | 0.015 | 0.552 | 0.000 | 0.258 | 0.000 | 0.000 | 0.248 |

| Problem 60 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 37 | 37 | 35 | 29 | 32 | 44 | 27 | 28 | 32 |
| N.S. | 1 | 1.00 | 0.95 | 0.78 | 0.86 | 1.19 | 0.73 | 0.76 | 0.86 |
| time (sec) | N/A | 0.046 | 0.014 | 0.023 | 0.190 | 0.236 | 0.037 | 0.267 | 13.811 |

| Problem 61 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 5 | 5 | 6 | 5 | 5 | 5 | 5 | 5 |
| N.S. | 1 | 1.00 | 1.00 | 1.20 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| time (sec) | N/A | 0.040 | 0.024 | 0.166 | 0.243 | 0.250 | 3.730 | 0.270 | 14.435 |

| Problem 62 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 17 | 17 | 14 | 17 | 13 | 10 | 16 | 13 |
| N.S. | 1 | 1.00 | 1.00 | 0.82 | 1.00 | 0.76 | 0.59 | 0.94 | 0.76 |
| time (sec) | N/A | 0.010 | 0.005 | 0.159 | 0.201 | 0.236 | 0.041 | 0.263 | 0.075 |

| Problem 63 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------------|
| grade | N/A | A | A | A | A | A | A | A | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 17 | 17 | 16 | 15 | 15 | 12 | 15 | 0 |
| N.S. | 1 | 1.00 | 1.00 | 0.94 | 0.88 | 0.88 | 0.71 | 0.88 | 0.00 |
| time (sec) | N/A | 0.038 | 0.012 | 0.155 | 0.276 | 0.254 | 0.072 | 0.274 | 0.000 |

| Problem 64 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | B | B | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 23 | 23 | 567 | 501 | 501 | 501 | 561 | 501 | 12 |
| N.S. | 1 | 1.00 | 24.65 | 21.78 | 21.78 | 21.78 | 24.39 | 21.78 | 0.52 |
| time (sec) | N/A | 0.008 | 0.010 | 0.188 | 0.198 | 0.238 | 0.079 | 0.269 | 13.917 |

| Problem 65 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 12 | 11 | 12 | 12 | 11 | 11 |
| N.S. | 1 | 1.00 | 1.00 | 0.92 | 0.85 | 0.92 | 0.92 | 0.85 | 0.85 |
| time (sec) | N/A | 0.022 | 0.014 | 0.078 | 0.200 | 0.269 | 0.265 | 0.268 | 14.361 |

| Problem 66 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 16 | 16 | 16 | 13 | 12 | 12 | 15 | 12 | 12 |
| N.S. | 1 | 1.00 | 1.00 | 0.81 | 0.75 | 0.75 | 0.94 | 0.75 | 0.75 |
| time (sec) | N/A | 0.009 | 0.036 | 0.156 | 0.270 | 0.244 | 0.408 | 0.272 | 14.481 |

| Problem 67 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 25 | 25 | 54 | 22 | 24 | 28 | 26 | 36 | 21 |
| N.S. | 1 | 1.00 | 2.16 | 0.88 | 0.96 | 1.12 | 1.04 | 1.44 | 0.84 |
| time (sec) | N/A | 0.005 | 0.033 | 0.192 | 0.274 | 0.242 | 0.071 | 0.271 | 0.155 |

| Problem 68 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 12 | 10 | 9 | 9 | 10 | 9 | 9 |
| N.S. | 1 | 1.00 | 1.00 | 0.83 | 0.75 | 0.75 | 0.83 | 0.75 | 0.75 |
| time (sec) | N/A | 0.011 | 0.030 | 0.041 | 0.282 | 0.232 | 0.221 | 0.272 | 0.135 |

| Problem 69 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 12 | 9 | 8 | 8 | 7 | 8 | 8 |
| N.S. | 1 | 1.00 | 1.00 | 0.75 | 0.67 | 0.67 | 0.58 | 0.67 | 0.67 |
| time (sec) | N/A | 0.006 | 0.006 | 0.170 | 0.337 | 0.237 | 0.042 | 0.269 | 15.463 |

| Problem 70 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 13 | 13 | 9 | 8 | 15 | 22 | 8 | 13 |
| N.S. | 1 | 1.62 | 1.62 | 1.12 | 1.00 | 1.88 | 2.75 | 1.00 | 1.62 |
| time (sec) | N/A | 0.019 | 0.031 | 0.140 | 0.196 | 0.252 | 0.327 | 0.299 | 15.118 |

| Problem 71 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | B | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 11 | 39 | 27 | 26 | 80 | 22 | 49 | 30 |
| N.S. | 1 | 1.00 | 3.55 | 2.45 | 2.36 | 7.27 | 2.00 | 4.45 | 2.73 |
| time (sec) | N/A | 0.019 | 0.007 | 0.204 | 0.226 | 0.231 | 0.222 | 0.283 | 0.096 |

| Problem 72 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 27 | 27 | 20 | 17 | 19 | 19 | 41 | 19 | 19 |
| N.S. | 1 | 1.00 | 0.74 | 0.63 | 0.70 | 0.70 | 1.52 | 0.70 | 0.70 |
| time (sec) | N/A | 0.014 | 0.024 | 0.231 | 0.183 | 0.245 | 0.093 | 0.277 | 0.051 |

| Problem 73 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 10 | 16 | 11 | 9 | 10 | 11 | 10 |
| N.S. | 1 | 1.00 | 1.00 | 1.60 | 1.10 | 0.90 | 1.00 | 1.10 | 1.00 |
| time (sec) | N/A | 0.045 | 0.033 | 0.025 | 0.214 | 0.237 | 0.563 | 0.268 | 18.822 |

| Problem 74 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|----------|----------|-------|
| grade | N/A | A | A | A | B | A | F | F | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 12 | 188 | 19 | 0 | 0 | 15 |
| N.S. | 1 | 1.00 | 1.00 | 0.92 | 14.46 | 1.46 | 0.00 | 0.00 | 1.15 |
| time (sec) | N/A | 0.060 | 0.022 | 0.434 | 0.363 | 0.258 | 0.000 | 0.000 | 0.002 |

| Problem 75 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 14 | 14 | 14 | 15 | 14 | 5 | 7 | 14 | 16 |
| N.S. | 1 | 1.00 | 1.00 | 1.07 | 1.00 | 0.36 | 0.50 | 1.00 | 1.14 |
| time (sec) | N/A | 0.007 | 0.004 | 0.016 | 0.188 | 0.246 | 0.027 | 0.270 | 0.088 |

| Problem 76 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |
| time (sec) | N/A | 0.001 | 0.000 | 0.013 | 0.198 | 0.260 | 0.025 | 0.278 | 0.009 |

| Problem 77 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|----------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | F | A | A | A | A | A | B | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 7 | 0 | 7 | 8 | 7 | 7 | 5 | 20 | 7 |
| N.S. | 1 | 0.00 | 1.00 | 1.14 | 1.00 | 1.00 | 0.71 | 2.86 | 1.00 |
| time (sec) | N/A | 0.000 | 0.887 | 0.151 | 0.254 | 0.256 | 0.329 | 0.277 | 16.800 |

| Problem 78 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | B | B | A | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 23 | 23 | 8 | 19 | 19 | 15 | 19 | 19 |
| N.S. | 1 | 2.09 | 2.09 | 0.73 | 1.73 | 1.73 | 1.36 | 1.73 | 1.73 |
| time (sec) | N/A | 0.004 | 0.000 | 0.009 | 0.183 | 0.242 | 0.015 | 0.268 | 0.033 |

| Problem 79 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 35 | 35 | 43 | 23 | 22 | 36 | 27 | 23 | 25 |
| N.S. | 1 | 1.00 | 1.23 | 0.66 | 0.63 | 1.03 | 0.77 | 0.66 | 0.71 |
| time (sec) | N/A | 0.006 | 0.121 | 0.321 | 0.263 | 0.247 | 0.129 | 0.289 | 0.036 |

| Problem 80 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 27 | 27 | 29 | 20 | 19 | 45 | 15 | 19 | 45 |
| N.S. | 1 | 1.00 | 1.07 | 0.74 | 0.70 | 1.67 | 0.56 | 0.70 | 1.67 |
| time (sec) | N/A | 0.008 | 0.040 | 0.193 | 0.196 | 0.260 | 0.048 | 0.264 | 16.237 |

| Problem 81 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-----------|--------|--------|----------|-------|--------------|
| grade | N/A | A | A | C | A | A | F | A | F(-1) |
| verified | N/A | Yes | Yes | No | TBD | TBD | TBD | TBD | TBD |
| size | 15 | 15 | 15 | 36 | 13 | 5 | 0 | 6 | 0 |
| N.S. | 1 | 1.00 | 1.00 | 2.40 | 0.87 | 0.33 | 0.00 | 0.40 | 0.00 |
| time (sec) | N/A | 0.041 | 0.020 | 0.372 | 0.193 | 0.270 | 0.000 | 0.282 | 0.000 |

| Problem 82 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 9 | 9 | 7 | 7 | 7 | 5 | 7 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 0.78 | 0.78 | 0.78 | 0.56 | 0.78 | 0.67 |
| time (sec) | N/A | 0.014 | 0.000 | 0.010 | 0.191 | 0.224 | 0.019 | 0.272 | 0.020 |

| Problem 83 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 9 | 8 | 8 | 5 | 8 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 1.12 | 1.00 | 1.00 | 0.62 | 1.00 | 0.75 |
| time (sec) | N/A | 0.002 | 0.000 | 0.013 | 0.186 | 0.258 | 0.038 | 0.268 | 0.020 |

| Problem 84 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 12 | 6 | 10 | 9 | 9 | 8 | 10 | 7 |
| N.S. | 1 | 2.00 | 1.00 | 1.67 | 1.50 | 1.50 | 1.33 | 1.67 | 1.17 |
| time (sec) | N/A | 0.012 | 0.016 | 0.019 | 0.203 | 0.246 | 0.036 | 0.282 | 15.700 |

| Problem 85 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 14 | 24 | 14 | 11 | 10 | 19 | 14 | 10 | 18 |
| N.S. | 1 | 1.71 | 1.00 | 0.79 | 0.71 | 1.36 | 1.00 | 0.71 | 1.29 |
| time (sec) | N/A | 0.031 | 0.007 | 0.074 | 0.200 | 0.238 | 0.023 | 0.271 | 17.683 |

| Problem 86 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 10 | 9 | 8 | 8 | 10 | 8 | 8 |
| N.S. | 1 | 1.00 | 1.00 | 0.90 | 0.80 | 0.80 | 1.00 | 0.80 | 0.80 |
| time (sec) | N/A | 0.017 | 0.033 | 0.073 | 0.202 | 0.281 | 0.106 | 0.274 | 17.252 |

| Problem 87 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 8 | 7 | 6 | 6 | 7 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.33 | 1.17 | 1.00 | 1.00 | 1.17 | 1.00 | 1.00 |
| time (sec) | N/A | 0.008 | 0.002 | 0.016 | 0.268 | 0.255 | 0.023 | 0.269 | 0.038 |

| Problem 88 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 30 | 52 | 31 | 26 | 21 | 21 | 48 | 21 | 28 |
| N.S. | 1 | 1.73 | 1.03 | 0.87 | 0.70 | 0.70 | 1.60 | 0.70 | 0.93 |
| time (sec) | N/A | 0.035 | 0.014 | 0.016 | 0.208 | 0.238 | 0.139 | 0.282 | 0.028 |

| Problem 89 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | B | A | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 19 | 12 | 17 | 21 | 19 | 19 | 18 |
| N.S. | 1 | 1.00 | 2.38 | 1.50 | 2.12 | 2.62 | 2.38 | 2.38 | 2.25 |
| time (sec) | N/A | 0.012 | 0.006 | 0.096 | 0.197 | 0.268 | 0.048 | 0.275 | 16.474 |

| Problem 90 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | B | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 6 | 7 | 21 | 6 | 5 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 1.17 | 3.50 | 1.00 | 0.83 | 1.00 | 1.00 |
| time (sec) | N/A | 0.007 | 0.001 | 0.010 | 0.199 | 0.250 | 0.032 | 0.266 | 0.002 |

| Problem 91 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 18 | 18 | 18 | 15 | 14 | 14 | 12 | 14 | 14 |
| N.S. | 1 | 1.00 | 1.00 | 0.83 | 0.78 | 0.78 | 0.67 | 0.78 | 0.78 |
| time (sec) | N/A | 0.010 | 0.004 | 0.151 | 0.188 | 0.235 | 0.028 | 0.278 | 16.802 |

| Problem 92 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 5 | 4 | 4 | 3 | 4 | 4 |
| N.S. | 1 | 1.00 | 1.00 | 0.62 | 0.50 | 0.50 | 0.38 | 0.50 | 0.50 |
| time (sec) | N/A | 0.003 | 0.005 | 0.299 | 0.286 | 0.259 | 0.039 | 0.275 | 16.309 |

| Problem 93 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------------|
| grade | N/A | A | A | A | B | A | B | A | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 15 | 15 | 26 | 20 | 89 | 28 | 105 | 26 | 0 |
| N.S. | 1 | 1.00 | 1.73 | 1.33 | 5.93 | 1.87 | 7.00 | 1.73 | 0.00 |
| time (sec) | N/A | 0.024 | 0.015 | 0.244 | 0.193 | 0.283 | 0.568 | 0.283 | 0.000 |

| Problem 94 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | B | A | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 23 | 7 | 17 | 17 | 15 | 18 | 6 |
| N.S. | 1 | 1.00 | 2.88 | 0.88 | 2.12 | 2.12 | 1.88 | 2.25 | 0.75 |
| time (sec) | N/A | 0.003 | 0.006 | 0.184 | 0.188 | 0.240 | 0.040 | 0.269 | 16.744 |

| Problem 95 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 35 | 35 | 43 | 23 | 22 | 36 | 27 | 23 | 25 |
| N.S. | 1 | 1.00 | 1.23 | 0.66 | 0.63 | 1.03 | 0.77 | 0.66 | 0.71 |
| time (sec) | N/A | 0.005 | 0.001 | 0.184 | 0.274 | 0.269 | 0.127 | 0.273 | 0.002 |

| Problem 96 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 17 | 17 | 14 | 14 | 14 | 14 | 14 | 13 |
| N.S. | 1 | 1.00 | 1.00 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.76 |
| time (sec) | N/A | 0.027 | 0.028 | 3.794 | 0.198 | 0.259 | 0.047 | 0.275 | 16.449 |

| Problem 97 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 11 | 25 | 11 | 15 | 17 | 8 | 10 | 10 |
| N.S. | 1 | 1.00 | 2.27 | 1.00 | 1.36 | 1.55 | 0.73 | 0.91 | 0.91 |
| time (sec) | N/A | 0.009 | 0.022 | 0.054 | 0.200 | 0.246 | 0.175 | 0.270 | 0.025 |

| Problem 98 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | C | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 22 | 22 | 22 | 18 | 14 | 24 | 39 | 18 | 18 |
| N.S. | 1 | 1.00 | 1.00 | 0.82 | 0.64 | 1.09 | 1.77 | 0.82 | 0.82 |
| time (sec) | N/A | 0.012 | 0.007 | 0.234 | 0.275 | 0.251 | 0.502 | 0.272 | 17.029 |

| Problem 99 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 10 | 11 | 10 | 10 | 8 | 10 | 8 |
| N.S. | 1 | 1.00 | 1.00 | 1.10 | 1.00 | 1.00 | 0.80 | 1.00 | 0.80 |
| time (sec) | N/A | 0.002 | 0.000 | 0.010 | 0.189 | 0.257 | 0.029 | 0.271 | 0.017 |

| Problem 100 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 35 | 35 | 29 | 26 | 21 | 21 | 34 | 21 | 21 |
| N.S. | 1 | 1.00 | 0.83 | 0.74 | 0.60 | 0.60 | 0.97 | 0.60 | 0.60 |
| time (sec) | N/A | 0.028 | 0.028 | 0.025 | 0.186 | 0.253 | 0.150 | 0.277 | 16.283 |

| Problem 101 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 10 | 10 | 9 | 9 | 7 | 9 | 11 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 0.90 | 0.90 | 0.70 | 0.90 | 1.10 |
| time (sec) | N/A | 0.013 | 0.061 | 0.031 | 0.226 | 0.277 | 0.040 | 0.277 | 0.071 |

| Problem 102 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | C | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 34 | 34 | 11 | 19 | 14 | 14 | 31 | 14 | 23 |
| N.S. | 1 | 1.00 | 0.32 | 0.56 | 0.41 | 0.41 | 0.91 | 0.41 | 0.68 |
| time (sec) | N/A | 0.031 | 0.004 | 0.010 | 0.194 | 0.252 | 0.072 | 0.268 | 17.718 |

| Problem 103 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 15 | 15 | 15 | 12 | 11 | 13 | 26 | 11 | 13 |
| N.S. | 1 | 1.00 | 1.00 | 0.80 | 0.73 | 0.87 | 1.73 | 0.73 | 0.87 |
| time (sec) | N/A | 0.009 | 0.008 | 0.102 | 0.201 | 0.244 | 0.127 | 0.278 | 0.054 |

| Problem 104 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 6 | 7 | 6 | 6 | 5 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 1.17 | 1.00 | 1.00 | 0.83 | 1.00 | 1.00 |
| time (sec) | N/A | 0.004 | 0.003 | 0.036 | 0.212 | 0.249 | 0.019 | 0.273 | 18.421 |

| Problem 105 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|--------|--------|--------|--------|--------|--------|--------|
| grade | N/A | A | B | B | B | F(-2) | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 23 | 23 | 12138 | 10076 | 10076 | 0 | 12024 | 10076 | 15 |
| N.S. | 1 | 1.00 | 527.74 | 438.09 | 438.09 | 0.00 | 522.78 | 438.09 | 0.65 |
| time (sec) | N/A | 0.029 | 0.132 | 7.625 | 2.294 | 0.000 | 2.415 | 1.638 | 34.755 |

| Problem 106 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 16 | 16 | 16 | 15 | 14 | 22 | 12 | 22 | 14 |
| N.S. | 1 | 1.00 | 1.00 | 0.94 | 0.88 | 1.38 | 0.75 | 1.38 | 0.88 |
| time (sec) | N/A | 0.004 | 0.004 | 0.008 | 0.185 | 0.265 | 0.049 | 0.277 | 19.877 |

| Problem 107 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 15 | 15 | 16 | 12 | 11 | 11 | 10 | 12 | 11 |
| N.S. | 1 | 1.00 | 1.07 | 0.80 | 0.73 | 0.73 | 0.67 | 0.80 | 0.73 |
| time (sec) | N/A | 0.006 | 0.004 | 0.168 | 0.187 | 0.249 | 0.024 | 0.272 | 0.029 |

| Problem 108 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 21 | 21 | 16 | 16 | 15 | 13 | 15 | 15 | 14 |
| N.S. | 1 | 1.00 | 0.76 | 0.76 | 0.71 | 0.62 | 0.71 | 0.71 | 0.67 |
| time (sec) | N/A | 0.010 | 0.006 | 0.038 | 0.270 | 0.237 | 0.079 | 0.270 | 0.029 |

| Problem 109 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 19 | 19 | 19 | 14 | 13 | 13 | 12 | 15 | 8 |
| N.S. | 1 | 1.00 | 1.00 | 0.74 | 0.68 | 0.68 | 0.63 | 0.79 | 0.42 |
| time (sec) | N/A | 0.004 | 0.004 | 0.179 | 0.185 | 0.247 | 0.045 | 0.267 | 0.175 |

| Problem 110 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 19 | 28 | 16 | 18 | 17 | 17 | 19 | 27 | 15 |
| N.S. | 1 | 1.47 | 0.84 | 0.95 | 0.89 | 0.89 | 1.00 | 1.42 | 0.79 |
| time (sec) | N/A | 0.284 | 0.046 | 0.198 | 0.339 | 0.245 | 0.789 | 0.267 | 21.299 |

| Problem 111 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 25 | 25 | 25 | 24 | 23 | 23 | 22 | 23 | 22 |
| N.S. | 1 | 1.00 | 1.00 | 0.96 | 0.92 | 0.92 | 0.88 | 0.92 | 0.88 |
| time (sec) | N/A | 0.039 | 0.007 | 0.032 | 0.273 | 0.249 | 0.066 | 0.265 | 0.033 |

| Problem 112 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | C | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 22 | 22 | 22 | 17 | 13 | 22 | 68 | 18 | 26 |
| N.S. | 1 | 1.00 | 1.00 | 0.77 | 0.59 | 1.00 | 3.09 | 0.82 | 1.18 |
| time (sec) | N/A | 0.011 | 0.006 | 0.245 | 0.274 | 0.255 | 0.704 | 0.263 | 0.105 |

| Problem 113 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | A | F | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 19 | 19 | 19 | 16 | 74 | 28 | 0 | 103 | 15 |
| N.S. | 1 | 1.00 | 1.00 | 0.84 | 3.89 | 1.47 | 0.00 | 5.42 | 0.79 |
| time (sec) | N/A | 0.022 | 0.012 | 0.131 | 0.280 | 0.267 | 0.000 | 0.280 | 20.914 |

| Problem 114 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 25 | 25 | 24 | 19 | 19 | 18 | 15 | 22 | 18 |
| N.S. | 1 | 1.00 | 0.96 | 0.76 | 0.76 | 0.72 | 0.60 | 0.88 | 0.72 |
| time (sec) | N/A | 0.018 | 0.007 | 0.023 | 0.195 | 0.254 | 0.050 | 0.267 | 19.619 |

| Problem 115 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|----------|-------|--------------|
| grade | N/A | A | A | A | A | A | F | A | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 11 | 11 | 17 | 16 | 11 | 0 | 12 | 0 |
| N.S. | 1 | 1.00 | 1.00 | 1.55 | 1.45 | 1.00 | 0.00 | 1.09 | 0.00 |
| time (sec) | N/A | 0.024 | 0.071 | 0.193 | 0.208 | 0.233 | 0.000 | 0.262 | 0.000 |

| Problem 116 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|----------|--------|-------|----------|--------------|
| grade | N/A | A | A | C | F | A | A | F | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 37 | 37 | 37 | 57 | 0 | 26 | 42 | 0 | 0 |
| N.S. | 1 | 1.00 | 1.00 | 1.54 | 0.00 | 0.70 | 1.14 | 0.00 | 0.00 |
| time (sec) | N/A | 0.014 | 0.010 | 0.034 | 0.000 | 0.260 | 0.118 | 0.000 | 0.000 |

| Problem 117 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 30 | 20 | 16 | 19 | 23 | 32 | 40 | 32 |
| N.S. | 1 | 1.50 | 1.00 | 0.80 | 0.95 | 1.15 | 1.60 | 2.00 | 1.60 |
| time (sec) | N/A | 0.027 | 0.024 | 0.046 | 0.283 | 0.247 | 0.113 | 0.273 | 21.007 |

| Problem 118 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | B | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 29 | 8 | 7 | 6 | 5 | 29 | 6 | 6 |
| N.S. | 1 | 5.80 | 1.60 | 1.40 | 1.20 | 1.00 | 5.80 | 1.20 | 1.20 |
| time (sec) | N/A | 0.030 | 0.004 | 0.240 | 0.190 | 0.252 | 0.022 | 0.263 | 20.292 |

| Problem 119 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | B | A | A | C | A | B | C | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 16 | 37 | 16 | 13 | 19 | 12 | 31 | 22 | 14 |
| N.S. | 1 | 2.31 | 1.00 | 0.81 | 1.19 | 0.75 | 1.94 | 1.38 | 0.88 |
| time (sec) | N/A | 0.008 | 0.024 | 0.167 | 0.179 | 0.253 | 0.529 | 0.262 | 0.044 |

| Problem 120 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 7 | 6 | 6 | 7 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 0.88 | 0.75 | 0.75 | 0.88 | 0.75 | 0.75 |
| time (sec) | N/A | 0.011 | 0.003 | 0.029 | 0.173 | 0.262 | 0.100 | 0.270 | 20.116 |

| Problem 121 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 7 | 6 | 17 | 15 | 25 | 11 |
| N.S. | 1 | 1.00 | 1.00 | 2.33 | 2.00 | 5.67 | 5.00 | 8.33 | 3.67 |
| time (sec) | N/A | 0.003 | 0.000 | 0.022 | 0.177 | 0.250 | 0.060 | 0.264 | 0.004 |

| Problem 122 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 4 | 4 | 4 | 4 | 3 | 3 | 0 | 3 | 3 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 0.75 | 0.75 | 0.00 | 0.75 | 0.75 |
| time (sec) | N/A | 0.009 | 0.009 | 0.438 | 0.189 | 0.239 | 0.000 | 0.265 | 17.480 |

| Problem 123 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 28 | 28 | 28 | 23 | 17 | 22 | 22 | 22 | 17 |
| N.S. | 1 | 1.00 | 1.00 | 0.82 | 0.61 | 0.79 | 0.79 | 0.79 | 0.61 |
| time (sec) | N/A | 0.011 | 0.001 | 0.013 | 0.185 | 0.262 | 0.046 | 0.260 | 0.079 |

| Problem 124 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 22 | 22 | 22 | 19 | 18 | 18 | 20 | 18 | 18 |
| N.S. | 1 | 1.00 | 1.00 | 0.86 | 0.82 | 0.82 | 0.91 | 0.82 | 0.82 |
| time (sec) | N/A | 0.018 | 0.019 | 0.114 | 0.279 | 0.246 | 0.077 | 0.274 | 0.144 |

| Problem 125 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 9 | 8 | 8 | 5 | 8 | 8 |
| N.S. | 1 | 1.00 | 1.00 | 1.12 | 1.00 | 1.00 | 0.62 | 1.00 | 1.00 |
| time (sec) | N/A | 0.005 | 0.001 | 0.033 | 0.183 | 0.247 | 0.031 | 0.262 | 0.103 |

| Problem 126 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 22 | 28 | 28 | 21 | 20 | 27 | 22 | 21 | 22 |
| N.S. | 1 | 1.27 | 1.27 | 0.95 | 0.91 | 1.23 | 1.00 | 0.95 | 1.00 |
| time (sec) | N/A | 0.011 | 0.012 | 0.227 | 0.196 | 0.239 | 0.039 | 0.274 | 16.606 |

| Problem 127 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 15 | 15 | 15 | 17 | 16 | 15 | 19 | 16 | 18 |
| N.S. | 1 | 1.00 | 1.00 | 1.13 | 1.07 | 1.00 | 1.27 | 1.07 | 1.20 |
| time (sec) | N/A | 0.014 | 0.013 | 0.038 | 0.201 | 0.245 | 0.078 | 0.266 | 15.224 |

| Problem 128 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | B | A | F | F | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 12 | 188 | 19 | 0 | 0 | 15 |
| N.S. | 1 | 1.00 | 1.00 | 0.92 | 14.46 | 1.46 | 0.00 | 0.00 | 1.15 |
| time (sec) | N/A | 0.056 | 0.021 | 0.436 | 0.356 | 0.260 | 0.000 | 0.000 | 0.002 |

| Problem 129 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | A | B | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 16 | 5 | 4 | 14 | 3 | 25 | 4 |
| N.S. | 1 | 1.00 | 2.67 | 0.83 | 0.67 | 2.33 | 0.50 | 4.17 | 0.67 |
| time (sec) | N/A | 0.001 | 0.020 | 0.204 | 0.264 | 0.256 | 0.057 | 0.266 | 0.034 |

| Problem 130 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 7 | 7 | 7 | 8 | 7 | 11 | 7 | 7 | 7 |
| N.S. | 1 | 1.00 | 1.00 | 1.14 | 1.00 | 1.57 | 1.00 | 1.00 | 1.00 |
| time (sec) | N/A | 0.028 | 0.001 | 0.023 | 0.207 | 0.266 | 0.028 | 0.263 | 17.156 |

| Problem 131 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | C | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 35 | 35 | 31 | 47 | 25 | 25 | 27 | 25 | 25 |
| N.S. | 1 | 1.00 | 0.89 | 1.34 | 0.71 | 0.71 | 0.77 | 0.71 | 0.71 |
| time (sec) | N/A | 0.049 | 0.018 | 0.222 | 0.199 | 0.256 | 3.329 | 0.268 | 15.271 |

| Problem 132 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | C | A | A | F(-1) | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 71 | 71 | 32 | 40 | 39 | 47 | 0 | 48 | 44 |
| N.S. | 1 | 1.00 | 0.45 | 0.56 | 0.55 | 0.66 | 0.00 | 0.68 | 0.62 |
| time (sec) | N/A | 0.061 | 0.071 | 0.192 | 0.283 | 0.266 | 0.000 | 0.269 | 18.243 |

| Problem 133 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 13 | 10 | 9 | 9 | 8 | 10 | 9 |
| N.S. | 1 | 1.00 | 1.08 | 0.83 | 0.75 | 0.75 | 0.67 | 0.83 | 0.75 |
| time (sec) | N/A | 0.027 | 0.028 | 0.025 | 0.197 | 0.254 | 0.033 | 0.277 | 0.061 |

| Problem 134 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 14 | 14 | 16 | 13 | 12 | 12 | 19 | 12 | 12 |
| N.S. | 1 | 1.00 | 1.14 | 0.93 | 0.86 | 0.86 | 1.36 | 0.86 | 0.86 |
| time (sec) | N/A | 0.011 | 0.007 | 0.027 | 0.272 | 0.241 | 0.027 | 0.267 | 0.041 |

| Problem 135 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | B | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 5 | 5 | 20 | 7 | 11 | 7 | 7 | 7 |
| N.S. | 1 | 1.00 | 1.00 | 4.00 | 1.40 | 2.20 | 1.40 | 1.40 | 1.40 |
| time (sec) | N/A | 0.016 | 0.005 | 0.224 | 0.184 | 0.257 | 0.031 | 0.267 | 15.419 |

| Problem 136 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 12 | 11 | 11 | 10 | 11 | 11 |
| N.S. | 1 | 1.00 | 1.00 | 0.92 | 0.85 | 0.85 | 0.77 | 0.85 | 0.85 |
| time (sec) | N/A | 0.003 | 0.004 | 0.471 | 0.184 | 0.235 | 0.031 | 0.275 | 0.039 |

| Problem 137 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 4 | 3 | 18 | 7 | 11 | 3 |
| N.S. | 1 | 1.00 | 1.00 | 1.33 | 1.00 | 6.00 | 2.33 | 3.67 | 1.00 |
| time (sec) | N/A | 0.004 | 0.002 | 0.034 | 0.187 | 0.234 | 0.051 | 0.279 | 0.027 |

| Problem 138 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 15 | 15 | 15 | 11 | 11 | 11 | 8 | 11 | 10 |
| N.S. | 1 | 1.00 | 1.00 | 0.73 | 0.73 | 0.73 | 0.53 | 0.73 | 0.67 |
| time (sec) | N/A | 0.002 | 0.000 | 0.011 | 0.179 | 0.236 | 0.014 | 0.270 | 0.022 |

| Problem 139 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 14 | 14 | 12 | 10 | 9 | 9 | 8 | 9 | 7 |
| N.S. | 1 | 1.00 | 0.86 | 0.71 | 0.64 | 0.64 | 0.57 | 0.64 | 0.50 |
| time (sec) | N/A | 0.002 | 0.000 | 0.012 | 0.179 | 0.232 | 0.032 | 0.266 | 0.025 |

| Problem 140 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | F | A | A | A | B | A | A | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 0 | 11 | 9 | 8 | 20 | 14 | 12 | 8 |
| N.S. | 1 | 0.00 | 1.00 | 0.82 | 0.73 | 1.82 | 1.27 | 1.09 | 0.73 |
| time (sec) | N/A | 0.000 | 0.043 | 0.195 | 0.278 | 0.235 | 0.104 | 0.276 | 14.764 |

| Problem 141 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 9 | 9 | 8 | 7 | 7 | 7 | 7 | 7 |
| N.S. | 1 | 1.00 | 1.00 | 0.89 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 |
| time (sec) | N/A | 0.028 | 0.006 | 0.030 | 0.191 | 0.249 | 0.068 | 0.263 | 15.846 |

| Problem 142 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 14 | 14 | 14 | 11 | 16 | 20 | 36 | 16 | 10 |
| N.S. | 1 | 1.00 | 1.00 | 0.79 | 1.14 | 1.43 | 2.57 | 1.14 | 0.71 |
| time (sec) | N/A | 0.014 | 0.004 | 0.043 | 0.272 | 0.258 | 0.188 | 0.273 | 13.510 |

| Problem 143 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 45 | 45 | 39 | 34 | 33 | 25 | 37 | 49 | 25 |
| N.S. | 1 | 1.00 | 0.87 | 0.76 | 0.73 | 0.56 | 0.82 | 1.09 | 0.56 |
| time (sec) | N/A | 0.023 | 0.052 | 0.053 | 0.276 | 4.288 | 0.166 | 0.279 | 14.143 |

| Problem 144 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 9 | 8 | 8 | 5 | 8 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 1.12 | 1.00 | 1.00 | 0.62 | 1.00 | 0.75 |
| time (sec) | N/A | 0.001 | 0.000 | 0.008 | 0.203 | 0.231 | 0.032 | 0.276 | 0.002 |

| Problem 145 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | B | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 6 | 6 | 21 | 5 | 5 | 21 | 5 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 3.50 | 0.83 | 0.83 | 3.50 | 0.83 |
| time (sec) | N/A | 0.007 | 0.007 | 0.086 | 0.187 | 0.241 | 0.086 | 0.291 | 0.054 |

| Problem 146 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 26 | 26 | 16 | 14 | 13 | 13 | 12 | 13 | 13 |
| N.S. | 1 | 1.00 | 0.62 | 0.54 | 0.50 | 0.50 | 0.46 | 0.50 | 0.50 |
| time (sec) | N/A | 0.024 | 0.006 | 0.035 | 0.184 | 0.243 | 0.032 | 0.262 | 16.547 |

| Problem 147 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|--------|--------|----------|-------|-------|
| grade | N/A | F | C | A | C | A | F | A | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 0 | 27 | 10 | 473 | 12 | 0 | 12 | 9 |
| N.S. | 1 | 0.00 | 2.70 | 1.00 | 47.30 | 1.20 | 0.00 | 1.20 | 0.90 |
| time (sec) | N/A | 0.000 | 0.627 | 0.212 | 0.279 | 0.247 | 0.000 | 0.266 | 0.084 |

| Problem 148 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 56 | 56 | 50 | 35 | 34 | 32 | 51 | 34 | 34 |
| N.S. | 1 | 1.00 | 0.89 | 0.62 | 0.61 | 0.57 | 0.91 | 0.61 | 0.61 |
| time (sec) | N/A | 0.100 | 0.046 | 0.026 | 0.188 | 0.232 | 4.522 | 0.284 | 0.033 |

| Problem 149 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 9 | 9 | 8 | 7 | 21 | 8 | 7 | 7 |
| N.S. | 1 | 1.00 | 1.00 | 0.89 | 0.78 | 2.33 | 0.89 | 0.78 | 0.78 |
| time (sec) | N/A | 0.022 | 2.049 | 0.220 | 0.182 | 0.238 | 0.274 | 0.279 | 0.148 |

| Problem 150 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | C | A | A | C | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 15 | 15 | 15 | 14 | 27 | 10 | 19 | 29 | 14 |
| N.S. | 1 | 1.00 | 1.00 | 0.93 | 1.80 | 0.67 | 1.27 | 1.93 | 0.93 |
| time (sec) | N/A | 0.096 | 0.045 | 0.180 | 0.239 | 0.230 | 1.291 | 0.273 | 16.153 |

| Problem 151 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 27 | 27 | 20 | 17 | 22 | 19 | 37 | 19 | 20 |
| N.S. | 1 | 1.00 | 0.74 | 0.63 | 0.81 | 0.70 | 1.37 | 0.70 | 0.74 |
| time (sec) | N/A | 0.012 | 0.006 | 0.164 | 0.277 | 0.238 | 0.125 | 0.271 | 0.038 |

| Problem 152 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 20 | 20 | 19 | 18 | 18 | 26 | 18 | 20 |
| N.S. | 1 | 1.00 | 1.00 | 0.95 | 0.90 | 0.90 | 1.30 | 0.90 | 1.00 |
| time (sec) | N/A | 0.023 | 0.009 | 0.030 | 0.276 | 0.229 | 0.041 | 0.286 | 0.113 |

| Problem 153 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 42 | 42 | 25 | 20 | 19 | 19 | 34 | 38 | 30 |
| N.S. | 1 | 1.00 | 0.60 | 0.48 | 0.45 | 0.45 | 0.81 | 0.90 | 0.71 |
| time (sec) | N/A | 0.029 | 0.017 | 0.018 | 0.199 | 0.260 | 0.413 | 0.266 | 15.592 |

| Problem 154 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 7 | 7 | 12 | 8 | 7 | 9 | 5 | 8 | 26 |
| N.S. | 1 | 1.00 | 1.71 | 1.14 | 1.00 | 1.29 | 0.71 | 1.14 | 3.71 |
| time (sec) | N/A | 0.004 | 0.010 | 0.122 | 0.187 | 0.251 | 0.020 | 0.272 | 15.059 |

| Problem 155 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 27 | 27 | 27 | 20 | 19 | 19 | 19 | 20 | 25 |
| N.S. | 1 | 1.00 | 1.00 | 0.74 | 0.70 | 0.70 | 0.70 | 0.74 | 0.93 |
| time (sec) | N/A | 0.016 | 0.008 | 0.024 | 0.271 | 0.238 | 0.057 | 0.273 | 0.061 |

| Problem 156 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | B | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 30 | 20 | 16 | 30 | 39 | 36 | 26 | 42 |
| N.S. | 1 | 1.50 | 1.00 | 0.80 | 1.50 | 1.95 | 1.80 | 1.30 | 2.10 |
| time (sec) | N/A | 0.024 | 0.028 | 0.034 | 0.277 | 0.241 | 0.155 | 0.277 | 0.150 |

| Problem 157 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 10 | 9 | 9 | 10 | 9 | 9 |
| N.S. | 1 | 1.00 | 1.00 | 0.77 | 0.69 | 0.69 | 0.77 | 0.69 | 0.69 |
| time (sec) | N/A | 0.003 | 0.015 | 0.194 | 0.198 | 0.224 | 0.059 | 0.278 | 0.047 |

| Problem 158 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 11 | 13 | 9 | 8 | 13 | 9 |
| N.S. | 1 | 1.00 | 1.00 | 0.85 | 1.00 | 0.69 | 0.62 | 1.00 | 0.69 |
| time (sec) | N/A | 0.007 | 0.001 | 0.013 | 0.192 | 0.247 | 0.037 | 0.277 | 13.952 |

| Problem 159 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | B | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 4 | 3 | 8 | 7 | 5 | 5 |
| N.S. | 1 | 1.00 | 1.00 | 1.33 | 1.00 | 2.67 | 2.33 | 1.67 | 1.67 |
| time (sec) | N/A | 0.003 | 0.002 | 0.089 | 0.187 | 0.235 | 0.168 | 0.271 | 0.026 |

| Problem 160 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 22 | 22 | 14 | 12 | 11 | 11 | 10 | 11 | 11 |
| N.S. | 1 | 1.00 | 0.64 | 0.55 | 0.50 | 0.50 | 0.45 | 0.50 | 0.50 |
| time (sec) | N/A | 0.021 | 0.002 | 0.020 | 0.204 | 0.233 | 0.029 | 0.269 | 0.002 |

| Problem 161 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | C | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 10 | 9 | 7 | 14 | 17 | 8 | 8 |
| N.S. | 1 | 1.00 | 1.00 | 0.90 | 0.70 | 1.40 | 1.70 | 0.80 | 0.80 |
| time (sec) | N/A | 0.008 | 0.021 | 0.190 | 0.278 | 0.239 | 0.482 | 0.266 | 0.098 |

| Problem 162 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 12 | 15 | 11 | 10 | 15 | 11 |
| N.S. | 1 | 1.00 | 1.00 | 0.92 | 1.15 | 0.85 | 0.77 | 1.15 | 0.85 |
| time (sec) | N/A | 0.006 | 0.005 | 0.163 | 0.185 | 0.250 | 0.035 | 0.264 | 13.303 |

| Problem 163 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 21 | 21 | 21 | 18 | 14 | 22 | 0 | 22 | 17 |
| N.S. | 1 | 1.00 | 1.00 | 0.86 | 0.67 | 1.05 | 0.00 | 1.05 | 0.81 |
| time (sec) | N/A | 0.006 | 0.005 | 0.014 | 0.181 | 0.244 | 0.000 | 0.275 | 0.072 |

| Problem 164 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 34 | 34 | 34 | 23 | 22 | 21 | 32 | 21 | 22 |
| N.S. | 1 | 1.00 | 1.00 | 0.68 | 0.65 | 0.62 | 0.94 | 0.62 | 0.65 |
| time (sec) | N/A | 0.012 | 0.061 | 0.021 | 0.268 | 0.239 | 0.239 | 0.263 | 0.034 |

| Problem 165 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 22 | 22 | 22 | 17 | 16 | 16 | 20 | 16 | 16 |
| N.S. | 1 | 1.00 | 1.00 | 0.77 | 0.73 | 0.73 | 0.91 | 0.73 | 0.73 |
| time (sec) | N/A | 0.013 | 0.029 | 0.030 | 0.194 | 0.239 | 0.096 | 0.277 | 13.609 |

| Problem 166 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 19 | 19 | 19 | 16 | 15 | 21 | 12 | 15 | 17 |
| N.S. | 1 | 1.00 | 1.00 | 0.84 | 0.79 | 1.11 | 0.63 | 0.79 | 0.89 |
| time (sec) | N/A | 0.005 | 0.012 | 0.023 | 0.277 | 0.235 | 0.038 | 0.284 | 13.506 |

| Problem 167 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | C | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 10 | 10 | 11 | 9 | 8 | 9 | 9 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 1.10 | 0.90 | 0.80 | 0.90 | 0.90 |
| time (sec) | N/A | 0.027 | 0.034 | 0.041 | 0.233 | 0.236 | 0.035 | 0.275 | 0.064 |

| Problem 168 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | A | B | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 40 | 7 | 6 | 16 | 5 | 25 | 6 |
| N.S. | 1 | 1.00 | 5.00 | 0.88 | 0.75 | 2.00 | 0.62 | 3.12 | 0.75 |
| time (sec) | N/A | 0.004 | 0.047 | 0.278 | 0.285 | 0.246 | 0.455 | 0.274 | 0.013 |

| Problem 169 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|----------|-------|-------|
| grade | N/A | A | A | A | A | B | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 12 | 19 | 12 | 23 | 0 | 10 | 12 |
| N.S. | 1 | 1.00 | 1.00 | 1.58 | 1.00 | 1.92 | 0.00 | 0.83 | 1.00 |
| time (sec) | N/A | 0.016 | 0.017 | 0.035 | 0.288 | 0.238 | 0.000 | 0.286 | 0.049 |

| Problem 170 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|----------|--------|----------|-------|--------|
| grade | N/A | A | B | A | F | B | F | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 40 | 17 | 0 | 24 | 0 | 22 | 16 |
| N.S. | 1 | 1.00 | 3.33 | 1.42 | 0.00 | 2.00 | 0.00 | 1.83 | 1.33 |
| time (sec) | N/A | 0.007 | 0.015 | 0.194 | 0.000 | 0.242 | 0.000 | 0.282 | 13.450 |

| Problem 171 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 18 | 18 | 18 | 15 | 15 | 14 | 15 | 14 | 14 |
| N.S. | 1 | 1.00 | 1.00 | 0.83 | 0.83 | 0.78 | 0.83 | 0.78 | 0.78 |
| time (sec) | N/A | 0.006 | 0.016 | 0.150 | 0.186 | 0.231 | 0.055 | 0.275 | 0.062 |

| Problem 172 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|----------|----------|--------------|
| grade | N/A | A | A | A | A | A | F | F | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 52 | 52 | 38 | 35 | 26 | 43 | 0 | 0 | 0 |
| N.S. | 1 | 1.00 | 0.73 | 0.67 | 0.50 | 0.83 | 0.00 | 0.00 | 0.00 |
| time (sec) | N/A | 0.063 | 0.068 | 0.166 | 0.279 | 0.257 | 0.000 | 0.000 | 0.000 |

| Problem 173 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|----------|--------|--------|----------|-------|--------|
| grade | N/A | A | A | F | C | A | F | A | B |
| verified | N/A | Yes | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 39 | 39 | 37 | 0 | 137 | 33 | 0 | 33 | 45 |
| N.S. | 1 | 1.00 | 0.95 | 0.00 | 3.51 | 0.85 | 0.00 | 0.85 | 1.15 |
| time (sec) | N/A | 0.216 | 0.697 | 0.000 | 0.335 | 0.239 | 0.000 | 0.279 | 14.609 |

| Problem 174 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 27 | 27 | 22 | 20 | 19 | 21 | 26 | 19 | 19 |
| N.S. | 1 | 1.00 | 0.81 | 0.74 | 0.70 | 0.78 | 0.96 | 0.70 | 0.70 |
| time (sec) | N/A | 0.013 | 0.051 | 0.068 | 0.199 | 0.250 | 0.099 | 0.285 | 0.036 |

| Problem 175 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | F | A | A | F | F | B |
| verified | N/A | Yes | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 7 | 7 | 7 | 0 | 7 | 13 | 0 | 0 | 7 |
| N.S. | 1 | 1.00 | 1.00 | 0.00 | 1.00 | 1.86 | 0.00 | 0.00 | 1.00 |
| time (sec) | N/A | 0.054 | 0.037 | 0.000 | 0.229 | 0.247 | 0.000 | 0.000 | 17.652 |

| Problem 176 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| time (sec) | N/A | 0.018 | 0.016 | 0.026 | 0.200 | 0.229 | 0.029 | 0.268 | 0.032 |

| Problem 177 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 7 | 6 | 6 | 7 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 0.88 | 0.75 | 0.75 | 0.88 | 0.75 | 0.75 |
| time (sec) | N/A | 0.003 | 0.029 | 0.042 | 0.192 | 0.239 | 0.035 | 0.266 | 13.962 |

| Problem 178 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 7 | 10 | 16 | 10 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 0.88 | 1.25 | 2.00 | 1.25 | 0.75 | 0.75 |
| time (sec) | N/A | 0.015 | 0.002 | 0.059 | 0.197 | 0.256 | 0.249 | 0.273 | 13.518 |

| Problem 179 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 19 | 19 | 19 | 15 | 14 | 14 | 17 | 14 | 14 |
| N.S. | 1 | 1.00 | 1.00 | 0.79 | 0.74 | 0.74 | 0.89 | 0.74 | 0.74 |
| time (sec) | N/A | 0.009 | 0.009 | 0.189 | 0.280 | 0.235 | 0.056 | 0.275 | 0.040 |

| Problem 180 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | F | A | B | B | B | A | B | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 0 | 5 | 16 | 52 | 34 | 5 | 45 | 5 |
| N.S. | 1 | 0.00 | 1.00 | 3.20 | 10.40 | 6.80 | 1.00 | 9.00 | 1.00 |
| time (sec) | N/A | 0.000 | 0.018 | 0.871 | 0.218 | 0.250 | 0.145 | 0.274 | 0.070 |

| Problem 181 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 7 | 7 | 7 | 7 | 6 | 6 | 7 | 77 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 0.86 | 0.86 | 1.00 | 11.00 | 0.86 |
| time (sec) | N/A | 0.032 | 0.108 | 0.259 | 0.198 | 0.244 | 0.062 | 0.275 | 14.079 |

| Problem 182 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 4 | 4 | 4 | 5 | 4 | 44 | 5 | 4 | 4 |
| N.S. | 1 | 1.00 | 1.00 | 1.25 | 1.00 | 11.00 | 1.25 | 1.00 | 1.00 |
| time (sec) | N/A | 0.029 | 9.252 | 8.366 | 0.189 | 0.257 | 0.901 | 0.281 | 14.974 |

| Problem 183 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 23 | 11 | 15 | 18 | 8 | 10 | 10 |
| N.S. | 1 | 1.00 | 2.30 | 1.10 | 1.50 | 1.80 | 0.80 | 1.00 | 1.00 |
| time (sec) | N/A | 0.007 | 0.007 | 0.035 | 0.192 | 0.247 | 0.178 | 0.270 | 0.002 |

| Problem 184 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | A | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 6 | 7 | 42 | 6 | 0 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 1.17 | 7.00 | 1.00 | 0.00 | 1.00 | 1.00 |
| time (sec) | N/A | 0.024 | 0.004 | 0.174 | 0.194 | 0.240 | 0.000 | 0.277 | 15.081 |

| Problem 185 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| time (sec) | N/A | 0.008 | 0.008 | 0.050 | 0.226 | 0.241 | 0.072 | 0.269 | 15.995 |

| Problem 186 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 6 | 8 | 7 | 12 | 16 | 3 | 12 | 6 |
| N.S. | 1 | 1.00 | 1.33 | 1.17 | 2.00 | 2.67 | 0.50 | 2.00 | 1.00 |
| time (sec) | N/A | 0.006 | 0.009 | 0.021 | 0.199 | 0.238 | 0.057 | 0.263 | 16.601 |

| Problem 187 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 7 | 12 | 12 | 8 | 36 | 9 | 8 | 21 | 26 |
| N.S. | 1 | 1.71 | 1.71 | 1.14 | 5.14 | 1.29 | 1.14 | 3.00 | 3.71 |
| time (sec) | N/A | 0.107 | 0.012 | 0.356 | 0.192 | 0.246 | 1.449 | 0.273 | 16.107 |

| Problem 188 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|---------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | F(-1) | F | A | F(-1) | A | B |
| verified | N/A | Yes | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 10 | 0 | 0 | 6 | 0 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 0.00 | 0.00 | 0.60 | 0.00 | 0.60 | 0.60 |
| time (sec) | N/A | 0.008 | 0.034 | 180.000 | 0.000 | 0.239 | 0.000 | 0.263 | 0.250 |

| Problem 189 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 4 | 3 | 3 | 219 | 3 | 3 |
| N.S. | 1 | 1.00 | 1.00 | 1.33 | 1.00 | 1.00 | 73.00 | 1.00 | 1.00 |
| time (sec) | N/A | 0.023 | 0.013 | 0.240 | 0.274 | 0.251 | 9.125 | 0.266 | 16.484 |

| Problem 190 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 11 | 11 | 10 | 9 | 22 | 8 | 9 | 9 |
| N.S. | 1 | 1.00 | 1.00 | 0.91 | 0.82 | 2.00 | 0.73 | 0.82 | 0.82 |
| time (sec) | N/A | 0.001 | 0.004 | 0.230 | 0.201 | 0.242 | 0.359 | 0.271 | 16.452 |

| Problem 191 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|----------|--------|----------|-------|--------------|
| grade | N/A | A | A | A | F | A | F | A | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 20 | 20 | 7 | 0 | 18 | 0 | 15 | 0 |
| N.S. | 1 | 1.00 | 1.00 | 0.35 | 0.00 | 0.90 | 0.00 | 0.75 | 0.00 |
| time (sec) | N/A | 0.007 | 0.113 | 0.251 | 0.000 | 0.235 | 0.000 | 0.286 | 0.000 |

| Problem 192 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 7 | 7 | 12 | 8 | 11 | 11 | 7 | 12 | 12 |
| N.S. | 1 | 1.00 | 1.71 | 1.14 | 1.57 | 1.57 | 1.00 | 1.71 | 1.71 |
| time (sec) | N/A | 0.067 | 0.078 | 0.232 | 0.216 | 0.240 | 0.053 | 0.256 | 16.321 |

| Problem 193 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 9 | 4 | 17 | 19 | 14 | 16 | 3 |
| N.S. | 1 | 1.00 | 3.00 | 1.33 | 5.67 | 6.33 | 4.67 | 5.33 | 1.00 |
| time (sec) | N/A | 0.008 | 0.003 | 0.122 | 0.192 | 0.252 | 0.051 | 0.265 | 0.047 |

| Problem 194 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| verified | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 5 | 3 | 5 | 5 | 5 | 5 | 5 |
| N.S. | 1 | 1.00 | 1.67 | 1.00 | 1.67 | 1.67 | 1.67 | 1.67 | 1.67 |
| time (sec) | N/A | 0.142 | 0.039 | 0.030 | 0.447 | 0.250 | 1.385 | 0.267 | 15.884 |

| Problem 195 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 5 | 5 | 6 | 5 | 5 | 5 | 5 | 5 |
| N.S. | 1 | 1.00 | 1.00 | 1.20 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| time (sec) | N/A | 0.047 | 0.061 | 0.288 | 0.220 | 0.244 | 0.050 | 0.269 | 16.576 |

| Problem 196 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | B | B | B | B | B | F(-1) | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 15 | 15 | 12 | 11 | 27 | 0 | 11 | 5 |
| N.S. | 1 | 2.50 | 2.50 | 2.00 | 1.83 | 4.50 | 0.00 | 1.83 | 0.83 |
| time (sec) | N/A | 0.016 | 0.018 | 0.028 | 0.183 | 0.245 | 0.000 | 0.276 | 16.607 |

| Problem 197 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | B | A | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 2 | 2 | 19 | 3 | 13 | 13 | 12 | 15 | 2 |
| N.S. | 1 | 1.00 | 9.50 | 1.50 | 6.50 | 6.50 | 6.00 | 7.50 | 1.00 |
| time (sec) | N/A | 0.001 | 0.004 | 0.186 | 0.195 | 0.231 | 0.048 | 0.275 | 16.288 |

| Problem 198 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 13 | 12 | 13 | 24 | 14 | 10 | 14 | 13 |
| N.S. | 1 | 1.08 | 1.00 | 1.08 | 2.00 | 1.17 | 0.83 | 1.17 | 1.08 |
| time (sec) | N/A | 0.006 | 0.008 | 0.046 | 0.193 | 0.247 | 0.092 | 0.267 | 16.268 |

| Problem 199 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | F(-1) | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 39 | 39 | 39 | 30 | 29 | 0 | 60 | 29 | 29 |
| N.S. | 1 | 1.00 | 1.00 | 0.77 | 0.74 | 0.00 | 1.54 | 0.74 | 0.74 |
| time (sec) | N/A | 0.059 | 0.067 | 1.460 | 0.209 | 0.000 | 0.246 | 0.268 | 17.420 |

| Problem 200 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|--------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 4 | 4 | 4 | 5 | 4 | 41 | 5 | 4 | 4 |
| N.S. | 1 | 1.00 | 1.00 | 1.25 | 1.00 | 10.25 | 1.25 | 1.00 | 1.00 |
| time (sec) | N/A | 0.026 | 0.011 | 10.368 | 0.195 | 0.245 | 0.853 | 0.278 | 0.336 |

| Problem 201 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | F | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 24 | 24 | 24 | 18 | 29 | 17 | 22 | 0 | 17 |
| N.S. | 1 | 1.00 | 1.00 | 0.75 | 1.21 | 0.71 | 0.92 | 0.00 | 0.71 |
| time (sec) | N/A | 0.028 | 0.010 | 0.042 | 0.231 | 0.250 | 0.394 | 0.000 | 15.657 |

| Problem 202 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 22 | 22 | 22 | 17 | 16 | 16 | 20 | 16 | 16 |
| N.S. | 1 | 1.00 | 1.00 | 0.77 | 0.73 | 0.73 | 0.91 | 0.73 | 0.73 |
| time (sec) | N/A | 0.013 | 0.007 | 0.024 | 0.200 | 0.246 | 0.101 | 0.277 | 0.003 |

| Problem 203 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 16 | 16 | 16 | 13 | 12 | 12 | 14 | 12 | 12 |
| N.S. | 1 | 1.00 | 1.00 | 0.81 | 0.75 | 0.75 | 0.88 | 0.75 | 0.75 |
| time (sec) | N/A | 0.004 | 0.005 | 0.188 | 0.285 | 0.240 | 0.066 | 0.278 | 15.914 |

| Problem 204 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 30 | 30 | 30 | 23 | 22 | 25 | 114 | 22 | 22 |
| N.S. | 1 | 1.00 | 1.00 | 0.77 | 0.73 | 0.83 | 3.80 | 0.73 | 0.73 |
| time (sec) | N/A | 0.035 | 0.005 | 0.850 | 0.186 | 0.270 | 0.886 | 0.274 | 16.175 |

| Problem 205 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|----------|-------|----------|--------------|
| grade | N/A | A | A | C | A | F | A | F | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 23 | 34 | 34 | 185 | 30 | 0 | 29 | 0 | 0 |
| N.S. | 1 | 1.48 | 1.48 | 8.04 | 1.30 | 0.00 | 1.26 | 0.00 | 0.00 |
| time (sec) | N/A | 0.004 | 0.009 | 0.055 | 0.284 | 0.000 | 0.379 | 0.000 | 0.000 |

| Problem 206 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 9 | 4 | 4 | 3 | 4 | 4 |
| N.S. | 1 | 1.00 | 1.00 | 3.00 | 1.33 | 1.33 | 1.00 | 1.33 | 1.33 |
| time (sec) | N/A | 0.001 | 0.000 | 0.012 | 0.188 | 0.237 | 0.016 | 0.264 | 0.013 |

| Problem 207 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|--------------|-------|--------|
| grade | N/A | B | B | C | B | B | F(-1) | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 264 | 131 | 16 | 2527 | 123 | 0 | 134 | 15 |
| N.S. | 1 | 24.00 | 11.91 | 1.45 | 229.73 | 11.18 | 0.00 | 12.18 | 1.36 |
| time (sec) | N/A | 4.540 | 0.423 | 0.640 | 0.367 | 0.339 | 0.000 | 0.323 | 16.884 |

| Problem 208 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 11 | 9 | 34 | 7 | 8 | 33 | 8 |
| N.S. | 1 | 1.00 | 1.38 | 1.12 | 4.25 | 0.88 | 1.00 | 4.12 | 1.00 |
| time (sec) | N/A | 0.013 | 0.015 | 0.231 | 0.193 | 0.242 | 0.144 | 0.274 | 15.331 |

| Problem 209 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | C | A | A | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 24 | 24 | 29 | 27 | 33 | 21 | 22 | 44 | 46 |
| N.S. | 1 | 1.00 | 1.21 | 1.12 | 1.38 | 0.88 | 0.92 | 1.83 | 1.92 |
| time (sec) | N/A | 0.014 | 0.102 | 0.190 | 0.278 | 0.262 | 0.407 | 0.292 | 0.384 |

| Problem 210 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 12 | 9 | 8 | 8 | 10 | 8 | 8 |
| N.S. | 1 | 1.00 | 1.00 | 0.75 | 0.67 | 0.67 | 0.83 | 0.67 | 0.67 |
| time (sec) | N/A | 0.004 | 0.016 | 0.166 | 0.272 | 0.240 | 0.065 | 0.279 | 0.258 |

| Problem 211 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|--------|--------|-------|----------|--------|
| grade | N/A | F | A | B | A | B | B | F | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 0 | 5 | 12 | 5 | 11 | 7 | 0 | 5 |
| N.S. | 1 | 0.00 | 1.00 | 2.40 | 1.00 | 2.20 | 1.40 | 0.00 | 1.00 |
| time (sec) | N/A | 0.000 | 0.019 | 0.032 | 0.243 | 0.236 | 0.068 | 0.000 | 15.455 |

| Problem 212 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 11 | 11 | 12 | 13 | 11 | 8 | 13 | 11 |
| N.S. | 1 | 1.00 | 1.00 | 1.09 | 1.18 | 1.00 | 0.73 | 1.18 | 1.00 |
| time (sec) | N/A | 0.014 | 0.007 | 0.170 | 0.176 | 0.243 | 0.039 | 0.267 | 15.515 |

| Problem 213 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | A | B | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 2 | 2 | 16 | 3 | 2 | 14 | 2 | 25 | 2 |
| N.S. | 1 | 1.00 | 8.00 | 1.50 | 1.00 | 7.00 | 1.00 | 12.50 | 1.00 |
| time (sec) | N/A | 0.001 | 0.003 | 0.175 | 0.275 | 0.235 | 0.068 | 0.268 | 0.032 |

| Problem 214 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 18 | 9 | 10 | 18 | 9 | 10 | 10 | 9 |
| N.S. | 1 | 2.00 | 1.00 | 1.11 | 2.00 | 1.00 | 1.11 | 1.11 | 1.00 |
| time (sec) | N/A | 0.046 | 0.014 | 0.052 | 0.184 | 0.252 | 0.048 | 0.273 | 15.230 |

| Problem 215 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 10 | 10 | 10 | 9 | 9 | 7 | 9 | 9 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 0.90 | 0.90 | 0.70 | 0.90 | 0.90 |
| time (sec) | N/A | 0.008 | 0.003 | 0.033 | 0.190 | 0.257 | 0.035 | 0.294 | 0.049 |

| Problem 216 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 20 | 20 | 17 | 16 | 16 | 17 | 16 | 13 |
| N.S. | 1 | 1.00 | 1.00 | 0.85 | 0.80 | 0.80 | 0.85 | 0.80 | 0.65 |
| time (sec) | N/A | 0.027 | 0.011 | 0.039 | 0.190 | 0.249 | 0.118 | 0.277 | 14.933 |

| Problem 217 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 25 | 25 | 25 | 22 | 22 | 20 | 15 | 107 | 20 |
| N.S. | 1 | 1.00 | 1.00 | 0.88 | 0.88 | 0.80 | 0.60 | 4.28 | 0.80 |
| time (sec) | N/A | 0.007 | 0.008 | 0.084 | 0.188 | 0.246 | 0.057 | 0.280 | 0.171 |

| Problem 218 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 7 | 6 | 6 | 5 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 0.88 | 0.75 | 0.75 | 0.62 | 0.75 | 0.75 |
| time (sec) | N/A | 0.006 | 0.008 | 0.252 | 0.271 | 0.240 | 0.047 | 0.293 | 0.085 |

| Problem 219 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 20 | 20 | 13 | 5 | 12 | 17 | 19 | 12 |
| N.S. | 1 | 1.00 | 1.00 | 0.65 | 0.25 | 0.60 | 0.85 | 0.95 | 0.60 |
| time (sec) | N/A | 0.070 | 0.008 | 0.098 | 0.333 | 0.244 | 0.512 | 0.289 | 15.403 |

| Problem 220 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | B | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 25 | 20 | 8 | 19 | 10 | 19 | 16 |
| N.S. | 1 | 1.00 | 2.08 | 1.67 | 0.67 | 1.58 | 0.83 | 1.58 | 1.33 |
| time (sec) | N/A | 0.130 | 0.017 | 0.345 | 0.185 | 0.246 | 1.043 | 0.276 | 15.260 |

| Problem 221 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 16 | 16 | 16 | 17 | 16 | 16 | 15 | 16 | 16 |
| N.S. | 1 | 1.00 | 1.00 | 1.06 | 1.00 | 1.00 | 0.94 | 1.00 | 1.00 |
| time (sec) | N/A | 0.005 | 0.004 | 0.051 | 0.276 | 0.245 | 0.050 | 0.269 | 0.092 |

| Problem 222 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 15 | 15 | 15 | 10 | 13 | 13 | 12 | 13 | 9 |
| N.S. | 1 | 1.00 | 1.00 | 0.67 | 0.87 | 0.87 | 0.80 | 0.87 | 0.60 |
| time (sec) | N/A | 0.004 | 0.004 | 0.259 | 0.187 | 0.239 | 0.044 | 0.275 | 14.935 |

| Problem 223 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------------|
| grade | N/A | A | A | A | A | A | C | A | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 28 | 28 | 23 | 23 | 22 | 19 | 37 | 40 | 0 |
| N.S. | 1 | 1.00 | 0.82 | 0.82 | 0.79 | 0.68 | 1.32 | 1.43 | 0.00 |
| time (sec) | N/A | 0.014 | 0.011 | 0.013 | 0.271 | 0.256 | 0.776 | 0.263 | 0.000 |

| Problem 224 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|--------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 21 | 13 | 47 | 17 | 13 | 24 |
| N.S. | 1 | 1.00 | 1.00 | 1.62 | 1.00 | 3.62 | 1.31 | 1.00 | 1.85 |
| time (sec) | N/A | 0.025 | 3.436 | 12.919 | 0.186 | 0.251 | 0.844 | 0.283 | 15.867 |

| Problem 225 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| verified | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 9 | 11 | 9 | 9 | 9 | 8 | 11 | 11 |
| N.S. | 1 | 1.00 | 1.22 | 1.00 | 1.00 | 1.00 | 0.89 | 1.22 | 1.22 |
| time (sec) | N/A | 0.010 | 1.895 | 0.040 | 0.400 | 0.249 | 0.495 | 0.267 | 15.397 |

| Problem 226 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| verified | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 14 | 14 | 16 | 12 | 1038 | 14 | 14 | 14 | 14 |
| N.S. | 1 | 1.00 | 1.14 | 0.86 | 74.14 | 1.00 | 1.00 | 1.00 | 1.00 |
| time (sec) | N/A | 0.022 | 9.778 | 0.105 | 0.736 | 0.247 | 0.800 | 0.278 | 15.380 |

| Problem 227 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|--------|--------|--------|--------|--------|--------|--------|
| grade | N/A | A | B | B | B | F(-2) | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 23 | 23 | 11128 | 10106 | 10106 | 0 | 11171 | 10106 | 15 |
| N.S. | 1 | 1.00 | 483.83 | 439.39 | 439.39 | 0.00 | 485.70 | 439.39 | 0.65 |
| time (sec) | N/A | 0.027 | 0.137 | 9.328 | 2.400 | 0.000 | 2.596 | 1.104 | 31.766 |

| Problem 228 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 19 | 19 | 10 | 9 | 19 | 29 | 19 | 15 |
| N.S. | 1 | 1.73 | 1.73 | 0.91 | 0.82 | 1.73 | 2.64 | 1.73 | 1.36 |
| time (sec) | N/A | 0.061 | 0.020 | 3.911 | 0.187 | 0.257 | 0.252 | 0.261 | 15.045 |

| Problem 229 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 5 | 5 | 6 | 5 | 5 | 3 | 5 | 5 |
| N.S. | 1 | 1.00 | 1.00 | 1.20 | 1.00 | 1.00 | 0.60 | 1.00 | 1.00 |
| time (sec) | N/A | 0.064 | 0.018 | 0.034 | 0.224 | 0.251 | 0.066 | 0.268 | 15.455 |

| Problem 230 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 23 | 23 | 37 | 18 | 17 | 31 | 15 | 17 | 17 |
| N.S. | 1 | 1.00 | 1.61 | 0.78 | 0.74 | 1.35 | 0.65 | 0.74 | 0.74 |
| time (sec) | N/A | 0.003 | 0.006 | 0.236 | 0.277 | 0.237 | 0.083 | 0.293 | 0.029 |

| Problem 231 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 28 | 28 | 28 | 22 | 21 | 21 | 20 | 35 | 21 |
| N.S. | 1 | 1.00 | 1.00 | 0.79 | 0.75 | 0.75 | 0.71 | 1.25 | 0.75 |
| time (sec) | N/A | 0.032 | 0.042 | 0.036 | 0.212 | 0.248 | 0.523 | 0.313 | 16.329 |

| Problem 232 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 5 | 5 | 6 | 5 | 5 | 5 | 72 | 5 |
| N.S. | 1 | 1.00 | 1.00 | 1.20 | 1.00 | 1.00 | 1.00 | 14.40 | 1.00 |
| time (sec) | N/A | 0.023 | 0.066 | 0.188 | 0.201 | 0.250 | 0.073 | 0.276 | 0.093 |

| Problem 233 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|----------|-------|--------------|
| grade | N/A | A | A | A | A | A | F | A | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 57 | 57 | 57 | 12 | 9 | 5 | 0 | 5 | 0 |
| N.S. | 1 | 1.00 | 1.00 | 0.21 | 0.16 | 0.09 | 0.00 | 0.09 | 0.00 |
| time (sec) | N/A | 0.057 | 0.009 | 0.065 | 0.415 | 0.237 | 0.000 | 0.277 | 0.000 |

| Problem 234 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | B | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 14 | 21 | 22 | 11 | 10 | 29 | 42 | 10 | 10 |
| N.S. | 1 | 1.50 | 1.57 | 0.79 | 0.71 | 2.07 | 3.00 | 0.71 | 0.71 |
| time (sec) | N/A | 0.027 | 0.006 | 0.075 | 0.193 | 0.243 | 0.266 | 0.277 | 0.091 |

| Problem 235 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|----------|--------|----------|-------|--------|
| grade | N/A | A | A | A | F | A | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 45 | 45 | 34 | 30 | 0 | 33 | 0 | 33 | 51 |
| N.S. | 1 | 1.00 | 0.76 | 0.67 | 0.00 | 0.73 | 0.00 | 0.73 | 1.13 |
| time (sec) | N/A | 0.037 | 0.313 | 0.040 | 0.000 | 0.235 | 0.000 | 0.284 | 14.998 |

| Problem 236 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| verified | N/A | N/A | N/A | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 5 | 7 | 5 | 7 | 7 | 7 | 7 | 7 |
| N.S. | 1 | 1.00 | 1.40 | 1.00 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| time (sec) | N/A | 0.009 | 1.613 | 0.065 | 0.410 | 0.249 | 0.591 | 0.273 | 15.895 |

| Problem 237 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 20 | 20 | 17 | 16 | 16 | 15 | 16 | 16 |
| N.S. | 1 | 1.00 | 1.00 | 0.85 | 0.80 | 0.80 | 0.75 | 0.80 | 0.80 |
| time (sec) | N/A | 0.018 | 0.002 | 0.132 | 0.194 | 0.245 | 0.114 | 0.275 | 0.119 |

| Problem 238 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 23 | 7 | 17 | 17 | 15 | 18 | 6 |
| N.S. | 1 | 1.00 | 2.88 | 0.88 | 2.12 | 2.12 | 1.88 | 2.25 | 0.75 |
| time (sec) | N/A | 0.003 | 0.004 | 0.204 | 0.187 | 0.254 | 0.046 | 0.279 | 0.004 |

| Problem 239 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | B | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 2 | 2 | 2 | 3 | 10 | 20 | 14 | 10 | 2 |
| N.S. | 1 | 1.00 | 1.00 | 1.50 | 5.00 | 10.00 | 7.00 | 5.00 | 1.00 |
| time (sec) | N/A | 0.008 | 0.002 | 0.233 | 0.204 | 0.246 | 0.308 | 0.287 | 0.047 |

| Problem 240 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|----------|--------|-------|----------|-------|
| grade | N/A | A | A | A | F | A | A | F | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 9 | 9 | 8 | 0 | 7 | 7 | 0 | 7 |
| N.S. | 1 | 1.00 | 1.00 | 0.89 | 0.00 | 0.78 | 0.78 | 0.00 | 0.78 |
| time (sec) | N/A | 0.043 | 0.014 | 0.042 | 0.000 | 0.262 | 0.070 | 0.000 | 0.068 |

| Problem 241 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | C | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 35 | 35 | 26 | 24 | 23 | 21 | 306 | 30 | 10 |
| N.S. | 1 | 1.00 | 0.74 | 0.69 | 0.66 | 0.60 | 8.74 | 0.86 | 0.29 |
| time (sec) | N/A | 0.011 | 0.025 | 0.205 | 0.206 | 0.247 | 0.562 | 0.275 | 16.078 |

| Problem 242 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | B | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 24 | 193 | 20 | 21 | 20 | 20 | 19 | 21 | 20 |
| N.S. | 1 | 8.04 | 0.83 | 0.88 | 0.83 | 0.83 | 0.79 | 0.88 | 0.83 |
| time (sec) | N/A | 0.796 | 0.007 | 0.026 | 0.264 | 0.239 | 0.051 | 0.275 | 16.006 |

| Problem 243 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|--------|--------|--------|----------|-------|--------|
| grade | N/A | F | A | A | A | B | F | A | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 5 | 0 | 5 | 6 | 5 | 65 | 0 | 5 | 5 |
| N.S. | 1 | 0.00 | 1.00 | 1.20 | 1.00 | 13.00 | 0.00 | 1.00 | 1.00 |
| time (sec) | N/A | 0.000 | 0.126 | 12.754 | 0.384 | 0.245 | 0.000 | 0.275 | 16.485 |

| Problem 244 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | B | A | C | B | A | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 33 | 12 | 40 | 79 | 14 | 80 | 55 | 14 |
| N.S. | 1 | 2.75 | 1.00 | 3.33 | 6.58 | 1.17 | 6.67 | 4.58 | 1.17 |
| time (sec) | N/A | 0.101 | 0.031 | 6.327 | 0.207 | 0.250 | 0.138 | 0.270 | 16.361 |

| Problem 245 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | F | A | A | A | A | A | A | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 0 | 18 | 12 | 16 | 11 | 10 | 11 | 11 |
| N.S. | 1 | 0.00 | 1.80 | 1.20 | 1.60 | 1.10 | 1.00 | 1.10 | 1.10 |
| time (sec) | N/A | 0.000 | 0.011 | 0.222 | 0.190 | 0.240 | 0.189 | 0.263 | 16.435 |

| Problem 246 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|----------|-------|--------|
| grade | N/A | C | A | A | C | A | F | C | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 42 | 3 | 4 | 14 | 3 | 0 | 40 | 3 |
| N.S. | 1 | 14.00 | 1.00 | 1.33 | 4.67 | 1.00 | 0.00 | 13.33 | 1.00 |
| time (sec) | N/A | 0.099 | 0.002 | 0.605 | 0.284 | 0.225 | 0.000 | 0.287 | 15.736 |

| Problem 247 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | B | A | A | B | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 40 | 7 | 6 | 16 | 5 | 25 | 6 |
| N.S. | 1 | 1.00 | 5.00 | 0.88 | 0.75 | 2.00 | 0.62 | 3.12 | 0.75 |
| time (sec) | N/A | 0.003 | 0.013 | 0.240 | 0.282 | 0.231 | 0.196 | 0.264 | 14.980 |

| Problem 248 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 34 | 34 | 15 | 14 | 13 | 31 | 63 | 46 | 26 |
| N.S. | 1 | 1.00 | 0.44 | 0.41 | 0.38 | 0.91 | 1.85 | 1.35 | 0.76 |
| time (sec) | N/A | 0.016 | 0.012 | 0.106 | 0.270 | 0.248 | 0.327 | 0.270 | 14.835 |

| Problem 249 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 18 | 18 | 18 | 16 | 18 | 19 | 14 | 20 | 18 |
| N.S. | 1 | 1.00 | 1.00 | 0.89 | 1.00 | 1.06 | 0.78 | 1.11 | 1.00 |
| time (sec) | N/A | 0.010 | 0.007 | 0.047 | 0.199 | 0.232 | 0.059 | 0.257 | 0.052 |

| Problem 250 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|----------|--------|--------|----------|--------------|--------------|
| grade | N/A | F | A | F | A | A | F | F(-1) | F(-1) |
| verified | N/A | N/A | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 56 | 0 | 56 | 0 | 51 | 69 | 0 | 0 | 0 |
| N.S. | 1 | 0.00 | 1.00 | 0.00 | 0.91 | 1.23 | 0.00 | 0.00 | 0.00 |
| time (sec) | N/A | 0.000 | 0.037 | 0.000 | 0.401 | 0.244 | 0.000 | 0.000 | 0.000 |

| Problem 251 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 20 | 20 | 17 | 16 | 16 | 15 | 16 | 17 |
| N.S. | 1 | 1.00 | 1.00 | 0.85 | 0.80 | 0.80 | 0.75 | 0.80 | 0.85 |
| time (sec) | N/A | 0.029 | 0.003 | 0.010 | 0.193 | 0.222 | 0.015 | 0.273 | 0.035 |

| Problem 252 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|--------|-------|--------|--------|-------|----------|--------|
| grade | N/A | A | A | A | A | A | C | F | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 21 | 21 | 13 | 12 | 32 | 11 | 65 | 0 | 11 |
| N.S. | 1 | 1.00 | 0.62 | 0.57 | 1.52 | 0.52 | 3.10 | 0.00 | 0.52 |
| time (sec) | N/A | 0.043 | 10.029 | 0.256 | 0.275 | 0.235 | 1.445 | 0.000 | 14.706 |

| Problem 253 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 25 | 33 | 24 | 25 | 39 | 29 | 18 | 38 |
| N.S. | 1 | 1.47 | 1.94 | 1.41 | 1.47 | 2.29 | 1.71 | 1.06 | 2.24 |
| time (sec) | N/A | 0.032 | 0.054 | 0.392 | 0.192 | 0.242 | 0.026 | 0.270 | 15.193 |

| Problem 254 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | B | A | A | B | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 25 | 8 | 7 | 61 | 10 | 5 | 6 | 6 |
| N.S. | 1 | 3.12 | 1.00 | 0.88 | 7.62 | 1.25 | 0.62 | 0.75 | 0.75 |
| time (sec) | N/A | 0.073 | 0.041 | 0.072 | 0.193 | 0.241 | 0.162 | 0.267 | 14.735 |

| Problem 255 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | B | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 17 | 23 | 14 | 39 | 42 | 19 | 37 | 14 |
| N.S. | 1 | 1.00 | 1.35 | 0.82 | 2.29 | 2.47 | 1.12 | 2.18 | 0.82 |
| time (sec) | N/A | 0.030 | 0.015 | 9.814 | 0.197 | 0.239 | 0.170 | 0.273 | 14.884 |

| Problem 256 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | C | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 33 | 33 | 22 | 23 | 31 | 22 | 34 | 51 | 22 |
| N.S. | 1 | 1.00 | 0.67 | 0.70 | 0.94 | 0.67 | 1.03 | 1.55 | 0.67 |
| time (sec) | N/A | 0.029 | 0.023 | 0.094 | 0.306 | 0.243 | 0.190 | 0.259 | 15.857 |

| Problem 257 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|----------|--------|----------|-------|--------|
| grade | N/A | F | A | C | F | B | F | B | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 6 | 0 | 6 | 44 | 0 | 15 | 0 | 35 | 35 |
| N.S. | 1 | 0.00 | 1.00 | 7.33 | 0.00 | 2.50 | 0.00 | 5.83 | 5.83 |
| time (sec) | N/A | 0.000 | 0.084 | 0.489 | 0.000 | 0.257 | 0.000 | 0.276 | 16.005 |

| Problem 258 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|----------|--------|--------------|
| grade | N/A | C | B | C | B | A | F | B | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 81 | 21 | 28 | 45 | 16 | 0 | 5161 | 0 |
| N.S. | 1 | 9.00 | 2.33 | 3.11 | 5.00 | 1.78 | 0.00 | 573.44 | 0.00 |
| time (sec) | N/A | 0.084 | 0.879 | 1.581 | 0.277 | 0.255 | 0.000 | 1.841 | 0.000 |

| Problem 259 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | F | F | F(-2) | F | F | F(-1) |
| verified | N/A | Yes | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 67 | 67 | 56 | 0 | 0 | 0 | 0 | 0 | 0 |
| N.S. | 1 | 1.00 | 0.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| time (sec) | N/A | 0.064 | 0.056 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| Problem 260 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 84 | 84 | 84 | 63 | 66 | 62 | 394 | 62 | 78 |
| N.S. | 1 | 1.00 | 1.00 | 0.75 | 0.79 | 0.74 | 4.69 | 0.74 | 0.93 |
| time (sec) | N/A | 0.247 | 0.103 | 1.304 | 0.236 | 0.264 | 4.266 | 0.261 | 16.535 |

| Problem 261 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | C | B | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 20 | 20 | 20 | 21 | 58 | 16 | 19 | 23 | 32 |
| N.S. | 1 | 1.00 | 1.00 | 1.05 | 2.90 | 0.80 | 0.95 | 1.15 | 1.60 |
| time (sec) | N/A | 0.031 | 0.110 | 0.376 | 0.289 | 0.271 | 0.063 | 0.273 | 16.873 |

| Problem 262 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 63 | 63 | 89 | 53 | 62 | 83 | 119 | 50 | 0 |
| N.S. | 1 | 1.00 | 1.41 | 0.84 | 0.98 | 1.32 | 1.89 | 0.79 | 0.00 |
| time (sec) | N/A | 0.025 | 0.184 | 0.237 | 0.273 | 0.252 | 1.065 | 0.267 | 0.000 |

| Problem 263 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | C | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 21 | 21 | 21 | 26 | 14 | 17 | 20 | 17 | 14 |
| N.S. | 1 | 1.00 | 1.00 | 1.24 | 0.67 | 0.81 | 0.95 | 0.81 | 0.67 |
| time (sec) | N/A | 0.010 | 0.013 | 0.188 | 0.215 | 0.274 | 0.346 | 0.261 | 16.239 |

| Problem 264 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 76 | 76 | 41 | 40 | 103 | 39 | 36 | 39 | 39 |
| N.S. | 1 | 1.00 | 0.54 | 0.53 | 1.36 | 0.51 | 0.47 | 0.51 | 0.51 |
| time (sec) | N/A | 0.313 | 0.624 | 0.079 | 0.198 | 0.244 | 0.049 | 0.259 | 16.514 |

| Problem 265 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|----------|--------|--------|-------|-------|--------------|
| grade | N/A | F | A | F | A | A | A | B | F(-1) |
| verified | N/A | N/A | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 38 | 0 | 38 | 0 | 34 | 34 | 34 | 163 | 0 |
| N.S. | 1 | 0.00 | 1.00 | 0.00 | 0.89 | 0.89 | 0.89 | 4.29 | 0.00 |
| time (sec) | N/A | 0.000 | 0.027 | 0.000 | 0.296 | 0.246 | 0.099 | 0.283 | 0.000 |

| Problem 266 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|----------|----------|----------|----------|----------|----------|--------------|
| grade | N/A | B | F | F | F | F | F | F | F(-1) |
| verified | N/A | Yes | N/A | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 52 | 115 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| N.S. | 1 | 2.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| time (sec) | N/A | 0.170 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| Problem 267 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | C | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 64 | 64 | 33 | 29 | 46 | 29 | 138 | 61 | 46 |
| N.S. | 1 | 1.00 | 0.52 | 0.45 | 0.72 | 0.45 | 2.16 | 0.95 | 0.72 |
| time (sec) | N/A | 0.016 | 0.027 | 0.212 | 0.204 | 0.236 | 1.700 | 0.270 | 0.034 |

| Problem 268 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|----------|----------|-------|----------|--------------|
| grade | N/A | A | A | C | F | F | B | F | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 43 | 77 | 70 | 47 | 0 | 0 | 56 | 0 | 0 |
| N.S. | 1 | 1.79 | 1.63 | 1.09 | 0.00 | 0.00 | 1.30 | 0.00 | 0.00 |
| time (sec) | N/A | 0.017 | 0.037 | 0.249 | 0.000 | 0.000 | 0.730 | 0.000 | 0.000 |

| Problem 269 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 41 | 41 | 58 | 31 | 30 | 48 | 34 | 30 | 31 |
| N.S. | 1 | 1.00 | 1.41 | 0.76 | 0.73 | 1.17 | 0.83 | 0.73 | 0.76 |
| time (sec) | N/A | 0.015 | 0.137 | 0.194 | 0.306 | 0.232 | 0.106 | 0.268 | 15.214 |

| Problem 270 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|----------|----------|----------|----------|----------|--------------|
| grade | N/A | A | A | F | F | F | F | F | F(-1) |
| verified | N/A | Yes | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 99 | 99 | 142 | 0 | 0 | 0 | 0 | 0 | 0 |
| N.S. | 1 | 1.00 | 1.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| time (sec) | N/A | 0.058 | 0.183 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| Problem 271 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|----------|----------|--------------|
| grade | N/A | A | A | A | A | A | F | F | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 36 | 36 | 36 | 31 | 29 | 36 | 0 | 0 | 0 |
| N.S. | 1 | 1.00 | 1.00 | 0.86 | 0.81 | 1.00 | 0.00 | 0.00 | 0.00 |
| time (sec) | N/A | 0.108 | 0.182 | 0.043 | 0.234 | 0.244 | 0.000 | 0.000 | 0.000 |

| Problem 272 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | B | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 44 | 93 | 47 | 42 | 41 | 45 | 85 | 41 | 55 |
| N.S. | 1 | 2.11 | 1.07 | 0.95 | 0.93 | 1.02 | 1.93 | 0.93 | 1.25 |
| time (sec) | N/A | 0.748 | 0.048 | 0.162 | 0.203 | 0.242 | 1.033 | 0.260 | 16.529 |

| Problem 273 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 56 | 56 | 33 | 30 | 58 | 29 | 68 | 42 | 30 |
| N.S. | 1 | 1.00 | 0.59 | 0.54 | 1.04 | 0.52 | 1.21 | 0.75 | 0.54 |
| time (sec) | N/A | 0.071 | 0.039 | 0.239 | 0.193 | 0.231 | 0.847 | 0.273 | 0.224 |

| Problem 274 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 31 | 31 | 25 | 23 | 28 | 37 | 26 | 23 | 28 |
| N.S. | 1 | 1.00 | 0.81 | 0.74 | 0.90 | 1.19 | 0.84 | 0.74 | 0.90 |
| time (sec) | N/A | 0.005 | 0.015 | 0.201 | 0.291 | 0.233 | 0.068 | 0.264 | 0.064 |

| Problem 275 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|--------|--------|----------|----------|--------------|
| grade | N/A | F | A | A | A | B | F | F | F(-1) |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 108 | 0 | 132 | 96 | 115 | 262 | 0 | 0 | 0 |
| N.S. | 1 | 0.00 | 1.22 | 0.89 | 1.06 | 2.43 | 0.00 | 0.00 | 0.00 |
| time (sec) | N/A | 0.000 | 0.050 | 0.644 | 0.337 | 0.272 | 0.000 | 0.000 | 0.000 |

| Problem 276 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-----------|--------|--------|----------|-------|--------|
| grade | N/A | B | A | C | A | A | F | A | B |
| verified | N/A | Yes | Yes | No | TBD | TBD | TBD | TBD | TBD |
| size | 32 | 100 | 29 | 17 | 8 | 8 | 0 | 32 | 8 |
| N.S. | 1 | 3.12 | 0.91 | 0.53 | 0.25 | 0.25 | 0.00 | 1.00 | 0.25 |
| time (sec) | N/A | 0.306 | 0.023 | 2.327 | 0.220 | 0.254 | 0.000 | 0.870 | 15.603 |

| Problem 277 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|--------|--------|----------|-------|-------|
| grade | N/A | F | A | A | C | A | F | A | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 21 | 0 | 21 | 22 | 27 | 13 | 0 | 13 | 19 |
| N.S. | 1 | 0.00 | 1.00 | 1.05 | 1.29 | 0.62 | 0.00 | 0.62 | 0.90 |
| time (sec) | N/A | 0.000 | 0.057 | 0.114 | 0.241 | 0.239 | 0.000 | 0.256 | 0.035 |

| Problem 278 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|----------|--------------|
| grade | N/A | A | A | C | A | A | C | F | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 102 | 102 | 114 | 13 | 117 | 114 | 31 | 0 | 0 |
| N.S. | 1 | 1.00 | 1.12 | 0.13 | 1.15 | 1.12 | 0.30 | 0.00 | 0.00 |
| time (sec) | N/A | 0.023 | 0.405 | 0.247 | 0.287 | 0.242 | 1.774 | 0.000 | 0.000 |

| Problem 279 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 9 | 4 | 4 | 3 | 4 | 4 |
| N.S. | 1 | 1.00 | 1.00 | 3.00 | 1.33 | 1.33 | 1.00 | 1.33 | 1.33 |
| time (sec) | N/A | 0.001 | 0.000 | 0.017 | 0.200 | 0.227 | 0.013 | 0.248 | 0.004 |

| Problem 280 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | B | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 3 | 3 | 3 | 4 | 3 | 8 | 7 | 5 | 5 |
| N.S. | 1 | 1.00 | 1.00 | 1.33 | 1.00 | 2.67 | 2.33 | 1.67 | 1.67 |
| time (sec) | N/A | 0.003 | 0.000 | 0.073 | 0.198 | 0.237 | 0.175 | 0.259 | 0.003 |

| Problem 281 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 7 | 7 | 7 | 7 | 6 | 6 | 7 | 6 | 6 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 0.86 | 0.86 | 1.00 | 0.86 | 0.86 |
| time (sec) | N/A | 0.076 | 0.022 | 0.054 | 0.198 | 0.243 | 0.068 | 0.269 | 0.182 |

| Problem 282 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 30 | 30 | 30 | 23 | 22 | 22 | 20 | 22 | 22 |
| N.S. | 1 | 1.00 | 1.00 | 0.77 | 0.73 | 0.73 | 0.67 | 0.73 | 0.73 |
| time (sec) | N/A | 0.033 | 0.001 | 0.075 | 0.193 | 0.226 | 0.017 | 0.265 | 0.022 |

| Problem 283 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 36 | 36 | 36 | 27 | 26 | 26 | 27 | 23 | 26 |
| N.S. | 1 | 1.00 | 1.00 | 0.75 | 0.72 | 0.72 | 0.75 | 0.64 | 0.72 |
| time (sec) | N/A | 0.037 | 0.003 | 0.015 | 0.205 | 0.221 | 0.017 | 0.263 | 0.024 |

| Problem 284 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 10 | 20 | 20 | 17 | 16 | 16 | 15 | 16 | 8 |
| N.S. | 1 | 2.00 | 2.00 | 1.70 | 1.60 | 1.60 | 1.50 | 1.60 | 0.80 |
| time (sec) | N/A | 0.023 | 0.007 | 0.203 | 0.205 | 0.245 | 0.072 | 0.269 | 15.369 |

| Problem 285 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 12 | 15 | 14 | 24 | 17 | 28 | 14 |
| N.S. | 1 | 1.00 | 1.00 | 1.25 | 1.17 | 2.00 | 1.42 | 2.33 | 1.17 |
| time (sec) | N/A | 0.037 | 0.261 | 1.191 | 0.289 | 0.252 | 0.030 | 0.292 | 16.002 |

| Problem 286 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 8 | 8 | 8 | 8 | 7 | 7 | 7 | 7 | 7 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 |
| time (sec) | N/A | 0.010 | 0.006 | 0.050 | 0.206 | 0.244 | 0.057 | 0.269 | 18.451 |

| Problem 287 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | B | A | A | A | A | A | C | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 1 | 3 | 1 | 2 | 1 | 1 | 0 | 26 | 1 |
| N.S. | 1 | 3.00 | 1.00 | 2.00 | 1.00 | 1.00 | 0.00 | 26.00 | 1.00 |
| time (sec) | N/A | 0.044 | 0.000 | 0.250 | 0.225 | 0.231 | 0.020 | 0.267 | 0.005 |

| Problem 288 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | C | A | A | A | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 1 | 50 | 1 | 2 | 1 | 1 | 58 | 1 | 1 |
| N.S. | 1 | 50.00 | 1.00 | 2.00 | 1.00 | 1.00 | 58.00 | 1.00 | 1.00 |
| time (sec) | N/A | 0.075 | 0.001 | 0.334 | 0.211 | 0.231 | 0.029 | 0.273 | 18.137 |

| Problem 289 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | C | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 9 | 9 | 9 | 81 | 8 | 8 | 8 | 9 |
| N.S. | 1 | 1.00 | 1.00 | 1.00 | 9.00 | 0.89 | 0.89 | 0.89 | 1.00 |
| time (sec) | N/A | 0.026 | 0.033 | 0.383 | 0.232 | 0.241 | 0.166 | 0.267 | 18.143 |

| Problem 290 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|----------|-------|--------|
| grade | N/A | A | B | A | B | B | F | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 49 | 49 | 100 | 61 | 79 | 114 | 0 | 73 | 238 |
| N.S. | 1 | 1.00 | 2.04 | 1.24 | 1.61 | 2.33 | 0.00 | 1.49 | 4.86 |
| time (sec) | N/A | 0.020 | 0.080 | 0.346 | 0.282 | 0.252 | 0.000 | 0.292 | 17.803 |

| Problem 291 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|--------------|--------|--------------|--------------|-------|--------------|
| grade | N/A | A | A | F(-1) | A | F(-1) | F(-1) | A | F(-1) |
| verified | N/A | Yes | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 0 | 11 | 0 | 0 | 15 | 0 |
| N.S. | 1 | 1.00 | 1.00 | 0.00 | 0.85 | 0.00 | 0.00 | 1.15 | 0.00 |
| time (sec) | N/A | 0.031 | 3.386 | 180.000 | 0.188 | 0.000 | 0.000 | 0.273 | 0.000 |

| Problem 292 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | B | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 17 | 17 | 14 | 13 | 131 | 34 | 13 | 13 |
| N.S. | 1 | 1.89 | 1.89 | 1.56 | 1.44 | 14.56 | 3.78 | 1.44 | 1.44 |
| time (sec) | N/A | 0.017 | 0.103 | 2.044 | 0.197 | 1.626 | 0.126 | 0.287 | 17.314 |

| Problem 293 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | F | A | C | B | A | A | B | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 19 | 0 | 21 | 30 | 91 | 16 | 17 | 119 | 22 |
| N.S. | 1 | 0.00 | 1.11 | 1.58 | 4.79 | 0.84 | 0.89 | 6.26 | 1.16 |
| time (sec) | N/A | 0.000 | 0.070 | 0.331 | 0.208 | 0.257 | 0.077 | 0.298 | 17.617 |

| Problem 294 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|----------|----------|----------|--------|--------|----------|--------------|
| grade | N/A | C | F | F | F | B | B | F | F(-1) |
| verified | N/A | Yes | N/A | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 87 | 0 | 0 | 0 | 30 | 56 | 0 | 0 |
| N.S. | 1 | 9.67 | 0.00 | 0.00 | 0.00 | 3.33 | 6.22 | 0.00 | 0.00 |
| time (sec) | N/A | 0.060 | 0.000 | 0.000 | 0.000 | 0.252 | 18.125 | 0.000 | 0.000 |

| Problem 295 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 32 | 32 | 32 | 24 | 24 | 24 | 26 | 24 | 24 |
| N.S. | 1 | 1.00 | 1.00 | 0.75 | 0.75 | 0.75 | 0.81 | 0.75 | 0.75 |
| time (sec) | N/A | 0.005 | 0.000 | 0.013 | 0.197 | 0.248 | 0.017 | 0.271 | 0.026 |

| Problem 296 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 14 | 14 | 14 | 15 | 14 | 14 | 14 | 16 | 10 |
| N.S. | 1 | 1.00 | 1.00 | 1.07 | 1.00 | 1.00 | 1.00 | 1.14 | 0.71 |
| time (sec) | N/A | 0.009 | 0.007 | 0.209 | 0.200 | 0.239 | 0.041 | 0.269 | 0.047 |

| Problem 297 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|----------|----------|--------------|
| grade | N/A | A | A | A | B | B | F | F | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 39 | 39 | 34 | 28 | 80 | 65 | 0 | 0 | 0 |
| N.S. | 1 | 1.00 | 0.87 | 0.72 | 2.05 | 1.67 | 0.00 | 0.00 | 0.00 |
| time (sec) | N/A | 0.057 | 0.017 | 0.047 | 0.203 | 0.250 | 0.000 | 0.000 | 0.000 |

| Problem 298 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | F | A | A | A | A | A | B | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 24 | 0 | 24 | 33 | 28 | 32 | 27 | 72 | 28 |
| N.S. | 1 | 0.00 | 1.00 | 1.38 | 1.17 | 1.33 | 1.12 | 3.00 | 1.17 |
| time (sec) | N/A | 0.000 | 0.047 | 0.121 | 0.247 | 0.237 | 0.051 | 0.276 | 18.187 |

| Problem 299 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|----------|--------|----------|-------|-------|
| grade | N/A | A | A | A | F | A | F | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 26 | 26 | 20 | 19 | 0 | 34 | 0 | 22 | 17 |
| N.S. | 1 | 1.00 | 0.77 | 0.73 | 0.00 | 1.31 | 0.00 | 0.85 | 0.65 |
| time (sec) | N/A | 0.015 | 0.013 | 0.265 | 0.000 | 0.238 | 0.000 | 0.279 | 0.063 |

| Problem 300 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 44 | 44 | 42 | 33 | 32 | 35 | 83 | 32 | 38 |
| N.S. | 1 | 1.00 | 0.95 | 0.75 | 0.73 | 0.80 | 1.89 | 0.73 | 0.86 |
| time (sec) | N/A | 0.033 | 0.019 | 0.369 | 0.206 | 0.243 | 0.178 | 0.269 | 16.927 |

| Problem 301 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|--------|-------|--------|
| grade | N/A | A | A | A | B | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 11 | 11 | 11 | 12 | 54 | 17 | 15 | 16 | 11 |
| N.S. | 1 | 1.00 | 1.00 | 1.09 | 4.91 | 1.55 | 1.36 | 1.45 | 1.00 |
| time (sec) | N/A | 0.086 | 0.016 | 0.175 | 0.281 | 0.255 | 92.250 | 0.271 | 16.288 |

| Problem 302 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|----------|--------|--------------|-------|-------|--------|
| grade | N/A | A | A | F | C | F(-2) | B | C | B |
| verified | N/A | Yes | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 13 | 13 | 13 | 0 | 41 | 0 | 83 | 41 | 9 |
| N.S. | 1 | 1.00 | 1.00 | 0.00 | 3.15 | 0.00 | 6.38 | 3.15 | 0.69 |
| time (sec) | N/A | 0.040 | 0.019 | 0.000 | 0.286 | 0.000 | 0.243 | 0.272 | 16.432 |

| Problem 303 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | B | A | B | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 12 | 13 | 94 | 22 | 83 | 12 | 35 |
| N.S. | 1 | 1.00 | 1.00 | 1.08 | 7.83 | 1.83 | 6.92 | 1.00 | 2.92 |
| time (sec) | N/A | 0.027 | 0.020 | 0.451 | 0.289 | 0.248 | 1.468 | 0.272 | 16.939 |

| Problem 304 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | B | A | B | B | B | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 19 | 19 | 19 | 86 | 19 | 85 | 82 | 85 | 85 |
| N.S. | 1 | 1.00 | 1.00 | 4.53 | 1.00 | 4.47 | 4.32 | 4.47 | 4.47 |
| time (sec) | N/A | 0.069 | 0.051 | 0.264 | 0.195 | 0.233 | 0.466 | 0.289 | 17.036 |

| Problem 305 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|--------|-------|-------|
| grade | N/A | A | A | A | F(-1) | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 86 | 108 | 86 | 67 | 0 | 71 | 100 | 66 | 66 |
| N.S. | 1 | 1.26 | 1.00 | 0.78 | 0.00 | 0.83 | 1.16 | 0.77 | 0.77 |
| time (sec) | N/A | 0.396 | 0.028 | 0.306 | 0.000 | 0.362 | 69.501 | 0.272 | 0.197 |

| Problem 306 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 26 | 26 | 26 | 23 | 22 | 22 | 19 | 22 | 22 |
| N.S. | 1 | 1.00 | 1.00 | 0.88 | 0.85 | 0.85 | 0.73 | 0.85 | 0.85 |
| time (sec) | N/A | 0.043 | 0.027 | 0.215 | 0.276 | 0.242 | 0.030 | 0.276 | 0.051 |

| Problem 307 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | F | A | F | F | A | F | A | F(-1) |
| verified | N/A | N/A | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 23 | 0 | 25 | 0 | 0 | 12 | 0 | 12 | 0 |
| N.S. | 1 | 0.00 | 1.09 | 0.00 | 0.00 | 0.52 | 0.00 | 0.52 | 0.00 |
| time (sec) | N/A | 0.000 | 0.063 | 0.000 | 0.000 | 0.247 | 0.000 | 0.273 | 0.000 |

| Problem 308 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 12 | 12 | 12 | 11 | 10 | 10 | 8 | 10 | 10 |
| N.S. | 1 | 1.00 | 1.00 | 0.92 | 0.83 | 0.83 | 0.67 | 0.83 | 0.83 |
| time (sec) | N/A | 0.002 | 0.056 | 0.219 | 0.199 | 0.232 | 0.232 | 0.264 | 0.104 |

| Problem 309 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------------|
| grade | N/A | A | A | B | C | A | A | C | F(-1) |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 23 | 23 | 22 | 34 | 46 | 15 | 27 | 42 | 0 |
| N.S. | 1 | 1.00 | 0.96 | 1.48 | 2.00 | 0.65 | 1.17 | 1.83 | 0.00 |
| time (sec) | N/A | 0.014 | 0.041 | 0.178 | 0.301 | 0.246 | 1.344 | 0.295 | 0.000 |

| Problem 310 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | B | A | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 9 | 9 | 24 | 8 | 12 | 17 | 7 | 8 | 7 |
| N.S. | 1 | 1.00 | 2.67 | 0.89 | 1.33 | 1.89 | 0.78 | 0.89 | 0.78 |
| time (sec) | N/A | 0.011 | 0.027 | 0.167 | 0.206 | 0.258 | 0.099 | 0.267 | 0.097 |

| Problem 311 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 22 | 22 | 22 | 23 | 34 | 24 | 20 | 22 | 18 |
| N.S. | 1 | 1.00 | 1.00 | 1.05 | 1.55 | 1.09 | 0.91 | 1.00 | 0.82 |
| time (sec) | N/A | 0.014 | 0.012 | 0.061 | 0.194 | 0.237 | 0.051 | 0.276 | 0.044 |

| Problem 312 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | B | A | B | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 22 | 22 | 22 | 39 | 34 | 40 | 17 | 31 | 38 |
| N.S. | 1 | 1.00 | 1.00 | 1.77 | 1.55 | 1.82 | 0.77 | 1.41 | 1.73 |
| time (sec) | N/A | 0.009 | 0.042 | 0.112 | 0.185 | 0.244 | 0.764 | 0.283 | 0.102 |

| Problem 313 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|----------|--------|----------|-------|--------|
| grade | N/A | F | A | C | F | B | F | B | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 21 | 0 | 21 | 52 | 0 | 84 | 0 | 136 | 15 |
| N.S. | 1 | 0.00 | 1.00 | 2.48 | 0.00 | 4.00 | 0.00 | 6.48 | 0.71 |
| time (sec) | N/A | 0.000 | 0.089 | 2.167 | 0.000 | 0.261 | 0.000 | 0.277 | 17.185 |

| Problem 314 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|--------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 17 | 17 | 17 | 18 | 17 | 17 | 15 | 21 | 17 |
| N.S. | 1 | 1.00 | 1.00 | 1.06 | 1.00 | 1.00 | 0.88 | 1.24 | 1.00 |
| time (sec) | N/A | 0.125 | 0.065 | 0.315 | 0.248 | 0.244 | 0.061 | 0.272 | 17.009 |

| Problem 315 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|----------|----------|--------|-------|----------|--------------|
| grade | N/A | A | B | F | F | A | B | F | F(-1) |
| verified | N/A | Yes | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 45 | 59 | 107 | 0 | 0 | 37 | 4362 | 0 | 0 |
| N.S. | 1 | 1.31 | 2.38 | 0.00 | 0.00 | 0.82 | 96.93 | 0.00 | 0.00 |
| time (sec) | N/A | 0.084 | 0.535 | 0.000 | 0.000 | 0.302 | 3.878 | 0.000 | 0.000 |

| Problem 316 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 54 | 54 | 54 | 45 | 44 | 44 | 49 | 44 | 44 |
| N.S. | 1 | 1.00 | 1.00 | 0.83 | 0.81 | 0.81 | 0.91 | 0.81 | 0.81 |
| time (sec) | N/A | 0.020 | 0.005 | 0.198 | 0.214 | 0.230 | 0.023 | 0.272 | 0.111 |

| Problem 317 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|-------|--------|--------|----------|-------|--------|
| grade | N/A | F | A | C | A | A | F | A | B |
| verified | N/A | N/A | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 18 | 0 | 18 | 34 | 23 | 23 | 0 | 23 | 18 |
| N.S. | 1 | 0.00 | 1.00 | 1.89 | 1.28 | 1.28 | 0.00 | 1.28 | 1.00 |
| time (sec) | N/A | 0.000 | 0.014 | 0.336 | 0.292 | 0.234 | 0.000 | 0.277 | 16.642 |

| Problem 318 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|----------|--------|--------|----------|-------|--------------|
| grade | N/A | A | A | F | A | B | F | A | F(-1) |
| verified | N/A | Yes | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 61 | 61 | 77 | 0 | 56 | 108 | 0 | 57 | 0 |
| N.S. | 1 | 1.00 | 1.26 | 0.00 | 0.92 | 1.77 | 0.00 | 0.93 | 0.00 |
| time (sec) | N/A | 0.106 | 0.284 | 0.000 | 0.277 | 0.249 | 0.000 | 0.290 | 0.000 |

| Problem 319 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|--------------|--------|--------|
| grade | N/A | A | A | B | A | A | F(-1) | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 64 | 78 | 64 | 228 | 52 | 55 | 0 | 61 | 66 |
| N.S. | 1 | 1.22 | 1.00 | 3.56 | 0.81 | 0.86 | 0.00 | 0.95 | 1.03 |
| time (sec) | N/A | 2.197 | 0.478 | 0.737 | 0.206 | 0.284 | 0.000 | 37.520 | 19.383 |

| Problem 320 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|----------|-------|----------|----------|--------|----------|----------|--------------|
| grade | N/A | F | A | F | F | A | F | F | F(-1) |
| verified | N/A | N/A | Yes | N/A | TBD | TBD | TBD | TBD | TBD |
| size | 105 | 0 | 105 | 0 | 0 | 148 | 0 | 0 | 0 |
| N.S. | 1 | 0.00 | 1.00 | 0.00 | 0.00 | 1.41 | 0.00 | 0.00 | 0.00 |
| time (sec) | N/A | 0.000 | 0.549 | 0.000 | 0.000 | 0.648 | 0.000 | 0.000 | 0.000 |

| Problem 321 | Optimal | Rubi | MMA | Maple | Maxima | Fricas | Sympy | Giac | Mupad |
|-------------|---------|-------|-------|-------|--------|--------|-------|-------|-------|
| grade | N/A | A | A | A | A | A | A | A | B |
| verified | N/A | Yes | Yes | Yes | TBD | TBD | TBD | TBD | TBD |
| size | 25 | 25 | 25 | 18 | 17 | 17 | 15 | 19 | 23 |
| N.S. | 1 | 1.00 | 1.00 | 0.72 | 0.68 | 0.68 | 0.60 | 0.76 | 0.92 |
| time (sec) | N/A | 0.019 | 0.006 | 0.055 | 0.202 | 0.236 | 0.080 | 0.335 | 0.105 |

2.3 Detailed conclusion table specific for Rubi results

The following table is specific to Rubi only. It gives additional statistics for each integral. the column **steps** is the number of steps used by Rubi to obtain the antiderivative. The **rules** column is the number of unique rules used. The **integrand size** column is the leaf size of the integrand. Finally the ratio $\frac{\text{number of rules}}{\text{integrand size}}$ is also given. The larger this ratio is, the harder the integral is to solve. In this test file, problem number [10] had the largest ratio of [1.3329999999999996]

Table 2.1: Rubi specific breakdown of results for each integral

| # | grade | number of steps used | number of unique rules | normalized antiderivative leaf size | integrand leaf size | $\frac{\text{number of rules}}{\text{integrand leaf size}}$ |
|----|-------|----------------------|------------------------|-------------------------------------|---------------------|---|
| 1 | A | 5 | 2 | 1.00 | 11 | 0.182 |
| 2 | A | 4 | 3 | 1.00 | 9 | 0.333 |
| 3 | A | 2 | 1 | 1.52 | 13 | 0.077 |
| 4 | A | 4 | 3 | 1.00 | 8 | 0.375 |
| 5 | A | 2 | 2 | 1.00 | 5 | 0.400 |
| 6 | A | 4 | 4 | 1.00 | 9 | 0.444 |
| 7 | A | 4 | 3 | 1.00 | 9 | 0.333 |
| 8 | A | 3 | 3 | 1.00 | 13 | 0.231 |
| 9 | A | 4 | 4 | 1.00 | 11 | 0.364 |
| 10 | A | 11 | 8 | 1.38 | 6 | 1.333 |
| 11 | A | 8 | 4 | 1.00 | 12 | 0.333 |
| 12 | A | 4 | 3 | 1.00 | 21 | 0.143 |
| 13 | A | 3 | 2 | 1.00 | 8 | 0.250 |
| 14 | A | 3 | 2 | 1.59 | 17 | 0.118 |
| 15 | A | 2 | 2 | 1.00 | 7 | 0.286 |
| 16 | A | 3 | 2 | 1.00 | 12 | 0.167 |
| 17 | A | 1 | 1 | 1.00 | 7 | 0.143 |
| 18 | A | 1 | 1 | 1.00 | 13 | 0.077 |
| 19 | A | 2 | 2 | 1.00 | 17 | 0.118 |
| 20 | F | 0 | 0 | N/A | 0.000 | N/A |
| 21 | A | 3 | 3 | 1.00 | 14 | 0.214 |
| 22 | A | 2 | 2 | 1.00 | 9 | 0.222 |
| 23 | A | 4 | 2 | 1.00 | 11 | 0.182 |
| 24 | A | 5 | 4 | 0.96 | 17 | 0.235 |

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Table 2.1 – continued from previous page

| # | grade | number of steps used | number of unique rules | normalized antiderivative leaf size | integrand leaf size | $\frac{\text{number of rules}}{\text{integrand leaf size}}$ |
|----|-------|----------------------|------------------------|-------------------------------------|---------------------|---|
| 25 | A | 2 | 1 | 1.00 | 19 | 0.053 |
| 26 | A | 4 | 2 | 1.00 | 9 | 0.222 |
| 27 | A | 3 | 3 | 1.00 | 14 | 0.214 |
| 28 | A | 2 | 1 | 1.00 | 11 | 0.091 |
| 29 | A | 4 | 3 | 1.00 | 27 | 0.111 |
| 30 | A | 2 | 2 | 1.00 | 4 | 0.500 |
| 31 | A | 3 | 2 | 1.00 | 9 | 0.222 |
| 32 | A | 3 | 3 | 1.00 | 11 | 0.273 |
| 33 | A | 4 | 2 | 1.00 | 4 | 0.500 |
| 34 | A | 3 | 3 | 1.00 | 12 | 0.250 |
| 35 | A | 1 | 1 | 1.00 | 3 | 0.333 |
| 36 | A | 1 | 1 | 1.00 | 2 | 0.500 |
| 37 | A | 2 | 1 | 1.00 | 15 | 0.067 |
| 38 | A | 1 | 1 | 1.00 | 13 | 0.077 |
| 39 | A | 6 | 2 | 1.00 | 11 | 0.182 |
| 40 | A | 4 | 2 | 1.00 | 8 | 0.250 |
| 41 | A | 4 | 4 | 2.00 | 7 | 0.571 |
| 42 | A | 4 | 4 | 1.00 | 15 | 0.267 |
| 43 | A | 3 | 3 | 1.00 | 12 | 0.250 |
| 44 | A | 3 | 2 | 1.00 | 8 | 0.250 |
| 45 | A | 3 | 3 | 1.21 | 13 | 0.231 |
| 46 | B | 102 | 2 | 66.75 | 9 | 0.222 |
| 47 | A | 3 | 3 | 1.00 | 9 | 0.333 |
| 48 | A | 3 | 2 | 1.00 | 34 | 0.059 |
| 49 | A | 3 | 3 | 1.00 | 15 | 0.200 |
| 50 | A | 3 | 2 | 1.00 | 9 | 0.222 |
| 51 | A | 1 | 1 | 1.00 | 8 | 0.125 |
| 52 | A | 3 | 2 | 1.60 | 21 | 0.095 |
| 53 | A | 3 | 2 | 1.00 | 15 | 0.133 |
| 54 | A | 2 | 2 | 1.00 | 11 | 0.182 |
| 55 | A | 2 | 2 | 1.00 | 14 | 0.143 |
| 56 | A | 1 | 1 | 1.00 | 4 | 0.250 |
| 57 | A | 1 | 1 | 1.00 | 6 | 0.167 |
| 58 | A | 7 | 6 | 1.00 | 23 | 0.261 |
| 59 | A | 4 | 4 | 1.00 | 21 | 0.190 |

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Table 2.1 – continued from previous page

| # | grade | number of steps used | number of unique rules | normalized antiderivative leaf size | integrand leaf size | $\frac{\text{number of rules}}{\text{integrand leaf size}}$ |
|----|-------|----------------------|------------------------|-------------------------------------|---------------------|---|
| 60 | A | 2 | 1 | 1.00 | 34 | 0.029 |
| 61 | A | 4 | 3 | 1.00 | 12 | 0.250 |
| 62 | A | 5 | 5 | 1.00 | 9 | 0.556 |
| 63 | A | 2 | 2 | 1.00 | 15 | 0.133 |
| 64 | A | 2 | 1 | 1.00 | 9 | 0.111 |
| 65 | A | 2 | 0 | 1.00 | 7 | 0.000 |
| 66 | A | 4 | 4 | 1.00 | 15 | 0.267 |
| 67 | A | 2 | 2 | 1.00 | 11 | 0.182 |
| 68 | A | 3 | 3 | 1.00 | 9 | 0.333 |
| 69 | A | 2 | 2 | 1.00 | 9 | 0.222 |
| 70 | A | 2 | 2 | 1.62 | 11 | 0.182 |
| 71 | A | 2 | 2 | 1.00 | 6 | 0.333 |
| 72 | A | 3 | 2 | 1.00 | 13 | 0.154 |
| 73 | A | 5 | 4 | 1.00 | 10 | 0.400 |
| 74 | A | 3 | 3 | 1.00 | 11 | 0.273 |
| 75 | A | 3 | 1 | 1.00 | 11 | 0.091 |
| 76 | A | 1 | 1 | 1.00 | 3 | 0.333 |
| 77 | F | 0 | 0 | N/A | 0.000 | N/A |
| 78 | B | 1 | 0 | 2.09 | 13 | 0.000 |
| 79 | A | 2 | 2 | 1.00 | 11 | 0.182 |
| 80 | A | 2 | 1 | 1.00 | 15 | 0.067 |
| 81 | A | 3 | 3 | 1.00 | 13 | 0.231 |
| 82 | A | 2 | 1 | 1.00 | 27 | 0.037 |
| 83 | A | 1 | 1 | 1.00 | 2 | 0.500 |
| 84 | A | 4 | 4 | 2.00 | 11 | 0.364 |
| 85 | A | 3 | 3 | 1.71 | 9 | 0.333 |
| 86 | A | 3 | 3 | 1.00 | 15 | 0.200 |
| 87 | A | 2 | 2 | 1.00 | 4 | 0.500 |
| 88 | A | 5 | 3 | 1.73 | 7 | 0.429 |
| 89 | A | 3 | 3 | 1.00 | 5 | 0.600 |
| 90 | A | 4 | 2 | 1.00 | 9 | 0.222 |
| 91 | A | 3 | 2 | 1.00 | 11 | 0.182 |
| 92 | A | 2 | 2 | 1.00 | 10 | 0.200 |
| 93 | A | 4 | 5 | 1.00 | 6 | 0.833 |
| 94 | A | 2 | 2 | 1.00 | 11 | 0.182 |

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Table 2.1 – continued from previous page

| # | grade | number of steps used | number of unique rules | normalized antiderivative leaf size | integrand leaf size | $\frac{\text{number of rules}}{\text{integrand leaf size}}$ |
|-----|-------|----------------------|------------------------|-------------------------------------|---------------------|---|
| 95 | A | 2 | 2 | 1.00 | 11 | 0.182 |
| 96 | A | 3 | 2 | 1.00 | 9 | 0.222 |
| 97 | A | 1 | 1 | 1.00 | 8 | 0.125 |
| 98 | A | 3 | 3 | 1.00 | 13 | 0.231 |
| 99 | A | 1 | 1 | 1.00 | 4 | 0.250 |
| 100 | A | 4 | 3 | 1.00 | 6 | 0.500 |
| 101 | A | 1 | 1 | 1.00 | 16 | 0.062 |
| 102 | A | 4 | 3 | 1.00 | 13 | 0.231 |
| 103 | A | 1 | 1 | 1.00 | 9 | 0.111 |
| 104 | A | 2 | 1 | 1.00 | 6 | 0.167 |
| 105 | A | 2 | 1 | 1.00 | 9 | 0.111 |
| 106 | A | 2 | 2 | 1.00 | 2 | 1.000 |
| 107 | A | 2 | 1 | 1.00 | 9 | 0.111 |
| 108 | A | 3 | 3 | 1.00 | 4 | 0.750 |
| 109 | A | 3 | 2 | 1.00 | 10 | 0.200 |
| 110 | A | 13 | 8 | 1.47 | 18 | 0.444 |
| 111 | A | 3 | 3 | 1.00 | 4 | 0.750 |
| 112 | A | 4 | 4 | 1.00 | 13 | 0.308 |
| 113 | A | 2 | 2 | 1.00 | 8 | 0.250 |
| 114 | A | 3 | 2 | 1.00 | 19 | 0.105 |
| 115 | A | 3 | 3 | 1.00 | 12 | 0.250 |
| 116 | A | 3 | 2 | 1.00 | 15 | 0.133 |
| 117 | A | 1 | 1 | 1.50 | 6 | 0.167 |
| 118 | B | 7 | 2 | 5.80 | 11 | 0.182 |
| 119 | B | 2 | 1 | 2.31 | 11 | 0.091 |
| 120 | A | 2 | 2 | 1.00 | 12 | 0.167 |
| 121 | A | 1 | 1 | 1.00 | 2 | 0.500 |
| 122 | A | 2 | 2 | 1.00 | 7 | 0.286 |
| 123 | A | 2 | 2 | 1.00 | 6 | 0.333 |
| 124 | A | 5 | 5 | 1.00 | 12 | 0.417 |
| 125 | A | 1 | 1 | 1.00 | 3 | 0.333 |
| 126 | A | 2 | 1 | 1.27 | 12 | 0.083 |
| 127 | A | 3 | 2 | 1.00 | 9 | 0.222 |
| 128 | A | 3 | 3 | 1.00 | 11 | 0.273 |
| 129 | A | 1 | 1 | 1.00 | 9 | 0.111 |

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Table 2.1 – continued from previous page

| # | grade | number of steps used | number of unique rules | normalized antiderivative leaf size | integrand leaf size | $\frac{\text{number of rules}}{\text{integrand leaf size}}$ |
|-----|-------|----------------------|------------------------|-------------------------------------|---------------------|---|
| 130 | A | 3 | 1 | 1.00 | 14 | 0.071 |
| 131 | A | 5 | 5 | 1.00 | 10 | 0.500 |
| 132 | A | 6 | 3 | 1.00 | 11 | 0.273 |
| 133 | A | 3 | 2 | 1.00 | 15 | 0.133 |
| 134 | A | 3 | 2 | 1.00 | 4 | 0.500 |
| 135 | A | 3 | 2 | 1.00 | 7 | 0.286 |
| 136 | A | 1 | 1 | 1.00 | 14 | 0.071 |
| 137 | A | 1 | 1 | 1.00 | 2 | 0.500 |
| 138 | A | 1 | 0 | 1.00 | 7 | 0.000 |
| 139 | A | 1 | 1 | 1.00 | 6 | 0.167 |
| 140 | F | 0 | 0 | N/A | 0.000 | N/A |
| 141 | A | 2 | 1 | 1.00 | 11 | 0.091 |
| 142 | A | 3 | 3 | 1.00 | 8 | 0.375 |
| 143 | A | 5 | 4 | 1.00 | 10 | 0.400 |
| 144 | A | 1 | 1 | 1.00 | 2 | 0.500 |
| 145 | A | 1 | 1 | 1.00 | 11 | 0.091 |
| 146 | A | 2 | 2 | 1.00 | 11 | 0.182 |
| 147 | F | 0 | 0 | N/A | 0.000 | N/A |
| 148 | A | 3 | 1 | 1.00 | 25 | 0.040 |
| 149 | A | 3 | 3 | 1.00 | 9 | 0.333 |
| 150 | A | 11 | 4 | 1.00 | 21 | 0.190 |
| 151 | A | 3 | 2 | 1.00 | 13 | 0.154 |
| 152 | A | 3 | 3 | 1.00 | 12 | 0.250 |
| 153 | A | 4 | 3 | 1.00 | 11 | 0.273 |
| 154 | A | 2 | 1 | 1.00 | 6 | 0.167 |
| 155 | A | 5 | 4 | 1.00 | 15 | 0.267 |
| 156 | A | 1 | 1 | 1.50 | 6 | 0.167 |
| 157 | A | 1 | 1 | 1.00 | 13 | 0.077 |
| 158 | A | 1 | 1 | 1.00 | 6 | 0.167 |
| 159 | A | 1 | 1 | 1.00 | 2 | 0.500 |
| 160 | A | 2 | 2 | 1.00 | 9 | 0.222 |
| 161 | A | 3 | 3 | 1.00 | 13 | 0.231 |
| 162 | A | 4 | 4 | 1.00 | 11 | 0.364 |
| 163 | A | 2 | 2 | 1.00 | 2 | 1.000 |
| 164 | A | 2 | 2 | 1.00 | 12 | 0.167 |

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Table 2.1 – continued from previous page

| # | grade | number of steps used | number of unique rules | normalized antiderivative leaf size | integrand leaf size | $\frac{\text{number of rules}}{\text{integrand leaf size}}$ |
|-----|-------|----------------------|------------------------|-------------------------------------|---------------------|---|
| 165 | A | 3 | 3 | 1.00 | 6 | 0.500 |
| 166 | A | 3 | 3 | 1.00 | 7 | 0.429 |
| 167 | A | 1 | 1 | 1.00 | 12 | 0.083 |
| 168 | A | 3 | 3 | 1.00 | 11 | 0.273 |
| 169 | A | 3 | 3 | 1.00 | 8 | 0.375 |
| 170 | A | 1 | 1 | 1.00 | 8 | 0.125 |
| 171 | A | 3 | 2 | 1.00 | 9 | 0.222 |
| 172 | A | 7 | 3 | 1.00 | 18 | 0.167 |
| 173 | A | 5 | 5 | 1.00 | 25 | 0.200 |
| 174 | A | 1 | 1 | 1.00 | 10 | 0.100 |
| 175 | A | 4 | 3 | 1.00 | 13 | 0.231 |
| 176 | A | 2 | 2 | 1.00 | 11 | 0.182 |
| 177 | A | 1 | 1 | 1.00 | 4 | 0.250 |
| 178 | A | 2 | 1 | 1.00 | 7 | 0.143 |
| 179 | A | 2 | 2 | 1.00 | 11 | 0.182 |
| 180 | F | 0 | 0 | N/A | 0.000 | N/A |
| 181 | A | 1 | 1 | 1.00 | 15 | 0.067 |
| 182 | A | 3 | 3 | 1.00 | 10 | 0.300 |
| 183 | A | 1 | 1 | 1.00 | 6 | 0.167 |
| 184 | A | 3 | 3 | 1.00 | 13 | 0.231 |
| 185 | A | 1 | 1 | 1.00 | 10 | 0.100 |
| 186 | A | 2 | 2 | 1.00 | 4 | 0.500 |
| 187 | A | 6 | 4 | 1.71 | 25 | 0.160 |
| 188 | A | 4 | 4 | 1.00 | 13 | 0.308 |
| 189 | A | 2 | 2 | 1.00 | 13 | 0.154 |
| 190 | A | 1 | 1 | 1.00 | 9 | 0.111 |
| 191 | A | 2 | 2 | 1.00 | 15 | 0.133 |
| 192 | A | 2 | 2 | 1.00 | 14 | 0.143 |
| 193 | A | 2 | 2 | 1.00 | 5 | 0.400 |
| 194 | N/A | 0 | 0 | 1.00 | 3 | 0.000 |
| 195 | A | 1 | 1 | 1.00 | 13 | 0.077 |
| 196 | B | 5 | 2 | 2.50 | 17 | 0.118 |
| 197 | A | 1 | 1 | 1.00 | 9 | 0.111 |
| 198 | A | 2 | 2 | 1.08 | 4 | 0.500 |
| 199 | A | 6 | 4 | 1.00 | 21 | 0.190 |

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Table 2.1 – continued from previous page

| # | grade | number of steps used | number of unique rules | normalized antiderivative leaf size | integrand leaf size | $\frac{\text{number of rules}}{\text{integrand leaf size}}$ |
|-----|-------|----------------------|------------------------|-------------------------------------|---------------------|---|
| 200 | A | 3 | 2 | 1.00 | 10 | 0.200 |
| 201 | A | 2 | 2 | 1.00 | 13 | 0.154 |
| 202 | A | 3 | 3 | 1.00 | 6 | 0.500 |
| 203 | A | 3 | 3 | 1.00 | 11 | 0.273 |
| 204 | A | 5 | 2 | 1.00 | 11 | 0.182 |
| 205 | A | 1 | 1 | 1.48 | 9 | 0.111 |
| 206 | A | 1 | 1 | 1.00 | 1 | 1.000 |
| 207 | B | 14 | 5 | 24.00 | 21 | 0.238 |
| 208 | A | 1 | 1 | 1.00 | 20 | 0.050 |
| 209 | A | 3 | 3 | 1.00 | 11 | 0.273 |
| 210 | A | 2 | 2 | 1.00 | 9 | 0.222 |
| 211 | F | 0 | 0 | N/A | 0.000 | N/A |
| 212 | A | 3 | 2 | 1.00 | 18 | 0.111 |
| 213 | A | 1 | 1 | 1.00 | 9 | 0.111 |
| 214 | A | 2 | 4 | 2.00 | 12 | 0.333 |
| 215 | A | 4 | 4 | 1.00 | 7 | 0.571 |
| 216 | A | 2 | 2 | 1.00 | 9 | 0.222 |
| 217 | A | 2 | 2 | 1.00 | 12 | 0.167 |
| 218 | A | 3 | 3 | 1.00 | 11 | 0.273 |
| 219 | A | 4 | 3 | 1.00 | 15 | 0.200 |
| 220 | A | 2 | 1 | 1.00 | 21 | 0.048 |
| 221 | A | 3 | 3 | 1.00 | 6 | 0.500 |
| 222 | A | 1 | 1 | 1.00 | 18 | 0.056 |
| 223 | A | 2 | 2 | 1.00 | 6 | 0.333 |
| 224 | A | 4 | 3 | 1.00 | 8 | 0.375 |
| 225 | N/A | 0 | 0 | 1.00 | 9 | 0.000 |
| 226 | N/A | 0 | 0 | 1.00 | 14 | 0.000 |
| 227 | A | 2 | 1 | 1.00 | 9 | 0.111 |
| 228 | A | 5 | 5 | 1.73 | 15 | 0.333 |
| 229 | A | 5 | 4 | 1.00 | 12 | 0.333 |
| 230 | A | 2 | 2 | 1.00 | 11 | 0.182 |
| 231 | A | 3 | 3 | 1.00 | 11 | 0.273 |
| 232 | A | 1 | 1 | 1.00 | 11 | 0.091 |
| 233 | A | 8 | 4 | 1.00 | 9 | 0.444 |
| 234 | A | 2 | 2 | 1.50 | 12 | 0.167 |

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Table 2.1 – continued from previous page

| # | grade | number of steps used | number of unique rules | normalized antiderivative leaf size | integrand leaf size | $\frac{\text{number of rules}}{\text{integrand leaf size}}$ |
|-----|-------|----------------------|------------------------|-------------------------------------|---------------------|---|
| 235 | A | 5 | 2 | 1.00 | 19 | 0.105 |
| 236 | N/A | 0 | 0 | 1.00 | 5 | 0.000 |
| 237 | A | 3 | 3 | 1.00 | 8 | 0.375 |
| 238 | A | 2 | 2 | 1.00 | 11 | 0.182 |
| 239 | A | 2 | 2 | 1.00 | 4 | 0.500 |
| 240 | A | 6 | 3 | 1.00 | 17 | 0.176 |
| 241 | A | 3 | 2 | 1.00 | 13 | 0.154 |
| 242 | B | 5 | 4 | 8.04 | 23 | 0.174 |
| 243 | F | 0 | 0 | N/A | 0.000 | N/A |
| 244 | B | 9 | 3 | 2.75 | 19 | 0.158 |
| 245 | F | 0 | 0 | N/A | 0.000 | N/A |
| 246 | C | 11 | 5 | 14.00 | 37 | 0.135 |
| 247 | A | 2 | 2 | 1.00 | 11 | 0.182 |
| 248 | A | 2 | 2 | 1.00 | 8 | 0.250 |
| 249 | A | 4 | 4 | 1.00 | 8 | 0.500 |
| 250 | F | 0 | 0 | N/A | 0.000 | N/A |
| 251 | A | 2 | 1 | 1.00 | 14 | 0.071 |
| 252 | A | 6 | 4 | 1.00 | 22 | 0.182 |
| 253 | A | 3 | 2 | 1.47 | 9 | 0.222 |
| 254 | B | 6 | 6 | 3.12 | 11 | 0.546 |
| 255 | A | 3 | 2 | 1.00 | 9 | 0.222 |
| 256 | A | 3 | 3 | 1.00 | 9 | 0.333 |
| 257 | F | 0 | 0 | N/A | 0.000 | N/A |
| 258 | C | 7 | 5 | 9.00 | 19 | 0.263 |
| 259 | A | 5 | 5 | 1.00 | 12 | 0.417 |
| 260 | A | 29 | 4 | 1.00 | 13 | 0.308 |
| 261 | A | 1 | 1 | 1.00 | 21 | 0.048 |
| 262 | A | 6 | 3 | 1.00 | 34 | 0.088 |
| 263 | A | 1 | 1 | 1.00 | 7 | 0.143 |
| 264 | A | 25 | 5 | 1.00 | 20 | 0.250 |
| 265 | F | 0 | 0 | N/A | 0.000 | N/A |
| 266 | B | 3 | 3 | 2.21 | 22 | 0.136 |
| 267 | A | 2 | 1 | 1.00 | 13 | 0.077 |
| 268 | A | 3 | 2 | 1.79 | 6 | 0.333 |

Continued on next page

Table 2.1 – continued from previous page

| # | grade | number of steps used | number of unique rules | normalized antiderivative leaf size | integrand leaf size | $\frac{\text{number of rules}}{\text{integrand leaf size}}$ |
|-----|-------|----------------------|------------------------|-------------------------------------|---------------------|---|
| 269 | A | 4 | 3 | 1.00 | 19 | 0.158 |
| 270 | A | 2 | 2 | 1.00 | 12 | 0.167 |
| 271 | A | 8 | 7 | 1.00 | 16 | 0.438 |
| 272 | B | 53 | 5 | 2.11 | 11 | 0.454 |
| 273 | A | 4 | 3 | 1.00 | 29 | 0.103 |
| 274 | A | 3 | 2 | 1.00 | 7 | 0.286 |
| 275 | F | 0 | 0 | N/A | 0.000 | N/A |
| 276 | B | 4 | 3 | 3.12 | 39 | 0.077 |
| 277 | F | 0 | 0 | N/A | 0.000 | N/A |
| 278 | A | 3 | 2 | 1.00 | 15 | 0.133 |
| 279 | A | 1 | 1 | 1.00 | 1 | 1.000 |
| 280 | A | 1 | 1 | 1.00 | 2 | 0.500 |
| 281 | A | 4 | 4 | 1.00 | 19 | 0.210 |
| 282 | A | 2 | 1 | 1.00 | 29 | 0.034 |
| 283 | A | 3 | 2 | 1.00 | 17 | 0.118 |
| 284 | A | 6 | 4 | 2.00 | 13 | 0.308 |
| 285 | A | 13 | 4 | 1.00 | 25 | 0.160 |
| 286 | A | 1 | 1 | 1.00 | 13 | 0.077 |
| 287 | B | 8 | 4 | 3.00 | 43 | 0.093 |
| 288 | C | 12 | 3 | 50.00 | 19 | 0.158 |
| 289 | A | 1 | 1 | 1.00 | 11 | 0.091 |
| 290 | A | 7 | 6 | 1.00 | 31 | 0.194 |
| 291 | A | 4 | 3 | 1.00 | 15 | 0.200 |
| 292 | A | 3 | 2 | 1.89 | 17 | 0.118 |
| 293 | F | 0 | 0 | N/A | 0.000 | N/A |
| 294 | C | 4 | 5 | 9.67 | 16 | 0.312 |
| 295 | A | 1 | 0 | 1.00 | 20 | 0.000 |
| 296 | A | 2 | 1 | 1.00 | 17 | 0.059 |
| 297 | A | 4 | 4 | 1.00 | 4 | 1.000 |
| 298 | F | 0 | 0 | N/A | 0.000 | N/A |
| 299 | A | 2 | 2 | 1.00 | 13 | 0.154 |
| 300 | A | 3 | 2 | 1.00 | 6 | 0.333 |
| 301 | A | 4 | 3 | 1.00 | 17 | 0.176 |
| 302 | A | 8 | 4 | 1.00 | 25 | 0.160 |

Continued on next page

Table 2.1 – continued from previous page

| # | grade | number of steps used | number of unique rules | normalized antiderivative leaf size | integrand leaf size | $\frac{\text{number of rules}}{\text{integrand leaf size}}$ |
|-----|-------|----------------------|------------------------|-------------------------------------|---------------------|---|
| 303 | A | 3 | 4 | 1.00 | 8 | 0.500 |
| 304 | A | 1 | 1 | 1.00 | 40 | 0.025 |
| 305 | A | 13 | 4 | 1.26 | 7 | 0.571 |
| 306 | A | 3 | 2 | 1.00 | 18 | 0.111 |
| 307 | F | 0 | 0 | N/A | 0.000 | N/A |
| 308 | A | 1 | 1 | 1.00 | 16 | 0.062 |
| 309 | A | 3 | 2 | 1.00 | 13 | 0.154 |
| 310 | A | 2 | 2 | 1.00 | 8 | 0.250 |
| 311 | A | 3 | 2 | 1.00 | 4 | 0.500 |
| 312 | A | 4 | 4 | 1.00 | 9 | 0.444 |
| 313 | F | 0 | 0 | N/A | 0.000 | N/A |
| 314 | A | 3 | 2 | 1.00 | 25 | 0.080 |
| 315 | A | 4 | 2 | 1.31 | 17 | 0.118 |
| 316 | A | 3 | 1 | 1.00 | 17 | 0.059 |
| 317 | F | 0 | 0 | N/A | 0.000 | N/A |
| 318 | A | 6 | 5 | 1.00 | 14 | 0.357 |
| 319 | A | 10 | 4 | 1.22 | 47 | 0.085 |
| 320 | F | 0 | 0 | N/A | 0.000 | N/A |
| 321 | A | 4 | 3 | 1.00 | 16 | 0.188 |

CHAPTER 3

LISTING OF INTEGRALS

| | | |
|------|---|-----|
| 3.1 | $\int \sin(x) \sin(2x) \sin(3x) dx$ | 112 |
| 3.2 | $\int \cos(x) \sin^3(2x) dx$ | 116 |
| 3.3 | $\int \sqrt[3]{-1+x}(1+x)^2 dx$ | 120 |
| 3.4 | $\int x \log\left(1 + \frac{1}{x}\right) dx$ | 124 |
| 3.5 | $\int \sin^2(\log(x)) dx$ | 128 |
| 3.6 | $\int \frac{1}{1+3e^x} dx$ | 132 |
| 3.7 | $\int \csc^3(x) \sec^5(x) dx$ | 136 |
| 3.8 | $\int \frac{1}{x\sqrt{-1+x^4}} dx$ | 140 |
| 3.9 | $\int \frac{1}{x(1+x^5)} dx$ | 144 |
| 3.10 | $\int \sqrt{\tan(x)} dx$ | 148 |
| 3.11 | $\int \frac{\log(1+x)}{1+x^2} dx$ | 154 |
| 3.12 | $\int \frac{\sqrt{x}}{-\sqrt[3]{x+\sqrt{x}}} dx$ | 159 |
| 3.13 | $\int x^x(1 + \log(x)) dx$ | 163 |
| 3.14 | $\int x^{13/2} \sqrt{1+x^{5/2}} dx$ | 167 |
| 3.15 | $\int \frac{1}{(1+x^2)^2} dx$ | 171 |
| 3.16 | $\int \frac{1}{36-13x^2+x^4} dx$ | 175 |
| 3.17 | $\int \frac{\log(\log(x))}{x} dx$ | 179 |
| 3.18 | $\int \frac{1+\cot(x)}{1-\cot(x)} dx$ | 182 |
| 3.19 | $\int \frac{\cos(x)+x \sin(x)}{x(x+\cos(x))} dx$ | 186 |
| 3.20 | $\int \frac{1}{\sec(x)+\sin(x)} dx$ | 190 |
| 3.21 | $\int \frac{1}{\sqrt{1+e^x+e^{2x}}} dx$ | 195 |
| 3.22 | $\int e^{x^2} x^3 dx$ | 199 |
| 3.23 | $\int \left(-\frac{1}{\log^2(x)} + \frac{1}{\log(x)}\right) dx$ | 203 |
| 3.24 | $\int \sqrt{2-x} \sqrt{-1+x} dx$ | 207 |

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|------|--|-----|
| 3.25 | $\int \frac{-1+x^6}{-1-x+x^3+x^4} dx$ | 211 |
| 3.26 | $\int (2 \log(x) + \log^2(x)) dx$ | 214 |
| 3.27 | $\int \frac{2x}{\sqrt{1-x^4}} dx$ | 218 |
| 3.28 | $\int \frac{1+x^2}{1+x} dx$ | 222 |
| 3.29 | $\int \frac{-2-2\sin(x)+\sin^2(x)+\sin^3(x)}{1+2\sin(x)+\sin^2(x)} dx$ | 225 |
| 3.30 | $\int \operatorname{csch}^2(x) dx$ | 230 |
| 3.31 | $\int \sec^4(x) \tan^2(x) dx$ | 234 |
| 3.32 | $\int \sqrt{\csc(x) - \sin(x)} dx$ | 238 |
| 3.33 | $\int \cos^6(x) dx$ | 242 |
| 3.34 | $\int \frac{1}{1+2x^2+x^4} dx$ | 246 |
| 3.35 | $\int \cos(\log(x)) dx$ | 250 |
| 3.36 | $\int \sec(x) dx$ | 253 |
| 3.37 | $\int \frac{1}{9\cos^2(x)+4\sin^2(x)} dx$ | 257 |
| 3.38 | $\int \frac{1}{x^2(1+x^4)^{3/4}} dx$ | 260 |
| 3.39 | $\int \cos(x) \cos(3x) \cos(5x) dx$ | 264 |
| 3.40 | $\int \left(\frac{1}{\log(x)} + \log(\log(x)) \right) dx$ | 268 |
| 3.41 | $\int \frac{1}{2+e^x} dx$ | 272 |
| 3.42 | $\int \sqrt{\frac{x}{1-x^3}} dx$ | 276 |
| 3.43 | $\int \frac{4x}{1-x^4} dx$ | 280 |
| 3.44 | $\int x^x (1 + \log(x)) dx$ | 284 |
| 3.45 | $\int \sqrt{6x - x^2} dx$ | 288 |
| 3.46 | $\int \sin^{99}(x) \sin(101x) dx$ | 292 |
| 3.47 | $\int e^{e^{x^2}} x dx$ | 303 |
| 3.48 | $\int \frac{-1+3x-3x^2+x^3}{1+4x+6x^2+4x^3+x^4} dx$ | 307 |
| 3.49 | $\int \sqrt{\frac{1-x}{1+x}} dx$ | 311 |
| 3.50 | $\int \frac{1}{-1+\sqrt{x}} dx$ | 315 |
| 3.51 | $\int \sqrt[4]{x} \log(x) dx$ | 319 |
| 3.52 | $\int \frac{1}{(1+\sqrt{x})\sqrt{x-x^2}} dx$ | 323 |
| 3.53 | $\int \frac{1}{(1+\sqrt[4]{x})^{10} \sqrt{x}} dx$ | 327 |
| 3.54 | $\int \sqrt{1-x^2} dx$ | 331 |
| 3.55 | $\int \frac{1}{\sqrt{1-4x-x^2}} dx$ | 335 |
| 3.56 | $\int \log\left(\frac{1}{x}\right) dx$ | 339 |
| 3.57 | $\int \frac{1}{1+\sin(x)} dx$ | 342 |
| 3.58 | $\int \frac{\sqrt{x}}{\sqrt{2012-x+\sqrt{x}}} dx$ | 345 |
| 3.59 | $\int \frac{-1+x}{(1+x)\sqrt{x+x^2+x^3}} dx$ | 350 |
| 3.60 | $\int \frac{1+4x+6x^2+4x^3+x^4}{-1+3x-3x^2+x^3} dx$ | 354 |
| 3.61 | $\int \left(\cos(x) \log(x) + \frac{\sin(x)}{x} \right) dx$ | 357 |
| 3.62 | $\int \frac{1}{-x+x^3} dx$ | 361 |

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|-------|---|-----|
| 3.63 | $\int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx$ | 365 |
| 3.64 | $\int (1-x)^{99} x dx$ | 368 |
| 3.65 | $\int \csc(x) \sin(4x) dx$ | 378 |
| 3.66 | $\int \frac{1}{(1+\sqrt[3]{x})\sqrt{x}} dx$ | 381 |
| 3.67 | $\int \frac{1}{\sqrt{-1+2x^2}} dx$ | 385 |
| 3.68 | $\int \frac{1}{\sqrt{-1+e^x}} dx$ | 389 |
| 3.69 | $\int \frac{x}{4+x^4} dx$ | 393 |
| 3.70 | $\int \frac{2}{(\cos(x)-\sin(x))^2} dx$ | 397 |
| 3.71 | $\int x \coth(x) \operatorname{csch}(x) dx$ | 401 |
| 3.72 | $\int x^5 \sqrt{1+x^3} dx$ | 405 |
| 3.73 | $\int \frac{-1+x^7}{\log(x)} dx$ | 409 |
| 3.74 | $\int \sqrt{\csc(x) - \sin(x)} dx$ | 413 |
| 3.75 | $\int (-2 \log(2x) + \log(x^2)) dx$ | 417 |
| 3.76 | $\int e^x dx$ | 420 |
| 3.77 | $\int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx$ | 423 |
| 3.78 | $\int (-1 + 3x - 3x^2 + x^3) dx$ | 426 |
| 3.79 | $\int \sqrt{12 - 3x^2} dx$ | 429 |
| 3.80 | $\int ((-3+x)^7 + x - \sin(3-x)) dx$ | 433 |
| 3.81 | $\int \sin(x) \sqrt{1 + \tan^2(x)} dx$ | 436 |
| 3.82 | $\int \frac{-1+x^2-x^3+x^5}{-1+x-x^3+x^4} dx$ | 440 |
| 3.83 | $\int \log(x) dx$ | 443 |
| 3.84 | $\int \frac{1}{1-e^{-x}} dx$ | 446 |
| 3.85 | $\int \cos^2(x) \sin^2(x) dx$ | 450 |
| 3.86 | $\int \frac{\pi \sin(\pi\sqrt{x})}{\sqrt{x}} dx$ | 454 |
| 3.87 | $\int \tan^2(x) dx$ | 458 |
| 3.88 | $\int e^{\sqrt[4]{x}} dx$ | 461 |
| 3.89 | $\int \cos(x) \cot(x) dx$ | 465 |
| 3.90 | $\int (2 \log(x) + \log^2(x)) dx$ | 469 |
| 3.91 | $\int \frac{x^3}{1+x^2} dx$ | 473 |
| 3.92 | $\int \frac{1}{2-2x+x^2} dx$ | 477 |
| 3.93 | $\int \log(\sin(x)) \sin(x) dx$ | 480 |
| 3.94 | $\int \frac{x}{1-x^4} dx$ | 485 |
| 3.95 | $\int \sqrt{12 - 3x^2} dx$ | 489 |
| 3.96 | $\int \sec^5(x) \tan^3(x) dx$ | 493 |
| 3.97 | $\int \frac{1}{1-\sin(x)} dx$ | 497 |
| 3.98 | $\int \frac{1}{x\sqrt{-2+x^2}} dx$ | 500 |
| 3.99 | $\int \log(x^2) dx$ | 504 |
| 3.100 | $\int \sin(\sqrt[3]{x}) dx$ | 507 |
| 3.101 | $\int e^{1+x-x^2} (1-2x) dx$ | 511 |
| 3.102 | $\int e^{\sqrt{x}} \sqrt{x} dx$ | 514 |

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|-------|---|------|
| 3.103 | $\int \cos(3x) \sin(2x) dx$ | 518 |
| 3.104 | $\int (1 + 2 \sin(x)) dx$ | 521 |
| 3.105 | $\int (1 - x)^{2014} x dx$ | 524 |
| 3.106 | $\int \operatorname{arcsinh}(x) dx$ | 1324 |
| 3.107 | $\int \frac{x^2}{-1+x} dx$ | 1327 |
| 3.108 | $\int x \arctan(x) dx$ | 1330 |
| 3.109 | $\int \frac{1}{-2014-15x+x^2} dx$ | 1334 |
| 3.110 | $\int e^x(-2(1+x) \arctan(x) + \log(1+x^2)) dx$ | 1337 |
| 3.111 | $\int \arcsin(x)^2 dx$ | 1342 |
| 3.112 | $\int \frac{\sqrt{-1+x^2}}{x} dx$ | 1346 |
| 3.113 | $\int x \sec^2(4x) dx$ | 1350 |
| 3.114 | $\int \frac{2}{6-11x+6x^2-x^3} dx$ | 1354 |
| 3.115 | $\int \frac{1}{1-\log(1-x)} dx$ | 1358 |
| 3.116 | $\int \sqrt{x + \sqrt{1+x^2}} dx$ | 1362 |
| 3.117 | $\int \frac{1}{2+\cos(x)} dx$ | 1366 |
| 3.118 | $\int (\cos^4(x) - \sin^4(x)) dx$ | 1370 |
| 3.119 | $\int \frac{x}{\sqrt{2+4x}} dx$ | 1374 |
| 3.120 | $\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx$ | 1378 |
| 3.121 | $\int \sec(x) dx$ | 1381 |
| 3.122 | $\int e^{\sin(x)} \cos(x) dx$ | 1385 |
| 3.123 | $\int x \log^2(x) dx$ | 1388 |
| 3.124 | $\int \frac{1}{5+4\sqrt{x}+x} dx$ | 1392 |
| 3.125 | $\int 2015^x dx$ | 1396 |
| 3.126 | $\int \frac{x}{(-3+x)(5+x)^2} dx$ | 1399 |
| 3.127 | $\int \frac{\log(1+\log(x))}{x} dx$ | 1403 |
| 3.128 | $\int \sqrt{\csc(x) - \sin(x)} dx$ | 1407 |
| 3.129 | $\int \frac{1}{\sqrt{25+x^2}} dx$ | 1411 |
| 3.130 | $\int \frac{-1+\log^2(x)}{x \log^2(x)} dx$ | 1414 |
| 3.131 | $\int e^{3x} \arctan(e^x) dx$ | 1418 |
| 3.132 | $\int \frac{1}{\cos^4(x)+\sin^4(x)} dx$ | 1422 |
| 3.133 | $\int \frac{1+e^x}{1-e^x} dx$ | 1426 |
| 3.134 | $\int \tan^4(x) dx$ | 1430 |
| 3.135 | $\int \sin(x) \tan^2(x) dx$ | 1434 |
| 3.136 | $\int \frac{1+x}{3+2x+x^2} dx$ | 1438 |
| 3.137 | $\int \tanh(x) dx$ | 1441 |
| 3.138 | $\int (-x + x^3) dx$ | 1444 |
| 3.139 | $\int \log(\sqrt{x}) dx$ | 1447 |
| 3.140 | $\int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x}\right) dx$ | 1450 |
| 3.141 | $\int \frac{\log(\log(x))}{x \log(x)} dx$ | 1453 |
| 3.142 | $\int \frac{1}{1+\tan^2(x)} dx$ | 1456 |

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| 3.143 | $\int \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) dx$ | 1460 |
| 3.144 | $\int \log(x) dx$ | 1464 |
| 3.145 | $\int e^x (\cos(x) - \sin(x)) dx$ | 1467 |
| 3.146 | $\int e^{-x^2} x^3 dx$ | 1470 |
| 3.147 | $\int \left((1 + 2e^{x^2} x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx$ | 1474 |
| 3.148 | $\int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}} \right) (1 + \sqrt[3]{x} + \sqrt{x}) dx$ | 1478 |
| 3.149 | $\int \cos(x) \cos(\sin(x)) \sin(\sin(x)) dx$ | 1482 |
| 3.150 | $\int \left(\frac{-\cos(x) + \sin(x)}{x} + \frac{\cos(x) + \sin(x)}{x^2} \right) dx$ | 1486 |
| 3.151 | $\int x^3 \sqrt{1 + x^2} dx$ | 1490 |
| 3.152 | $\int \frac{x}{1 + x^2 + x^4} dx$ | 1494 |
| 3.153 | $\int e^{e^{2016x} + 6048x} dx$ | 1498 |
| 3.154 | $\int (1 - \cot(x)) dx$ | 1502 |
| 3.155 | $\int \frac{1}{1 - x + x^2 - x^3} dx$ | 1505 |
| 3.156 | $\int \frac{1}{2 + \cosh(x)} dx$ | 1509 |
| 3.157 | $\int \frac{x^2}{\sqrt{2 + x^3}} dx$ | 1513 |
| 3.158 | $\int \frac{\log(x)}{x^2} dx$ | 1516 |
| 3.159 | $\int \operatorname{sech}(x) dx$ | 1519 |
| 3.160 | $\int e^{x^2} x^3 dx$ | 1522 |
| 3.161 | $\int \frac{1}{x\sqrt{-1 + x^2}} dx$ | 1526 |
| 3.162 | $\int \frac{1}{x(1 + x^2)} dx$ | 1530 |
| 3.163 | $\int \operatorname{arccosh}(x) dx$ | 1534 |
| 3.164 | $\int e^{-3 - 5x - 2x^2} dx$ | 1537 |
| 3.165 | $\int \sin(\sqrt{x}) dx$ | 1540 |
| 3.166 | $\int \frac{1}{\left(\frac{1}{x} + x\right)^2} dx$ | 1544 |
| 3.167 | $\int \frac{e^{-x}(2+x)}{x^3} dx$ | 1548 |
| 3.168 | $\int \frac{1}{\sqrt{(1-x)x}} dx$ | 1551 |
| 3.169 | $\int e^{-x} \tanh(x) dx$ | 1555 |
| 3.170 | $\int \sqrt{1 + \sin(x)} dx$ | 1559 |
| 3.171 | $\int \frac{1}{1 + \sqrt{x}} dx$ | 1562 |
| 3.172 | $\int e^{-x^2} \sin^2\left(\frac{\pi}{4} + x\right) dx$ | 1566 |
| 3.173 | $\int 3e^{-2x^3 - x^6} x^2 (1 + x^3)^2 dx$ | 1570 |
| 3.174 | $\int e^{2x} \cos(3x) dx$ | 1574 |
| 3.175 | $\int \cos^{\cos(x)}(x) (1 + \log(\cos(x))) \sin(x) dx$ | 1577 |
| 3.176 | $\int \frac{e^x}{2 + e^x} dx$ | 1581 |
| 3.177 | $\int \sin(2018x) dx$ | 1584 |
| 3.178 | $\int \frac{1}{\cot(x) + \tan(x)} dx$ | 1587 |
| 3.179 | $\int \frac{x^5}{2 + x^{12}} dx$ | 1590 |
| 3.180 | $\int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx$ | 1594 |

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| 3.181 | $\int \frac{e^x + \cos(x)}{e^x + \sin(x)} dx$ | 1597 |
| 3.182 | $\int \cos(x) \sin(\cos(\sin(x))) \sin(\sin(x)) dx$ | 1601 |
| 3.183 | $\int \frac{1}{1 + \sin(x)} dx$ | 1605 |
| 3.184 | $\int \frac{\cos(x)}{1 - \cos(2x)} dx$ | 1608 |
| 3.185 | $\int e^x \left(\frac{1}{x} + \log(x) \right) dx$ | 1612 |
| 3.186 | $\int \tanh^2(x) dx$ | 1615 |
| 3.187 | $\int \frac{-\sin^2(x) + \sin(2x)}{-\cos^2(x) + \cos(2x)} dx$ | 1618 |
| 3.188 | $\int \frac{1}{x^{9/25} + x^{41/25}} dx$ | 1622 |
| 3.189 | $\int \frac{\cos(x)}{2 - \cos^2(x)} dx$ | 1626 |
| 3.190 | $\int \frac{1}{(1+x^2)^{3/2}} dx$ | 1630 |
| 3.191 | $\int \frac{1}{\sqrt{x^{3/2} - x^2}} dx$ | 1633 |
| 3.192 | $\int \frac{-1+x}{x+x^2 \log(x)} dx$ | 1637 |
| 3.193 | $\int \csc(x) \sec(x) dx$ | 1640 |
| 3.194 | $\int \tan(\cos(x)) dx$ | 1644 |
| 3.195 | $\int \frac{1+x}{x(x+\log(x))} dx$ | 1647 |
| 3.196 | $\int (e^{-e^x+x} + e^{e^x+x}) dx$ | 1650 |
| 3.197 | $\int \frac{1}{1-x^2} dx$ | 1654 |
| 3.198 | $\int 2^{\log(x)} dx$ | 1658 |
| 3.199 | $\int (\cos(3x) + \sin(2x)(\cos(3x) - \sin(2019x))) dx$ | 1662 |
| 3.200 | $\int \cos(x) \cos(\sin(x)) \cos(\sin(\sin(x))) dx$ | 1666 |
| 3.201 | $\int \frac{e^{-\frac{2019}{4x^2}}}{x^2} dx$ | 1670 |
| 3.202 | $\int \sin(\sqrt{x}) dx$ | 1674 |
| 3.203 | $\int \frac{\sqrt{x}}{1+x} dx$ | 1678 |
| 3.204 | $\int \cos(x) \cos(2x) \cos(3x) dx$ | 1682 |
| 3.205 | $\int e^{-x^{2n}} dx$ | 1686 |
| 3.206 | $\int e dx$ | 1689 |
| 3.207 | $\int \frac{\sin(19x) + \sin(20x)}{\cos(19x) + \cos(20x)} dx$ | 1692 |
| 3.208 | $\int e^x (\cos^2(x) + \cos(x) \sin(x) - \sin^2(x)) dx$ | 1702 |
| 3.209 | $\int \csc\left(\frac{\pi}{4} + x\right) \sin(x) dx$ | 1706 |
| 3.210 | $\int \frac{1}{\sqrt[3]{x+x}} dx$ | 1710 |
| 3.211 | $\int x^{1+x^2} (1 + 2 \log(x)) dx$ | 1714 |
| 3.212 | $\int \frac{-1+2x^3}{x(1+x^3)} dx$ | 1717 |
| 3.213 | $\int \frac{1}{\sqrt{1+x^2}} dx$ | 1721 |
| 3.214 | $\int \frac{\log(2x)}{x \log(x)} dx$ | 1724 |
| 3.215 | $\int \frac{1}{1+e^x} dx$ | 1728 |
| 3.216 | $\int \frac{\log(x) \log(\log(x))}{x} dx$ | 1732 |
| 3.217 | $\int \log\left(\frac{1+x}{1-x}\right) dx$ | 1735 |
| 3.218 | $\int \frac{1}{(-1+x)^2 + x^2} dx$ | 1739 |
| 3.219 | $\int \sqrt{x} \sqrt{x^{3/2}} dx$ | 1743 |

| | | |
|-------|--|------|
| 3.220 | $\int \cos^4(x)(\cos(x) - \sin(x)) \sin^4(x)(\cos(x) + \sin(x)) dx$ | 1747 |
| 3.221 | $\int \log(1 + x^2) dx$ | 1751 |
| 3.222 | $\int \frac{1+2x}{1+2x+2x^2} dx$ | 1755 |
| 3.223 | $\int \frac{\arcsin(x)}{x^3} dx$ | 1758 |
| 3.224 | $\int \cos(\cos(x)) \sin(2x) dx$ | 1762 |
| 3.225 | $\int -\sin(x - \sin(x)) dx$ | 1766 |
| 3.226 | $\int \frac{1}{1+\tan^2\sqrt{505}(x)} dx$ | 1769 |
| 3.227 | $\int (1-x)^{2020} x dx$ | 1773 |
| 3.228 | $\int \frac{\sec^4(x) \tan(x)}{4+\sec^4(x)} dx$ | 2576 |
| 3.229 | $\int x^{2x}(2 + 2 \log(x)) dx$ | 2580 |
| 3.230 | $\int \sqrt{1-x^2} dx$ | 2584 |
| 3.231 | $\int e^{-x^4} x^5 dx$ | 2588 |
| 3.232 | $\int \frac{1+\cos(x)}{x+\sin(x)} dx$ | 2592 |
| 3.233 | $\int \frac{\cot^{-1}(x)+\arctan(x)}{x} dx$ | 2596 |
| 3.234 | $\int \frac{\sinh(x)}{\cosh(x)-\sinh(x)} dx$ | 2600 |
| 3.235 | $\int \frac{x}{\sqrt{-1+x}+\sqrt{1+x}} dx$ | 2604 |
| 3.236 | $\int \cos(x + \cos(x)) dx$ | 2608 |
| 3.237 | $\int x^3 \sin(x^2) dx$ | 2611 |
| 3.238 | $\int \frac{x}{1-x^4} dx$ | 2615 |
| 3.239 | $\int \operatorname{sech}^2(x) dx$ | 2619 |
| 3.240 | $\int (e^{e^x} - e^{e^x-x}) dx$ | 2623 |
| 3.241 | $\int \sqrt{1-\sqrt{x}} dx$ | 2627 |
| 3.242 | $\int \frac{x^3}{1+x+\frac{x^2}{2}+\frac{x^3}{6}} dx$ | 2631 |
| 3.243 | $\int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx$ | 2636 |
| 3.244 | $\int (\sec^5(x) \tan^2(x) + \sec^3(x) \tan^4(x)) dx$ | 2639 |
| 3.245 | $\int (1 + \log(x)) \log(\log(x)) dx$ | 2643 |
| 3.246 | $\int \left(\frac{1}{1+\cos(x)} + \frac{1}{1+\cot(x)} + \frac{1}{1+\csc(x)} + \frac{1}{1+\sec(x)} + \frac{1}{1+\sin(x)} + \frac{1}{1+\tan(x)} \right) dx$ | 2646 |
| 3.247 | $\int \frac{1}{\sqrt{x-x^2}} dx$ | 2651 |
| 3.248 | $\int \frac{1}{1+\cos^2(x)} dx$ | 2655 |
| 3.249 | $\int \frac{\log(1+x)}{x^2} dx$ | 2659 |
| 3.250 | $\int \sqrt{1 - \arccos(\sin(x))^2} dx$ | 2663 |
| 3.251 | $\int (-2+x)(-1+x)x(1+x)(2+x) dx$ | 2666 |
| 3.252 | $\int \frac{1+2x^2+3x^3}{\sqrt[3]{1+x^3}} dx$ | 2669 |
| 3.253 | $\int \csc^4(x) \sec^4(x) dx$ | 2673 |
| 3.254 | $\int \frac{x+\sin(x)}{1+\cos(x)} dx$ | 2677 |
| 3.255 | $\int \cosh^2(x) \sinh^3(x) dx$ | 2682 |
| 3.256 | $\int 3^{2^x} 4^x dx$ | 2686 |
| 3.257 | $\int \frac{\cos(x)-\sin(x)}{2+\sin(2x)} dx$ | 2690 |
| 3.258 | $\int \frac{\sec^2(1+\log(x))-\tan(1+\log(x))}{x^2} dx$ | 2693 |

| | | |
|-------|--|------|
| 3.259 | $\int \sqrt{\frac{\log(\frac{1}{x})}{x}} dx$ | 2701 |
| 3.260 | $\int (1 - \cos(x))^5 \cos(5x) dx$ | 2705 |
| 3.261 | $\int \frac{3 \cos(x) + 4 \sin(x)}{4 \cos(x) + 3 \sin(x)} dx$ | 2712 |
| 3.262 | $\int \left(-\sqrt{3} - \sqrt{4 - x^2} + \sqrt{4 - (1 + x)^2} \right) dx$ | 2716 |
| 3.263 | $\int x^2 \sin(\log(x)) dx$ | 2721 |
| 3.264 | $\int e^{-x} (36x^5 - 12x^6 + x^7) dx$ | 2724 |
| 3.265 | $\int \arccos(x) \arcsin(x) dx$ | 2729 |
| 3.266 | $\int (1 + 6x - 7x^2 + 4x^3 - x^4)^n dx$ | 2732 |
| 3.267 | $\int \frac{x^4}{\sqrt{1-x}} dx$ | 2736 |
| 3.268 | $\int \sin(x^{-n}) dx$ | 2740 |
| 3.269 | $\int \frac{1}{2} (-x + \sqrt{4 - 3x^2}) dx$ | 2744 |
| 3.270 | $\int (1 - 3x^2 + x^4)^n dx$ | 2748 |
| 3.271 | $\int \frac{(1+e^{-x})x}{-1+e^x} dx$ | 2752 |
| 3.272 | $\int e^{-x} x^4 \sin(x) dx$ | 2756 |
| 3.273 | $\int \frac{-3(-3x+x^3)+(-3x+x^3)^3}{\sqrt{-4+x^2}} dx$ | 2762 |
| 3.274 | $\int \frac{1}{(1+x^2)^3} dx$ | 2766 |
| 3.275 | $\int \log(\sqrt{3} + \tan(x)) dx$ | 2770 |
| 3.276 | $\int \sqrt{(\cos(20x) + 3 \cos(21x) + \cos(22x))^2 + (\sin(20x) + 3 \sin(21x) + \sin(22x))^2} dx$ | 2775 |
| 3.277 | $\int \frac{e^{-2x} \sin(3x)}{x} dx$ | 2780 |
| 3.278 | $\int (1 - x)^{2/3} \sqrt[3]{x} dx$ | 2783 |
| 3.279 | $\int e dx$ | 2788 |
| 3.280 | $\int \operatorname{sech}(x) dx$ | 2791 |
| 3.281 | $\int \frac{e^x}{(1+e^x) \log(1+e^x)} dx$ | 2794 |
| 3.282 | $\int (1 - x + x^2 - x^3 + x^4) (1 + x + x^2 + x^3 + x^4) dx$ | 2798 |
| 3.283 | $\int \frac{1}{120} (-4 + x)(-3 + x)(-2 + x)(-1 + x)x dx$ | 2801 |
| 3.284 | $\int (x + x \cos(x) + \sin(x) + \cos(x) \sin(x)) dx$ | 2805 |
| 3.285 | $\int (\cos^2(x) + \cot^2(x) + \csc^2(x) + \sec^2(x) + \sin^2(x) + \tan^2(x)) dx$ | 2809 |
| 3.286 | $\int e^{\log^2(x)} (1 + 2 \log(x)) dx$ | 2813 |
| 3.287 | $\int \left((1 - x)^3 + (x - x^2)^3 - 3(1 - x)(x - x^2)(-1 + x^2) + (-1 + x^2)^3 \right) dx$ | 2816 |
| 3.288 | $\int (\cos^6(x) + 3 \cos^2(x) \sin^2(x) + \sin^6(x)) dx$ | 2820 |
| 3.289 | $\int e^x x^e (1 + e + x) dx$ | 2824 |
| 3.290 | $\int \left(\sqrt{2} \sqrt{\frac{x}{1+x}} + \frac{x^2}{2-x^2} \right) dx$ | 2828 |
| 3.291 | $\int \frac{1+2x^{2022}}{x+x^{2023}} dx$ | 2834 |
| 3.292 | $\int (3 \cos(23x) \sin(20x) + 20 \sin(43x)) dx$ | 2838 |
| 3.293 | $\int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx$ | 2843 |
| 3.294 | $\int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx$ | 2847 |
| 3.295 | $\int (x + 8x^2 + 10x^3 + 5x^4 + x^5) dx$ | 2851 |
| 3.296 | $\int \frac{(1+x)(4+x)}{(2+x)(3+x)} dx$ | 2854 |
| 3.297 | $\int x \cot(x) dx$ | 2857 |

| | | |
|-------|--|------|
| 3.298 | $\int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx$ | 2861 |
| 3.299 | $\int \frac{1}{\sqrt{(-1+x)(1+x)^3}} dx$ | 2865 |
| 3.300 | $\int x \sin^4(x) dx$ | 2869 |
| 3.301 | $\int \cos(3x) \csc^2(x) \sec^3(x) \sin(2x) dx$ | 2873 |
| 3.302 | $\int \left(\frac{1}{\sqrt{2}\sqrt{\log(x)}} + \sqrt{2}\sqrt{\log(x)} \right) dx$ | 2877 |
| 3.303 | $\int \log(\cos(x)) \sec^2(x) dx$ | 2881 |
| 3.304 | $\int \frac{\frac{5}{(-5+x)^6} + \frac{3}{(-3+x)^4} + \frac{1}{(-1+x)^2}}{\left(1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}\right)^2} dx$ | 2885 |
| 3.305 | $\int \csc(x) \sin(23x) dx$ | 2889 |
| 3.306 | $\int \frac{(1-x)^2 x^4}{1+x^2} dx$ | 2896 |
| 3.307 | $\int x^{-\log(x)} dx$ | 2900 |
| 3.308 | $\int \frac{1-2x}{x^{2/3}(1+x)^2} dx$ | 2903 |
| 3.309 | $\int \cos^2\left(\frac{\pi x^2}{\sqrt{2}}\right) dx$ | 2906 |
| 3.310 | $\int \frac{1}{1+\cos(x)+\sin(x)} dx$ | 2910 |
| 3.311 | $\int \tan^5(x) dx$ | 2914 |
| 3.312 | $\int \sqrt{1 + \frac{1}{x}} dx$ | 2918 |
| 3.313 | $\int e^{\cos(x)} \cos(2x + \sin(x)) dx$ | 2922 |
| 3.314 | $\int \frac{-1+2x+3 \log(x)}{x^2+2x^4+x \log(x)} dx$ | 2925 |
| 3.315 | $\int (-\sqrt{x} + \sqrt{1+x})^\pi dx$ | 2929 |
| 3.316 | $\int \left(-2 + \left(-2 + \left(-2 + (-2 + x^2)^2 \right)^2 \right)^2 \right) dx$ | 2935 |
| 3.317 | $\int \sin(4 \arctan(x)) dx$ | 2939 |
| 3.318 | $\int \frac{\sqrt[3]{\tan(x)}}{(\cos(x)+\sin(x))^2} dx$ | 2942 |
| 3.319 | $\int \csc^2(x) \csc^2(6x) \csc^2(10x) \csc^2(15x) \sin^2(2x) \sin^2(3x) \sin^2(5x) \sin^2(30x) dx$ | 2947 |
| 3.320 | $\int \sqrt{1+x^2+\sqrt{1+x^2+x^4}} dx$ | 2953 |
| 3.321 | $\int \frac{x^9}{575-48x^{10}+x^{20}} dx$ | 2956 |

3.1 $\int \sin(x) \sin(2x) \sin(3x) dx$

| | |
|---|-----|
| Optimal result | 112 |
| Rubi [A] (verified) | 112 |
| Mathematica [A] (verified) | 113 |
| Maple [A] (verified) | 113 |
| Fricas [A] (verification not implemented) | 114 |
| Sympy [B] (verification not implemented) | 114 |
| Maxima [A] (verification not implemented) | 114 |
| Giac [A] (verification not implemented) | 115 |
| Mupad [B] (verification not implemented) | 115 |

Optimal result

Integrand size = 11, antiderivative size = 25

$$\int \sin(x) \sin(2x) \sin(3x) dx = -\frac{1}{8} \cos(2x) - \frac{1}{16} \cos(4x) + \frac{1}{24} \cos(6x)$$

[Out] $-1/8*\cos(2*x)-1/16*\cos(4*x)+1/24*\cos(6*x)$

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {4440, 2718}

$$\int \sin(x) \sin(2x) \sin(3x) dx = -\frac{1}{8} \cos(2x) - \frac{1}{16} \cos(4x) + \frac{1}{24} \cos(6x)$$

[In] `Int[Sin[x]*Sin[2*x]*Sin[3*x],x]`

[Out] $-1/8*\text{Cos}[2*x] - \text{Cos}[4*x]/16 + \text{Cos}[6*x]/24$

Rule 2718

`Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Cos[c + d*x]/d, x] /; FreeQ[{c, d}, x]`

Rule 4440

`Int[(F_)[(a_.) + (b_.)*(x_)]^(p_.)*(G_)[(c_.) + (d_.)*(x_)]^(q_.)*(H_)[(e_.) + (f_.)*(x_)]^(r_.), x_Symbol] := Int[ExpandTrigReduce[ActivateTrig[F[a + b*x]^p*G[c + d*x]^q*H[e + f*x]^r], x], x] /; FreeQ[{a, b, c, d, e, f}, x] && (EqQ[F, sin] || EqQ[F, cos]) && (EqQ[G, sin] || EqQ[G, cos]) && (EqQ[H,`

sin] || EqQ[H, cos]) && IGtQ[p, 0] && IGtQ[q, 0] && IGtQ[r, 0]

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(\frac{1}{4} \sin(2x) + \frac{1}{4} \sin(4x) - \frac{1}{4} \sin(6x) \right) dx \\ &= \frac{1}{4} \int \sin(2x) dx + \frac{1}{4} \int \sin(4x) dx - \frac{1}{4} \int \sin(6x) dx \\ &= -\frac{1}{8} \cos(2x) - \frac{1}{16} \cos(4x) + \frac{1}{24} \cos(6x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00

$$\int \sin(x) \sin(2x) \sin(3x) dx = -\frac{1}{8} \cos(2x) - \frac{1}{16} \cos(4x) + \frac{1}{24} \cos(6x)$$

[In] Integrate[Sin[x]*Sin[2*x]*Sin[3*x],x]

[Out] -1/8*Cos[2*x] - Cos[4*x]/16 + Cos[6*x]/24

Maple [A] (verified)

Time = 1.02 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.80

| method | result | size |
|---------------|---|------|
| default | $-\frac{\cos(2x)}{8} - \frac{\cos(4x)}{16} + \frac{\cos(6x)}{24}$ | 20 |
| risch | $-\frac{\cos(2x)}{8} - \frac{\cos(4x)}{16} + \frac{\cos(6x)}{24}$ | 20 |
| parallelrisch | $\frac{1}{16} + \frac{\cos(6x)}{24} - \frac{\cos(4x)}{16} - \frac{\cos(2x)}{8}$ | 21 |

[In] int(sin(x)*sin(2*x)*sin(3*x),x,method=_RETURNVERBOSE)

[Out] -1/8*cos(2*x)-1/16*cos(4*x)+1/24*cos(6*x)

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.68

$$\int \sin(x) \sin(2x) \sin(3x) dx = \frac{4}{3} \cos(x)^6 - \frac{5}{2} \cos(x)^4 + \cos(x)^2$$

[In] integrate(sin(x)*sin(2*x)*sin(3*x),x, algorithm="fricas")

[Out] 4/3*cos(x)^6 - 5/2*cos(x)^4 + cos(x)^2

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 114 vs. 2(19) = 38.

Time = 1.04 (sec) , antiderivative size = 114, normalized size of antiderivative = 4.56

$$\begin{aligned} \int \sin(x) \sin(2x) \sin(3x) dx = & \frac{x \sin(x) \sin(2x) \sin(3x)}{4} + \frac{x \sin(x) \cos(2x) \cos(3x)}{4} \\ & + \frac{x \sin(2x) \cos(x) \cos(3x)}{4} \\ & - \frac{x \sin(3x) \cos(x) \cos(2x)}{4} - \frac{3 \sin(x) \sin(2x) \cos(3x)}{8} \\ & + \frac{\sin(x) \sin(3x) \cos(2x)}{6} + \frac{\sin(2x) \sin(3x) \cos(x)}{24} \end{aligned}$$

[In] integrate(sin(x)*sin(2*x)*sin(3*x),x)

[Out] x*sin(x)*sin(2*x)*sin(3*x)/4 + x*sin(x)*cos(2*x)*cos(3*x)/4 + x*sin(2*x)*cos(x)*cos(3*x)/4 - x*sin(3*x)*cos(x)*cos(2*x)/4 - 3*sin(x)*sin(2*x)*cos(3*x)/8 + sin(x)*sin(3*x)*cos(2*x)/6 + sin(2*x)*sin(3*x)*cos(x)/24

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.76

$$\int \sin(x) \sin(2x) \sin(3x) dx = \frac{1}{24} \cos(6x) - \frac{1}{16} \cos(4x) - \frac{1}{8} \cos(2x)$$

[In] integrate(sin(x)*sin(2*x)*sin(3*x),x, algorithm="maxima")

[Out] 1/24*cos(6*x) - 1/16*cos(4*x) - 1/8*cos(2*x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.52

$$\int \sin(x) \sin(2x) \sin(3x) dx = -\frac{4}{3} \sin(x)^6 + \frac{3}{2} \sin(x)^4$$

[In] integrate(sin(x)*sin(2*x)*sin(3*x),x, algorithm="giac")

[Out] -4/3*sin(x)^6 + 3/2*sin(x)^4

Mupad [B] (verification not implemented)

Time = 16.61 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.56

$$\int \sin(x) \sin(2x) \sin(3x) dx = -\frac{\sin(x)^4 (8 \sin(x)^2 - 9)}{6}$$

[In] int(sin(2*x)*sin(3*x)*sin(x),x)

[Out] -(sin(x)^4*(8*sin(x)^2 - 9))/6

3.2 $\int \cos(x) \sin^3(2x) dx$

| | |
|---|-----|
| Optimal result | 116 |
| Rubi [A] (verified) | 116 |
| Mathematica [A] (verified) | 117 |
| Maple [A] (verified) | 117 |
| Fricas [A] (verification not implemented) | 118 |
| Sympy [B] (verification not implemented) | 118 |
| Maxima [A] (verification not implemented) | 118 |
| Giac [A] (verification not implemented) | 119 |
| Mupad [B] (verification not implemented) | 119 |

Optimal result

Integrand size = 9, antiderivative size = 17

$$\int \cos(x) \sin^3(2x) dx = -\frac{8}{5} \cos^5(x) + \frac{8 \cos^7(x)}{7}$$

[Out] $-8/5*\cos(x)^5+8/7*\cos(x)^7$

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {4372, 2645, 14}

$$\int \cos(x) \sin^3(2x) dx = \frac{8 \cos^7(x)}{7} - \frac{8 \cos^5(x)}{5}$$

[In] `Int[Cos[x]*Sin[2*x]^3,x]`

[Out] $(-8*\cos[x]^5)/5 + (8*\cos[x]^7)/7$

Rule 14

```
Int[(u_)*((c_.)*(x_))^(m_.), x_Symbol] := Int[ExpandIntegrand[(c*x)^m*u, x], x] /; FreeQ[{c, m}, x] && SumQ[u] && !LinearQ[u, x] && !MatchQ[u, (a_ + (b_.)*(v_)) /; FreeQ[{a, b}, x] && InverseFunctionQ[v]]
```

Rule 2645

```
Int[(cos[(e_.) + (f_.)*(x_)]*(a_.))^(m_.)*sin[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] := Dist[-(a*f)^(-1), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*Cos[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&
```


!(IntegerQ[(m - 1)/2] && GtQ[m, 0] && LeQ[m, n])

Rule 4372

Int[(cos[(a_.) + (b_.)*(x_.)]*(e_.))^(m_.)*sin[(c_.) + (d_.)*(x_.)]^(p_.), x_Symbol] :> Dist[2^p/e^p, Int[(e*Cos[a + b*x])^(m + p)*Sin[a + b*x]^p, x] /; FreeQ[{a, b, c, d, e, m}, x] && EqQ[b*c - a*d, 0] && EqQ[d/b, 2] && IntegerQ[p]

Rubi steps

$$\begin{aligned} \text{integral} &= 8 \int \cos^4(x) \sin^3(x) dx \\ &= -\left(8 \text{Subst}\left(\int x^4(1-x^2) dx, x, \cos(x)\right)\right) \\ &= -\left(8 \text{Subst}\left(\int (x^4 - x^6) dx, x, \cos(x)\right)\right) \\ &= -\frac{8}{5} \cos^5(x) + \frac{8 \cos^7(x)}{7} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.82

$$\int \cos(x) \sin^3(2x) dx = -\frac{3 \cos(x)}{8} - \frac{1}{8} \cos(3x) + \frac{1}{40} \cos(5x) + \frac{1}{56} \cos(7x)$$

[In] Integrate[Cos[x]*Sin[2*x]^3,x]

[Out] (-3*Cos[x])/8 - Cos[3*x]/8 + Cos[5*x]/40 + Cos[7*x]/56

Maple [A] (verified)

Time = 0.21 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.41

| method | result | size |
|---------------|---|------|
| default | $-\frac{3 \cos(x)}{8} - \frac{\cos(3x)}{8} + \frac{\cos(5x)}{40} + \frac{\cos(7x)}{56}$ | 24 |
| risch | $-\frac{3 \cos(x)}{8} - \frac{\cos(3x)}{8} + \frac{\cos(5x)}{40} + \frac{\cos(7x)}{56}$ | 24 |
| parallelrisch | $\frac{8}{21} - \frac{3 \cos(x)}{8} - \frac{\cos(3x)}{8} + \frac{\cos(5x)}{40} + \frac{\cos(7x)}{56}$ | 25 |

[In] int(sin(2*x)^3*cos(x),x,method=_RETURNVERBOSE)

[Out] -3/8*cos(x)-1/8*cos(3*x)+1/40*cos(5*x)+1/56*cos(7*x)

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \cos(x) \sin^3(2x) dx = \frac{8}{7} \cos(x)^7 - \frac{8}{5} \cos(x)^5$$

[In] integrate(sin(2*x)^3*cos(x),x, algorithm="fricas")

[Out] 8/7*cos(x)^7 - 8/5*cos(x)^5

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 65 vs. 2(15) = 30.

Time = 0.59 (sec) , antiderivative size = 65, normalized size of antiderivative = 3.82

$$\int \cos(x) \sin^3(2x) dx = -\frac{9 \sin(x) \sin^3(2x)}{35} - \frac{8 \sin(x) \sin(2x) \cos^2(2x)}{35} \\ - \frac{22 \sin^2(2x) \cos(x) \cos(2x)}{35} - \frac{16 \cos(x) \cos^3(2x)}{35}$$

[In] integrate(sin(2*x)**3*cos(x),x)

[Out] -9*sin(x)*sin(2*x)**3/35 - 8*sin(x)*sin(2*x)*cos(2*x)**2/35 - 22*sin(2*x)**2*cos(x)*cos(2*x)/35 - 16*cos(x)*cos(2*x)**3/35

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.35

$$\int \cos(x) \sin^3(2x) dx = \frac{1}{56} \cos(7x) + \frac{1}{40} \cos(5x) - \frac{1}{8} \cos(3x) - \frac{3}{8} \cos(x)$$

[In] integrate(sin(2*x)^3*cos(x),x, algorithm="maxima")

[Out] 1/56*cos(7*x) + 1/40*cos(5*x) - 1/8*cos(3*x) - 3/8*cos(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \cos(x) \sin^3(2x) dx = \frac{8}{7} \cos(x)^7 - \frac{8}{5} \cos(x)^5$$

[In] integrate(sin(2*x)^3*cos(x),x, algorithm="giac")

[Out] 8/7*cos(x)^7 - 8/5*cos(x)^5

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.82

$$\int \cos(x) \sin^3(2x) dx = \frac{8 \cos(x)^5 (5 \cos(x)^2 - 7)}{35}$$

[In] int(sin(2*x)^3*cos(x),x)

[Out] (8*cos(x)^5*(5*cos(x)^2 - 7))/35

3.3 $\int \sqrt[3]{-1+x}(1+x)^2 dx$

| | |
|---|-----|
| Optimal result | 120 |
| Rubi [A] (verified) | 120 |
| Mathematica [A] (verified) | 121 |
| Maple [A] (verified) | 121 |
| Fricas [A] (verification not implemented) | 121 |
| Sympy [C] (verification not implemented) | 122 |
| Maxima [A] (verification not implemented) | 122 |
| Giac [A] (verification not implemented) | 122 |
| Mupad [B] (verification not implemented) | 123 |

Optimal result

Integrand size = 13, antiderivative size = 21

$$\int \sqrt[3]{-1+x}(1+x)^2 dx = \frac{3}{70}(-1+x)^{4/3} (37 + 26x + 7x^2)$$

[Out] 3/70*(-1+x)^(4/3)*(7*x^2+26*x+37)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.52, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.077$, Rules used = {45}

$$\int \sqrt[3]{-1+x}(1+x)^2 dx = \frac{3}{10}(x-1)^{10/3} + \frac{12}{7}(x-1)^{7/3} + 3(x-1)^{4/3}$$

[In] Int[(-1 + x)^(1/3)*(1 + x)^2, x]

[Out] 3*(-1 + x)^(4/3) + (12*(-1 + x)^(7/3))/7 + (3*(-1 + x)^(10/3))/10

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rubi steps

$$\begin{aligned} \text{integral} &= \int (4\sqrt[3]{-1+x} + 4(-1+x)^{4/3} + (-1+x)^{7/3}) dx \\ &= 3(-1+x)^{4/3} + \frac{12}{7}(-1+x)^{7/3} + \frac{3}{10}(-1+x)^{10/3} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.00

$$\int \sqrt[3]{-1+x}(1+x)^2 dx = \frac{3}{70}(-1+x)^{4/3}(37+26x+7x^2)$$

`[In] Integrate[(-1 + x)^(1/3)*(1 + x)^2,x]``[Out] (3*(-1 + x)^(4/3)*(37 + 26*x + 7*x^2))/70`**Maple [A] (verified)**

Time = 0.28 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.86

| method | result |
|------------------|---|
| gospers | $\frac{3(-1+x)^{4/3}(7x^2+26x+37)}{70}$ |
| trager | $\left(\frac{3}{10}x^3 + \frac{57}{70}x^2 + \frac{33}{70}x - \frac{111}{70}\right)(-1+x)^{1/3}$ |
| derivativdivides | $\frac{3(-1+x)^{10/3}}{10} + \frac{12(-1+x)^{7/3}}{7} + 3(-1+x)^{4/3}$ |
| default | $\frac{3(-1+x)^{10/3}}{10} + \frac{12(-1+x)^{7/3}}{7} + 3(-1+x)^{4/3}$ |
| risch | $\frac{3(-1+x)^{1/3}(7x^3+19x^2+11x-37)}{70}$ |
| meijerg | $\frac{\text{signum}(-1+x)^{1/3} x \text{ hypergeom}\left(\left[-\frac{1}{3}, 1\right], [2], x\right)}{\left(-\text{signum}(-1+x)\right)^{1/3}} + \frac{\text{signum}(-1+x)^{1/3} x^2 \text{ hypergeom}\left(\left[-\frac{1}{3}, 2\right], [3], x\right)}{\left(-\text{signum}(-1+x)\right)^{1/3}} + \frac{\text{signum}(-1+x)^{1/3} x^3}{3(-\text{signum}(-1+x))^{1/3}}$ |

`[In] int((1+x)^2*(-1+x)^(1/3),x,method=_RETURNVERBOSE)``[Out] 3/70*(-1+x)^(4/3)*(7*x^2+26*x+37)`**Fricas [A] (verification not implemented)**

none

Time = 0.25 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.05

$$\int \sqrt[3]{-1+x}(1+x)^2 dx = \frac{3}{70}(7x^3+19x^2+11x-37)(x-1)^{1/3}$$

`[In] integrate((1+x)^2*(-1+x)^(1/3),x, algorithm="fricas")``[Out] 3/70*(7*x^3 + 19*x^2 + 11*x - 37)*(x - 1)^(1/3)`

Sympy [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.86 (sec) , antiderivative size = 144, normalized size of antiderivative = 6.86

$$\int \sqrt[3]{-1+x}(1+x)^2 dx$$

$$= \begin{cases} \frac{3\sqrt[3]{x-1}(x+1)^3}{10} - \frac{3\sqrt[3]{x-1}(x+1)^2}{35} - \frac{9\sqrt[3]{x-1}(x+1)}{35} - \frac{54\sqrt[3]{x-1}}{35} & \text{for } |x+1| > 2 \\ -\frac{3\sqrt[3]{1-x}(x+1)^3 e^{-\frac{2i\pi}{3}}}{10} + \frac{3\sqrt[3]{1-x}(x+1)^2 e^{-\frac{2i\pi}{3}}}{35} + \frac{9\sqrt[3]{1-x}(x+1) e^{-\frac{2i\pi}{3}}}{35} + \frac{54\sqrt[3]{1-x} e^{-\frac{2i\pi}{3}}}{35} & \text{otherwise} \end{cases}$$

[In] integrate((1+x)**2*(-1+x)**(1/3),x)

[Out] Piecewise((3*(x - 1)**(1/3)*(x + 1)**3/10 - 3*(x - 1)**(1/3)*(x + 1)**2/35 - 9*(x - 1)**(1/3)*(x + 1)/35 - 54*(x - 1)**(1/3)/35, Abs(x + 1) > 2), (-3*(1 - x)**(1/3)*(x + 1)**3*exp(-2*I*pi/3)/10 + 3*(1 - x)**(1/3)*(x + 1)**2*exp(-2*I*pi/3)/35 + 9*(1 - x)**(1/3)*(x + 1)*exp(-2*I*pi/3)/35 + 54*(1 - x)**(1/3)*exp(-2*I*pi/3)/35, True))

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.05

$$\int \sqrt[3]{-1+x}(1+x)^2 dx = \frac{3}{10}(x-1)^{\frac{10}{3}} + \frac{12}{7}(x-1)^{\frac{7}{3}} + 3(x-1)^{\frac{4}{3}}$$

[In] integrate((1+x)^2*(-1+x)^(1/3),x, algorithm="maxima")

[Out] 3/10*(x - 1)^(10/3) + 12/7*(x - 1)^(7/3) + 3*(x - 1)^(4/3)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.05

$$\int \sqrt[3]{-1+x}(1+x)^2 dx = \frac{3}{10}(x-1)^{\frac{10}{3}} + \frac{12}{7}(x-1)^{\frac{7}{3}} + 3(x-1)^{\frac{4}{3}}$$

[In] integrate((1+x)^2*(-1+x)^(1/3),x, algorithm="giac")

[Out] 3/10*(x - 1)^(10/3) + 12/7*(x - 1)^(7/3) + 3*(x - 1)^(4/3)

Mupad [B] (verification not implemented)

Time = 16.73 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.90

$$\int \sqrt[3]{-1+x}(1+x)^2 dx = \frac{3(x-1)^{4/3}(40x+7(x-1)^2+30)}{70}$$

[In] int((x - 1)^(1/3)*(x + 1)^2,x)

[Out] (3*(x - 1)^(4/3)*(40*x + 7*(x - 1)^2 + 30))/70

3.4 $\int x \log\left(1 + \frac{1}{x}\right) dx$

| | |
|---|-----|
| Optimal result | 124 |
| Rubi [A] (verified) | 124 |
| Mathematica [A] (verified) | 125 |
| Maple [A] (verified) | 125 |
| Fricas [A] (verification not implemented) | 126 |
| Sympy [A] (verification not implemented) | 126 |
| Maxima [A] (verification not implemented) | 126 |
| Giac [B] (verification not implemented) | 127 |
| Mupad [B] (verification not implemented) | 127 |

Optimal result

Integrand size = 8, antiderivative size = 27

$$\int x \log\left(1 + \frac{1}{x}\right) dx = \frac{x}{2} + \frac{1}{2}x^2 \log\left(1 + \frac{1}{x}\right) - \frac{1}{2} \log(1+x)$$

[Out] 1/2*x+1/2*x^2*ln(1+1/x)-1/2*ln(1+x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.375$, Rules used = {2505, 199, 45}

$$\int x \log\left(1 + \frac{1}{x}\right) dx = \frac{1}{2}x^2 \log\left(\frac{1}{x} + 1\right) + \frac{x}{2} - \frac{1}{2} \log(x+1)$$

[In] Int[x*Log[1 + x^(-1)],x]

[Out] x/2 + (x^2*Log[1 + x^(-1)])/2 - Log[1 + x]/2

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] :> Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x], x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LtQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rule 199

Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] :> Int[x^(n*p)*(b + a/x^n)^p, x] /; FreeQ[{a, b}, x] && LtQ[n, 0] && IntegerQ[p]

Rule 2505

```
Int[((a_.) + Log[(c_.)*((d_) + (e_.)*(x_)^(n_))^(p_.)]*(b_.))*((f_.)*(x_)^(m_.), x_Symbol] :> Simp[(f*x)^(m + 1)*((a + b*Log[c*(d + e*x^n)^p])/(f*(m + 1))), x] - Dist[b*e*n*(p/(f*(m + 1))), Int[x^(n - 1)*((f*x)^(m + 1)/(d + e*x^n)), x], x] /; FreeQ[{a, b, c, d, e, f, m, n, p}, x] && NeQ[m, -1]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \frac{1}{2}x^2 \log\left(1 + \frac{1}{x}\right) + \frac{1}{2} \int \frac{1}{1 + \frac{1}{x}} dx \\
 &= \frac{1}{2}x^2 \log\left(1 + \frac{1}{x}\right) + \frac{1}{2} \int \frac{x}{1 + x} dx \\
 &= \frac{1}{2}x^2 \log\left(1 + \frac{1}{x}\right) + \frac{1}{2} \int \left(1 + \frac{1}{-1 - x}\right) dx \\
 &= \frac{x}{2} + \frac{1}{2}x^2 \log\left(1 + \frac{1}{x}\right) - \frac{1}{2} \log(1 + x)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.00

$$\int x \log\left(1 + \frac{1}{x}\right) dx = \frac{x}{2} + \frac{1}{2}x^2 \log\left(1 + \frac{1}{x}\right) - \frac{1}{2} \log(1 + x)$$

[In] Integrate[x*Log[1 + x^(-1)],x]

[Out] x/2 + (x^2*Log[1 + x^(-1)])/2 - Log[1 + x]/2

Maple [A] (verified)

Time = 0.07 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.81

| method | result | size |
|-------------------|--|------|
| risch | $\frac{x}{2} + \frac{x^2 \ln(1 + \frac{1}{x})}{2} - \frac{\ln(1+x)}{2}$ | 22 |
| parts | $\frac{x}{2} + \frac{x^2 \ln(1 + \frac{1}{x})}{2} - \frac{\ln(1+x)}{2}$ | 22 |
| derivativedivides | $\frac{x}{2} + \frac{\ln(\frac{1}{x})}{2} - \frac{\ln(1 + \frac{1}{x})(1 + \frac{1}{x})(\frac{1}{x} - 1)x^2}{2}$ | 32 |
| default | $\frac{x}{2} + \frac{\ln(\frac{1}{x})}{2} - \frac{\ln(1 + \frac{1}{x})(1 + \frac{1}{x})(\frac{1}{x} - 1)x^2}{2}$ | 32 |
| parallelrisch | $\frac{\ln(\frac{1+x}{x})x^2}{2} - \frac{1}{2} - \frac{\ln(x)}{2} + \frac{x}{2} - \frac{\ln(\frac{1+x}{x})}{2}$ | 33 |

[In] `int(x*ln(1+1/x),x,method=_RETURNVERBOSE)`

[Out] `1/2*x+1/2*x^2*ln(1+1/x)-1/2*ln(1+x)`

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.85

$$\int x \log \left(1 + \frac{1}{x} \right) dx = \frac{1}{2} x^2 \log \left(\frac{x+1}{x} \right) + \frac{1}{2} x - \frac{1}{2} \log(x+1)$$

[In] `integrate(x*log(1+1/x),x, algorithm="fricas")`

[Out] `1/2*x^2*log((x + 1)/x) + 1/2*x - 1/2*log(x + 1)`

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.74

$$\int x \log \left(1 + \frac{1}{x} \right) dx = \frac{x^2 \log \left(1 + \frac{1}{x} \right)}{2} + \frac{x}{2} - \frac{\log(x+1)}{2}$$

[In] `integrate(x*ln(1+1/x),x)`

[Out] `x**2*log(1 + 1/x)/2 + x/2 - log(x + 1)/2`

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.78

$$\int x \log \left(1 + \frac{1}{x} \right) dx = \frac{1}{2} x^2 \log \left(\frac{1}{x} + 1 \right) + \frac{1}{2} x - \frac{1}{2} \log(x+1)$$

[In] `integrate(x*log(1+1/x),x, algorithm="maxima")`

[Out] `1/2*x^2*log(1/x + 1) + 1/2*x - 1/2*log(x + 1)`

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 60 vs. $2(21) = 42$.

Time = 0.27 (sec) , antiderivative size = 60, normalized size of antiderivative = 2.22

$$\int x \log \left(1 + \frac{1}{x} \right) dx = \frac{1}{2 \left(\frac{x+1}{x} - 1 \right)} + \frac{\log \left(\frac{x+1}{x} \right)}{2 \left(\frac{x+1}{x} - 1 \right)^2} - \frac{1}{2} \log \left(\frac{|x+1|}{|x|} \right) + \frac{1}{2} \log \left(\left| \frac{x+1}{x} - 1 \right| \right)$$

[In] integrate(x*log(1+1/x),x, algorithm="giac")

[Out] 1/2/((x + 1)/x - 1) + 1/2*log((x + 1)/x)/((x + 1)/x - 1)^2 - 1/2*log(abs(x + 1)/abs(x)) + 1/2*log(abs((x + 1)/x - 1))

Mupad [B] (verification not implemented)

Time = 16.96 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.15

$$\int x \log \left(1 + \frac{1}{x} \right) dx = \frac{x}{2} - \frac{\ln(x(x+1))}{4} - \frac{\ln\left(\frac{1}{x} + 1\right)}{4} + \frac{x^2 \ln\left(\frac{1}{x} + 1\right)}{2}$$

[In] int(x*log(1/x + 1),x)

[Out] x/2 - log(x*(x + 1))/4 - log(1/x + 1)/4 + (x^2*log(1/x + 1))/2

3.5 $\int \sin^2(\log(x)) dx$

| | |
|---|-----|
| Optimal result | 128 |
| Rubi [A] (verified) | 128 |
| Mathematica [A] (verified) | 129 |
| Maple [A] (verified) | 129 |
| Fricas [A] (verification not implemented) | 130 |
| Sympy [A] (verification not implemented) | 130 |
| Maxima [A] (verification not implemented) | 130 |
| Giac [A] (verification not implemented) | 130 |
| Mupad [B] (verification not implemented) | 131 |

Optimal result

Integrand size = 5, antiderivative size = 27

$$\int \sin^2(\log(x)) dx = \frac{2x}{5} - \frac{2}{5}x \cos(\log(x)) \sin(\log(x)) + \frac{1}{5}x \sin^2(\log(x))$$

[Out] 2/5*x-2/5*x*cos(ln(x))*sin(ln(x))+1/5*x*sin(ln(x))^2

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 27, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.400$, Rules used = {4565, 8}

$$\int \sin^2(\log(x)) dx = \frac{2x}{5} + \frac{1}{5}x \sin^2(\log(x)) - \frac{2}{5}x \sin(\log(x)) \cos(\log(x))$$

[In] Int[Sin[Log[x]]^2,x]

[Out] (2*x)/5 - (2*x*Cos[Log[x]]*Sin[Log[x]])/5 + (x*Sin[Log[x]]^2)/5

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 4565

Int[Sin[(a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.)]*(d_.)]^(p_), x_Symbol] := Simp[x*(Sin[d*(a + b*Log[c*x^n])]^p/(b^2*d^2*n^2*p^2 + 1)), x] + (Dist[b^2*d^2*n^2*p*(p - 1)/(b^2*d^2*n^2*p^2 + 1), Int[Sin[d*(a + b*Log[c*x^n])]^(p - 2), x], x] - Simp[b*d*n*p*x*Cos[d*(a + b*Log[c*x^n])]*(Sin[d*(a + b*Log[c*x^n])]^(p - 1)/(b^2*d^2*n^2*p^2 + 1)), x]) /; FreeQ[{a, b, c, d, n}, x] && I

GtQ[p, 1] && NeQ[b^2*d^2*n^2*p^2 + 1, 0]

Rubi steps

$$\begin{aligned} \text{integral} &= -\frac{2}{5}x \cos(\log(x)) \sin(\log(x)) + \frac{1}{5}x \sin^2(\log(x)) + \frac{2 \int 1 dx}{5} \\ &= \frac{2x}{5} - \frac{2}{5}x \cos(\log(x)) \sin(\log(x)) + \frac{1}{5}x \sin^2(\log(x)) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.96

$$\int \sin^2(\log(x)) dx = \frac{x}{2} - \frac{1}{10}x \cos(2 \log(x)) - \frac{1}{5}x \sin(2 \log(x))$$

[In] Integrate[Sin[Log[x]]^2,x]

[Out] x/2 - (x*Cos[2*Log[x]])/10 - (x*Sin[2*Log[x]])/5

Maple [A] (verified)

Time = 0.28 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.67

| method | result | size |
|---------------|---|------|
| parallelrisch | $-\frac{x(-5+\cos(2\ln(x))+2\sin(2\ln(x)))}{10}$ | 18 |
| default | $\frac{(\sin(\ln(x))-2\cos(\ln(x)))x\sin(\ln(x))}{5} + \frac{2x}{5}$ | 20 |
| risch | $\frac{x}{2} + \left(-\frac{1}{20} + \frac{i}{10}\right) x x^{2i} + \left(-\frac{1}{20} - \frac{i}{10}\right) x x^{-2i}$ | 27 |
| norman | $\frac{\frac{2x}{5} - \frac{4x \tan\left(\frac{\ln(x)}{2}\right)}{5} + \frac{8x \tan\left(\frac{\ln(x)}{2}\right)^2}{5} + \frac{4x \tan\left(\frac{\ln(x)}{2}\right)^3}{5} + \frac{2x \tan\left(\frac{\ln(x)}{2}\right)^4}{5}}{\left(1+\tan\left(\frac{\ln(x)}{2}\right)^2\right)^2}$ | 55 |

[In] int(sin(ln(x))^2,x,method=_RETURNVERBOSE)

[Out] -1/10*x*(-5+cos(2*ln(x))+2*sin(2*ln(x)))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.78

$$\int \sin^2(\log(x)) dx = -\frac{1}{5} x \cos(\log(x))^2 - \frac{2}{5} x \cos(\log(x)) \sin(\log(x)) + \frac{3}{5} x$$

[In] integrate(sin(log(x))^2,x, algorithm="fricas")

[Out] -1/5*x*cos(log(x))^2 - 2/5*x*cos(log(x))*sin(log(x)) + 3/5*x

Sympy [A] (verification not implemented)

Time = 0.19 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.37

$$\int \sin^2(\log(x)) dx = \frac{3x \sin^2(\log(x))}{5} - \frac{2x \sin(\log(x)) \cos(\log(x))}{5} + \frac{2x \cos^2(\log(x))}{5}$$

[In] integrate(sin(ln(x))**2,x)

[Out] 3*x*sin(log(x))**2/5 - 2*x*sin(log(x))*cos(log(x))/5 + 2*x*cos(log(x))**2/5

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.74

$$\int \sin^2(\log(x)) dx = -\frac{1}{10} x \cos(2 \log(x)) - \frac{1}{5} x \sin(2 \log(x)) + \frac{1}{2} x$$

[In] integrate(sin(log(x))^2,x, algorithm="maxima")

[Out] -1/10*x*cos(2*log(x)) - 1/5*x*sin(2*log(x)) + 1/2*x

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.78

$$\int \sin^2(\log(x)) dx = -\frac{1}{5} x \cos(\log(x))^2 - \frac{2}{5} x \cos(\log(x)) \sin(\log(x)) + \frac{3}{5} x$$

[In] integrate(sin(log(x))^2,x, algorithm="giac")

[Out] -1/5*x*cos(log(x))^2 - 2/5*x*cos(log(x))*sin(log(x)) + 3/5*x

Mupad [B] (verification not implemented)

Time = 16.20 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.89

$$\int \sin^2(\log(x)) dx = \frac{x}{2} + \frac{x (2 \sin(\ln(x))^2 - 1)}{10} - \frac{x \sin(2 \ln(x))}{5}$$

[In] int(sin(log(x))^2,x)

[Out] x/2 + (x*(2*sin(log(x))^2 - 1))/10 - (x*sin(2*log(x)))/5

3.6 $\int \frac{1}{1+3e^x} dx$

| | |
|---|-----|
| Optimal result | 132 |
| Rubi [A] (verified) | 132 |
| Mathematica [A] (verified) | 133 |
| Maple [A] (verified) | 133 |
| Fricas [A] (verification not implemented) | 134 |
| Sympy [A] (verification not implemented) | 134 |
| Maxima [A] (verification not implemented) | 134 |
| Giac [A] (verification not implemented) | 135 |
| Mupad [B] (verification not implemented) | 135 |

Optimal result

Integrand size = 9, antiderivative size = 12

$$\int \frac{1}{1+3e^x} dx = x - \log(1+3e^x)$$

[Out] x-ln(1+3*exp(x))

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.444$, Rules used = {2320, 36, 29, 31}

$$\int \frac{1}{1+3e^x} dx = x - \log(3e^x + 1)$$

[In] Int[(1 + 3*E^x)^(-1), x]

[Out] x - Log[1 + 3*E^x]

Rule 29

Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]

Rule 31

Int[((a_) + (b_.)*(x_))(-1), x_Symbol] :> Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 36

Int[1/(((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))), x_Symbol] :> Dist[b/(b*c - a*d), Int[1/(a + b*x), x], x] - Dist[d/(b*c - a*d), Int[1/(c + d*x), x],


```
x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0]
```

Rule 2320

```
Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_)[v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{1}{x(1+3x)} dx, x, e^x\right) \\ &= -\left(3\text{Subst}\left(\int \frac{1}{1+3x} dx, x, e^x\right)\right) + \text{Subst}\left(\int \frac{1}{x} dx, x, e^x\right) \\ &= x - \log(1+3e^x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.25

$$\int \frac{1}{1+3e^x} dx = \log(e^x) - \log(1+3e^x)$$

```
[In] Integrate[(1 + 3*E^x)^(-1), x]
```

```
[Out] Log[E^x] - Log[1 + 3*E^x]
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

| method | result | size |
|-------------------|---|------|
| risch | $x - \ln\left(\frac{1}{3} + e^x\right)$ | 10 |
| parallelrisch | $x - \ln\left(\frac{1}{3} + e^x\right)$ | 10 |
| norman | $x - \ln(1 + 3e^x)$ | 12 |
| derivativedivides | $-\ln(1 + 3e^x) + \ln(e^x)$ | 14 |
| default | $-\ln(1 + 3e^x) + \ln(e^x)$ | 14 |

```
[In] int(1/(1+3*exp(x)), x, method=_RETURNVERBOSE)
```

[Out] $x - \ln(1/3 + \exp(x))$

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.92

$$\int \frac{1}{1 + 3e^x} dx = x - \log(3e^x + 1)$$

[In] `integrate(1/(1+3*exp(x)),x, algorithm="fricas")`

[Out] $x - \log(3e^x + 1)$

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{1}{1 + 3e^x} dx = x - \log\left(e^x + \frac{1}{3}\right)$$

[In] `integrate(1/(1+3*exp(x)),x)`

[Out] $x - \log(\exp(x) + 1/3)$

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.92

$$\int \frac{1}{1 + 3e^x} dx = x - \log(3e^x + 1)$$

[In] `integrate(1/(1+3*exp(x)),x, algorithm="maxima")`

[Out] $x - \log(3e^x + 1)$

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.92

$$\int \frac{1}{1+3e^x} dx = x - \log(3e^x + 1)$$

```
[In] integrate(1/(1+3*exp(x)),x, algorithm="giac")
```

```
[Out] x - log(3*e^x + 1)
```

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.92

$$\int \frac{1}{1+3e^x} dx = x - \ln(3e^x + 1)$$

```
[In] int(1/(3*exp(x) + 1),x)
```

```
[Out] x - log(3*exp(x) + 1)
```

3.7 $\int \csc^3(x) \sec^5(x) dx$

| | |
|---|-----|
| Optimal result | 136 |
| Rubi [A] (verified) | 136 |
| Mathematica [A] (verified) | 137 |
| Maple [A] (verified) | 137 |
| Fricas [B] (verification not implemented) | 138 |
| Sympy [A] (verification not implemented) | 138 |
| Maxima [B] (verification not implemented) | 139 |
| Giac [A] (verification not implemented) | 139 |
| Mupad [B] (verification not implemented) | 139 |

Optimal result

Integrand size = 9, antiderivative size = 30

$$\int \csc^3(x) \sec^5(x) dx = -\frac{1}{2} \cot^2(x) + 3 \log(\tan(x)) + \frac{3 \tan^2(x)}{2} + \frac{\tan^4(x)}{4}$$

[Out] $-1/2*\cot(x)^2+3*\ln(\tan(x))+3/2*\tan(x)^2+1/4*\tan(x)^4$

Rubi [A] (verified)

Time = 0.04 (sec), antiderivative size = 30, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {2700, 272, 45}

$$\int \csc^3(x) \sec^5(x) dx = \frac{\tan^4(x)}{4} + \frac{3 \tan^2(x)}{2} - \frac{\cot^2(x)}{2} + 3 \log(\tan(x))$$

[In] $\text{Int}[\text{Csc}[x]^3*\text{Sec}[x]^5,x]$

[Out] $-1/2*\text{Cot}[x]^2 + 3*\text{Log}[\text{Tan}[x]] + (3*\text{Tan}[x]^2)/2 + \text{Tan}[x]^4/4$

Rule 45

$\text{Int}[(a_. + (b_.)*(x_.))^(m_.)*((c_.) + (d_.)*(x_.))^(n_.), x_Symbol] \rightarrow \text{Int}[\text{ExpandIntegrand}[(a + b*x)^m*(c + d*x)^n, x], x] /; \text{FreeQ}\{a, b, c, d, n\}, x \ \&\& \ \text{NeQ}[b*c - a*d, 0] \ \&\& \ \text{IGtQ}[m, 0] \ \&\& \ (!\text{IntegerQ}[n] \ || \ (\text{EqQ}[c, 0] \ \&\& \ \text{LeQ}[7*m + 4*n + 4, 0]) \ || \ \text{LtQ}[9*m + 5*(n + 1), 0] \ || \ \text{GtQ}[m + n + 2, 0])$

Rule 272

$\text{Int}[(x_.)^(m_.)*((a_.) + (b_.)*(x_.))^(n_.)]^(p_.), x_Symbol] \rightarrow \text{Dist}[1/n, \text{Subst}[\text{Int}[x^{(\text{Simplify}[(m + 1)/n] - 1)*(a + b*x)^p, x}], x, x^n], x] /; \text{FreeQ}\{a, b$

, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]

Rule 2700

```
Int[csc[(e_.) + (f_.)*(x_.)]^(m_.)*sec[(e_.) + (f_.)*(x_.)]^(n_.), x_Symbol]
:> Dist[1/f, Subst[Int[(1 + x^2)^((m + n)/2 - 1)/x^m, x], x, Tan[e + f*x]],
x] /; FreeQ[{e, f}, x] && IntegersQ[m, n, (m + n)/2]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \text{Subst} \left(\int \frac{(1+x^2)^3}{x^3} dx, x, \tan(x) \right) \\
 &= \frac{1}{2} \text{Subst} \left(\int \frac{(1+x)^3}{x^2} dx, x, \tan^2(x) \right) \\
 &= \frac{1}{2} \text{Subst} \left(\int \left(3 + \frac{1}{x^2} + \frac{3}{x} + x \right) dx, x, \tan^2(x) \right) \\
 &= -\frac{1}{2} \cot^2(x) + 3 \log(\tan(x)) + \frac{3 \tan^2(x)}{2} + \frac{\tan^4(x)}{4}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.03

$$\int \csc^3(x) \sec^5(x) dx = -\frac{1}{2} \csc^2(x) - 3 \log(\cos(x)) + 3 \log(\sin(x)) + \sec^2(x) + \frac{\sec^4(x)}{4}$$

[In] Integrate[Csc[x]^3*Sec[x]^5,x]

[Out] -1/2*Csc[x]^2 - 3*Log[Cos[x]] + 3*Log[Sin[x]] + Sec[x]^2 + Sec[x]^4/4

Maple [A] (verified)

Time = 0.29 (sec) , antiderivative size = 33, normalized size of antiderivative = 1.10

| method | result |
|---------------|---|
| default | $\frac{1}{4 \sin(x)^2 \cos(x)^4} + \frac{3}{4 \sin(x)^2 \cos(x)^2} - \frac{3}{2 \sin(x)^2} + 3 \ln(\tan(x))$ |
| parallelrisch | $-3 \ln(1 + \csc(x) - \cot(x)) - 3 \ln(\csc(x) - \cot(x) - 1) + 3 \ln(-\cot(x) + \csc(x)) + \frac{(8 \sec(x) - 1)^2}{8 \sec(x)}$ |
| norman | $\frac{-\frac{1}{8} - 10 \tan(\frac{x}{2})^6 + \frac{57 \tan(\frac{x}{2})^4}{8} + \frac{57 \tan(\frac{x}{2})^8}{8} - \frac{\tan(\frac{x}{2})^{12}}{8}}{\tan(\frac{x}{2})^2 (\tan(\frac{x}{2})^2 - 1)^4} + 3 \ln(\tan(\frac{x}{2})) - 3 \ln(\tan(\frac{x}{2}) - 1) - 3 \ln(1 + \tan(\frac{x}{2}))$ |
| risch | $\frac{6 e^{10ix} + 12 e^{8ix} - 4 e^{6ix} + 12 e^{4ix} + 6 e^{2ix}}{(e^{2ix} + 1)^4 (e^{2ix} - 1)^2} + 3 \ln(e^{2ix} - 1) - 3 \ln(e^{2ix} + 1)$ |

[In] `int(1/sin(x)^3/cos(x)^5,x,method=_RETURNVERBOSE)`

[Out] `1/4/sin(x)^2/cos(x)^4+3/4/sin(x)^2/cos(x)^2-3/2/sin(x)^2+3*ln(tan(x))`

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 69 vs. $2(24) = 48$.

Time = 0.27 (sec) , antiderivative size = 69, normalized size of antiderivative = 2.30

$$\int \csc^3(x) \sec^5(x) dx = \frac{6 \cos(x)^4 - 3 \cos(x)^2 - 6 (\cos(x)^6 - \cos(x)^4) \log(\cos(x)^2) + 6 (\cos(x)^6 - \cos(x)^4) \log(-\frac{1}{4} \cos(x)^2 + \frac{1}{4})}{4 (\cos(x)^6 - \cos(x)^4)}$$

[In] `integrate(1/sin(x)^3/cos(x)^5,x, algorithm="fricas")`

[Out] `1/4*(6*cos(x)^4 - 3*cos(x)^2 - 6*(cos(x)^6 - cos(x)^4)*log(cos(x)^2) + 6*(cos(x)^6 - cos(x)^4)*log(-1/4*cos(x)^2 + 1/4) - 1)/(cos(x)^6 - cos(x)^4)`

Sympy [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 46, normalized size of antiderivative = 1.53

$$\int \csc^3(x) \sec^5(x) dx = \frac{3 \log(\cos^2(x) - 1)}{2} - 3 \log(\cos(x)) - \frac{-6 \cos^4(x) + 3 \cos^2(x) + 1}{4 \cos^6(x) - 4 \cos^4(x)}$$

[In] `integrate(1/sin(x)**3/cos(x)**5,x)`

[Out] `3*log(cos(x)**2 - 1)/2 - 3*log(cos(x)) - (-6*cos(x)**4 + 3*cos(x)**2 + 1)/(4*cos(x)**6 - 4*cos(x)**4)`

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 50 vs. 2(24) = 48.

Time = 0.20 (sec) , antiderivative size = 50, normalized size of antiderivative = 1.67

$$\int \csc^3(x) \sec^5(x) dx = -\frac{6 \sin(x)^4 - 9 \sin(x)^2 + 2}{4 (\sin(x)^6 - 2 \sin(x)^4 + \sin(x)^2)} - \frac{3}{2} \log(\sin(x)^2 - 1) + \frac{3}{2} \log(\sin(x)^2)$$

[In] integrate(1/sin(x)^3/cos(x)^5,x, algorithm="maxima")

[Out] -1/4*(6*sin(x)^4 - 9*sin(x)^2 + 2)/(sin(x)^6 - 2*sin(x)^4 + sin(x)^2) - 3/2*log(sin(x)^2 - 1) + 3/2*log(sin(x)^2)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 46, normalized size of antiderivative = 1.53

$$\int \csc^3(x) \sec^5(x) dx = \frac{6 \cos(x)^4 - 3 \cos(x)^2 - 1}{4 (\cos(x)^2 - 1) \cos(x)^4} + \frac{3}{2} \log(-\cos(x)^2 + 1) - 3 \log(|\cos(x)|)$$

[In] integrate(1/sin(x)^3/cos(x)^5,x, algorithm="giac")

[Out] 1/4*(6*cos(x)^4 - 3*cos(x)^2 - 1)/((cos(x)^2 - 1)*cos(x)^4) + 3/2*log(-cos(x)^2 + 1) - 3*log(abs(cos(x)))

Mupad [B] (verification not implemented)

Time = 15.25 (sec) , antiderivative size = 30, normalized size of antiderivative = 1.00

$$\int \csc^3(x) \sec^5(x) dx = 3 \ln(\tan(x)) + \frac{\frac{3}{4 \cos(x)^2} + \frac{1}{4 \cos(x)^4}}{\sin(x)^2} - \frac{3}{2 \sin(x)^2}$$

[In] int(1/(cos(x)^5*sin(x)^3),x)

[Out] 3*log(tan(x)) + (3/(4*cos(x)^2) + 1/(4*cos(x)^4))/sin(x)^2 - 3/(2*sin(x)^2)

3.8 $\int \frac{1}{x\sqrt{-1+x^4}} dx$

| | |
|---|-----|
| Optimal result | 140 |
| Rubi [A] (verified) | 140 |
| Mathematica [A] (verified) | 141 |
| Maple [A] (verified) | 142 |
| Fricas [A] (verification not implemented) | 142 |
| Sympy [C] (verification not implemented) | 142 |
| Maxima [A] (verification not implemented) | 143 |
| Giac [A] (verification not implemented) | 143 |
| Mupad [B] (verification not implemented) | 143 |

Optimal result

Integrand size = 13, antiderivative size = 14

$$\int \frac{1}{x\sqrt{-1+x^4}} dx = \frac{1}{2} \arctan(\sqrt{-1+x^4})$$

[Out] 1/2*arctan((x^4-1)^(1/2))

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 14, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.231$, Rules used = {272, 65, 209}

$$\int \frac{1}{x\sqrt{-1+x^4}} dx = \frac{1}{2} \arctan(\sqrt{x^4-1})$$

[In] Int[1/(x*Sqrt[-1 + x^4]),x]

[Out] ArcTan[Sqrt[-1 + x^4]]/2

Rule 65

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] :> With[
{p = Denominator[m]}, Dist[p/b, Subst[Int[x^(p*(m + 1) - 1)*(c - a*(d/b) +
d*(x^p/b))^(n), x], x, (a + b*x)^(1/p)], x]] /; FreeQ[{a, b, c, d}, x] && NeQ
[b*c - a*d, 0] && LtQ[-1, m, 0] && LeQ[-1, n, 0] && LeQ[Denominator[n], Den
ominator[m]] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 209

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] :> Simp[(1/(Rt[a, 2]*Rt[b, 2]))*A
rcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a
```


, 0] || GtQ[b, 0])

Rule 272

```
Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] :=> Dist[1/n, Subst[
Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b
, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{4} \text{Subst} \left(\int \frac{1}{\sqrt{-1 + xx}} dx, x, x^4 \right) \\ &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{1 + x^2} dx, x, \sqrt{-1 + x^4} \right) \\ &= \frac{1}{2} \arctan \left(\sqrt{-1 + x^4} \right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{1}{x\sqrt{-1 + x^4}} dx = \frac{1}{2} \arctan \left(\sqrt{-1 + x^4} \right)$$

[In] Integrate[1/(x*Sqrt[-1 + x^4]),x]

[Out] ArcTan[Sqrt[-1 + x^4]]/2

Maple [A] (verified)

Time = 0.38 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.79

| method | result | size |
|----------------|--|------|
| default | $-\frac{\arctan\left(\frac{1}{\sqrt{x^4-1}}\right)}{2}$ | 11 |
| elliptic | $-\frac{\arctan\left(\frac{1}{\sqrt{x^4-1}}\right)}{2}$ | 11 |
| pseudoelliptic | $-\frac{\arctan\left(\frac{1}{\sqrt{x^4-1}}\right)}{2}$ | 11 |
| trager | $\frac{\text{RootOf}\left(-Z^2+1\right) \ln\left(\frac{\text{RootOf}\left(-Z^2+1\right)+\sqrt{x^4-1}}{x^2}\right)}{2}$ | 28 |
| meijerg | $\frac{\sqrt{-\text{signum}(x^4-1)}\left((-2\ln(2)+4\ln(x)+i\pi)\sqrt{\pi}-2\sqrt{\pi}\ln\left(\frac{1}{2}+\frac{\sqrt{-x^4+1}}{2}\right)\right)}{4\sqrt{\pi}\sqrt{\text{signum}(x^4-1)}}$ | 61 |

```
[In] int(1/x/(x^4-1)^(1/2),x,method=_RETURNVERBOSE)
```

```
[Out] -1/2*arctan(1/(x^4-1)^(1/2))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \frac{1}{x\sqrt{-1+x^4}} dx = \frac{1}{2} \arctan\left(\sqrt{x^4-1}\right)$$

```
[In] integrate(1/x/(x^4-1)^(1/2),x, algorithm="fricas")
```

```
[Out] 1/2*arctan(sqrt(x^4 - 1))
```

Sympy [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.44 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.71

$$\int \frac{1}{x\sqrt{-1+x^4}} dx = \begin{cases} \frac{i \operatorname{acosh}\left(\frac{1}{x^2}\right)}{2} & \text{for } \frac{1}{|x^4|} > 1 \\ -\frac{\operatorname{asin}\left(\frac{1}{x^2}\right)}{2} & \text{otherwise} \end{cases}$$

```
[In] integrate(1/x/(x**4-1)**(1/2),x)
```

```
[Out] Piecewise((I*acosh(x**(-2))/2, 1/Abs(x**4) > 1), (-asin(x**(-2))/2, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \frac{1}{x\sqrt{-1+x^4}} dx = \frac{1}{2} \arctan(\sqrt{x^4-1})$$

[In] integrate(1/x/(x^4-1)^(1/2),x, algorithm="maxima")

[Out] 1/2*arctan(sqrt(x^4 - 1))

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \frac{1}{x\sqrt{-1+x^4}} dx = \frac{1}{2} \arctan(\sqrt{x^4-1})$$

[In] integrate(1/x/(x^4-1)^(1/2),x, algorithm="giac")

[Out] 1/2*arctan(sqrt(x^4 - 1))

Mupad [B] (verification not implemented)

Time = 15.31 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \frac{1}{x\sqrt{-1+x^4}} dx = \frac{\operatorname{atan}(\sqrt{x^4-1})}{2}$$

[In] int(1/(x*(x^4 - 1)^(1/2)),x)

[Out] atan((x^4 - 1)^(1/2))/2

3.9 $\int \frac{1}{x(1+x^5)} dx$

| | |
|---|-----|
| Optimal result | 144 |
| Rubi [A] (verified) | 144 |
| Mathematica [A] (verified) | 145 |
| Maple [A] (verified) | 145 |
| Fricas [A] (verification not implemented) | 146 |
| Sympy [A] (verification not implemented) | 146 |
| Maxima [A] (verification not implemented) | 146 |
| Giac [A] (verification not implemented) | 147 |
| Mupad [B] (verification not implemented) | 147 |

Optimal result

Integrand size = 11, antiderivative size = 13

$$\int \frac{1}{x(1+x^5)} dx = \log(x) - \frac{1}{5} \log(1+x^5)$$

[Out] $\ln(x) - 1/5 * \ln(x^5 + 1)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.364$, Rules used = {272, 36, 29, 31}

$$\int \frac{1}{x(1+x^5)} dx = \log(x) - \frac{1}{5} \log(x^5 + 1)$$

[In] $\text{Int}[1/(x*(1 + x^5)), x]$

[Out] $\text{Log}[x] - \text{Log}[1 + x^5]/5$

Rule 29

$\text{Int}[(x_)^{(-1)}, x_Symbol] \text{ :> Simp}[\text{Log}[x], x]$

Rule 31

$\text{Int}[((a_) + (b_)*(x_))^{(-1)}, x_Symbol] \text{ :> Simp}[\text{Log}[\text{RemoveContent}[a + b*x, x]]/b, x] \text{ /; FreeQ}\{a, b\}, x]$

Rule 36

```
Int[1/(((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))), x_Symbol] := Dist[b/(b*c
- a*d), Int[1/(a + b*x), x], x] - Dist[d/(b*c - a*d), Int[1/(c + d*x), x],
x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0]
```

Rule 272

```
Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_.))^(p_), x_Symbol] := Dist[1/n, Subst[
Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b
, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{5} \text{Subst} \left(\int \frac{1}{x(1+x)} dx, x, x^5 \right) \\ &= \frac{1}{5} \text{Subst} \left(\int \frac{1}{x} dx, x, x^5 \right) - \frac{1}{5} \text{Subst} \left(\int \frac{1}{1+x} dx, x, x^5 \right) \\ &= \log(x) - \frac{1}{5} \log(1+x^5) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \frac{1}{x(1+x^5)} dx = \log(x) - \frac{1}{5} \log(1+x^5)$$

[In] Integrate[1/(x*(1 + x^5)),x]

[Out] Log[x] - Log[1 + x^5]/5

Maple [A] (verified)

Time = 0.14 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.92

| method | result | size |
|---------------|---|------|
| meijerg | $\ln(x) - \frac{\ln(x^5+1)}{5}$ | 12 |
| risch | $\ln(x) - \frac{\ln(x^5+1)}{5}$ | 12 |
| default | $-\frac{\ln(1+x)}{5} - \frac{\ln(x^4-x^3+x^2-x+1)}{5} + \ln(x)$ | 29 |
| norman | $-\frac{\ln(1+x)}{5} - \frac{\ln(x^4-x^3+x^2-x+1)}{5} + \ln(x)$ | 29 |
| parallelrisch | $-\frac{\ln(1+x)}{5} - \frac{\ln(x^4-x^3+x^2-x+1)}{5} + \ln(x)$ | 29 |

```
[In] int(1/x/(x^5+1),x,method=_RETURNVERBOSE)
```

```
[Out] ln(x)-1/5*ln(x^5+1)
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{1}{x(1+x^5)} dx = -\frac{1}{5} \log(x^5 + 1) + \log(x)$$

```
[In] integrate(1/x/(x^5+1),x, algorithm="fricas")
```

```
[Out] -1/5*log(x^5 + 1) + log(x)
```

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.77

$$\int \frac{1}{x(1+x^5)} dx = \log(x) - \frac{\log(x^5 + 1)}{5}$$

```
[In] integrate(1/x/(x**5+1),x)
```

```
[Out] log(x) - log(x**5 + 1)/5
```

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.15

$$\int \frac{1}{x(1+x^5)} dx = -\frac{1}{5} \log(x^5 + 1) + \frac{1}{5} \log(x^5)$$

```
[In] integrate(1/x/(x^5+1),x, algorithm="maxima")
```

```
[Out] -1/5*log(x^5 + 1) + 1/5*log(x^5)
```

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \frac{1}{x(1+x^5)} dx = -\frac{1}{5} \log(|x^5 + 1|) + \log(|x|)$$

[In] integrate(1/x/(x^5+1),x, algorithm="giac")

[Out] -1/5*log(abs(x^5 + 1)) + log(abs(x))

Mupad [B] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{1}{x(1+x^5)} dx = \ln(x) - \frac{\ln(x^5 + 1)}{5}$$

[In] int(1/(x*(x^5 + 1)),x)

[Out] log(x) - log(x^5 + 1)/5

3.10 $\int \sqrt{\tan(x)} dx$

| | |
|---|-----|
| Optimal result | 148 |
| Rubi [A] (verified) | 148 |
| Mathematica [A] (verified) | 151 |
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| Maxima [A] (verification not implemented) | 152 |
| Giac [A] (verification not implemented) | 153 |
| Mupad [B] (verification not implemented) | 153 |

Optimal result

Integrand size = 6, antiderivative size = 71

$$\int \sqrt{\tan(x)} dx = -\frac{\arctan\left(1 - \sqrt{2}\sqrt{\tan(x)}\right)}{\sqrt{2}} + \frac{\arctan\left(1 + \sqrt{2}\sqrt{\tan(x)}\right)}{\sqrt{2}} - \frac{\operatorname{arctanh}\left(\frac{\sqrt{2}\sqrt{\tan(x)}}{1+\tan(x)}\right)}{\sqrt{2}}$$

[Out] 1/2*arctan(-1+2^(1/2)*tan(x)^(1/2))*2^(1/2)+1/2*arctan(1+2^(1/2)*tan(x)^(1/2))*2^(1/2)-1/2*arctanh(2^(1/2)*tan(x)^(1/2)/(1+tan(x)))*2^(1/2)

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 98, normalized size of antiderivative = 1.38, number of steps used = 11, number of rules used = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 1.333$, Rules used = {3557, 335, 303, 1176, 631, 210, 1179, 642}

$$\int \sqrt{\tan(x)} dx = -\frac{\arctan\left(1 - \sqrt{2}\sqrt{\tan(x)}\right)}{\sqrt{2}} + \frac{\arctan\left(\sqrt{2}\sqrt{\tan(x)} + 1\right)}{\sqrt{2}} + \frac{\log\left(\tan(x) - \sqrt{2}\sqrt{\tan(x)} + 1\right)}{2\sqrt{2}} - \frac{\log\left(\tan(x) + \sqrt{2}\sqrt{\tan(x)} + 1\right)}{2\sqrt{2}}$$

[In] Int[Sqrt[Tan[x]],x]

[Out] -(ArcTan[1 - Sqrt[2]*Sqrt[Tan[x]]]/Sqrt[2]) + ArcTan[1 + Sqrt[2]*Sqrt[Tan[x]]]/Sqrt[2] + Log[1 - Sqrt[2]*Sqrt[Tan[x]] + Tan[x]]/(2*Sqrt[2]) - Log[1 + Sqrt[2]*Sqrt[Tan[x]] + Tan[x]]/(2*Sqrt[2])

Rule 210

Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] := Simp[(-Rt[-a, 2]*Rt[-b, 2])^(-1)*ArcTan[Rt[-b, 2]*(x/Rt[-a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (LtQ[a, 0] || LtQ[b, 0])

Rule 303

Int[(x_)^2/((a_) + (b_)*(x_)^4), x_Symbol] := With[{r = Numerator[Rt[a/b, 2]], s = Denominator[Rt[a/b, 2]]}, Dist[1/(2*s), Int[(r + s*x^2)/(a + b*x^4), x], x] - Dist[1/(2*s), Int[(r - s*x^2)/(a + b*x^4), x], x]] /; FreeQ[{a, b}, x] && (GtQ[a/b, 0] || (PosQ[a/b] && AtomQ[SplitProduct[SumBaseQ, a]] && AtomQ[SplitProduct[SumBaseQ, b]]))

Rule 335

Int[((c_)*(x_)^(m_))*((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] := With[{k = Denominator[m]}, Dist[k/c, Subst[Int[x^(k*(m + 1) - 1)*(a + b*(x^(k*n))/c^n)]^p, x], x, (c*x)^(1/k)], x]] /; FreeQ[{a, b, c, p}, x] && IGtQ[n, 0] && FractionQ[m] && IntBinomialQ[a, b, c, n, m, p, x]

Rule 631

Int[((a_) + (b_)*(x_) + (c_)*(x_)^2)^(-1), x_Symbol] := With[{q = 1 - 4*Simplify[a*(c/b^2)]}, Dist[-2/b, Subst[Int[1/(q - x^2), x], x, 1 + 2*c*(x/b)], x] /; RationalQ[q] && (EqQ[q^2, 1] || !RationalQ[b^2 - 4*a*c])] /; FreeQ[{a, b, c}, x] && NeQ[b^2 - 4*a*c, 0]

Rule 642

Int[((d_) + (e_)*(x_))/((a_) + (b_)*(x_) + (c_)*(x_)^2), x_Symbol] := Simp[d*(Log[RemoveContent[a + b*x + c*x^2, x]]/b), x] /; FreeQ[{a, b, c, d, e}, x] && EqQ[2*c*d - b*e, 0]

Rule 1176

Int[((d_) + (e_)*(x_)^2)/((a_) + (c_)*(x_)^4), x_Symbol] := With[{q = Rt[2*(d/e), 2]}, Dist[e/(2*c), Int[1/Simp[d/e + q*x + x^2, x], x], x] + Dist[e/(2*c), Int[1/Simp[d/e - q*x + x^2, x], x], x]] /; FreeQ[{a, c, d, e}, x] && EqQ[c*d^2 - a*e^2, 0] && PosQ[d*e]

Rule 1179

Int[((d_) + (e_)*(x_)^2)/((a_) + (c_)*(x_)^4), x_Symbol] := With[{q = Rt[-2*(d/e), 2]}, Dist[e/(2*c*q), Int[(q - 2*x)/Simp[d/e + q*x - x^2, x], x], x] + Dist[e/(2*c*q), Int[(q + 2*x)/Simp[d/e - q*x - x^2, x], x], x]] /; Fre

$eQ[\{a, c, d, e\}, x] \ \&\& \ EqQ[c*d^2 - a*e^2, 0] \ \&\& \ NegQ[d*e]$

Rule 3557

$\text{Int}[(b_.)*\tan[(c_.) + (d_.)*(x_)]^{(n_)}, x_Symbol] \ :> \text{Dist}[b/d, \text{Subst}[\text{Int}[x^n/(b^2 + x^2), x], x, b*\text{Tan}[c + d*x]], x] \ /; \text{FreeQ}[\{b, c, d, n\}, x] \ \&\& \ ! \ \text{IntegerQ}[n]$

Rubi steps

$$\begin{aligned}
 \text{integral} &= \text{Subst}\left(\int \frac{\sqrt{x}}{1+x^2} dx, x, \tan(x)\right) \\
 &= 2\text{Subst}\left(\int \frac{x^2}{1+x^4} dx, x, \sqrt{\tan(x)}\right) \\
 &= -\text{Subst}\left(\int \frac{1-x^2}{1+x^4} dx, x, \sqrt{\tan(x)}\right) + \text{Subst}\left(\int \frac{1+x^2}{1+x^4} dx, x, \sqrt{\tan(x)}\right) \\
 &= \frac{1}{2}\text{Subst}\left(\int \frac{1}{1-\sqrt{2}x+x^2} dx, x, \sqrt{\tan(x)}\right) + \frac{1}{2}\text{Subst}\left(\int \frac{1}{1+\sqrt{2}x+x^2} dx, x, \sqrt{\tan(x)}\right) \\
 &\quad + \frac{\text{Subst}\left(\int \frac{\sqrt{2}+2x}{-1-\sqrt{2}x-x^2} dx, x, \sqrt{\tan(x)}\right)}{2\sqrt{2}} + \frac{\text{Subst}\left(\int \frac{\sqrt{2}-2x}{-1+\sqrt{2}x-x^2} dx, x, \sqrt{\tan(x)}\right)}{2\sqrt{2}} \\
 &= \frac{\log\left(1-\sqrt{2}\sqrt{\tan(x)}+\tan(x)\right)}{2\sqrt{2}} - \frac{\log\left(1+\sqrt{2}\sqrt{\tan(x)}+\tan(x)\right)}{2\sqrt{2}} \\
 &\quad + \frac{\text{Subst}\left(\int \frac{1}{-1-x^2} dx, x, 1-\sqrt{2}\sqrt{\tan(x)}\right)}{\sqrt{2}} \\
 &\quad - \frac{\text{Subst}\left(\int \frac{1}{-1-x^2} dx, x, 1+\sqrt{2}\sqrt{\tan(x)}\right)}{\sqrt{2}} \\
 &= -\frac{\arctan\left(1-\sqrt{2}\sqrt{\tan(x)}\right)}{\sqrt{2}} + \frac{\arctan\left(1+\sqrt{2}\sqrt{\tan(x)}\right)}{\sqrt{2}} \\
 &\quad + \frac{\log\left(1-\sqrt{2}\sqrt{\tan(x)}+\tan(x)\right)}{2\sqrt{2}} - \frac{\log\left(1+\sqrt{2}\sqrt{\tan(x)}+\tan(x)\right)}{2\sqrt{2}}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 40, normalized size of antiderivative = 0.56

$$\int \sqrt{\tan(x)} dx = \frac{\left(\arctan\left(\sqrt[4]{-\tan^2(x)}\right) - \operatorname{arctanh}\left(\sqrt[4]{-\tan^2(x)}\right) \right) \sqrt[4]{-\tan(x)}}{\sqrt[4]{\tan(x)}}$$

`[In] Integrate[Sqrt[Tan[x]],x]``[Out] ((ArcTan[(-Tan[x]^2)^(1/4)] - ArcTanh[(-Tan[x]^2)^(1/4)])*(-Tan[x])^(1/4))/Tan[x]^(1/4)`**Maple [A] (verified)**

Time = 0.12 (sec) , antiderivative size = 49, normalized size of antiderivative = 0.69

| method | result | size |
|-------------------|--|------|
| lookup | $\frac{\sqrt{\tan(x)} \cos(x) \sqrt{2} \arccos(\cos(x) - \sin(x))}{2\sqrt{\cos(x) \sin(x)}} - \frac{\sqrt{2} \ln(\cos(x) + \sqrt{2} \sqrt{\tan(x)} \cos(x) + \sin(x))}{2}$ | 49 |
| default | $\frac{\sqrt{\tan(x)} \cos(x) \sqrt{2} \arccos(\cos(x) - \sin(x))}{2\sqrt{\cos(x) \sin(x)}} - \frac{\sqrt{2} \ln(\cos(x) + \sqrt{2} \sqrt{\tan(x)} \cos(x) + \sin(x))}{2}$ | 49 |
| derivativedivides | $\frac{\sqrt{2} \left(\ln\left(\frac{\tan(x) - \sqrt{2} \sqrt{\tan(x)} + 1}{\tan(x) + \sqrt{2} \sqrt{\tan(x)} + 1}\right) + 2 \arctan(1 + \sqrt{2} \sqrt{\tan(x)}) + 2 \arctan(-1 + \sqrt{2} \sqrt{\tan(x)}) \right)}{4}$ | 62 |

`[In] int(tan(x)^(1/2),x,method=_RETURNVERBOSE)``[Out] 1/2*tan(x)^(1/2)/(cos(x)*sin(x))^(1/2)*cos(x)*2^(1/2)*arccos(cos(x)-sin(x)) - 1/2*2^(1/2)*ln(cos(x)+2^(1/2)*tan(x)^(1/2)*cos(x)+sin(x))`**Fricas [C] (verification not implemented)**

Result contains complex when optimal does not.

Time = 0.27 (sec) , antiderivative size = 73, normalized size of antiderivative = 1.03

$$\begin{aligned} \int \sqrt{\tan(x)} dx = & \left(\frac{1}{4}i - \frac{1}{4}\right) \sqrt{2} \log\left((i+1) \sqrt{2} + 2 \sqrt{\tan(x)}\right) \\ & - \left(\frac{1}{4}i + \frac{1}{4}\right) \sqrt{2} \log\left(-(i-1) \sqrt{2} + 2 \sqrt{\tan(x)}\right) \\ & + \left(\frac{1}{4}i + \frac{1}{4}\right) \sqrt{2} \log\left((i-1) \sqrt{2} + 2 \sqrt{\tan(x)}\right) \\ & - \left(\frac{1}{4}i - \frac{1}{4}\right) \sqrt{2} \log\left(-(i+1) \sqrt{2} + 2 \sqrt{\tan(x)}\right) \end{aligned}$$

```
[In] integrate(tan(x)^(1/2),x, algorithm="fricas")
```

```
[Out] (1/4*I - 1/4)*sqrt(2)*log((I + 1)*sqrt(2) + 2*sqrt(tan(x))) - (1/4*I + 1/4)
*sqrt(2)*log(-(I - 1)*sqrt(2) + 2*sqrt(tan(x))) + (1/4*I + 1/4)*sqrt(2)*log
((I - 1)*sqrt(2) + 2*sqrt(tan(x))) - (1/4*I - 1/4)*sqrt(2)*log(-(I + 1)*sq
r(2) + 2*sqrt(tan(x)))
```

Sympy [F]

$$\int \sqrt{\tan(x)} dx = \int \sqrt{\tan(x)} dx$$

```
[In] integrate(tan(x)**(1/2),x)
```

```
[Out] Integral(sqrt(tan(x)), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 80, normalized size of antiderivative = 1.13

$$\begin{aligned} \int \sqrt{\tan(x)} dx = & \frac{1}{2} \sqrt{2} \arctan \left(\frac{1}{2} \sqrt{2} (\sqrt{2} + 2 \sqrt{\tan(x)}) \right) \\ & + \frac{1}{2} \sqrt{2} \arctan \left(-\frac{1}{2} \sqrt{2} (\sqrt{2} - 2 \sqrt{\tan(x)}) \right) \\ & - \frac{1}{4} \sqrt{2} \log \left(\sqrt{2} \sqrt{\tan(x)} + \tan(x) + 1 \right) \\ & + \frac{1}{4} \sqrt{2} \log \left(-\sqrt{2} \sqrt{\tan(x)} + \tan(x) + 1 \right) \end{aligned}$$

```
[In] integrate(tan(x)^(1/2),x, algorithm="maxima")
```

```
[Out] 1/2*sqrt(2)*arctan(1/2*sqrt(2)*(sqrt(2) + 2*sqrt(tan(x)))) + 1/2*sqrt(2)*ar
ctan(-1/2*sqrt(2)*(sqrt(2) - 2*sqrt(tan(x)))) - 1/4*sqrt(2)*log(sqrt(2)*sq
r(2)*sqrt(tan(x)) + tan(x) + 1) + 1/4*sqrt(2)*log(-sqrt(2)*sqrt(tan(x)) + tan(x) +
1)
```

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 80, normalized size of antiderivative = 1.13

$$\int \sqrt{\tan(x)} dx = \frac{1}{2} \sqrt{2} \arctan \left(\frac{1}{2} \sqrt{2} (\sqrt{2} + 2 \sqrt{\tan(x)}) \right) + \frac{1}{2} \sqrt{2} \arctan \left(-\frac{1}{2} \sqrt{2} (\sqrt{2} - 2 \sqrt{\tan(x)}) \right) - \frac{1}{4} \sqrt{2} \log \left(\sqrt{2} \sqrt{\tan(x)} + \tan(x) + 1 \right) + \frac{1}{4} \sqrt{2} \log \left(-\sqrt{2} \sqrt{\tan(x)} + \tan(x) + 1 \right)$$

`[In] integrate(tan(x)^(1/2),x, algorithm="giac")`

```
[Out] 1/2*sqrt(2)*arctan(1/2*sqrt(2)*(sqrt(2) + 2*sqrt(tan(x)))) + 1/2*sqrt(2)*arctan(-1/2*sqrt(2)*(sqrt(2) - 2*sqrt(tan(x)))) - 1/4*sqrt(2)*log(sqrt(2)*sqrt(tan(x)) + tan(x) + 1) + 1/4*sqrt(2)*log(-sqrt(2)*sqrt(tan(x)) + tan(x) + 1)
```

Mupad [B] (verification not implemented)

Time = 0.15 (sec) , antiderivative size = 65, normalized size of antiderivative = 0.92

$$\int \sqrt{\tan(x)} dx = \frac{\sqrt{2} \left(\ln \left(\sqrt{2} \sqrt{\tan(x)} - \tan(x) - 1 \right) - \ln \left(\tan(x) + \sqrt{2} \sqrt{\tan(x)} + 1 \right) \right)}{4} + \frac{\sqrt{2} \left(\operatorname{atan} \left(\sqrt{2} \sqrt{\tan(x)} - 1 \right) + \operatorname{atan} \left(\sqrt{2} \sqrt{\tan(x)} + 1 \right) \right)}{2}$$

`[In] int(tan(x)^(1/2),x)`

```
[Out] (2^(1/2)*(log(2^(1/2)*tan(x)^(1/2) - tan(x) - 1) - log(tan(x) + 2^(1/2)*tan(x)^(1/2) + 1)))/4 + (2^(1/2)*(atan(2^(1/2)*tan(x)^(1/2) - 1) + atan(2^(1/2)*tan(x)^(1/2) + 1)))/2
```

3.11 $\int \frac{\log(1+x)}{1+x^2} dx$

| | |
|---|-----|
| Optimal result | 154 |
| Rubi [A] (verified) | 154 |
| Mathematica [A] (verified) | 156 |
| Maple [A] (verified) | 156 |
| Fricas [F] | 157 |
| Sympy [F] | 157 |
| Maxima [A] (verification not implemented) | 157 |
| Giac [F] | 158 |
| Mupad [F(-1)] | 158 |

Optimal result

Integrand size = 12, antiderivative size = 89

$$\int \frac{\log(1+x)}{1+x^2} dx = -\frac{1}{2}i \log\left(\left(\frac{1}{2} - \frac{i}{2}\right)(i-x)\right) \log(1+x) \\ + \frac{1}{2}i \log\left(\left(-\frac{1}{2} - \frac{i}{2}\right)(i+x)\right) \log(1+x) \\ - \frac{1}{2}i \operatorname{PolyLog}\left(2, \left(\frac{1}{2} - \frac{i}{2}\right)(1+x)\right) + \frac{1}{2}i \operatorname{PolyLog}\left(2, \left(\frac{1}{2} + \frac{i}{2}\right)(1+x)\right)$$

[Out] $-1/2*I*\ln\left(\left(\frac{1}{2}-1/2*I\right)*(I-x)\right)*\ln(1+x)+1/2*I*\ln\left(\left(-1/2-1/2*I\right)*(I+x)\right)*\ln(1+x)-1/2*I*\operatorname{polylog}\left(2,\left(\frac{1}{2}-1/2*I\right)*(1+x)\right)+1/2*I*\operatorname{polylog}\left(2,\left(\frac{1}{2}+1/2*I\right)*(1+x)\right)$

Rubi [A] (verified)

Time = 0.09 (sec), antiderivative size = 89, normalized size of antiderivative = 1.00, number of steps used = 8, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {2456, 2441, 2440, 2438}

$$\int \frac{\log(1+x)}{1+x^2} dx = -\frac{1}{2}i \operatorname{PolyLog}\left(2, \left(\frac{1}{2} - \frac{i}{2}\right)(x+1)\right) + \frac{1}{2}i \operatorname{PolyLog}\left(2, \left(\frac{1}{2} + \frac{i}{2}\right)(x+1)\right) \\ - \frac{1}{2}i \log\left(\left(\frac{1}{2} - \frac{i}{2}\right)(-x+i)\right) \log(x+1) \\ + \frac{1}{2}i \log\left(\left(-\frac{1}{2} - \frac{i}{2}\right)(x+i)\right) \log(x+1)$$

[In] $\operatorname{Int}[\operatorname{Log}[1+x]/(1+x^2),x]$

[Out] $(-1/2*I)*\text{Log}[(1/2 - I/2)*(I - x)]*\text{Log}[1 + x] + (I/2)*\text{Log}[(-1/2 - I/2)*(I + x)]*\text{Log}[1 + x] - (I/2)*\text{PolyLog}[2, (1/2 - I/2)*(1 + x)] + (I/2)*\text{PolyLog}[2, (1/2 + I/2)*(1 + x)]$

Rule 2438

$\text{Int}[\text{Log}[(c_)*((d_)+(e_)*(x_)^{(n_)})]/(x_), x_Symbol] \rightarrow \text{Simp}[-\text{PolyLog}[2, (-c)*e*x^n/n, x] /; \text{FreeQ}\{c, d, e, n\}, x] \&\& \text{EqQ}[c*d, 1]$

Rule 2440

$\text{Int}[(a_)+\text{Log}[(c_)*((d_)+(e_)*(x_))]*(b_)]/((f_)+(g_)*(x_)), x_Symbol] \rightarrow \text{Dist}[1/g, \text{Subst}[\text{Int}[(a + b*\text{Log}[1 + c*e*(x/g)])/x, x], x, f + g*x], x] /; \text{FreeQ}\{a, b, c, d, e, f, g\}, x] \&\& \text{NeQ}[e*f - d*g, 0] \&\& \text{EqQ}[g + c*(e*f - d*g), 0]$

Rule 2441

$\text{Int}[(a_)+\text{Log}[(c_)*((d_)+(e_)*(x_))^{(n_)}]*(b_)]/((f_)+(g_)*(x_)), x_Symbol] \rightarrow \text{Simp}[\text{Log}[e*((f + g*x)/(e*f - d*g))]*(a + b*\text{Log}[c*(d + e*x)^n])/g, x] - \text{Dist}[b*e*(n/g), \text{Int}[\text{Log}[(e*(f + g*x))/(e*f - d*g)]/(d + e*x), x], x] /; \text{FreeQ}\{a, b, c, d, e, f, g, n\}, x] \&\& \text{NeQ}[e*f - d*g, 0]$

Rule 2456

$\text{Int}[(a_)+\text{Log}[(c_)*((d_)+(e_)*(x_))^{(n_)}]*(b_)]^{(p_)*((f_)+(g_)*(x_))^{(r_)}]^{(q_)}, x_Symbol] \rightarrow \text{Int}[\text{ExpandIntegrand}[(a + b*\text{Log}[c*(d + e*x)^n])^p, (f + g*x^r)^q, x], x] /; \text{FreeQ}\{a, b, c, d, e, f, g, n, r\}, x] \&\& \text{IntegerQ}[q] \&\& \text{IntegerQ}[r] \&\& \text{NeQ}[r, 1] \&\& \text{GtQ}[p, 0] \&\& \text{GtQ}[q, 0] \&\& \text{GtQ}[q, 0] \&\& (\text{IntegerQ}[r] \&\& \text{NeQ}[r, 1])$

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(\frac{i \log(1+x)}{2(i-x)} + \frac{i \log(1+x)}{2(i+x)} \right) dx \\ &= \frac{1}{2}i \int \frac{\log(1+x)}{i-x} dx + \frac{1}{2}i \int \frac{\log(1+x)}{i+x} dx \\ &= -\frac{1}{2}i \log \left(\left(\frac{1}{2} - \frac{i}{2} \right) (i-x) \right) \log(1+x) + \frac{1}{2}i \log \left(\left(-\frac{1}{2} - \frac{i}{2} \right) (i+x) \right) \log(1+x) \\ &\quad + \frac{1}{2}i \int \frac{\log \left(\left(\frac{1}{2} - \frac{i}{2} \right) (i-x) \right)}{1+x} dx - \frac{1}{2}i \int \frac{\log \left(\left(-\frac{1}{2} - \frac{i}{2} \right) (i+x) \right)}{1+x} dx \end{aligned}$$

$$\begin{aligned}
&= -\frac{1}{2}i \log\left(\left(\frac{1}{2} - \frac{i}{2}\right)(i-x)\right) \log(1+x) + \frac{1}{2}i \log\left(\left(-\frac{1}{2} - \frac{i}{2}\right)(i+x)\right) \log(1+x) \\
&\quad - \frac{1}{2}i \text{Subst}\left(\int \frac{\log\left(1 - \left(\frac{1}{2} + \frac{i}{2}\right)x\right)}{x} dx, x, 1+x\right) \\
&\quad + \frac{1}{2}i \text{Subst}\left(\int \frac{\log\left(1 - \left(\frac{1}{2} - \frac{i}{2}\right)x\right)}{x} dx, x, 1+x\right) \\
&= -\frac{1}{2}i \log\left(\left(\frac{1}{2} - \frac{i}{2}\right)(i-x)\right) \log(1+x) + \frac{1}{2}i \log\left(\left(-\frac{1}{2} - \frac{i}{2}\right)(i+x)\right) \log(1+x) \\
&\quad - \frac{1}{2}i \text{PolyLog}\left(2, \left(\frac{1}{2} - \frac{i}{2}\right)(1+x)\right) + \frac{1}{2}i \text{PolyLog}\left(2, \left(\frac{1}{2} + \frac{i}{2}\right)(1+x)\right)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 89, normalized size of antiderivative = 1.00

$$\begin{aligned}
\int \frac{\log(1+x)}{1+x^2} dx &= -\frac{1}{2}i \log\left(\left(\frac{1}{2} - \frac{i}{2}\right)(i-x)\right) \log(1+x) \\
&\quad + \frac{1}{2}i \log\left(\left(-\frac{1}{2} - \frac{i}{2}\right)(i+x)\right) \log(1+x) \\
&\quad - \frac{1}{2}i \text{PolyLog}\left(2, \left(\frac{1}{2} - \frac{i}{2}\right)(1+x)\right) + \frac{1}{2}i \text{PolyLog}\left(2, \left(\frac{1}{2} + \frac{i}{2}\right)(1+x)\right)
\end{aligned}$$

[In] Integrate[Log[1 + x]/(1 + x^2), x]

[Out] (-1/2*I)*Log[(1/2 - I/2)*(I - x)]*Log[1 + x] + (I/2)*Log[(-1/2 - I/2)*(I + x)]*Log[1 + x] - (I/2)*PolyLog[2, (1/2 - I/2)*(1 + x)] + (I/2)*PolyLog[2, (1/2 + I/2)*(1 + x)]

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 70, normalized size of antiderivative = 0.79

| method | result |
|-------------------|--|
| derivativedivides | $-\frac{i \ln(1+x) \ln\left(\frac{1}{2} - \frac{x}{2} + \frac{i(1+x)}{2}\right)}{2} + \frac{i \ln(1+x) \ln\left(\frac{1}{2} - \frac{x}{2} - \frac{i(1+x)}{2}\right)}{2} - \frac{i \operatorname{dilog}\left(\frac{1}{2} - \frac{x}{2} + \frac{i(1+x)}{2}\right)}{2} + \frac{i \operatorname{dilog}\left(\frac{1}{2} - \frac{x}{2} - \frac{i(1+x)}{2}\right)}{2}$ |
| default | $-\frac{i \ln(1+x) \ln\left(\frac{1}{2} - \frac{x}{2} + \frac{i(1+x)}{2}\right)}{2} + \frac{i \ln(1+x) \ln\left(\frac{1}{2} - \frac{x}{2} - \frac{i(1+x)}{2}\right)}{2} - \frac{i \operatorname{dilog}\left(\frac{1}{2} - \frac{x}{2} + \frac{i(1+x)}{2}\right)}{2} + \frac{i \operatorname{dilog}\left(\frac{1}{2} - \frac{x}{2} - \frac{i(1+x)}{2}\right)}{2}$ |
| risch | $-\frac{i \ln(1+x) \ln\left(\frac{1}{2} - \frac{x}{2} + \frac{i(1+x)}{2}\right)}{2} + \frac{i \ln(1+x) \ln\left(\frac{1}{2} - \frac{x}{2} - \frac{i(1+x)}{2}\right)}{2} - \frac{i \operatorname{dilog}\left(\frac{1}{2} - \frac{x}{2} + \frac{i(1+x)}{2}\right)}{2} + \frac{i \operatorname{dilog}\left(\frac{1}{2} - \frac{x}{2} - \frac{i(1+x)}{2}\right)}{2}$ |
| parts | $-\frac{i \ln(1+x) \ln\left(\frac{1}{2} - \frac{x}{2} + \frac{i(1+x)}{2}\right)}{2} + \frac{i \ln(1+x) \ln\left(\frac{1}{2} - \frac{x}{2} - \frac{i(1+x)}{2}\right)}{2} - \frac{i \operatorname{dilog}\left(\frac{1}{2} - \frac{x}{2} + \frac{i(1+x)}{2}\right)}{2} + \frac{i \operatorname{dilog}\left(\frac{1}{2} - \frac{x}{2} - \frac{i(1+x)}{2}\right)}{2}$ |

[In] `int(ln(1+x)/(x^2+1),x,method=_RETURNVERBOSE)`

[Out] `-1/2*I*ln(1+x)*ln(1/2-1/2*x+1/2*I*(1+x))+1/2*I*ln(1+x)*ln(1/2-1/2*x-1/2*I*(1+x))-1/2*I*dilog(1/2-1/2*x+1/2*I*(1+x))+1/2*I*dilog(1/2-1/2*x-1/2*I*(1+x))`

Fricas [F]

$$\int \frac{\log(1+x)}{1+x^2} dx = \int \frac{\log(x+1)}{x^2+1} dx$$

[In] `integrate(log(1+x)/(x^2+1),x, algorithm="fricas")`

[Out] `integral(log(x + 1)/(x^2 + 1), x)`

Sympy [F]

$$\int \frac{\log(1+x)}{1+x^2} dx = \int \frac{\log(x+1)}{x^2+1} dx$$

[In] `integrate(ln(1+x)/(x**2+1),x)`

[Out] `Integral(log(x + 1)/(x**2 + 1), x)`

Maxima [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 56, normalized size of antiderivative = 0.63

$$\begin{aligned} \int \frac{\log(1+x)}{1+x^2} dx &= \frac{1}{2} \arctan\left(\frac{1}{2}x + \frac{1}{2}, \frac{1}{2}x + \frac{1}{2}\right) \log(x^2+1) \\ &\quad - \frac{1}{2} \arctan(x) \log\left(\frac{1}{2}x^2 + x + \frac{1}{2}\right) + \arctan(x) \log(x+1) \\ &\quad + \frac{1}{2}i \operatorname{Li}_2\left(\left(\frac{1}{2}i - \frac{1}{2}\right)x + \frac{1}{2}i + \frac{1}{2}\right) - \frac{1}{2}i \operatorname{Li}_2\left(-\left(\frac{1}{2}i + \frac{1}{2}\right)x - \frac{1}{2}i + \frac{1}{2}\right) \end{aligned}$$

[In] `integrate(log(1+x)/(x^2+1),x, algorithm="maxima")`

[Out] `1/2*arctan2(1/2*x + 1/2, 1/2*x + 1/2)*log(x^2 + 1) - 1/2*arctan(x)*log(1/2*x^2 + x + 1/2) + arctan(x)*log(x + 1) + 1/2*I*dilog((1/2*I - 1/2)*x + 1/2*I + 1/2) - 1/2*I*dilog(-(1/2*I + 1/2)*x - 1/2*I + 1/2)`

Giac [F]

$$\int \frac{\log(1+x)}{1+x^2} dx = \int \frac{\log(x+1)}{x^2+1} dx$$

[In] integrate(log(1+x)/(x^2+1),x, algorithm="giac")

[Out] integrate(log(x + 1)/(x^2 + 1), x)

Mupad [F(-1)]

Timed out.

$$\int \frac{\log(1+x)}{1+x^2} dx = \int \frac{\ln(x+1)}{x^2+1} dx$$

[In] int(log(x + 1)/(x^2 + 1),x)

[Out] int(log(x + 1)/(x^2 + 1), x)

$$3.12 \quad \int \frac{\sqrt{x}}{-\sqrt[3]{x} + \sqrt{x}} dx$$

| | |
|---|-----|
| Optimal result | 159 |
| Rubi [A] (verified) | 159 |
| Mathematica [A] (verified) | 160 |
| Maple [A] (verified) | 160 |
| Fricas [A] (verification not implemented) | 161 |
| Sympy [F] | 161 |
| Maxima [A] (verification not implemented) | 161 |
| Giac [A] (verification not implemented) | 162 |
| Mupad [B] (verification not implemented) | 162 |

Optimal result

Integrand size = 21, antiderivative size = 53

$$\int \frac{\sqrt{x}}{-\sqrt[3]{x} + \sqrt{x}} dx = 6\sqrt[6]{x} + 3\sqrt[3]{x} + 2\sqrt{x} + \frac{3x^{2/3}}{2} + \frac{6x^{5/6}}{5} + x + 6 \log(1 - \sqrt[6]{x})$$

[Out] 6*x^(1/6)+3*x^(1/3)+2*x^(1/2)+3/2*x^(2/3)+6/5*x^(5/6)+x+6*ln(1-x^(1/6))

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 53, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.143$, Rules used = {1598, 272, 45}

$$\int \frac{\sqrt{x}}{-\sqrt[3]{x} + \sqrt{x}} dx = \frac{6x^{5/6}}{5} + \frac{3x^{2/3}}{2} + x + 2\sqrt{x} + 3\sqrt[3]{x} + 6\sqrt[6]{x} + 6 \log(1 - \sqrt[6]{x})$$

[In] Int[Sqrt[x]/(-x^(1/3) + Sqrt[x]),x]

[Out] 6*x^(1/6) + 3*x^(1/3) + 2*Sqrt[x] + (3*x^(2/3))/2 + (6*x^(5/6))/5 + x + 6*Log[1 - x^(1/6)]

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rule 272

```
Int[(x_)^(m_)*((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[
Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b
, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]
```

Rule 1598

```
Int[(u_)*(x_)^(m_)*((a_)*(x_)^(p_) + (b_)*(x_)^(q_))^(n_), x_Symbol]
:= Int[u*x^(m + n*p)*(a + b*x^(q - p))^n, x] /; FreeQ[{a, b, m, p, q}, x]
&& IntegerQ[n] && PosQ[q - p]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \frac{\sqrt[6]{x}}{-1 + \sqrt[6]{x}} dx \\
&= 6\text{Subst}\left(\int \frac{x^6}{-1 + x} dx, x, \sqrt[6]{x}\right) \\
&= 6\text{Subst}\left(\int \left(1 + \frac{1}{-1 + x} + x + x^2 + x^3 + x^4 + x^5\right) dx, x, \sqrt[6]{x}\right) \\
&= 6\sqrt[6]{x} + 3\sqrt[3]{x} + 2\sqrt{x} + \frac{3x^{2/3}}{2} + \frac{6x^{5/6}}{5} + x + 6 \log(1 - \sqrt[6]{x})
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 51, normalized size of antiderivative = 0.96

$$\int \frac{\sqrt{x}}{-\sqrt[3]{x} + \sqrt{x}} dx = 6\sqrt[6]{x} + 3\sqrt[3]{x} + 2\sqrt{x} + \frac{3x^{2/3}}{2} + \frac{6x^{5/6}}{5} + x + 6 \log(-1 + \sqrt[6]{x})$$

```
[In] Integrate[Sqrt[x]/(-x^(1/3) + Sqrt[x]),x]
```

```
[Out] 6*x^(1/6) + 3*x^(1/3) + 2*Sqrt[x] + (3*x^(2/3))/2 + (6*x^(5/6))/5 + x + 6*L
og[-1 + x^(1/6)]
```

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 36, normalized size of antiderivative = 0.68

| method | result | size |
|-------------------|--|------|
| derivativedivides | $x + \frac{6x^{\frac{5}{6}}}{5} + \frac{3x^{\frac{2}{3}}}{2} + 2\sqrt{x} + 3x^{\frac{1}{3}} + 6x^{\frac{1}{6}} + 6 \ln(x^{\frac{1}{6}} - 1)$ | 36 |
| default | $x + \frac{6x^{\frac{5}{6}}}{5} + \frac{3x^{\frac{2}{3}}}{2} + 2\sqrt{x} + 3x^{\frac{1}{3}} + 6x^{\frac{1}{6}} + 6 \ln(x^{\frac{1}{6}} - 1)$ | 36 |
| meijerg | $\frac{x^{\frac{1}{6}}(70x^{\frac{5}{6}} + 84x^{\frac{2}{3}} + 105\sqrt{x} + 140x^{\frac{1}{3}} + 210x^{\frac{1}{6}} + 420)}{70} + 6 \ln(1 - x^{\frac{1}{6}})$ | 44 |

[In] `int(x^(1/2)/(x^(1/2)-x^(1/3)),x,method=_RETURNVERBOSE)`

[Out] `x+6/5*x^(5/6)+3/2*x^(2/3)+2*sqrt(x)+3*x^(1/3)+6*x^(1/6)+6*ln(x^(1/6)-1)`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 35, normalized size of antiderivative = 0.66

$$\int \frac{\sqrt{x}}{-\sqrt[3]{x} + \sqrt{x}} dx = x + \frac{6}{5}x^{\frac{5}{6}} + \frac{3}{2}x^{\frac{2}{3}} + 2\sqrt{x} + 3x^{\frac{1}{3}} + 6x^{\frac{1}{6}} + 6 \log(x^{\frac{1}{6}} - 1)$$

[In] `integrate(x^(1/2)/(x^(1/2)-x^(1/3)),x, algorithm="fricas")`

[Out] `x + 6/5*x^(5/6) + 3/2*x^(2/3) + 2*sqrt(x) + 3*x^(1/3) + 6*x^(1/6) + 6*log(x^(1/6) - 1)`

Sympy [F]

$$\int \frac{\sqrt{x}}{-\sqrt[3]{x} + \sqrt{x}} dx = \int \frac{\sqrt{x}}{-\sqrt[3]{x} + \sqrt{x}} dx$$

[In] `integrate(x**(1/2)/(x**(1/2)-x**(1/3)),x)`

[Out] `Integral(sqrt(x)/(-x**(1/3) + sqrt(x)), x)`

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 35, normalized size of antiderivative = 0.66

$$\int \frac{\sqrt{x}}{-\sqrt[3]{x} + \sqrt{x}} dx = x + \frac{6}{5}x^{\frac{5}{6}} + \frac{3}{2}x^{\frac{2}{3}} + 2\sqrt{x} + 3x^{\frac{1}{3}} + 6x^{\frac{1}{6}} + 6 \log(x^{\frac{1}{6}} - 1)$$

[In] `integrate(x^(1/2)/(x^(1/2)-x^(1/3)),x, algorithm="maxima")`

[Out] `x + 6/5*x^(5/6) + 3/2*x^(2/3) + 2*sqrt(x) + 3*x^(1/3) + 6*x^(1/6) + 6*log(x^(1/6) - 1)`

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 36, normalized size of antiderivative = 0.68

$$\int \frac{\sqrt{x}}{-\sqrt[3]{x} + \sqrt{x}} dx = x + \frac{6}{5} x^{\frac{5}{6}} + \frac{3}{2} x^{\frac{2}{3}} + 2\sqrt{x} + 3x^{\frac{1}{3}} + 6x^{\frac{1}{6}} + 6 \log\left(\left|x^{\frac{1}{6}} - 1\right|\right)$$

[In] integrate(x^(1/2)/(x^(1/2)-x^(1/3)),x, algorithm="giac")

[Out] x + 6/5*x^(5/6) + 3/2*x^(2/3) + 2*sqrt(x) + 3*x^(1/3) + 6*x^(1/6) + 6*log(abs(x^(1/6) - 1))

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 35, normalized size of antiderivative = 0.66

$$\int \frac{\sqrt{x}}{-\sqrt[3]{x} + \sqrt{x}} dx = x + 6 \ln(x^{1/6} - 1) + 2\sqrt{x} + 3x^{1/3} + \frac{3x^{2/3}}{2} + 6x^{1/6} + \frac{6x^{5/6}}{5}$$

[In] int(x^(1/2)/(x^(1/2) - x^(1/3)),x)

[Out] x + 6*log(x^(1/6) - 1) + 2*x^(1/2) + 3*x^(1/3) + (3*x^(2/3))/2 + 6*x^(1/6) + (6*x^(5/6))/5

3.13 $\int x^x(1 + \log(x)) dx$

| | |
|---|-----|
| Optimal result | 163 |
| Rubi [A] (verified) | 163 |
| Mathematica [A] (verified) | 164 |
| Maple [A] (verified) | 164 |
| Fricas [A] (verification not implemented) | 165 |
| Sympy [A] (verification not implemented) | 165 |
| Maxima [A] (verification not implemented) | 165 |
| Giac [A] (verification not implemented) | 165 |
| Mupad [B] (verification not implemented) | 166 |

Optimal result

Integrand size = 8, antiderivative size = 3

$$\int x^x(1 + \log(x)) dx = x^x$$

[Out] x^x

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {6874, 2633}

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] `Int[x^x*(1 + Log[x]),x]`

[Out] x^x

Rule 2633

```
Int[Log[u]*(u)^((a_.)*(x_)), x_Symbol] := Simp[u^(a*x)/a, x] - Int[SimplifyIntegrand[x*u^(a*x - 1)*D[u, x], x], x] /; FreeQ[a, x] && InverseFunctionFreeQ[u, x]
```

Rule 6874

```
Int[u_, x_Symbol] := With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int (x^x + x^x \log(x)) dx \\
 &= \int x^x dx + \int x^x \log(x) dx \\
 &= x^x
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] Integrate[x^x*(1 + Log[x]),x]

[Out] x^x

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

| method | result | size |
|-------------------|----------------|------|
| derivativedivides | x^x | 4 |
| default | x^x | 4 |
| risch | x^x | 4 |
| parallelrisch | x^x | 4 |
| norman | $e^{x \ln(x)}$ | 6 |

[In] int(x^x*(ln(x)+1),x,method=_RETURNVERBOSE)

[Out] x^x

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] integrate(x^x*(log(x)+1),x, algorithm="fricas")

[Out] x^x

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 2, normalized size of antiderivative = 0.67

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] integrate(x**x*(ln(x)+1),x)

[Out] x**x

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] integrate(x^x*(log(x)+1),x, algorithm="maxima")

[Out] x^x

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] integrate(x^x*(log(x)+1),x, algorithm="giac")

[Out] x^x

Mupad [B] (verification not implemented)

Time = 16.26 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] `int(x^x*(log(x) + 1),x)`

[Out] `x^x`

3.14 $\int x^{13/2} \sqrt{1 + x^{5/2}} dx$

| | |
|---|-----|
| Optimal result | 167 |
| Rubi [A] (verified) | 167 |
| Mathematica [A] (verified) | 168 |
| Maple [A] (verified) | 168 |
| Fricas [A] (verification not implemented) | 169 |
| Sympy [B] (verification not implemented) | 169 |
| Maxima [A] (verification not implemented) | 169 |
| Giac [A] (verification not implemented) | 170 |
| Mupad [B] (verification not implemented) | 170 |

Optimal result

Integrand size = 17, antiderivative size = 29

$$\int x^{13/2} \sqrt{1 + x^{5/2}} dx = \frac{4}{525} (1 + x^{5/2})^{3/2} (8 - 12x^{5/2} + 15x^5)$$

[Out] 4/525*(1+x^(5/2))^(3/2)*(8-12*x^(5/2)+15*x^5)

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 46, normalized size of antiderivative = 1.59, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.118$, Rules used = {272, 45}

$$\int x^{13/2} \sqrt{1 + x^{5/2}} dx = \frac{4}{35} (x^{5/2} + 1)^{7/2} - \frac{8}{25} (x^{5/2} + 1)^{5/2} + \frac{4}{15} (x^{5/2} + 1)^{3/2}$$

[In] Int[x^(13/2)*Sqrt[1 + x^(5/2)],x]

[Out] (4*(1 + x^(5/2))^(3/2))/15 - (8*(1 + x^(5/2))^(5/2))/25 + (4*(1 + x^(5/2))^(7/2))/35

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rule 272

Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b

, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{2}{5} \text{Subst} \left(\int x^2 \sqrt{1+x} dx, x, x^{5/2} \right) \\ &= \frac{2}{5} \text{Subst} \left(\int \left(\sqrt{1+x} - 2(1+x)^{3/2} + (1+x)^{5/2} \right) dx, x, x^{5/2} \right) \\ &= \frac{4}{15} (1+x^{5/2})^{3/2} - \frac{8}{25} (1+x^{5/2})^{5/2} + \frac{4}{35} (1+x^{5/2})^{7/2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.00

$$\int x^{13/2} \sqrt{1+x^{5/2}} dx = \frac{4}{525} (1+x^{5/2})^{3/2} (8-12x^{5/2}+15x^5)$$

[In] Integrate[x^(13/2)*Sqrt[1 + x^(5/2)],x]

[Out] (4*(1 + x^(5/2))^(3/2)*(8 - 12*x^(5/2) + 15*x^5))/525

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.24

| method | result | size |
|---------|---|------|
| meijerg | $-\frac{32\sqrt{\pi}}{105} - \frac{4\sqrt{\pi} \left(1+x^{\frac{5}{2}}\right)^{\frac{3}{2}} \left(8-12x^{\frac{5}{2}}+15x^5\right)}{5\sqrt{\pi} \cdot 105}$ | 36 |

[In] int(x^(13/2)*(1+x^(5/2))^(1/2),x,method=_RETURNVERBOSE)

[Out] -1/5/Pi^(1/2)*(32/105*Pi^(1/2)-4/105*Pi^(1/2)*(1+x^(5/2))^(3/2)*(8-12*x^(5/2)+15*x^5))

Fricas [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.07

$$\int x^{13/2} \sqrt{1+x^{5/2}} dx = \frac{4}{525} (3x^5 + (15x^7 - 4x^2)\sqrt{x} + 8)\sqrt{x^{5/2} + 1}$$

[In] integrate(x^(13/2)*(1+x^(5/2))^(1/2),x, algorithm="fricas")

[Out] 4/525*(3*x^5 + (15*x^7 - 4*x^2)*sqrt(x) + 8)*sqrt(x^(5/2) + 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 66 vs. 2(26) = 52.

Time = 84.09 (sec) , antiderivative size = 66, normalized size of antiderivative = 2.28

$$\int x^{13/2} \sqrt{1+x^{5/2}} dx = \frac{4x^{15/2} \sqrt{x^{5/2} + 1}}{35} - \frac{16x^{5/2} \sqrt{x^{5/2} + 1}}{525} + \frac{4x^5 \sqrt{x^{5/2} + 1}}{175} + \frac{32\sqrt{x^{5/2} + 1}}{525}$$

[In] integrate(x**(13/2)*(1+x**(5/2))**(1/2),x)

[Out] 4*x**(15/2)*sqrt(x**(5/2) + 1)/35 - 16*x**(5/2)*sqrt(x**(5/2) + 1)/525 + 4*x**5*sqrt(x**(5/2) + 1)/175 + 32*sqrt(x**(5/2) + 1)/525

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 28, normalized size of antiderivative = 0.97

$$\int x^{13/2} \sqrt{1+x^{5/2}} dx = \frac{4}{35} (x^{5/2} + 1)^{7/2} - \frac{8}{25} (x^{5/2} + 1)^{5/2} + \frac{4}{15} (x^{5/2} + 1)^{3/2}$$

[In] integrate(x^(13/2)*(1+x^(5/2))^(1/2),x, algorithm="maxima")

[Out] 4/35*(x^(5/2) + 1)^(7/2) - 8/25*(x^(5/2) + 1)^(5/2) + 4/15*(x^(5/2) + 1)^(3/2)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 28, normalized size of antiderivative = 0.97

$$\int x^{13/2} \sqrt{1+x^{5/2}} dx = \frac{4}{35} \left(x^{5/2} + 1\right)^{7/2} - \frac{8}{25} \left(x^{5/2} + 1\right)^{5/2} + \frac{4}{15} \left(x^{5/2} + 1\right)^{3/2}$$

[In] integrate(x^(13/2)*(1+x^(5/2))^(1/2),x, algorithm="giac")

[Out] 4/35*(x^(5/2) + 1)^(7/2) - 8/25*(x^(5/2) + 1)^(5/2) + 4/15*(x^(5/2) + 1)^(3/2)

Mupad [B] (verification not implemented)

Time = 16.62 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.86

$$\int x^{13/2} \sqrt{1+x^{5/2}} dx = -\frac{4 \left(x^{5/2} + 1\right)^{3/2} \left(42 x^{5/2} - 15 \left(x^{5/2} + 1\right)^2 + 7\right)}{525}$$

[In] int(x^(13/2)*(x^(5/2) + 1)^(1/2),x)

[Out] -(4*(x^(5/2) + 1)^(3/2)*(42*x^(5/2) - 15*(x^(5/2) + 1)^2 + 7))/525

3.15 $\int \frac{1}{(1+x^2)^2} dx$

| | |
|---|-----|
| Optimal result | 171 |
| Rubi [A] (verified) | 171 |
| Mathematica [A] (verified) | 172 |
| Maple [A] (verified) | 172 |
| Fricas [A] (verification not implemented) | 173 |
| Sympy [A] (verification not implemented) | 173 |
| Maxima [A] (verification not implemented) | 173 |
| Giac [A] (verification not implemented) | 173 |
| Mupad [B] (verification not implemented) | 174 |

Optimal result

Integrand size = 7, antiderivative size = 19

$$\int \frac{1}{(1+x^2)^2} dx = \frac{x}{2(1+x^2)} + \frac{\arctan(x)}{2}$$

[Out] $x/(2*x^2+2)+1/2*\arctan(x)$

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 19, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.286$, Rules used = {205, 209}

$$\int \frac{1}{(1+x^2)^2} dx = \frac{\arctan(x)}{2} + \frac{x}{2(x^2+1)}$$

[In] Int[(1 + x^2)^(-2), x]

[Out] $x/(2*(1 + x^2)) + \text{ArcTan}[x]/2$

Rule 205

```
Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Simp[(-x)*((a + b*x^n)^(p + 1)/(a*n*(p + 1))), x] + Dist[(n*(p + 1) + 1)/(a*n*(p + 1)), Int[(a + b*x^n)^(p + 1), x], x] /; FreeQ[{a, b}, x] && IGtQ[n, 0] && LtQ[p, -1] && (IntegerQ[2*p] || (n == 2 && IntegerQ[4*p]) || (n == 2 && IntegerQ[3*p]) || Denominator[p + 1/n] < Denominator[p])
```

Rule 209

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a
```

, 0] || GtQ[b, 0])

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{x}{2(1+x^2)} + \frac{1}{2} \int \frac{1}{1+x^2} dx \\ &= \frac{x}{2(1+x^2)} + \frac{\arctan(x)}{2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.84

$$\int \frac{1}{(1+x^2)^2} dx = \frac{1}{2} \left(\frac{x}{1+x^2} + \arctan(x) \right)$$

[In] Integrate[(1 + x^2)^(-2), x]

[Out] (x/(1 + x^2) + ArcTan[x])/2

Maple [A] (verified)

Time = 0.21 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.84

| method | result | size |
|--------------|--|------|
| default | $\frac{x}{2x^2+2} + \frac{\arctan(x)}{2}$ | 16 |
| risch | $\frac{x}{2x^2+2} + \frac{\arctan(x)}{2}$ | 16 |
| meijerg | $\frac{x}{2x^2+2} + \frac{\arctan(x)}{2}$ | 17 |
| parallelrisc | $-\frac{i \ln(x-i)x^2 - i \ln(i+x)x^2 + i \ln(x-i) - i \ln(i+x) - 2x}{4(x^2+1)}$ | 52 |

[In] int(1/(x^2+1)^2,x,method=_RETURNVERBOSE)

[Out] 1/2/(x^2+1)*x+1/2*arctan(x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int \frac{1}{(1+x^2)^2} dx = \frac{(x^2+1)\arctan(x) + x}{2(x^2+1)}$$

[In] integrate(1/(x^2+1)^2,x, algorithm="fricas")

[Out] 1/2*((x^2 + 1)*arctan(x) + x)/(x^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.63

$$\int \frac{1}{(1+x^2)^2} dx = \frac{x}{2x^2+2} + \frac{\text{atan}(x)}{2}$$

[In] integrate(1/(x**2+1)**2,x)

[Out] x/(2*x**2 + 2) + atan(x)/2

Maxima [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.79

$$\int \frac{1}{(1+x^2)^2} dx = \frac{x}{2(x^2+1)} + \frac{1}{2} \arctan(x)$$

[In] integrate(1/(x^2+1)^2,x, algorithm="maxima")

[Out] 1/2*x/(x^2 + 1) + 1/2*arctan(x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.79

$$\int \frac{1}{(1+x^2)^2} dx = \frac{x}{2(x^2+1)} + \frac{1}{2} \arctan(x)$$

[In] integrate(1/(x^2+1)^2,x, algorithm="giac")

[Out] 1/2*x/(x^2 + 1) + 1/2*arctan(x)

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.84

$$\int \frac{1}{(1+x^2)^2} dx = \frac{\operatorname{atan}(x)}{2} + \frac{x}{2(x^2+1)}$$

[In] `int(1/(x^2 + 1)^2,x)`

[Out] `atan(x)/2 + x/(2*(x^2 + 1))`

3.16 $\int \frac{1}{36-13x^2+x^4} dx$

| | |
|---|-----|
| Optimal result | 175 |
| Rubi [A] (verified) | 175 |
| Mathematica [A] (verified) | 176 |
| Maple [A] (verified) | 176 |
| Fricas [A] (verification not implemented) | 177 |
| Sympy [B] (verification not implemented) | 177 |
| Maxima [A] (verification not implemented) | 177 |
| Giac [B] (verification not implemented) | 178 |
| Mupad [B] (verification not implemented) | 178 |

Optimal result

Integrand size = 12, antiderivative size = 21

$$\int \frac{1}{36-13x^2+x^4} dx = -\frac{1}{15} \operatorname{arctanh}\left(\frac{x}{3}\right) + \frac{1}{10} \operatorname{arctanh}\left(\frac{x}{2}\right)$$

[Out] $-1/15*\operatorname{arctanh}(1/3*x)+1/10*\operatorname{arctanh}(1/2*x)$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 21, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {1107, 213}

$$\int \frac{1}{36-13x^2+x^4} dx = \frac{1}{10} \operatorname{arctanh}\left(\frac{x}{2}\right) - \frac{1}{15} \operatorname{arctanh}\left(\frac{x}{3}\right)$$

[In] $\operatorname{Int}[(36 - 13*x^2 + x^4)^{-1}, x]$

[Out] $-1/15*\operatorname{ArcTanh}[x/3] + \operatorname{ArcTanh}[x/2]/10$

Rule 213

$\operatorname{Int}[(a_+ + (b_+)*(x_+)^2)^{-1}, x_Symbol] := \operatorname{Simp}[(-\operatorname{Rt}[-a, 2]*\operatorname{Rt}[b, 2])^{-1})*\operatorname{ArcTanh}[\operatorname{Rt}[b, 2]*(x/\operatorname{Rt}[-a, 2])], x] /;$ $\operatorname{FreeQ}\{a, b, x\} \ \&\& \ \operatorname{NegQ}[a/b] \ \&\& \ (\operatorname{LtQ}[a, 0] \ || \ \operatorname{GtQ}[b, 0])$

Rule 1107

$\operatorname{Int}[(a_+ + (b_+)*(x_+)^2 + (c_+)*(x_+)^4)^{-1}, x_Symbol] := \operatorname{With}\{q = \operatorname{Rt}[b^2 - 4*a*c, 2]\}, \operatorname{Dist}[c/q, \operatorname{Int}[1/(b/2 - q/2 + c*x^2), x], x] - \operatorname{Dist}[c/q, \operatorname{Int}[1/(b/2 + q/2 + c*x^2), x], x] /;$ $\operatorname{FreeQ}\{a, b, c, x\} \ \&\& \ \operatorname{NeQ}[b^2 - 4*a*c,$

0] && PosQ[b^2 - 4*a*c]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{5} \int \frac{1}{-9+x^2} dx - \frac{1}{5} \int \frac{1}{-4+x^2} dx \\ &= -\frac{1}{15} \operatorname{arctanh}\left(\frac{x}{3}\right) + \frac{1}{10} \operatorname{arctanh}\left(\frac{x}{2}\right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.76

$$\int \frac{1}{36 - 13x^2 + x^4} dx = -\frac{1}{20} \log(2-x) + \frac{1}{30} \log(3-x) + \frac{1}{20} \log(2+x) - \frac{1}{30} \log(3+x)$$

[In] Integrate[(36 - 13*x^2 + x^4)^(-1),x]

[Out] -1/20*Log[2 - x] + Log[3 - x]/30 + Log[2 + x]/20 - Log[3 + x]/30

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.24

| method | result | size |
|--------------|--|------|
| default | $-\frac{\ln(3+x)}{30} + \frac{\ln(2+x)}{20} - \frac{\ln(-2+x)}{20} + \frac{\ln(-3+x)}{30}$ | 26 |
| norman | $-\frac{\ln(3+x)}{30} + \frac{\ln(2+x)}{20} - \frac{\ln(-2+x)}{20} + \frac{\ln(-3+x)}{30}$ | 26 |
| risch | $-\frac{\ln(3+x)}{30} + \frac{\ln(2+x)}{20} - \frac{\ln(-2+x)}{20} + \frac{\ln(-3+x)}{30}$ | 26 |
| parallelrisc | $-\frac{\ln(3+x)}{30} + \frac{\ln(2+x)}{20} - \frac{\ln(-2+x)}{20} + \frac{\ln(-3+x)}{30}$ | 26 |

[In] int(1/(x^4-13*x^2+36),x,method=_RETURNVERBOSE)

[Out] -1/30*ln(3+x)+1/20*ln(2+x)-1/20*ln(-2+x)+1/30*ln(-3+x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.19

$$\int \frac{1}{36 - 13x^2 + x^4} dx = -\frac{1}{30} \log(x + 3) + \frac{1}{20} \log(x + 2) - \frac{1}{20} \log(x - 2) + \frac{1}{30} \log(x - 3)$$

[In] integrate(1/(x^4-13*x^2+36),x, algorithm="fricas")

[Out] -1/30*log(x + 3) + 1/20*log(x + 2) - 1/20*log(x - 2) + 1/30*log(x - 3)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 26 vs. 2(12) = 24.

Time = 0.08 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.24

$$\int \frac{1}{36 - 13x^2 + x^4} dx = \frac{\log(x - 3)}{30} - \frac{\log(x - 2)}{20} + \frac{\log(x + 2)}{20} - \frac{\log(x + 3)}{30}$$

[In] integrate(1/(x**4-13*x**2+36),x)

[Out] log(x - 3)/30 - log(x - 2)/20 + log(x + 2)/20 - log(x + 3)/30

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.19

$$\int \frac{1}{36 - 13x^2 + x^4} dx = -\frac{1}{30} \log(x + 3) + \frac{1}{20} \log(x + 2) - \frac{1}{20} \log(x - 2) + \frac{1}{30} \log(x - 3)$$

[In] integrate(1/(x^4-13*x^2+36),x, algorithm="maxima")

[Out] -1/30*log(x + 3) + 1/20*log(x + 2) - 1/20*log(x - 2) + 1/30*log(x - 3)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 29 vs. 2(13) = 26.

Time = 0.27 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.38

$$\int \frac{1}{36 - 13x^2 + x^4} dx = -\frac{1}{30} \log(|x + 3|) + \frac{1}{20} \log(|x + 2|) \\ - \frac{1}{20} \log(|x - 2|) + \frac{1}{30} \log(|x - 3|)$$

[In] integrate(1/(x^4-13*x^2+36),x, algorithm="giac")

[Out] -1/30*log(abs(x + 3)) + 1/20*log(abs(x + 2)) - 1/20*log(abs(x - 2)) + 1/30*log(abs(x - 3))

Mupad [B] (verification not implemented)

Time = 15.98 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.62

$$\int \frac{1}{36 - 13x^2 + x^4} dx = \frac{\operatorname{atanh}\left(\frac{x}{2}\right)}{10} - \frac{\operatorname{atanh}\left(\frac{x}{3}\right)}{15}$$

[In] int(1/(x^4 - 13*x^2 + 36),x)

[Out] atanh(x/2)/10 - atanh(x/3)/15

3.17 $\int \frac{\log(\log(x))}{x} dx$

| | |
|---|-----|
| Optimal result | 179 |
| Rubi [A] (verified) | 179 |
| Mathematica [A] (verified) | 180 |
| Maple [A] (verified) | 180 |
| Fricas [A] (verification not implemented) | 180 |
| Sympy [A] (verification not implemented) | 181 |
| Maxima [A] (verification not implemented) | 181 |
| Giac [A] (verification not implemented) | 181 |
| Mupad [B] (verification not implemented) | 181 |

Optimal result

Integrand size = 7, antiderivative size = 11

$$\int \frac{\log(\log(x))}{x} dx = -\log(x) + \log(x) \log(\log(x))$$

[Out] $-\ln(x) + \ln(x) \cdot \ln(\ln(x))$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.143$, Rules used = {2601}

$$\int \frac{\log(\log(x))}{x} dx = \log(x) \log(\log(x)) - \log(x)$$

[In] `Int[Log[Log[x]]/x,x]`

[Out] `-Log[x] + Log[x]*Log[Log[x]]`

Rule 2601

```
Int[((a_.) + Log[Log[(d_.)*(x_)^(n_.)]^(p_.)*(c_.)]*(b_.))/(x_), x_Symbol]
:> Simp[Log[d*x^n]*((a + b*Log[c*Log[d*x^n]^p])/n), x] - Simp[b*p*Log[x], x]
] /; FreeQ[{a, b, c, d, n, p}, x]
```

Rubi steps

$$\text{integral} = -\log(x) + \log(x) \log(\log(x))$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \frac{\log(\log(x))}{x} dx = -\log(x) + \log(x) \log(\log(x))$$

[In] Integrate[Log[Log[x]]/x,x]

[Out] -Log[x] + Log[x]*Log[Log[x]]

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.09

| method | result | size |
|-------------------|--------------------------------|------|
| derivativedivides | $-\ln(x) + \ln(x) \ln(\ln(x))$ | 12 |
| default | $-\ln(x) + \ln(x) \ln(\ln(x))$ | 12 |
| norman | $-\ln(x) + \ln(x) \ln(\ln(x))$ | 12 |
| risch | $-\ln(x) + \ln(x) \ln(\ln(x))$ | 12 |

[In] int(ln(ln(x))/x,x,method=_RETURNVERBOSE)

[Out] -ln(x)+ln(x)*ln(ln(x))

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \frac{\log(\log(x))}{x} dx = \log(x) \log(\log(x)) - \log(x)$$

[In] integrate(log(log(x))/x,x, algorithm="fricas")

[Out] log(x)*log(log(x)) - log(x)

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.91

$$\int \frac{\log(\log(x))}{x} dx = \log(x) \log(\log(x)) - \log(x)$$

[In] integrate(ln(ln(x))/x,x)

[Out] log(x)*log(log(x)) - log(x)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \frac{\log(\log(x))}{x} dx = \log(x) \log(\log(x)) - \log(x)$$

[In] integrate(log(log(x))/x,x, algorithm="maxima")

[Out] log(x)*log(log(x)) - log(x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \frac{\log(\log(x))}{x} dx = \log(x) \log(\log(x)) - \log(x)$$

[In] integrate(log(log(x))/x,x, algorithm="giac")

[Out] log(x)*log(log(x)) - log(x)

Mupad [B] (verification not implemented)

Time = 15.86 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.73

$$\int \frac{\log(\log(x))}{x} dx = \ln(x) (\ln(\ln(x)) - 1)$$

[In] int(log(log(x))/x,x)

[Out] log(x)*(log(log(x)) - 1)

3.18 $\int \frac{1+\cot(x)}{1-\cot(x)} dx$

| | |
|---|-----|
| Optimal result | 182 |
| Rubi [A] (verified) | 182 |
| Mathematica [A] (verified) | 183 |
| Maple [A] (verified) | 183 |
| Fricas [A] (verification not implemented) | 183 |
| Sympy [B] (verification not implemented) | 184 |
| Maxima [A] (verification not implemented) | 184 |
| Giac [A] (verification not implemented) | 184 |
| Mupad [B] (verification not implemented) | 185 |

Optimal result

Integrand size = 13, antiderivative size = 8

$$\int \frac{1 + \cot(x)}{1 - \cot(x)} dx = \log(\cos(x) - \sin(x))$$

[Out] $\ln(\cos(x) - \sin(x))$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.077$, Rules used = {3611}

$$\int \frac{1 + \cot(x)}{1 - \cot(x)} dx = \log(\cos(x) - \sin(x))$$

[In] $\text{Int}[(1 + \text{Cot}[x])/(1 - \text{Cot}[x]), x]$

[Out] $\text{Log}[\text{Cos}[x] - \text{Sin}[x]]$

Rule 3611

```
Int[((c_) + (d_)*tan[(e_) + (f_)*(x_)])/((a_) + (b_)*tan[(e_) + (f_)*
(x_)]), x_Symbol] := Simp[(c/(b*f))*Log[RemoveContent[a*Cos[e + f*x] + b*Si
n[e + f*x], x]], x] /; FreeQ[{a, b, c, d, e, f}, x] && NeQ[b*c - a*d, 0] &&
NeQ[a^2 + b^2, 0] && EqQ[a*c + b*d, 0]
```

Rubi steps

$$\text{integral} = \log(\cos(x) - \sin(x))$$

Mathematica [A] (verified)

Time = 0.13 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \frac{1 + \cot(x)}{1 - \cot(x)} dx = \log(\cos(x) - \sin(x))$$

[In] Integrate[(1 + Cot[x])/(1 - Cot[x]),x]

[Out] Log[Cos[x] - Sin[x]]

Maple [A] (verified)

Time = 0.06 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.75

| method | result | size |
|------------------|---|------|
| parallelrisc | $\ln\left(\frac{1}{\sqrt{\sec(x)^2}}\right) + \ln(\tan(x) - 1)$ | 14 |
| risc | $-ix + \ln(e^{2ix} - i)$ | 15 |
| derivativdivides | $\ln(-1 + \cot(x)) - \frac{\ln(1 + \cot(x)^2)}{2}$ | 16 |
| default | $\ln(-1 + \cot(x)) - \frac{\ln(1 + \cot(x)^2)}{2}$ | 16 |
| norman | $-\frac{\ln(1 + \tan(x)^2)}{2} + \ln(\tan(x) - 1)$ | 16 |

[In] int((1+cot(x))/(1-cot(x)),x,method=_RETURNVERBOSE)

[Out] ln(1/(sec(x)^2)^(1/2))+ln(tan(x)-1)

Fricas [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.38

$$\int \frac{1 + \cot(x)}{1 - \cot(x)} dx = \frac{1}{2} \log(-\sin(2x) + 1)$$

[In] integrate((1+cot(x))/(1-cot(x)),x, algorithm="fricas")

[Out] 1/2*log(-sin(2*x) + 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(7) = 14$.

Time = 0.08 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.88

$$\int \frac{1 + \cot(x)}{1 - \cot(x)} dx = \log(\tan(x) - 1) - \frac{\log(\tan^2(x) + 1)}{2}$$

[In] integrate((1+cot(x))/(1-cot(x)),x)

[Out] log(tan(x) - 1) - log(tan(x)**2 + 1)/2

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.88

$$\int \frac{1 + \cot(x)}{1 - \cot(x)} dx = -\frac{1}{2} \log(\tan(x)^2 + 1) + \log(\tan(x) - 1)$$

[In] integrate((1+cot(x))/(1-cot(x)),x, algorithm="maxima")

[Out] -1/2*log(tan(x)^2 + 1) + log(tan(x) - 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 16, normalized size of antiderivative = 2.00

$$\int \frac{1 + \cot(x)}{1 - \cot(x)} dx = -\frac{1}{2} \log(\tan(x)^2 + 1) + \log(|\tan(x) - 1|)$$

[In] integrate((1+cot(x))/(1-cot(x)),x, algorithm="giac")

[Out] -1/2*log(tan(x)^2 + 1) + log(abs(tan(x) - 1))

Mupad [B] (verification not implemented)

Time = 16.24 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.75

$$\int \frac{1 + \cot(x)}{1 - \cot(x)} dx = -x \operatorname{li} + \ln(e^{x2i} - i)$$

[In] int(-(cot(x) + 1)/(cot(x) - 1),x)

[Out] log(exp(x*2i) - 1i) - x*1i

3.19 $\int \frac{\cos(x) + x \sin(x)}{x(x + \cos(x))} dx$

| | |
|---|-----|
| Optimal result | 186 |
| Rubi [A] (verified) | 186 |
| Mathematica [A] (verified) | 187 |
| Maple [B] (verified) | 187 |
| Fricas [A] (verification not implemented) | 188 |
| Sympy [A] (verification not implemented) | 188 |
| Maxima [B] (verification not implemented) | 188 |
| Giac [B] (verification not implemented) | 189 |
| Mupad [B] (verification not implemented) | 189 |

Optimal result

Integrand size = 17, antiderivative size = 11

$$\int \frac{\cos(x) + x \sin(x)}{x(x + \cos(x))} dx = -\log\left(1 + \frac{\cos(x)}{x}\right)$$

[Out] $-\ln(1 + \cos(x)/x)$

Rubi [A] (verified)

Time = 0.26 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.118$, Rules used = {6844, 31}

$$\int \frac{\cos(x) + x \sin(x)}{x(x + \cos(x))} dx = -\log\left(\frac{\cos(x)}{x} + 1\right)$$

[In] $\text{Int}[(\text{Cos}[x] + x*\text{Sin}[x])/(x*(x + \text{Cos}[x])),x]$

[Out] $-\text{Log}[1 + \text{Cos}[x]/x]$

Rule 31

$\text{Int}[(a + (b*x)^{-1}), x_Symbol] \rightarrow \text{Simp}[\text{Log}[\text{RemoveContent}[a + b*x, x]]/b, x] /; \text{FreeQ}\{a, b, x\}$

Rule 6844

$\text{Int}[(u)*(v)^{(r)}*((a)*(v)^{(p)} + (b)*(w)^{(q)})^{(m)}, x_Symbol] \rightarrow \text{With}\{c = \text{Simplify}[u/(p*w*D[v, x] - q*v*D[w, x])]\}, \text{Dist}[(-c)*q, \text{Subst}[\text{Int}[(a + b*x^q)^m, x], x, v^{(m*p + r + 1)*w}, x] /; \text{FreeQ}[c, x] /; \text{FreeQ}\{a, b, m, p, q, r\}, x] \&\& \text{EqQ}[p + q*(m*p + r + 1), 0] \&\& \text{IntegerQ}[q] \&\& \text{Integ}$

erQ [m]

Rubi steps

$$\begin{aligned} \text{integral} &= -\text{Subst}\left(\int \frac{1}{1+x} dx, x, \frac{\cos(x)}{x}\right) \\ &= -\log\left(1 + \frac{\cos(x)}{x}\right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.16 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.91

$$\int \frac{\cos(x) + x \sin(x)}{x(x + \cos(x))} dx = \log(x) - \log(x + \cos(x))$$

`[In] Integrate[(Cos[x] + x*Sin[x])/(x*(x + Cos[x])), x]``[Out] Log[x] - Log[x + Cos[x]]`**Maple [B] (verified)**

Leaf count of result is larger than twice the leaf count of optimal. 24 vs. 2(11) = 22.

Time = 0.21 (sec) , antiderivative size = 25, normalized size of antiderivative = 2.27

| method | result | size |
|---------------|--|------|
| parallelrisch | $-\ln\left(\frac{x+\cos(x)}{1+\cos(x)}\right) + \ln(x) + \ln\left(\frac{1}{1+\cos(x)}\right)$ | 25 |
| risch | $ix + \ln(x) - \ln(2x e^{ix} + e^{2ix} + 1)$ | 26 |
| norman | $-\ln\left(x \tan\left(\frac{x}{2}\right)^2 - \tan\left(\frac{x}{2}\right)^2 + x + 1\right) + \ln(x) + \ln\left(1 + \tan\left(\frac{x}{2}\right)^2\right)$ | 35 |

`[In] int((cos(x)+x*sin(x))/x/(x+cos(x)), x, method=_RETURNVERBOSE)``[Out] -ln((x+cos(x))/(1+cos(x)))+ln(x)+ln(1/(1+cos(x)))`

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.91

$$\int \frac{\cos(x) + x \sin(x)}{x(x + \cos(x))} dx = -\log(x + \cos(x)) + \log(x)$$

[In] integrate((cos(x)+x*sin(x))/x/(x+cos(x)),x, algorithm="fricas")

[Out] -log(x + cos(x)) + log(x)

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.73

$$\int \frac{\cos(x) + x \sin(x)}{x(x + \cos(x))} dx = \log(x) - \log(x + \cos(x))$$

[In] integrate((cos(x)+x*sin(x))/x/(x+cos(x)),x)

[Out] log(x) - log(x + cos(x))

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 65 vs. 2(11) = 22.

Time = 0.30 (sec) , antiderivative size = 65, normalized size of antiderivative = 5.91

$$\int \frac{\cos(x) + x \sin(x)}{x(x + \cos(x))} dx = -\frac{1}{2} \log(4x^2 \cos(x)^2 + 4x^2 \sin(x)^2 + 4x \sin(2x) \sin(x) + 2(2x \cos(x) + 1) \cos(2x) + \cos(2x)^2 + 4x \cos(x) + \sin(2x)^2 + 1) + \log(x)$$

[In] integrate((cos(x)+x*sin(x))/x/(x+cos(x)),x, algorithm="maxima")

[Out] -1/2*log(4*x^2*cos(x)^2 + 4*x^2*sin(x)^2 + 4*x*sin(2*x)*sin(x) + 2*(2*x*cos(x) + 1)*cos(2*x) + cos(2*x)^2 + 4*x*cos(x) + sin(2*x)^2 + 1) + log(x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 79 vs. $2(11) = 22$.

Time = 0.29 (sec) , antiderivative size = 79, normalized size of antiderivative = 7.18

$$\int \frac{\cos(x) + x \sin(x)}{x(x + \cos(x))} dx =$$

$$-\frac{1}{2} \log \left(\frac{4 \left(x^2 \tan \left(\frac{1}{2} x \right)^4 - 2 x \tan \left(\frac{1}{2} x \right)^4 + 2 x^2 \tan \left(\frac{1}{2} x \right)^2 + \tan \left(\frac{1}{2} x \right)^4 + x^2 - 2 \tan \left(\frac{1}{2} x \right)^2 + 2 x + 1 \right)}{\tan \left(\frac{1}{2} x \right)^4 + 2 \tan \left(\frac{1}{2} x \right)^2 + 1} \right)$$

$$+ \log(|x|)$$

[In] integrate((cos(x)+x*sin(x))/x/(x+cos(x)),x, algorithm="giac")

[Out] -1/2*log(4*(x^2*tan(1/2*x)^4 - 2*x*tan(1/2*x)^4 + 2*x^2*tan(1/2*x)^2 + tan(1/2*x)^4 + x^2 - 2*tan(1/2*x)^2 + 2*x + 1)/(tan(1/2*x)^4 + 2*tan(1/2*x)^2 + 1)) + log(abs(x))

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.91

$$\int \frac{\cos(x) + x \sin(x)}{x(x + \cos(x))} dx = \ln(x) - \ln(x + \cos(x))$$

[In] int((cos(x) + x*sin(x))/(x*(x + cos(x))),x)

[Out] log(x) - log(x + cos(x))

3.20 $\int \frac{1}{\sec(x)+\sin(x)} dx$

| | |
|---|-----|
| Optimal result | 190 |
| Rubi [F] | 190 |
| Mathematica [B] (verified) | 191 |
| Maple [C] (verified) | 191 |
| Fricas [C] (verification not implemented) | 192 |
| Sympy [F] | 192 |
| Maxima [F] | 192 |
| Giac [B] (verification not implemented) | 193 |
| Mupad [B] (verification not implemented) | 193 |

Optimal result

Integrand size = 7, antiderivative size = 28

$$\int \frac{1}{\sec(x) + \sin(x)} dx = \arctan(\cos(x) + \sin(x)) - \frac{\operatorname{arctanh}\left(\frac{\cos(x) - \sin(x)}{\sqrt{3}}\right)}{\sqrt{3}}$$

[Out] $\arctan(\cos(x)+\sin(x))-1/3*3^{(1/2)}*\operatorname{arctanh}(1/3*(\cos(x)-\sin(x))*3^{(1/2)})$

Rubi [F]

$$\int \frac{1}{\sec(x) + \sin(x)} dx = \int \frac{1}{\sec(x) + \sin(x)} dx$$

[In] $\operatorname{Int}[(\operatorname{Sec}[x] + \operatorname{Sin}[x])^{-1}, x]$

[Out] $\operatorname{Defer}[\operatorname{Int}[(\operatorname{Sec}[x] + \operatorname{Sin}[x])^{-1}, x]]$

Rubi steps

$$\text{integral} = \int \frac{1}{\sec(x) + \sin(x)} dx$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 93 vs. $2(28) = 56$.

Time = 1.25 (sec) , antiderivative size = 93, normalized size of antiderivative = 3.32

$$\int \frac{1}{\sec(x) + \sin(x)} dx$$

$$= \arctan\left(1 - \left(-1 + \sqrt{3}\right) \tan\left(\frac{x}{2}\right)\right) + \arctan\left(1 + \left(1 + \sqrt{3}\right) \tan\left(\frac{x}{2}\right)\right)$$

$$+ \frac{-\log\left(\sec^2\left(\frac{x}{2}\right) (\sqrt{3} + \cos(x) - \sin(x))\right) + \log\left(-\sec^2\left(\frac{x}{2}\right) (\sqrt{3} - \cos(x) + \sin(x))\right)}{2\sqrt{3}}$$

[In] Integrate[(Sec[x] + Sin[x])^(-1),x]

[Out] ArcTan[1 - (-1 + Sqrt[3])*Tan[x/2]] + ArcTan[1 + (1 + Sqrt[3])*Tan[x/2]] + (-Log[Sec[x/2]^2*(Sqrt[3] + Cos[x] - Sin[x])] + Log[-(Sec[x/2]^2*(Sqrt[3] - Cos[x] + Sin[x]))])/(2*Sqrt[3])

Maple [C] (verified)

Result contains higher order function than in optimal. Order 9 vs. order 3.

Time = 0.21 (sec) , antiderivative size = 57, normalized size of antiderivative = 2.04

| method | result |
|---------|--|
| default | $\sum_{_R=\text{RootOf}(_Z^4-2_Z^3+2_Z^2+2_Z+1)} \frac{(-_R^2+1) \ln(\tan(\frac{x}{2})-_R)}{2_R^3-3_R^2+2_R+1}$ |
| risch | $-\frac{i \ln\left(e^{ix+\frac{1}{2}-\frac{i}{2}+\frac{i\sqrt{3}}{2}-\frac{\sqrt{3}}{2}}\right)}{2} + \frac{\ln\left(e^{ix+\frac{1}{2}-\frac{i}{2}+\frac{i\sqrt{3}}{2}-\frac{\sqrt{3}}{2}}\right)\sqrt{3}}{6} - \frac{i \ln\left(e^{ix+\frac{1}{2}-\frac{i}{2}-\frac{i\sqrt{3}}{2}+\frac{\sqrt{3}}{2}}\right)}{2} - \frac{\ln\left(e^{ix+\frac{1}{2}-\frac{i}{2}-\frac{i\sqrt{3}}{2}+\frac{\sqrt{3}}{2}}\right)\sqrt{3}}{6} +$ |

[In] int(1/(sin(x)+sec(x)),x,method=_RETURNVERBOSE)

[Out] sum((-_R^2+1)/(2*_R^3-3*_R^2+2*_R+1)*ln(tan(1/2*x)-_R),_R=RootOf(_Z^4-2*_Z^3+2*_Z^2+2*_Z+1))

Fricas [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.29 (sec) , antiderivative size = 165, normalized size of antiderivative = 5.89

$$\begin{aligned} & \int \frac{1}{\sec(x) + \sin(x)} dx \\ &= -\frac{1}{12} \sqrt{3} \sqrt{2i\sqrt{3} - 2} \log\left(-\frac{1}{2} \left((\sqrt{3} - i) \sin(x) + 2i \cos(x) \right) \sqrt{2i\sqrt{3} - 2} + 2\right) \\ &+ \frac{1}{12} \sqrt{3} \sqrt{2i\sqrt{3} - 2} \log\left(-\frac{1}{2} \left((\sqrt{3} - i) \sin(x) + 2i \cos(x) \right) \sqrt{2i\sqrt{3} - 2} - 2\right) \\ &+ \frac{1}{12} \sqrt{3} \sqrt{-2i\sqrt{3} - 2} \log\left(\frac{1}{2} \left((\sqrt{3} + i) \sin(x) - 2i \cos(x) \right) \sqrt{-2i\sqrt{3} - 2} + 2\right) \\ &- \frac{1}{12} \sqrt{3} \sqrt{-2i\sqrt{3} - 2} \log\left(\frac{1}{2} \left((\sqrt{3} + i) \sin(x) - 2i \cos(x) \right) \sqrt{-2i\sqrt{3} - 2} - 2\right) \end{aligned}$$

[In] integrate(1/(sin(x)+sec(x)),x, algorithm="fricas")

[Out] -1/12*sqrt(3)*sqrt(2*I*sqrt(3) - 2)*log(-1/2*((sqrt(3) - I)*sin(x) + 2*I*cos(x))*sqrt(2*I*sqrt(3) - 2) + 2) + 1/12*sqrt(3)*sqrt(2*I*sqrt(3) - 2)*log(-1/2*((sqrt(3) - I)*sin(x) + 2*I*cos(x))*sqrt(2*I*sqrt(3) - 2) - 2) + 1/12*sqrt(3)*sqrt(-2*I*sqrt(3) - 2)*log(1/2*((sqrt(3) + I)*sin(x) - 2*I*cos(x))*sqrt(-2*I*sqrt(3) - 2) + 2) - 1/12*sqrt(3)*sqrt(-2*I*sqrt(3) - 2)*log(1/2*((sqrt(3) + I)*sin(x) - 2*I*cos(x))*sqrt(-2*I*sqrt(3) - 2) - 2)

Sympy [F]

$$\int \frac{1}{\sec(x) + \sin(x)} dx = \int \frac{1}{\sin(x) + \sec(x)} dx$$

[In] integrate(1/(sin(x)+sec(x)),x)

[Out] Integral(1/(sin(x) + sec(x)), x)

Maxima [F]

$$\int \frac{1}{\sec(x) + \sin(x)} dx = \int \frac{1}{\sec(x) + \sin(x)} dx$$

[In] integrate(1/(sin(x)+sec(x)),x, algorithm="maxima")

[Out] integrate(1/(sec(x) + sin(x)), x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 81 vs. $2(25) = 50$.

Time = 0.29 (sec) , antiderivative size = 81, normalized size of antiderivative = 2.89

$$\int \frac{1}{\sec(x) + \sin(x)} dx = \frac{1}{2} \pi + \frac{1}{6} \sqrt{3} \log \left(\left(\sqrt{3} + \tan \left(\frac{1}{2} x \right) - 1 \right)^2 + \tan \left(\frac{1}{2} x \right)^2 \right) - \frac{1}{6} \sqrt{3} \log \left(\left(\sqrt{3} - \tan \left(\frac{1}{2} x \right) + 1 \right)^2 + \tan \left(\frac{1}{2} x \right)^2 \right) + \arctan \left(\left(\sqrt{3} + 1 \right) \tan \left(\frac{1}{2} x \right) + 1 \right) + \arctan \left(- \left(\sqrt{3} - 1 \right) \tan \left(\frac{1}{2} x \right) + 1 \right)$$

[In] integrate(1/(sin(x)+sec(x)),x, algorithm="giac")

[Out] 1/2*pi + 1/6*sqrt(3)*log((sqrt(3) + tan(1/2*x) - 1)^2 + tan(1/2*x)^2) - 1/6*sqrt(3)*log((sqrt(3) - tan(1/2*x) + 1)^2 + tan(1/2*x)^2) + arctan((sqrt(3) + 1)*tan(1/2*x) + 1) + arctan(-(sqrt(3) - 1)*tan(1/2*x) + 1)

Mupad [B] (verification not implemented)

Time = 16.06 (sec) , antiderivative size = 233, normalized size of antiderivative = 8.32

$$\int \frac{1}{\sec(x) + \sin(x)} dx = -\operatorname{atan} \left(\frac{96 \tan \left(\frac{x}{2} \right)}{64 \tan \left(\frac{x}{2} \right) + 64 - \sqrt{3} \tan \left(\frac{x}{2} \right) 64i} + \frac{\sqrt{3} 32i}{64 \tan \left(\frac{x}{2} \right) + 64 - \sqrt{3} \tan \left(\frac{x}{2} \right) 64i} + \frac{32}{64 \tan \left(\frac{x}{2} \right) + 64 - \sqrt{3} \tan \left(\frac{x}{2} \right) 64i} + \frac{\sqrt{3} \tan \left(\frac{x}{2} \right) 32i}{64 \tan \left(\frac{x}{2} \right) + 64 - \sqrt{3} \tan \left(\frac{x}{2} \right) 64i} \right) \left(-1 + \frac{\sqrt{3} 1i}{3} \right) - \operatorname{atan} \left(-\frac{96 \tan \left(\frac{x}{2} \right)}{64 \tan \left(\frac{x}{2} \right) + 64 + \sqrt{3} \tan \left(\frac{x}{2} \right) 64i} + \frac{\sqrt{3} 32i}{64 \tan \left(\frac{x}{2} \right) + 64 + \sqrt{3} \tan \left(\frac{x}{2} \right) 64i} - \frac{32}{64 \tan \left(\frac{x}{2} \right) + 64 + \sqrt{3} \tan \left(\frac{x}{2} \right) 64i} + \frac{\sqrt{3} \tan \left(\frac{x}{2} \right) 32i}{64 \tan \left(\frac{x}{2} \right) + 64 + \sqrt{3} \tan \left(\frac{x}{2} \right) 64i} \right) \left(1 + \frac{\sqrt{3} 1i}{3} \right)$$

[In] `int(1/(sin(x) + 1/cos(x)),x)`

[Out]
$$- \operatorname{atan}\left(\frac{96 \tan(x/2)}{64 \tan(x/2) - 3^{1/2} \tan(x/2) * 64i + 64}\right) + \frac{3^{1/2} * 32i}{64 \tan(x/2) - 3^{1/2} \tan(x/2) * 64i + 64} + \frac{32}{64 \tan(x/2) - 3^{1/2} \tan(x/2) * 64i + 64} + \frac{3^{1/2} \tan(x/2) * 32i}{64 \tan(x/2) - 3^{1/2} \tan(x/2) * 64i + 64} * \left(\frac{3^{1/2} * 1i}{3} - 1\right) - \operatorname{atan}\left(\frac{3^{1/2} * 32i}{64 \tan(x/2) + 3^{1/2} \tan(x/2) * 64i + 64}\right) - \frac{96 \tan(x/2)}{64 \tan(x/2) + 3^{1/2} \tan(x/2) * 64i + 64} - \frac{32}{64 \tan(x/2) + 3^{1/2} \tan(x/2) * 64i + 64} + \frac{3^{1/2} \tan(x/2) * 32i}{64 \tan(x/2) + 3^{1/2} \tan(x/2) * 64i + 64} * \left(\frac{3^{1/2} * 1i}{3} + 1\right)$$

3.21 $\int \frac{1}{\sqrt{1+e^x+e^{2x}}} dx$

| | |
|---|-----|
| Optimal result | 195 |
| Rubi [A] (verified) | 195 |
| Mathematica [A] (verified) | 196 |
| Maple [A] (verified) | 196 |
| Fricas [A] (verification not implemented) | 197 |
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Optimal result

Integrand size = 14, antiderivative size = 26

$$\int \frac{1}{\sqrt{1+e^x+e^{2x}}} dx = -\operatorname{arctanh}\left(\frac{2+e^x}{2\sqrt{1+e^x+e^{2x}}}\right)$$

[Out] `-arctanh(1/2*(exp(x)+2)/(1+exp(x)+exp(2*x))^(1/2))`

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.214$, Rules used = {2320, 738, 212}

$$\int \frac{1}{\sqrt{1+e^x+e^{2x}}} dx = -\operatorname{arctanh}\left(\frac{e^x+2}{2\sqrt{e^x+e^{2x}+1}}\right)$$

[In] `Int[1/Sqrt[1 + E^x + E^(2*x)], x]`

[Out] `-ArcTanh[(2 + E^x)/(2*Sqrt[1 + E^x + E^(2*x)])]`

Rule 212

`Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])`

Rule 738

`Int[1/(((d_.) + (e_.)*(x_))*Sqrt[(a_.) + (b_.)*(x_) + (c_.)*(x_)^2]), x_Symbol] := Dist[-2, Subst[Int[1/(4*c*d^2 - 4*b*d*e + 4*a*e^2 - x^2), x], x, (2*a*e - b*d - (2*c*d - b*e)*x)/Sqrt[a + b*x + c*x^2]], x] /; FreeQ[{a, b, c,`

`d, e}, x] && NeQ[b^2 - 4*a*c, 0] && NeQ[2*c*d - b*e, 0]`

Rule 2320

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_) [v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst} \left(\int \frac{1}{x\sqrt{1+x+x^2}} dx, x, e^x \right) \\ &= - \left(2 \text{Subst} \left(\int \frac{1}{4-x^2} dx, x, \frac{2+e^x}{\sqrt{1+e^x+e^{2x}}} \right) \right) \\ &= -\text{arctanh} \left(\frac{2+e^x}{2\sqrt{1+e^x+e^{2x}}} \right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.10 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.88

$$\int \frac{1}{\sqrt{1+e^x+e^{2x}}} dx = 2\text{arctanh} \left(e^x - \sqrt{1+e^x+e^{2x}} \right)$$

[In] Integrate[1/Sqrt[1 + E^x + E^(2*x)], x]

[Out] 2*ArcTanh[E^x - Sqrt[1 + E^x + E^(2*x)]]

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.77

| method | result | size |
|---------|---|------|
| default | $-\text{arctanh} \left(\frac{e^x+2}{2\sqrt{1+e^x+e^{2x}}} \right)$ | 20 |

[In] int(1/(1+exp(x)+exp(2*x))^(1/2), x, method=_RETURNVERBOSE)

[Out] -arctanh(1/2*(exp(x)+2)/(1+exp(x)+exp(x)^2)^(1/2))

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.42

$$\int \frac{1}{\sqrt{1+e^x+e^{2x}}} dx = -\log\left(\sqrt{e^{(2x)}+e^x+1}-e^x+1\right) + \log\left(\sqrt{e^{(2x)}+e^x+1}-e^x-1\right)$$

[In] integrate(1/(1+exp(x)+exp(2*x))^(1/2),x, algorithm="fricas")

[Out] -log(sqrt(e^(2*x) + e^x + 1) - e^x + 1) + log(sqrt(e^(2*x) + e^x + 1) - e^x - 1)

Sympy [F]

$$\int \frac{1}{\sqrt{1+e^x+e^{2x}}} dx = \int \frac{1}{\sqrt{e^{2x}+e^x+1}} dx$$

[In] integrate(1/(1+exp(x)+exp(2*x))**(1/2),x)

[Out] Integral(1/sqrt(exp(2*x) + exp(x) + 1), x)

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.69

$$\int \frac{1}{\sqrt{1+e^x+e^{2x}}} dx = -\operatorname{arsinh}\left(\frac{2}{3}\sqrt{3}e^{-x} + \frac{1}{3}\sqrt{3}\right)$$

[In] integrate(1/(1+exp(x)+exp(2*x))^(1/2),x, algorithm="maxima")

[Out] -arcsinh(2/3*sqrt(3)*e^(-x) + 1/3*sqrt(3))

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.42

$$\int \frac{1}{\sqrt{1+e^x+e^{2x}}} dx = -\log\left(\sqrt{e^{(2x)}+e^x+1}-e^x+1\right) + \log\left(-\sqrt{e^{(2x)}+e^x+1}+e^x+1\right)$$

[In] integrate(1/(1+exp(x)+exp(2*x))^(1/2),x, algorithm="giac")

[Out] -log(sqrt(e^(2*x) + e^x + 1) - e^x + 1) + log(-sqrt(e^(2*x) + e^x + 1) + e^x + 1)

Mupad [B] (verification not implemented)

Time = 16.08 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.81

$$\int \frac{1}{\sqrt{1 + e^x + e^{2x}}} dx = x - \ln \left(\frac{e^x}{2} + \sqrt{e^{2x} + e^x + 1} + 1 \right)$$

[In] int(1/(exp(2*x) + exp(x) + 1)^(1/2),x)

[Out] x - log(exp(x)/2 + (exp(2*x) + exp(x) + 1)^(1/2) + 1)

3.22 $\int e^{x^2} x^3 dx$

| | |
|---|-----|
| Optimal result | 199 |
| Rubi [A] (verified) | 199 |
| Mathematica [A] (verified) | 200 |
| Maple [A] (verified) | 200 |
| Fricas [A] (verification not implemented) | 201 |
| Sympy [A] (verification not implemented) | 201 |
| Maxima [A] (verification not implemented) | 201 |
| Giac [A] (verification not implemented) | 202 |
| Mupad [B] (verification not implemented) | 202 |

Optimal result

Integrand size = 9, antiderivative size = 22

$$\int e^{x^2} x^3 dx = -\frac{e^{x^2}}{2} + \frac{1}{2}e^{x^2} x^2$$

[Out] $-1/2*\exp(x^2)+1/2*x^2*\exp(x^2)$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {2243, 2240}

$$\int e^{x^2} x^3 dx = \frac{1}{2}e^{x^2} x^2 - \frac{e^{x^2}}{2}$$

[In] $\text{Int}[E^{x^2}*x^3,x]$

[Out] $-1/2*E^{x^2} + (E^{x^2}*x^2)/2$

Rule 2240

$\text{Int}[(F_)^{((a_.) + (b_.)*((c_.) + (d_.)*(x_))^{(n_.)})*((e_.) + (f_.)*(x_))^{(m_.)}, x_Symbol] :> \text{Simp}[(e + f*x)^n*(F^{(a + b*(c + d*x)^n})/(b*f*n*(c + d*x)^n * \text{Log}[F])), x] /;$ $\text{FreeQ}\{F, a, b, c, d, e, f, n\}, x\} \&\& \text{EqQ}[m, n - 1] \&\& \text{EqQ}[d*e - c*f, 0]$

Rule 2243

$\text{Int}[(F_)^{((a_.) + (b_.)*((c_.) + (d_.)*(x_))^{(n_.)})*((c_.) + (d_.)*(x_))^{(m_.)}, x_Symbol] :> \text{Simp}[(c + d*x)^{(m - n + 1)}*(F^{(a + b*(c + d*x)^n})/(b*d*n*L$

```
og[F])) , x] - Dist[(m - n + 1)/(b*n*Log[F]), Int[(c + d*x)^(m - n)*F^(a + b
*(c + d*x)^n), x], x] /; FreeQ[{F, a, b, c, d}, x] && IntegerQ[2*(m + 1)/n
]) && LtQ[0, (m + 1)/n, 5] && IntegerQ[n] && (LtQ[0, n, m + 1] || LtQ[m, n,
0])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2}e^{x^2} x^2 - \int e^{x^2} x dx \\ &= -\frac{e^{x^2}}{2} + \frac{1}{2}e^{x^2} x^2 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.64

$$\int e^{x^2} x^3 dx = \frac{1}{2}e^{x^2}(-1 + x^2)$$

[In] Integrate[E^x^2*x^3,x]

[Out] (E^x^2*(-1 + x^2))/2

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.55

| method | result | size |
|------------------|--|------|
| gospers | $\frac{(x^2-1)e^{x^2}}{2}$ | 12 |
| risch | $\left(\frac{x^2}{2} - \frac{1}{2}\right)e^{x^2}$ | 13 |
| meijerg | $\frac{1}{2} - \frac{(-2x^2+2)e^{x^2}}{4}$ | 16 |
| derivativdivides | $-\frac{e^{x^2}}{2} + \frac{x^2 e^{x^2}}{2}$ | 17 |
| default | $-\frac{e^{x^2}}{2} + \frac{x^2 e^{x^2}}{2}$ | 17 |
| norman | $-\frac{e^{x^2}}{2} + \frac{x^2 e^{x^2}}{2}$ | 17 |
| parallelrisch | $-\frac{e^{x^2}}{2} + \frac{x^2 e^{x^2}}{2}$ | 17 |
| parts | $\frac{\sqrt{\pi} \operatorname{erfi}(x)x^3}{2} - \frac{3\sqrt{\pi} \left(\frac{x^3 \operatorname{erfi}(x)}{3} - \frac{2 \left(-\frac{e^{x^2}}{2} + \frac{x^2 e^{x^2}}{2} \right)}{3\sqrt{\pi}} \right)}{2}$ | 46 |

[In] `int(x^3*exp(x^2),x,method=_RETURNVERBOSE)`

[Out] `1/2*(x^2-1)*exp(x^2)`

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.50

$$\int e^{x^2} x^3 dx = \frac{1}{2} (x^2 - 1) e^{(x^2)}$$

[In] `integrate(x^3*exp(x^2),x, algorithm="fricas")`

[Out] `1/2*(x^2 - 1)*e^(x^2)`

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.45

$$\int e^{x^2} x^3 dx = \frac{(x^2 - 1) e^{x^2}}{2}$$

[In] `integrate(x**3*exp(x**2),x)`

[Out] `(x**2 - 1)*exp(x**2)/2`

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.50

$$\int e^{x^2} x^3 dx = \frac{1}{2} (x^2 - 1) e^{(x^2)}$$

[In] `integrate(x^3*exp(x^2),x, algorithm="maxima")`

[Out] `1/2*(x^2 - 1)*e^(x^2)`

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.50

$$\int e^{x^2} x^3 dx = \frac{1}{2} (x^2 - 1) e^{(x^2)}$$

```
[In] integrate(x^3*exp(x^2),x, algorithm="giac")
```

```
[Out] 1/2*(x^2 - 1)*e^(x^2)
```

Mupad [B] (verification not implemented)

Time = 15.79 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.50

$$\int e^{x^2} x^3 dx = \frac{e^{x^2} (x^2 - 1)}{2}$$

```
[In] int(x^3*exp(x^2),x)
```

```
[Out] (exp(x^2)*(x^2 - 1))/2
```

$$3.23 \quad \int \left(-\frac{1}{\log^2(x)} + \frac{1}{\log(x)} \right) dx$$

| | |
|---|-----|
| Optimal result | 203 |
| Rubi [A] (verified) | 203 |
| Mathematica [A] (verified) | 204 |
| Maple [A] (verified) | 204 |
| Fricas [A] (verification not implemented) | 205 |
| Sympy [A] (verification not implemented) | 205 |
| Maxima [C] (verification not implemented) | 205 |
| Giac [A] (verification not implemented) | 205 |
| Mupad [B] (verification not implemented) | 206 |

Optimal result

Integrand size = 11, antiderivative size = 6

$$\int \left(-\frac{1}{\log^2(x)} + \frac{1}{\log(x)} \right) dx = \frac{x}{\log(x)}$$

[Out] x/ln(x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {2334, 2335}

$$\int \left(-\frac{1}{\log^2(x)} + \frac{1}{\log(x)} \right) dx = \frac{x}{\log(x)}$$

[In] Int[-Log[x]^(-2) + Log[x]^(-1), x]

[Out] x/Log[x]

Rule 2334

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_), x_Symbol] :> Simp[x*((a + b
*Log[c*x^n])^(p + 1)/(b*n*(p + 1))), x] - Dist[1/(b*n*(p + 1)), Int[(a + b*
Log[c*x^n])^(p + 1), x], x] /; FreeQ[{a, b, c, n}, x] && LtQ[p, -1] && Inte
gerQ[2*p]
```

Rule 2335

```
Int[Log[(c_.)*(x_)^(-1), x_Symbol] :> Simp[LogIntegral[c*x]/c, x] /; FreeQ
[c, x]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= - \int \frac{1}{\log^2(x)} dx + \int \frac{1}{\log(x)} dx \\
&= \frac{x}{\log(x)} + \text{LogIntegral}(x) - \int \frac{1}{\log(x)} dx \\
&= \frac{x}{\log(x)}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \left(-\frac{1}{\log^2(x)} + \frac{1}{\log(x)} \right) dx = \frac{x}{\log(x)}$$

[In] Integrate[-Log[x]^(-2) + Log[x]^(-1),x]

[Out] x/Log[x]

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.17

| method | result | size |
|---------------|--------------------|------|
| default | $\frac{x}{\ln(x)}$ | 7 |
| norman | $\frac{x}{\ln(x)}$ | 7 |
| risch | $\frac{x}{\ln(x)}$ | 7 |
| parallelrisch | $\frac{x}{\ln(x)}$ | 7 |
| parts | $\frac{x}{\ln(x)}$ | 7 |

[In] int(1/ln(x)-1/ln(x)^2,x,method=_RETURNVERBOSE)

[Out] x/ln(x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \left(-\frac{1}{\log^2(x)} + \frac{1}{\log(x)} \right) dx = \frac{x}{\log(x)}$$

[In] integrate(1/log(x)-1/log(x)^2,x, algorithm="fricas")

[Out] x/log(x)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 3, normalized size of antiderivative = 0.50

$$\int \left(-\frac{1}{\log^2(x)} + \frac{1}{\log(x)} \right) dx = \frac{x}{\log(x)}$$

[In] integrate(1/ln(x)-1/ln(x)**2,x)

[Out] x/log(x)

Maxima [C] (verification not implemented)

Result contains higher order function than in optimal. Order 4 vs. order 3.

Time = 0.25 (sec) , antiderivative size = 12, normalized size of antiderivative = 2.00

$$\int \left(-\frac{1}{\log^2(x)} + \frac{1}{\log(x)} \right) dx = \text{Ei}(\log(x)) - \Gamma(-1, -\log(x))$$

[In] integrate(1/log(x)-1/log(x)^2,x, algorithm="maxima")

[Out] Ei(log(x)) - gamma(-1, -log(x))

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \left(-\frac{1}{\log^2(x)} + \frac{1}{\log(x)} \right) dx = \frac{x}{\log(x)}$$

[In] integrate(1/log(x)-1/log(x)^2,x, algorithm="giac")

[Out] x/log(x)

Mupad [B] (verification not implemented)

Time = 15.23 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \left(-\frac{1}{\log^2(x)} + \frac{1}{\log(x)} \right) dx = \frac{x}{\ln(x)}$$

[In] int(1/log(x) - 1/log(x)^2,x)

[Out] x/log(x)

3.24 $\int \sqrt{2-x}\sqrt{-1+x} dx$

| | |
|---|-----|
| Optimal result | 207 |
| Rubi [A] (verified) | 207 |
| Mathematica [A] (verified) | 208 |
| Maple [A] (verified) | 209 |
| Fricas [A] (verification not implemented) | 209 |
| Sympy [C] (verification not implemented) | 209 |
| Maxima [A] (verification not implemented) | 210 |
| Giac [A] (verification not implemented) | 210 |
| Mupad [B] (verification not implemented) | 210 |

Optimal result

Integrand size = 17, antiderivative size = 53

$$\int \sqrt{2-x}\sqrt{-1+x} dx = \frac{1}{4}\sqrt{2-x}\sqrt{-1+x} - \frac{1}{2}(2-x)^{3/2}\sqrt{-1+x} + \frac{1}{4}\arcsin(\sqrt{-1+x})$$

[Out] $1/4*(-1+x)^{(1/2)}*(2-x)^{(1/2)}-1/2*(2-x)^{(3/2)}*(-1+x)^{(1/2)}+1/4*\arcsin((-1+x)^{(1/2)})$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 51, normalized size of antiderivative = 0.96, number of steps used = 5, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.235$, Rules used = {52, 55, 633, 222}

$$\int \sqrt{2-x}\sqrt{-1+x} dx = -\frac{1}{8}\arcsin(3-2x) - \frac{1}{2}\sqrt{x-1}(2-x)^{3/2} + \frac{1}{4}\sqrt{x-1}\sqrt{2-x}$$

[In] Int[Sqrt[2 - x]*Sqrt[-1 + x],x]

[Out] (Sqrt[2 - x]*Sqrt[-1 + x])/4 - ((2 - x)^(3/2)*Sqrt[-1 + x])/2 - ArcSin[3 - 2*x]/8

Rule 52

Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] := Simp[(a + b*x)^(m + 1)*((c + d*x)^n/(b*(m + n + 1))), x] + Dist[n*((b*c - a*d)/(b*(m + n + 1))), Int[(a + b*x)^m*(c + d*x)^(n - 1), x], x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0] && GtQ[n, 0] && NeQ[m + n + 1, 0] && !(IGtQ[m, 0] && (!IntegerQ[n] || (GtQ[m, 0] && LtQ[m - n, 0]))) && !ILtQ[m + n + 2, 0] && IntLinearQ[a, b, c, d, m, n, x]

Rule 55

```
Int[1/(Sqrt[(a_) + (b_.)*(x_)]*Sqrt[(c_) + (d_.)*(x_)]), x_Symbol] := Int[
1/Sqrt[a*c - b*(a - c)*x - b^2*x^2], x] /; FreeQ[{a, b, c, d}, x] && EqQ[b
+ d, 0] && GtQ[a + c, 0]
```

Rule 222

```
Int[1/Sqrt[(a_) + (b_.)*(x_)^2], x_Symbol] := Simp[ArcSin[Rt[-b, 2]*(x/Sqrt
[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]
```

Rule 633

```
Int[((a_) + (b_.)*(x_) + (c_.)*(x_)^2)^(p_), x_Symbol] := Dist[1/(2*c*(-4*
(c/(b^2 - 4*a*c)))^p), Subst[Int[Simp[1 - x^2/(b^2 - 4*a*c), x]^p, x], x, b
+ 2*c*x], x] /; FreeQ[{a, b, c, p}, x] && GtQ[4*a - b^2/c, 0]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\frac{1}{2}(2-x)^{3/2}\sqrt{-1+x} + \frac{1}{4} \int \frac{\sqrt{2-x}}{\sqrt{-1+x}} dx \\
&= \frac{1}{4}\sqrt{2-x}\sqrt{-1+x} - \frac{1}{2}(2-x)^{3/2}\sqrt{-1+x} + \frac{1}{8} \int \frac{1}{\sqrt{2-x}\sqrt{-1+x}} dx \\
&= \frac{1}{4}\sqrt{2-x}\sqrt{-1+x} - \frac{1}{2}(2-x)^{3/2}\sqrt{-1+x} + \frac{1}{8} \int \frac{1}{\sqrt{-2+3x-x^2}} dx \\
&= \frac{1}{4}\sqrt{2-x}\sqrt{-1+x} - \frac{1}{2}(2-x)^{3/2}\sqrt{-1+x} - \frac{1}{8} \text{Subst} \left(\int \frac{1}{\sqrt{1-x^2}} dx, x, 3-2x \right) \\
&= \frac{1}{4}\sqrt{2-x}\sqrt{-1+x} - \frac{1}{2}(2-x)^{3/2}\sqrt{-1+x} - \frac{1}{8} \arcsin(3-2x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.12 (sec) , antiderivative size = 53, normalized size of antiderivative = 1.00

$$\int \sqrt{2-x}\sqrt{-1+x} dx = \frac{1}{4}\sqrt{-2+3x-x^2} \left(-3+2x - \frac{\text{arctanh}\left(\frac{1}{\sqrt{\frac{-2+x}{-1+x}}}\right)}{\sqrt{-2+x}\sqrt{-1+x}} \right)$$

```
[In] Integrate[Sqrt[2 - x]*Sqrt[-1 + x],x]
```

```
[Out] (Sqrt[-2 + 3*x - x^2]*(-3 + 2*x - ArcTanh[1/Sqrt[(-2 + x)/(-1 + x)]]/(Sqrt[-2 + x]*Sqrt[-1 + x]))/4
```

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 61, normalized size of antiderivative = 1.15

| method | result | size |
|---------|--|------|
| default | $-\frac{(2-x)^{\frac{3}{2}}\sqrt{-1+x}}{2} + \frac{\sqrt{-1+x}\sqrt{2-x}}{4} + \frac{\sqrt{(2-x)(-1+x)} \arcsin(-3+2x)}{8\sqrt{2-x}\sqrt{-1+x}}$ | 61 |
| risch | $-\frac{(-3+2x)\sqrt{-1+x}(-2+x)\sqrt{(2-x)(-1+x)}}{4\sqrt{-(-1+x)(-2+x)}\sqrt{2-x}} + \frac{\sqrt{(2-x)(-1+x)} \arcsin(-3+2x)}{8\sqrt{2-x}\sqrt{-1+x}}$ | 76 |

[In] `int((-1+x)^(1/2)*(2-x)^(1/2),x,method=_RETURNVERBOSE)`[Out]
$$-1/2*(2-x)^(3/2)*(-1+x)^(1/2)+1/4*(-1+x)^(1/2)*(2-x)^(1/2)+1/8*((2-x)*(-1+x))^(1/2)/(2-x)^(1/2)/(-1+x)^(1/2)*\arcsin(-3+2*x)$$
Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 52, normalized size of antiderivative = 0.98

$$\int \sqrt{2-x}\sqrt{-1+x} dx$$

$$= \frac{1}{4}(2x-3)\sqrt{x-1}\sqrt{-x+2} - \frac{1}{8} \arctan\left(\frac{(2x-3)\sqrt{x-1}\sqrt{-x+2}}{2(x^2-3x+2)}\right)$$

[In] `integrate((-1+x)^(1/2)*(2-x)^(1/2),x, algorithm="fricas")`[Out]
$$1/4*(2*x-3)*\sqrt{x-1}*\sqrt{-x+2} - 1/8*\arctan(1/2*(2*x-3)*\sqrt{x-1}*\sqrt{-x+2}/(x^2-3*x+2))$$
Sympy [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 1.89 (sec) , antiderivative size = 124, normalized size of antiderivative = 2.34

$$\int \sqrt{2-x}\sqrt{-1+x} dx = \begin{cases} -\frac{i \operatorname{acosh}(\sqrt{x-1})}{4} + \frac{i(x-1)^{\frac{5}{2}}}{2\sqrt{x-2}} - \frac{3i(x-1)^{\frac{3}{2}}}{4\sqrt{x-2}} + \frac{i\sqrt{x-1}}{4\sqrt{x-2}} & \text{for } |x-1| > 1 \\ \frac{\operatorname{asin}(\sqrt{x-1})}{4} - \frac{(x-1)^{\frac{5}{2}}}{2\sqrt{2-x}} + \frac{3(x-1)^{\frac{3}{2}}}{4\sqrt{2-x}} - \frac{\sqrt{x-1}}{4\sqrt{2-x}} & \text{otherwise} \end{cases}$$

[In] `integrate((-1+x)**(1/2)*(2-x)**(1/2),x)`[Out]
$$\text{Piecewise}((-I*\operatorname{acosh}(\sqrt{x-1}))/4 + I*(x-1)**(5/2)/(2*\sqrt{x-2}) - 3*I*(x-1)**(3/2)/(4*\sqrt{x-2}) + I*\sqrt{x-1}/(4*\sqrt{x-2}), \operatorname{Abs}(x-1) > 1), (\operatorname{asin}(\sqrt{x-1}))/4 - (x-1)**(5/2)/(2*\sqrt{2-x}) + 3*(x-1)**(3/2)/(4*\sqrt{2-x}) - \sqrt{x-1}/(4*\sqrt{2-x}), \text{True}))$$

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.72

$$\int \sqrt{2-x}\sqrt{-1+x} dx = \frac{1}{2} \sqrt{-x^2 + 3x - 2}x - \frac{3}{4} \sqrt{-x^2 + 3x - 2} + \frac{1}{8} \arcsin(2x - 3)$$

[In] integrate((-1+x)^(1/2)*(2-x)^(1/2),x, algorithm="maxima")

[Out] 1/2*sqrt(-x^2 + 3*x - 2)*x - 3/4*sqrt(-x^2 + 3*x - 2) + 1/8*arcsin(2*x - 3)

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 42, normalized size of antiderivative = 0.79

$$\int \sqrt{2-x}\sqrt{-1+x} dx = \frac{1}{4} (2x + 1)\sqrt{x-1}\sqrt{-x+2} - \sqrt{x-1}\sqrt{-x+2} + \frac{1}{4} \arcsin(\sqrt{x-1})$$

[In] integrate((-1+x)^(1/2)*(2-x)^(1/2),x, algorithm="giac")

[Out] 1/4*(2*x + 1)*sqrt(x - 1)*sqrt(-x + 2) - sqrt(x - 1)*sqrt(-x + 2) + 1/4*arcsin(sqrt(x - 1))

Mupad [B] (verification not implemented)

Time = 0.12 (sec) , antiderivative size = 41, normalized size of antiderivative = 0.77

$$\int \sqrt{2-x}\sqrt{-1+x} dx = \left(\frac{x}{2} - \frac{3}{4}\right) \sqrt{x-1}\sqrt{2-x} - \frac{\ln\left(x - \frac{3}{2} - \sqrt{x-1}\sqrt{2-x}\right)}{8}$$

[In] int((x - 1)^(1/2)*(2 - x)^(1/2),x)

[Out] (x/2 - 3/4)*(x - 1)^(1/2)*(2 - x)^(1/2) - (log(x - (x - 1)^(1/2)*(2 - x)^(1/2) - 3/2))/8

3.25 $\int \frac{-1+x^6}{-1-x+x^3+x^4} dx$

| | |
|---|-----|
| Optimal result | 211 |
| Rubi [A] (verified) | 211 |
| Mathematica [A] (verified) | 212 |
| Maple [A] (verified) | 212 |
| Fricas [A] (verification not implemented) | 212 |
| Sympy [A] (verification not implemented) | 213 |
| Maxima [A] (verification not implemented) | 213 |
| Giac [A] (verification not implemented) | 213 |
| Mupad [B] (verification not implemented) | 213 |

Optimal result

Integrand size = 19, antiderivative size = 16

$$\int \frac{-1+x^6}{-1-x+x^3+x^4} dx = x - \frac{x^2}{2} + \frac{x^3}{3}$$

[Out] $x-1/2*x^2+1/3*x^3$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.053$, Rules used = {1600}

$$\int \frac{-1+x^6}{-1-x+x^3+x^4} dx = \frac{x^3}{3} - \frac{x^2}{2} + x$$

[In] $\text{Int}[(-1 + x^6)/(-1 - x + x^3 + x^4), x]$

[Out] $x - x^2/2 + x^3/3$

Rule 1600

$\text{Int}[(u_*)*(P_x)^{(p_*)}*(Q_x)^{(q_*)}, x_Symbol] \rightarrow \text{Int}[u*PolynomialQuotient[P_x, Q_x, x]^p*Q_x^{(p+q)}, x] /; \text{FreeQ}[q, x] \ \&\& \ \text{PolyQ}[P_x, x] \ \&\& \ \text{PolyQ}[Q_x, x] \ \&\& \ \text{EqQ}[PolynomialRemainder[P_x, Q_x, x], 0] \ \&\& \ \text{IntegerQ}[p] \ \&\& \ \text{LtQ}[p*q, 0]$

Rubi steps

$$\begin{aligned} \text{integral} &= \int (1 - x + x^2) dx \\ &= x - \frac{x^2}{2} + \frac{x^3}{3} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \frac{-1 + x^6}{-1 - x + x^3 + x^4} dx = x - \frac{x^2}{2} + \frac{x^3}{3}$$

[In] Integrate[(-1 + x^6)/(-1 - x + x^3 + x^4),x]

[Out] x - x^2/2 + x^3/3

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.81

| method | result | size |
|---------------|---------------------------------------|------|
| default | $x - \frac{1}{2}x^2 + \frac{1}{3}x^3$ | 13 |
| norman | $x - \frac{1}{2}x^2 + \frac{1}{3}x^3$ | 13 |
| risch | $x - \frac{1}{2}x^2 + \frac{1}{3}x^3$ | 13 |
| parallelrisch | $x - \frac{1}{2}x^2 + \frac{1}{3}x^3$ | 13 |
| parts | $x - \frac{1}{2}x^2 + \frac{1}{3}x^3$ | 13 |
| gospers | $\frac{x(2x^2-3x+6)}{6}$ | 14 |

[In] int((x^6-1)/(x^4+x^3-x-1),x,method=_RETURNVERBOSE)

[Out] x-1/2*x^2+1/3*x^3

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{-1 + x^6}{-1 - x + x^3 + x^4} dx = \frac{1}{3}x^3 - \frac{1}{2}x^2 + x$$

[In] integrate((x^6-1)/(x^4+x^3-x-1),x, algorithm="fricas")

[Out] 1/3*x^3 - 1/2*x^2 + x

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.62

$$\int \frac{-1 + x^6}{-1 - x + x^3 + x^4} dx = \frac{x^3}{3} - \frac{x^2}{2} + x$$

[In] integrate((x**6-1)/(x**4+x**3-x-1),x)

[Out] x**3/3 - x**2/2 + x

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{-1 + x^6}{-1 - x + x^3 + x^4} dx = \frac{1}{3} x^3 - \frac{1}{2} x^2 + x$$

[In] integrate((x^6-1)/(x^4+x^3-x-1),x, algorithm="maxima")

[Out] 1/3*x^3 - 1/2*x^2 + x

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{-1 + x^6}{-1 - x + x^3 + x^4} dx = \frac{1}{3} x^3 - \frac{1}{2} x^2 + x$$

[In] integrate((x^6-1)/(x^4+x^3-x-1),x, algorithm="giac")

[Out] 1/3*x^3 - 1/2*x^2 + x

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.81

$$\int \frac{-1 + x^6}{-1 - x + x^3 + x^4} dx = \frac{x(2x^2 - 3x + 6)}{6}$$

[In] int(-(x^6 - 1)/(x - x^3 - x^4 + 1),x)

[Out] (x*(2*x^2 - 3*x + 6))/6

3.26 $\int (2 \log(x) + \log^2(x)) dx$

| | |
|---|-----|
| Optimal result | 214 |
| Rubi [A] (verified) | 214 |
| Mathematica [A] (verified) | 215 |
| Maple [A] (verified) | 215 |
| Fricas [A] (verification not implemented) | 216 |
| Sympy [A] (verification not implemented) | 216 |
| Maxima [B] (verification not implemented) | 216 |
| Giac [A] (verification not implemented) | 216 |
| Mupad [B] (verification not implemented) | 217 |

Optimal result

Integrand size = 9, antiderivative size = 6

$$\int (2 \log(x) + \log^2(x)) dx = x \log^2(x)$$

[Out] $x \cdot \ln(x)^2$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {2332, 2333}

$$\int (2 \log(x) + \log^2(x)) dx = x \log^2(x)$$

[In] `Int[2*Log[x] + Log[x]^2,x]`

[Out] $x \cdot \text{Log}[x]^2$

Rule 2332

`Int[Log[(c_.)*(x_)^(n_.)], x_Symbol] := Simp[x*Log[c*x^n], x] - Simp[n*x, x] /;` `FreeQ[{c, n}, x]`

Rule 2333

`Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_.), x_Symbol] := Simp[x*(a + b*Log[c*x^n])^p, x] - Dist[b*n*p, Int[(a + b*Log[c*x^n])^(p - 1), x], x] /;` `FreeQ[{a, b, c, n}, x] && GtQ[p, 0] && IntegerQ[2*p]`

Rubi steps

$$\begin{aligned}
\text{integral} &= 2 \int \log(x) dx + \int \log^2(x) dx \\
&= -2x + 2x \log(x) + x \log^2(x) - 2 \int \log(x) dx \\
&= x \log^2(x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (2\log(x) + \log^2(x)) dx = x \log^2(x)$$

[In] Integrate[2*Log[x] + Log[x]^2,x]

[Out] x*Log[x]^2

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.17

| method | result | size |
|---------------|--------------|------|
| default | $x \ln(x)^2$ | 7 |
| norman | $x \ln(x)^2$ | 7 |
| risch | $x \ln(x)^2$ | 7 |
| parallelrisch | $x \ln(x)^2$ | 7 |
| parts | $x \ln(x)^2$ | 7 |

[In] int(2*ln(x)+ln(x)^2,x,method=_RETURNVERBOSE)

[Out] x*ln(x)^2

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (2 \log(x) + \log^2(x)) dx = x \log(x)^2$$

[In] integrate(2*log(x)+log(x)^2,x, algorithm="fricas")

[Out] x*log(x)^2

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int (2 \log(x) + \log^2(x)) dx = x \log(x)^2$$

[In] integrate(2*ln(x)+ln(x)**2,x)

[Out] x*log(x)**2

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 21 vs. 2(6) = 12.

Time = 0.20 (sec) , antiderivative size = 21, normalized size of antiderivative = 3.50

$$\int (2 \log(x) + \log^2(x)) dx = (\log(x)^2 - 2 \log(x) + 2)x + 2x \log(x) - 2x$$

[In] integrate(2*log(x)+log(x)^2,x, algorithm="maxima")

[Out] (log(x)^2 - 2*log(x) + 2)*x + 2*x*log(x) - 2*x

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (2 \log(x) + \log^2(x)) dx = x \log(x)^2$$

[In] integrate(2*log(x)+log(x)^2,x, algorithm="giac")

[Out] x*log(x)^2

Mupad [B] (verification not implemented)

Time = 14.72 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (2\log(x) + \log^2(x)) dx = x \ln(x)^2$$

[In] int(2*log(x) + log(x)^2,x)

[Out] x*log(x)^2

3.27 $\int \frac{2x}{\sqrt{1-x^4}} dx$

| | |
|---|-----|
| Optimal result | 218 |
| Rubi [A] (verified) | 218 |
| Mathematica [A] (verified) | 219 |
| Maple [A] (verified) | 219 |
| Fricas [B] (verification not implemented) | 220 |
| Sympy [A] (verification not implemented) | 220 |
| Maxima [B] (verification not implemented) | 220 |
| Giac [A] (verification not implemented) | 221 |
| Mupad [B] (verification not implemented) | 221 |

Optimal result

Integrand size = 14, antiderivative size = 4

$$\int \frac{2x}{\sqrt{1-x^4}} dx = \arcsin(x^2)$$

[Out] arcsin(x^2)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.214$, Rules used = {12, 281, 222}

$$\int \frac{2x}{\sqrt{1-x^4}} dx = \arcsin(x^2)$$

[In] Int[(2*x)/Sqrt[1 - x^4],x]

[Out] ArcSin[x^2]

Rule 12

Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]

Rule 222

Int[1/Sqrt[(a_) + (b_.)*(x_)^2], x_Symbol] := Simp[ArcSin[Rt[-b, 2]*(x/Sqrt[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]

Rule 281

```
Int[(x_)^(m_)*((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] := With[{k = GCD[m
+ 1, n]}, Dist[1/k, Subst[Int[x^((m + 1)/k - 1)*(a + b*x^(n/k))^p, x], x, x
^k], x] /; k != 1] /; FreeQ[{a, b, p}, x] && IGtQ[n, 0] && IntegerQ[m]
```

Rubi steps

$$\begin{aligned} \text{integral} &= 2 \int \frac{x}{\sqrt{1-x^4}} dx \\ &= \text{Subst}\left(\int \frac{1}{\sqrt{1-x^2}} dx, x, x^2\right) \\ &= \arcsin(x^2) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.13 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \frac{2x}{\sqrt{1-x^4}} dx = \arcsin(x^2)$$

[In] Integrate[(2*x)/Sqrt[1 - x^4],x]

[Out] ArcSin[x^2]

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.25

| method | result | size |
|----------------|--|------|
| default | $\arcsin(x^2)$ | 5 |
| meijerg | $\arcsin(x^2)$ | 5 |
| elliptic | $\arcsin(x^2)$ | 5 |
| pseudoelliptic | $\arcsin(x^2)$ | 5 |
| trager | $\text{RootOf}(_Z^2 + 1) \ln(\text{RootOf}(_Z^2 + 1) \sqrt{-x^4 + 1} + x^2)$ | 29 |

[In] int(2*x/(-x^4+1)^(1/2),x,method=_RETURNVERBOSE)

[Out] arcsin(x^2)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 18 vs. $2(4) = 8$.

Time = 0.25 (sec) , antiderivative size = 18, normalized size of antiderivative = 4.50

$$\int \frac{2x}{\sqrt{1-x^4}} dx = -2 \arctan \left(\frac{\sqrt{-x^4+1}-1}{x^2} \right)$$

[In] integrate(2*x/(-x^4+1)^(1/2),x, algorithm="fricas")

[Out] -2*arctan((sqrt(-x^4 + 1) - 1)/x^2)

Sympy [A] (verification not implemented)

Time = 0.46 (sec) , antiderivative size = 20, normalized size of antiderivative = 5.00

$$\int \frac{2x}{\sqrt{1-x^4}} dx = 2 \left(\begin{cases} -\frac{i \operatorname{acosh}(x^2)}{2} & \text{for } |x^4| > 1 \\ \frac{\operatorname{asin}(x^2)}{2} & \text{otherwise} \end{cases} \right)$$

[In] integrate(2*x/(-x**4+1)**(1/2),x)

[Out] 2*Piecewise((-I*acosh(x**2)/2, Abs(x**4) > 1), (asin(x**2)/2, True))

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 16 vs. $2(4) = 8$.

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 4.00

$$\int \frac{2x}{\sqrt{1-x^4}} dx = -\arctan \left(\frac{\sqrt{-x^4+1}}{x^2} \right)$$

[In] integrate(2*x/(-x^4+1)^(1/2),x, algorithm="maxima")

[Out] -arctan(sqrt(-x^4 + 1)/x^2)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \frac{2x}{\sqrt{1-x^4}} dx = \arcsin(x^2)$$

[In] integrate(2*x/(-x^4+1)^(1/2),x, algorithm="giac")

[Out] arcsin(x^2)

Mupad [B] (verification not implemented)

Time = 14.90 (sec) , antiderivative size = 14, normalized size of antiderivative = 3.50

$$\int \frac{2x}{\sqrt{1-x^4}} dx = \operatorname{atan}\left(\frac{x^2}{\sqrt{1-x^4}}\right)$$

[In] int((2*x)/(1 - x^4)^(1/2),x)

[Out] atan(x^2/(1 - x^4)^(1/2))

3.28 $\int \frac{1+x^2}{1+x} dx$

| | |
|---|-----|
| Optimal result | 222 |
| Rubi [A] (verified) | 222 |
| Mathematica [A] (verified) | 223 |
| Maple [A] (verified) | 223 |
| Fricas [A] (verification not implemented) | 223 |
| Sympy [A] (verification not implemented) | 224 |
| Maxima [A] (verification not implemented) | 224 |
| Giac [A] (verification not implemented) | 224 |
| Mupad [B] (verification not implemented) | 224 |

Optimal result

Integrand size = 11, antiderivative size = 17

$$\int \frac{1+x^2}{1+x} dx = -x + \frac{x^2}{2} + 2 \log(1+x)$$

[Out] $-x+1/2*x^2+2*\ln(1+x)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.091$, Rules used = {711}

$$\int \frac{1+x^2}{1+x} dx = \frac{x^2}{2} - x + 2 \log(x+1)$$

[In] $\text{Int}[(1+x^2)/(1+x), x]$

[Out] $-x + x^2/2 + 2*\text{Log}[1+x]$

Rule 711

$\text{Int}[(d + (e \cdot x)^m) \cdot ((a + (c \cdot x)^2)^p), x_Symbol] \rightarrow \text{Int}[\text{ExpandIntegrand}[(d + e \cdot x)^m \cdot (a + c \cdot x^2)^p, x], x] /;$ $\text{FreeQ}\{a, c, d, e, m, x\}$ && $\text{NeQ}[c \cdot d^2 + a \cdot e^2, 0]$ && $\text{IGtQ}[p, 0]$

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(-1 + x + \frac{2}{1+x} \right) dx \\ &= -x + \frac{x^2}{2} + 2 \log(1+x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.06

$$\int \frac{1+x^2}{1+x} dx = \frac{1}{2}(-3 - 2x + x^2 + 4 \log(1+x))$$

[In] Integrate[(1 + x^2)/(1 + x),x]

[Out] (-3 - 2*x + x^2 + 4*Log[1 + x])/2

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.94

| method | result | size |
|--------------|------------------------------------|------|
| default | $-x + \frac{x^2}{2} + 2 \ln(1+x)$ | 16 |
| norman | $-x + \frac{x^2}{2} + 2 \ln(1+x)$ | 16 |
| meijerg | $-\frac{x(-3x+6)}{6} + 2 \ln(1+x)$ | 16 |
| risch | $-x + \frac{x^2}{2} + 2 \ln(1+x)$ | 16 |
| parallelrisc | $-x + \frac{x^2}{2} + 2 \ln(1+x)$ | 16 |

[In] int((x^2+1)/(1+x),x,method=_RETURNVERBOSE)

[Out] -x+1/2*x^2+2*ln(1+x)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.88

$$\int \frac{1+x^2}{1+x} dx = \frac{1}{2}x^2 - x + 2 \log(x+1)$$

[In] integrate((x^2+1)/(1+x),x, algorithm="fricas")

[Out] 1/2*x^2 - x + 2*log(x + 1)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.71

$$\int \frac{1+x^2}{1+x} dx = \frac{x^2}{2} - x + 2 \log(x+1)$$

[In] integrate((x**2+1)/(1+x),x)

[Out] x**2/2 - x + 2*log(x + 1)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.88

$$\int \frac{1+x^2}{1+x} dx = \frac{1}{2} x^2 - x + 2 \log(x+1)$$

[In] integrate((x^2+1)/(1+x),x, algorithm="maxima")

[Out] 1/2*x^2 - x + 2*log(x + 1)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.94

$$\int \frac{1+x^2}{1+x} dx = \frac{1}{2} x^2 - x + 2 \log(|x+1|)$$

[In] integrate((x^2+1)/(1+x),x, algorithm="giac")

[Out] 1/2*x^2 - x + 2*log(abs(x + 1))

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.88

$$\int \frac{1+x^2}{1+x} dx = 2 \ln(x+1) - x + \frac{x^2}{2}$$

[In] int((x^2 + 1)/(x + 1),x)

[Out] 2*log(x + 1) - x + x^2/2

$$3.29 \quad \int \frac{-2 - 2 \sin(x) + \sin^2(x) + \sin^3(x)}{1 + 2 \sin(x) + \sin^2(x)} dx$$

| | |
|---|-----|
| Optimal result | 225 |
| Rubi [A] (verified) | 225 |
| Mathematica [A] (verified) | 226 |
| Maple [A] (verified) | 226 |
| Fricas [A] (verification not implemented) | 227 |
| Sympy [B] (verification not implemented) | 227 |
| Maxima [B] (verification not implemented) | 228 |
| Giac [B] (verification not implemented) | 228 |
| Mupad [B] (verification not implemented) | 229 |

Optimal result

Integrand size = 27, antiderivative size = 17

$$\int \frac{-2 - 2 \sin(x) + \sin^2(x) + \sin^3(x)}{1 + 2 \sin(x) + \sin^2(x)} dx = -x - \cos(x) + \frac{\cos(x)}{1 + \sin(x)}$$

[Out] $-x - \cos(x) + \cos(x)/(1 + \sin(x))$

Rubi [A] (verified)

Time = 0.10 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {4486, 2727, 2718}

$$\int \frac{-2 - 2 \sin(x) + \sin^2(x) + \sin^3(x)}{1 + 2 \sin(x) + \sin^2(x)} dx = -x - \cos(x) + \frac{\cos(x)}{\sin(x) + 1}$$

[In] $\text{Int}[(-2 - 2*\text{Sin}[x] + \text{Sin}[x]^2 + \text{Sin}[x]^3)/(1 + 2*\text{Sin}[x] + \text{Sin}[x]^2), x]$

[Out] $-x - \text{Cos}[x] + \text{Cos}[x]/(1 + \text{Sin}[x])$

Rule 2718

$\text{Int}[\sin[(c_.) + (d_.)*(x_)], x_Symbol] \rightarrow \text{Simp}[-\text{Cos}[c + d*x]/d, x] /;$ FreeQ[{c, d}, x]

Rule 2727

$\text{Int}[((a_.) + (b_.)*\sin[(c_.) + (d_.)*(x_)])^{(-1)}, x_Symbol] \rightarrow \text{Simp}[-\text{Cos}[c + d*x]/(d*(b + a*\text{Sin}[c + d*x])), x] /;$ FreeQ[{a, b, c, d}, x] && EqQ[a^2 - b^2, 0]

Rule 4486

```
Int[u_, x_Symbol] :> With[{v = ExpandTrig[u, x]}, Int[v, x] /; SumQ[v]] /;
!InertTrigFreeQ[u]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(-1 + \frac{1}{-1 - \sin(x)} + \sin(x) \right) dx \\ &= -x + \int \frac{1}{-1 - \sin(x)} dx + \int \sin(x) dx \\ &= -x - \cos(x) + \frac{\cos(x)}{1 + \sin(x)} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.08 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.82

$$\int \frac{-2 - 2 \sin(x) + \sin^2(x) + \sin^3(x)}{1 + 2 \sin(x) + \sin^2(x)} dx = -x - \cos(x) - \frac{2 \sin\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right) + \sin\left(\frac{x}{2}\right)}$$

```
[In] Integrate[(-2 - 2*Sin[x] + Sin[x]^2 + Sin[x]^3)/(1 + 2*Sin[x] + Sin[x]^2), x]
```

```
[Out] -x - Cos[x] - (2*Sin[x/2])/(Cos[x/2] + Sin[x/2])
```

Maple [A] (verified)

Time = 0.14 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.71

| method | result |
|--------------|---|
| parallelrisc | $-x + \tan(x)(-1 + \sin(x))$ |
| default | $\frac{2}{1 + \tan\left(\frac{x}{2}\right)} - \frac{2}{1 + \tan\left(\frac{x}{2}\right)^2} - 2 \arctan\left(\tan\left(\frac{x}{2}\right)\right)$ |
| risc | $-x - \frac{e^{ix}}{2} - \frac{e^{-ix}}{2} + \frac{2}{i + e^{ix}}$ |
| norman | $\frac{-2 \tan\left(\frac{x}{2}\right) - 2 \tan\left(\frac{x}{2}\right)^2 - 2 \tan\left(\frac{x}{2}\right)^3 - 2 \tan\left(\frac{x}{2}\right)^4 + 2 \tan\left(\frac{x}{2}\right)^8 + 2 \tan\left(\frac{x}{2}\right)^7 + 2 \tan\left(\frac{x}{2}\right)^6 + 2 \tan\left(\frac{x}{2}\right)^5 - x - 3x \tan\left(\frac{x}{2}\right) - 6x \tan\left(\frac{x}{2}\right)^2 - 10x \tan\left(\frac{x}{2}\right)^3}{\left(1 + \tan\left(\frac{x}{2}\right)^2\right)^3 \left(1 + \tan\left(\frac{x}{2}\right)\right)^3}$ |

```
[In] int((sin(x)^3+sin(x)^2-2*sin(x)-2)/(1+sin(x)^2+2*sin(x)),x,method=_RETURNVE
RBOSE)
```

```
[Out] -x+tan(x)*(-1+sin(x))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.71

$$\int \frac{-2 - 2 \sin(x) + \sin^2(x) + \sin^3(x)}{1 + 2 \sin(x) + \sin^2(x)} dx$$

$$= -\frac{x \cos(x) + \cos(x)^2 + (x + \cos(x) + 1) \sin(x) + x - 1}{\cos(x) + \sin(x) + 1}$$

```
[In] integrate((sin(x)^3+sin(x)^2-2*sin(x)-2)/(1+sin(x)^2+2*sin(x)),x, algorithm
="fricas")
```

```
[Out] -(x*cos(x) + cos(x)^2 + (x + cos(x) + 1)*sin(x) + x - 1)/(cos(x) + sin(x) +
1)
```

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 162 vs. 2(12) = 24.

Time = 8.20 (sec) , antiderivative size = 162, normalized size of antiderivative = 9.53

$$\int \frac{-2 - 2 \sin(x) + \sin^2(x) + \sin^3(x)}{1 + 2 \sin(x) + \sin^2(x)} dx = -\frac{x \tan^3\left(\frac{x}{2}\right)}{\tan^3\left(\frac{x}{2}\right) + \tan^2\left(\frac{x}{2}\right) + \tan\left(\frac{x}{2}\right) + 1}$$

$$- \frac{x \tan^2\left(\frac{x}{2}\right)}{\tan^3\left(\frac{x}{2}\right) + \tan^2\left(\frac{x}{2}\right) + \tan\left(\frac{x}{2}\right) + 1}$$

$$- \frac{x \tan\left(\frac{x}{2}\right)}{\tan^3\left(\frac{x}{2}\right) + \tan^2\left(\frac{x}{2}\right) + \tan\left(\frac{x}{2}\right) + 1}$$

$$- \frac{x}{\tan^3\left(\frac{x}{2}\right) + \tan^2\left(\frac{x}{2}\right) + \tan\left(\frac{x}{2}\right) + 1}$$

$$+ \frac{2 \tan^2\left(\frac{x}{2}\right)}{\tan^3\left(\frac{x}{2}\right) + \tan^2\left(\frac{x}{2}\right) + \tan\left(\frac{x}{2}\right) + 1}$$

$$- \frac{2 \tan\left(\frac{x}{2}\right)}{\tan^3\left(\frac{x}{2}\right) + \tan^2\left(\frac{x}{2}\right) + \tan\left(\frac{x}{2}\right) + 1}$$

```
[In] integrate((sin(x)**3+sin(x)**2-2*sin(x)-2)/(1+sin(x)**2+2*sin(x)),x)
```

```
[Out] -x*tan(x/2)**3/(tan(x/2)**3 + tan(x/2)**2 + tan(x/2) + 1) - x*tan(x/2)**2/(
tan(x/2)**3 + tan(x/2)**2 + tan(x/2) + 1) - x*tan(x/2)/(tan(x/2)**3 + tan(x
/2)**2 + tan(x/2) + 1) - x/(tan(x/2)**3 + tan(x/2)**2 + tan(x/2) + 1) + 2*t
an(x/2)**2/(tan(x/2)**3 + tan(x/2)**2 + tan(x/2) + 1) - 2*tan(x/2)/(tan(x/2
)**3 + tan(x/2)**2 + tan(x/2) + 1)
```

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 301 vs. 2(17) = 34.

Time = 0.28 (sec) , antiderivative size = 301, normalized size of antiderivative = 17.71

$$\int \frac{-2 - 2 \sin(x) + \sin^2(x) + \sin^3(x)}{1 + 2 \sin(x) + \sin^2(x)} dx$$

$$= -\frac{4 \left(\frac{12 \sin(x)}{\cos(x)+1} + \frac{11 \sin(x)^2}{(\cos(x)+1)^2} + \frac{9 \sin(x)^3}{(\cos(x)+1)^3} + \frac{3 \sin(x)^4}{(\cos(x)+1)^4} + 5 \right)}{3 \left(\frac{3 \sin(x)}{\cos(x)+1} + \frac{4 \sin(x)^2}{(\cos(x)+1)^2} + \frac{4 \sin(x)^3}{(\cos(x)+1)^3} + \frac{3 \sin(x)^4}{(\cos(x)+1)^4} + \frac{\sin(x)^5}{(\cos(x)+1)^5} + 1 \right)}$$

$$+ \frac{2 \left(\frac{9 \sin(x)}{\cos(x)+1} + \frac{3 \sin(x)^2}{(\cos(x)+1)^2} + 4 \right)}{3 \left(\frac{3 \sin(x)}{\cos(x)+1} + \frac{3 \sin(x)^2}{(\cos(x)+1)^2} + \frac{\sin(x)^3}{(\cos(x)+1)^3} + 1 \right)} + \frac{4 \left(\frac{3 \sin(x)}{\cos(x)+1} + \frac{3 \sin(x)^2}{(\cos(x)+1)^2} + 2 \right)}{3 \left(\frac{3 \sin(x)}{\cos(x)+1} + \frac{3 \sin(x)^2}{(\cos(x)+1)^2} + \frac{\sin(x)^3}{(\cos(x)+1)^3} + 1 \right)}$$

$$+ \frac{4 \left(\frac{3 \sin(x)}{\cos(x)+1} + 1 \right)}{3 \left(\frac{3 \sin(x)}{\cos(x)+1} + \frac{3 \sin(x)^2}{(\cos(x)+1)^2} + \frac{\sin(x)^3}{(\cos(x)+1)^3} + 1 \right)} - 2 \arctan \left(\frac{\sin(x)}{\cos(x) + 1} \right)$$

[In] integrate((sin(x)^3+sin(x)^2-2*sin(x)-2)/(1+sin(x)^2+2*sin(x)),x, algorithm="maxima")

[Out] -4/3*(12*sin(x)/(cos(x) + 1) + 11*sin(x)^2/(cos(x) + 1)^2 + 9*sin(x)^3/(cos(x) + 1)^3 + 3*sin(x)^4/(cos(x) + 1)^4 + 5)/(3*sin(x)/(cos(x) + 1) + 4*sin(x)^2/(cos(x) + 1)^2 + 4*sin(x)^3/(cos(x) + 1)^3 + 3*sin(x)^4/(cos(x) + 1)^4 + sin(x)^5/(cos(x) + 1)^5 + 1) + 2/3*(9*sin(x)/(cos(x) + 1) + 3*sin(x)^2/(cos(x) + 1)^2 + 4)/(3*sin(x)/(cos(x) + 1) + 3*sin(x)^2/(cos(x) + 1)^2 + sin(x)^3/(cos(x) + 1)^3 + 1) + 4/3*(3*sin(x)/(cos(x) + 1) + 3*sin(x)^2/(cos(x) + 1)^2 + 2)/(3*sin(x)/(cos(x) + 1) + 3*sin(x)^2/(cos(x) + 1)^2 + sin(x)^3/(cos(x) + 1)^3 + 1) + 4/3*(3*sin(x)/(cos(x) + 1) + 1)/(3*sin(x)/(cos(x) + 1) + 3*sin(x)^2/(cos(x) + 1)^2 + sin(x)^3/(cos(x) + 1)^3 + 1) - 2*arctan(sin(x)/(cos(x) + 1))

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 39 vs. 2(17) = 34.

Time = 0.28 (sec) , antiderivative size = 39, normalized size of antiderivative = 2.29

$$\int \frac{-2 - 2 \sin(x) + \sin^2(x) + \sin^3(x)}{1 + 2 \sin(x) + \sin^2(x)} dx = -x + \frac{2 \left(\tan \left(\frac{1}{2} x \right)^2 - \tan \left(\frac{1}{2} x \right) \right)}{\tan \left(\frac{1}{2} x \right)^3 + \tan \left(\frac{1}{2} x \right)^2 + \tan \left(\frac{1}{2} x \right) + 1}$$

[In] integrate((sin(x)^3+sin(x)^2-2*sin(x)-2)/(1+sin(x)^2+2*sin(x)),x, algorithm="giac")

[Out] -x + 2*(tan(1/2*x)^2 - tan(1/2*x))/(tan(1/2*x)^3 + tan(1/2*x)^2 + tan(1/2*x) + 1)

Mupad [B] (verification not implemented)

Time = 14.99 (sec) , antiderivative size = 39, normalized size of antiderivative = 2.29

$$\int \frac{-2 - 2 \sin(x) + \sin^2(x) + \sin^3(x)}{1 + 2 \sin(x) + \sin^2(x)} dx = -x - \frac{2 \tan\left(\frac{x}{2}\right) - 2 \tan\left(\frac{x}{2}\right)^2}{\left(\tan\left(\frac{x}{2}\right)^2 + 1\right) \left(\tan\left(\frac{x}{2}\right) + 1\right)}$$

[In] `int(-(2*sin(x) - sin(x)^2 - sin(x)^3 + 2)/(2*sin(x) + sin(x)^2 + 1),x)`

[Out] `- x - (2*tan(x/2) - 2*tan(x/2)^2)/((tan(x/2)^2 + 1)*(tan(x/2) + 1))`

3.30 $\int \operatorname{csch}^2(x) dx$

| | |
|---|-----|
| Optimal result | 230 |
| Rubi [A] (verified) | 230 |
| Mathematica [A] (verified) | 231 |
| Maple [A] (verified) | 231 |
| Fricas [B] (verification not implemented) | 231 |
| Sympy [B] (verification not implemented) | 232 |
| Maxima [B] (verification not implemented) | 232 |
| Giac [B] (verification not implemented) | 232 |
| Mupad [B] (verification not implemented) | 233 |

Optimal result

Integrand size = 4, antiderivative size = 4

$$\int \operatorname{csch}^2(x) dx = -\operatorname{coth}(x)$$

[Out] $-\operatorname{coth}(x)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3852, 8}

$$\int \operatorname{csch}^2(x) dx = -\operatorname{coth}(x)$$

[In] `Int[Csch[x]^2,x]`

[Out] `-Coth[x]`

Rule 8

`Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]`

Rule 3852

`Int[csc[(c_.) + (d_.)*(x_)]^(n_), x_Symbol] := Dist[-d^(-1), Subst[Int[ExpandIntegrand[(1 + x^2)^(n/2 - 1), x], x], x, Cot[c + d*x]], x] /; FreeQ[{c, d}, x] && IGtQ[n/2, 0]`

Rubi steps

$$\begin{aligned} \text{integral} &= -(i\text{Subst}(\int 1 dx, x, -i \coth(x))) \\ &= -\coth(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \text{csch}^2(x) dx = -\coth(x)$$

[In] Integrate[Csch[x]^2,x]

[Out] -Coth[x]

Maple [A] (verified)

Time = 0.23 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.25

| method | result | size |
|--------------|-----------------------|------|
| default | $-\coth(x)$ | 5 |
| parallelrisc | $-\coth(x)$ | 5 |
| risc | $-\frac{2}{e^{2x}-1}$ | 11 |

[In] int(1/sinh(x)^2,x,method=_RETURNVERBOSE)

[Out] -coth(x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 20 vs. 2(4) = 8.

Time = 0.23 (sec) , antiderivative size = 20, normalized size of antiderivative = 5.00

$$\int \text{csch}^2(x) dx = -\frac{2}{\cosh(x)^2 + 2 \cosh(x) \sinh(x) + \sinh(x)^2 - 1}$$

[In] integrate(1/sinh(x)^2,x, algorithm="fricas")

[Out] -2/(cosh(x)^2 + 2*cosh(x)*sinh(x) + sinh(x)^2 - 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(3) = 6$.

Time = 0.23 (sec) , antiderivative size = 15, normalized size of antiderivative = 3.75

$$\int \operatorname{csch}^2(x) dx = -\frac{\tanh\left(\frac{x}{2}\right)}{2} - \frac{1}{2 \tanh\left(\frac{x}{2}\right)}$$

[In] integrate(1/sinh(x)**2,x)

[Out] -tanh(x/2)/2 - 1/(2*tanh(x/2))

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 10 vs. $2(4) = 8$.

Time = 0.19 (sec) , antiderivative size = 10, normalized size of antiderivative = 2.50

$$\int \operatorname{csch}^2(x) dx = \frac{2}{e^{(-2x)} - 1}$$

[In] integrate(1/sinh(x)^2,x, algorithm="maxima")

[Out] 2/(e^(-2*x) - 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 10 vs. $2(4) = 8$.

Time = 0.25 (sec) , antiderivative size = 10, normalized size of antiderivative = 2.50

$$\int \operatorname{csch}^2(x) dx = -\frac{2}{e^{(2x)} - 1}$$

[In] integrate(1/sinh(x)^2,x, algorithm="giac")

[Out] -2/(e^(2*x) - 1)

Mupad [B] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \operatorname{csch}^2(x) dx = -\operatorname{coth}(x)$$

[In] `int(1/sinh(x)^2,x)`

[Out] `-coth(x)`

3.31 $\int \sec^4(x) \tan^2(x) dx$

| | |
|---|-----|
| Optimal result | 234 |
| Rubi [A] (verified) | 234 |
| Mathematica [A] (verified) | 235 |
| Maple [A] (verified) | 235 |
| Fricas [A] (verification not implemented) | 236 |
| Sympy [B] (verification not implemented) | 236 |
| Maxima [A] (verification not implemented) | 236 |
| Giac [A] (verification not implemented) | 237 |
| Mupad [B] (verification not implemented) | 237 |

Optimal result

Integrand size = 9, antiderivative size = 17

$$\int \sec^4(x) \tan^2(x) dx = \frac{\tan^3(x)}{3} + \frac{\tan^5(x)}{5}$$

[Out] 1/5*tan(x)^5+1/3*tan(x)^3

Rubi [A] (verified)

Time = 0.03 (sec), antiderivative size = 17, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {2687, 14}

$$\int \sec^4(x) \tan^2(x) dx = \frac{\tan^5(x)}{5} + \frac{\tan^3(x)}{3}$$

[In] Int[Sec[x]^4*Tan[x]^2,x]

[Out] Tan[x]^3/3 + Tan[x]^5/5

Rule 14

```
Int[(u_)*((c_.)*(x_))^(m_.), x_Symbol] := Int[ExpandIntegrand[(c*x)^m*u, x], x] /; FreeQ[{c, m}, x] && SumQ[u] && !LinearQ[u, x] && !MatchQ[u, (a_ + (b_.)*(v_)) /; FreeQ[{a, b}, x] && InverseFunctionQ[v]]
```

Rule 2687

```
Int[sec[(e_.) + (f_.)*(x_)]^(m_)*((b_.)*tan[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] := Dist[1/f, Subst[Int[(b*x)^n*(1 + x^2)^(m/2 - 1), x], x, Tan[e + f*x]], x] /; FreeQ[{b, e, f, n}, x] && IntegerQ[m/2] && !(IntegerQ[(n - 1)/
```

2] && LtQ[0, n, m - 1])

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int x^2(1+x^2) dx, x, \tan(x)\right) \\ &= \text{Subst}\left(\int (x^2+x^4) dx, x, \tan(x)\right) \\ &= \frac{\tan^3(x)}{3} + \frac{\tan^5(x)}{5} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.59

$$\int \sec^4(x) \tan^2(x) dx = -\frac{2 \tan(x)}{15} - \frac{1}{15} \sec^2(x) \tan(x) + \frac{1}{5} \sec^4(x) \tan(x)$$

[In] Integrate[Sec[x]^4*Tan[x]^2,x]

[Out] (-2*Tan[x])/15 - (Sec[x]^2*Tan[x])/15 + (Sec[x]^4*Tan[x])/5

Maple [A] (verified)

Time = 1.00 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.82

| method | result | size |
|------------------|--|------|
| derivativdivides | $\frac{\tan(x)^5}{5} + \frac{\tan(x)^3}{3}$ | 14 |
| default | $\frac{\tan(x)^5}{5} + \frac{\tan(x)^3}{3}$ | 14 |
| risch | $-\frac{4i(15e^{6ix}-5e^{4ix}+5e^{2ix}+1)}{15(e^{2ix}+1)^5}$ | 36 |

[In] int(sec(x)^4*tan(x)^2,x,method=_RETURNVERBOSE)

[Out] 1/5*tan(x)^5+1/3*tan(x)^3

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.18

$$\int \sec^4(x) \tan^2(x) dx = -\frac{(2 \cos(x)^4 + \cos(x)^2 - 3) \sin(x)}{15 \cos(x)^5}$$

`[In] integrate(sec(x)^4*tan(x)^2,x, algorithm="fricas")``[Out] -1/15*(2*cos(x)^4 + cos(x)^2 - 3)*sin(x)/cos(x)^5`**Sympy [B] (verification not implemented)**

Leaf count of result is larger than twice the leaf count of optimal. 29 vs. 2(12) = 24.

Time = 0.02 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.71

$$\int \sec^4(x) \tan^2(x) dx = -\frac{2 \sin(x)}{15 \cos(x)} - \frac{\sin(x)}{15 \cos^3(x)} + \frac{\sin(x)}{5 \cos^5(x)}$$

`[In] integrate(sec(x)**4*tan(x)**2,x)``[Out] -2*sin(x)/(15*cos(x)) - sin(x)/(15*cos(x)**3) + sin(x)/(5*cos(x)**5)`**Maxima [A] (verification not implemented)**

none

Time = 0.19 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \sec^4(x) \tan^2(x) dx = \frac{1}{5} \tan(x)^5 + \frac{1}{3} \tan(x)^3$$

`[In] integrate(sec(x)^4*tan(x)^2,x, algorithm="maxima")``[Out] 1/5*tan(x)^5 + 1/3*tan(x)^3`

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \sec^4(x) \tan^2(x) dx = \frac{1}{5} \tan(x)^5 + \frac{1}{3} \tan(x)^3$$

[In] integrate(sec(x)^4*tan(x)^2,x, algorithm="giac")

[Out] 1/5*tan(x)^5 + 1/3*tan(x)^3

Mupad [B] (verification not implemented)

Time = 14.96 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \sec^4(x) \tan^2(x) dx = \frac{\tan(x)^5}{5} + \frac{\tan(x)^3}{3}$$

[In] int(tan(x)^2/cos(x)^4,x)

[Out] tan(x)^3/3 + tan(x)^5/5

3.32 $\int \sqrt{\csc(x) - \sin(x)} dx$

| | |
|---|-----|
| Optimal result | 238 |
| Rubi [A] (verified) | 238 |
| Mathematica [A] (verified) | 239 |
| Maple [A] (verified) | 239 |
| Fricas [A] (verification not implemented) | 240 |
| Sympy [F] | 240 |
| Maxima [B] (verification not implemented) | 240 |
| Giac [F] | 241 |
| Mupad [B] (verification not implemented) | 241 |

Optimal result

Integrand size = 11, antiderivative size = 13

$$\int \sqrt{\csc(x) - \sin(x)} dx = 2\sqrt{\cos(x) \cot(x)} \tan(x)$$

[Out] $2*(\cos(x)*\cot(x))^{(1/2)}*\tan(x)$

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.273$, Rules used = {4482, 4485, 2669}

$$\int \sqrt{\csc(x) - \sin(x)} dx = 2 \tan(x) \sqrt{\cos(x) \cot(x)}$$

[In] `Int[Sqrt[Csc[x] - Sin[x]],x]`

[Out] `2*Sqrt[Cos[x]*Cot[x]]*Tan[x]`

Rule 2669

`Int[((a_.)*sin[(e_.) + (f_.)*(x_.)])^(m_.)*((b_.)*tan[(e_.) + (f_.)*(x_.)])^(n_.), x_Symbol] := Simp[(-b)*(a*Sin[e + f*x])^m*((b*Tan[e + f*x])^(n - 1)/(f*m)), x] /; FreeQ[{a, b, e, f, m, n}, x] && EqQ[m + n - 1, 0]`

Rule 4482

`Int[u_, x_Symbol] := Int[TrigSimplify[u], x] /; TrigSimplifyQ[u]`

Rule 4485

```
Int[(u_.)*((v_)^(m_.)*(w_)^(n_.))^(p_), x_Symbol] := With[{uu = ActivateTrig[u], vv = ActivateTrig[v], ww = ActivateTrig[w]}, Dist[(vv^m*ww^n)^FracPart[p]/(vv^(m*FracPart[p])*ww^(n*FracPart[p]))], Int[uu*vv^(m*p)*ww^(n*p), x], x]] /; FreeQ[{m, n, p}, x] && !IntegerQ[p] && ( !InertTrigFreeQ[v] || !InertTrigFreeQ[w])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \sqrt{\cos(x) \cot(x)} dx \\ &= \frac{\sqrt{\cos(x) \cot(x)} \int \sqrt{\cos(x)} \sqrt{\cot(x)} dx}{\sqrt{\cos(x)} \sqrt{\cot(x)}} \\ &= 2\sqrt{\cos(x) \cot(x)} \tan(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \sqrt{\csc(x) - \sin(x)} dx = 2\sqrt{\cos(x) \cot(x)} \tan(x)$$

[In] Integrate[Sqrt[Csc[x] - Sin[x]], x]

[Out] 2*Sqrt[Cos[x]*Cot[x]]*Tan[x]

Maple [A] (verified)

Time = 0.60 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.92

| method | result | size |
|---------|--|------|
| default | $2\sqrt{\cos(x) \cot(x)} \tan(x)$ | 12 |
| risch | $-\frac{i\sqrt{2} \sqrt{\frac{i(e^{2ix}+1)^2 e^{-ix}}{e^{2ix}-1}} (e^{2ix}-1)}{e^{2ix}+1}$ | 51 |

[In] int((csc(x)-sin(x))^(1/2), x, method=_RETURNVERBOSE)

[Out] 2*(cos(x)*cot(x))^(1/2)*tan(x)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.46

$$\int \sqrt{\csc(x) - \sin(x)} dx = \frac{2 \sqrt{\frac{\cos(x)^2}{\sin(x)}} \sin(x)}{\cos(x)}$$

[In] integrate((csc(x)-sin(x))^(1/2),x, algorithm="fricas")

[Out] 2*sqrt(cos(x)^2/sin(x))*sin(x)/cos(x)

Sympy [F]

$$\int \sqrt{\csc(x) - \sin(x)} dx = \int \sqrt{-\sin(x) + \csc(x)} dx$$

[In] integrate((csc(x)-sin(x))**(1/2),x)

[Out] Integral(sqrt(-sin(x) + csc(x)), x)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 188 vs. 2(11) = 22.

Time = 0.37 (sec) , antiderivative size = 188, normalized size of antiderivative = 14.46

$$\int \sqrt{\csc(x) - \sin(x)} dx$$

$$= \frac{((\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) + \sin(\frac{3}{2}x) + \sin(\frac{1}{2}x)) \cos(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1)) - (\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) - \sin(\frac{3}{2}x) - \sin(\frac{1}{2}x)) \sin(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1))) \cos(\frac{1}{2} \arctan(\sin(x), \cos(x) + 1)) - ((\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) - \sin(\frac{3}{2}x) - \sin(\frac{1}{2}x)) \cos(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1)) + (\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) + \sin(\frac{3}{2}x) + \sin(\frac{1}{2}x)) \sin(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1))) \sin(\frac{1}{2} \arctan(\sin(x), \cos(x) + 1))}{(\cos(x)^2 + \sin(x)^2 + 2\cos(x) + 1)^{1/4} (\cos(x)^2 + \sin(x)^2 - 2\cos(x) + 1)^{1/4}}$$

[In] integrate((csc(x)-sin(x))^(1/2),x, algorithm="maxima")

```
[Out] (((cos(3/2*x) - cos(1/2*x) + sin(3/2*x) + sin(1/2*x))*cos(1/2*arctan2(sin(x), cos(x) - 1)) - (cos(3/2*x) - cos(1/2*x) - sin(3/2*x) - sin(1/2*x))*sin(1/2*arctan2(sin(x), cos(x) - 1)))*cos(1/2*arctan2(sin(x), cos(x) + 1)) - ((cos(3/2*x) - cos(1/2*x) - sin(3/2*x) - sin(1/2*x))*cos(1/2*arctan2(sin(x), cos(x) - 1)) + (cos(3/2*x) - cos(1/2*x) + sin(3/2*x) + sin(1/2*x))*sin(1/2*arctan2(sin(x), cos(x) - 1)))*sin(1/2*arctan2(sin(x), cos(x) + 1)))/((cos(x)^2 + sin(x)^2 + 2*cos(x) + 1)^(1/4)*(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1)^(1/4))
```

Giac [F]

$$\int \sqrt{\csc(x) - \sin(x)} dx = \int \sqrt{\csc(x) - \sin(x)} dx$$

[In] integrate((csc(x)-sin(x))^(1/2),x, algorithm="giac")

[Out] integrate(sqrt(csc(x) - sin(x)), x)

Mupad [B] (verification not implemented)

Time = 15.46 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.15

$$\int \sqrt{\csc(x) - \sin(x)} dx = \frac{2 |\cos(x)|}{\cos(x) \sqrt{\frac{1}{\sin(x)}}}$$

[In] int((1/sin(x) - sin(x))^(1/2),x)

[Out] (2*abs(cos(x)))/(cos(x)*(1/sin(x))^(1/2))

3.33 $\int \cos^6(x) dx$

| | |
|---|-----|
| Optimal result | 242 |
| Rubi [A] (verified) | 242 |
| Mathematica [A] (verified) | 243 |
| Maple [A] (verified) | 243 |
| Fricas [A] (verification not implemented) | 244 |
| Sympy [A] (verification not implemented) | 244 |
| Maxima [A] (verification not implemented) | 244 |
| Giac [A] (verification not implemented) | 244 |
| Mupad [B] (verification not implemented) | 245 |

Optimal result

Integrand size = 4, antiderivative size = 34

$$\int \cos^6(x) dx = \frac{5x}{16} + \frac{5}{16} \cos(x) \sin(x) + \frac{5}{24} \cos^3(x) \sin(x) + \frac{1}{6} \cos^5(x) \sin(x)$$

[Out] 5/16*x+5/16*cos(x)*sin(x)+5/24*cos(x)^3*sin(x)+1/6*cos(x)^5*sin(x)

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {2715, 8}

$$\int \cos^6(x) dx = \frac{5x}{16} + \frac{1}{6} \sin(x) \cos^5(x) + \frac{5}{24} \sin(x) \cos^3(x) + \frac{5}{16} \sin(x) \cos(x)$$

[In] Int[Cos[x]^6,x]

[Out] (5*x)/16 + (5*Cos[x]*Sin[x])/16 + (5*Cos[x]^3*Ssin[x])/24 + (Cos[x]^5*Ssin[x])/6

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 2715

Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] := Simp[(-b)*Cos[c + d*x]*((b*Ssin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Ssin[c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2*n]

Rubi steps

$$\begin{aligned}
\text{integral} &= \frac{1}{6} \cos^5(x) \sin(x) + \frac{5}{6} \int \cos^4(x) dx \\
&= \frac{5}{24} \cos^3(x) \sin(x) + \frac{1}{6} \cos^5(x) \sin(x) + \frac{5}{8} \int \cos^2(x) dx \\
&= \frac{5}{16} \cos(x) \sin(x) + \frac{5}{24} \cos^3(x) \sin(x) + \frac{1}{6} \cos^5(x) \sin(x) + \frac{5}{16} \int 1 dx \\
&= \frac{5x}{16} + \frac{5}{16} \cos(x) \sin(x) + \frac{5}{24} \cos^3(x) \sin(x) + \frac{1}{6} \cos^5(x) \sin(x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.88

$$\int \cos^6(x) dx = \frac{5x}{16} + \frac{15}{64} \sin(2x) + \frac{3}{64} \sin(4x) + \frac{1}{192} \sin(6x)$$

`[In] Integrate[Cos[x]^6,x]``[Out] (5*x)/16 + (15*Sin[2*x])/64 + (3*Sin[4*x])/64 + Sin[6*x]/192`**Maple [A] (verified)**

Time = 0.26 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.68

| method | result |
|---------------|--|
| risch | $\frac{5x}{16} + \frac{\sin(6x)}{192} + \frac{3 \sin(4x)}{64} + \frac{15 \sin(2x)}{64}$ |
| parallelrisch | $\frac{5x}{16} + \frac{\sin(6x)}{192} + \frac{3 \sin(4x)}{64} + \frac{15 \sin(2x)}{64}$ |
| default | $\frac{\left(\cos(x)^5 + \frac{5 \cos(x)^3}{4} + \frac{15 \cos(x)}{8}\right) \sin(x)}{6} + \frac{5x}{16}$ |
| norman | $\frac{\frac{5x}{16} - \frac{5 \tan\left(\frac{x}{2}\right)^3}{24} + \frac{15 \tan\left(\frac{x}{2}\right)^5}{4} - \frac{15 \tan\left(\frac{x}{2}\right)^7}{4} + \frac{5 \tan\left(\frac{x}{2}\right)^9}{24} - \frac{11 \tan\left(\frac{x}{2}\right)^{11}}{8} + \frac{15x \tan\left(\frac{x}{2}\right)^2}{8} + \frac{75x \tan\left(\frac{x}{2}\right)^4}{16} + \frac{25x \tan\left(\frac{x}{2}\right)^6}{4} + \frac{75x \tan\left(\frac{x}{2}\right)^8}{16}}{\left(1 + \tan\left(\frac{x}{2}\right)^2\right)^6}$ |

`[In] int(cos(x)^6,x,method=_RETURNVERBOSE)``[Out] 5/16*x+1/192*sin(6*x)+3/64*sin(4*x)+15/64*sin(2*x)`

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.74

$$\int \cos^6(x) dx = \frac{1}{48} (8 \cos(x)^5 + 10 \cos(x)^3 + 15 \cos(x)) \sin(x) + \frac{5}{16} x$$

[In] integrate(cos(x)^6,x, algorithm="fricas")

[Out] 1/48*(8*cos(x)^5 + 10*cos(x)^3 + 15*cos(x))*sin(x) + 5/16*x

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.06

$$\int \cos^6(x) dx = \frac{5x}{16} + \frac{\sin(x) \cos^5(x)}{6} + \frac{5 \sin(x) \cos^3(x)}{24} + \frac{5 \sin(x) \cos(x)}{16}$$

[In] integrate(cos(x)**6,x)

[Out] 5*x/16 + sin(x)*cos(x)**5/6 + 5*sin(x)*cos(x)**3/24 + 5*sin(x)*cos(x)/16

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.71

$$\int \cos^6(x) dx = -\frac{1}{48} \sin(2x)^3 + \frac{5}{16} x + \frac{3}{64} \sin(4x) + \frac{1}{4} \sin(2x)$$

[In] integrate(cos(x)^6,x, algorithm="maxima")

[Out] -1/48*sin(2*x)^3 + 5/16*x + 3/64*sin(4*x) + 1/4*sin(2*x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.65

$$\int \cos^6(x) dx = \frac{5}{16} x + \frac{1}{192} \sin(6x) + \frac{3}{64} \sin(4x) + \frac{15}{64} \sin(2x)$$

[In] integrate(cos(x)^6,x, algorithm="giac")

[Out] 5/16*x + 1/192*sin(6*x) + 3/64*sin(4*x) + 15/64*sin(2*x)

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.65

$$\int \cos^6(x) dx = \frac{5x}{16} + \frac{15 \sin(2x)}{64} + \frac{3 \sin(4x)}{64} + \frac{\sin(6x)}{192}$$

[In] `int(cos(x)^6,x)`

[Out] `(5*x)/16 + (15*sin(2*x))/64 + (3*sin(4*x))/64 + sin(6*x)/192`

3.34 $\int \frac{1}{1+2x^2+x^4} dx$

| | |
|---|-----|
| Optimal result | 246 |
| Rubi [A] (verified) | 246 |
| Mathematica [A] (verified) | 247 |
| Maple [A] (verified) | 247 |
| Fricas [A] (verification not implemented) | 248 |
| Sympy [A] (verification not implemented) | 248 |
| Maxima [A] (verification not implemented) | 248 |
| Giac [A] (verification not implemented) | 248 |
| Mupad [B] (verification not implemented) | 249 |

Optimal result

Integrand size = 12, antiderivative size = 19

$$\int \frac{1}{1+2x^2+x^4} dx = \frac{x}{2(1+x^2)} + \frac{\arctan(x)}{2}$$

[Out] $x/(2*x^2+2)+1/2*\arctan(x)$

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 19, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {28, 205, 209}

$$\int \frac{1}{1+2x^2+x^4} dx = \frac{\arctan(x)}{2} + \frac{x}{2(x^2+1)}$$

[In] $\text{Int}[(1 + 2*x^2 + x^4)^{-1}, x]$

[Out] $x/(2*(1 + x^2)) + \text{ArcTan}[x]/2$

Rule 28

```
Int[(u_.)*((a_) + (c_.)*(x_)^(n2_.) + (b_.)*(x_)^(n_.))^ (p_.), x_Symbol] :=
Dist[1/c^p, Int[u*(b/2 + c*x^n)^(2*p), x], x] /; FreeQ[{a, b, c, n}, x] &&
EqQ[n2, 2*n] && EqQ[b^2 - 4*a*c, 0] && IntegerQ[p]
```

Rule 205

```
Int[((a_) + (b_.)*(x_)^(n_.))^ (p_.), x_Symbol] := Simp[(-x)*((a + b*x^n)^(p +
1)/(a*n*(p + 1))), x] + Dist[(n*(p + 1) + 1)/(a*n*(p + 1)), Int[(a + b*x^n)
]^(p + 1), x], x] /; FreeQ[{a, b}, x] && IGtQ[n, 0] && LtQ[p, -1] && (Integ
erQ[2*p] || (n == 2 && IntegerQ[4*p]) || (n == 2 && IntegerQ[3*p]) || Denom
```

inator[p + 1/n] < Denominator[p])

Rule 209

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])

Rubi steps

$$\begin{aligned} \text{integral} &= \int \frac{1}{(1+x^2)^2} dx \\ &= \frac{x}{2(1+x^2)} + \frac{1}{2} \int \frac{1}{1+x^2} dx \\ &= \frac{x}{2(1+x^2)} + \frac{\arctan(x)}{2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.84

$$\int \frac{1}{1+2x^2+x^4} dx = \frac{1}{2} \left(\frac{x}{1+x^2} + \arctan(x) \right)$$

[In] Integrate[(1 + 2*x^2 + x^4)^(-1), x]

[Out] (x/(1 + x^2) + ArcTan[x])/2

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.84

| method | result | size |
|--------------|--|------|
| default | $\frac{x}{2x^2+2} + \frac{\arctan(x)}{2}$ | 16 |
| risch | $\frac{x}{2x^2+2} + \frac{\arctan(x)}{2}$ | 16 |
| parallelrisc | $-\frac{i \ln(x-i)x^2 - i \ln(i+x)x^2 + i \ln(x-i) - i \ln(i+x) - 2x}{4(x^2+1)}$ | 52 |

[In] int(1/(x^4+2*x^2+1), x, method=_RETURNVERBOSE)

[Out] 1/2/(x^2+1)*x+1/2*arctan(x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 + 2x^2 + x^4} dx = \frac{(x^2 + 1) \arctan(x) + x}{2(x^2 + 1)}$$

[In] integrate(1/(x^4+2*x^2+1),x, algorithm="fricas")

[Out] 1/2*((x^2 + 1)*arctan(x) + x)/(x^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.63

$$\int \frac{1}{1 + 2x^2 + x^4} dx = \frac{x}{2x^2 + 2} + \frac{\operatorname{atan}(x)}{2}$$

[In] integrate(1/(x**4+2*x**2+1),x)

[Out] x/(2*x**2 + 2) + atan(x)/2

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.79

$$\int \frac{1}{1 + 2x^2 + x^4} dx = \frac{x}{2(x^2 + 1)} + \frac{1}{2} \arctan(x)$$

[In] integrate(1/(x^4+2*x^2+1),x, algorithm="maxima")

[Out] 1/2*x/(x^2 + 1) + 1/2*arctan(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.79

$$\int \frac{1}{1 + 2x^2 + x^4} dx = \frac{x}{2(x^2 + 1)} + \frac{1}{2} \arctan(x)$$

[In] integrate(1/(x^4+2*x^2+1),x, algorithm="giac")

[Out] 1/2*x/(x^2 + 1) + 1/2*arctan(x)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.84

$$\int \frac{1}{1 + 2x^2 + x^4} dx = \frac{\operatorname{atan}(x)}{2} + \frac{x}{2(x^2 + 1)}$$

[In] `int(1/(2*x^2 + x^4 + 1),x)`

[Out] `atan(x)/2 + x/(2*(x^2 + 1))`

3.35 $\int \cos(\log(x)) dx$

| | |
|---|-----|
| Optimal result | 250 |
| Rubi [A] (verified) | 250 |
| Mathematica [A] (verified) | 251 |
| Maple [A] (verified) | 251 |
| Fricas [A] (verification not implemented) | 251 |
| Sympy [A] (verification not implemented) | 252 |
| Maxima [A] (verification not implemented) | 252 |
| Giac [A] (verification not implemented) | 252 |
| Mupad [B] (verification not implemented) | 252 |

Optimal result

Integrand size = 3, antiderivative size = 17

$$\int \cos(\log(x)) dx = \frac{1}{2}x \cos(\log(x)) + \frac{1}{2}x \sin(\log(x))$$

[Out] 1/2*x*cos(ln(x))+1/2*x*sin(ln(x))

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 17, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {4564}

$$\int \cos(\log(x)) dx = \frac{1}{2}x \sin(\log(x)) + \frac{1}{2}x \cos(\log(x))$$

[In] Int[Cos[Log[x]],x]

[Out] (x*Cos[Log[x]])/2 + (x*Sin[Log[x]])/2

Rule 4564

Int[Cos[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*(d_.)], x_Symbol] :> Simp[x*(Cos[d*(a + b*Log[c*x^n])]/(b^2*d^2*n^2 + 1)), x] + Simp[b*d*n*x*(Sin[d*(a + b*Log[c*x^n])]/(b^2*d^2*n^2 + 1)), x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b^2*d^2*n^2 + 1, 0]

Rubi steps

$$\text{integral} = \frac{1}{2}x \cos(\log(x)) + \frac{1}{2}x \sin(\log(x))$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00

$$\int \cos(\log(x)) dx = \frac{1}{2}x \cos(\log(x)) + \frac{1}{2}x \sin(\log(x))$$

[In] Integrate[Cos[Log[x]],x]

[Out] (x*Cos[Log[x]])/2 + (x*Sin[Log[x]])/2

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.65

| method | result | size |
|--------------|--|------|
| parallelrisc | $\frac{x(\cos(\ln(x))+\sin(\ln(x)))}{2}$ | 11 |
| lookup | $\frac{x \cos(\ln(x))}{2} + \frac{x \sin(\ln(x))}{2}$ | 14 |
| default | $\frac{x \cos(\ln(x))}{2} + \frac{x \sin(\ln(x))}{2}$ | 14 |
| risc | $(\frac{1}{4} - \frac{i}{4}) x x^i + (\frac{1}{4} + \frac{i}{4}) x x^{-i}$ | 22 |

[In] int(cos(ln(x)),x,method=_RETURNVERBOSE)

[Out] 1/2*x*(cos(ln(x))+sin(ln(x)))

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \cos(\log(x)) dx = \frac{1}{2}x \cos(\log(x)) + \frac{1}{2}x \sin(\log(x))$$

[In] integrate(cos(log(x)),x, algorithm="fricas")

[Out] 1/2*x*cos(log(x)) + 1/2*x*sin(log(x))

Sympy [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.88

$$\int \cos(\log(x)) dx = \frac{x \sin(\log(x))}{2} + \frac{x \cos(\log(x))}{2}$$

[In] integrate(cos(ln(x)),x)

[Out] x*sin(log(x))/2 + x*cos(log(x))/2

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.59

$$\int \cos(\log(x)) dx = \frac{1}{2} x (\cos(\log(x)) + \sin(\log(x)))$$

[In] integrate(cos(log(x)),x, algorithm="maxima")

[Out] 1/2*x*(cos(log(x)) + sin(log(x)))

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \cos(\log(x)) dx = \frac{1}{2} x \cos(\log(x)) + \frac{1}{2} x \sin(\log(x))$$

[In] integrate(cos(log(x)),x, algorithm="giac")

[Out] 1/2*x*cos(log(x)) + 1/2*x*sin(log(x))

Mupad [B] (verification not implemented)

Time = 14.86 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \cos(\log(x)) dx = \frac{\sqrt{2} x \sin\left(\frac{\pi}{4} + \ln(x)\right)}{2}$$

[In] int(cos(log(x)),x)

[Out] (2^(1/2)*x*sin(pi/4 + log(x)))/2

3.36 $\int \sec(x) dx$

| | |
|---|-----|
| Optimal result | 253 |
| Rubi [A] (verified) | 253 |
| Mathematica [A] (verified) | 254 |
| Maple [A] (verified) | 254 |
| Fricas [B] (verification not implemented) | 254 |
| Sympy [B] (verification not implemented) | 255 |
| Maxima [B] (verification not implemented) | 255 |
| Giac [B] (verification not implemented) | 255 |
| Mupad [B] (verification not implemented) | 256 |

Optimal result

Integrand size = 2, antiderivative size = 3

$$\int \sec(x) dx = \operatorname{arctanh}(\sin(x))$$

[Out] $\operatorname{arctanh}(\sin(x))$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3855}

$$\int \sec(x) dx = \operatorname{arctanh}(\sin(x))$$

[In] $\operatorname{Int}[\operatorname{Sec}[x], x]$

[Out] $\operatorname{ArcTanh}[\operatorname{Sin}[x]]$

Rule 3855

$\operatorname{Int}[\operatorname{csc}[(c_.) + (d_.)*(x_.)], x_Symbol] \rightarrow \operatorname{Simp}[-\operatorname{ArcTanh}[\operatorname{Cos}[c + d*x]]/d, x]$
 /; $\operatorname{FreeQ}\{c, d\}, x]$

Rubi steps

integral = $\operatorname{arctanh}(\sin(x))$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \sec(x) dx = \operatorname{arctanh}(\sin(x))$$

[In] Integrate[Sec[x],x]

[Out] ArcTanh[Sin[x]]

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 7, normalized size of antiderivative = 2.33

| method | result | size |
|---------------|--|------|
| default | $\ln(\sec(x) + \tan(x))$ | 7 |
| norman | $-\ln\left(\tan\left(\frac{x}{2}\right) - 1\right) + \ln\left(1 + \tan\left(\frac{x}{2}\right)\right)$ | 18 |
| parallelrisch | $-\ln\left(\tan\left(\frac{x}{2}\right) - 1\right) + \ln\left(1 + \tan\left(\frac{x}{2}\right)\right)$ | 18 |
| risch | $\ln(i + e^{ix}) - \ln(e^{ix} - i)$ | 22 |

[In] int(1/cos(x),x,method=_RETURNVERBOSE)

[Out] ln(sec(x)+tan(x))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 17 vs. $2(3) = 6$.

Time = 0.26 (sec) , antiderivative size = 17, normalized size of antiderivative = 5.67

$$\int \sec(x) dx = \frac{1}{2} \log(\sin(x) + 1) - \frac{1}{2} \log(-\sin(x) + 1)$$

[In] integrate(1/cos(x),x, algorithm="fricas")

[Out] 1/2*log(sin(x) + 1) - 1/2*log(-sin(x) + 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(3) = 6$.

Time = 0.06 (sec) , antiderivative size = 15, normalized size of antiderivative = 5.00

$$\int \sec(x) dx = -\frac{\log(\sin(x) - 1)}{2} + \frac{\log(\sin(x) + 1)}{2}$$

[In] `integrate(1/cos(x),x)`

[Out] `-log(sin(x) - 1)/2 + log(sin(x) + 1)/2`

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(3) = 6$.

Time = 0.21 (sec) , antiderivative size = 15, normalized size of antiderivative = 5.00

$$\int \sec(x) dx = \frac{1}{2} \log(\sin(x) + 1) - \frac{1}{2} \log(\sin(x) - 1)$$

[In] `integrate(1/cos(x),x, algorithm="maxima")`

[Out] `1/2*log(sin(x) + 1) - 1/2*log(sin(x) - 1)`

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 17 vs. $2(3) = 6$.

Time = 0.27 (sec) , antiderivative size = 17, normalized size of antiderivative = 5.67

$$\int \sec(x) dx = \frac{1}{2} \log(\sin(x) + 1) - \frac{1}{2} \log(-\sin(x) + 1)$$

[In] `integrate(1/cos(x),x, algorithm="giac")`

[Out] `1/2*log(sin(x) + 1) - 1/2*log(-sin(x) + 1)`

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 11, normalized size of antiderivative = 3.67

$$\int \sec(x) dx = \ln\left(\frac{1}{\cos(x)}\right) + \ln(\sin(x) + 1)$$

[In] int(1/cos(x),x)

[Out] log(1/cos(x)) + log(sin(x) + 1)

$$3.37 \quad \int \frac{1}{9 \cos^2(x) + 4 \sin^2(x)} dx$$

| | |
|---|-----|
| Optimal result | 257 |
| Rubi [A] (verified) | 257 |
| Mathematica [A] (verified) | 258 |
| Maple [A] (verified) | 258 |
| Fricas [A] (verification not implemented) | 258 |
| Sympy [F] | 259 |
| Maxima [A] (verification not implemented) | 259 |
| Giac [A] (verification not implemented) | 259 |
| Mupad [B] (verification not implemented) | 259 |

Optimal result

Integrand size = 15, antiderivative size = 24

$$\int \frac{1}{9 \cos^2(x) + 4 \sin^2(x)} dx = \frac{x}{6} - \frac{1}{6} \arctan\left(\frac{\cos(x) \sin(x)}{2 + \cos^2(x)}\right)$$

[Out] 1/6*x-1/6*arctan(cos(x)*sin(x)/(2+cos(x)^2))

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.067$, Rules used = {209}

$$\int \frac{1}{9 \cos^2(x) + 4 \sin^2(x)} dx = \frac{x}{6} - \frac{1}{6} \arctan\left(\frac{\sin(x) \cos(x)}{\cos^2(x) + 2}\right)$$

[In] Int[(9*Cos[x]^2 + 4*Sin[x]^2)^(-1), x]

[Out] x/6 - ArcTan[(Cos[x]*Sin[x])/(2 + Cos[x]^2)]/6

Rule 209

Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{1}{9 + 4x^2} dx, x, \tan(x)\right) \\ &= \frac{x}{6} - \frac{1}{6} \arctan\left(\frac{\cos(x) \sin(x)}{2 + \cos^2(x)}\right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.46

$$\int \frac{1}{9 \cos^2(x) + 4 \sin^2(x)} dx = \frac{1}{6} \arctan\left(\frac{2 \tan(x)}{3}\right)$$

[In] Integrate[(9*Cos[x]^2 + 4*Sin[x]^2)^(-1),x]

[Out] ArcTan[(2*Tan[x])/3]/6

Maple [A] (verified)

Time = 0.32 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.33

| method | result | size |
|---------------|---|------|
| default | $\frac{\arctan\left(\frac{2 \tan(x)}{3}\right)}{6}$ | 8 |
| risch | $-\frac{i \ln\left(e^{2ix} + \frac{1}{5}\right)}{12} + \frac{i \ln(e^{2ix} + 5)}{12}$ | 24 |
| parallelrisch | $-\frac{i \left(\ln\left(\frac{-2i \sin(x) - 3 \cos(x)}{1 + \cos(x)}\right) - \ln\left(\frac{2i \sin(x) - 3 \cos(x)}{1 + \cos(x)}\right) \right)}{12}$ | 43 |

[In] int(1/(9*cos(x)^2+4*sin(x)^2),x,method=_RETURNVERBOSE)

[Out] 1/6*arctan(2/3*tan(x))

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.88

$$\int \frac{1}{9 \cos^2(x) + 4 \sin^2(x)} dx = -\frac{1}{12} \arctan\left(\frac{13 \cos(x)^2 - 4}{12 \cos(x) \sin(x)}\right)$$

[In] integrate(1/(9*cos(x)^2+4*sin(x)^2),x, algorithm="fricas")

[Out] -1/12*arctan(1/12*(13*cos(x)^2 - 4)/(cos(x)*sin(x)))

Sympy [F]

$$\int \frac{1}{9 \cos^2(x) + 4 \sin^2(x)} dx = \int \frac{1}{4 \sin^2(x) + 9 \cos^2(x)} dx$$

[In] integrate(1/(9*cos(x)**2+4*sin(x)**2),x)

[Out] Integral(1/(4*sin(x)**2 + 9*cos(x)**2), x)

Maxima [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.29

$$\int \frac{1}{9 \cos^2(x) + 4 \sin^2(x)} dx = \frac{1}{6} \arctan\left(\frac{2}{3} \tan(x)\right)$$

[In] integrate(1/(9*cos(x)^2+4*sin(x)^2),x, algorithm="maxima")

[Out] 1/6*arctan(2/3*tan(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.83

$$\int \frac{1}{9 \cos^2(x) + 4 \sin^2(x)} dx = \frac{1}{6} x - \frac{1}{6} \arctan\left(\frac{\sin(2x)}{\cos(2x) + 5}\right)$$

[In] integrate(1/(9*cos(x)^2+4*sin(x)^2),x, algorithm="giac")

[Out] 1/6*x - 1/6*arctan(sin(2*x)/(cos(2*x) + 5))

Mupad [B] (verification not implemented)

Time = 15.66 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.67

$$\int \frac{1}{9 \cos^2(x) + 4 \sin^2(x)} dx = \frac{x}{6} - \frac{\operatorname{atan}(\tan(x))}{6} + \frac{\operatorname{atan}\left(\frac{2 \tan(x)}{3}\right)}{6}$$

[In] int(1/(9*cos(x)^2 + 4*sin(x)^2),x)

[Out] x/6 - atan(tan(x))/6 + atan((2*tan(x))/3)/6

$$3.38 \quad \int \frac{1}{x^2(1+x^4)^{3/4}} dx$$

| | |
|---|-----|
| Optimal result | 260 |
| Rubi [A] (verified) | 260 |
| Mathematica [A] (verified) | 261 |
| Maple [A] (verified) | 261 |
| Fricas [A] (verification not implemented) | 261 |
| Sympy [B] (verification not implemented) | 262 |
| Maxima [A] (verification not implemented) | 262 |
| Giac [F] | 262 |
| Mupad [B] (verification not implemented) | 263 |

Optimal result

Integrand size = 13, antiderivative size = 14

$$\int \frac{1}{x^2(1+x^4)^{3/4}} dx = -\frac{\sqrt[4]{1+x^4}}{x}$$

[Out] $-(x^4+1)^{(1/4)}/x$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.077$, Rules used = {270}

$$\int \frac{1}{x^2(1+x^4)^{3/4}} dx = -\frac{\sqrt[4]{x^4+1}}{x}$$

[In] `Int[1/(x^2*(1 + x^4)^(3/4)),x]`

[Out] $-\left((1 + x^4)^{(1/4)}/x\right)$

Rule 270

`Int[((c_.)*(x_))^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Simp[(c*x)^(m + 1)*((a + b*x^n)^(p + 1)/(a*c*(m + 1))), x] /; FreeQ[{a, b, c, m, n, p}, x] && EqQ[(m + 1)/n + p + 1, 0] && NeQ[m, -1]`

Rubi steps

$$\text{integral} = -\frac{\sqrt[4]{1+x^4}}{x}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{1}{x^2 (1 + x^4)^{3/4}} dx = -\frac{\sqrt[4]{1 + x^4}}{x}$$

[In] Integrate[1/(x^2*(1 + x^4)^(3/4)),x]

[Out] -((1 + x^4)^(1/4)/x)

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.93

| method | result | size |
|----------------|------------------------------------|------|
| gospers | $-\frac{(x^4+1)^{\frac{1}{4}}}{x}$ | 13 |
| trager | $-\frac{(x^4+1)^{\frac{1}{4}}}{x}$ | 13 |
| meijerg | $-\frac{(x^4+1)^{\frac{1}{4}}}{x}$ | 13 |
| risch | $-\frac{(x^4+1)^{\frac{1}{4}}}{x}$ | 13 |
| pseudoelliptic | $-\frac{(x^4+1)^{\frac{1}{4}}}{x}$ | 13 |

[In] int(1/x^2/(x^4+1)^(3/4),x,method=_RETURNVERBOSE)

[Out] -(x^4+1)^(1/4)/x

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.86

$$\int \frac{1}{x^2 (1 + x^4)^{3/4}} dx = -\frac{(x^4 + 1)^{\frac{1}{4}}}{x}$$

[In] integrate(1/x^2/(x^4+1)^(3/4),x, algorithm="fricas")

[Out] -(x^4 + 1)^(1/4)/x

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 22 vs. 2(10) = 20.

Time = 0.32 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.57

$$\int \frac{1}{x^2 (1+x^4)^{3/4}} dx = \frac{\sqrt[4]{1 + \frac{1}{x^4}} \Gamma(-\frac{1}{4})}{4\Gamma(\frac{3}{4})}$$

[In] integrate(1/x**2/(x**4+1)**(3/4),x)

[Out] (1 + x**(-4))**(1/4)*gamma(-1/4)/(4*gamma(3/4))

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.86

$$\int \frac{1}{x^2 (1+x^4)^{3/4}} dx = -\frac{(x^4 + 1)^{\frac{1}{4}}}{x}$$

[In] integrate(1/x^2/(x^4+1)^(3/4),x, algorithm="maxima")

[Out] -(x^4 + 1)^(1/4)/x

Giac [F]

$$\int \frac{1}{x^2 (1+x^4)^{3/4}} dx = \int \frac{1}{(x^4 + 1)^{\frac{3}{4}} x^2} dx$$

[In] integrate(1/x^2/(x^4+1)^(3/4),x, algorithm="giac")

[Out] integrate(1/((x^4 + 1)^(3/4)*x^2), x)

Mupad [B] (verification not implemented)

Time = 15.02 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.86

$$\int \frac{1}{x^2(1+x^4)^{3/4}} dx = -\frac{(x^4+1)^{1/4}}{x}$$

[In] int(1/(x^2*(x^4 + 1)^(3/4)),x)

[Out] -(x^4 + 1)^(1/4)/x

3.39 $\int \cos(x) \cos(3x) \cos(5x) dx$

| | |
|---|-----|
| Optimal result | 264 |
| Rubi [A] (verified) | 264 |
| Mathematica [A] (verified) | 265 |
| Maple [A] (verified) | 265 |
| Fricas [A] (verification not implemented) | 266 |
| Sympy [B] (verification not implemented) | 266 |
| Maxima [A] (verification not implemented) | 266 |
| Giac [A] (verification not implemented) | 267 |
| Mupad [B] (verification not implemented) | 267 |

Optimal result

Integrand size = 11, antiderivative size = 31

$$\int \cos(x) \cos(3x) \cos(5x) dx = \frac{\sin(x)}{4} + \frac{1}{12} \sin(3x) + \frac{1}{28} \sin(7x) + \frac{1}{36} \sin(9x)$$

[Out] 1/4*sin(x)+1/12*sin(3*x)+1/28*sin(7*x)+1/36*sin(9*x)

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {4440, 2717}

$$\int \cos(x) \cos(3x) \cos(5x) dx = \frac{\sin(x)}{4} + \frac{1}{12} \sin(3x) + \frac{1}{28} \sin(7x) + \frac{1}{36} \sin(9x)$$

[In] Int[Cos[x]*Cos[3*x]*Cos[5*x],x]

[Out] Sin[x]/4 + Sin[3*x]/12 + Sin[7*x]/28 + Sin[9*x]/36

Rule 2717

Int[sin[Pi/2 + (c_.) + (d_.)*(x_.)], x_Symbol] := Simp[Sin[c + d*x]/d, x] /;
FreeQ[{c, d}, x]

Rule 4440

Int[(F_)[(a_.) + (b_.)*(x_.)]^(p_.)*(G_)[(c_.) + (d_.)*(x_.)]^(q_.)*(H_)[(e_.) + (f_.)*(x_.)]^(r_.), x_Symbol] := Int[ExpandTrigReduce[ActivateTrig[F[a + b*x]^p*G[c + d*x]^q*H[e + f*x]^r], x], x] /; FreeQ[{a, b, c, d, e, f}, x] && (EqQ[F, sin] || EqQ[F, cos]) && (EqQ[G, sin] || EqQ[G, cos]) && (EqQ[H,

```
sin] || EqQ[H, cos]) && IGtQ[p, 0] && IGtQ[q, 0] && IGtQ[r, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(\frac{\cos(x)}{4} + \frac{1}{4} \cos(3x) + \frac{1}{4} \cos(7x) + \frac{1}{4} \cos(9x) \right) dx \\ &= \frac{1}{4} \int \cos(x) dx + \frac{1}{4} \int \cos(3x) dx + \frac{1}{4} \int \cos(7x) dx + \frac{1}{4} \int \cos(9x) dx \\ &= \frac{\sin(x)}{4} + \frac{1}{12} \sin(3x) + \frac{1}{28} \sin(7x) + \frac{1}{36} \sin(9x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.00

$$\int \cos(x) \cos(3x) \cos(5x) dx = \frac{\sin(x)}{4} + \frac{1}{12} \sin(3x) + \frac{1}{28} \sin(7x) + \frac{1}{36} \sin(9x)$$

```
[In] Integrate[Cos[x]*Cos[3*x]*Cos[5*x],x]
```

```
[Out] Sin[x]/4 + Sin[3*x]/12 + Sin[7*x]/28 + Sin[9*x]/36
```

Maple [A] (verified)

Time = 0.70 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.77

| method | result | size |
|--------------|---|------|
| default | $\frac{\sin(x)}{4} + \frac{\sin(3x)}{12} + \frac{\sin(7x)}{28} + \frac{\sin(9x)}{36}$ | 24 |
| risch | $\frac{\sin(x)}{4} + \frac{\sin(3x)}{12} + \frac{\sin(7x)}{28} + \frac{\sin(9x)}{36}$ | 24 |
| parallelrisc | $\frac{\sin(x)}{4} + \frac{\sin(3x)}{12} + \frac{\sin(7x)}{28} + \frac{\sin(9x)}{36}$ | 24 |

```
[In] int(cos(x)*cos(3*x)*cos(5*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/4*sin(x)+1/12*sin(3*x)+1/28*sin(7*x)+1/36*sin(9*x)
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.97

$$\int \cos(x) \cos(3x) \cos(5x) dx$$

$$= \frac{1}{63} (448 \cos(x)^8 - 640 \cos(x)^6 + 240 \cos(x)^4 + 5 \cos(x)^2 + 10) \sin(x)$$

`[In] integrate(cos(x)*cos(3*x)*cos(5*x),x, algorithm="fricas")``[Out] 1/63*(448*cos(x)^8 - 640*cos(x)^6 + 240*cos(x)^4 + 5*cos(x)^2 + 10)*sin(x)`**Sympy [B] (verification not implemented)**

Leaf count of result is larger than twice the leaf count of optimal. 66 vs. 2(24) = 48.

Time = 0.83 (sec) , antiderivative size = 66, normalized size of antiderivative = 2.13

$$\int \cos(x) \cos(3x) \cos(5x) dx = -\frac{10 \sin(x) \sin(3x) \sin(5x)}{63} - \frac{11 \sin(x) \cos(3x) \cos(5x)}{63}$$

$$- \frac{17 \sin(3x) \cos(x) \cos(5x)}{63} + \frac{25 \sin(5x) \cos(x) \cos(3x)}{63}$$

`[In] integrate(cos(x)*cos(3*x)*cos(5*x),x)``[Out] -10*sin(x)*sin(3*x)*sin(5*x)/63 - 11*sin(x)*cos(3*x)*cos(5*x)/63 - 17*sin(3*x)*cos(x)*cos(5*x)/63 + 25*sin(5*x)*cos(x)*cos(3*x)/63`**Maxima [A] (verification not implemented)**

none

Time = 0.19 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.74

$$\int \cos(x) \cos(3x) \cos(5x) dx = \frac{1}{36} \sin(9x) + \frac{1}{28} \sin(7x) + \frac{1}{12} \sin(3x) + \frac{1}{4} \sin(x)$$

`[In] integrate(cos(x)*cos(3*x)*cos(5*x),x, algorithm="maxima")``[Out] 1/36*sin(9*x) + 1/28*sin(7*x) + 1/12*sin(3*x) + 1/4*sin(x)`

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.74

$$\int \cos(x) \cos(3x) \cos(5x) dx = \frac{1}{36} \sin(9x) + \frac{1}{28} \sin(7x) + \frac{1}{12} \sin(3x) + \frac{1}{4} \sin(x)$$

[In] integrate(cos(x)*cos(3*x)*cos(5*x),x, algorithm="giac")

[Out] 1/36*sin(9*x) + 1/28*sin(7*x) + 1/12*sin(3*x) + 1/4*sin(x)

Mupad [B] (verification not implemented)

Time = 15.14 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.87

$$\int \cos(x) \cos(3x) \cos(5x) dx = \frac{64 \sin(x)^9}{9} - \frac{128 \sin(x)^7}{7} + 16 \sin(x)^5 - \frac{17 \sin(x)^3}{3} + \sin(x)$$

[In] int(cos(3*x)*cos(5*x)*cos(x),x)

[Out] sin(x) - (17*sin(x)^3)/3 + 16*sin(x)^5 - (128*sin(x)^7)/7 + (64*sin(x)^9)/9

3.40 $\int \left(\frac{1}{\log(x)} + \log(\log(x)) \right) dx$

| | |
|---|-----|
| Optimal result | 268 |
| Rubi [A] (verified) | 268 |
| Mathematica [A] (verified) | 269 |
| Maple [A] (verified) | 269 |
| Fricas [A] (verification not implemented) | 270 |
| Sympy [A] (verification not implemented) | 270 |
| Maxima [A] (verification not implemented) | 270 |
| Giac [A] (verification not implemented) | 270 |
| Mupad [B] (verification not implemented) | 271 |

Optimal result

Integrand size = 8, antiderivative size = 5

$$\int \left(\frac{1}{\log(x)} + \log(\log(x)) \right) dx = x \log(\log(x))$$

[Out] x*ln(ln(x))

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {2335, 2600}

$$\int \left(\frac{1}{\log(x)} + \log(\log(x)) \right) dx = x \log(\log(x))$$

[In] Int[Log[x]^(-1) + Log[Log[x]],x]

[Out] x*Log[Log[x]]

Rule 2335

Int[Log[(c_.)*(x_)^(-1)], x_Symbol] := Simp[LogIntegral[c*x]/c, x] /; FreeQ[c, x]

Rule 2600

Int[Log[Log[(d_.)*(x_)^(n_.)]^(p_.)*(c_.)], x_Symbol] := Simp[x*Log[c*Log[d*x^n]^p], x] - Dist[n*p, Int[1/Log[d*x^n], x], x] /; FreeQ[{c, d, n, p}, x]

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \frac{1}{\log(x)} dx + \int \log(\log(x)) dx \\
 &= x \log(\log(x)) + \text{LogIntegral}(x) - \int \frac{1}{\log(x)} dx \\
 &= x \log(\log(x))
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\frac{1}{\log(x)} + \log(\log(x)) \right) dx = x \log(\log(x))$$

[In] Integrate[Log[x]^(-1) + Log[Log[x]],x]

[Out] x*Log[Log[x]]

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.20

| method | result | size |
|---------------|-----------------|------|
| default | $x \ln(\ln(x))$ | 6 |
| norman | $x \ln(\ln(x))$ | 6 |
| risch | $x \ln(\ln(x))$ | 6 |
| parallelrisch | $x \ln(\ln(x))$ | 6 |
| parts | $x \ln(\ln(x))$ | 6 |

[In] int(1/ln(x)+ln(ln(x)),x,method=_RETURNVERBOSE)

[Out] x*ln(ln(x))

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\frac{1}{\log(x)} + \log(\log(x)) \right) dx = x \log(\log(x))$$

[In] integrate(1/log(x)+log(log(x)),x, algorithm="fricas")

[Out] x*log(log(x))

Sympy [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\frac{1}{\log(x)} + \log(\log(x)) \right) dx = x \log(\log(x))$$

[In] integrate(1/ln(x)+ln(ln(x)),x)

[Out] x*log(log(x))

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\frac{1}{\log(x)} + \log(\log(x)) \right) dx = x \log(\log(x))$$

[In] integrate(1/log(x)+log(log(x)),x, algorithm="maxima")

[Out] x*log(log(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\frac{1}{\log(x)} + \log(\log(x)) \right) dx = x \log(\log(x))$$

[In] integrate(1/log(x)+log(log(x)),x, algorithm="giac")

[Out] x*log(log(x))

Mupad [B] (verification not implemented)

Time = 15.17 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\frac{1}{\log(x)} + \log(\log(x)) \right) dx = x \ln(\ln(x))$$

[In] int(log(log(x)) + 1/log(x),x)

[Out] x*log(log(x))

3.41 $\int \frac{1}{2+e^x} dx$

| | |
|---|-----|
| Optimal result | 272 |
| Rubi [A] (verified) | 272 |
| Mathematica [A] (verified) | 273 |
| Maple [A] (verified) | 273 |
| Fricas [A] (verification not implemented) | 274 |
| Sympy [A] (verification not implemented) | 274 |
| Maxima [A] (verification not implemented) | 274 |
| Giac [A] (verification not implemented) | 275 |
| Mupad [B] (verification not implemented) | 275 |

Optimal result

Integrand size = 7, antiderivative size = 8

$$\int \frac{1}{2+e^x} dx = -\operatorname{arctanh}(1+e^x)$$

[Out] `-arctanh(exp(x)+1)`

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 16, normalized size of antiderivative = 2.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.571$, Rules used = {2320, 36, 29, 31}

$$\int \frac{1}{2+e^x} dx = \frac{x}{2} - \frac{1}{2} \log(e^x + 2)$$

[In] `Int[(2 + E^x)^(-1), x]`

[Out] `x/2 - Log[2 + E^x]/2`

Rule 29

`Int[(x_)^(-1), x_Symbol] := Simp[Log[x], x]`

Rule 31

`Int[((a_) + (b_.)*(x_))^(-1), x_Symbol] := Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]`

Rule 36

`Int[1/(((a_) + (b_.)*(x_))*((c_) + (d_.)*(x_))), x_Symbol] := Dist[b/(b*c - a*d), Int[1/(a + b*x), x], x] - Dist[d/(b*c - a*d), Int[1/(c + d*x), x],`

`x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0]`

Rule 2320

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_) [v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{1}{x(2+x)} dx, x, e^x\right) \\ &= \frac{1}{2}\text{Subst}\left(\int \frac{1}{x} dx, x, e^x\right) - \frac{1}{2}\text{Subst}\left(\int \frac{1}{2+x} dx, x, e^x\right) \\ &= \frac{x}{2} - \frac{1}{2}\log(2 + e^x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \frac{1}{2 + e^x} dx = -\text{arctanh}(1 + e^x)$$

[In] Integrate[(2 + E^x)^(-1), x]

[Out] -ArcTanh[1 + E^x]

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.50

| method | result | size |
|------------------|---|------|
| norman | $\frac{x}{2} - \frac{\ln(e^x+2)}{2}$ | 12 |
| risch | $\frac{x}{2} - \frac{\ln(e^x+2)}{2}$ | 12 |
| parallelrisch | $\frac{x}{2} - \frac{\ln(e^x+2)}{2}$ | 12 |
| derivativdivides | $\frac{\ln(e^x)}{2} - \frac{\ln(e^x+2)}{2}$ | 14 |
| default | $\frac{\ln(e^x)}{2} - \frac{\ln(e^x+2)}{2}$ | 14 |

[In] `int(1/(exp(x)+2),x,method=_RETURNVERBOSE)`

[Out] `1/2*x-1/2*ln(exp(x)+2)`

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.38

$$\int \frac{1}{2+e^x} dx = \frac{1}{2}x - \frac{1}{2} \log(e^x + 2)$$

[In] `integrate(1/(exp(x)+2),x, algorithm="fricas")`

[Out] `1/2*x - 1/2*log(e^x + 2)`

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.25

$$\int \frac{1}{2+e^x} dx = \frac{x}{2} - \frac{\log(e^x + 2)}{2}$$

[In] `integrate(1/(exp(x)+2),x)`

[Out] `x/2 - log(exp(x) + 2)/2`

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.38

$$\int \frac{1}{2+e^x} dx = \frac{1}{2}x - \frac{1}{2} \log(e^x + 2)$$

[In] `integrate(1/(exp(x)+2),x, algorithm="maxima")`

[Out] `1/2*x - 1/2*log(e^x + 2)`

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.38

$$\int \frac{1}{2 + e^x} dx = \frac{1}{2} x - \frac{1}{2} \log(e^x + 2)$$

```
[In] integrate(1/(exp(x)+2),x, algorithm="giac")
```

```
[Out] 1/2*x - 1/2*log(e^x + 2)
```

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.38

$$\int \frac{1}{2 + e^x} dx = \frac{x}{2} - \frac{\ln(e^x + 2)}{2}$$

```
[In] int(1/(exp(x) + 2),x)
```

```
[Out] x/2 - log(exp(x) + 2)/2
```

3.42 $\int \sqrt{\frac{x}{1-x^3}} dx$

| | |
|---|-----|
| Optimal result | 276 |
| Rubi [A] (verified) | 276 |
| Mathematica [A] (verified) | 277 |
| Maple [A] (verified) | 278 |
| Fricas [A] (verification not implemented) | 278 |
| Sympy [F] | 278 |
| Maxima [F] | 279 |
| Giac [A] (verification not implemented) | 279 |
| Mupad [F(-1)] | 279 |

Optimal result

Integrand size = 15, antiderivative size = 41

$$\int \sqrt{\frac{x}{1-x^3}} dx = \frac{2\sqrt{\frac{x}{1-x^3}}\sqrt{1-x^3} \arcsin(x^{3/2})}{3\sqrt{x}}$$

[Out] $2/3*(x/(-x^3+1))^{(1/2)}*(-x^3+1)^{(1/2)}*\arcsin(x^{(3/2)})/x^{(1/2)}$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 41, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.267$, Rules used = {6851, 335, 281, 222}

$$\int \sqrt{\frac{x}{1-x^3}} dx = \frac{2\sqrt{\frac{x}{1-x^3}}\sqrt{1-x^3} \arcsin(x^{3/2})}{3\sqrt{x}}$$

[In] Int[Sqrt[x/(1 - x^3)], x]

[Out] (2*Sqrt[x/(1 - x^3)]*Sqrt[1 - x^3]*ArcSin[x^(3/2)])/(3*Sqrt[x])

Rule 222

Int[1/Sqrt[(a_) + (b_)*(x_)^2], x_Symbol] := Simp[ArcSin[Rt[-b, 2]*(x/Sqrt[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]

Rule 281

Int[(x_)^(m_)*((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] := With[{k = GCD[m + 1, n]}, Dist[1/k, Subst[Int[x^((m + 1)/k - 1)*(a + b*x^(n/k))^p, x], x, x^k], x] /; k != 1] /; FreeQ[{a, b, p}, x] && IGtQ[n, 0] && IntegerQ[m]

Rule 335

```
Int[((c_.)*(x_))^(m_)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := With[{k =
  Denominator[m]}, Dist[k/c, Subst[Int[x^(k*(m + 1) - 1)*(a + b*(x^(k*n)/c^n
  ))^p, x], x, (c*x)^(1/k)], x] /; FreeQ[{a, b, c, p}, x] && IGtQ[n, 0] && F
ractionQ[m] && IntBinomialQ[a, b, c, n, m, p, x]
```

Rule 6851

```
Int[(u_.)*((a_.)*(v_)^(m_.)*(w_)^(n_.))^(p_), x_Symbol] := Dist[a^IntPart[p
  ]*((a*v^m*w^n)^FracPart[p]/(v^(m*FracPart[p])*w^(n*FracPart[p]))), Int[u*v^
  (m*p)*w^(n*p), x], x] /; FreeQ[{a, m, n, p}, x] && !IntegerQ[p] && !FreeQ
[v, x] && !FreeQ[w, x]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \frac{\left(\sqrt{\frac{x}{1-x^3}}\sqrt{1-x^3}\right) \int \frac{\sqrt{x}}{\sqrt{1-x^3}} dx}{\sqrt{x}} \\
 &= \frac{\left(2\sqrt{\frac{x}{1-x^3}}\sqrt{1-x^3}\right) \text{Subst}\left(\int \frac{x^2}{\sqrt{1-x^6}} dx, x, \sqrt{x}\right)}{\sqrt{x}} \\
 &= \frac{\left(2\sqrt{\frac{x}{1-x^3}}\sqrt{1-x^3}\right) \text{Subst}\left(\int \frac{1}{\sqrt{1-x^2}} dx, x, x^{3/2}\right)}{3\sqrt{x}} \\
 &= \frac{2\sqrt{\frac{x}{1-x^3}}\sqrt{1-x^3} \arcsin(x^{3/2})}{3\sqrt{x}}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.28 (sec) , antiderivative size = 48, normalized size of antiderivative = 1.17

$$\int \sqrt{\frac{x}{1-x^3}} dx = \frac{2\sqrt{-\frac{x}{-1+x^3}}\sqrt{-1+x^3} \log(x^{3/2} + \sqrt{-1+x^3})}{3\sqrt{x}}$$

[In] Integrate[Sqrt[x/(1 - x^3)],x]

[Out] (2*Sqrt[-(x/(-1 + x^3))]*Sqrt[-1 + x^3]*Log[x^(3/2) + Sqrt[-1 + x^3]])/(3*Sqrt[x])

Maple [A] (verified)

Time = 0.78 (sec) , antiderivative size = 43, normalized size of antiderivative = 1.05

| method | result |
|----------|---|
| default | $\frac{2\sqrt{-\frac{x}{x^3-1}}(x^3-1)\operatorname{arctanh}\left(\frac{\sqrt{x^4-x}}{x^2}\right)}{3\sqrt{(x^3-1)x}}$ |
| trager | $\frac{\operatorname{RootOf}(-Z^2+1)\ln\left(-2\sqrt{-\frac{x}{x^3-1}}x^4-2\operatorname{RootOf}(-Z^2+1)x^3+2\sqrt{-\frac{x}{x^3-1}}x+\operatorname{RootOf}(-Z^2+1)\right)}{3}$ |
| elliptic | $\frac{2\sqrt{-\frac{x}{x^3-1}}\sqrt{(x^3-1)x}\left(\frac{1}{2}-\frac{i\sqrt{3}}{2}\right)\sqrt{\frac{\left(-\frac{3}{2}+\frac{i\sqrt{3}}{2}\right)x}{\left(-\frac{1}{2}+\frac{i\sqrt{3}}{2}\right)(-1+x)}}(-1+x)^2\sqrt{\frac{x+\frac{1}{2}+\frac{i\sqrt{3}}{2}}{\left(-\frac{1}{2}-\frac{i\sqrt{3}}{2}\right)(-1+x)}}\sqrt{\frac{x+\frac{1}{2}-\frac{i\sqrt{3}}{2}}{\left(-\frac{1}{2}+\frac{i\sqrt{3}}{2}\right)(-1+x)}}\left(\operatorname{EllipticF}\left(\sqrt{\frac{\left(-\frac{3}{2}+\frac{i\sqrt{3}}{2}\right)x}{\left(-\frac{1}{2}+\frac{i\sqrt{3}}{2}\right)(-1+x)}}\right)}{x\left(-\frac{3}{2}+\frac{i\sqrt{3}}{2}\right)\sqrt{x(-1+x)\left(x+\frac{1}{2}+\frac{i\sqrt{3}}{2}\right)}}$ |

```
[In] int((x/(-x^3+1))^(1/2),x,method=_RETURNVERBOSE)
```

```
[Out] 2/3*(-x/(x^3-1))^(1/2)*(x^3-1)/((x^3-1)*x)^(1/2)*arctanh((x^4-x)^(1/2)/x^2)
```

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 33, normalized size of antiderivative = 0.80

$$\int \sqrt{\frac{x}{1-x^3}} dx = \frac{1}{3} \arctan\left(\frac{2(x^4-x)\sqrt{-\frac{x}{x^3-1}}}{2x^3-1}\right)$$

```
[In] integrate((x/(-x^3+1))^(1/2),x, algorithm="fricas")
```

```
[Out] 1/3*arctan(2*(x^4 - x)*sqrt(-x/(x^3 - 1))/(2*x^3 - 1))
```

Sympy [F]

$$\int \sqrt{\frac{x}{1-x^3}} dx = \int \sqrt{\frac{x}{1-x^3}} dx$$

```
[In] integrate((x/(-x**3+1))**(1/2),x)
```

```
[Out] Integral(sqrt(x/(1 - x**3)), x)
```

Maxima [F]

$$\int \sqrt{\frac{x}{1-x^3}} dx = \int \sqrt{-\frac{x}{x^3-1}} dx$$

[In] integrate((x/(-x^3+1))^(1/2),x, algorithm="maxima")

[Out] integrate(sqrt(-x/(x^3 - 1)), x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.39

$$\int \sqrt{\frac{x}{1-x^3}} dx = \frac{2}{3} \arctan\left(\sqrt{\frac{1}{x^3}-1}\right) \operatorname{sgn}(x^3-1)$$

[In] integrate((x/(-x^3+1))^(1/2),x, algorithm="giac")

[Out] 2/3*arctan(sqrt(1/x^3 - 1))*sgn(x^3 - 1)

Mupad [F(-1)]

Timed out.

$$\int \sqrt{\frac{x}{1-x^3}} dx = \int \sqrt{-\frac{x}{x^3-1}} dx$$

[In] int((-x/(x^3 - 1))^(1/2),x)

[Out] int((-x/(x^3 - 1))^(1/2), x)

3.43 $\int \frac{4x}{1-x^4} dx$

| | |
|---|-----|
| Optimal result | 280 |
| Rubi [A] (verified) | 280 |
| Mathematica [B] (verified) | 281 |
| Maple [A] (verified) | 281 |
| Fricas [B] (verification not implemented) | 282 |
| Sympy [B] (verification not implemented) | 282 |
| Maxima [B] (verification not implemented) | 282 |
| Giac [B] (verification not implemented) | 282 |
| Mupad [B] (verification not implemented) | 283 |

Optimal result

Integrand size = 12, antiderivative size = 6

$$\int \frac{4x}{1-x^4} dx = 2\operatorname{arctanh}(x^2)$$

[Out] 2*arctanh(x^2)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {12, 281, 212}

$$\int \frac{4x}{1-x^4} dx = 2\operatorname{arctanh}(x^2)$$

[In] Int[(4*x)/(1 - x^4),x]

[Out] 2*ArcTanh[x^2]

Rule 12

Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_) /; FreeQ[b, x]]

Rule 212

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])

Rule 281

```
Int[(x_)^(m_)*((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] := With[{k = GCD[m
+ 1, n]}, Dist[1/k, Subst[Int[x^((m + 1)/k - 1)*(a + b*x^(n/k))^p, x], x, x
^k], x] /; k != 1] /; FreeQ[{a, b, p}, x] && IGtQ[n, 0] && IntegerQ[m]
```

Rubi steps

$$\begin{aligned} \text{integral} &= 4 \int \frac{x}{1-x^4} dx \\ &= 2 \text{Subst} \left(\int \frac{1}{1-x^2} dx, x, x^2 \right) \\ &= 2 \text{arctanh}(x^2) \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 25 vs. 2(6) = 12.

Time = 0.01 (sec) , antiderivative size = 25, normalized size of antiderivative = 4.17

$$\int \frac{4x}{1-x^4} dx = -4 \left(\frac{1}{4} \log(1-x^2) - \frac{1}{4} \log(1+x^2) \right)$$

[In] Integrate[(4*x)/(1 - x^4),x]

[Out] -4*(Log[1 - x^2]/4 - Log[1 + x^2]/4)

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.17

| method | result | size |
|---------------|--|------|
| meijerg | $2 \operatorname{arctanh}(x^2)$ | 7 |
| risch | $\ln(x^2 + 1) - \ln(x^2 - 1)$ | 16 |
| default | $-\ln(-1 + x) - \ln(1 + x) + \ln(x^2 + 1)$ | 20 |
| norman | $-\ln(-1 + x) - \ln(1 + x) + \ln(x^2 + 1)$ | 20 |
| parallelrisch | $-\ln(-1 + x) - \ln(1 + x) + \ln(x^2 + 1)$ | 20 |

[In] int(4*x/(-x^4+1),x,method=_RETURNVERBOSE)

[Out] 2*arctanh(x^2)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(6) = 12$.

Time = 0.24 (sec) , antiderivative size = 15, normalized size of antiderivative = 2.50

$$\int \frac{4x}{1-x^4} dx = \log(x^2+1) - \log(x^2-1)$$

[In] integrate(4*x/(-x^4+1),x, algorithm="fricas")

[Out] log(x^2 + 1) - log(x^2 - 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 12 vs. $2(5) = 10$.

Time = 0.04 (sec) , antiderivative size = 12, normalized size of antiderivative = 2.00

$$\int \frac{4x}{1-x^4} dx = -\log(x^2-1) + \log(x^2+1)$$

[In] integrate(4*x/(-x**4+1),x)

[Out] -log(x**2 - 1) + log(x**2 + 1)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(6) = 12$.

Time = 0.20 (sec) , antiderivative size = 15, normalized size of antiderivative = 2.50

$$\int \frac{4x}{1-x^4} dx = \log(x^2+1) - \log(x^2-1)$$

[In] integrate(4*x/(-x^4+1),x, algorithm="maxima")

[Out] log(x^2 + 1) - log(x^2 - 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 16 vs. $2(6) = 12$.

Time = 0.26 (sec) , antiderivative size = 16, normalized size of antiderivative = 2.67

$$\int \frac{4x}{1-x^4} dx = \log(x^2+1) - \log(|x^2-1|)$$

[In] integrate(4*x/(-x^4+1),x, algorithm="giac")

[Out] log(x^2 + 1) - log(abs(x^2 - 1))

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \frac{4x}{1-x^4} dx = 2 \operatorname{atanh}(x^2)$$

[In] `int(-(4*x)/(x^4 - 1),x)`

[Out] `2*atanh(x^2)`

3.44 $\int x^x(1 + \log(x)) dx$

| | |
|---|-----|
| Optimal result | 284 |
| Rubi [A] (verified) | 284 |
| Mathematica [A] (verified) | 285 |
| Maple [A] (verified) | 285 |
| Fricas [A] (verification not implemented) | 286 |
| Sympy [A] (verification not implemented) | 286 |
| Maxima [A] (verification not implemented) | 286 |
| Giac [A] (verification not implemented) | 286 |
| Mupad [B] (verification not implemented) | 287 |

Optimal result

Integrand size = 8, antiderivative size = 3

$$\int x^x(1 + \log(x)) dx = x^x$$

[Out] x^x

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {6874, 2633}

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] `Int[x^x*(1 + Log[x]),x]`

[Out] x^x

Rule 2633

```
Int[Log[u_]*(u_)^((a_.)*(x_)), x_Symbol] := Simp[u^(a*x)/a, x] - Int[SimplifyIntegrand[x*u^(a*x - 1)*D[u, x], x], x] /; FreeQ[a, x] && InverseFunctionFreeQ[u, x]
```

Rule 6874

```
Int[u_, x_Symbol] := With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]]
```


Rubi steps

$$\begin{aligned} \text{integral} &= \int (x^x + x^x \log(x)) dx \\ &= \int x^x dx + \int x^x \log(x) dx \\ &= x^x \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] Integrate[x^x*(1 + Log[x]),x]

[Out] x^x

Maple [A] (verified)

Time = 0.00 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

| method | result | size |
|-------------------|----------------|------|
| derivativedivides | x^x | 4 |
| default | x^x | 4 |
| risch | x^x | 4 |
| parallelrisch | x^x | 4 |
| norman | $e^{x \ln(x)}$ | 6 |

[In] int(x^x*(ln(x)+1),x,method=_RETURNVERBOSE)

[Out] x^x

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] integrate(x^x*(log(x)+1),x, algorithm="fricas")

[Out] x^x

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 2, normalized size of antiderivative = 0.67

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] integrate(x**x*(ln(x)+1),x)

[Out] x**x

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] integrate(x^x*(log(x)+1),x, algorithm="maxima")

[Out] x^x

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] integrate(x^x*(log(x)+1),x, algorithm="giac")

[Out] x^x

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int x^x(1 + \log(x)) dx = x^x$$

[In] int(x^x*(log(x) + 1),x)

[Out] x^x

3.45 $\int \sqrt{6x - x^2} dx$

| | |
|---|-----|
| Optimal result | 288 |
| Rubi [A] (verified) | 288 |
| Mathematica [A] (verified) | 289 |
| Maple [A] (verified) | 290 |
| Fricas [A] (verification not implemented) | 290 |
| Sympy [A] (verification not implemented) | 290 |
| Maxima [A] (verification not implemented) | 291 |
| Giac [A] (verification not implemented) | 291 |
| Mupad [B] (verification not implemented) | 291 |

Optimal result

Integrand size = 13, antiderivative size = 29

$$\int \sqrt{6x - x^2} dx = \frac{1}{2} \left((-3 + x) \sqrt{-((-6 + x)x)} - 9 \arcsin \left(1 - \frac{x}{3} \right) \right)$$

[Out] 1/2*(-3+x)*(-x*(-6+x))^(1/2)+9/2*arcsin(-1+1/3*x)

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 35, normalized size of antiderivative = 1.21, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.231$, Rules used = {626, 633, 222}

$$\int \sqrt{6x - x^2} dx = -\frac{9}{2} \arcsin \left(1 - \frac{x}{3} \right) - \frac{1}{2} \sqrt{6x - x^2} (3 - x)$$

[In] Int[Sqrt[6*x - x^2], x]

[Out] -1/2*((3 - x)*Sqrt[6*x - x^2]) - (9*ArcSin[1 - x/3])/2

Rule 222

Int[1/Sqrt[(a_) + (b_.)*(x_)^2], x_Symbol] :> Simp[ArcSin[Rt[-b, 2]*(x/Sqrt[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]

Rule 626

Int[((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^(p_), x_Symbol] :> Simp[(b + 2*c*x)*((a + b*x + c*x^2)^p/(2*c*(2*p + 1))), x] - Dist[p*((b^2 - 4*a*c)/(2*c*(2*p + 1))), Int[(a + b*x + c*x^2)^(p - 1), x], x] /; FreeQ[{a, b, c}, x] && NeQ[b^2 - 4*a*c, 0] && GtQ[p, 0] && IntegerQ[4*p]

Rule 633

```
Int[((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^(p_), x_Symbol] := Dist[1/(2*c*(-4*
(c/(b^2 - 4*a*c)))^p), Subst[Int[Simp[1 - x^2/(b^2 - 4*a*c), x]^p, x], x, b
+ 2*c*x], x] /; FreeQ[{a, b, c, p}, x] && GtQ[4*a - b^2/c, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= -\frac{1}{2}(3-x)\sqrt{6x-x^2} + \frac{9}{2} \int \frac{1}{\sqrt{6x-x^2}} dx \\ &= -\frac{1}{2}(3-x)\sqrt{6x-x^2} - \frac{3}{4} \text{Subst} \left(\int \frac{1}{\sqrt{1-\frac{x^2}{36}}} dx, x, 6-2x \right) \\ &= -\frac{1}{2}(3-x)\sqrt{6x-x^2} - \frac{9}{2} \arcsin \left(1 - \frac{x}{3} \right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.08 (sec) , antiderivative size = 47, normalized size of antiderivative = 1.62

$$\int \sqrt{6x-x^2} dx = \frac{1}{2} \sqrt{-((-6+x)x)} \left(-3+x + \frac{18 \log(\sqrt{-6+x} - \sqrt{x})}{\sqrt{-6+x}\sqrt{x}} \right)$$

```
[In] Integrate[Sqrt[6*x - x^2],x]
```

```
[Out] (Sqrt[-((-6 + x)*x)]*(-3 + x + (18*Log[Sqrt[-6 + x] - Sqrt[x]])/(Sqrt[-6 +
x]*Sqrt[x]))) / 2
```

Maple [A] (verified)

Time = 0.34 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.93

| method | result | size |
|----------------|--|------|
| risch | $-\frac{(-3+x)x(-6+x)}{2\sqrt{-x(-6+x)}} + \frac{9 \arcsin(\frac{x}{3}-1)}{2}$ | 27 |
| default | $-\frac{(-2x+6)\sqrt{-x^2+6x}}{4} + \frac{9 \arcsin(\frac{x}{3}-1)}{2}$ | 28 |
| pseudoelliptic | $-9 \arctan\left(\frac{\sqrt{-x(-6+x)}}{x}\right) + \frac{(-3+x)\sqrt{-x(-6+x)}}{2}$ | 30 |
| meijerg | $18i \left(-\frac{i\sqrt{\pi} \sqrt{x} \sqrt{6} (-x+3) \sqrt{-\frac{x}{6}+1}}{36} + \frac{i\sqrt{\pi} \arcsin\left(\frac{\sqrt{6}\sqrt{x}}{6}\right)}{2} \right)$ $\frac{\quad}{\sqrt{\pi}}$ | 47 |
| trager | $\left(-\frac{3}{2} + \frac{x}{2}\right) \sqrt{-x^2+6x} + \frac{9 \operatorname{RootOf}(-Z^2+1) \ln(-\operatorname{RootOf}(-Z^2+1)x + \sqrt{-x^2+6x} + 3 \operatorname{RootOf}(-Z^2+1))}{2}$ | 57 |

[In] int((-x^2+6*x)^(1/2),x,method=_RETURNVERBOSE)

[Out] -1/2*(-3+x)*x*(-6+x)/(-x*(-6+x))^(1/2)+9/2*arcsin(1/3*x-1)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 35, normalized size of antiderivative = 1.21

$$\int \sqrt{6x-x^2} dx = \frac{1}{2} \sqrt{-x^2+6x}(x-3) - 9 \arctan\left(\frac{\sqrt{-x^2+6x}}{x}\right)$$

[In] integrate((-x^2+6*x)^(1/2),x, algorithm="fricas")

[Out] 1/2*sqrt(-x^2 + 6*x)*(x - 3) - 9*arctan(sqrt(-x^2 + 6*x)/x)

Sympy [A] (verification not implemented)

Time = 0.20 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.90

$$\int \sqrt{6x-x^2} dx = \left(\frac{x}{2} - \frac{3}{2}\right) \sqrt{-x^2+6x} + \frac{9 \operatorname{asin}\left(\frac{x}{3}-1\right)}{2}$$

[In] integrate((-x**2+6*x)**(1/2),x)

[Out] (x/2 - 3/2)*sqrt(-x**2 + 6*x) + 9*asin(x/3 - 1)/2

Maxima [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.24

$$\int \sqrt{6x - x^2} dx = \frac{1}{2} \sqrt{-x^2 + 6x} - \frac{3}{2} \sqrt{-x^2 + 6x} - \frac{9}{2} \arcsin\left(-\frac{1}{3}x + 1\right)$$

[In] integrate((-x^2+6*x)^(1/2),x, algorithm="maxima")

[Out] 1/2*sqrt(-x^2 + 6*x)*x - 3/2*sqrt(-x^2 + 6*x) - 9/2*arcsin(-1/3*x + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.86

$$\int \sqrt{6x - x^2} dx = \frac{1}{2} \sqrt{-x^2 + 6x}(x - 3) + \frac{9}{2} \arcsin\left(\frac{1}{3}x - 1\right)$$

[In] integrate((-x^2+6*x)^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(-x^2 + 6*x)*(x - 3) + 9/2*arcsin(1/3*x - 1)

Mupad [B] (verification not implemented)

Time = 14.40 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.90

$$\int \sqrt{6x - x^2} dx = \frac{9 \operatorname{asin}\left(\frac{x}{3} - 1\right)}{2} + \left(\frac{x}{2} - \frac{3}{2}\right) \sqrt{6x - x^2}$$

[In] int((6*x - x^2)^(1/2),x)

[Out] (9*asin(x/3 - 1))/2 + (x/2 - 3/2)*(6*x - x^2)^(1/2)

3.46 $\int \sin^{99}(x) \sin(101x) dx$

| | |
|--|-----|
| Optimal result | 292 |
| Rubi [B] (verified) | 292 |
| Mathematica [A] (verified) | 295 |
| Maple [B] (verified) | 295 |
| Fricas [F(-1)] | 297 |
| Sympy [F(-1)] | 297 |
| Maxima [F(-2)] | 298 |
| Giac [B] (verification not implemented) | 298 |
| Mupad [B] (verification not implemented) | 300 |

Optimal result

Integrand size = 9, antiderivative size = 12

$$\int \sin^{99}(x) \sin(101x) dx = \frac{1}{100} \sin^{100}(x) \sin(100x)$$

[Out] 1/100*sin(x)^100*sin(100*x)

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 801 vs. $2(12) = 24$.

Time = 0.63 (sec) , antiderivative size = 801, normalized size of antiderivative = 66.75, number of steps used = 102, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {4439, 2717}

$$\int \sin^{99}(x) \sin(101x) dx = \text{Too large to display}$$

[In] Int[Sin[x]^99*Sin[101*x],x]

[Out] $-1/1267650600228229401496703205376*\text{Sin}[2*x] + (99*\text{Sin}[4*x])/2535301200456458802993406410752 - (1617*\text{Sin}[6*x])/1267650600228229401496703205376 + (156849*\text{Sin}[8*x])/5070602400912917605986812821504 - (470547*\text{Sin}[10*x])/792281625142643375935439503360 + (2980131*\text{Sin}[12*x])/316912650057057350374175801344 - (20009451*\text{Sin}[14*x])/158456325028528675187087900672 + (1860878943*\text{Sin}[16*x])/1267650600228229401496703205376 - (4755579521*\text{Sin}[18*x])/316912650057057350374175801344 + (432757736411*\text{Sin}[20*x])/3169126500570573503741758013440 - (354074511609*\text{Sin}[22*x])/316912650057057350374175801344 + (10504210511067*\text{Sin}[24*x])/1267650600228229401496703205376 - (8888178124749*\text{Sin}[26*x])/158456325028528675187087900672 + (110467356693309*\text{Sin}[28*x])/31691265005705735$

0374175801344 - (1583365445937429*Sin[30*x])/792281625142643375935439503360
 + (26917212580936293*Sin[32*x])/2535301200456458802993406410752 - (3325067
 4364686009*Sin[34*x])/633825300114114700748351602688 + (306645108029882083*
 Sin[36*x])/1267650600228229401496703205376 - (661707864696061337*Sin[38*x])
 /633825300114114700748351602688 + (53598337040380968297*Sin[40*x])/12676506
 002282294014967032053760 - (2552301763827665157*Sin[42*x])/1584563250285286
 75187087900672 + (18330167212944140673*Sin[44*x])/3169126500570573503741758
 01344 - (31081587882818325489*Sin[46*x])/158456325028528675187087900672 + (
 797760755659003687551*Sin[48*x])/1267650600228229401496703205376 - (1515745
 4357521070063469*Sin[50*x])/7922816251426433759354395033600 + (349787408250
 4862322339*Sin[52*x])/633825300114114700748351602688 - (4793383001951107626
 909*Sin[54*x])/316912650057057350374175801344 + (49988137020347265252051*Si
 n[56*x])/1267650600228229401496703205376 - (15513559764935358181671*Sin[58*
 x])/158456325028528675187087900672 + (367154247770136810299547*Sin[60*x])/1
 584563250285286751870879006720 - (82905797883579279745059*Sin[62*x])/158456
 325028528675187087900672 + (5720500053966970302409071*Sin[64*x])/5070602400
 912917605986812821504 - (2946924270225408943665279*Sin[66*x])/1267650600228
 229401496703205376 + (11614348594417788189739629*Sin[68*x])/253530120045645
 8802993406410752 - (54753357659398144323058251*Sin[70*x])/63382530011411470
 07483516026880 + (79088183285797319577750807*Sin[72*x])/5070602400912917605
 986812821504 - (2137518467183711339939211*Sin[74*x])/7922816251426433759354
 3950336 + (7087561233293358653482647*Sin[76*x])/158456325028528675187087900
 672 - (5633702518771644057896463*Sin[78*x])/79228162514264337593543950336 +
 (343655853645070287531684243*Sin[80*x])/3169126500570573503741758013440 -
 (25145550266712460063293969*Sin[82*x])/158456325028528675187087900672 + (70
 647022177906435415921151*Sin[84*x])/316912650057057350374175801344 - (47645
 666119983409931667753*Sin[86*x])/158456325028528675187087900672 + (24689117
 8985368578736823811*Sin[88*x])/633825300114114700748351602688 - (1920264725
 44175561239751853*Sin[90*x])/396140812571321687967719751680 + (918387477385
 18746679881321*Sin[92*x])/158456325028528675187087900672 - (527584295519150
 24688442461*Sin[94*x])/79228162514264337593543950336 + (9320655887504987694
 95816811*Sin[96*x])/1267650600228229401496703205376 - (24728270721952008170
 2971807*Sin[98*x])/316912650057057350374175801344 + (1261141806819552416685
 1562157*Sin[100*x])/15845632502852867518708790067200 - (2472827072195200817
 02971807*Sin[102*x])/316912650057057350374175801344 + (93206558875049876949
 5816811*Sin[104*x])/1267650600228229401496703205376 - (52758429551915024688
 442461*Sin[106*x])/79228162514264337593543950336 + (91838747738518746679881
 321*Sin[108*x])/158456325028528675187087900672 - (1920264725441755612397518
 53*Sin[110*x])/396140812571321687967719751680 + (24689117898536857873682381
 1*Sin[112*x])/633825300114114700748351602688 - (47645666119983409931667753*
 Sin[114*x])/158456325028528675187087900672 + (70647022177906435415921151*Si
 n[116*x])/316912650057057350374175801344 - (25145550266712460063293969*Sin[
 118*x])/158456325028528675187087900672 + (343655853645070287531684243*Sin[1
 20*x])/3169126500570573503741758013440 - (5633702518771644057896463*Sin[122
 *x])/79228162514264337593543950336 + (7087561233293358653482647*Sin[124*x])

```

/158456325028528675187087900672 - (2137518467183711339939211*Sin[126*x])/79
228162514264337593543950336 + (79088183285797319577750807*Sin[128*x])/50706
02400912917605986812821504 - (54753357659398144323058251*Sin[130*x])/633825
3001141147007483516026880 + (11614348594417788189739629*Sin[132*x])/2535301
200456458802993406410752 - (2946924270225408943665279*Sin[134*x])/126765060
0228229401496703205376 + (5720500053966970302409071*Sin[136*x])/50706024009
12917605986812821504 - (82905797883579279745059*Sin[138*x])/158456325028528
675187087900672 + (367154247770136810299547*Sin[140*x])/1584563250285286751
870879006720 - (15513559764935358181671*Sin[142*x])/15845632502852867518708
7900672 + (49988137020347265252051*Sin[144*x])/1267650600228229401496703205
376 - (4793383001951107626909*Sin[146*x])/316912650057057350374175801344 +
(3497874082504862322339*Sin[148*x])/633825300114114700748351602688 - (15157
454357521070063469*Sin[150*x])/7922816251426433759354395033600 + (797760755
659003687551*Sin[152*x])/1267650600228229401496703205376 - (310815878828183
25489*Sin[154*x])/158456325028528675187087900672 + (18330167212944140673*Si
n[156*x])/316912650057057350374175801344 - (2552301763827665157*Sin[158*x])
/158456325028528675187087900672 + (53598337040380968297*Sin[160*x])/1267650
6002282294014967032053760 - (661707864696061337*Sin[162*x])/633825300114114
700748351602688 + (306645108029882083*Sin[164*x])/1267650600228229401496703
205376 - (33250674364686009*Sin[166*x])/633825300114114700748351602688 + (2
6917212580936293*Sin[168*x])/2535301200456458802993406410752 - (15833654459
37429*Sin[170*x])/792281625142643375935439503360 + (110467356693309*Sin[172
*x])/316912650057057350374175801344 - (8888178124749*Sin[174*x])/1584563250
28528675187087900672 + (10504210511067*Sin[176*x])/126765060022822940149670
3205376 - (354074511609*Sin[178*x])/316912650057057350374175801344 + (43275
7736411*Sin[180*x])/3169126500570573503741758013440 - (4755579521*Sin[182*x
])/316912650057057350374175801344 + (1860878943*Sin[184*x])/126765060022822
9401496703205376 - (20009451*Sin[186*x])/158456325028528675187087900672 + (
2980131*Sin[188*x])/316912650057057350374175801344 - (470547*Sin[190*x])/79
2281625142643375935439503360 + (156849*Sin[192*x])/507060240091291760598681
2821504 - (1617*Sin[194*x])/1267650600228229401496703205376 + (99*Sin[196*x
])/2535301200456458802993406410752 - Sin[198*x]/126765060022822940149670320
5376 + Sin[200*x]/126765060022822940149670320537600

```

Rule 2717

```

Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] := Simp[Sin[c + d*x]/d, x] /;
FreeQ[{c, d}, x]

```

Rule 4439

```

Int[(F_)[(a_.) + (b_.)*(x_)]^(p_.)*(G_)[(c_.) + (d_.)*(x_)]^(q_.), x_Symbol
] := Int[ExpandTrigReduce[ActivateTrig[F[a + b*x]^p*G[c + d*x]^q], x], x] /;
FreeQ[{a, b, c, d}, x] && (EqQ[F, sin] || EqQ[F, cos]) && (EqQ[G, sin] ||
EqQ[G, cos]) && IGtQ[p, 0] && IGtQ[q, 0]

```

Rubi steps

integral = Too large to display

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \sin^{99}(x) \sin(101x) dx = \frac{1}{100} \sin^{100}(x) \sin(100x)$$

[In] Integrate[Sin[x]^99*Sin[101*x],x]

[Out] (Sin[x]^100*Sin[100*x])/100

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 601 vs. 2(10) = 20.

Time = 1.16 (sec) , antiderivative size = 602, normalized size of antiderivative = 50.17

Expression too large to display

[In] int(sin(101*x)*sin(x)^99,x)

[Out] -354074511609/316912650057057350374175801344*sin(178*x)+343655853645070287531684243/3169126500570573503741758013440*sin(80*x)+1/126765060022822940149670320537600*sin(200*x)-1583365445937429/792281625142643375935439503360*sin(170*x)-15157454357521070063469/7922816251426433759354395033600*sin(150*x)-888178124749/158456325028528675187087900672*sin(174*x)+2980131/316912650057057350374175801344*sin(12*x)-20009451/158456325028528675187087900672*sin(14*x)+1860878943/1267650600228229401496703205376*sin(16*x)-4755579521/316912650057057350374175801344*sin(18*x)-1583365445937429/792281625142643375935439503360*sin(30*x)-354074511609/316912650057057350374175801344*sin(22*x)+156849/5070602400912917605986812821504*sin(8*x)-470547/792281625142643375935439503360*sin(10*x)-1617/1267650600228229401496703205376*sin(6*x)+432757736411/3169126500570573503741758013440*sin(20*x)+99/2535301200456458802993406410752*sin(4*x)+12611418068195524166851562157/15845632502852867518708790067200*sin(100*x)-1/1267650600228229401496703205376*sin(2*x)-247282707219520081702971807/316912650057057350374175801344*sin(98*x)-192026472544175561239751853/396140812571321687967719751680*sin(90*x)-54753357659398144323058251/6338253001141147007483516026880*sin(130*x)+3497874082504862322339/633825300114114700748351602688*sin(148*x)+26917212580936293/2535301200456458802993406410752*sin(168*x)-2552301763827665157/158456325028528675187087900672*sin(158*x)+99/2535301200456458802993406410752*sin(196*x)-2946924270225408943665279/1267650600228229401496703205376*sin(134*x)-2137518467183711339939211/792281625142643375935439503360*sin(126*x)-247282707219520081702971807/316912650057057350374175801344*sin(102*x)+11614348594417788189739629/253530120045645880299

3406410752*sin(132*x)-5633702518771644057896463/792281625142643375935439503
36*sin(122*x)-15513559764935358181671/158456325028528675187087900672*sin(14
2*x)+91838747738518746679881321/158456325028528675187087900672*sin(92*x)+43
2757736411/3169126500570573503741758013440*sin(180*x)-661707864696061337/63
3825300114114700748351602688*sin(162*x)+246891178985368578736823811/6338253
00114114700748351602688*sin(112*x)+110467356693309/316912650057057350374175
801344*sin(28*x)+932065588750498769495816811/126765060022822940149670320537
6*sin(96*x)+70647022177906435415921151/316912650057057350374175801344*sin(8
4*x)-25145550266712460063293969/158456325028528675187087900672*sin(82*x)+26
917212580936293/2535301200456458802993406410752*sin(32*x)+10504210511067/12
67650600228229401496703205376*sin(24*x)-33250674364686009/63382530011411470
0748351602688*sin(34*x)+306645108029882083/1267650600228229401496703205376*
sin(36*x)+1860878943/1267650600228229401496703205376*sin(184*x)+24689117898
5368578736823811/633825300114114700748351602688*sin(88*x)-47645666119983409
931667753/158456325028528675187087900672*sin(114*x)-661707864696061337/6338
25300114114700748351602688*sin(38*x)-52758429551915024688442461/79228162514
264337593543950336*sin(94*x)-31081587882818325489/1584563250285286751870879
00672*sin(154*x)+53598337040380968297/12676506002282294014967032053760*sin(
40*x)+3497874082504862322339/633825300114114700748351602688*sin(52*x)+29801
31/316912650057057350374175801344*sin(188*x)-5633702518771644057896463/7922
8162514264337593543950336*sin(78*x)-192026472544175561239751853/39614081257
1321687967719751680*sin(110*x)+7087561233293358653482647/158456325028528675
187087900672*sin(76*x)-2137518467183711339939211/79228162514264337593543950
336*sin(74*x)-33250674364686009/633825300114114700748351602688*sin(166*x)-8
2905797883579279745059/158456325028528675187087900672*sin(138*x)+7908818328
5797319577750807/5070602400912917605986812821504*sin(72*x)+9183874773851874
6679881321/158456325028528675187087900672*sin(108*x)-5475335765939814432305
8251/6338253001141147007483516026880*sin(70*x)-4755579521/31691265005705735
0374175801344*sin(182*x)-15513559764935358181671/15845632502852867518708790
0672*sin(58*x)+10504210511067/1267650600228229401496703205376*sin(176*x)+11
614348594417788189739629/2535301200456458802993406410752*sin(68*x)+49988137
020347265252051/1267650600228229401496703205376*sin(56*x)-25145550266712460
063293969/158456325028528675187087900672*sin(118*x)-29469242702254089436652
79/1267650600228229401496703205376*sin(66*x)-52758429551915024688442461/792
28162514264337593543950336*sin(106*x)+367154247770136810299547/158456325028
5286751870879006720*sin(60*x)-4793383001951107626909/3169126500570573503741
75801344*sin(54*x)+7087561233293358653482647/158456325028528675187087900672
*sin(124*x)+367154247770136810299547/1584563250285286751870879006720*sin(14
0*x)+18330167212944140673/316912650057057350374175801344*sin(156*x)-1515745
4357521070063469/7922816251426433759354395033600*sin(50*x)+5720500053966970
302409071/5070602400912917605986812821504*sin(136*x)+53598337040380968297/1
2676506002282294014967032053760*sin(160*x)+70647022177906435415921151/31691
2650057057350374175801344*sin(116*x)-82905797883579279745059/15845632502852
8675187087900672*sin(62*x)+110467356693309/316912650057057350374175801344*s
in(172*x)-1/1267650600228229401496703205376*sin(198*x)+49988137020347265252

```

051/1267650600228229401496703205376*sin(144*x)+79088183285797319577750807/5
070602400912917605986812821504*sin(128*x)+932065588750498769495816811/12676
50600228229401496703205376*sin(104*x)+156849/507060240091291760598681282150
4*sin(192*x)+343655853645070287531684243/3169126500570573503741758013440*si
n(120*x)-470547/792281625142643375935439503360*sin(190*x)-47933830019511076
26909/316912650057057350374175801344*sin(146*x)-2552301763827665157/1584563
25028528675187087900672*sin(42*x)+797760755659003687551/1267650600228229401
496703205376*sin(152*x)+18330167212944140673/316912650057057350374175801344
*sin(44*x)-20009451/158456325028528675187087900672*sin(186*x)+3066451080298
82083/1267650600228229401496703205376*sin(164*x)-8888178124749/158456325028
528675187087900672*sin(26*x)-47645666119983409931667753/1584563250285286751
87087900672*sin(86*x)+797760755659003687551/1267650600228229401496703205376
*sin(48*x)-31081587882818325489/158456325028528675187087900672*sin(46*x)-16
17/1267650600228229401496703205376*sin(194*x)+5720500053966970302409071/507
0602400912917605986812821504*sin(64*x)

```

Fricas [F(-1)]

Timed out.

$$\int \sin^{99}(x) \sin(101x) dx = \text{Timed out}$$

```
[In] integrate(sin(101*x)*sin(x)^99,x, algorithm="fricas")
```

```
[Out] Timed out
```

Sympy [F(-1)]

Timed out.

$$\int \sin^{99}(x) \sin(101x) dx = \text{Timed out}$$

```
[In] integrate(sin(101*x)*sin(x)**99,x)
```

```
[Out] Timed out
```

Maxima [F(-2)]

Exception generated.

$$\int \sin^{99}(x) \sin(101x) dx = \text{Exception raised: RuntimeError}$$

[In] integrate(sin(101*x)*sin(x)^99,x, algorithm="maxima")

[Out] Exception raised: RuntimeError >> ECL says: Memory limit reached. Please jump to an outer pointer, quit program and enlarge the memory limits before executing the program again.

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 601 vs. 2(10) = 20.

Time = 0.29 (sec) , antiderivative size = 601, normalized size of antiderivative = 50.08

$$\int \sin^{99}(x) \sin(101x) dx = \text{Too large to display}$$

[In] integrate(sin(101*x)*sin(x)^99,x, algorithm="giac")

[Out] 1/126765060022822940149670320537600*sin(200*x) - 1/1267650600228229401496703205376*sin(198*x) + 99/2535301200456458802993406410752*sin(196*x) - 1617/1267650600228229401496703205376*sin(194*x) + 156849/5070602400912917605986812821504*sin(192*x) - 470547/792281625142643375935439503360*sin(190*x) + 2980131/316912650057057350374175801344*sin(188*x) - 20009451/158456325028528675187087900672*sin(186*x) + 1860878943/1267650600228229401496703205376*sin(184*x) - 4755579521/316912650057057350374175801344*sin(182*x) + 432757736411/3169126500570573503741758013440*sin(180*x) - 354074511609/316912650057057350374175801344*sin(178*x) + 10504210511067/1267650600228229401496703205376*sin(176*x) - 8888178124749/158456325028528675187087900672*sin(174*x) + 110467356693309/316912650057057350374175801344*sin(172*x) - 1583365445937429/792281625142643375935439503360*sin(170*x) + 26917212580936293/2535301200456458802993406410752*sin(168*x) - 33250674364686009/633825300114114700748351602688*sin(166*x) + 306645108029882083/1267650600228229401496703205376*sin(164*x) - 661707864696061337/633825300114114700748351602688*sin(162*x) + 53598337040380968297/12676506002282294014967032053760*sin(160*x) - 2552301763827665157/158456325028528675187087900672*sin(158*x) + 18330167212944140673/316912650057057350374175801344*sin(156*x) - 31081587882818325489/158456325028528675187087900672*sin(154*x) + 797760755659003687551/1267650600228229401496703205376*sin(152*x) - 15157454357521070063469/7922816251426433759354395033600*sin(150*x) + 3497874082504862322339/633825300114114700748351602688*sin(148*x) - 4793383001951107626909/316912650057057350374175801344*sin(146*x) +

49988137020347265252051/1267650600228229401496703205376*sin(144*x) - 155135
59764935358181671/158456325028528675187087900672*sin(142*x) + 3671542477701
36810299547/1584563250285286751870879006720*sin(140*x) - 829057978835792797
45059/158456325028528675187087900672*sin(138*x) + 5720500053966970302409071
/5070602400912917605986812821504*sin(136*x) - 2946924270225408943665279/126
7650600228229401496703205376*sin(134*x) + 11614348594417788189739629/253530
1200456458802993406410752*sin(132*x) - 54753357659398144323058251/633825300
1141147007483516026880*sin(130*x) + 79088183285797319577750807/507060240091
2917605986812821504*sin(128*x) - 2137518467183711339939211/7922816251426433
7593543950336*sin(126*x) + 7087561233293358653482647/1584563250285286751870
87900672*sin(124*x) - 5633702518771644057896463/792281625142643375935439503
36*sin(122*x) + 343655853645070287531684243/3169126500570573503741758013440
*sin(120*x) - 25145550266712460063293969/158456325028528675187087900672*sin
(118*x) + 70647022177906435415921151/316912650057057350374175801344*sin(116
*x) - 47645666119983409931667753/158456325028528675187087900672*sin(114*x)
+ 246891178985368578736823811/633825300114114700748351602688*sin(112*x) - 1
92026472544175561239751853/396140812571321687967719751680*sin(110*x) + 9183
8747738518746679881321/158456325028528675187087900672*sin(108*x) - 52758429
551915024688442461/79228162514264337593543950336*sin(106*x) + 9320655887504
98769495816811/1267650600228229401496703205376*sin(104*x) - 247282707219520
081702971807/316912650057057350374175801344*sin(102*x) + 126114180681955241
66851562157/15845632502852867518708790067200*sin(100*x) - 24728270721952008
1702971807/316912650057057350374175801344*sin(98*x) + 932065588750498769495
816811/1267650600228229401496703205376*sin(96*x) - 527584295519150246884424
61/79228162514264337593543950336*sin(94*x) + 91838747738518746679881321/158
456325028528675187087900672*sin(92*x) - 192026472544175561239751853/3961408
12571321687967719751680*sin(90*x) + 246891178985368578736823811/63382530011
4114700748351602688*sin(88*x) - 47645666119983409931667753/1584563250285286
75187087900672*sin(86*x) + 70647022177906435415921151/316912650057057350374
175801344*sin(84*x) - 25145550266712460063293969/15845632502852867518708790
0672*sin(82*x) + 343655853645070287531684243/316912650057057350374175801344
0*sin(80*x) - 5633702518771644057896463/79228162514264337593543950336*sin(7
8*x) + 7087561233293358653482647/158456325028528675187087900672*sin(76*x) -
2137518467183711339939211/79228162514264337593543950336*sin(74*x) + 790881
83285797319577750807/5070602400912917605986812821504*sin(72*x) - 5475335765
9398144323058251/6338253001141147007483516026880*sin(70*x) + 11614348594417
788189739629/2535301200456458802993406410752*sin(68*x) - 294692427022540894
3665279/1267650600228229401496703205376*sin(66*x) + 57205000539669703024090
71/5070602400912917605986812821504*sin(64*x) - 82905797883579279745059/1584
56325028528675187087900672*sin(62*x) + 367154247770136810299547/15845632502
85286751870879006720*sin(60*x) - 15513559764935358181671/158456325028528675
187087900672*sin(58*x) + 49988137020347265252051/12676506002282294014967032
05376*sin(56*x) - 4793383001951107626909/316912650057057350374175801344*sin
(54*x) + 3497874082504862322339/633825300114114700748351602688*sin(52*x) -
15157454357521070063469/7922816251426433759354395033600*sin(50*x) + 7977607

```

55659003687551/1267650600228229401496703205376*sin(48*x) - 3108158788281832
5489/158456325028528675187087900672*sin(46*x) + 18330167212944140673/316912
650057057350374175801344*sin(44*x) - 2552301763827665157/158456325028528675
187087900672*sin(42*x) + 53598337040380968297/12676506002282294014967032053
760*sin(40*x) - 661707864696061337/633825300114114700748351602688*sin(38*x)
+ 306645108029882083/1267650600228229401496703205376*sin(36*x) - 332506743
64686009/633825300114114700748351602688*sin(34*x) + 26917212580936293/25353
01200456458802993406410752*sin(32*x) - 1583365445937429/7922816251426433759
35439503360*sin(30*x) + 110467356693309/316912650057057350374175801344*sin(
28*x) - 8888178124749/158456325028528675187087900672*sin(26*x) + 1050421051
1067/1267650600228229401496703205376*sin(24*x) - 354074511609/3169126500570
57350374175801344*sin(22*x) + 432757736411/3169126500570573503741758013440*
sin(20*x) - 4755579521/316912650057057350374175801344*sin(18*x) + 186087894
3/1267650600228229401496703205376*sin(16*x) - 20009451/15845632502852867518
7087900672*sin(14*x) + 2980131/316912650057057350374175801344*sin(12*x) - 4
70547/792281625142643375935439503360*sin(10*x) + 156849/5070602400912917605
986812821504*sin(8*x) - 1617/1267650600228229401496703205376*sin(6*x) + 99/
2535301200456458802993406410752*sin(4*x) - 1/126765060022822940149670320537
6*sin(2*x)

```

Mupad [B] (verification not implemented)

Time = 21.21 (sec) , antiderivative size = 601, normalized size of antiderivative = 50.08

$$\int \sin^{99}(x) \sin(101x) dx = \text{Too large to display}$$

[In] int(sin(101*x)*sin(x)^99,x)

```

[Out] (99*sin(4*x))/2535301200456458802993406410752 - sin(2*x)/126765060022822940
1496703205376 - (1617*sin(6*x))/1267650600228229401496703205376 + (156849*s
in(8*x))/5070602400912917605986812821504 - (470547*sin(10*x))/7922816251426
43375935439503360 + (2980131*sin(12*x))/316912650057057350374175801344 - (2
0009451*sin(14*x))/158456325028528675187087900672 + (1860878943*sin(16*x))/
1267650600228229401496703205376 - (4755579521*sin(18*x))/316912650057057350
374175801344 + (432757736411*sin(20*x))/3169126500570573503741758013440 - (
354074511609*sin(22*x))/316912650057057350374175801344 + (10504210511067*si
n(24*x))/1267650600228229401496703205376 - (8888178124749*sin(26*x))/158456
325028528675187087900672 + (110467356693309*sin(28*x))/31691265005705735037
4175801344 - (1583365445937429*sin(30*x))/792281625142643375935439503360 +
(26917212580936293*sin(32*x))/2535301200456458802993406410752 - (3325067436
4686009*sin(34*x))/633825300114114700748351602688 + (306645108029882083*sin
(36*x))/1267650600228229401496703205376 - (661707864696061337*sin(38*x))/63
3825300114114700748351602688 + (53598337040380968297*sin(40*x))/12676506002
282294014967032053760 - (2552301763827665157*sin(42*x))/1584563250285286751

```


87087900672 + (18330167212944140673*sin(44*x))/3169126500570573503741758013
44 - (31081587882818325489*sin(46*x))/158456325028528675187087900672 + (797
760755659003687551*sin(48*x))/1267650600228229401496703205376 - (1515745435
7521070063469*sin(50*x))/7922816251426433759354395033600 + (349787408250486
2322339*sin(52*x))/633825300114114700748351602688 - (4793383001951107626909
*sin(54*x))/316912650057057350374175801344 + (49988137020347265252051*sin(5
6*x))/1267650600228229401496703205376 - (15513559764935358181671*sin(58*x))
/158456325028528675187087900672 + (367154247770136810299547*sin(60*x))/1584
563250285286751870879006720 - (82905797883579279745059*sin(62*x))/158456325
028528675187087900672 + (5720500053966970302409071*sin(64*x))/5070602400912
917605986812821504 - (2946924270225408943665279*sin(66*x))/1267650600228229
401496703205376 + (11614348594417788189739629*sin(68*x))/253530120045645880
2993406410752 - (54753357659398144323058251*sin(70*x))/63382530011411470074
83516026880 + (79088183285797319577750807*sin(72*x))/5070602400912917605986
812821504 - (2137518467183711339939211*sin(74*x))/7922816251426433759354395
0336 + (7087561233293358653482647*sin(76*x))/158456325028528675187087900672
- (5633702518771644057896463*sin(78*x))/79228162514264337593543950336 + (3
43655853645070287531684243*sin(80*x))/3169126500570573503741758013440 - (25
145550266712460063293969*sin(82*x))/158456325028528675187087900672 + (70647
022177906435415921151*sin(84*x))/316912650057057350374175801344 - (47645666
119983409931667753*sin(86*x))/158456325028528675187087900672 + (24689117898
5368578736823811*sin(88*x))/633825300114114700748351602688 - (1920264725441
75561239751853*sin(90*x))/396140812571321687967719751680 + (918387477385187
46679881321*sin(92*x))/158456325028528675187087900672 - (527584295519150246
88442461*sin(94*x))/79228162514264337593543950336 + (9320655887504987694958
16811*sin(96*x))/1267650600228229401496703205376 - (24728270721952008170297
1807*sin(98*x))/316912650057057350374175801344 + (1261141806819552416685156
2157*sin(100*x))/15845632502852867518708790067200 - (2472827072195200817029
71807*sin(102*x))/316912650057057350374175801344 + (93206558875049876949581
6811*sin(104*x))/1267650600228229401496703205376 - (52758429551915024688442
461*sin(106*x))/79228162514264337593543950336 + (91838747738518746679881321
*sin(108*x))/158456325028528675187087900672 - (192026472544175561239751853*
sin(110*x))/396140812571321687967719751680 + (246891178985368578736823811*s
in(112*x))/633825300114114700748351602688 - (47645666119983409931667753*sin
(114*x))/158456325028528675187087900672 + (70647022177906435415921151*sin(1
16*x))/316912650057057350374175801344 - (25145550266712460063293969*sin(118
*x))/158456325028528675187087900672 + (343655853645070287531684243*sin(120*
x))/3169126500570573503741758013440 - (5633702518771644057896463*sin(122*x)
)/79228162514264337593543950336 + (7087561233293358653482647*sin(124*x))/15
8456325028528675187087900672 - (2137518467183711339939211*sin(126*x))/79228
162514264337593543950336 + (79088183285797319577750807*sin(128*x))/50706024
00912917605986812821504 - (54753357659398144323058251*sin(130*x))/633825300
1141147007483516026880 + (11614348594417788189739629*sin(132*x))/2535301200
456458802993406410752 - (2946924270225408943665279*sin(134*x))/126765060022
8229401496703205376 + (5720500053966970302409071*sin(136*x))/50706024009129

$$\begin{aligned}
& 17605986812821504 - (82905797883579279745059 \cdot \sin(138x)) / 158456325028528675 \\
& 187087900672 + (367154247770136810299547 \cdot \sin(140x)) / 1584563250285286751870 \\
& 879006720 - (15513559764935358181671 \cdot \sin(142x)) / 15845632502852867518708790 \\
& 0672 + (49988137020347265252051 \cdot \sin(144x)) / 1267650600228229401496703205376 \\
& - (4793383001951107626909 \cdot \sin(146x)) / 316912650057057350374175801344 + (34 \\
& 97874082504862322339 \cdot \sin(148x)) / 633825300114114700748351602688 - (15157454 \\
& 357521070063469 \cdot \sin(150x)) / 7922816251426433759354395033600 + (797760755659 \\
& 003687551 \cdot \sin(152x)) / 1267650600228229401496703205376 - (310815878828183254 \\
& 89 \cdot \sin(154x)) / 158456325028528675187087900672 + (18330167212944140673 \cdot \sin(1 \\
& 56x)) / 316912650057057350374175801344 - (2552301763827665157 \cdot \sin(158x)) / 15 \\
& 8456325028528675187087900672 + (53598337040380968297 \cdot \sin(160x)) / 1267650600 \\
& 2282294014967032053760 - (661707864696061337 \cdot \sin(162x)) / 633825300114114700 \\
& 748351602688 + (306645108029882083 \cdot \sin(164x)) / 1267650600228229401496703205 \\
& 376 - (33250674364686009 \cdot \sin(166x)) / 633825300114114700748351602688 + (2691 \\
& 7212580936293 \cdot \sin(168x)) / 2535301200456458802993406410752 - (15833654459374 \\
& 29 \cdot \sin(170x)) / 792281625142643375935439503360 + (110467356693309 \cdot \sin(172x) \\
&) / 316912650057057350374175801344 - (8888178124749 \cdot \sin(174x)) / 1584563250285 \\
& 28675187087900672 + (10504210511067 \cdot \sin(176x)) / 126765060022822940149670320 \\
& 5376 - (354074511609 \cdot \sin(178x)) / 316912650057057350374175801344 + (43275773 \\
& 6411 \cdot \sin(180x)) / 3169126500570573503741758013440 - (4755579521 \cdot \sin(182x)) / \\
& 316912650057057350374175801344 + (1860878943 \cdot \sin(184x)) / 126765060022822940 \\
& 1496703205376 - (20009451 \cdot \sin(186x)) / 158456325028528675187087900672 + (298 \\
& 0131 \cdot \sin(188x)) / 316912650057057350374175801344 - (470547 \cdot \sin(190x)) / 79228 \\
& 1625142643375935439503360 + (156849 \cdot \sin(192x)) / 507060240091291760598681282 \\
& 1504 - (1617 \cdot \sin(194x)) / 1267650600228229401496703205376 + (99 \cdot \sin(196x)) / \\
& 2535301200456458802993406410752 - \sin(198x) / 126765060022822940149670320537 \\
& 6 + \sin(200x) / 126765060022822940149670320537600
\end{aligned}$$

3.47 $\int e^{e^{x^2}} x dx$

| | |
|---|-----|
| Optimal result | 303 |
| Rubi [A] (verified) | 303 |
| Mathematica [A] (verified) | 304 |
| Maple [A] (verified) | 304 |
| Fricas [A] (verification not implemented) | 305 |
| Sympy [A] (verification not implemented) | 305 |
| Maxima [A] (verification not implemented) | 305 |
| Giac [A] (verification not implemented) | 306 |
| Mupad [B] (verification not implemented) | 306 |

Optimal result

Integrand size = 9, antiderivative size = 10

$$\int e^{e^{x^2}} x dx = \frac{\text{ExpIntegralEi}(e^{x^2})}{2}$$

[Out] 1/2*Ei(exp(x^2))

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {6847, 2320, 2209}

$$\int e^{e^{x^2}} x dx = \frac{\text{ExpIntegralEi}(e^{x^2})}{2}$$

[In] Int[E^E^x^2*x,x]

[Out] ExpIntegralEi[E^x^2]/2

Rule 2209

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] := Si
mp[(F^(g*(e - c*(f/d)))/d)*ExpIntegralEi[f*g*(c + d*x)*(Log[F]/d)], x] /; F
reeQ[{F, c, d, e, f, g}, x] && !TrueQ[$UseGamma]
```

Rule 2320

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x] /; Functi
```

```

onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_) /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n]] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_) [v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]

```

Rule 6847

```

Int[(u_)*(x_)^(m_.), x_Symbol] := Dist[1/(m + 1), Subst[Int[SubstFor[x^(m +
1), u, x], x], x, x^(m + 1)], x] /; FreeQ[m, x] && NeQ[m, -1] && FunctionO
fQ[x^(m + 1), u, x]

```

Rubi steps

$$\begin{aligned}
\text{integral} &= \frac{1}{2} \text{Subst} \left(\int e^{e^x} dx, x, x^2 \right) \\
&= \frac{1}{2} \text{Subst} \left(\int \frac{e^x}{x} dx, x, e^{x^2} \right) \\
&= \frac{\text{ExpIntegralEi} \left(e^{x^2} \right)}{2}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int e^{e^{x^2}} x dx = \frac{\text{ExpIntegralEi} \left(e^{x^2} \right)}{2}$$

[In] Integrate[E^E^x^2*x,x]

[Out] ExpIntegralEi[E^x^2]/2

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

| method | result | size |
|------------------|------------------------------------|------|
| derivativdivides | $-\frac{\text{Ei}_1(-e^{x^2})}{2}$ | 11 |
| default | $-\frac{\text{Ei}_1(-e^{x^2})}{2}$ | 11 |
| risch | $-\frac{\text{Ei}_1(-e^{x^2})}{2}$ | 11 |

[In] int(exp(exp(x^2))*x,x,method=_RETURNVERBOSE)

[Out] $-1/2 * \text{Ei}(1, -\exp(x^2))$

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.70

$$\int e^{e^{x^2}} x dx = \frac{1}{2} \text{Ei}(e^{(x^2)})$$

[In] `integrate(exp(exp(x^2))*x,x, algorithm="fricas")`

[Out] $1/2 * \text{Ei}(e^{(x^2)})$

Sympy [A] (verification not implemented)

Time = 0.66 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.70

$$\int e^{e^{x^2}} x dx = \frac{\text{Ei}(e^{x^2})}{2}$$

[In] `integrate(exp(exp(x**2))*x,x)`

[Out] $\text{Ei}(\exp(x**2))/2$

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.70

$$\int e^{e^{x^2}} x dx = \frac{1}{2} \text{Ei}(e^{(x^2)})$$

[In] `integrate(exp(exp(x^2))*x,x, algorithm="maxima")`

[Out] $1/2 * \text{Ei}(e^{(x^2)})$

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.70

$$\int e^{e^{x^2}} x dx = \frac{1}{2} \operatorname{Ei}(e^{(x^2)})$$

```
[In] integrate(exp(exp(x^2))*x,x, algorithm="giac")
```

```
[Out] 1/2*Ei(e^(x^2))
```

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.70

$$\int e^{e^{x^2}} x dx = \frac{\operatorname{ei}(e^{x^2})}{2}$$

```
[In] int(x*exp(exp(x^2)),x)
```

```
[Out] ei(exp(x^2))/2
```

$$3.48 \quad \int \frac{-1+3x-3x^2+x^3}{1+4x+6x^2+4x^3+x^4} dx$$

| | |
|---|-----|
| Optimal result | 307 |
| Rubi [A] (verified) | 307 |
| Mathematica [A] (verified) | 308 |
| Maple [A] (verified) | 308 |
| Fricas [A] (verification not implemented) | 309 |
| Sympy [A] (verification not implemented) | 309 |
| Maxima [A] (verification not implemented) | 309 |
| Giac [A] (verification not implemented) | 309 |
| Mupad [B] (verification not implemented) | 310 |

Optimal result

Integrand size = 34, antiderivative size = 28

$$\int \frac{-1+3x-3x^2+x^3}{1+4x+6x^2+4x^3+x^4} dx = \frac{8}{3(1+x)^3} - \frac{6}{(1+x)^2} + \frac{6}{1+x} + \log(1+x)$$

[Out] 8/3/(1+x)^3-6/(1+x)^2+6/(1+x)+ln(1+x)

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.059$, Rules used = {1694, 45}

$$\int \frac{-1+3x-3x^2+x^3}{1+4x+6x^2+4x^3+x^4} dx = \frac{6}{x+1} - \frac{6}{(x+1)^2} + \frac{8}{3(x+1)^3} + \log(x+1)$$

[In] Int[(-1 + 3*x - 3*x^2 + x^3)/(1 + 4*x + 6*x^2 + 4*x^3 + x^4), x]

[Out] 8/(3*(1 + x)^3) - 6/(1 + x)^2 + 6/(1 + x) + Log[1 + x]

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LtQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rule 1694

Int[(Pq_)*(Q4_)^(p_), x_Symbol] := With[{a = Coeff[Q4, x, 0], b = Coeff[Q4, x, 1], c = Coeff[Q4, x, 2], d = Coeff[Q4, x, 3], e = Coeff[Q4, x, 4]}, Sub

```

st[Int[SimplifyIntegrand[(Pq /. x -> -d/(4*e) + x)*(a + d^4/(256*e^3) - b*(
d/(8*e)) + (c - 3*(d^2/(8*e)))*x^2 + e*x^4)^p, x], x], x, d/(4*e) + x] /; E
qq[d^3 - 4*c*d*e + 8*b*e^2, 0] && NeQ[d, 0]] /; FreeQ[p, x] && PolyQ[Pq, x]
&& PolyQ[Q4, x, 4] && !IGtQ[p, 0]

```

Rubi steps

$$\begin{aligned}
\text{integral} &= \text{Subst}\left(\int \frac{(-2+x)^3}{x^4} dx, x, 1+x\right) \\
&= \text{Subst}\left(\int \left(-\frac{8}{x^4} + \frac{12}{x^3} - \frac{6}{x^2} + \frac{1}{x}\right) dx, x, 1+x\right) \\
&= \frac{8}{3(1+x)^3} - \frac{6}{(1+x)^2} + \frac{6}{1+x} + \log(1+x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.86

$$\int \frac{-1+3x-3x^2+x^3}{1+4x+6x^2+4x^3+x^4} dx = \frac{2(4+9x+9x^2)}{3(1+x)^3} + \log(1+x)$$

[In] Integrate[(-1 + 3*x - 3*x^2 + x^3)/(1 + 4*x + 6*x^2 + 4*x^3 + x^4), x]

[Out] (2*(4 + 9*x + 9*x^2))/(3*(1 + x)^3) + Log[1 + x]

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.79

| method | result | size |
|---------------|---|------|
| norman | $\frac{6x+6x^2+\frac{8}{3}}{(1+x)^3} + \ln(1+x)$ | 22 |
| default | $\frac{8}{3(1+x)^3} - \frac{6}{(1+x)^2} + \frac{6}{1+x} + \ln(1+x)$ | 27 |
| risch | $\frac{6x+6x^2+\frac{8}{3}}{x^3+3x^2+3x+1} + \ln(1+x)$ | 32 |
| parallelrisch | $\frac{3\ln(1+x)x^3+8+9\ln(1+x)x^2+9\ln(1+x)x+18x^2+3\ln(1+x)+18x}{3x^3+9x^2+9x+3}$ | 59 |

[In] int((x^3-3*x^2+3*x-1)/(x^4+4*x^3+6*x^2+4*x+1), x, method=_RETURNVERBOSE)

[Out] (6*x+6*x^2+8/3)/(1+x)^3+ln(1+x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 46, normalized size of antiderivative = 1.64

$$\int \frac{-1 + 3x - 3x^2 + x^3}{1 + 4x + 6x^2 + 4x^3 + x^4} dx = \frac{18x^2 + 3(x^3 + 3x^2 + 3x + 1)\log(x + 1) + 18x + 8}{3(x^3 + 3x^2 + 3x + 1)}$$

[In] integrate((x^3-3*x^2+3*x-1)/(x^4+4*x^3+6*x^2+4*x+1),x, algorithm="fricas")

[Out] 1/3*(18*x^2 + 3*(x^3 + 3*x^2 + 3*x + 1)*log(x + 1) + 18*x + 8)/(x^3 + 3*x^2 + 3*x + 1)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.04

$$\int \frac{-1 + 3x - 3x^2 + x^3}{1 + 4x + 6x^2 + 4x^3 + x^4} dx = \frac{18x^2 + 18x + 8}{3x^3 + 9x^2 + 9x + 3} + \log(x + 1)$$

[In] integrate((x**3-3*x**2+3*x-1)/(x**4+4*x**3+6*x**2+4*x+1),x)

[Out] (18*x**2 + 18*x + 8)/(3*x**3 + 9*x**2 + 9*x + 3) + log(x + 1)

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.14

$$\int \frac{-1 + 3x - 3x^2 + x^3}{1 + 4x + 6x^2 + 4x^3 + x^4} dx = \frac{2(9x^2 + 9x + 4)}{3(x^3 + 3x^2 + 3x + 1)} + \log(x + 1)$$

[In] integrate((x^3-3*x^2+3*x-1)/(x^4+4*x^3+6*x^2+4*x+1),x, algorithm="maxima")

[Out] 2/3*(9*x^2 + 9*x + 4)/(x^3 + 3*x^2 + 3*x + 1) + log(x + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.82

$$\int \frac{-1 + 3x - 3x^2 + x^3}{1 + 4x + 6x^2 + 4x^3 + x^4} dx = \frac{2(9x^2 + 9x + 4)}{3(x + 1)^3} + \log(|x + 1|)$$

[In] integrate((x^3-3*x^2+3*x-1)/(x^4+4*x^3+6*x^2+4*x+1),x, algorithm="giac")

[Out] 2/3*(9*x^2 + 9*x + 4)/(x + 1)^3 + log(abs(x + 1))

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.75

$$\int \frac{-1 + 3x - 3x^2 + x^3}{1 + 4x + 6x^2 + 4x^3 + x^4} dx = \ln(x + 1) + \frac{6x^2 + 6x + \frac{8}{3}}{(x + 1)^3}$$

[In] int((3*x - 3*x^2 + x^3 - 1)/(4*x + 6*x^2 + 4*x^3 + x^4 + 1),x)

[Out] log(x + 1) + (6*x + 6*x^2 + 8/3)/(x + 1)^3

3.49 $\int \sqrt{\frac{1-x}{1+x}} dx$

| | |
|---|-----|
| Optimal result | 311 |
| Rubi [A] (verified) | 311 |
| Mathematica [A] (verified) | 312 |
| Maple [A] (verified) | 313 |
| Fricas [A] (verification not implemented) | 313 |
| Sympy [F] | 313 |
| Maxima [A] (verification not implemented) | 314 |
| Giac [A] (verification not implemented) | 314 |
| Mupad [B] (verification not implemented) | 314 |

Optimal result

Integrand size = 15, antiderivative size = 38

$$\int \sqrt{\frac{1-x}{1+x}} dx = \sqrt{\frac{1-x}{1+x}}(1+x) - 2 \arctan\left(\sqrt{\frac{1-x}{1+x}}\right)$$

[Out] $((1-x)/(1+x))^{(1/2)}*(1+x)-2*\arctan(((1-x)/(1+x))^{(1/2)})$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 38, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.200$, Rules used = {1979, 294, 210}

$$\int \sqrt{\frac{1-x}{1+x}} dx = \sqrt{\frac{1-x}{x+1}}(x+1) - 2 \arctan\left(\sqrt{\frac{1-x}{x+1}}\right)$$

[In] Int[Sqrt[(1 - x)/(1 + x)],x]

[Out] Sqrt[(1 - x)/(1 + x)]*(1 + x) - 2*ArcTan[Sqrt[(1 - x)/(1 + x)]]

Rule 210

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(-(Rt[-a, 2]*Rt[-b, 2])^(-1))*ArcTan[Rt[-b, 2]*(x/Rt[-a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] & & (LtQ[a, 0] || LtQ[b, 0])

Rule 294

Int[((c_.)*(x_))^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Simp[c^(n - 1)*(c*x)^(m - n + 1)*((a + b*x^n)^(p + 1)/(b*n*(p + 1))), x] - Dist[c^n

```

*((m - n + 1)/(b*n*(p + 1))), Int[(c*x)^(m - n)*(a + b*x^n)^(p + 1), x], x]
;/; FreeQ[{a, b, c}, x] && IGtQ[n, 0] && LtQ[p, -1] && GtQ[m + 1, n] && !I
LtQ[(m + n*(p + 1) + 1)/n, 0] && IntBinomialQ[a, b, c, n, m, p, x]

```

Rule 1979

```

Int[(((e_.)*((a_.) + (b_.)*(x_)^(n_.)))/((c_) + (d_.)*(x_)^(n_.)))^(p_), x_
Symbol] :> With[{q = Denominator[p]}, Dist[q*e*((b*c - a*d)/n), Subst[Int[x
^(q*(p + 1) - 1)*((-a)*e + c*x^q)^(1/n - 1)/(b*e - d*x^q)^(1/n + 1)], x],
x, (e*((a + b*x^n)/(c + d*x^n)))^(1/q)], x] /; FreeQ[{a, b, c, d, e}, x] &
& FractionQ[p] && IntegerQ[1/n]

```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\left(4\text{Subst}\left(\int \frac{x^2}{(-1-x^2)^2} dx, x, \sqrt{\frac{1-x}{1+x}}\right)\right) \\
&= \sqrt{\frac{1-x}{1+x}}(1+x) + 2\text{Subst}\left(\int \frac{1}{-1-x^2} dx, x, \sqrt{\frac{1-x}{1+x}}\right) \\
&= \sqrt{\frac{1-x}{1+x}}(1+x) - 2\arctan\left(\sqrt{\frac{1-x}{1+x}}\right)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.11 (sec) , antiderivative size = 64, normalized size of antiderivative = 1.68

$$\int \sqrt{\frac{1-x}{1+x}} dx = \frac{\sqrt{\frac{1-x}{1+x}}\sqrt{1+x}\left(\sqrt{1-x^2} - 2\arctan\left(\frac{\sqrt{1-x^2}}{-1+x}\right)\right)}{\sqrt{1-x}}$$

```
[In] Integrate[Sqrt[(1 - x)/(1 + x)],x]
```

```
[Out] (Sqrt[(1 - x)/(1 + x)]*Sqrt[1 + x]*(Sqrt[1 - x^2] - 2*ArcTan[Sqrt[1 - x^2]/
(-1 + x)]))/Sqrt[1 - x]
```

Maple [A] (verified)

Time = 0.12 (sec) , antiderivative size = 39, normalized size of antiderivative = 1.03

| method | result |
|---------|--|
| default | $\frac{\sqrt{-\frac{-1+x}{1+x}}(1+x)(\sqrt{-x^2+1}+\arcsin(x))}{\sqrt{-(-1+x)(1+x)}}$ |
| risch | $(1+x)\sqrt{-\frac{-1+x}{1+x}} - \frac{\arcsin(x)\sqrt{-\frac{-1+x}{1+x}}\sqrt{-(-1+x)(1+x)}}{-1+x}$ |
| trager | $(1+x)\sqrt{-\frac{-1+x}{1+x}} + \text{RootOf}(_Z^2+1)\ln\left(\text{RootOf}(_Z^2+1)\sqrt{-\frac{-1+x}{1+x}}x + \text{RootOf}(_Z^2+1)\sqrt{-\frac{-1+x}{1+x}}\right)$ |

```
[In] int(((1-x)/(1+x))^(1/2),x,method=_RETURNVERBOSE)
```

```
[Out] (-(-1+x)/(1+x))^(1/2)*(1+x)/(-(-1+x)*(1+x))^(1/2)*((-x^2+1)^(1/2)+arcsin(x))
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 32, normalized size of antiderivative = 0.84

$$\int \sqrt{\frac{1-x}{1+x}} dx = (x+1)\sqrt{-\frac{x-1}{x+1}} - 2 \arctan\left(\sqrt{-\frac{x-1}{x+1}}\right)$$

```
[In] integrate(((1-x)/(1+x))^(1/2),x, algorithm="fricas")
```

```
[Out] (x + 1)*sqrt(-(x - 1)/(x + 1)) - 2*arctan(sqrt(-(x - 1)/(x + 1)))
```

Sympy [F]

$$\int \sqrt{\frac{1-x}{1+x}} dx = \int \sqrt{\frac{1-x}{x+1}} dx$$

```
[In] integrate(((1-x)/(1+x))**(1/2),x)
```

```
[Out] Integral(sqrt((1 - x)/(x + 1)), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.31 (sec) , antiderivative size = 43, normalized size of antiderivative = 1.13

$$\int \sqrt{\frac{1-x}{1+x}} dx = -\frac{2\sqrt{-\frac{x-1}{x+1}}}{\frac{x-1}{x+1}-1} - 2 \arctan\left(\sqrt{-\frac{x-1}{x+1}}\right)$$

[In] integrate(((1-x)/(1+x))^(1/2),x, algorithm="maxima")

[Out] -2*sqrt(-(x - 1)/(x + 1))/((x - 1)/(x + 1) - 1) - 2*arctan(sqrt(-(x - 1)/(x + 1)))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.76

$$\int \sqrt{\frac{1-x}{1+x}} dx = \frac{1}{2} \pi \operatorname{sgn}(x+1) + \arcsin(x) \operatorname{sgn}(x+1) + \sqrt{-x^2+1} \operatorname{sgn}(x+1)$$

[In] integrate(((1-x)/(1+x))^(1/2),x, algorithm="giac")

[Out] 1/2*pi*sgn(x + 1) + arcsin(x)*sgn(x + 1) + sqrt(-x^2 + 1)*sgn(x + 1)

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 43, normalized size of antiderivative = 1.13

$$\int \sqrt{\frac{1-x}{1+x}} dx = -2 \operatorname{atan}\left(\sqrt{-\frac{x-1}{x+1}}\right) - \frac{2\sqrt{-\frac{x-1}{x+1}}}{\frac{x-1}{x+1}-1}$$

[In] int((-x - 1)/(x + 1))^(1/2),x)

[Out] - 2*atan((-x - 1)/(x + 1))^(1/2)) - (2*(-x - 1)/(x + 1))^(1/2))/((x - 1)/(x + 1) - 1)

3.50 $\int \frac{1}{-1+\sqrt{x}} dx$

| | |
|---|-----|
| Optimal result | 315 |
| Rubi [A] (verified) | 315 |
| Mathematica [A] (verified) | 316 |
| Maple [A] (verified) | 316 |
| Fricas [A] (verification not implemented) | 317 |
| Sympy [A] (verification not implemented) | 317 |
| Maxima [A] (verification not implemented) | 317 |
| Giac [A] (verification not implemented) | 317 |
| Mupad [B] (verification not implemented) | 318 |

Optimal result

Integrand size = 9, antiderivative size = 20

$$\int \frac{1}{-1+\sqrt{x}} dx = 2\sqrt{x} + 2 \log(1 - \sqrt{x})$$

[Out] 2*x^(1/2)+2*ln(1-x^(1/2))

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {196, 45}

$$\int \frac{1}{-1+\sqrt{x}} dx = 2\sqrt{x} + 2 \log(1 - \sqrt{x})$$

[In] Int[(-1 + Sqrt[x])^(-1), x]

[Out] 2*Sqrt[x] + 2*Log[1 - Sqrt[x]]

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x], x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rule 196

Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[Int[x^(1/n - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b, p}, x] && FractionQ[n] &&

IntegerQ[1/n]

Rubi steps

$$\begin{aligned}
 \text{integral} &= 2\text{Subst}\left(\int \frac{x}{-1+x} dx, x, \sqrt{x}\right) \\
 &= 2\text{Subst}\left(\int \left(1 + \frac{1}{-1+x}\right) dx, x, \sqrt{x}\right) \\
 &= 2\sqrt{x} + 2\log(1 - \sqrt{x})
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.90

$$\int \frac{1}{-1 + \sqrt{x}} dx = 2\sqrt{x} + 2\log(-1 + \sqrt{x})$$

`[In] Integrate[(-1 + Sqrt[x])^(-1), x]``[Out] 2*Sqrt[x] + 2*Log[-1 + Sqrt[x]]`**Maple [A] (verified)**

Time = 0.15 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.75

| method | result | size |
|-------------------|--|------|
| derivativedivides | $2\sqrt{x} + 2\ln(-1 + \sqrt{x})$ | 15 |
| meijerg | $2\sqrt{x} + 2\ln(1 - \sqrt{x})$ | 17 |
| trager | $2\sqrt{x} + \ln(2\sqrt{x} - 1 - x)$ | 18 |
| default | $\ln(-1 + x) + 2\sqrt{x} + \ln(-1 + \sqrt{x}) - \ln(1 + \sqrt{x})$ | 25 |

`[In] int(1/(-1+x^(1/2)),x,method=_RETURNVERBOSE)``[Out] 2*x^(1/2)+2*ln(-1+x^(1/2))`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.70

$$\int \frac{1}{-1 + \sqrt{x}} dx = 2\sqrt{x} + 2 \log(\sqrt{x} - 1)$$

[In] integrate(1/(-1+x^(1/2)),x, algorithm="fricas")

[Out] 2*sqrt(x) + 2*log(sqrt(x) - 1)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.75

$$\int \frac{1}{-1 + \sqrt{x}} dx = 2\sqrt{x} + 2 \log(\sqrt{x} - 1)$$

[In] integrate(1/(-1+x**(1/2)),x)

[Out] 2*sqrt(x) + 2*log(sqrt(x) - 1)

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.75

$$\int \frac{1}{-1 + \sqrt{x}} dx = 2\sqrt{x} + 2 \log(\sqrt{x} - 1) - 2$$

[In] integrate(1/(-1+x^(1/2)),x, algorithm="maxima")

[Out] 2*sqrt(x) + 2*log(sqrt(x) - 1) - 2

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.75

$$\int \frac{1}{-1 + \sqrt{x}} dx = 2\sqrt{x} + 2 \log(|\sqrt{x} - 1|)$$

[In] integrate(1/(-1+x^(1/2)),x, algorithm="giac")

[Out] 2*sqrt(x) + 2*log(abs(sqrt(x) - 1))

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.70

$$\int \frac{1}{-1 + \sqrt{x}} dx = 2 \ln(\sqrt{x} - 1) + 2\sqrt{x}$$

[In] int(1/(x^(1/2) - 1),x)

[Out] 2*log(x^(1/2) - 1) + 2*x^(1/2)

3.51 $\int \sqrt[4]{x} \log(x) dx$

| | |
|---|-----|
| Optimal result | 319 |
| Rubi [A] (verified) | 319 |
| Mathematica [A] (verified) | 320 |
| Maple [A] (verified) | 320 |
| Fricas [A] (verification not implemented) | 320 |
| Sympy [B] (verification not implemented) | 321 |
| Maxima [A] (verification not implemented) | 321 |
| Giac [A] (verification not implemented) | 321 |
| Mupad [B] (verification not implemented) | 322 |

Optimal result

Integrand size = 8, antiderivative size = 21

$$\int \sqrt[4]{x} \log(x) dx = -\frac{16x^{5/4}}{25} + \frac{4}{5}x^{5/4} \log(x)$$

[Out] $-16/25*x^{(5/4)}+4/5*x^{(5/4)}*\ln(x)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.125$, Rules used = {2341}

$$\int \sqrt[4]{x} \log(x) dx = \frac{4}{5}x^{5/4} \log(x) - \frac{16x^{5/4}}{25}$$

[In] $\text{Int}[x^{(1/4)}*\text{Log}[x], x]$

[Out] $(-16*x^{(5/4)})/25 + (4*x^{(5/4)}*\text{Log}[x])/5$

Rule 2341

$\text{Int}[(a + \text{Log}[c * x^n]) * (b * x)^m, x_Symbol] :>$
 $\text{Simp}[(d * x)^{m+1} * (a + b * \text{Log}[c * x^n]) / (d * (m+1)), x] - \text{Simp}[b * n * (d * x)^{m+1} / (d * (m+1)^2), x] /;$ $\text{FreeQ}\{a, b, c, d, m, n\}, x \} \&\& \text{NeQ}[m, -1]$

Rubi steps

$$\text{integral} = -\frac{16x^{5/4}}{25} + \frac{4}{5}x^{5/4} \log(x)$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.71

$$\int \sqrt[4]{x} \log(x) dx = \frac{4}{25} x^{5/4} (-4 + 5 \log(x))$$

[In] Integrate[x^(1/4)*Log[x],x]

[Out] (4*x^(5/4)*(-4 + 5*Log[x]))/25

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.67

| method | result | size |
|-------------------|---|------|
| derivativedivides | $-\frac{16x^{5/4}}{25} + \frac{4x^{5/4} \ln(x)}{5}$ | 14 |
| default | $-\frac{16x^{5/4}}{25} + \frac{4x^{5/4} \ln(x)}{5}$ | 14 |
| risch | $-\frac{16x^{5/4}}{25} + \frac{4x^{5/4} \ln(x)}{5}$ | 14 |

[In] int(x^(1/4)*ln(x),x,method=_RETURNVERBOSE)

[Out] -16/25*x^(5/4)+4/5*x^(5/4)*ln(x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.67

$$\int \sqrt[4]{x} \log(x) dx = \frac{4}{25} (5x \log(x) - 4x) x^{1/4}$$

[In] integrate(x^(1/4)*log(x),x, algorithm="fricas")

[Out] 4/25*(5*x*log(x) - 4*x)*x^(1/4)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 105 vs. $2(19) = 38$.

Time = 1.66 (sec) , antiderivative size = 105, normalized size of antiderivative = 5.00

$$\int \sqrt[4]{x} \log(x) dx = \begin{cases} -\frac{4x^{\frac{5}{4}} \log\left(\frac{1}{x}\right)}{5} + \frac{4x^{\frac{5}{4}} \log(x)}{5} - \frac{32x^{\frac{5}{4}}}{25} & \text{for } \frac{1}{|x|} < 1 \wedge |x| < 1 \\ \frac{4x^{\frac{5}{4}} \log(x)}{5} - \frac{16x^{\frac{5}{4}}}{25} & \text{for } |x| < 1 \\ -\frac{4x^{\frac{5}{4}} \log\left(\frac{1}{x}\right)}{5} - \frac{16x^{\frac{5}{4}}}{25} & \text{for } \frac{1}{|x|} < 1 \\ -G_{3,3}^{2,1} \left(\begin{matrix} 1 & \frac{9}{4}, \frac{9}{4} \\ \frac{5}{4}, \frac{5}{4} & 0 \end{matrix} \middle| x \right) + G_{3,3}^{0,3} \left(\begin{matrix} \frac{9}{4}, \frac{9}{4}, 1 \\ \frac{5}{4}, \frac{5}{4}, 0 \end{matrix} \middle| x \right) & \text{otherwise} \end{cases}$$

[In] integrate(x**(1/4)*ln(x),x)

[Out] Piecewise((-4*x**(5/4)*log(1/x)/5 + 4*x**(5/4)*log(x)/5 - 32*x**(5/4)/25, (Abs(x) < 1) & (1/Abs(x) < 1)), (4*x**(5/4)*log(x)/5 - 16*x**(5/4)/25, Abs(x) < 1), (-4*x**(5/4)*log(1/x)/5 - 16*x**(5/4)/25, 1/Abs(x) < 1), (-meijerg(((1,), (9/4, 9/4)), ((5/4, 5/4), (0,)), x) + meijerg(((9/4, 9/4, 1), ()), ((5/4, 5/4, 0)), x), True))

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.62

$$\int \sqrt[4]{x} \log(x) dx = \frac{4}{5} x^{\frac{5}{4}} \log(x) - \frac{16}{25} x^{\frac{5}{4}}$$

[In] integrate(x^(1/4)*log(x),x, algorithm="maxima")

[Out] 4/5*x^(5/4)*log(x) - 16/25*x^(5/4)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.62

$$\int \sqrt[4]{x} \log(x) dx = \frac{4}{5} x^{\frac{5}{4}} \log(x) - \frac{16}{25} x^{\frac{5}{4}}$$

[In] integrate(x^(1/4)*log(x),x, algorithm="giac")

[Out] 4/5*x^(5/4)*log(x) - 16/25*x^(5/4)

Mupad [B] (verification not implemented)

Time = 15.09 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.43

$$\int \sqrt[4]{x} \log(x) dx = \frac{4x^{5/4} \left(\ln(x) - \frac{4}{5} \right)}{5}$$

[In] int(x^(1/4)*log(x),x)

[Out] (4*x^(5/4)*(log(x) - 4/5))/5

3.52 $\int \frac{1}{(1+\sqrt{x})\sqrt{x-x^2}} dx$

| | |
|---|-----|
| Optimal result | 323 |
| Rubi [A] (verified) | 323 |
| Mathematica [A] (verified) | 324 |
| Maple [B] (verified) | 324 |
| Fricas [B] (verification not implemented) | 325 |
| Sympy [F] | 325 |
| Maxima [F] | 325 |
| Giac [A] (verification not implemented) | 325 |
| Mupad [F(-1)] | 326 |

Optimal result

Integrand size = 21, antiderivative size = 20

$$\int \frac{1}{(1+\sqrt{x})\sqrt{x-x^2}} dx = -\frac{2(1-\sqrt{x})}{\sqrt{1-x}}$$

[Out] $-2*(1-x^{(1/2)})/(1-x)^{(1/2)}$

Rubi [A] (verified)

Time = 0.20 (sec), antiderivative size = 32, normalized size of antiderivative = 1.60, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.095$, Rules used = {2081, 665}

$$\int \frac{1}{(1+\sqrt{x})\sqrt{x-x^2}} dx = -\frac{2(1-x)\sqrt{x}}{(\sqrt{x}+1)\sqrt{x-x^2}}$$

[In] `Int[1/((1 + Sqrt[x])*Sqrt[x - x^2]),x]`

[Out] $(-2*(1-x)*\text{Sqrt}[x])/((1+\text{Sqrt}[x])*\text{Sqrt}[x-x^2])$

Rule 665

`Int[((d_) + (e_)*(x_)^(m_))*((a_) + (c_)*(x_)^2)^(p_), x_Symbol] := Simp[e*(d + e*x)^(m+1)/(2*c*d*(p+1)), x] /; FreeQ[{a, c, d, e, m, p}, x] && EqQ[c*d^2 + a*e^2, 0] && !IntegerQ[p] && EqQ[m + 2*p + 2, 0]`

Rule 2081

`Int[(u_)*(P_)^(p_), x_Symbol] := With[{m = MinimumMonomialExponent[P, x]}, Dist[P^FracPart[p]/(x^(m*FracPart[p])*Distrib[1/x^m, P]^FracPart[p]), Int`

`[u*x^(m*p)*Distrib[1/x^m, P]^p, x], x]] /; FreeQ[p, x] && !IntegerQ[p] && SumQ[P] && EveryQ[BinomialQ[#1, x] & , P] && !PolyQ[P, x, 2]`

Rubi steps

$$\begin{aligned} \text{integral} &= 2\text{Subst}\left(\int \frac{x}{(1+x)\sqrt{x^2-x^4}} dx, x, \sqrt{x}\right) \\ &= \frac{(2\sqrt{1-x}\sqrt{x}) \text{Subst}\left(\int \frac{1}{(1+x)\sqrt{1-x^2}} dx, x, \sqrt{x}\right)}{\sqrt{x-x^2}} \\ &= -\frac{2(1-x)\sqrt{x}}{(1+\sqrt{x})\sqrt{x-x^2}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.12 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.05

$$\int \frac{1}{(1+\sqrt{x})\sqrt{x-x^2}} dx = \frac{2(-\sqrt{x}+x)}{\sqrt{-((-1+x)x)}}$$

`[In] Integrate[1/((1+Sqrt[x])*Sqrt[x-x^2]),x]`

`[Out] (2*(-Sqrt[x]+x))/Sqrt[-((-1+x)*x)]`

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 40 vs. 2(16) = 32.

Time = 0.16 (sec) , antiderivative size = 41, normalized size of antiderivative = 2.05

| method | result | size |
|---------|--|------|
| default | $\frac{2\sqrt{-(-1+x)x}}{\sqrt{x}(-1+x)} - \frac{2\sqrt{-(-1+x)^2-x+1}}{-1+x}$ | 41 |

`[In] int(1/(1+x^(1/2))/(-x^2+x)^(1/2),x,method=_RETURNVERBOSE)`

`[Out] 2*(-(-1+x)*x)^(1/2)/x^(1/2)/(-1+x)-2/(-1+x)*(-(-1+x)^2-x+1)^(1/2)`

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 37 vs. $2(14) = 28$.

Time = 0.26 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.85

$$\int \frac{1}{(1 + \sqrt{x}) \sqrt{x - x^2}} dx = -\frac{2(\sqrt{-x^2 + xx} - \sqrt{-x^2 + x\sqrt{x}})}{x^2 - x}$$

[In] integrate(1/(1+x^(1/2)))/(-x^2+x)^(1/2),x, algorithm="fricas")

[Out] -2*(sqrt(-x^2 + x)*x - sqrt(-x^2 + x)*sqrt(x))/(x^2 - x)

Sympy [F]

$$\int \frac{1}{(1 + \sqrt{x}) \sqrt{x - x^2}} dx = \int \frac{1}{\sqrt{-x(x - 1)}(\sqrt{x} + 1)} dx$$

[In] integrate(1/(1+x**(1/2)))/(-x**2+x)**(1/2),x)

[Out] Integral(1/(sqrt(-x*(x - 1))*(sqrt(x) + 1)), x)

Maxima [F]

$$\int \frac{1}{(1 + \sqrt{x}) \sqrt{x - x^2}} dx = \int \frac{1}{\sqrt{-x^2 + x}(\sqrt{x} + 1)} dx$$

[In] integrate(1/(1+x^(1/2)))/(-x^2+x)^(1/2),x, algorithm="maxima")

[Out] integrate(1/(sqrt(-x^2 + x)*(sqrt(x) + 1)), x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.05

$$\int \frac{1}{(1 + \sqrt{x}) \sqrt{x - x^2}} dx = \frac{4}{\frac{\sqrt{-x+1}-1}{\sqrt{x}} - 1} + 4$$

[In] integrate(1/(1+x^(1/2)))/(-x^2+x)^(1/2),x, algorithm="giac")

[Out] 4/((sqrt(-x + 1) - 1)/sqrt(x) - 1) + 4

Mupad [F(-1)]

Timed out.

$$\int \frac{1}{(1 + \sqrt{x}) \sqrt{x - x^2}} dx = \int \frac{1}{\sqrt{x - x^2} (\sqrt{x} + 1)} dx$$

```
[In] int(1/((x - x^2)^(1/2)*(x^(1/2) + 1)),x)
```

```
[Out] int(1/((x - x^2)^(1/2)*(x^(1/2) + 1)), x)
```

$$3.53 \quad \int \frac{1}{(1 + \sqrt[4]{x})^{10} \sqrt{x}} dx$$

| | |
|---|-----|
| Optimal result | 327 |
| Rubi [A] (verified) | 327 |
| Mathematica [A] (verified) | 328 |
| Maple [A] (verified) | 328 |
| Fricas [B] (verification not implemented) | 329 |
| Sympy [B] (verification not implemented) | 329 |
| Maxima [A] (verification not implemented) | 330 |
| Giac [A] (verification not implemented) | 330 |
| Mupad [B] (verification not implemented) | 330 |

Optimal result

Integrand size = 15, antiderivative size = 27

$$\int \frac{1}{(1 + \sqrt[4]{x})^{10} \sqrt{x}} dx = \frac{4}{9(1 + \sqrt[4]{x})^9} - \frac{1}{2(1 + \sqrt[4]{x})^8}$$

[Out] 4/9/(x^(1/4)+1)^9-1/2/(x^(1/4)+1)^8

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.133$, Rules used = {272, 45}

$$\int \frac{1}{(1 + \sqrt[4]{x})^{10} \sqrt{x}} dx = \frac{4}{9(\sqrt[4]{x} + 1)^9} - \frac{1}{2(\sqrt[4]{x} + 1)^8}$$

[In] Int[1/((1 + x^(1/4))^10*Sqrt[x]),x]

[Out] 4/(9*(1 + x^(1/4))^9) - 1/(2*(1 + x^(1/4))^8)

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rule 272

Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b

, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]

Rubi steps

$$\begin{aligned} \text{integral} &= 4\text{Subst}\left(\int \frac{x}{(1+x)^{10}} dx, x, \sqrt[4]{x}\right) \\ &= 4\text{Subst}\left(\int \left(-\frac{1}{(1+x)^{10}} + \frac{1}{(1+x)^9}\right) dx, x, \sqrt[4]{x}\right) \\ &= \frac{4}{9(1+\sqrt[4]{x})^9} - \frac{1}{2(1+\sqrt[4]{x})^8} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.81

$$\int \frac{1}{(1+\sqrt[4]{x})^{10} \sqrt{x}} dx = \frac{-1-9\sqrt[4]{x}}{18(1+\sqrt[4]{x})^9}$$

[In] Integrate[1/((1 + x^(1/4))^10*Sqrt[x]),x]

[Out] (-1 - 9*x^(1/4))/(18*(1 + x^(1/4))^9)

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.74

| method | result | size |
|-------------------|--|------|
| derivativedivides | $\frac{4}{9(x^{\frac{1}{4}}+1)^9} - \frac{1}{2(x^{\frac{1}{4}}+1)^8}$ | 20 |
| default | $\frac{4}{9(x^{\frac{1}{4}}+1)^9} - \frac{1}{2(x^{\frac{1}{4}}+1)^8}$ | 20 |
| meijerg | $\frac{\sqrt{x}(x^{\frac{7}{4}}+9x^{\frac{3}{2}}+36x^{\frac{5}{4}}+84x+126x^{\frac{3}{4}}+126\sqrt{x}+84x^{\frac{1}{4}}+36)}{18(x^{\frac{1}{4}}+1)^9}$ | 46 |

[In] int(1/x^(1/2)/(x^(1/4)+1)^10,x,method=_RETURNVERBOSE)

[Out] 4/9/(x^(1/4)+1)^9-1/2/(x^(1/4)+1)^8

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 186 vs. $2(19) = 38$.

Time = 0.25 (sec) , antiderivative size = 186, normalized size of antiderivative = 6.89

$$\int \frac{1}{(1 + \sqrt[4]{x})^{10} \sqrt{x}} dx =$$

$$\frac{9x^7 + 4209x^6 + 71109x^5 + 227277x^4 + 184587x^3 + 36099x^2 - 16(5x^6 + 648x^5 + 6813x^4 + 15288x^3 + 8847x^2 + 1152x + 15)x^{3/4} + 4(99x^6 + 5544x^5 + 38027x^4 + 60552x^3 + 24777x^2 + 2064x + 9)\sqrt{x} - 32(45x^6 + 1311x^5 + 6066x^4 + 6894x^3 + 1969x^2 + 99x)x^{1/4} + 999x - 1}{(x^9 - 9x^8 + 36x^7 - 84x^6 + 126x^5 - 126x^4 + 84x^3 - 36x^2 + 9x - 1)}$$

[In] integrate(1/x^(1/2)/(x^(1/4)+1)^10,x, algorithm="fricas")

[Out] -1/18*(9*x^7 + 4209*x^6 + 71109*x^5 + 227277*x^4 + 184587*x^3 + 36099*x^2 - 16*(5*x^6 + 648*x^5 + 6813*x^4 + 15288*x^3 + 8847*x^2 + 1152*x + 15)*x^(3/4) + 4*(99*x^6 + 5544*x^5 + 38027*x^4 + 60552*x^3 + 24777*x^2 + 2064*x + 9)*sqrt(x) - 32*(45*x^6 + 1311*x^5 + 6066*x^4 + 6894*x^3 + 1969*x^2 + 99*x)*x^(1/4) + 999*x - 1)/(x^9 - 9*x^8 + 36*x^7 - 84*x^6 + 126*x^5 - 126*x^4 + 84*x^3 - 36*x^2 + 9*x - 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 138 vs. $2(22) = 44$.

Time = 53.39 (sec) , antiderivative size = 138, normalized size of antiderivative = 5.11

$$\int \frac{1}{(1 + \sqrt[4]{x})^{10} \sqrt{x}} dx =$$

$$\frac{\sqrt[4]{x}}{162x^{9/4} + 1512x^{7/4} + 2268x^{5/4} + 648x^{3/4} + 18\sqrt[4]{x} + 18x^{5/2} + 2268x^{3/2} + 162\sqrt{x} + 648x^2 + 1512x}$$

$$\frac{9\sqrt{x}}{162x^{9/4} + 1512x^{7/4} + 2268x^{5/4} + 648x^{3/4} + 18\sqrt[4]{x} + 18x^{5/2} + 2268x^{3/2} + 162\sqrt{x} + 648x^2 + 1512x}$$

[In] integrate(1/x**(1/2)/(x**(1/4)+1)**10,x)

[Out] -x**(1/4)/(162*x**(9/4) + 1512*x**(7/4) + 2268*x**(5/4) + 648*x**(3/4) + 18*x**(1/4) + 18*x**(5/2) + 2268*x**(3/2) + 162*sqrt(x) + 648*x**2 + 1512*x) - 9*sqrt(x)/(162*x**(9/4) + 1512*x**(7/4) + 2268*x**(5/4) + 648*x**(3/4) + 18*x**(1/4) + 18*x**(5/2) + 2268*x**(3/2) + 162*sqrt(x) + 648*x**2 + 1512*x)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int \frac{1}{(1 + \sqrt[4]{x})^{10} \sqrt{x}} dx = -\frac{1}{2(x^{\frac{1}{4}} + 1)^8} + \frac{4}{9(x^{\frac{1}{4}} + 1)^9}$$

[In] integrate(1/x^(1/2)/(x^(1/4)+1)^10,x, algorithm="maxima")

[Out] -1/2/(x^(1/4) + 1)^8 + 4/9/(x^(1/4) + 1)^9

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.59

$$\int \frac{1}{(1 + \sqrt[4]{x})^{10} \sqrt{x}} dx = -\frac{9x^{\frac{1}{4}} + 1}{18(x^{\frac{1}{4}} + 1)^9}$$

[In] integrate(1/x^(1/2)/(x^(1/4)+1)^10,x, algorithm="giac")

[Out] -1/18*(9*x^(1/4) + 1)/(x^(1/4) + 1)^9

Mupad [B] (verification not implemented)

Time = 15.16 (sec) , antiderivative size = 53, normalized size of antiderivative = 1.96

$$\int \frac{1}{(1 + \sqrt[4]{x})^{10} \sqrt{x}} dx = \frac{9x^{1/4} + 1}{2268x + \sqrt{x}(1512x + 648) + x^{3/4}(648x + 1512) + x^{1/4}(18x^2 + 2268x + 162) + 162x^2 + 18}$$

[In] int(1/(x^(1/2)*(x^(1/4) + 1)^10),x)

[Out] -(9*x^(1/4) + 1)/(2268*x + x^(1/2)*(1512*x + 648) + x^(3/4)*(648*x + 1512) + x^(1/4)*(2268*x + 18*x^2 + 162) + 162*x^2 + 18)

3.54 $\int \sqrt{1-x^2} dx$

| | |
|---|-----|
| Optimal result | 331 |
| Rubi [A] (verified) | 331 |
| Mathematica [A] (verified) | 332 |
| Maple [A] (verified) | 332 |
| Fricas [A] (verification not implemented) | 333 |
| Sympy [A] (verification not implemented) | 333 |
| Maxima [A] (verification not implemented) | 333 |
| Giac [A] (verification not implemented) | 333 |
| Mupad [B] (verification not implemented) | 334 |

Optimal result

Integrand size = 11, antiderivative size = 23

$$\int \sqrt{1-x^2} dx = \frac{1}{2}x\sqrt{1-x^2} + \frac{\arcsin(x)}{2}$$

[Out] 1/2*x*(-x^2+1)^(1/2)+1/2*arcsin(x)

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 23, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {201, 222}

$$\int \sqrt{1-x^2} dx = \frac{\arcsin(x)}{2} + \frac{1}{2}\sqrt{1-x^2}x$$

[In] Int[Sqrt[1 - x^2], x]

[Out] (x*Sqrt[1 - x^2])/2 + ArcSin[x]/2

Rule 201

Int[((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] := Simp[x*((a + b*x^n)^p/(n*p + 1)), x] + Dist[a*n*(p/(n*p + 1)), Int[(a + b*x^n)^(p - 1), x], x] /; FreeQ[{a, b}, x] && IGtQ[n, 0] && GtQ[p, 0] && (IntegerQ[2*p] || (EqQ[n, 2] && IntegerQ[4*p]) || (EqQ[n, 2] && IntegerQ[3*p]) || LtQ[Denominator[p + 1/n], Denominator[p]])

Rule 222

Int[1/Sqrt[(a_) + (b_)*(x_)^2], x_Symbol] := Simp[ArcSin[Rt[-b, 2]*(x/Sqrt[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2}x\sqrt{1-x^2} + \frac{1}{2} \int \frac{1}{\sqrt{1-x^2}} dx \\ &= \frac{1}{2}x\sqrt{1-x^2} + \frac{\arcsin(x)}{2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.61

$$\int \sqrt{1-x^2} dx = \frac{1}{2}x\sqrt{1-x^2} - \arctan\left(\frac{\sqrt{1-x^2}}{1+x}\right)$$

[In] Integrate[Sqrt[1 - x^2],x]

[Out] (x*Sqrt[1 - x^2])/2 - ArcTan[Sqrt[1 - x^2]/(1 + x)]

Maple [A] (verified)

Time = 0.26 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.78

| method | result | size |
|----------------|---|------|
| default | $\frac{x\sqrt{-x^2+1}}{2} + \frac{\arcsin(x)}{2}$ | 18 |
| risch | $-\frac{x(x^2-1)}{2\sqrt{-x^2+1}} + \frac{\arcsin(x)}{2}$ | 23 |
| pseudoelliptic | $\frac{x\sqrt{-x^2+1}}{2} - \frac{\arctan\left(\frac{\sqrt{-x^2+1}}{x}\right)}{2}$ | 30 |
| meijerg | $\frac{i(-2i\sqrt{\pi}x\sqrt{-x^2+1}-2i\sqrt{\pi}\arcsin(x))}{4\sqrt{\pi}}$ | 32 |
| trager | $\frac{x\sqrt{-x^2+1}}{2} + \frac{\text{RootOf}(_Z^2+1)\ln(\text{RootOf}(_Z^2+1)\sqrt{-x^2+1+x})}{2}$ | 41 |

[In] int((-x^2+1)^(1/2),x,method=_RETURNVERBOSE)

[Out] 1/2*x*(-x^2+1)^(1/2)+1/2*arcsin(x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.35

$$\int \sqrt{1-x^2} dx = \frac{1}{2} \sqrt{-x^2+1}x - \arctan\left(\frac{\sqrt{-x^2+1}-1}{x}\right)$$

[In] integrate((-x^2+1)^(1/2),x, algorithm="fricas")

[Out] 1/2*sqrt(-x^2 + 1)*x - arctan((sqrt(-x^2 + 1) - 1)/x)

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.65

$$\int \sqrt{1-x^2} dx = \frac{x\sqrt{1-x^2}}{2} + \frac{\arcsin(x)}{2}$$

[In] integrate((-x**2+1)**(1/2),x)

[Out] x*sqrt(1 - x**2)/2 + asin(x)/2

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.74

$$\int \sqrt{1-x^2} dx = \frac{1}{2} \sqrt{-x^2+1}x + \frac{1}{2} \arcsin(x)$$

[In] integrate((-x^2+1)^(1/2),x, algorithm="maxima")

[Out] 1/2*sqrt(-x^2 + 1)*x + 1/2*arcsin(x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.74

$$\int \sqrt{1-x^2} dx = \frac{1}{2} \sqrt{-x^2+1}x + \frac{1}{2} \arcsin(x)$$

[In] integrate((-x^2+1)^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(-x^2 + 1)*x + 1/2*arcsin(x)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.74

$$\int \sqrt{1-x^2} dx = \frac{\arcsin(x)}{2} + \frac{x\sqrt{1-x^2}}{2}$$

[In] int((1 - x^2)^(1/2),x)

[Out] asin(x)/2 + (x*(1 - x^2)^(1/2))/2

3.55 $\int \frac{1}{\sqrt{1-4x-x^2}} dx$

| | |
|---|-----|
| Optimal result | 335 |
| Rubi [A] (verified) | 335 |
| Mathematica [B] (verified) | 336 |
| Maple [A] (verified) | 336 |
| Fricas [B] (verification not implemented) | 337 |
| Sympy [A] (verification not implemented) | 337 |
| Maxima [A] (verification not implemented) | 337 |
| Giac [B] (verification not implemented) | 337 |
| Mupad [B] (verification not implemented) | 338 |

Optimal result

Integrand size = 14, antiderivative size = 10

$$\int \frac{1}{\sqrt{1-4x-x^2}} dx = \arcsin\left(\frac{2+x}{\sqrt{5}}\right)$$

[Out] arcsin(1/5*(2+x)*5^(1/2))

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.143$, Rules used = {633, 222}

$$\int \frac{1}{\sqrt{1-4x-x^2}} dx = \arcsin\left(\frac{x+2}{\sqrt{5}}\right)$$

[In] Int[1/Sqrt[1 - 4*x - x^2],x]

[Out] ArcSin[(2 + x)/Sqrt[5]]

Rule 222

Int[1/Sqrt[(a_) + (b_.)*(x_)^2], x_Symbol] :> Simp[ArcSin[Rt[-b, 2]*(x/Sqrt[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]

Rule 633

Int[((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^(p_), x_Symbol] :> Dist[1/(2*c*(-4*(c/(b^2 - 4*a*c)))^p), Subst[Int[Simp[1 - x^2/(b^2 - 4*a*c), x]^p, x], x, b + 2*c*x], x] /; FreeQ[{a, b, c, p}, x] && GtQ[4*a - b^2/c, 0]

Rubi steps

$$\begin{aligned} \text{integral} &= -\frac{\text{Subst}\left(\int \frac{1}{\sqrt{1-\frac{x^2}{20}}} dx, x, -4-2x\right)}{2\sqrt{5}} \\ &= \arcsin\left(\frac{2+x}{\sqrt{5}}\right) \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 23 vs. 2(10) = 20.

Time = 0.09 (sec) , antiderivative size = 23, normalized size of antiderivative = 2.30

$$\int \frac{1}{\sqrt{1-4x-x^2}} dx = 2 \arctan\left(\frac{x}{-1+\sqrt{1-4x-x^2}}\right)$$

[In] Integrate[1/Sqrt[1 - 4*x - x^2],x]

[Out] 2*ArcTan[x/(-1 + Sqrt[1 - 4*x - x^2])]

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

| method | result | size |
|---------|---|------|
| default | $\arcsin\left(\frac{(2+x)\sqrt{5}}{5}\right)$ | 10 |
| trager | $\text{RootOf}(_Z^2 + 1) \ln(-\text{RootOf}(_Z^2 + 1) x + \sqrt{-x^2 - 4x + 1}) - 2 \text{RootOf}(_Z^2 + 1)$ | 39 |

[In] int(1/(-x^2-4*x+1)^(1/2),x,method=_RETURNVERBOSE)

[Out] arcsin(1/5*(2+x)*5^(1/2))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 21 vs. 2(9) = 18.

Time = 0.24 (sec) , antiderivative size = 21, normalized size of antiderivative = 2.10

$$\int \frac{1}{\sqrt{1-4x-x^2}} dx = -2 \arctan \left(\frac{\sqrt{-x^2-4x+1}-1}{x} \right)$$

[In] integrate(1/(-x^2-4*x+1)^(1/2),x, algorithm="fricas")

[Out] -2*arctan((sqrt(-x^2 - 4*x + 1) - 1)/x)

Sympy [A] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{1}{\sqrt{1-4x-x^2}} dx = \operatorname{asin} \left(\frac{\sqrt{5}(x+2)}{5} \right)$$

[In] integrate(1/(-x**2-4*x+1)**(1/2),x)

[Out] asin(sqrt(5)*(x + 2)/5)

Maxima [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

$$\int \frac{1}{\sqrt{1-4x-x^2}} dx = -\arcsin \left(-\frac{1}{5} \sqrt{5}(x+2) \right)$$

[In] integrate(1/(-x^2-4*x+1)^(1/2),x, algorithm="maxima")

[Out] -arcsin(-1/5*sqrt(5)*(x + 2))

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 29 vs. 2(9) = 18.

Time = 0.27 (sec) , antiderivative size = 29, normalized size of antiderivative = 2.90

$$\int \frac{1}{\sqrt{1-4x-x^2}} dx = \frac{1}{2} \sqrt{-x^2-4x+1}(x+2) + \frac{5}{2} \arcsin \left(\frac{1}{5} \sqrt{5}(x+2) \right)$$

[In] integrate(1/(-x^2-4*x+1)^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(-x^2 - 4*x + 1)*(x + 2) + 5/2*arcsin(1/5*sqrt(5)*(x + 2))

Mupad [B] (verification not implemented)

Time = 14.49 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

$$\int \frac{1}{\sqrt{1-4x-x^2}} dx = \operatorname{asin}\left(\frac{\sqrt{20}(2x+4)}{20}\right)$$

[In] `int(1/(1 - x^2 - 4*x)^(1/2),x)`

[Out] `asin((20^(1/2)*(2*x + 4))/20)`

3.56 $\int \log\left(\frac{1}{x}\right) dx$

| | |
|---|-----|
| Optimal result | 339 |
| Rubi [A] (verified) | 339 |
| Mathematica [A] (verified) | 340 |
| Maple [A] (verified) | 340 |
| Fricas [A] (verification not implemented) | 340 |
| Sympy [A] (verification not implemented) | 341 |
| Maxima [A] (verification not implemented) | 341 |
| Giac [A] (verification not implemented) | 341 |
| Mupad [B] (verification not implemented) | 341 |

Optimal result

Integrand size = 4, antiderivative size = 8

$$\int \log\left(\frac{1}{x}\right) dx = x + x \log\left(\frac{1}{x}\right)$$

[Out] $x+x*\ln(1/x)$

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {2332}

$$\int \log\left(\frac{1}{x}\right) dx = x + x \log\left(\frac{1}{x}\right)$$

[In] `Int[Log[x^(-1)], x]`

[Out] `x + x*Log[x^(-1)]`

Rule 2332

`Int[Log[(c_.)*(x_)^(n_.)], x_Symbol] := Simp[x*Log[c*x^n], x] - Simp[n*x, x] /; FreeQ[{c, n}, x]`

Rubi steps

$$\text{integral} = x + x \log\left(\frac{1}{x}\right)$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log\left(\frac{1}{x}\right) dx = x + x \log\left(\frac{1}{x}\right)$$

[In] Integrate[Log[x^(-1)],x]

[Out] x + x*Log[x^(-1)]

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.12

| method | result | size |
|------------------|-------------------------------------|------|
| derivativdivides | $x + x \ln\left(\frac{1}{x}\right)$ | 9 |
| default | $x + x \ln\left(\frac{1}{x}\right)$ | 9 |
| norman | $x + x \ln\left(\frac{1}{x}\right)$ | 9 |
| risch | $x + x \ln\left(\frac{1}{x}\right)$ | 9 |
| parallelrisc | $x + x \ln\left(\frac{1}{x}\right)$ | 9 |
| parts | $x + x \ln\left(\frac{1}{x}\right)$ | 9 |

[In] int(ln(1/x),x,method=_RETURNVERBOSE)

[Out] x+x*ln(1/x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log\left(\frac{1}{x}\right) dx = x \log\left(\frac{1}{x}\right) + x$$

[In] integrate(log(1/x),x, algorithm="fricas")

[Out] x*log(1/x) + x

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int \log\left(\frac{1}{x}\right) dx = x \log\left(\frac{1}{x}\right) + x$$

[In] integrate(ln(1/x),x)

[Out] x*log(1/x) + x

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int \log\left(\frac{1}{x}\right) dx = -x \log(x) + x$$

[In] integrate(log(1/x),x, algorithm="maxima")

[Out] -x*log(x) + x

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int \log\left(\frac{1}{x}\right) dx = -x \log(x) + x$$

[In] integrate(log(1/x),x, algorithm="giac")

[Out] -x*log(x) + x

Mupad [B] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log\left(\frac{1}{x}\right) dx = x \left(\ln\left(\frac{1}{x}\right) + 1 \right)$$

[In] int(log(1/x),x)

[Out] x*(log(1/x) + 1)

3.57 $\int \frac{1}{1+\sin(x)} dx$

| | |
|---|-----|
| Optimal result | 342 |
| Rubi [A] (verified) | 342 |
| Mathematica [B] (verified) | 343 |
| Maple [A] (verified) | 343 |
| Fricas [A] (verification not implemented) | 343 |
| Sympy [A] (verification not implemented) | 344 |
| Maxima [A] (verification not implemented) | 344 |
| Giac [A] (verification not implemented) | 344 |
| Mupad [B] (verification not implemented) | 344 |

Optimal result

Integrand size = 6, antiderivative size = 10

$$\int \frac{1}{1+\sin(x)} dx = -\frac{\cos(x)}{1+\sin(x)}$$

[Out] `-cos(x)/(1+sin(x))`

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {2727}

$$\int \frac{1}{1+\sin(x)} dx = -\frac{\cos(x)}{\sin(x)+1}$$

[In] `Int[(1 + Sin[x])^(-1),x]`

[Out] `-(Cos[x]/(1 + Sin[x]))`

Rule 2727

`Int[((a_) + (b_.)*sin[(c_.) + (d_.)*(x_)])^(-1), x_Symbol] := Simp[-Cos[c + d*x]/(d*(b + a*Sin[c + d*x])), x] /; FreeQ[{a, b, c, d}, x] && EqQ[a^2 - b^2, 0]`

Rubi steps

$$\text{integral} = -\frac{\cos(x)}{1+\sin(x)}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 23 vs. $2(10) = 20$.

Time = 0.01 (sec) , antiderivative size = 23, normalized size of antiderivative = 2.30

$$\int \frac{1}{1 + \sin(x)} dx = \frac{2 \sin\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right) + \sin\left(\frac{x}{2}\right)}$$

[In] Integrate[(1 + Sin[x])^(-1),x]

[Out] (2*Sin[x/2])/(Cos[x/2] + Sin[x/2])

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

| method | result | size |
|---------------|---|------|
| default | $-\frac{2}{1+\tan\left(\frac{x}{2}\right)}$ | 11 |
| norman | $-\frac{2}{1+\tan\left(\frac{x}{2}\right)}$ | 11 |
| parallelrisch | $-\frac{2}{1+\tan\left(\frac{x}{2}\right)}$ | 11 |
| risch | $-\frac{2}{i+e^{ix}}$ | 13 |

[In] int(1/(1+sin(x)),x,method=_RETURNVERBOSE)

[Out] -2/(1+tan(1/2*x))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.80

$$\int \frac{1}{1 + \sin(x)} dx = -\frac{\cos(x) - \sin(x) + 1}{\cos(x) + \sin(x) + 1}$$

[In] integrate(1/(1+sin(x)),x, algorithm="fricas")

[Out] -(cos(x) - sin(x) + 1)/(cos(x) + sin(x) + 1)

Sympy [A] (verification not implemented)

Time = 0.17 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \frac{1}{1 + \sin(x)} dx = -\frac{2}{\tan\left(\frac{x}{2}\right) + 1}$$

[In] integrate(1/(1+sin(x)),x)

[Out] -2/(tan(x/2) + 1)

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.50

$$\int \frac{1}{1 + \sin(x)} dx = -\frac{2}{\frac{\sin(x)}{\cos(x)+1} + 1}$$

[In] integrate(1/(1+sin(x)),x, algorithm="maxima")

[Out] -2/(sin(x)/(cos(x) + 1) + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 + \sin(x)} dx = -\frac{2}{\tan\left(\frac{1}{2}x\right) + 1}$$

[In] integrate(1/(1+sin(x)),x, algorithm="giac")

[Out] -2/(tan(1/2*x) + 1)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 + \sin(x)} dx = -\frac{2}{\tan\left(\frac{x}{2}\right) + 1}$$

[In] int(1/(sin(x) + 1),x)

[Out] -2/(tan(x/2) + 1)

$$3.58 \quad \int \frac{\sqrt{x}}{\sqrt{2012-x+\sqrt{x}}} dx$$

| | |
|---|-----|
| Optimal result | 345 |
| Rubi [A] (verified) | 345 |
| Mathematica [A] (verified) | 347 |
| Maple [A] (verified) | 347 |
| Fricas [A] (verification not implemented) | 348 |
| Sympy [F] | 348 |
| Maxima [F] | 348 |
| Giac [B] (verification not implemented) | 349 |
| Mupad [B] (verification not implemented) | 349 |

Optimal result

Integrand size = 23, antiderivative size = 53

$$\int \frac{\sqrt{x}}{\sqrt{2012-x+\sqrt{x}}} dx = -\frac{1}{2}\sqrt{2012-x}\sqrt{x} + \frac{x}{2} + 503\operatorname{arctanh}\left(\frac{\sqrt{2012-x}\sqrt{x}}{1006}\right) + 503\log(1006-x)$$

[Out] $-1/2*(2012-x)^{(1/2)}*x^{(1/2)}+1/2*x+503*\operatorname{arctanh}(1/1006*(2012-x)^{(1/2)}*x^{(1/2)})+503*\ln(1006-x)$

Rubi [A] (verified)

Time = 0.05 (sec) , antiderivative size = 53, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.261$, Rules used = {2130, 103, 12, 94, 212, 45}

$$\int \frac{\sqrt{x}}{\sqrt{2012-x+\sqrt{x}}} dx = 503\operatorname{arctanh}\left(\frac{\sqrt{2012-x}\sqrt{x}}{1006}\right) + \frac{x}{2} - \frac{1}{2}\sqrt{2012-x}\sqrt{x} + 503\log(1006-x)$$

[In] `Int[Sqrt[x]/(Sqrt[2012 - x] + Sqrt[x]),x]`

[Out] $-1/2*(\operatorname{Sqrt}[2012 - x]*\operatorname{Sqrt}[x]) + x/2 + 503*\operatorname{ArcTanh}[(\operatorname{Sqrt}[2012 - x]*\operatorname{Sqrt}[x])/1006] + 503*\operatorname{Log}[1006 - x]$

Rule 12

`Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_) /; FreeQ[b, x]]`

Rule 45

```
Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int
[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x], x] /; FreeQ[{a, b, c, d, n},
x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && Le
Q[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])
```

Rule 94

```
Int[1/(Sqrt[(a_.) + (b_.)*(x_)]*Sqrt[(c_.) + (d_.)*(x_)]*((e_.) + (f_.)*(x_
))), x_Symbol] := Dist[b*f, Subst[Int[1/(d*(b*e - a*f)^2 + b*f^2*x^2), x],
x, Sqrt[a + b*x]*Sqrt[c + d*x]], x] /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[
2*b*d*e - f*(b*c + a*d), 0]
```

Rule 103

```
Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_
))^p, x_Symbol] := Simp[(a + b*x)^m*(c + d*x)^n*((e + f*x)^(p + 1)/(f*(
m + n + p + 1))), x] - Dist[1/(f*(m + n + p + 1)), Int[(a + b*x)^(m - 1)*(
c + d*x)^(n - 1)*(e + f*x)^p*Simp[c*m*(b*e - a*f) + a*n*(d*e - c*f) + (d*m*(
b*e - a*f) + b*n*(d*e - c*f))*x, x], x], x] /; FreeQ[{a, b, c, d, e, f, p},
x] && GtQ[m, 0] && GtQ[n, 0] && NeQ[m + n + p + 1, 0] && (IntegersQ[2*m,
2*n, 2*p] || (IntegersQ[m, n + p] || IntegersQ[p, m + n]))
```

Rule 212

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*
ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (Gt
Q[a, 0] || LtQ[b, 0])
```

Rule 2130

```
Int[(u_)/((e_.)*Sqrt[(a_.) + (b_.)*(x_)] + (f_.)*Sqrt[(c_.) + (d_.)*(x_)]),
x_Symbol] := Dist[e, Int[(u*Sqrt[a + b*x])/(a*e^2 - c*f^2 + (b*e^2 - d*f^2
)*x), x], x] - Dist[f, Int[(u*Sqrt[c + d*x])/(a*e^2 - c*f^2 + (b*e^2 - d*f^
2)*x), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && NeQ[a*e^2 - c*f^2, 0] && N
eQ[b*e^2 - d*f^2, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \frac{\sqrt{2012 - x}\sqrt{x}}{2012 - 2x} dx - \int \frac{x}{2012 - 2x} dx \\ &= -\frac{1}{2}\sqrt{2012 - x}\sqrt{x} + \frac{1}{2} \int \frac{2024072}{(2012 - 2x)\sqrt{2012 - x}\sqrt{x}} dx - \int \left(-\frac{1}{2} - \frac{503}{-1006 + x} \right) dx \end{aligned}$$

$$\begin{aligned}
&= -\frac{1}{2}\sqrt{2012-x}\sqrt{x} + \frac{x}{2} + 503 \log(1006-x) + 1012036 \int \frac{1}{(2012-2x)\sqrt{2012-x}\sqrt{x}} dx \\
&= -\frac{1}{2}\sqrt{2012-x}\sqrt{x} + \frac{x}{2} + 503 \log(1006-x) \\
&\quad + 2024072 \operatorname{Subst}\left(\int \frac{1}{4048144-4x^2} dx, x, \sqrt{2012-x}\sqrt{x}\right) \\
&= -\frac{1}{2}\sqrt{2012-x}\sqrt{x} + \frac{x}{2} + 503 \operatorname{arctanh}\left(\frac{\sqrt{2012-x}\sqrt{x}}{1006}\right) + 503 \log(1006-x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.21 (sec) , antiderivative size = 70, normalized size of antiderivative = 1.32

$$\begin{aligned}
\int \frac{\sqrt{x}}{\sqrt{2012-x} + \sqrt{x}} dx &= \frac{1}{2} \left(x - \sqrt{-((-2012+x)x)} + 2012 \log(2\sqrt{503} - \sqrt{x}) \right. \\
&\quad \left. + 2012 \log(\sqrt{2012-x} + \sqrt{x}) - 2012 \log(-1006 + \sqrt{503}\sqrt{x}) \right)
\end{aligned}$$

[In] Integrate[Sqrt[x]/(Sqrt[2012 - x] + Sqrt[x]), x]

[Out] (x - Sqrt[-((-2012 + x)*x)] + 2012*Log[2*Sqrt[503] - Sqrt[x]] + 2012*Log[Sqrt[2012 - x] + Sqrt[x]] - 2012*Log[-1006 + Sqrt[503]*Sqrt[x]])/2

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 53, normalized size of antiderivative = 1.00

| method | result | size |
|---------|--|------|
| default | $\frac{x}{2} + 503 \ln(x - 1006) - \frac{\sqrt{x} \sqrt{2012-x} \left(\sqrt{-x(-2012+x)} - 1006 \operatorname{arctanh}\left(\frac{1006}{\sqrt{-x(-2012+x)}}\right) \right)}{2\sqrt{-x(-2012+x)}}$ | 53 |

[In] int(x^(1/2)/((2012-x)^(1/2)+x^(1/2)), x, method=_RETURNVERBOSE)

[Out] 1/2*x+503*ln(x-1006)-1/2*x^(1/2)*(2012-x)^(1/2)*((-x*(-2012+x))^(1/2)-1006*arctanh(1006/(-x*(-2012+x))^(1/2)))/(-x*(-2012+x))^(1/2)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 64, normalized size of antiderivative = 1.21

$$\int \frac{\sqrt{x}}{\sqrt{2012-x} + \sqrt{x}} dx = \frac{1}{2}x - \frac{1}{2}\sqrt{x}\sqrt{-x+2012} + 503 \log(x-1006) \\ + 503 \log\left(\frac{x + \sqrt{x}\sqrt{-x+2012}}{x}\right) \\ - 503 \log\left(-\frac{x - \sqrt{x}\sqrt{-x+2012}}{x}\right)$$

[In] integrate(x^(1/2)/((2012-x)^(1/2)+x^(1/2)),x, algorithm="fricas")

[Out] 1/2*x - 1/2*sqrt(x)*sqrt(-x + 2012) + 503*log(x - 1006) + 503*log((x + sqrt(x)*sqrt(-x + 2012))/x) - 503*log(-(x - sqrt(x)*sqrt(-x + 2012))/x)

Sympy [F]

$$\int \frac{\sqrt{x}}{\sqrt{2012-x} + \sqrt{x}} dx = \int \frac{\sqrt{x}}{\sqrt{x} + \sqrt{2012-x}} dx$$

[In] integrate(x**(1/2)/((2012-x)**(1/2)+x**(1/2)),x)

[Out] Integral(sqrt(x)/(sqrt(x) + sqrt(2012 - x)), x)

Maxima [F]

$$\int \frac{\sqrt{x}}{\sqrt{2012-x} + \sqrt{x}} dx = \int \frac{\sqrt{x}}{\sqrt{x} + \sqrt{-x+2012}} dx$$

[In] integrate(x^(1/2)/((2012-x)^(1/2)+x^(1/2)),x, algorithm="maxima")

[Out] integrate(sqrt(x)/(sqrt(x) + sqrt(-x + 2012)), x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 117 vs. 2(39) = 78.

Time = 0.31 (sec) , antiderivative size = 117, normalized size of antiderivative = 2.21

$$\begin{aligned} & \int \frac{\sqrt{x}}{\sqrt{2012-x} + \sqrt{x}} dx \\ &= \frac{1}{2}x - \frac{1}{2}\sqrt{x}\sqrt{-x+2012} + 503 \log(|x-1006|) \\ &+ 503 \log\left(\left| -\frac{2\sqrt{503}-\sqrt{-x+2012}}{\sqrt{x}} + \frac{\sqrt{x}}{2\sqrt{503}-\sqrt{-x+2012}} + 2 \right|\right) \\ &- 503 \log\left(\left| -\frac{2\sqrt{503}-\sqrt{-x+2012}}{\sqrt{x}} + \frac{\sqrt{x}}{2\sqrt{503}-\sqrt{-x+2012}} - 2 \right|\right) \end{aligned}$$

[In] integrate(x^(1/2)/((2012-x)^(1/2)+x^(1/2)),x, algorithm="giac")

[Out] 1/2*x - 1/2*sqrt(x)*sqrt(-x + 2012) + 503*log(abs(x - 1006)) + 503*log(abs(-(2*sqrt(503) - sqrt(-x + 2012))/sqrt(x) + sqrt(x)/(2*sqrt(503) - sqrt(-x + 2012)) + 2)) - 503*log(abs(-(2*sqrt(503) - sqrt(-x + 2012))/sqrt(x) + sqrt(x)/(2*sqrt(503) - sqrt(-x + 2012)) - 2))

Mupad [B] (verification not implemented)

Time = 16.55 (sec) , antiderivative size = 64, normalized size of antiderivative = 1.21

$$\begin{aligned} \int \frac{\sqrt{x}}{\sqrt{2012-x} + \sqrt{x}} dx &= \frac{x}{2} + 1006 \operatorname{atanh}\left(\frac{2\sqrt{503}\sqrt{x} - \sqrt{x}\sqrt{2012-x}}{x + 2\sqrt{503}\sqrt{2012-x} - 2012}\right) \\ &+ 503 \ln(x - 1006) - \frac{\sqrt{x}\sqrt{2012-x}}{2} \end{aligned}$$

[In] int(x^(1/2)/((2012 - x)^(1/2) + x^(1/2)),x)

[Out] x/2 + 1006*atanh((2*503^(1/2)*x^(1/2) - x^(1/2)*(2012 - x)^(1/2))/(x + 2*503^(1/2)*(2012 - x)^(1/2) - 2012)) + 503*log(x - 1006) - (x^(1/2)*(2012 - x)^(1/2))/2

$$3.59 \quad \int \frac{-1+x}{(1+x)\sqrt{x+x^2+x^3}} dx$$

| | |
|---|-----|
| Optimal result | 350 |
| Rubi [A] (verified) | 350 |
| Mathematica [A] (verified) | 351 |
| Maple [A] (verified) | 352 |
| Fricas [A] (verification not implemented) | 352 |
| Sympy [F] | 352 |
| Maxima [F] | 353 |
| Giac [F] | 353 |
| Mupad [B] (verification not implemented) | 353 |

Optimal result

Integrand size = 21, antiderivative size = 46

$$\int \frac{-1+x}{(1+x)\sqrt{x+x^2+x^3}} dx = -\frac{2\sqrt{x}\sqrt{1+x+x^2} \arctan\left(\frac{\sqrt{x}}{\sqrt{1+x+x^2}}\right)}{\sqrt{x+x^2+x^3}}$$

[Out] $-2x^{(1/2)}*(x^2+x+1)^{(1/2)}*\arctan(x^{(1/2)}/(x^2+x+1)^{(1/2)})/(x^3+x^2+x)^{(1/2)}$

Rubi [A] (verified)

Time = 0.48 (sec) , antiderivative size = 46, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.190$, Rules used = {2081, 6865, 1712, 209}

$$\int \frac{-1+x}{(1+x)\sqrt{x+x^2+x^3}} dx = -\frac{2\sqrt{x}\sqrt{x^2+x+1} \arctan\left(\frac{\sqrt{x}}{\sqrt{x^2+x+1}}\right)}{\sqrt{x^3+x^2+x}}$$

[In] `Int[(-1 + x)/((1 + x)*Sqrt[x + x^2 + x^3]),x]`

[Out] `(-2*Sqrt[x]*Sqrt[1 + x + x^2]*ArcTan[Sqrt[x]/Sqrt[1 + x + x^2]])/Sqrt[x + x^2 + x^3]`

Rule 209

`Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])`

Rule 1712

```
Int[((A_) + (B_)*(x_)^2)/(((d_) + (e_)*(x_)^2)*Sqrt[(a_) + (b_)*(x_)^2 +
(c_)*(x_)^4]), x_Symbol] := Dist[A, Subst[Int[1/(d - (b*d - 2*a*e)*x^2),
x], x, x/Sqrt[a + b*x^2 + c*x^4]], x] /; FreeQ[{a, b, c, d, e, A, B}, x] &&
NeQ[b^2 - 4*a*c, 0] && NeQ[c*d^2 - b*d*e + a*e^2, 0] && EqQ[c*d^2 - a*e^2,
0] && EqQ[B*d + A*e, 0]
```

Rule 2081

```
Int[(u_)*(P_)^(p_), x_Symbol] := With[{m = MinimumMonomialExponent[P, x]}
, Dist[P^FracPart[p]/(x^(m*FracPart[p]))*Distrib[1/x^m, P]^FracPart[p]], Int
[u*x^(m*p)*Distrib[1/x^m, P]^p, x], x] /; FreeQ[p, x] && !IntegerQ[p] &&
SumQ[P] && EveryQ[BinomialQ[#1, x] & , P] && !PolyQ[P, x, 2]
```

Rule 6865

```
Int[(u_)*(x_)^(m_), x_Symbol] := With[{k = Denominator[m]}, Dist[k, Subst[I
nt[x^(k*(m + 1) - 1)*(u /. x -> x^k), x], x, x^(1/k)], x] /; FractionQ[m]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{(\sqrt{x}\sqrt{1+x+x^2}) \int \frac{-1+x}{\sqrt{x}(1+x)\sqrt{1+x+x^2}} dx}{\sqrt{x+x^2+x^3}} \\ &= \frac{(2\sqrt{x}\sqrt{1+x+x^2}) \text{Subst}\left(\int \frac{-1+x^2}{(1+x^2)\sqrt{1+x^2+x^4}} dx, x, \sqrt{x}\right)}{\sqrt{x+x^2+x^3}} \\ &= -\frac{(2\sqrt{x}\sqrt{1+x+x^2}) \text{Subst}\left(\int \frac{1}{1+x^2} dx, x, \frac{\sqrt{x}}{\sqrt{1+x+x^2}}\right)}{\sqrt{x+x^2+x^3}} \\ &= -\frac{2\sqrt{x}\sqrt{1+x+x^2} \arctan\left(\frac{\sqrt{x}}{\sqrt{1+x+x^2}}\right)}{\sqrt{x+x^2+x^3}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 46, normalized size of antiderivative = 1.00

$$\int \frac{-1+x}{(1+x)\sqrt{x+x^2+x^3}} dx = -\frac{2\sqrt{x}\sqrt{1+x+x^2} \arctan\left(\frac{\sqrt{x}}{\sqrt{1+x+x^2}}\right)}{\sqrt{x}(1+x+x^2)}$$

```
[In] Integrate[(-1 + x)/((1 + x)*Sqrt[x + x^2 + x^3]), x]
```

```
[Out] (-2*Sqrt[x]*Sqrt[1 + x + x^2]*ArcTan[Sqrt[x]/Sqrt[1 + x + x^2]])/Sqrt[x*(1
+ x + x^2)]
```

Maple [A] (verified)

Time = 0.55 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.39

| method | result |
|----------------|---|
| default | $2 \arctan \left(\frac{\sqrt{(x^2+x+1)x}}{x} \right)$ |
| pseudoelliptic | $2 \arctan \left(\frac{\sqrt{(x^2+x+1)x}}{x} \right)$ |
| trager | $-\text{RootOf} \left(_Z^2 + 1 \right) \ln \left(\frac{\text{RootOf} \left(_Z^2 + 1 \right) x^2 + \text{RootOf} \left(_Z^2 + 1 \right) + 2\sqrt{x^3+x^2+x}}{(1+x)^2} \right)$ |
| elliptic | $\frac{2\left(\frac{1}{2} + \frac{i\sqrt{3}}{2}\right) \sqrt{\frac{x+\frac{1}{2} + \frac{i\sqrt{3}}{2}}{\frac{1}{2} + \frac{i\sqrt{3}}{2}}} \sqrt{3} \sqrt{i\left(x+\frac{1}{2} - \frac{i\sqrt{3}}{2}\right)} \sqrt{3} \sqrt{\frac{x}{-\frac{1}{2} - \frac{i\sqrt{3}}{2}}} \text{EllipticF} \left(\sqrt{\frac{x+\frac{1}{2} + \frac{i\sqrt{3}}{2}}{\frac{1}{2} + \frac{i\sqrt{3}}{2}}}, \frac{\sqrt{3} \sqrt{i\left(-\frac{1}{2} - \frac{i\sqrt{3}}{2}\right)} \sqrt{3}}{3} \right)}{3\sqrt{x^3+x^2+x}} - \frac{4\left(\frac{1}{2} + \frac{i\sqrt{3}}{2}\right)}{3\sqrt{x^3+x^2+x}}$ |

[In] int((-1+x)/(1+x)/(x^3+x^2+x)^(1/2),x,method=_RETURNVERBOSE)

[Out] 2*arctan(((x^2+x+1)*x)^(1/2)/x)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.39

$$\int \frac{-1+x}{(1+x)\sqrt{x+x^2+x^3}} dx = \arctan \left(\frac{x^2+1}{2\sqrt{x^3+x^2+x}} \right)$$

[In] integrate((-1+x)/(1+x)/(x^3+x^2+x)^(1/2),x, algorithm="fricas")

[Out] arctan(1/2*(x^2 + 1)/sqrt(x^3 + x^2 + x))

Sympy [F]

$$\int \frac{-1+x}{(1+x)\sqrt{x+x^2+x^3}} dx = \int \frac{x-1}{\sqrt{x(x^2+x+1)}(x+1)} dx$$

[In] integrate((-1+x)/(1+x)/(x**3+x**2+x)**(1/2),x)

[Out] Integral((x - 1)/(sqrt(x*(x**2 + x + 1))*(x + 1)), x)

Maxima [F]

$$\int \frac{-1+x}{(1+x)\sqrt{x+x^2+x^3}} dx = \int \frac{x-1}{\sqrt{x^3+x^2+x}(x+1)} dx$$

[In] integrate((-1+x)/(1+x)/(x^3+x^2+x)^(1/2),x, algorithm="maxima")

[Out] integrate((x - 1)/(sqrt(x^3 + x^2 + x)*(x + 1)), x)

Giac [F]

$$\int \frac{-1+x}{(1+x)\sqrt{x+x^2+x^3}} dx = \int \frac{x-1}{\sqrt{x^3+x^2+x}(x+1)} dx$$

[In] integrate((-1+x)/(1+x)/(x^3+x^2+x)^(1/2),x, algorithm="giac")

[Out] integrate((x - 1)/(sqrt(x^3 + x^2 + x)*(x + 1)), x)

Mupad [B] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 179, normalized size of antiderivative = 3.89

$$\int \frac{-1+x}{(1+x)\sqrt{x+x^2+x^3}} dx$$

$$= \frac{\sqrt{\frac{x}{-\frac{1}{2}+\frac{\sqrt{3}1i}{2}}} \sqrt{-\frac{x+\frac{1}{2}-\frac{\sqrt{3}1i}{2}}{-\frac{1}{2}+\frac{\sqrt{3}1i}{2}}} \sqrt{\frac{x+\frac{1}{2}+\frac{\sqrt{3}1i}{2}}{\frac{1}{2}+\frac{\sqrt{3}1i}{2}}} (\sqrt{3}+1i) \left(F\left(\operatorname{asin}\left(\sqrt{\frac{x}{-\frac{1}{2}+\frac{\sqrt{3}1i}{2}}}\right)\middle|-\frac{-\frac{1}{2}+\frac{\sqrt{3}1i}{2}}{\frac{1}{2}+\frac{\sqrt{3}1i}{2}}\right) - 2\Pi\left(\frac{1}{2}-\frac{\sqrt{3}1i}{2}; \operatorname{asin}\left(\sqrt{\frac{x}{-\frac{1}{2}+\frac{\sqrt{3}1i}{2}}}\right)\right) \right)}{\sqrt{x^3+x^2-\left(-\frac{1}{2}+\frac{\sqrt{3}1i}{2}\right)\left(\frac{1}{2}+\frac{\sqrt{3}1i}{2}\right)} x}$$

[In] int((x - 1)/((x + 1)*(x + x^2 + x^3)^(1/2)),x)

[Out] ((x/((3^(1/2)*1i)/2 - 1/2))^(1/2)*(-(x - (3^(1/2)*1i)/2 + 1/2)/((3^(1/2)*1i)/2 - 1/2))^(1/2)*((x + (3^(1/2)*1i)/2 + 1/2)/((3^(1/2)*1i)/2 + 1/2))^(1/2) * (3^(1/2) + 1i) * (ellipticF(asin((x/((3^(1/2)*1i)/2 - 1/2))^(1/2)), -(3^(1/2)*1i)/2 - 1/2)/((3^(1/2)*1i)/2 + 1/2)) - 2*ellipticPi(1/2 - (3^(1/2)*1i)/2, asin((x/((3^(1/2)*1i)/2 - 1/2))^(1/2)), -(3^(1/2)*1i)/2 - 1/2)/((3^(1/2)*1i)/2 + 1/2)) * 1i)/(x^2 + x^3 - x*((3^(1/2)*1i)/2 - 1/2)*((3^(1/2)*1i)/2 + 1/2))^(1/2)

$$3.60 \quad \int \frac{1+4x+6x^2+4x^3+x^4}{-1+3x-3x^2+x^3} dx$$

| | |
|---|-----|
| Optimal result | 354 |
| Rubi [A] (verified) | 354 |
| Mathematica [A] (verified) | 355 |
| Maple [A] (verified) | 355 |
| Fricas [A] (verification not implemented) | 355 |
| Sympy [A] (verification not implemented) | 356 |
| Maxima [A] (verification not implemented) | 356 |
| Giac [A] (verification not implemented) | 356 |
| Mupad [B] (verification not implemented) | 356 |

Optimal result

Integrand size = 34, antiderivative size = 37

$$\int \frac{1+4x+6x^2+4x^3+x^4}{-1+3x-3x^2+x^3} dx = -\frac{8}{(1-x)^2} + \frac{32}{1-x} + 7x + \frac{x^2}{2} + 24 \log(1-x)$$

[Out] -8/(1-x)^2+32/(1-x)+7*x+1/2*x^2+24*ln(1-x)

Rubi [A] (verified)

Time = 0.05 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.029$, Rules used = {2099}

$$\int \frac{1+4x+6x^2+4x^3+x^4}{-1+3x-3x^2+x^3} dx = \frac{x^2}{2} + 7x + \frac{32}{1-x} - \frac{8}{(1-x)^2} + 24 \log(1-x)$$

[In] Int[(1 + 4*x + 6*x^2 + 4*x^3 + x^4)/(-1 + 3*x - 3*x^2 + x^3), x]

[Out] -8/(1 - x)^2 + 32/(1 - x) + 7*x + x^2/2 + 24*Log[1 - x]

Rule 2099

Int[(P_)^(p_)*(Q_)^(q_.), x_Symbol] :> With[{PP = Factor[P]}, Int[ExpandIntegrand[PP^p*Q^q, x], x] /; !SumQ[NonfreeFactors[PP, x]] /; FreeQ[q, x] && PolyQ[P, x] && PolyQ[Q, x] && IntegerQ[p] && NeQ[P, x]

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(7 + \frac{16}{(-1+x)^3} + \frac{32}{(-1+x)^2} + \frac{24}{-1+x} + x \right) dx \\ &= -\frac{8}{(1-x)^2} + \frac{32}{1-x} + 7x + \frac{x^2}{2} + 24 \log(1-x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 35, normalized size of antiderivative = 0.95

$$\int \frac{1 + 4x + 6x^2 + 4x^3 + x^4}{-1 + 3x - 3x^2 + x^3} dx = -\frac{8}{(-1+x)^2} - \frac{32}{-1+x} + 8(-1+x) + \frac{1}{2}(-1+x)^2 + 24 \log(-1+x)$$

[In] Integrate[(1 + 4*x + 6*x^2 + 4*x^3 + x^4)/(-1 + 3*x - 3*x^2 + x^3),x]

[Out] -8/(-1 + x)^2 - 32/(-1 + x) + 8*(-1 + x) + (-1 + x)^2/2 + 24*Log[-1 + x]

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.78

| method | result | size |
|---------------|--|------|
| norman | $\frac{-52x+6x^3+\frac{1}{2}x^4+\frac{75}{2}}{(-1+x)^2} + 24 \ln(-1+x)$ | 29 |
| default | $\frac{x^2}{2} + 7x - \frac{32}{-1+x} + 24 \ln(-1+x) - \frac{8}{(-1+x)^2}$ | 30 |
| risch | $\frac{x^2}{2} + 7x + \frac{-32x+24}{x^2-2x+1} + 24 \ln(-1+x)$ | 32 |
| parallelrisch | $\frac{x^4+48 \ln(-1+x)x^2+12x^3+75-96 \ln(-1+x)x+48 \ln(-1+x)-104x}{2x^2-4x+2}$ | 48 |

[In] int((x^4+4*x^3+6*x^2+4*x+1)/(x^3-3*x^2+3*x-1),x,method=_RETURNVERBOSE)

[Out] (-52*x+6*x^3+1/2*x^4+75/2)/(-1+x)^2+24*ln(-1+x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 44, normalized size of antiderivative = 1.19

$$\int \frac{1 + 4x + 6x^2 + 4x^3 + x^4}{-1 + 3x - 3x^2 + x^3} dx = \frac{x^4 + 12x^3 - 27x^2 + 48(x^2 - 2x + 1) \log(x - 1) - 50x + 48}{2(x^2 - 2x + 1)}$$

[In] integrate((x^4+4*x^3+6*x^2+4*x+1)/(x^3-3*x^2+3*x-1),x, algorithm="fricas")

[Out] 1/2*(x^4 + 12*x^3 - 27*x^2 + 48*(x^2 - 2*x + 1)*log(x - 1) - 50*x + 48)/(x^2 - 2*x + 1)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.73

$$\int \frac{1 + 4x + 6x^2 + 4x^3 + x^4}{-1 + 3x - 3x^2 + x^3} dx = \frac{x^2}{2} + 7x + \frac{24 - 32x}{x^2 - 2x + 1} + 24 \log(x - 1)$$

[In] integrate((x**4+4*x**3+6*x**2+4*x+1)/(x**3-3*x**2+3*x-1),x)

[Out] x**2/2 + 7*x + (24 - 32*x)/(x**2 - 2*x + 1) + 24*log(x - 1)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 32, normalized size of antiderivative = 0.86

$$\int \frac{1 + 4x + 6x^2 + 4x^3 + x^4}{-1 + 3x - 3x^2 + x^3} dx = \frac{1}{2}x^2 + 7x - \frac{8(4x - 3)}{x^2 - 2x + 1} + 24 \log(x - 1)$$

[In] integrate((x^4+4*x^3+6*x^2+4*x+1)/(x^3-3*x^2+3*x-1),x, algorithm="maxima")

[Out] 1/2*x^2 + 7*x - 8*(4*x - 3)/(x^2 - 2*x + 1) + 24*log(x - 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 28, normalized size of antiderivative = 0.76

$$\int \frac{1 + 4x + 6x^2 + 4x^3 + x^4}{-1 + 3x - 3x^2 + x^3} dx = \frac{1}{2}x^2 + 7x - \frac{8(4x - 3)}{(x - 1)^2} + 24 \log(|x - 1|)$$

[In] integrate((x^4+4*x^3+6*x^2+4*x+1)/(x^3-3*x^2+3*x-1),x, algorithm="giac")

[Out] 1/2*x^2 + 7*x - 8*(4*x - 3)/(x - 1)^2 + 24*log(abs(x - 1))

Mupad [B] (verification not implemented)

Time = 13.81 (sec) , antiderivative size = 32, normalized size of antiderivative = 0.86

$$\int \frac{1 + 4x + 6x^2 + 4x^3 + x^4}{-1 + 3x - 3x^2 + x^3} dx = 7x + 24 \ln(x - 1) - \frac{32x - 24}{x^2 - 2x + 1} + \frac{x^2}{2}$$

[In] int((4*x + 6*x^2 + 4*x^3 + x^4 + 1)/(3*x - 3*x^2 + x^3 - 1),x)

[Out] 7*x + 24*log(x - 1) - (32*x - 24)/(x^2 - 2*x + 1) + x^2/2

3.61 $\int \left(\cos(x) \log(x) + \frac{\sin(x)}{x} \right) dx$

| | |
|---|-----|
| Optimal result | 357 |
| Rubi [A] (verified) | 357 |
| Mathematica [A] (verified) | 358 |
| Maple [A] (verified) | 358 |
| Fricas [A] (verification not implemented) | 359 |
| Sympy [A] (verification not implemented) | 359 |
| Maxima [A] (verification not implemented) | 359 |
| Giac [A] (verification not implemented) | 359 |
| Mupad [B] (verification not implemented) | 360 |

Optimal result

Integrand size = 12, antiderivative size = 5

$$\int \left(\cos(x) \log(x) + \frac{\sin(x)}{x} \right) dx = \log(x) \sin(x)$$

[Out] $\ln(x) \sin(x)$

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {2717, 2634, 3380}

$$\int \left(\cos(x) \log(x) + \frac{\sin(x)}{x} \right) dx = \log(x) \sin(x)$$

[In] $\text{Int}[\text{Cos}[x] \cdot \text{Log}[x] + \text{Sin}[x]/x, x]$

[Out] $\text{Log}[x] \cdot \text{Sin}[x]$

Rule 2634

```
Int[Log[u]*(v_), x_Symbol] := With[{w = IntHide[v, x]}, Dist[Log[u], w, x]
- Int[SimplifyIntegrand[w*(D[u, x]/u), x], x] /; InverseFunctionFreeQ[w, x]
] /; InverseFunctionFreeQ[u, x]
```

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] := Simp[Sin[c + d*x]/d, x] /;
FreeQ[{c, d}, x]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[SinIntegral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \cos(x) \log(x) dx + \int \frac{\sin(x)}{x} dx \\ &= \log(x) \sin(x) + \text{Si}(x) - \int \frac{\sin(x)}{x} dx \\ &= \log(x) \sin(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\cos(x) \log(x) + \frac{\sin(x)}{x} \right) dx = \log(x) \sin(x)$$

```
[In] Integrate[Cos[x]*Log[x] + Sin[x]/x,x]
```

```
[Out] Log[x]*Sin[x]
```

Maple [A] (verified)

Time = 0.17 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.20

| method | result | size |
|--------------|--|------|
| risch | $\ln(x) \sin(x)$ | 6 |
| parallelrisk | $\ln(x) \sin(x)$ | 6 |
| norman | $\frac{2 \ln(x) \tan(\frac{x}{2})}{1 + \tan(\frac{x}{2})^2}$ | 19 |

```
[In] int(cos(x)*ln(x)+sin(x)/x,x,method=_RETURNVERBOSE)
```

```
[Out] ln(x)*sin(x)
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\cos(x) \log(x) + \frac{\sin(x)}{x} \right) dx = \log(x) \sin(x)$$

[In] integrate(cos(x)*log(x)+sin(x)/x,x, algorithm="fricas")

[Out] log(x)*sin(x)

Sympy [A] (verification not implemented)

Time = 3.73 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\cos(x) \log(x) + \frac{\sin(x)}{x} \right) dx = \log(x) \sin(x)$$

[In] integrate(cos(x)*ln(x)+sin(x)/x,x)

[Out] log(x)*sin(x)

Maxima [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\cos(x) \log(x) + \frac{\sin(x)}{x} \right) dx = \log(x) \sin(x)$$

[In] integrate(cos(x)*log(x)+sin(x)/x,x, algorithm="maxima")

[Out] log(x)*sin(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\cos(x) \log(x) + \frac{\sin(x)}{x} \right) dx = \log(x) \sin(x)$$

[In] integrate(cos(x)*log(x)+sin(x)/x,x, algorithm="giac")

[Out] log(x)*sin(x)

Mupad [B] (verification not implemented)

Time = 14.43 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \left(\cos(x) \log(x) + \frac{\sin(x)}{x} \right) dx = \ln(x) \sin(x)$$

```
[In] int(cos(x)*log(x) + sin(x)/x,x)
```

```
[Out] log(x)*sin(x)
```

3.62 $\int \frac{1}{-x+x^3} dx$

| | |
|---|-----|
| Optimal result | 361 |
| Rubi [A] (verified) | 361 |
| Mathematica [A] (verified) | 362 |
| Maple [A] (verified) | 363 |
| Fricas [A] (verification not implemented) | 363 |
| Sympy [A] (verification not implemented) | 363 |
| Maxima [A] (verification not implemented) | 364 |
| Giac [A] (verification not implemented) | 364 |
| Mupad [B] (verification not implemented) | 364 |

Optimal result

Integrand size = 9, antiderivative size = 17

$$\int \frac{1}{-x+x^3} dx = -\log(x) + \frac{1}{2} \log(1-x^2)$$

[Out] $-\ln(x)+1/2*\ln(-x^2+1)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.556$, Rules used = {1607, 272, 36, 31, 29}

$$\int \frac{1}{-x+x^3} dx = \frac{1}{2} \log(1-x^2) - \log(x)$$

[In] $\text{Int}[(-x + x^3)^{-1}, x]$

[Out] $-\text{Log}[x] + \text{Log}[1 - x^2]/2$

Rule 29

$\text{Int}[(x_)^{-1}, x_Symbol] \rightarrow \text{Simp}[\text{Log}[x], x]$

Rule 31

$\text{Int}[(a_) + (b_)*(x_)^{-1}, x_Symbol] \rightarrow \text{Simp}[\text{Log}[\text{RemoveContent}[a + b*x, x]]/b, x] /; \text{FreeQ}[\{a, b\}, x]$

Rule 36

$\text{Int}[1/(((a_) + (b_)*(x_))*((c_) + (d_)*(x_))), x_Symbol] \rightarrow \text{Dist}[b/(b*c - a*d), \text{Int}[1/(a + b*x), x], x] - \text{Dist}[d/(b*c - a*d), \text{Int}[1/(c + d*x), x],$

`x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0]`

Rule 272

`Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_.))^(p_), x_Symbol] := Dist[1/n, Subst[
Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b
, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]`

Rule 1607

`Int[(u_.)*((a_.)*(x_)^(p_.) + (b_.)*(x_)^(q_.))^(n_.), x_Symbol] := Int[u*x
^(n*p)*(a + b*x^(q - p))^n, x] /; FreeQ[{a, b, p, q}, x] && IntegerQ[n] &&
PosQ[q - p]`

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \frac{1}{x(-1+x^2)} dx \\
 &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{(-1+x)x} dx, x, x^2 \right) \\
 &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{-1+x} dx, x, x^2 \right) - \frac{1}{2} \text{Subst} \left(\int \frac{1}{x} dx, x, x^2 \right) \\
 &= -\log(x) + \frac{1}{2} \log(1-x^2)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00

$$\int \frac{1}{-x+x^3} dx = -\log(x) + \frac{1}{2} \log(1-x^2)$$

[In] Integrate[(-x + x^3)^(-1), x]

[Out] -Log[x] + Log[1 - x^2]/2

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.82

| method | result | size |
|---------------|---|------|
| risch | $-\ln(x) + \frac{\ln(x^2-1)}{2}$ | 14 |
| default | $\frac{\ln(1+x)}{2} - \ln(x) + \frac{\ln(-1+x)}{2}$ | 18 |
| norman | $\frac{\ln(1+x)}{2} - \ln(x) + \frac{\ln(-1+x)}{2}$ | 18 |
| parallelrisch | $\frac{\ln(1+x)}{2} - \ln(x) + \frac{\ln(-1+x)}{2}$ | 18 |
| meijerg | $-\ln(x) - \frac{i\pi}{2} + \frac{\ln(-x^2+1)}{2}$ | 20 |

[In] `int(1/(x^3-x),x,method=_RETURNVERBOSE)`

[Out] `-ln(x)+1/2*ln(x^2-1)`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \frac{1}{-x + x^3} dx = \frac{1}{2} \log(x^2 - 1) - \log(x)$$

[In] `integrate(1/(x^3-x),x, algorithm="fricas")`

[Out] `1/2*log(x^2 - 1) - log(x)`

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.59

$$\int \frac{1}{-x + x^3} dx = -\log(x) + \frac{\log(x^2 - 1)}{2}$$

[In] `integrate(1/(x**3-x),x)`

[Out] `-log(x) + log(x**2 - 1)/2`

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00

$$\int \frac{1}{-x + x^3} dx = \frac{1}{2} \log(x + 1) + \frac{1}{2} \log(x - 1) - \log(x)$$

[In] integrate(1/(x^3-x),x, algorithm="maxima")

[Out] 1/2*log(x + 1) + 1/2*log(x - 1) - log(x)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.94

$$\int \frac{1}{-x + x^3} dx = -\frac{1}{2} \log(x^2) + \frac{1}{2} \log(|x^2 - 1|)$$

[In] integrate(1/(x^3-x),x, algorithm="giac")

[Out] -1/2*log(x^2) + 1/2*log(abs(x^2 - 1))

Mupad [B] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \frac{1}{-x + x^3} dx = \frac{\ln(x^2 - 1)}{2} - \ln(x)$$

[In] int(-1/(x - x^3),x)

[Out] log(x^2 - 1)/2 - log(x)

3.63 $\int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx$

| | |
|---|-----|
| Optimal result | 365 |
| Rubi [A] (verified) | 365 |
| Mathematica [A] (verified) | 366 |
| Maple [A] (verified) | 366 |
| Fricas [A] (verification not implemented) | 366 |
| Sympy [A] (verification not implemented) | 367 |
| Maxima [A] (verification not implemented) | 367 |
| Giac [A] (verification not implemented) | 367 |
| Mupad [F(-1)] | 367 |

Optimal result

Integrand size = 15, antiderivative size = 17

$$\int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx = x - \sqrt{1-x^2} \arcsin(x)$$

[Out] $x - (-x^2 + 1)^{(1/2)} * \arcsin(x)$

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.133$, Rules used = {4767, 8}

$$\int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx = x - \sqrt{1-x^2} \arcsin(x)$$

[In] `Int[(x*ArcSin[x])/Sqrt[1 - x^2],x]`

[Out] `x - Sqrt[1 - x^2]*ArcSin[x]`

Rule 8

`Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]`

Rule 4767

`Int[((a_.) + ArcSin[(c_.)*(x_)]*(b_.))^(n_.)*(x_)*((d_) + (e_.)*(x_)^2)^(p_.), x_Symbol] := Simp[(d + e*x^2)^(p + 1)*((a + b*ArcSin[c*x])^n/(2*e*(p + 1))), x] + Dist[b*(n/(2*c*(p + 1)))*Simp[(d + e*x^2)^p/(1 - c^2*x^2)^p], Int[(1 - c^2*x^2)^(p + 1/2)*(a + b*ArcSin[c*x])^(n - 1), x], x] /; FreeQ[{a, b, c, d, e, p}, x] && EqQ[c^2*d + e, 0] && GtQ[n, 0] && NeQ[p, -1]`

Rubi steps

$$\begin{aligned} \text{integral} &= -\sqrt{1-x^2} \arcsin(x) + \int 1 dx \\ &= x - \sqrt{1-x^2} \arcsin(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00

$$\int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx = x - \sqrt{1-x^2} \arcsin(x)$$

[In] Integrate[(x*ArcSin[x])/Sqrt[1 - x^2],x]

[Out] x - Sqrt[1 - x^2]*ArcSin[x]

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.94

| method | result | size |
|---------|----------------------------------|------|
| default | $x - \sqrt{-x^2 + 1} \arcsin(x)$ | 16 |

[In] int(x*arcsin(x)/(-x^2+1)^(1/2),x,method=_RETURNVERBOSE)

[Out] x-(-x^2+1)^(1/2)*arcsin(x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.88

$$\int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx = -\sqrt{-x^2 + 1} \arcsin(x) + x$$

[In] integrate(x*arcsin(x)/(-x^2+1)^(1/2),x, algorithm="fricas")

[Out] -sqrt(-x^2 + 1)*arcsin(x) + x

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.71

$$\int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx = x - \sqrt{1-x^2} \arcsin(x)$$

[In] integrate(x*asin(x)/(-x**2+1)**(1/2),x)

[Out] x - sqrt(1 - x**2)*asin(x)

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.88

$$\int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx = -\sqrt{-x^2+1} \arcsin(x) + x$$

[In] integrate(x*arcsin(x)/(-x^2+1)^(1/2),x, algorithm="maxima")

[Out] -sqrt(-x^2 + 1)*arcsin(x) + x

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.88

$$\int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx = -\sqrt{-x^2+1} \arcsin(x) + x$$

[In] integrate(x*arcsin(x)/(-x^2+1)^(1/2),x, algorithm="giac")

[Out] -sqrt(-x^2 + 1)*arcsin(x) + x

Mupad [F(-1)]

Timed out.

$$\int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx = \int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx$$

[In] int((x*asin(x))/(1 - x^2)^(1/2),x)

[Out] int((x*asin(x))/(1 - x^2)^(1/2), x)

3.64 $\int (1 - x)^{99} x dx$

| | |
|---|-----|
| Optimal result | 368 |
| Rubi [A] (verified) | 368 |
| Mathematica [B] (verified) | 369 |
| Maple [B] (verified) | 372 |
| Fricas [B] (verification not implemented) | 373 |
| Sympy [B] (verification not implemented) | 374 |
| Maxima [B] (verification not implemented) | 375 |
| Giac [B] (verification not implemented) | 376 |
| Mupad [B] (verification not implemented) | 377 |

Optimal result

Integrand size = 9, antiderivative size = 23

$$\int (1 - x)^{99} x dx = -\frac{1}{100}(1 - x)^{100} + \frac{1}{101}(1 - x)^{101}$$

[Out] -1/100*(1-x)^100+1/101*(1-x)^101

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {45}

$$\int (1 - x)^{99} x dx = \frac{1}{101}(1 - x)^{101} - \frac{1}{100}(1 - x)^{100}$$

[In] Int[(1 - x)^99*x,x]

[Out] -1/100*(1 - x)^100 + (1 - x)^101/101

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] :> Int [ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && Le Q[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rubi steps

$$\begin{aligned} \text{integral} &= \int ((1 - x)^{99} - (1 - x)^{100}) dx \\ &= -\frac{1}{100}(1 - x)^{100} + \frac{1}{101}(1 - x)^{101} \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 567 vs. $2(23) = 46$.

Time = 0.01 (sec) , antiderivative size = 567, normalized size of antiderivative = 24.65

$$\begin{aligned}
 \int (1-x)^{99} x dx = & \frac{x^2}{2} - 33x^3 + \frac{4851x^4}{4} - \frac{156849x^5}{5} + 627396x^6 - 10217592x^7 \\
 & + 140066157x^8 - 1654114616x^9 + \frac{85600431378x^{10}}{5} \\
 & - 157366449604x^{11} + 1298273209233x^{12} - 9696194317908x^{13} \\
 & + 66026466069564x^{14} - \frac{2062057324941768x^{15}}{5} + \frac{4750096337812287x^{16}}{2} \\
 & - 12666923567499432x^{17} + 62806829355518017x^{18} \\
 & - 290505891817783026x^{19} + \frac{12572449429225165403x^{20}}{10} \\
 & - 5104603527655330314x^{21} + 19490304378320352108x^{22} \\
 & - 70132813684308016488x^{23} + 238292173768273828749x^{24} \\
 & - \frac{19146258135816088501224x^{25}}{25} + 2331916055003241548226x^{26} \\
 & - 6736646381120475583764x^{27} + 18488763007525700846649x^{28} \\
 & - 48264408157576669898532x^{29} + \frac{599857644244167183024612x^{30}}{5} \\
 & - 284248449886557530554488x^{31} + \frac{2570079734390957672096829x^{32}}{4} \\
 & - 1386787891870780679371896x^{33} + \frac{5720500053966970302409071x^{34}}{2} \\
 & - \frac{28206275157871771317939099x^{35}}{5} + \frac{42585944846198556695711973x^{36}}{4} \\
 & - 19237666204653402059452899x^{37} + 33300287699283081927474024x^{38} \\
 & - 55246631151825154632274992x^{39} + \frac{439428796464188236515924114x^{40}}{5} \\
 & - 134109601422466453670901168x^{41} \\
 & + 196374773511468735732390996x^{42} \\
 & - 276016272695076305811040776x^{43} \\
 & + 372502480574415750374856978x^{44} \\
 & - \frac{2414047083412492769871166152x^{45}}{5} \\
 & + 601126348833940887359223192x^{46} \\
 & - 719077854633508484642475024x^{47} \\
 & + 826548729646668720118931889x^{48} \\
 & - 913043842041304917057126672x^{49} \\
 & + \frac{24233705307512968006891237086x^{50}}{25} \\
 & - 989130828878080326811887228x^{51} \\
 & + 970109082168886474373197089x^{52} \\
 & - 914479445566527094599669324x^{53} \\
 & + 82850274555998906218503832x^{54} \\
 & - \frac{3606758093003645324155339152x^{55}}{5} \\
 & + 603511770853123192467791538x^{56} \\
 & - 485119509585285628395162576x^{57} \\
 & + 374593512943317843600698196x^{58} \\
 & - 277798460089394796889723848x^{59} \\
 & + 989058310490690095822896114x^{60}
 \end{aligned}$$

[In] Integrate[(1 - x)^99*x, x]

[Out] $x^2/2 - 33x^3 + (4851x^4)/4 - (156849x^5)/5 + 627396x^6 - 10217592x^7 + 140066157x^8 - 1654114616x^9 + (85600431378x^{10})/5 - 157366449604x^{11} + 1298273209233x^{12} - 9696194317908x^{13} + 66026466069564x^{14} - (2062057324941768x^{15})/5 + (4750096337812287x^{16})/2 - 12666923567499432x^{17} + 62806829355518017x^{18} - 290505891817783026x^{19} + (12572449429225165403x^{20})/10 - 5104603527655330314x^{21} + 19490304378320352108x^{22} - 70132813684308016488x^{23} + 238292173768273828749x^{24} - (19146258135816088501224x^{25})/25 + 2331916055003241548226x^{26} - 6736646381120475583764x^{27} + 18488763007525700846649x^{28} - 48264408157576669898532x^{29} + (599857644244167183024612x^{30})/5 - 284248449886557530554488x^{31} + (2570079734390957672096829x^{32})/4 - 1386787891870780679371896x^{33} + (5720500053966970302409071x^{34})/2 - (28206275157871771317939099x^{35})/5 + (42585944846198556695711973x^{36})/4 - 19237666204653402059452899x^{37} + 33300287699283081927474024x^{38} - 55246631151825154632274992x^{39} + (439428796464188236515924114x^{40})/5 - 134109601422466453670901168x^{41} + 196374773511468735732390996x^{42} - 276016272695076305811040776x^{43} + 372502480574415750374856978x^{44} - (2414047083412492769871166152x^{45})/5 + 601126348833940887359223192x^{46} - 719077854633508484642475024x^{47} + 826548729646668720118931889x^{48} - 913043842041304917057126672x^{49} + (24233705307512968006891237086x^{50})/25 - 989130828878080326811887228x^{51} + 970109082168886474373197089x^{52} - 914479445566527094599669324x^{53} + 828502745555998906218503832x^{54} - (3606758093003645324155339152x^{55})/5 + 603511770853123192467791538x^{56} - 485119509585285628395162576x^{57} + 374593512943317843600698196x^{58} - 277798460089394796889723848x^{59} + (989058310490690095822896114x^{60})/5 - 135208860450519457389515112x^{61} + 88685381585824590330757224x^{62} - 55800482090690569716307824x^{63} + (134663663432573814416170293x^{64})/4 - (97339302505596701018770224x^{65})/5 + (21569504532490178066659311x^{66})/2 - 5720500053966970302409071x^{67} + (11614348594417788189739629x^{68})/4 - 1409398564020847755666003x^{69} + (3268857173695411601376612x^{70})/5 - 289586448945460019391192x^{71} + 122384749256712270099849x^{72} - 49303368020068535591064x^{73} + 18914430223915181446722x^{74} - (172561788070239874568724x^{75})/25 + 2393282266977011062653x^{76} - 787400226364730912388x^{77} + 245464847895078057708x^{78} - 72392559119475593544x^{79} + (201631839342385547403x^{80})/10 - 5293662917568490696x^{81} + 1307276513180023617x^{82} - 302950588656028082x^{83} + (131419332012806607x^{84})/2 - (66501348729372018x^{85})/5 + 2503926751715004x^{86} - 436790467844808x^{87} + 70297408804833x^{88} - 10386185673864x^{89} + (7002807007378x^{90})/5 - 171200862756x^{91} + 18815553757x^{92} - 1840869492x^{93} + 158372676x^{94} - (58975224x^{95})/5 + (2980131x^{96})/4 - 38808x^{97} + (3201x^{98})/2 - 49x^{99} + (99x^{100})/100 - x^{101}/101$

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 500 vs. $2(19) = 38$.

Time = 0.19 (sec) , antiderivative size = 501, normalized size of antiderivative = 21.78

| method | result | size |
|--------------|---------------------------------|------|
| gospers | Expression too large to display | 501 |
| default | Expression too large to display | 502 |
| risch | Expression too large to display | 502 |
| parallelrisc | Expression too large to display | 502 |

[In] `int(x*(1-x)^99,x,method=_RETURNVERBOSE)`

[Out]
$$-1/10100x^{100} + (100x^{99} - 9999x^{98} + 494900x^{97} - 16165050x^{96} + 391960800x^{95} - 7524830775x^{94} + 119129952480x^{93} - 1599564027600x^{92} + 18592781869200x^{91} - 190037092945700x^{90} + 1729128713835600x^{89} - 14145670154903560x^{88} + 104900475306026400x^{87} - 710003828928813300x^{86} + 4411583725232560800x^{85} - 25289660192321540400x^{84} + 134332724433331476360x^{83} - 663667626664673365350x^{82} + 3059800945425883628200x^{81} - 13203492783118238531700x^{80} + 53465995467441756029600x^{79} - 203648157735809402877030x^{78} + 731164847106703494794400x^{77} - 2479194963740288382850800x^{76} + 7952742286283782215118800x^{75} - 24172150896467811732795300x^{74} + 69714962380376909325764496x^{73} - 191035745261543332611892200x^{72} + 497964017002692209469746400x^{71} - 1236085967492793928008474900x^{70} + 2924823134349146195851039200x^{69} - 6603091490864731434780756240x^{68} + 14234925496610562332226630300x^{67} - 29326230200904915179092563225x^{66} + 57777050545066400054331617100x^{65} - 108925997889075399236629520550x^{64} + 196625391061305336057915852480x^{63} - 340025750167248881400829989825x^{62} + 563584869115974754134709022400x^{61} - 895722354016828362340647962400x^{60} + 1365609490550246519634102631200x^{59} - 1997897787191193993562250150280x^{58} + 2805764446902887448586210864800x^{57} - 3783394480727510220367051779600x^{56} + 4899707046811384846791142017600x^{55} - 6095468885616544243924694533800x^{54} + 7285651347867363554793785087040x^{53} - 8367877730115588952806888703200x^{52} + 9236242400221923655456660172400x^{51} - 798101729905753391169290598900x^{50} + 9990221371668611300800061002800x^{49} - 9790416944235239074784059782744x^{48} + 9221742804617179662276979387200x^{47} - 8348142169431354073201212078900x^{46} + 7262686331798435694888997742400x^{45} - 6071376123222802962328154239200x^{44} + 4876375108493235395139755627040x^{43} - 3762275053801599078786055477800x^{42} + 2787764354220270688691511837600x^{41} - 1983385212465834230897149059600x^{40} + 1354506974366911182076101796800x^{39} - 887646168857660237762166710280x^{38} + 557990974633434061785977419200x^{37} - 336332905762759127467487642400x^{36} + 194300428666999360800474279900x^{35} - 107529510736651355656672731825x^{34} + 56976675818900978062236979980x^{33} - 28888525272533200027165808550x^{32} + 14006557707894884861656149600x^{31} - 6489451329337168122044493225x^{30} + 2870909343854231058600328800x^{29} - 1211712441373217709709716240x^{28} + 487470522391524365975173200x^{27} - 186736506376009578551154900x^{26} + 68040128449316803396016400x^{25} - 23552352155532739637082600x^{24} + 773508828686969$$


```

9754494496*x^23-2406750955059565670364900*x^22+708341418211510966528800*x^2
1-196852074221035556290800*x^20+51556495629318836171400*x^19-12698173923517
417057030*x^18+2934109507359608562600*x^17-634348976490731971700*x^16+12793
5928031744263200*x^15-23987986505952049350*x^14+4165355796382371360*x^13-66
6867307302596400*x^12+97931562610870800*x^11-13112559413253300*x^10+1589401
141000400*x^9-172912871383560*x^8+16706557621600*x^7-1414668185700*x^6+1031
97679200*x^5-6336699600*x^4+316834980*x^3-12248775*x^2+333300*x-5050)

```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 501 vs. 2(15) = 30.

Time = 0.24 (sec) , antiderivative size = 501, normalized size of antiderivative = 21.78

$$\int (1-x)^{99} x dx = \text{Too large to display}$$

```
[In] integrate(x*(1-x)^99,x, algorithm="fricas")
```

```

[Out] -1/101*x^101 + 99/100*x^100 - 49*x^99 + 3201/2*x^98 - 38808*x^97 + 2980131/
4*x^96 - 58975224/5*x^95 + 158372676*x^94 - 1840869492*x^93 + 18815553757*x
^92 - 171200862756*x^91 + 7002807007378/5*x^90 - 10386185673864*x^89 + 7029
7408804833*x^88 - 436790467844808*x^87 + 2503926751715004*x^86 - 6650134872
9372018/5*x^85 + 131419332012806607/2*x^84 - 302950588656028082*x^83 + 1307
276513180023617*x^82 - 5293662917568490696*x^81 + 201631839342385547403/10*
x^80 - 72392559119475593544*x^79 + 245464847895078057708*x^78 - 78740022636
4730912388*x^77 + 2393282266977011062653*x^76 - 172561788070239874568724/25
*x^75 + 18914430223915181446722*x^74 - 49303368020068535591064*x^73 + 12238
4749256712270099849*x^72 - 289586448945460019391192*x^71 + 3268857173695411
601376612/5*x^70 - 1409398564020847755666003*x^69 + 11614348594417788189739
629/4*x^68 - 5720500053966970302409071*x^67 + 21569504532490178066659311/2*
x^66 - 97339302505596701018770224/5*x^65 + 134663663432573814416170293/4*x^
64 - 55800482090690569716307824*x^63 + 88685381585824590330757224*x^62 - 13
5208860450519457389515112*x^61 + 989058310490690095822896114/5*x^60 - 27779
8460089394796889723848*x^59 + 374593512943317843600698196*x^58 - 4851195095
85285628395162576*x^57 + 603511770853123192467791538*x^56 - 360675809300364
5324155339152/5*x^55 + 828502745555998906218503832*x^54 - 91447944556652709
4599669324*x^53 + 970109082168886474373197089*x^52 - 9891308288780803268118
87228*x^51 + 24233705307512968006891237086/25*x^50 - 9130438420413049170571
26672*x^49 + 826548729646668720118931889*x^48 - 719077854633508484642475024
*x^47 + 601126348833940887359223192*x^46 - 2414047083412492769871166152/5*x
^45 + 372502480574415750374856978*x^44 - 276016272695076305811040776*x^43 +
196374773511468735732390996*x^42 - 134109601422466453670901168*x^41 + 4394
28796464188236515924114/5*x^40 - 55246631151825154632274992*x^39 + 33300287
699283081927474024*x^38 - 19237666204653402059452899*x^37 + 425859448461985
56695711973/4*x^36 - 28206275157871771317939099/5*x^35 + 572050005396697030

```

$2409071/2*x^{34} - 1386787891870780679371896*x^{33} + 2570079734390957672096829/4*x^{32} - 284248449886557530554488*x^{31} + 599857644244167183024612/5*x^{30} - 48264408157576669898532*x^{29} + 18488763007525700846649*x^{28} - 6736646381120475583764*x^{27} + 2331916055003241548226*x^{26} - 19146258135816088501224/25*x^{25} + 238292173768273828749*x^{24} - 70132813684308016488*x^{23} + 19490304378320352108*x^{22} - 5104603527655330314*x^{21} + 12572449429225165403/10*x^{20} - 290505891817783026*x^{19} + 62806829355518017*x^{18} - 12666923567499432*x^{17} + 4750096337812287/2*x^{16} - 2062057324941768/5*x^{15} + 66026466069564*x^{14} - 9696194317908*x^{13} + 1298273209233*x^{12} - 157366449604*x^{11} + 85600431378/5*x^{10} - 1654114616*x^9 + 140066157*x^8 - 10217592*x^7 + 627396*x^6 - 156849/5*x^5 + 4851/4*x^4 - 33*x^3 + 1/2*x^2$

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 561 vs. $2(12) = 24$.

Time = 0.08 (sec) , antiderivative size = 561, normalized size of antiderivative = 24.39

$$\int (1-x)^{99} x dx = \text{Too large to display}$$

[In] integrate(x*(1-x)**99,x)

[Out] $-x^{101}/101 + 99x^{100}/100 - 49x^{99} + 3201x^{98}/2 - 38808x^{97} + 2980131x^{96}/4 - 58975224x^{95}/5 + 158372676x^{94} - 1840869492x^{93} + 1881553757x^{92} - 171200862756x^{91} + 7002807007378x^{90}/5 - 10386185673864x^{89} + 70297408804833x^{88} - 436790467844808x^{87} + 2503926751715004x^{86} - 66501348729372018x^{85}/5 + 131419332012806607x^{84}/2 - 302950588656028082x^{83} + 1307276513180023617x^{82} - 5293662917568490696x^{81} + 201631839342385547403x^{80}/10 - 72392559119475593544x^{79} + 245464847895078057708x^{78} - 787400226364730912388x^{77} + 2393282266977011062653x^{76} - 172561788070239874568724x^{75}/25 + 18914430223915181446722x^{74} - 49303368020068535591064x^{73} + 122384749256712270099849x^{72} - 289586448945460019391192x^{71} + 3268857173695411601376612x^{70}/5 - 1409398564020847755666003x^{69} + 11614348594417788189739629x^{68}/4 - 5720500053966970302409071x^{67} + 21569504532490178066659311x^{66}/2 - 97339302505596701018770224x^{65}/5 + 134663663432573814416170293x^{64}/4 - 55800482090690569716307824x^{63} + 88685381585824590330757224x^{62} - 135208860450519457389515112x^{61} + 989058310490690095822896114x^{60}/5 - 277798460089394796889723848x^{59} + 374593512943317843600698196x^{58} - 485119509585285628395162576x^{57} + 603511770853123192467791538x^{56} - 3606758093003645324155339152x^{55}/5 + 82850274555998906218503832x^{54} - 914479445566527094599669324x^{53} + 970109082168886474373197089x^{52} - 989130828878080326811887228x^{51} + 24233705307512968006891237086x^{50}/25 - 913043842041304917057126672x^{49} + 826548729646668720118931889x^{48} - 719077854633508484642475024x^{47} + 601126348833940887359223192x^{46} - 2414047083412492769871166152x^{45}/5 + 37250248057441$

```

5750374856978*x**44 - 276016272695076305811040776*x**43 + 19637477351146873
5732390996*x**42 - 134109601422466453670901168*x**41 + 43942879646418823651
5924114*x**40/5 - 55246631151825154632274992*x**39 + 3330028769928308192747
4024*x**38 - 19237666204653402059452899*x**37 + 42585944846198556695711973*
x**36/4 - 28206275157871771317939099*x**35/5 + 5720500053966970302409071*x*
*34/2 - 1386787891870780679371896*x**33 + 2570079734390957672096829*x**32/4
- 284248449886557530554488*x**31 + 599857644244167183024612*x**30/5 - 4826
4408157576669898532*x**29 + 18488763007525700846649*x**28 - 673664638112047
5583764*x**27 + 2331916055003241548226*x**26 - 19146258135816088501224*x**2
5/25 + 238292173768273828749*x**24 - 70132813684308016488*x**23 + 194903043
78320352108*x**22 - 5104603527655330314*x**21 + 12572449429225165403*x**20/
10 - 290505891817783026*x**19 + 62806829355518017*x**18 - 12666923567499432
*x**17 + 4750096337812287*x**16/2 - 2062057324941768*x**15/5 + 660264660695
64*x**14 - 9696194317908*x**13 + 1298273209233*x**12 - 157366449604*x**11 +
85600431378*x**10/5 - 1654114616*x**9 + 140066157*x**8 - 10217592*x**7 + 6
27396*x**6 - 156849*x**5/5 + 4851*x**4/4 - 33*x**3 + x**2/2

```

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 501 vs. $2(15) = 30$.

Time = 0.20 (sec) , antiderivative size = 501, normalized size of antiderivative = 21.78

$$\int (1-x)^{99} x dx = \text{Too large to display}$$

```
[In] integrate(x*(1-x)^99,x, algorithm="maxima")
```

```

[Out] -1/101*x^101 + 99/100*x^100 - 49*x^99 + 3201/2*x^98 - 38808*x^97 + 2980131/
4*x^96 - 58975224/5*x^95 + 158372676*x^94 - 1840869492*x^93 + 18815553757*x
^92 - 171200862756*x^91 + 7002807007378/5*x^90 - 10386185673864*x^89 + 7029
7408804833*x^88 - 436790467844808*x^87 + 2503926751715004*x^86 - 6650134872
9372018/5*x^85 + 131419332012806607/2*x^84 - 302950588656028082*x^83 + 1307
276513180023617*x^82 - 5293662917568490696*x^81 + 201631839342385547403/10*
x^80 - 72392559119475593544*x^79 + 245464847895078057708*x^78 - 78740022636
4730912388*x^77 + 2393282266977011062653*x^76 - 172561788070239874568724/25
*x^75 + 18914430223915181446722*x^74 - 49303368020068535591064*x^73 + 12238
4749256712270099849*x^72 - 289586448945460019391192*x^71 + 3268857173695411
601376612/5*x^70 - 1409398564020847755666003*x^69 + 11614348594417788189739
629/4*x^68 - 5720500053966970302409071*x^67 + 21569504532490178066659311/2*
x^66 - 97339302505596701018770224/5*x^65 + 134663663432573814416170293/4*x^
64 - 55800482090690569716307824*x^63 + 88685381585824590330757224*x^62 - 13
5208860450519457389515112*x^61 + 989058310490690095822896114/5*x^60 - 27779
8460089394796889723848*x^59 + 374593512943317843600698196*x^58 - 4851195095
85285628395162576*x^57 + 603511770853123192467791538*x^56 - 360675809300364
5324155339152/5*x^55 + 828502745555998906218503832*x^54 - 91447944556652709

```

```

4599669324*x^53 + 970109082168886474373197089*x^52 - 9891308288780803268118
87228*x^51 + 24233705307512968006891237086/25*x^50 - 9130438420413049170571
26672*x^49 + 826548729646668720118931889*x^48 - 719077854633508484642475024
*x^47 + 601126348833940887359223192*x^46 - 2414047083412492769871166152/5*x
^45 + 372502480574415750374856978*x^44 - 276016272695076305811040776*x^43 +
196374773511468735732390996*x^42 - 134109601422466453670901168*x^41 + 4394
28796464188236515924114/5*x^40 - 55246631151825154632274992*x^39 + 33300287
699283081927474024*x^38 - 19237666204653402059452899*x^37 + 425859448461985
56695711973/4*x^36 - 28206275157871771317939099/5*x^35 + 572050005396697030
2409071/2*x^34 - 1386787891870780679371896*x^33 + 2570079734390957672096829
/4*x^32 - 284248449886557530554488*x^31 + 599857644244167183024612/5*x^30 -
48264408157576669898532*x^29 + 18488763007525700846649*x^28 - 673664638112
0475583764*x^27 + 2331916055003241548226*x^26 - 19146258135816088501224/25*
x^25 + 238292173768273828749*x^24 - 70132813684308016488*x^23 + 19490304378
320352108*x^22 - 5104603527655330314*x^21 + 12572449429225165403/10*x^20 -
290505891817783026*x^19 + 62806829355518017*x^18 - 12666923567499432*x^17 +
4750096337812287/2*x^16 - 2062057324941768/5*x^15 + 66026466069564*x^14 -
9696194317908*x^13 + 1298273209233*x^12 - 157366449604*x^11 + 85600431378/5
*x^10 - 1654114616*x^9 + 140066157*x^8 - 10217592*x^7 + 627396*x^6 - 156849
/5*x^5 + 4851/4*x^4 - 33*x^3 + 1/2*x^2

```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 501 vs. $2(15) = 30$.

Time = 0.27 (sec) , antiderivative size = 501, normalized size of antiderivative = 21.78

$$\int (1-x)^{99} x dx = \text{Too large to display}$$

```
[In] integrate(x*(1-x)^99,x, algorithm="giac")
```

```

[Out] -1/101*x^101 + 99/100*x^100 - 49*x^99 + 3201/2*x^98 - 38808*x^97 + 2980131/
4*x^96 - 58975224/5*x^95 + 158372676*x^94 - 1840869492*x^93 + 18815553757*x
^92 - 171200862756*x^91 + 7002807007378/5*x^90 - 10386185673864*x^89 + 7029
7408804833*x^88 - 436790467844808*x^87 + 2503926751715004*x^86 - 6650134872
9372018/5*x^85 + 131419332012806607/2*x^84 - 302950588656028082*x^83 + 1307
276513180023617*x^82 - 5293662917568490696*x^81 + 201631839342385547403/10*
x^80 - 72392559119475593544*x^79 + 245464847895078057708*x^78 - 78740022636
4730912388*x^77 + 2393282266977011062653*x^76 - 172561788070239874568724/25
*x^75 + 18914430223915181446722*x^74 - 49303368020068535591064*x^73 + 12238
4749256712270099849*x^72 - 289586448945460019391192*x^71 + 3268857173695411
601376612/5*x^70 - 1409398564020847755666003*x^69 + 11614348594417788189739
629/4*x^68 - 5720500053966970302409071*x^67 + 21569504532490178066659311/2*
x^66 - 97339302505596701018770224/5*x^65 + 134663663432573814416170293/4*x^
64 - 55800482090690569716307824*x^63 + 88685381585824590330757224*x^62 - 13

```

5208860450519457389515112*x⁶¹ + 989058310490690095822896114/5*x⁶⁰ - 27779
8460089394796889723848*x⁵⁹ + 374593512943317843600698196*x⁵⁸ - 4851195095
85285628395162576*x⁵⁷ + 603511770853123192467791538*x⁵⁶ - 360675809300364
5324155339152/5*x⁵⁵ + 828502745555998906218503832*x⁵⁴ - 91447944556652709
4599669324*x⁵³ + 970109082168886474373197089*x⁵² - 9891308288780803268118
87228*x⁵¹ + 24233705307512968006891237086/25*x⁵⁰ - 9130438420413049170571
26672*x⁴⁹ + 826548729646668720118931889*x⁴⁸ - 719077854633508484642475024
*x⁴⁷ + 601126348833940887359223192*x⁴⁶ - 2414047083412492769871166152/5*x⁴⁵
+ 372502480574415750374856978*x⁴⁴ - 276016272695076305811040776*x⁴³ +
196374773511468735732390996*x⁴² - 134109601422466453670901168*x⁴¹ + 4394
28796464188236515924114/5*x⁴⁰ - 55246631151825154632274992*x³⁹ + 33300287
699283081927474024*x³⁸ - 19237666204653402059452899*x³⁷ + 425859448461985
56695711973/4*x³⁶ - 28206275157871771317939099/5*x³⁵ + 572050005396697030
2409071/2*x³⁴ - 1386787891870780679371896*x³³ + 2570079734390957672096829
/4*x³² - 284248449886557530554488*x³¹ + 599857644244167183024612/5*x³⁰ -
48264408157576669898532*x²⁹ + 18488763007525700846649*x²⁸ - 673664638112
0475583764*x²⁷ + 2331916055003241548226*x²⁶ - 19146258135816088501224/25*
x²⁵ + 238292173768273828749*x²⁴ - 70132813684308016488*x²³ + 19490304378
320352108*x²² - 5104603527655330314*x²¹ + 12572449429225165403/10*x²⁰ -
290505891817783026*x¹⁹ + 62806829355518017*x¹⁸ - 12666923567499432*x¹⁷ +
4750096337812287/2*x¹⁶ - 2062057324941768/5*x¹⁵ + 66026466069564*x¹⁴ -
9696194317908*x¹³ + 1298273209233*x¹² - 157366449604*x¹¹ + 85600431378/5
*x¹⁰ - 1654114616*x⁹ + 140066157*x⁸ - 10217592*x⁷ + 627396*x⁶ - 156849
/5*x⁵ + 4851/4*x⁴ - 33*x³ + 1/2*x²

Mupad [B] (verification not implemented)

Time = 13.92 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.52

$$\int (1-x)^{99} x dx = -\frac{(100x+1)(x-1)^{100}}{10100}$$

[In] int(-x*(x - 1)^99,x)

[Out] -((100*x + 1)*(x - 1)^100)/10100

3.65 $\int \csc(x) \sin(4x) dx$

| | |
|---|-----|
| Optimal result | 378 |
| Rubi [A] (verified) | 378 |
| Mathematica [A] (verified) | 379 |
| Maple [A] (verified) | 379 |
| Fricas [A] (verification not implemented) | 379 |
| Sympy [A] (verification not implemented) | 380 |
| Maxima [A] (verification not implemented) | 380 |
| Giac [A] (verification not implemented) | 380 |
| Mupad [B] (verification not implemented) | 380 |

Optimal result

Integrand size = 7, antiderivative size = 13

$$\int \csc(x) \sin(4x) dx = 4 \sin(x) - \frac{8 \sin^3(x)}{3}$$

[Out] 4*sin(x)-8/3*sin(x)^3

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \csc(x) \sin(4x) dx = 4 \sin(x) - \frac{8 \sin^3(x)}{3}$$

[In] Int[Csc[x]*Sin[4*x],x]

[Out] 4*Sin[x] - (8*Sin[x]^3)/3

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int (4 - 8x^2) dx, x, \sin(x)\right) \\ &= 4 \sin(x) - \frac{8 \sin^3(x)}{3} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \csc(x) \sin(4x) dx = 4 \sin(x) - \frac{8 \sin^3(x)}{3}$$

[In] Integrate[Csc[x]*Sin[4*x],x]

[Out] 4*Sin[x] - (8*Sin[x]^3)/3

Maple [A] (verified)

Time = 0.08 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.92

| method | result | size |
|-------------------|-------------------------------------|------|
| derivativedivides | $4 \sin(x) - \frac{8 \sin^3(x)}{3}$ | 12 |
| default | $4 \sin(x) - \frac{8 \sin^3(x)}{3}$ | 12 |
| risch | $2 \sin(x) + \frac{2 \sin(3x)}{3}$ | 12 |

[In] int(sin(4*x)/sin(x),x,method=_RETURNVERBOSE)

[Out] 4*sin(x)-8/3*sin(x)^3

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.92

$$\int \csc(x) \sin(4x) dx = \frac{4}{3} (2 \cos(x)^2 + 1) \sin(x)$$

[In] integrate(sin(4*x)/sin(x),x, algorithm="fricas")

[Out] 4/3*(2*cos(x)^2 + 1)*sin(x)

Sympy [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.92

$$\int \csc(x) \sin(4x) dx = -\frac{8 \sin^3(x)}{3} + 4 \sin(x)$$

[In] integrate(sin(4*x)/sin(x),x)

[Out] -8*sin(x)**3/3 + 4*sin(x)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \csc(x) \sin(4x) dx = -\frac{8}{3} \sin(x)^3 + 4 \sin(x)$$

[In] integrate(sin(4*x)/sin(x),x, algorithm="maxima")

[Out] -8/3*sin(x)^3 + 4*sin(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \csc(x) \sin(4x) dx = \frac{2}{3} \sin(3x) + 2 \sin(x)$$

[In] integrate(sin(4*x)/sin(x),x, algorithm="giac")

[Out] 2/3*sin(3*x) + 2*sin(x)

Mupad [B] (verification not implemented)

Time = 14.36 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \csc(x) \sin(4x) dx = 4 \sin(x) - \frac{8 \sin(x)^3}{3}$$

[In] int(sin(4*x)/sin(x),x)

[Out] 4*sin(x) - (8*sin(x)^3)/3

$$3.66 \quad \int \frac{1}{(1 + \sqrt[3]{x})\sqrt{x}} dx$$

| | |
|---|-----|
| Optimal result | 381 |
| Rubi [A] (verified) | 381 |
| Mathematica [A] (verified) | 382 |
| Maple [A] (verified) | 383 |
| Fricas [A] (verification not implemented) | 383 |
| Sympy [A] (verification not implemented) | 383 |
| Maxima [A] (verification not implemented) | 384 |
| Giac [A] (verification not implemented) | 384 |
| Mupad [B] (verification not implemented) | 384 |

Optimal result

Integrand size = 15, antiderivative size = 16

$$\int \frac{1}{(1 + \sqrt[3]{x})\sqrt{x}} dx = 6\sqrt[6]{x} - 6 \arctan(\sqrt[6]{x})$$

[Out] 6*x^(1/6)-6*arctan(x^(1/6))

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 16, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.267$, Rules used = {348, 52, 65, 209}

$$\int \frac{1}{(1 + \sqrt[3]{x})\sqrt{x}} dx = 6\sqrt[6]{x} - 6 \arctan(\sqrt[6]{x})$$

[In] Int[1/((1 + x^(1/3))*Sqrt[x]),x]

[Out] 6*x^(1/6) - 6*ArcTan[x^(1/6)]

Rule 52

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] := Simp[
(a + b*x)^(m + 1)*((c + d*x)^n/(b*(m + n + 1))), x] + Dist[n*((b*c - a*d)/(
b*(m + n + 1))), Int[(a + b*x)^m*(c + d*x)^(n - 1), x], x] /; FreeQ[{a, b,
c, d}, x] && NeQ[b*c - a*d, 0] && GtQ[n, 0] && NeQ[m + n + 1, 0] && !(IGtQ[
m, 0] && (!IntegerQ[n] || (GtQ[m, 0] && LtQ[m - n, 0]))) && !ILtQ[m + n
+ 2, 0] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 65

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] := With[
{p = Denominator[m]}, Dist[p/b, Subst[Int[x^(p*(m + 1) - 1)*(c - a*(d/b) +
d*(x^p/b))^(n), x], x, (a + b*x)^(1/p)], x]] /; FreeQ[{a, b, c, d}, x] && NeQ
[b*c - a*d, 0] && LtQ[-1, m, 0] && LeQ[-1, n, 0] && LeQ[Denominator[n], Den
ominator[m]] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 209

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*A
rcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a
, 0] || GtQ[b, 0])
```

Rule 348

```
Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := With[{k = Denomi
nator[n]}, Dist[k, Subst[Int[x^(k*(m + 1) - 1)*(a + b*x^(k*n))^p, x], x, x^
(1/k)], x]] /; FreeQ[{a, b, m, p}, x] && FractionQ[n]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= 3\text{Subst}\left(\int \frac{\sqrt{x}}{1+x} dx, x, \sqrt[3]{x}\right) \\
&= 6\sqrt[6]{x} - 3\text{Subst}\left(\int \frac{1}{\sqrt{x}(1+x)} dx, x, \sqrt[3]{x}\right) \\
&= 6\sqrt[6]{x} - 6\text{Subst}\left(\int \frac{1}{1+x^2} dx, x, \sqrt[6]{x}\right) \\
&= 6\sqrt[6]{x} - 6 \arctan(\sqrt[6]{x})
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \frac{1}{(1 + \sqrt[3]{x})\sqrt{x}} dx = 6\sqrt[6]{x} - 6 \arctan(\sqrt[6]{x})$$

```
[In] Integrate[1/((1 + x^(1/3))*Sqrt[x]),x]
```

```
[Out] 6*x^(1/6) - 6*ArcTan[x^(1/6)]
```

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.81

| method | result | size |
|-------------------|--|------|
| derivativedivides | $6x^{\frac{1}{6}} - 6 \arctan\left(x^{\frac{1}{6}}\right)$ | 13 |
| default | $6x^{\frac{1}{6}} - 6 \arctan\left(x^{\frac{1}{6}}\right)$ | 13 |
| meijerg | $6x^{\frac{1}{6}} - 6 \arctan\left(x^{\frac{1}{6}}\right)$ | 13 |

[In] `int(1/x^(1/2)/(1+x^(1/3)),x,method=_RETURNVERBOSE)`

[Out] `6*x^(1/6)-6*arctan(x^(1/6))`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{1}{(1 + \sqrt[3]{x}) \sqrt{x}} dx = 6x^{\frac{1}{6}} - 6 \arctan\left(x^{\frac{1}{6}}\right)$$

[In] `integrate(1/x^(1/2)/(1+x^(1/3)),x, algorithm="fricas")`

[Out] `6*x^(1/6) - 6*arctan(x^(1/6))`

Sympy [A] (verification not implemented)

Time = 0.41 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.94

$$\int \frac{1}{(1 + \sqrt[3]{x}) \sqrt{x}} dx = 6\sqrt[6]{x} + 6 \operatorname{atan}\left(\frac{1}{\sqrt[6]{x}}\right)$$

[In] `integrate(1/x**(1/2)/(1+x**(1/3)),x)`

[Out] `6*x**(1/6) + 6*atan(x**(-1/6))`

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{1}{(1 + \sqrt[3]{x}) \sqrt{x}} dx = 6x^{\frac{1}{6}} - 6 \arctan\left(x^{\frac{1}{6}}\right)$$

[In] integrate(1/x^(1/2)/(1+x^(1/3)),x, algorithm="maxima")

[Out] 6*x^(1/6) - 6*arctan(x^(1/6))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{1}{(1 + \sqrt[3]{x}) \sqrt{x}} dx = 6x^{\frac{1}{6}} - 6 \arctan\left(x^{\frac{1}{6}}\right)$$

[In] integrate(1/x^(1/2)/(1+x^(1/3)),x, algorithm="giac")

[Out] 6*x^(1/6) - 6*arctan(x^(1/6))

Mupad [B] (verification not implemented)

Time = 14.48 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{1}{(1 + \sqrt[3]{x}) \sqrt{x}} dx = 6x^{1/6} - 6 \operatorname{atan}(x^{1/6})$$

[In] int(1/(x^(1/2)*(x^(1/3) + 1)),x)

[Out] 6*x^(1/6) - 6*atan(x^(1/6))

3.67 $\int \frac{1}{\sqrt{-1+2x^2}} dx$

| | |
|---|-----|
| Optimal result | 385 |
| Rubi [A] (verified) | 385 |
| Mathematica [B] (verified) | 386 |
| Maple [A] (verified) | 386 |
| Fricas [A] (verification not implemented) | 387 |
| Sympy [A] (verification not implemented) | 387 |
| Maxima [A] (verification not implemented) | 387 |
| Giac [A] (verification not implemented) | 387 |
| Mupad [B] (verification not implemented) | 388 |

Optimal result

Integrand size = 11, antiderivative size = 25

$$\int \frac{1}{\sqrt{-1+2x^2}} dx = \frac{\operatorname{arctanh}\left(\frac{\sqrt{2}x}{\sqrt{-1+2x^2}}\right)}{\sqrt{2}}$$

[Out] 1/2*arctanh(2^(1/2)*x/(2*x^2-1)^(1/2))*2^(1/2)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {223, 212}

$$\int \frac{1}{\sqrt{-1+2x^2}} dx = \frac{\operatorname{arctanh}\left(\frac{\sqrt{2}x}{\sqrt{2x^2-1}}\right)}{\sqrt{2}}$$

[In] Int[1/Sqrt[-1 + 2*x^2], x]

[Out] ArcTanh[(Sqrt[2]*x)/Sqrt[-1 + 2*x^2]]/Sqrt[2]

Rule 212

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])

Rule 223

Int[1/Sqrt[(a_) + (b_.)*(x_)^2], x_Symbol] := Subst[Int[1/(1 - b*x^2), x], x, x/Sqrt[a + b*x^2]] /; FreeQ[{a, b}, x] && !GtQ[a, 0]

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{1}{1-2x^2} dx, x, \frac{x}{\sqrt{-1+2x^2}}\right) \\ &= \frac{\operatorname{arctanh}\left(\frac{\sqrt{2}x}{\sqrt{-1+2x^2}}\right)}{\sqrt{2}} \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 54 vs. $2(25) = 50$.

Time = 0.03 (sec) , antiderivative size = 54, normalized size of antiderivative = 2.16

$$\int \frac{1}{\sqrt{-1+2x^2}} dx = \frac{-\log\left(\sqrt{2} - \frac{2x}{\sqrt{-1+2x^2}}\right) + \log\left(\sqrt{2} + \frac{2x}{\sqrt{-1+2x^2}}\right)}{2\sqrt{2}}$$

[In] Integrate[1/Sqrt[-1 + 2*x^2],x]

[Out] (-Log[Sqrt[2] - (2*x)/Sqrt[-1 + 2*x^2]] + Log[Sqrt[2] + (2*x)/Sqrt[-1 + 2*x^2]])/(2*Sqrt[2])

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.88

| method | result | size |
|----------------|--|------|
| default | $\frac{\ln(x\sqrt{2} + \sqrt{2x^2-1})\sqrt{2}}{2}$ | 22 |
| pseudoelliptic | $\frac{\sqrt{2} \operatorname{arctanh}\left(\frac{\sqrt{2x^2-1}\sqrt{2}}{2x}\right)}{2}$ | 24 |
| trager | $\frac{\operatorname{RootOf}(_Z^2-2) \ln(\operatorname{RootOf}(_Z^2-2)\sqrt{2x^2-1}+2x)}{2}$ | 30 |
| meijerg | $\frac{\sqrt{-\operatorname{signum}(2x^2-1)}\sqrt{2} \arcsin(x\sqrt{2})}{2\sqrt{\operatorname{signum}(2x^2-1)}}$ | 34 |

[In] int(1/(2*x^2-1)^(1/2),x,method=_RETURNVERBOSE)

[Out] 1/2*ln(x*2^(1/2)+(2*x^2-1)^(1/2))*2^(1/2)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.12

$$\int \frac{1}{\sqrt{-1+2x^2}} dx = \frac{1}{4} \sqrt{2} \log \left(2 \sqrt{2} \sqrt{2x^2-1} x + 4x^2 - 1 \right)$$

[In] integrate(1/(2*x^2-1)^(1/2),x, algorithm="fricas")

[Out] 1/4*sqrt(2)*log(2*sqrt(2)*sqrt(2*x^2 - 1)*x + 4*x^2 - 1)

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.04

$$\int \frac{1}{\sqrt{-1+2x^2}} dx = \frac{\sqrt{2} \log(2x + \sqrt{2} \sqrt{2x^2-1})}{2}$$

[In] integrate(1/(2*x**2-1)**(1/2),x)

[Out] sqrt(2)*log(2*x + sqrt(2)*sqrt(2*x**2 - 1))/2

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.96

$$\int \frac{1}{\sqrt{-1+2x^2}} dx = \frac{1}{2} \sqrt{2} \log \left(2 \sqrt{2} \sqrt{2x^2-1} + 4x \right)$$

[In] integrate(1/(2*x^2-1)^(1/2),x, algorithm="maxima")

[Out] 1/2*sqrt(2)*log(2*sqrt(2)*sqrt(2*x^2 - 1) + 4*x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.44

$$\int \frac{1}{\sqrt{-1+2x^2}} dx = \frac{1}{2} \sqrt{2} x^2 - 1x + \frac{1}{4} \sqrt{2} \log \left(\left| -\sqrt{2}x + \sqrt{2x^2-1} \right| \right)$$

[In] integrate(1/(2*x^2-1)^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(2*x^2 - 1)*x + 1/4*sqrt(2)*log(abs(-sqrt(2)*x + sqrt(2*x^2 - 1)))

Mupad [B] (verification not implemented)

Time = 0.15 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.84

$$\int \frac{1}{\sqrt{-1+2x^2}} dx = \frac{\sqrt{2} \ln(\sqrt{2}x + \sqrt{2x^2 - 1})}{2}$$

[In] int(1/(2*x^2 - 1)^(1/2),x)

[Out] (2^(1/2)*log(2^(1/2)*x + (2*x^2 - 1)^(1/2)))/2

3.68 $\int \frac{1}{\sqrt{-1+e^x}} dx$

| | |
|---|-----|
| Optimal result | 389 |
| Rubi [A] (verified) | 389 |
| Mathematica [A] (verified) | 390 |
| Maple [A] (verified) | 390 |
| Fricas [A] (verification not implemented) | 391 |
| Sympy [A] (verification not implemented) | 391 |
| Maxima [A] (verification not implemented) | 391 |
| Giac [A] (verification not implemented) | 391 |
| Mupad [B] (verification not implemented) | 392 |

Optimal result

Integrand size = 9, antiderivative size = 12

$$\int \frac{1}{\sqrt{-1+e^x}} dx = 2 \arctan(\sqrt{-1+e^x})$$

[Out] 2*arctan((-1+exp(x))^(1/2))

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {2320, 65, 209}

$$\int \frac{1}{\sqrt{-1+e^x}} dx = 2 \arctan(\sqrt{e^x-1})$$

[In] Int[1/Sqrt[-1 + E^x],x]

[Out] 2*ArcTan[Sqrt[-1 + E^x]]

Rule 65

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] := With[
{p = Denominator[m]}, Dist[p/b, Subst[Int[x^(p*(m + 1) - 1)*(c - a*(d/b) +
d*(x^p/b))^n, x], x, (a + b*x)^(1/p)], x] /; FreeQ[{a, b, c, d}, x] && NeQ
[b*c - a*d, 0] && LtQ[-1, m, 0] && LeQ[-1, n, 0] && LeQ[Denominator[n], Den
ominator[m]] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 209

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*A
rcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a
```

, 0] || GtQ[b, 0])

Rule 2320

```
Int[u_, x_Symbol] :=> With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_) [v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{1}{\sqrt{-1+xx}} dx, x, e^x\right) \\ &= 2\text{Subst}\left(\int \frac{1}{1+x^2} dx, x, \sqrt{-1+e^x}\right) \\ &= 2\arctan(\sqrt{-1+e^x}) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \frac{1}{\sqrt{-1+e^x}} dx = 2\arctan(\sqrt{-1+e^x})$$

[In] Integrate[1/Sqrt[-1 + E^x], x]

[Out] 2*ArcTan[Sqrt[-1 + E^x]]

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

| method | result | size |
|-------------------|--------------------------|------|
| derivativedivides | $2\arctan(\sqrt{e^x-1})$ | 10 |
| default | $2\arctan(\sqrt{e^x-1})$ | 10 |

[In] int(1/(exp(x)-1)^(1/2), x, method=_RETURNVERBOSE)

[Out] 2*arctan((exp(x)-1)^(1/2))

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.75

$$\int \frac{1}{\sqrt{-1 + e^x}} dx = 2 \arctan(\sqrt{e^x - 1})$$

[In] integrate(1/(exp(x)-1)^(1/2),x, algorithm="fricas")

[Out] 2*arctan(sqrt(e^x - 1))

Sympy [A] (verification not implemented)

Time = 0.22 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int \frac{1}{\sqrt{-1 + e^x}} dx = 2 \operatorname{atan}(\sqrt{e^x - 1})$$

[In] integrate(1/(exp(x)-1)**(1/2),x)

[Out] 2*atan(sqrt(exp(x) - 1))

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.75

$$\int \frac{1}{\sqrt{-1 + e^x}} dx = 2 \arctan(\sqrt{e^x - 1})$$

[In] integrate(1/(exp(x)-1)^(1/2),x, algorithm="maxima")

[Out] 2*arctan(sqrt(e^x - 1))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.75

$$\int \frac{1}{\sqrt{-1 + e^x}} dx = 2 \arctan(\sqrt{e^x - 1})$$

[In] integrate(1/(exp(x)-1)^(1/2),x, algorithm="giac")

[Out] 2*arctan(sqrt(e^x - 1))

Mupad [B] (verification not implemented)

Time = 0.13 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.75

$$\int \frac{1}{\sqrt{-1 + e^x}} dx = 2 \operatorname{atan}(\sqrt{e^x - 1})$$

[In] int(1/(exp(x) - 1)^(1/2),x)

[Out] 2*atan((exp(x) - 1)^(1/2))

3.69 $\int \frac{x}{4+x^4} dx$

| | |
|---|-----|
| Optimal result | 393 |
| Rubi [A] (verified) | 393 |
| Mathematica [A] (verified) | 394 |
| Maple [A] (verified) | 394 |
| Fricas [A] (verification not implemented) | 395 |
| Sympy [A] (verification not implemented) | 395 |
| Maxima [A] (verification not implemented) | 395 |
| Giac [A] (verification not implemented) | 395 |
| Mupad [B] (verification not implemented) | 396 |

Optimal result

Integrand size = 9, antiderivative size = 12

$$\int \frac{x}{4+x^4} dx = \frac{1}{4} \arctan\left(\frac{x^2}{2}\right)$$

[Out] 1/4*arctan(1/2*x^2)

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {281, 209}

$$\int \frac{x}{4+x^4} dx = \frac{1}{4} \arctan\left(\frac{x^2}{2}\right)$$

[In] Int[x/(4 + x^4), x]

[Out] ArcTan[x^2/2]/4

Rule 209

Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])

Rule 281

Int[(x_)^(m_)*((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] := With[{k = GCD[m + 1, n]}, Dist[1/k, Subst[Int[x^((m + 1)/k - 1)*(a + b*x^(n/k))^p, x], x, x^k], x] /; k != 1 /; FreeQ[{a, b, p}, x] && IGtQ[n, 0] && IntegerQ[m]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{4+x^2} dx, x, x^2 \right) \\ &= \frac{1}{4} \arctan \left(\frac{x^2}{2} \right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \frac{x}{4+x^4} dx = \frac{1}{4} \arctan \left(\frac{x^2}{2} \right)$$

[In] Integrate[x/(4 + x^4),x]

[Out] ArcTan[x^2/2]/4

Maple [A] (verified)

Time = 0.17 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.75

| method | result | size |
|--------------|--|------|
| default | $\frac{\arctan\left(\frac{x^2}{2}\right)}{4}$ | 9 |
| meijerg | $\frac{\arctan\left(\frac{x^2}{2}\right)}{4}$ | 9 |
| risch | $\frac{\arctan\left(\frac{x^2}{2}\right)}{4}$ | 9 |
| parallelrisc | $-\frac{i \ln(x-1-i)}{8} + \frac{i \ln(x-1+i)}{8} + \frac{i \ln(x+1-i)}{8} - \frac{i \ln(x+1+i)}{8}$ | 38 |

[In] int(x/(x^4+4),x,method=_RETURNVERBOSE)

[Out] 1/4*arctan(1/2*x^2)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{x}{4+x^4} dx = \frac{1}{4} \arctan\left(\frac{1}{2}x^2\right)$$

[In] integrate(x/(x^4+4),x, algorithm="fricas")

[Out] 1/4*arctan(1/2*x^2)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.58

$$\int \frac{x}{4+x^4} dx = \frac{\operatorname{atan}\left(\frac{x^2}{2}\right)}{4}$$

[In] integrate(x/(x**4+4),x)

[Out] atan(x**2/2)/4

Maxima [A] (verification not implemented)

none

Time = 0.34 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{x}{4+x^4} dx = \frac{1}{4} \arctan\left(\frac{1}{2}x^2\right)$$

[In] integrate(x/(x^4+4),x, algorithm="maxima")

[Out] 1/4*arctan(1/2*x^2)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{x}{4+x^4} dx = \frac{1}{4} \arctan\left(\frac{1}{2}x^2\right)$$

[In] integrate(x/(x^4+4),x, algorithm="giac")

[Out] 1/4*arctan(1/2*x^2)

Mupad [B] (verification not implemented)

Time = 15.46 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{x}{4+x^4} dx = \frac{\operatorname{atan}\left(\frac{x^2}{2}\right)}{4}$$

[In] `int(x/(x^4 + 4),x)`

[Out] `atan(x^2/2)/4`

3.70 $\int \frac{2}{(\cos(x)-\sin(x))^2} dx$

| | |
|---|-----|
| Optimal result | 397 |
| Rubi [A] (verified) | 397 |
| Mathematica [A] (verified) | 398 |
| Maple [A] (verified) | 398 |
| Fricas [A] (verification not implemented) | 399 |
| Sympy [B] (verification not implemented) | 399 |
| Maxima [A] (verification not implemented) | 399 |
| Giac [A] (verification not implemented) | 400 |
| Mupad [B] (verification not implemented) | 400 |

Optimal result

Integrand size = 11, antiderivative size = 8

$$\int \frac{2}{(\cos(x) - \sin(x))^2} dx = \frac{2}{-1 + \cot(x)}$$

[Out] 2/(-1+cot(x))

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.62, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {12, 3154}

$$\int \frac{2}{(\cos(x) - \sin(x))^2} dx = \frac{2 \sin(x)}{\cos(x) - \sin(x)}$$

[In] Int[2/(Cos[x] - Sin[x])^2,x]

[Out] (2*Sin[x])/(Cos[x] - Sin[x])

Rule 12

```
Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_) /; FreeQ[b, x]]
```

Rule 3154

```
Int[(cos[(c_.) + (d_)*(x_)]*(a_.) + (b_.)*sin[(c_.) + (d_)*(x_)])^(-2), x_Symbol] := Simp[Sin[c + d*x]/(a*d*(a*cos[c + d*x] + b*sin[c + d*x]), x] /; FreeQ[{a, b, c, d}, x] && NeQ[a^2 + b^2, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= 2 \int \frac{1}{(\cos(x) - \sin(x))^2} dx \\ &= \frac{2 \sin(x)}{\cos(x) - \sin(x)} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.62

$$\int \frac{2}{(\cos(x) - \sin(x))^2} dx = \frac{2 \sin(x)}{\cos(x) - \sin(x)}$$

[In] Integrate[2/(Cos[x] - Sin[x])^2,x]

[Out] (2*Sin[x])/(Cos[x] - Sin[x])

Maple [A] (verified)

Time = 0.14 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.12

| method | result | size |
|---------------|--|------|
| default | $-\frac{2}{\tan(x)-1}$ | 9 |
| risch | $\frac{2}{e^{2ix}-i}$ | 13 |
| parallelrisch | $\frac{2 \sin(x)}{\cos(x)-\sin(x)}$ | 14 |
| norman | $-\frac{4 \tan(\frac{x}{2})}{\tan(\frac{x}{2})^2 + 2 \tan(\frac{x}{2}) - 1}$ | 23 |

[In] int(2/(cos(x)-sin(x))^2,x,method=_RETURNVERBOSE)

[Out] -2/(tan(x)-1)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.88

$$\int \frac{2}{(\cos(x) - \sin(x))^2} dx = \frac{\cos(x) + \sin(x)}{\cos(x) - \sin(x)}$$

[In] integrate(2/(cos(x)-sin(x))^2,x, algorithm="fricas")

[Out] (cos(x) + sin(x))/(cos(x) - sin(x))

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 22 vs. 2(5) = 10.

Time = 0.33 (sec) , antiderivative size = 22, normalized size of antiderivative = 2.75

$$\int \frac{2}{(\cos(x) - \sin(x))^2} dx = -\frac{4 \tan\left(\frac{x}{2}\right)}{\tan^2\left(\frac{x}{2}\right) + 2 \tan\left(\frac{x}{2}\right) - 1}$$

[In] integrate(2/(cos(x)-sin(x))**2,x)

[Out] -4*tan(x/2)/(tan(x/2)**2 + 2*tan(x/2) - 1)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \frac{2}{(\cos(x) - \sin(x))^2} dx = -\frac{2}{\tan(x) - 1}$$

[In] integrate(2/(cos(x)-sin(x))^2,x, algorithm="maxima")

[Out] -2/(tan(x) - 1)

Giac [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \frac{2}{(\cos(x) - \sin(x))^2} dx = -\frac{2}{\tan(x) - 1}$$

[In] integrate(2/(cos(x)-sin(x))^2,x, algorithm="giac")

[Out] -2/(tan(x) - 1)

Mupad [B] (verification not implemented)

Time = 15.12 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.62

$$\int \frac{2}{(\cos(x) - \sin(x))^2} dx = \frac{2 \sin(x)}{\cos(x) - \sin(x)}$$

[In] int(2/(cos(x) - sin(x))^2,x)

[Out] (2*sin(x))/(cos(x) - sin(x))

3.71 $\int x \coth(x) \operatorname{csch}(x) dx$

| | |
|---|-----|
| Optimal result | 401 |
| Rubi [A] (verified) | 401 |
| Mathematica [B] (verified) | 402 |
| Maple [B] (verified) | 402 |
| Fricas [B] (verification not implemented) | 402 |
| Sympy [B] (verification not implemented) | 403 |
| Maxima [B] (verification not implemented) | 403 |
| Giac [B] (verification not implemented) | 403 |
| Mupad [B] (verification not implemented) | 404 |

Optimal result

Integrand size = 6, antiderivative size = 11

$$\int x \coth(x) \operatorname{csch}(x) dx = -\operatorname{arctanh}(\cosh(x)) - x \operatorname{csch}(x)$$

[Out] $-\operatorname{arctanh}(\cosh(x)) - x \operatorname{csch}(x)$

Rubi [A] (verified)

Time = 0.02 (sec), antiderivative size = 11, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {5527, 3855}

$$\int x \coth(x) \operatorname{csch}(x) dx = -\operatorname{arctanh}(\cosh(x)) - x \operatorname{csch}(x)$$

[In] $\operatorname{Int}[x \operatorname{Coth}[x] \operatorname{CsCh}[x], x]$

[Out] $-\operatorname{ArcTanh}[\operatorname{Cosh}[x]] - x \operatorname{CsCh}[x]$

Rule 3855

$\operatorname{Int}[\operatorname{csc}[(c_.) + (d_.) \cdot (x_.)], x_Symbol] \rightarrow \operatorname{Simp}[-\operatorname{ArcTanh}[\operatorname{Cos}[c + d \cdot x]]/d, x] /;$ $\operatorname{FreeQ}\{c, d\}, x]$

Rule 5527

$\operatorname{Int}[\operatorname{Coth}[(a_.) + (b_.) \cdot (x_.)^{(n_.)}]^{(q_.)} \operatorname{CsCh}[(a_.) + (b_.) \cdot (x_.)^{(n_.)}]^{(p_.)} \cdot (x_.)^{(m_.)}, x_Symbol] \rightarrow \operatorname{Simp}[(-x^{(m-n+1)}) \cdot (\operatorname{CsCh}[a + b \cdot x^n]^p / (b \cdot n \cdot p)), x] + \operatorname{Dist}[(m-n+1)/(b \cdot n \cdot p), \operatorname{Int}[x^{(m-n)} \operatorname{CsCh}[a + b \cdot x^n]^p, x], x] /;$ $\operatorname{FreeQ}\{a, b, p\}, x] \ \&\& \operatorname{RationalQ}[m] \ \&\& \operatorname{IntegerQ}[n] \ \&\& \operatorname{GeQ}[m-n, 0] \ \&\& E$

qQ[q, 1]

Rubi steps

$$\begin{aligned} \text{integral} &= -x\text{csch}(x) + \int \text{csch}(x) dx \\ &= -\text{arctanh}(\cosh(x)) - x\text{csch}(x) \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 39 vs. 2(11) = 22.

Time = 0.01 (sec) , antiderivative size = 39, normalized size of antiderivative = 3.55

$$\int x \coth(x) \text{csch}(x) dx = -\frac{1}{2}x \coth\left(\frac{x}{2}\right) - \log\left(\cosh\left(\frac{x}{2}\right)\right) + \log\left(\sinh\left(\frac{x}{2}\right)\right) + \frac{1}{2}x \tanh\left(\frac{x}{2}\right)$$

[In] Integrate[x*Coth[x]*Csch[x],x]

[Out] -1/2*(x*Coth[x/2]) - Log[Cosh[x/2]] + Log[Sinh[x/2]] + (x*Tanh[x/2])/2

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 26 vs. 2(11) = 22.

Time = 0.20 (sec) , antiderivative size = 27, normalized size of antiderivative = 2.45

| method | result | size |
|--------|--|------|
| risch | $-\frac{2x e^x}{e^{2x}-1} + \ln(e^x - 1) - \ln(e^x + 1)$ | 27 |

[In] int(x*cosh(x)/sinh(x)^2,x,method=_RETURNVERBOSE)

[Out] -2*x*exp(x)/(exp(2*x)-1)+ln(exp(x)-1)-ln(exp(x)+1)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 80 vs. 2(11) = 22.

Time = 0.23 (sec) , antiderivative size = 80, normalized size of antiderivative = 7.27

$$\int x \coth(x) \text{csch}(x) dx = \frac{2x \cosh(x) + (\cosh(x)^2 + 2 \cosh(x) \sinh(x) + \sinh(x)^2 - 1) \log(\cosh(x) + \sinh(x) + 1) - (\cosh(x)^2 + \sinh(x)^2 + 2 \cosh(x) \sinh(x) + 1) \log(\cosh(x) + \sinh(x) - 1)}{\cosh(x)^2 + 2 \cosh(x) \sinh(x) + \sinh(x)^2 + 1}$$

[In] integrate(x*cosh(x)/sinh(x)^2,x, algorithm="fricas")

```
[Out] -(2*x*cosh(x) + (cosh(x)^2 + 2*cosh(x)*sinh(x) + sinh(x)^2 - 1)*log(cosh(x)
+ sinh(x) + 1) - (cosh(x)^2 + 2*cosh(x)*sinh(x) + sinh(x)^2 - 1)*log(cosh(
x) + sinh(x) - 1) + 2*x*sinh(x))/(cosh(x)^2 + 2*cosh(x)*sinh(x) + sinh(x)^2
- 1)
```

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 22 vs. $2(10) = 20$.

Time = 0.22 (sec) , antiderivative size = 22, normalized size of antiderivative = 2.00

$$\int x \coth(x) \operatorname{csch}(x) dx = \frac{x \tanh\left(\frac{x}{2}\right)}{2} - \frac{x}{2 \tanh\left(\frac{x}{2}\right)} + \log\left(\tanh\left(\frac{x}{2}\right)\right)$$

```
[In] integrate(x*cosh(x)/sinh(x)**2,x)
```

```
[Out] x*tanh(x/2)/2 - x/(2*tanh(x/2)) + log(tanh(x/2))
```

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 26 vs. $2(11) = 22$.

Time = 0.23 (sec) , antiderivative size = 26, normalized size of antiderivative = 2.36

$$\int x \coth(x) \operatorname{csch}(x) dx = -\frac{2xe^x}{e^{(2x)} - 1} - \log(e^x + 1) + \log(e^x - 1)$$

```
[In] integrate(x*cosh(x)/sinh(x)^2,x, algorithm="maxima")
```

```
[Out] -2*x*e^x/(e^(2*x) - 1) - log(e^x + 1) + log(e^x - 1)
```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 49 vs. $2(11) = 22$.

Time = 0.28 (sec) , antiderivative size = 49, normalized size of antiderivative = 4.45

$$\int x \coth(x) \operatorname{csch}(x) dx = -\frac{2xe^x + e^{(2x)} \log(e^x + 1) - e^{(2x)} \log(e^x - 1) - \log(e^x + 1) + \log(e^x - 1)}{e^{(2x)} - 1}$$

```
[In] integrate(x*cosh(x)/sinh(x)^2,x, algorithm="giac")
```

```
[Out] -(2*x*e^x + e^(2*x)*log(e^x + 1) - e^(2*x)*log(e^x - 1) - log(e^x + 1) + lo
g(e^x - 1))/(e^(2*x) - 1)
```

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 30, normalized size of antiderivative = 2.73

$$\int x \coth(x) \operatorname{csch}(x) dx = \ln(2 - 2e^x) - \ln(-2e^x - 2) - \frac{2xe^x}{e^{2x} - 1}$$

[In] `int((x*cosh(x))/sinh(x)^2,x)`

[Out] `log(2 - 2*exp(x)) - log(- 2*exp(x) - 2) - (2*x*exp(x))/(exp(2*x) - 1)`

3.72 $\int x^5 \sqrt{1+x^3} dx$

| | |
|---|-----|
| Optimal result | 405 |
| Rubi [A] (verified) | 405 |
| Mathematica [A] (verified) | 406 |
| Maple [A] (verified) | 406 |
| Fricas [A] (verification not implemented) | 407 |
| Sympy [A] (verification not implemented) | 407 |
| Maxima [A] (verification not implemented) | 407 |
| Giac [A] (verification not implemented) | 407 |
| Mupad [B] (verification not implemented) | 408 |

Optimal result

Integrand size = 13, antiderivative size = 27

$$\int x^5 \sqrt{1+x^3} dx = -\frac{2}{9}(1+x^3)^{3/2} + \frac{2}{15}(1+x^3)^{5/2}$$

[Out] $-2/9*(x^3+1)^{(3/2)}+2/15*(x^3+1)^{(5/2)}$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.154$, Rules used = {272, 45}

$$\int x^5 \sqrt{1+x^3} dx = \frac{2}{15}(x^3+1)^{5/2} - \frac{2}{9}(x^3+1)^{3/2}$$

[In] $\text{Int}[x^5*\text{Sqrt}[1+x^3],x]$

[Out] $(-2*(1+x^3)^{(3/2)})/9+(2*(1+x^3)^{(5/2)})/15$

Rule 45

$\text{Int}[(a_.) + (b_.)*(x_.)^{(m_.)}*((c_.) + (d_.)*(x_.)^{(n_.)}), x_Symbol] \rightarrow \text{Int}[\text{ExpandIntegrand}[(a + b*x)^m*(c + d*x)^n, x], x] /;$ FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rule 272

$\text{Int}[(x_.)^{(m_.)}*((a_.) + (b_.)*(x_.)^{(n_.)})^{(p_.)}, x_Symbol] \rightarrow \text{Dist}[1/n, \text{Subst}[\text{Int}[x^{(\text{Simplify}[(m+1)/n]-1)*(a+b*x)^p, x}], x, x^n], x] /;$ FreeQ[{a, b

, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{3} \text{Subst} \left(\int x \sqrt{1+x} dx, x, x^3 \right) \\ &= \frac{1}{3} \text{Subst} \left(\int \left(-\sqrt{1+x} + (1+x)^{3/2} \right) dx, x, x^3 \right) \\ &= -\frac{2}{9} (1+x^3)^{3/2} + \frac{2}{15} (1+x^3)^{5/2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.74

$$\int x^5 \sqrt{1+x^3} dx = \frac{2}{45} (1+x^3)^{3/2} (-2+3x^3)$$

[In] Integrate[x^5*Sqrt[1 + x^3], x]

[Out] (2*(1 + x^3)^(3/2)*(-2 + 3*x^3))/45

Maple [A] (verified)

Time = 0.23 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.63

| method | result | size |
|----------------|--|------|
| pseudoelliptic | $\frac{2(x^3+1)^{\frac{3}{2}}(3x^3-2)}{45}$ | 17 |
| risch | $\frac{2(3x^6+x^3-2)\sqrt{x^3+1}}{45}$ | 20 |
| trager | $\left(\frac{2}{15}x^6 + \frac{2}{45}x^3 - \frac{4}{45}\right)\sqrt{x^3+1}$ | 21 |
| gospers | $\frac{2(1+x)(x^2-x+1)(3x^3-2)\sqrt{x^3+1}}{45}$ | 28 |
| meijerg | $-\frac{\frac{8\sqrt{\pi}}{15} + \frac{4\sqrt{\pi}(x^3+1)^{\frac{3}{2}}(-3x^3+2)}{15}}{6\sqrt{\pi}}$ | 31 |
| default | $\frac{2x^6\sqrt{x^3+1}}{15} + \frac{2x^3\sqrt{x^3+1}}{45} - \frac{4\sqrt{x^3+1}}{45}$ | 35 |
| elliptic | $\frac{2x^6\sqrt{x^3+1}}{15} + \frac{2x^3\sqrt{x^3+1}}{45} - \frac{4\sqrt{x^3+1}}{45}$ | 35 |

[In] int(x^5*(x^3+1)^(1/2), x, method=_RETURNVERBOSE)

[Out] 2/45*(x^3+1)^(3/2)*(3*x^3-2)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int x^5 \sqrt{1+x^3} dx = \frac{2}{45} (3x^6 + x^3 - 2) \sqrt{x^3 + 1}$$

[In] integrate(x⁵*(x³+1)^(1/2),x, algorithm="fricas")[Out] 2/45*(3*x⁶ + x³ - 2)*sqrt(x³ + 1)**Sympy [A] (verification not implemented)**

Time = 0.09 (sec) , antiderivative size = 41, normalized size of antiderivative = 1.52

$$\int x^5 \sqrt{1+x^3} dx = \frac{2x^6 \sqrt{x^3+1}}{15} + \frac{2x^3 \sqrt{x^3+1}}{45} - \frac{4\sqrt{x^3+1}}{45}$$

[In] integrate(x**5*(x**3+1)**(1/2),x)

[Out] 2*x**6*sqrt(x**3 + 1)/15 + 2*x**3*sqrt(x**3 + 1)/45 - 4*sqrt(x**3 + 1)/45

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int x^5 \sqrt{1+x^3} dx = \frac{2}{15} (x^3 + 1)^{\frac{5}{2}} - \frac{2}{9} (x^3 + 1)^{\frac{3}{2}}$$

[In] integrate(x⁵*(x³+1)^(1/2),x, algorithm="maxima")[Out] 2/15*(x³ + 1)^(5/2) - 2/9*(x³ + 1)^(3/2)**Giac [A] (verification not implemented)**

none

Time = 0.28 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int x^5 \sqrt{1+x^3} dx = \frac{2}{15} (x^3 + 1)^{\frac{5}{2}} - \frac{2}{9} (x^3 + 1)^{\frac{3}{2}}$$

[In] integrate(x⁵*(x³+1)^(1/2),x, algorithm="giac")[Out] 2/15*(x³ + 1)^(5/2) - 2/9*(x³ + 1)^(3/2)

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int x^5 \sqrt{1+x^3} dx = \frac{2(x^3+1)^{5/2}}{15} - \frac{2(x^3+1)^{3/2}}{9}$$

[In] `int(x^5*(x^3 + 1)^(1/2),x)`

[Out] `(2*(x^3 + 1)^(5/2))/15 - (2*(x^3 + 1)^(3/2))/9`

3.73 $\int \frac{-1+x^7}{\log(x)} dx$

| | |
|---|-----|
| Optimal result | 409 |
| Rubi [A] (verified) | 409 |
| Mathematica [A] (verified) | 410 |
| Maple [A] (verified) | 410 |
| Fricas [A] (verification not implemented) | 411 |
| Sympy [A] (verification not implemented) | 411 |
| Maxima [A] (verification not implemented) | 411 |
| Giac [A] (verification not implemented) | 412 |
| Mupad [B] (verification not implemented) | 412 |

Optimal result

Integrand size = 10, antiderivative size = 10

$$\int \frac{-1+x^7}{\log(x)} dx = \text{ExpIntegralEi}(8 \log(x)) - \text{LogIntegral}(x)$$

[Out] Ei(8*ln(x))-Li(x)

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.400$, Rules used = {2367, 2335, 2346, 2209}

$$\int \frac{-1+x^7}{\log(x)} dx = \text{ExpIntegralEi}(8 \log(x)) - \text{LogIntegral}(x)$$

[In] Int[(-1 + x^7)/Log[x],x]

[Out] ExpIntegralEi[8*Log[x]] - LogIntegral[x]

Rule 2209

Int[(F_)^((g_)*(e_) + (f_)*(x_)))/((c_) + (d_)*(x_)), x_Symbol] := Simp[(F^(g*(e - c*(f/d)))/d)*ExpIntegralEi[f*g*(c + d*x)*(Log[F]/d)], x] /; FreeQ[{F, c, d, e, f, g}, x] && !TrueQ[\$UseGamma]

Rule 2335

Int[Log[(c_)*(x_)]^(-1), x_Symbol] := Simp[LogIntegral[c*x]/c, x] /; FreeQ[c, x]

Rule 2346

```
Int[((a_.) + Log[(c_.)*(x_.)]*(b_.))^(p_.)*(x_.)^(m_.), x_Symbol] := Dist[1/c^(
(m + 1), Subst[Int[E^((m + 1)*x)*(a + b*x)^p, x], x, Log[c*x]], x] /; FreeQ
[{a, b, c, p}, x] && IntegerQ[m]
```

Rule 2367

```
Int[((a_.) + Log[(c_.)*(x_.)^(n_.)]*(b_.))^(p_.)*((d_.) + (e_.)*(x_.)^(r_.))^(
q_.), x_Symbol] := With[{u = ExpandIntegrand[(a + b*Log[c*x^n])^p, (d + e*x
^r)^q, x]}, Int[u, x] /; SumQ[u] /; FreeQ[{a, b, c, d, e, n, p, q, r}, x]
&& IntegerQ[q] && (GtQ[q, 0] || (IGtQ[p, 0] && IntegerQ[r]))
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(-\frac{1}{\log(x)} + \frac{x^7}{\log(x)} \right) dx \\
&= -\int \frac{1}{\log(x)} dx + \int \frac{x^7}{\log(x)} dx \\
&= -\text{LogIntegral}(x) + \text{Subst} \left(\int \frac{e^{8x}}{x} dx, x, \log(x) \right) \\
&= \text{ExpIntegralEi}(8 \log(x)) - \text{LogIntegral}(x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{-1 + x^7}{\log(x)} dx = \text{ExpIntegralEi}(8 \log(x)) - \text{LogIntegral}(x)$$

```
[In] Integrate[(-1 + x^7)/Log[x], x]
```

```
[Out] ExpIntegralEi[8*Log[x]] - LogIntegral[x]
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.60

| method | result | size |
|---------|------------------------------------|------|
| default | $-Ei_1(-8 \ln(x)) + Ei_1(-\ln(x))$ | 16 |
| risch | $-Ei_1(-8 \ln(x)) + Ei_1(-\ln(x))$ | 16 |

```
[In] int((x^7-1)/ln(x), x, method=_RETURNVERBOSE)
```

[Out] $-\text{Ei}(1, -8 \cdot \ln(x)) + \text{Ei}(1, -\ln(x))$

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int \frac{-1 + x^7}{\log(x)} dx = \log_integral(x^8) - \log_integral(x)$$

[In] `integrate((x^7-1)/log(x),x, algorithm="fricas")`

[Out] `log_integral(x^8) - log_integral(x)`

Sympy [A] (verification not implemented)

Time = 0.56 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{-1 + x^7}{\log(x)} dx = -\text{Ei}(\log(x)) + \text{Ei}(8 \log(x))$$

[In] `integrate((x**7-1)/ln(x),x)`

[Out] `-\text{Ei}(\log(x)) + \text{Ei}(8 \cdot \log(x))`

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

$$\int \frac{-1 + x^7}{\log(x)} dx = \text{Ei}(8 \log(x)) - \text{Ei}(\log(x))$$

[In] `integrate((x^7-1)/log(x),x, algorithm="maxima")`

[Out] `\text{Ei}(8 \cdot \log(x)) - \text{Ei}(\log(x))`

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

$$\int \frac{-1 + x^7}{\log(x)} dx = \text{Ei}(8 \log(x)) - \text{Ei}(\log(x))$$

[In] integrate((x^7-1)/log(x),x, algorithm="giac")

[Out] Ei(8*log(x)) - Ei(log(x))

Mupad [B] (verification not implemented)

Time = 18.82 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{-1 + x^7}{\log(x)} dx = \text{ei}(8 \ln(x)) - \text{logint}(x)$$

[In] int((x^7 - 1)/log(x),x)

[Out] ei(8*log(x)) - logint(x)

3.74 $\int \sqrt{\csc(x) - \sin(x)} dx$

| | |
|---|-----|
| Optimal result | 413 |
| Rubi [A] (verified) | 413 |
| Mathematica [A] (verified) | 414 |
| Maple [A] (verified) | 414 |
| Fricas [A] (verification not implemented) | 415 |
| Sympy [F] | 415 |
| Maxima [B] (verification not implemented) | 415 |
| Giac [F] | 416 |
| Mupad [B] (verification not implemented) | 416 |

Optimal result

Integrand size = 11, antiderivative size = 13

$$\int \sqrt{\csc(x) - \sin(x)} dx = 2\sqrt{\cos(x) \cot(x)} \tan(x)$$

[Out] $2*(\cos(x)*\cot(x))^{(1/2)}*\tan(x)$

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.273$, Rules used = {4482, 4485, 2669}

$$\int \sqrt{\csc(x) - \sin(x)} dx = 2 \tan(x) \sqrt{\cos(x) \cot(x)}$$

[In] `Int[Sqrt[Csc[x] - Sin[x]],x]`

[Out] `2*Sqrt[Cos[x]*Cot[x]]*Tan[x]`

Rule 2669

`Int[((a_.)*sin[(e_.) + (f_.)*(x_)]))^(m_)*((b_.)*tan[(e_.) + (f_.)*(x_)]))^(n_), x_Symbol] :> Simp[(-b)*(a*Sin[e + f*x])^m*((b*Tan[e + f*x])^(n - 1)/(f*m)), x] /; FreeQ[{a, b, e, f, m, n}, x] && EqQ[m + n - 1, 0]`

Rule 4482

`Int[u_, x_Symbol] :> Int[TrigSimplify[u], x] /; TrigSimplifyQ[u]`

Rule 4485

```
Int[(u_.)*((v_)^(m_.)*(w_)^(n_.))^(p_), x_Symbol] := With[{uu = ActivateTrig[u], vv = ActivateTrig[v], ww = ActivateTrig[w]}, Dist[(vv^m*ww^n)^FracPart[p]/(vv^(m*FracPart[p])*ww^(n*FracPart[p]))], Int[uu*vv^(m*p)*ww^(n*p), x], x]] /; FreeQ[{m, n, p}, x] && !IntegerQ[p] && (!InertTrigFreeQ[v] || !InertTrigFreeQ[w])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \sqrt{\cos(x) \cot(x)} dx \\ &= \frac{\sqrt{\cos(x) \cot(x)} \int \sqrt{\cos(x)} \sqrt{\cot(x)} dx}{\sqrt{\cos(x)} \sqrt{\cot(x)}} \\ &= 2\sqrt{\cos(x) \cot(x)} \tan(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \sqrt{\csc(x) - \sin(x)} dx = 2\sqrt{\cos(x) \cot(x)} \tan(x)$$

[In] Integrate[Sqrt[Csc[x] - Sin[x]], x]

[Out] 2*Sqrt[Cos[x]*Cot[x]]*Tan[x]

Maple [A] (verified)

Time = 0.43 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.92

| method | result | size |
|---------|--|------|
| default | $2\sqrt{\cos(x) \cot(x)} \tan(x)$ | 12 |
| risch | $-\frac{i\sqrt{2} \sqrt{\frac{i(e^{2ix}+1)^2 e^{-ix}}{e^{2ix}-1}} (e^{2ix}-1)}{e^{2ix}+1}$ | 51 |

[In] int((csc(x)-sin(x))^(1/2), x, method=_RETURNVERBOSE)

[Out] 2*(cos(x)*cot(x))^(1/2)*tan(x)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.46

$$\int \sqrt{\csc(x) - \sin(x)} dx = \frac{2 \sqrt{\frac{\cos(x)^2}{\sin(x)}} \sin(x)}{\cos(x)}$$

[In] integrate((csc(x)-sin(x))^(1/2),x, algorithm="fricas")

[Out] 2*sqrt(cos(x)^2/sin(x))*sin(x)/cos(x)

Sympy [F]

$$\int \sqrt{\csc(x) - \sin(x)} dx = \int \sqrt{-\sin(x) + \csc(x)} dx$$

[In] integrate((csc(x)-sin(x))**(1/2),x)

[Out] Integral(sqrt(-sin(x) + csc(x)), x)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 188 vs. 2(11) = 22.

Time = 0.36 (sec) , antiderivative size = 188, normalized size of antiderivative = 14.46

$$\int \sqrt{\csc(x) - \sin(x)} dx$$

$$= \frac{((\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) + \sin(\frac{3}{2}x) + \sin(\frac{1}{2}x)) \cos(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1)) - (\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) - \sin(\frac{3}{2}x) - \sin(\frac{1}{2}x)) \sin(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1))) \cos(\frac{1}{2} \arctan(\sin(x), \cos(x) + 1)) - ((\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) - \sin(\frac{3}{2}x) - \sin(\frac{1}{2}x)) \cos(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1)) + (\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) + \sin(\frac{3}{2}x) + \sin(\frac{1}{2}x)) \sin(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1))) \sin(\frac{1}{2} \arctan(\sin(x), \cos(x) + 1))}{((\cos(x)^2 + \sin(x)^2 + 2\cos(x) + 1)^{1/4} * (\cos(x)^2 + \sin(x)^2 - 2\cos(x) + 1)^{1/4})}$$

[In] integrate((csc(x)-sin(x))^(1/2),x, algorithm="maxima")

```
[Out] (((cos(3/2*x) - cos(1/2*x) + sin(3/2*x) + sin(1/2*x))*cos(1/2*arctan2(sin(x), cos(x) - 1)) - (cos(3/2*x) - cos(1/2*x) - sin(3/2*x) - sin(1/2*x))*sin(1/2*arctan2(sin(x), cos(x) - 1)))*cos(1/2*arctan2(sin(x), cos(x) + 1)) - ((cos(3/2*x) - cos(1/2*x) - sin(3/2*x) - sin(1/2*x))*cos(1/2*arctan2(sin(x), cos(x) - 1)) + (cos(3/2*x) - cos(1/2*x) + sin(3/2*x) + sin(1/2*x))*sin(1/2*arctan2(sin(x), cos(x) - 1)))*sin(1/2*arctan2(sin(x), cos(x) + 1)))/((cos(x)^2 + sin(x)^2 + 2*cos(x) + 1)^(1/4)*(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1)^(1/4))
```

Giac [F]

$$\int \sqrt{\csc(x) - \sin(x)} dx = \int \sqrt{\csc(x) - \sin(x)} dx$$

[In] integrate((csc(x)-sin(x))^(1/2),x, algorithm="giac")

[Out] integrate(sqrt(csc(x) - sin(x)), x)

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.15

$$\int \sqrt{\csc(x) - \sin(x)} dx = \frac{2 |\cos(x)|}{\cos(x) \sqrt{\frac{1}{\sin(x)}}}$$

[In] int((1/sin(x) - sin(x))^(1/2),x)

[Out] (2*abs(cos(x)))/(cos(x)*(1/sin(x))^(1/2))

3.75 $\int (-2 \log(2x) + \log(x^2)) dx$

| | |
|---|-----|
| Optimal result | 417 |
| Rubi [A] (verified) | 417 |
| Mathematica [A] (verified) | 418 |
| Maple [A] (verified) | 418 |
| Fricas [A] (verification not implemented) | 418 |
| Sympy [A] (verification not implemented) | 419 |
| Maxima [A] (verification not implemented) | 419 |
| Giac [A] (verification not implemented) | 419 |
| Mupad [B] (verification not implemented) | 419 |

Optimal result

Integrand size = 11, antiderivative size = 14

$$\int (-2 \log(2x) + \log(x^2)) dx = -2x \log(2x) + x \log(x^2)$$

[Out] $-2*x*\ln(2*x)+x*\ln(x^2)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.091$, Rules used = {2332}

$$\int (-2 \log(2x) + \log(x^2)) dx = x \log(x^2) - 2x \log(2x)$$

[In] $\text{Int}[-2*\text{Log}[2*x] + \text{Log}[x^2], x]$

[Out] $-2*x*\text{Log}[2*x] + x*\text{Log}[x^2]$

Rule 2332

$\text{Int}[\text{Log}[(c_*)*(x_)^{(n_*)}], x_Symbol] \rightarrow \text{Simp}[x*\text{Log}[c*x^n], x] - \text{Simp}[n*x, x]$
 /; $\text{FreeQ}\{c, n\}, x]$

Rubi steps

$$\begin{aligned} \text{integral} &= -(2 \int \log(2x) dx) + \int \log(x^2) dx \\ &= -2x \log(2x) + x \log(x^2) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int (-2 \log(2x) + \log(x^2)) dx = -2x \log(2x) + x \log(x^2)$$

[In] Integrate[-2*Log[2*x] + Log[x^2],x]

[Out] -2*x*Log[2*x] + x*Log[x^2]

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.07

| method | result | size |
|---------------|----------------------------|------|
| default | $-2x \ln(2x) + x \ln(x^2)$ | 15 |
| norman | $-2x \ln(2x) + x \ln(x^2)$ | 15 |
| risch | $-2x \ln(2x) + x \ln(x^2)$ | 15 |
| parallelrisch | $-2x \ln(2x) + x \ln(x^2)$ | 15 |
| parts | $-2x \ln(2x) + x \ln(x^2)$ | 15 |

[In] int(ln(x^2)-2*ln(2*x),x,method=_RETURNVERBOSE)

[Out] -2*x*ln(2*x)+x*ln(x^2)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.36

$$\int (-2 \log(2x) + \log(x^2)) dx = -2x \log(2)$$

[In] integrate(log(x^2)-2*log(2*x),x, algorithm="fricas")

[Out] -2*x*log(2)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.50

$$\int (-2 \log(2x) + \log(x^2)) dx = -2x \log(2)$$

[In] integrate(ln(x**2)-2*ln(2*x),x)

[Out] -2*x*log(2)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int (-2 \log(2x) + \log(x^2)) dx = x \log(x^2) - 2x \log(2x)$$

[In] integrate(log(x^2)-2*log(2*x),x, algorithm="maxima")

[Out] x*log(x^2) - 2*x*log(2*x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int (-2 \log(2x) + \log(x^2)) dx = x \log(x^2) - 2x \log(2x)$$

[In] integrate(log(x^2)-2*log(2*x),x, algorithm="giac")

[Out] x*log(x^2) - 2*x*log(2*x)

Mupad [B] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.14

$$\int (-2 \log(2x) + \log(x^2)) dx = -x (2 \ln(2x) - \ln(x^2))$$

[In] int(log(x^2) - 2*log(2*x),x)

[Out] -x*(2*log(2*x) - log(x^2))

3.76 $\int e^x dx$

| | |
|---|-----|
| Optimal result | 420 |
| Rubi [A] (verified) | 420 |
| Mathematica [A] (verified) | 421 |
| Maple [A] (verified) | 421 |
| Fricas [A] (verification not implemented) | 421 |
| Sympy [A] (verification not implemented) | 422 |
| Maxima [A] (verification not implemented) | 422 |
| Giac [A] (verification not implemented) | 422 |
| Mupad [B] (verification not implemented) | 422 |

Optimal result

Integrand size = 3, antiderivative size = 3

$$\int e^x dx = e^x$$

[Out] exp(x)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {2225}

$$\int e^x dx = e^x$$

[In] Int[E^x,x]

[Out] E^x

Rule 2225

Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a + b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]

Rubi steps

$$\text{integral} = e^x$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int e^x dx = e^x$$

[In] Integrate[E^x,x]

[Out] E^x

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

| method | result | size |
|-------------------|-----------|------|
| gospers | e^x | 3 |
| lookup | e^x | 3 |
| derivativedivides | e^x | 3 |
| default | e^x | 3 |
| norman | e^x | 3 |
| risch | e^x | 3 |
| parallelrisch | e^x | 3 |
| meijerg | $e^x - 1$ | 5 |

[In] int(exp(x),x,method=_RETURNVERBOSE)

[Out] exp(x)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 2, normalized size of antiderivative = 0.67

$$\int e^x dx = e^x$$

[In] integrate(exp(x),x, algorithm="fricas")

[Out] e^x

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 2, normalized size of antiderivative = 0.67

$$\int e^x dx = e^x$$

[In] integrate(exp(x),x)

[Out] exp(x)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 2, normalized size of antiderivative = 0.67

$$\int e^x dx = e^x$$

[In] integrate(exp(x),x, algorithm="maxima")

[Out] e^x

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 2, normalized size of antiderivative = 0.67

$$\int e^x dx = e^x$$

[In] integrate(exp(x),x, algorithm="giac")

[Out] e^x

Mupad [B] (verification not implemented)

Time = 0.01 (sec) , antiderivative size = 2, normalized size of antiderivative = 0.67

$$\int e^x dx = e^x$$

[In] int(exp(x),x)

[Out] exp(x)

$$3.77 \quad \int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx$$

| | |
|---|-----|
| Optimal result | 423 |
| Rubi [F] | 423 |
| Mathematica [A] (verified) | 424 |
| Maple [A] (verified) | 424 |
| Fricas [A] (verification not implemented) | 424 |
| Sympy [A] (verification not implemented) | 425 |
| Maxima [A] (verification not implemented) | 425 |
| Giac [B] (verification not implemented) | 425 |
| Mupad [B] (verification not implemented) | 425 |

Optimal result

Integrand size = 18, antiderivative size = 7

$$\int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx = \frac{\sin(x)}{\log(x)}$$

[Out] sin(x)/ln(x)

Rubi [F]

$$\int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx = \int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx$$

[In] Int[(Cos[x]*Log[x] - Sin[x]/x)/Log[x]^2,x]

[Out] Defer[Int][Cos[x]/Log[x], x] - Defer[Int][Sin[x]/(x*Log[x]^2), x]

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(\frac{\cos(x)}{\log(x)} - \frac{\sin(x)}{x \log^2(x)} \right) dx \\ &= \int \frac{\cos(x)}{\log(x)} dx - \int \frac{\sin(x)}{x \log^2(x)} dx \end{aligned}$$

Mathematica [A] (verified)

Time = 0.89 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx = \frac{\sin(x)}{\log(x)}$$

[In] Integrate[(Cos[x]*Log[x] - Sin[x]/x)/Log[x]^2,x]

[Out] Sin[x]/Log[x]

Maple [A] (verified)

Time = 0.15 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.14

| method | result | size |
|---------------|--|------|
| risch | $\frac{\sin(x)}{\ln(x)}$ | 8 |
| parallelrisch | $\frac{\sin(x)}{\ln(x)}$ | 8 |
| norman | $\frac{2 \tan(\frac{x}{2})}{(1 + \tan(\frac{x}{2})^2) \ln(x)}$ | 21 |

[In] int((cos(x)*ln(x)-sin(x)/x)/ln(x)^2,x,method=_RETURNVERBOSE)

[Out] sin(x)/ln(x)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx = \frac{\sin(x)}{\log(x)}$$

[In] integrate((cos(x)*log(x)-sin(x)/x)/log(x)^2,x, algorithm="fricas")

[Out] sin(x)/log(x)

Sympy [A] (verification not implemented)

Time = 0.33 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.71

$$\int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx = \frac{\sin(x)}{\log(x)}$$

[In] integrate((cos(x)*ln(x)-sin(x)/x)/ln(x)**2,x)

[Out] sin(x)/log(x)

Maxima [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx = \frac{\sin(x)}{\log(x)}$$

[In] integrate((cos(x)*log(x)-sin(x)/x)/log(x)^2,x, algorithm="maxima")

[Out] sin(x)/log(x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 20 vs. 2(7) = 14.

Time = 0.28 (sec) , antiderivative size = 20, normalized size of antiderivative = 2.86

$$\int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx = \frac{2 \tan\left(\frac{1}{2} x\right)}{\log(x) \tan\left(\frac{1}{2} x\right)^2 + \log(x)}$$

[In] integrate((cos(x)*log(x)-sin(x)/x)/log(x)^2,x, algorithm="giac")

[Out] 2*tan(1/2*x)/(log(x)*tan(1/2*x)^2 + log(x))

Mupad [B] (verification not implemented)

Time = 16.80 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x) \log(x) - \frac{\sin(x)}{x}}{\log^2(x)} dx = \frac{\sin(x)}{\ln(x)}$$

[In] int((cos(x)*log(x) - sin(x)/x)/log(x)^2,x)

[Out] sin(x)/log(x)

3.78 $\int (-1 + 3x - 3x^2 + x^3) dx$

| | |
|---|-----|
| Optimal result | 426 |
| Rubi [B] (verified) | 426 |
| Mathematica [B] (verified) | 427 |
| Maple [A] (verified) | 427 |
| Fricas [B] (verification not implemented) | 427 |
| Sympy [B] (verification not implemented) | 428 |
| Maxima [B] (verification not implemented) | 428 |
| Giac [B] (verification not implemented) | 428 |
| Mupad [B] (verification not implemented) | 428 |

Optimal result

Integrand size = 13, antiderivative size = 11

$$\int (-1 + 3x - 3x^2 + x^3) dx = \frac{1}{4}(1 - x)^4$$

[Out] 1/4*(1-x)^4

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 23 vs. 2(11) = 22.

Time = 0.00 (sec) , antiderivative size = 23, normalized size of antiderivative = 2.09, number of steps used = 1, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int (-1 + 3x - 3x^2 + x^3) dx = \frac{x^4}{4} - x^3 + \frac{3x^2}{2} - x$$

[In] Int[-1 + 3*x - 3*x^2 + x^3, x]

[Out] -x + (3*x^2)/2 - x^3 + x^4/4

Rubi steps

$$\text{integral} = -x + \frac{3x^2}{2} - x^3 + \frac{x^4}{4}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 23 vs. $2(11) = 22$.

Time = 0.00 (sec) , antiderivative size = 23, normalized size of antiderivative = 2.09

$$\int (-1 + 3x - 3x^2 + x^3) dx = -x + \frac{3x^2}{2} - x^3 + \frac{x^4}{4}$$

[In] Integrate[-1 + 3*x - 3*x^2 + x^3,x]

[Out] -x + (3*x^2)/2 - x^3 + x^4/4

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.73

| method | result | size |
|---------------|---|------|
| default | $\frac{(-1+x)^4}{4}$ | 8 |
| gospers | $\frac{x(x^3-4x^2+6x-4)}{4}$ | 17 |
| norman | $\frac{1}{4}x^4 - x^3 + \frac{3}{2}x^2 - x$ | 20 |
| risch | $\frac{1}{4}x^4 - x^3 + \frac{3}{2}x^2 - x$ | 20 |
| parallelrisch | $\frac{1}{4}x^4 - x^3 + \frac{3}{2}x^2 - x$ | 20 |
| parts | $\frac{1}{4}x^4 - x^3 + \frac{3}{2}x^2 - x$ | 20 |

[In] int(x^3-3*x^2+3*x-1,x,method=_RETURNVERBOSE)

[Out] 1/4*(-1+x)^4

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 19 vs. $2(7) = 14$.

Time = 0.24 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.73

$$\int (-1 + 3x - 3x^2 + x^3) dx = \frac{1}{4}x^4 - x^3 + \frac{3}{2}x^2 - x$$

[In] integrate(x^3-3*x^2+3*x-1,x, algorithm="fricas")

[Out] 1/4*x^4 - x^3 + 3/2*x^2 - x

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(5) = 10$.

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.36

$$\int (-1 + 3x - 3x^2 + x^3) dx = \frac{x^4}{4} - x^3 + \frac{3x^2}{2} - x$$

[In] integrate(x**3-3*x**2+3*x-1,x)

[Out] x**4/4 - x**3 + 3*x**2/2 - x

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 19 vs. $2(7) = 14$.

Time = 0.18 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.73

$$\int (-1 + 3x - 3x^2 + x^3) dx = \frac{1}{4}x^4 - x^3 + \frac{3}{2}x^2 - x$$

[In] integrate(x^3-3*x^2+3*x-1,x, algorithm="maxima")

[Out] 1/4*x^4 - x^3 + 3/2*x^2 - x

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 19 vs. $2(7) = 14$.

Time = 0.27 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.73

$$\int (-1 + 3x - 3x^2 + x^3) dx = \frac{1}{4}x^4 - x^3 + \frac{3}{2}x^2 - x$$

[In] integrate(x^3-3*x^2+3*x-1,x, algorithm="giac")

[Out] 1/4*x^4 - x^3 + 3/2*x^2 - x

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.73

$$\int (-1 + 3x - 3x^2 + x^3) dx = \frac{x^4}{4} - x^3 + \frac{3x^2}{2} - x$$

[In] int(3*x - 3*x^2 + x^3 - 1,x)

[Out] (3*x^2)/2 - x - x^3 + x^4/4

3.79 $\int \sqrt{12 - 3x^2} dx$

| | |
|---|-----|
| Optimal result | 429 |
| Rubi [A] (verified) | 429 |
| Mathematica [A] (verified) | 430 |
| Maple [A] (verified) | 430 |
| Fricas [A] (verification not implemented) | 431 |
| Sympy [A] (verification not implemented) | 431 |
| Maxima [A] (verification not implemented) | 431 |
| Giac [A] (verification not implemented) | 431 |
| Mupad [B] (verification not implemented) | 432 |

Optimal result

Integrand size = 11, antiderivative size = 35

$$\int \sqrt{12 - 3x^2} dx = \frac{1}{2}\sqrt{3}x\sqrt{4 - x^2} + 2\sqrt{3} \arcsin\left(\frac{x}{2}\right)$$

[Out] $1/2*3^{(1/2)}*x*(-x^2+4)^{(1/2)}+2*3^{(1/2)}*\arcsin(1/2*x)$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 35, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {201, 222}

$$\int \sqrt{12 - 3x^2} dx = 2\sqrt{3} \arcsin\left(\frac{x}{2}\right) + \frac{1}{2}\sqrt{3}\sqrt{4 - x^2}x$$

[In] `Int[Sqrt[12 - 3*x^2], x]`

[Out] `(Sqrt[3]*x*Sqrt[4 - x^2])/2 + 2*Sqrt[3]*ArcSin[x/2]`

Rule 201

`Int[((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] :> Simp[x*((a + b*x^n)^p/(n*p + 1)), x] + Dist[a*n*(p/(n*p + 1)), Int[(a + b*x^n)^(p - 1), x], x] /; FreeQ[{a, b}, x] && IGtQ[n, 0] && GtQ[p, 0] && (IntegerQ[2*p] || (EqQ[n, 2] && IntegerQ[4*p]) || (EqQ[n, 2] && IntegerQ[3*p]) || LtQ[Denominator[p + 1/n], Denominator[p]])`

Rule 222

`Int[1/Sqrt[(a_) + (b_)*(x_)^2], x_Symbol] :> Simp[ArcSin[Rt[-b, 2]*(x/Sqrt[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]`

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2}\sqrt{3}x\sqrt{4-x^2} + 6 \int \frac{1}{\sqrt{12-3x^2}} dx \\ &= \frac{1}{2}\sqrt{3}x\sqrt{4-x^2} + 2\sqrt{3} \arcsin\left(\frac{x}{2}\right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.12 (sec) , antiderivative size = 43, normalized size of antiderivative = 1.23

$$\int \sqrt{12-3x^2} dx = \frac{1}{2}\sqrt{3} \left(x\sqrt{4-x^2} - 8 \arctan\left(\frac{\sqrt{4-x^2}}{2+x}\right) \right)$$

[In] Integrate[Sqrt[12 - 3*x^2], x]

[Out] (Sqrt[3]*(x*Sqrt[4 - x^2] - 8*ArcTan[Sqrt[4 - x^2]/(2 + x)]))/2

Maple [A] (verified)

Time = 0.32 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.66

| method | result | size |
|----------------|---|------|
| default | $\frac{x\sqrt{-3x^2+12}}{2} + 2\sqrt{3} \arcsin\left(\frac{x}{2}\right)$ | 23 |
| risch | $-\frac{3x(x^2-4)}{2\sqrt{-3x^2+12}} + 2\sqrt{3} \arcsin\left(\frac{x}{2}\right)$ | 28 |
| meijerg | $\frac{i\sqrt{3} \left(-i\sqrt{\pi} x \sqrt{-\frac{x^2}{4}+1} - 2i\sqrt{\pi} \arcsin\left(\frac{x}{2}\right) \right)}{\sqrt{\pi}}$ | 37 |
| pseudoelliptic | $\frac{x\sqrt{-3x^2+12}}{2} - 2\sqrt{3} \arctan\left(\frac{\sqrt{-3x^2+12}\sqrt{3}}{3x}\right)$ | 37 |
| trager | $\frac{x\sqrt{-3x^2+12}}{2} + 2 \text{RootOf}(_Z^2 + 3) \ln(\text{RootOf}(_Z^2 + 3) \sqrt{-3x^2 + 12} + 3x)$ | 43 |

[In] int((-3*x^2+12)^(1/2), x, method=_RETURNVERBOSE)

[Out] 1/2*x*(-3*x^2+12)^(1/2)+2*3^(1/2)*arcsin(1/2*x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.03

$$\int \sqrt{12 - 3x^2} dx = \frac{1}{2} \sqrt{-3x^2 + 12}x - 2\sqrt{3} \arctan\left(\frac{\sqrt{3}\sqrt{-3x^2 + 12}}{3x}\right)$$

[In] integrate((-3*x^2+12)^(1/2),x, algorithm="fricas")

[Out] 1/2*sqrt(-3*x^2 + 12)*x - 2*sqrt(3)*arctan(1/3*sqrt(3)*sqrt(-3*x^2 + 12)/x)

Sympy [A] (verification not implemented)

Time = 0.13 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.77

$$\int \sqrt{12 - 3x^2} dx = \frac{\sqrt{3}x\sqrt{4 - x^2}}{2} + 2\sqrt{3} \operatorname{asin}\left(\frac{x}{2}\right)$$

[In] integrate((-3*x**2+12)**(1/2),x)

[Out] sqrt(3)*x*sqrt(4 - x**2)/2 + 2*sqrt(3)*asin(x/2)

Maxima [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.63

$$\int \sqrt{12 - 3x^2} dx = \frac{1}{2} \sqrt{-3x^2 + 12}x + 2\sqrt{3} \arcsin\left(\frac{1}{2}x\right)$$

[In] integrate((-3*x^2+12)^(1/2),x, algorithm="maxima")

[Out] 1/2*sqrt(-3*x^2 + 12)*x + 2*sqrt(3)*arcsin(1/2*x)

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.66

$$\int \sqrt{12 - 3x^2} dx = \frac{1}{2} \sqrt{3} \left(\sqrt{-x^2 + 4}x + 4 \arcsin\left(\frac{1}{2}x\right) \right)$$

[In] integrate((-3*x^2+12)^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(3)*(sqrt(-x^2 + 4)*x + 4*arcsin(1/2*x))

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.71

$$\int \sqrt{12 - 3x^2} dx = 2\sqrt{3} \operatorname{asin}\left(\frac{x}{2}\right) + \frac{\sqrt{3}x\sqrt{4 - x^2}}{2}$$

[In] `int((12 - 3*x^2)^(1/2),x)`

[Out] `2*3^(1/2)*asin(x/2) + (3^(1/2)*x*(4 - x^2)^(1/2))/2`

3.80 $\int ((-3 + x)^7 + x - \sin(3 - x)) dx$

| | |
|---|-----|
| Optimal result | 433 |
| Rubi [A] (verified) | 433 |
| Mathematica [A] (verified) | 434 |
| Maple [A] (verified) | 434 |
| Fricas [B] (verification not implemented) | 434 |
| Sympy [A] (verification not implemented) | 435 |
| Maxima [A] (verification not implemented) | 435 |
| Giac [A] (verification not implemented) | 435 |
| Mupad [B] (verification not implemented) | 435 |

Optimal result

Integrand size = 15, antiderivative size = 27

$$\int ((-3 + x)^7 + x - \sin(3 - x)) dx = \frac{1}{8}(3 - x)^8 + \frac{x^2}{2} - \cos(3 - x)$$

[Out] 1/8*(-x+3)^8+1/2*x^2-cos(-3+x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.067$, Rules used = {2718}

$$\int ((-3 + x)^7 + x - \sin(3 - x)) dx = \frac{x^2}{2} + \frac{1}{8}(3 - x)^8 - \cos(3 - x)$$

[In] Int[(-3 + x)^7 + x - Sin[3 - x], x]

[Out] (3 - x)^8/8 + x^2/2 - Cos[3 - x]

Rule 2718

Int[sin[(c_.) + (d_.)*(x_.)], x_Symbol] := Simp[-Cos[c + d*x]/d, x] /; FreeQ[{c, d}, x]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{8}(3 - x)^8 + \frac{x^2}{2} - \int \sin(3 - x) dx \\ &= \frac{1}{8}(3 - x)^8 + \frac{x^2}{2} - \cos(3 - x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.07

$$\int ((-3+x)^7 + x - \sin(3-x)) dx = \frac{1}{8}(-3+x)^8 + \frac{x^2}{2} - \cos(3)\cos(x) - \sin(3)\sin(x)$$

[In] Integrate[(-3 + x)^7 + x - Sin[3 - x], x]

[Out] (-3 + x)^8/8 + x^2/2 - Cos[3]*Cos[x] - Sin[3]*Sin[x]

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.74

| method | result |
|-------------------|--|
| default | $\frac{x^2}{2} + \frac{(-3+x)^8}{8} - \cos(-3+x)$ |
| derivativedivides | $-9 + 3x + \frac{(-3+x)^2}{2} + \frac{(-3+x)^8}{8} - \cos(-3+x)$ |
| parts | $-2187x + 2552x^2 - 1701x^3 + \frac{2835x^4}{4} - 189x^5 + \frac{63x^6}{2} - 3x^7 + \frac{x^8}{8} - \cos(-3+x)$ |
| risch | $2552x^2 + \frac{x^8}{8} - 3x^7 + \frac{63x^6}{2} - 189x^5 + \frac{2835x^4}{4} - 1701x^3 - 2187x + \frac{6561}{8} - \cos(-3+x)$ |
| parallelrisc | $\frac{x^8}{8} - 3x^7 + \frac{63x^6}{2} - 189x^5 + \frac{2835x^4}{4} - 1701x^3 + 2552x^2 - 2187x - 1 - \cos(-3+x)$ |
| norman | $\frac{-2187x + 2552x^2 - 1701x^3 + \frac{2835x^4}{4} - 189x^5 + \frac{63x^6}{2} - 3x^7 + \frac{x^8}{8} - 2187x \tan(-\frac{3}{2} + \frac{x}{2}) + 2552x^2 \tan(-\frac{3}{2} + \frac{x}{2})^2 - 1701x^3 \tan(-\frac{3}{2} + \frac{x}{2})}{1 + \tan(-\frac{3}{2} + \frac{x}{2})}$ |

[In] int(x+(-3+x)^7+sin(-3+x),x,method=_RETURNVERBOSE)

[Out] 1/2*x^2+1/8*(-3+x)^8-cos(-3+x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 45 vs. 2(19) = 38.

Time = 0.26 (sec) , antiderivative size = 45, normalized size of antiderivative = 1.67

$$\int ((-3+x)^7 + x - \sin(3-x)) dx = \frac{1}{8}x^8 - 3x^7 + \frac{63}{2}x^6 - 189x^5 + \frac{2835}{4}x^4 - 1701x^3 + 2552x^2 - 2187x - \cos(x-3)$$

[In] integrate(x+(-3+x)^7+sin(-3+x),x, algorithm="fricas")

[Out] 1/8*x^8 - 3*x^7 + 63/2*x^6 - 189*x^5 + 2835/4*x^4 - 1701*x^3 + 2552*x^2 - 2187*x - cos(x - 3)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.56

$$\int ((-3 + x)^7 + x - \sin(3 - x)) dx = \frac{x^2}{2} + \frac{(x - 3)^8}{8} - \cos(x - 3)$$

[In] integrate(x+(-3+x)**7+sin(-3+x),x)

[Out] x**2/2 + (x - 3)**8/8 - cos(x - 3)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int ((-3 + x)^7 + x - \sin(3 - x)) dx = \frac{1}{8} (x - 3)^8 + \frac{1}{2} x^2 - \cos(x - 3)$$

[In] integrate(x+(-3+x)^7+sin(-3+x),x, algorithm="maxima")

[Out] 1/8*(x - 3)^8 + 1/2*x^2 - cos(x - 3)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int ((-3 + x)^7 + x - \sin(3 - x)) dx = \frac{1}{8} (x - 3)^8 + \frac{1}{2} x^2 - \cos(x - 3)$$

[In] integrate(x+(-3+x)^7+sin(-3+x),x, algorithm="giac")

[Out] 1/8*(x - 3)^8 + 1/2*x^2 - cos(x - 3)

Mupad [B] (verification not implemented)

Time = 16.24 (sec) , antiderivative size = 45, normalized size of antiderivative = 1.67

$$\int ((-3 + x)^7 + x - \sin(3 - x)) dx = 2552 x^2 - \cos(x - 3) - 2187 x - 1701 x^3 + \frac{2835 x^4}{4} - 189 x^5 + \frac{63 x^6}{2} - 3 x^7 + \frac{x^8}{8}$$

[In] int(x + sin(x - 3) + (x - 3)^7,x)

[Out] 2552*x^2 - cos(x - 3) - 2187*x - 1701*x^3 + (2835*x^4)/4 - 189*x^5 + (63*x^6)/2 - 3*x^7 + x^8/8

3.81 $\int \sin(x) \sqrt{1 + \tan^2(x)} dx$

| | |
|---|-----|
| Optimal result | 436 |
| Rubi [A] (verified) | 436 |
| Mathematica [A] (verified) | 437 |
| Maple [C] (warning: unable to verify) | 437 |
| Fricas [A] (verification not implemented) | 438 |
| Sympy [F] | 438 |
| Maxima [A] (verification not implemented) | 438 |
| Giac [A] (verification not implemented) | 438 |
| Mupad [F(-1)] | 439 |

Optimal result

Integrand size = 13, antiderivative size = 15

$$\int \sin(x) \sqrt{1 + \tan^2(x)} dx = -\cos(x) \log(\cos(x)) \sqrt{\sec^2(x)}$$

[Out] $-\cos(x) \cdot \ln(\cos(x)) \cdot (\sec(x)^2)^{1/2}$

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.231$, Rules used = {3738, 4210, 3556}

$$\int \sin(x) \sqrt{1 + \tan^2(x)} dx = -\cos(x) \sqrt{\sec^2(x)} \log(\cos(x))$$

[In] `Int[Sin[x]*Sqrt[1 + Tan[x]^2],x]`

[Out] `-(Cos[x]*Log[Cos[x]]*Sqrt[Sec[x]^2])`

Rule 3556

`Int[tan[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Log[RemoveContent[Cos[c + d*x], x]]/d, x] /; FreeQ[{c, d}, x]`

Rule 3738

`Int[(u_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)]^2)^p, x_Symbol] := Int[ActivateTrig[u*(a*sec[e + f*x]^2)^p], x] /; FreeQ[{a, b, e, f, p}, x] && EqQ[a, b]`

Rule 4210

```
Int[(u_.)*((b_.)*sec[(e_.) + (f_.)*(x_)]^(n_))^(p_), x_Symbol] := With[{ff = FreeFactors[Sec[e + f*x], x]}, Dist[(b*ff^n)^IntPart[p]*((b*Sec[e + f*x]^n)^FracPart[p]/(Sec[e + f*x]/ff)^(n*FracPart[p])), Int[ActivateTrig[u]*(Sec[e + f*x]/ff)^(n*p), x], x]] /; FreeQ[{b, e, f, n, p}, x] && !IntegerQ[p] && IntegerQ[n] && (EqQ[u, 1] || MatchQ[u, ((d_.)*(trig_)[e + f*x])^(m_.)] /; FreeQ[{d, m}, x] && MemberQ[{sin, cos, tan, cot, sec, csc}, trig])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \sqrt{\sec^2(x)} \sin(x) dx \\ &= \left(\cos(x) \sqrt{\sec^2(x)} \right) \int \tan(x) dx \\ &= -\cos(x) \log(\cos(x)) \sqrt{\sec^2(x)} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int \sin(x) \sqrt{1 + \tan^2(x)} dx = -\cos(x) \log(\cos(x)) \sqrt{\sec^2(x)}$$

[In] Integrate[Sin[x]*Sqrt[1 + Tan[x]^2], x]

[Out] -(Cos[x]*Log[Cos[x]]*Sqrt[Sec[x]^2])

Maple [C] (warning: unable to verify)

Result contains higher order function than in optimal. Order 9 vs. order 3.

Time = 0.37 (sec) , antiderivative size = 36, normalized size of antiderivative = 2.40

| method | result | size |
|---------|--|------|
| default | $-\text{csgn}(\sec(x)) \left(\ln(1 + \csc(x) - \cot(x)) + \ln(\csc(x) - \cot(x) - 1) - \ln\left(\frac{2}{1 + \cos(x)}\right) \right)$ | 36 |
| risch | $2i \sqrt{\frac{e^{2ix}}{(e^{2ix} + 1)^2}} x \cos(x) - 2 \sqrt{\frac{e^{2ix}}{(e^{2ix} + 1)^2}} \ln(e^{2ix} + 1) \cos(x)$ | 54 |

[In] int(sin(x)*(1+tan(x)^2)^(1/2), x, method=_RETURNVERBOSE)

[Out] -csgn(sec(x))*(ln(1+csc(x)-cot(x))+ln(csc(x)-cot(x)-1)-ln(2/(1+cos(x))))

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.33

$$\int \sin(x) \sqrt{1 + \tan^2(x)} dx = \log(-\cos(x))$$

[In] integrate(sin(x)*(1+tan(x)^2)^(1/2),x, algorithm="fricas")

[Out] log(-cos(x))

Sympy [F]

$$\int \sin(x) \sqrt{1 + \tan^2(x)} dx = \int \sqrt{\tan^2(x) + 1} \sin(x) dx$$

[In] integrate(sin(x)*(1+tan(x)**2)**(1/2),x)

[Out] Integral(sqrt(tan(x)**2 + 1)*sin(x), x)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \sin(x) \sqrt{1 + \tan^2(x)} dx = -\sqrt{\frac{1}{\cos(x)^2}} \cos(x) \log(\cos(x))$$

[In] integrate(sin(x)*(1+tan(x)^2)^(1/2),x, algorithm="maxima")

[Out] -sqrt(cos(x)^(-2))*cos(x)*log(cos(x))

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.40

$$\int \sin(x) \sqrt{1 + \tan^2(x)} dx = -\log(|\cos(x)|)$$

[In] integrate(sin(x)*(1+tan(x)^2)^(1/2),x, algorithm="giac")

[Out] -log(abs(cos(x)))

Mupad [F(-1)]

Timed out.

$$\int \sin(x) \sqrt{1 + \tan^2(x)} dx = \int \sin(x) \sqrt{\tan(x)^2 + 1} dx$$

```
[In] int(sin(x)*(tan(x)^2 + 1)^(1/2),x)
```

```
[Out] int(sin(x)*(tan(x)^2 + 1)^(1/2), x)
```

$$3.82 \quad \int \frac{-1+x^2-x^3+x^5}{-1+x-x^3+x^4} dx$$

| | |
|---|-----|
| Optimal result | 440 |
| Rubi [A] (verified) | 440 |
| Mathematica [A] (verified) | 441 |
| Maple [A] (verified) | 441 |
| Fricas [A] (verification not implemented) | 441 |
| Sympy [A] (verification not implemented) | 442 |
| Maxima [A] (verification not implemented) | 442 |
| Giac [A] (verification not implemented) | 442 |
| Mupad [B] (verification not implemented) | 442 |

Optimal result

Integrand size = 27, antiderivative size = 9

$$\int \frac{-1+x^2-x^3+x^5}{-1+x-x^3+x^4} dx = \frac{1}{2}(1+x)^2$$

[Out] 1/2*(1+x)^2

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.037$, Rules used = {1600}

$$\int \frac{-1+x^2-x^3+x^5}{-1+x-x^3+x^4} dx = \frac{x^2}{2} + x$$

[In] Int[(-1 + x^2 - x^3 + x^5)/(-1 + x - x^3 + x^4), x]

[Out] x + x^2/2

Rule 1600

```
Int[(u_)*(Px_)^(p_)*(Qx_)^(q_), x_Symbol] := Int[u*PolynomialQuotient[Px
, Qx, x]^p*Qx^(p + q), x] /; FreeQ[q, x] && PolyQ[Px, x] && PolyQ[Qx, x] &&
EqQ[PolynomialRemainder[Px, Qx, x], 0] && IntegerQ[p] && LtQ[p*q, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int (1+x) dx \\ &= x + \frac{x^2}{2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int \frac{-1 + x^2 - x^3 + x^5}{-1 + x - x^3 + x^4} dx = x + \frac{x^2}{2}$$

[In] Integrate[(-1 + x^2 - x^3 + x^5)/(-1 + x - x^3 + x^4), x]

[Out] x + x^2/2

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

| method | result | size |
|---------------|----------------------|------|
| gospers | $\frac{x(2+x)}{2}$ | 7 |
| default | $\frac{1}{2}x^2 + x$ | 8 |
| norman | $\frac{1}{2}x^2 + x$ | 8 |
| risch | $\frac{1}{2}x^2 + x$ | 8 |
| parallexrisch | $\frac{1}{2}x^2 + x$ | 8 |
| parts | $\frac{1}{2}x^2 + x$ | 8 |

[In] int((x^5-x^3+x^2-1)/(x^4-x^3+x-1), x, method=_RETURNVERBOSE)

[Out] 1/2*x*(2+x)

Fricas [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \frac{-1 + x^2 - x^3 + x^5}{-1 + x - x^3 + x^4} dx = \frac{1}{2}x^2 + x$$

[In] integrate((x^5-x^3+x^2-1)/(x^4-x^3+x-1), x, algorithm="fricas")

[Out] 1/2*x^2 + x

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.56

$$\int \frac{-1 + x^2 - x^3 + x^5}{-1 + x - x^3 + x^4} dx = \frac{x^2}{2} + x$$

[In] integrate((x**5-x**3+x**2-1)/(x**4-x**3+x-1),x)

[Out] x**2/2 + x

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \frac{-1 + x^2 - x^3 + x^5}{-1 + x - x^3 + x^4} dx = \frac{1}{2} x^2 + x$$

[In] integrate((x^5-x^3+x^2-1)/(x^4-x^3+x-1),x, algorithm="maxima")

[Out] 1/2*x^2 + x

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \frac{-1 + x^2 - x^3 + x^5}{-1 + x - x^3 + x^4} dx = \frac{1}{2} x^2 + x$$

[In] integrate((x^5-x^3+x^2-1)/(x^4-x^3+x-1),x, algorithm="giac")

[Out] 1/2*x^2 + x

Mupad [B] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.67

$$\int \frac{-1 + x^2 - x^3 + x^5}{-1 + x - x^3 + x^4} dx = \frac{x(x+2)}{2}$$

[In] int((x^2 - x^3 + x^5 - 1)/(x - x^3 + x^4 - 1),x)

[Out] (x*(x + 2))/2

3.83 $\int \log(x) dx$

| | |
|---|-----|
| Optimal result | 443 |
| Rubi [A] (verified) | 443 |
| Mathematica [A] (verified) | 444 |
| Maple [A] (verified) | 444 |
| Fricas [A] (verification not implemented) | 444 |
| Sympy [A] (verification not implemented) | 445 |
| Maxima [A] (verification not implemented) | 445 |
| Giac [A] (verification not implemented) | 445 |
| Mupad [B] (verification not implemented) | 445 |

Optimal result

Integrand size = 2, antiderivative size = 8

$$\int \log(x) dx = -x + x \log(x)$$

[Out] $x*\ln(x)-x$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {2332}

$$\int \log(x) dx = x \log(x) - x$$

[In] Int[Log[x],x]

[Out] $-x + x*\text{Log}[x]$

Rule 2332

Int[Log[(c_.)*(x_)^(n_.)], x_Symbol] := Simp[x*Log[c*x^n], x] - Simp[n*x, x] /; FreeQ[{c, n}, x]

Rubi steps

$$\text{integral} = -x + x \log(x)$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log(x) dx = -x + x \log(x)$$

[In] Integrate[Log[x],x]

[Out] -x + x*Log[x]

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.12

| method | result | size |
|--------------|----------------|------|
| lookup | $x \ln(x) - x$ | 9 |
| default | $x \ln(x) - x$ | 9 |
| norman | $x \ln(x) - x$ | 9 |
| risch | $x \ln(x) - x$ | 9 |
| parallelrisc | $x \ln(x) - x$ | 9 |
| parts | $x \ln(x) - x$ | 9 |

[In] int(ln(x),x,method=_RETURNVERBOSE)

[Out] x*ln(x)-x

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log(x) dx = x \log(x) - x$$

[In] integrate(log(x),x, algorithm="fricas")

[Out] x*log(x) - x

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.62

$$\int \log(x) dx = x \log(x) - x$$

[In] integrate(ln(x),x)

[Out] x*log(x) - x

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log(x) dx = x \log(x) - x$$

[In] integrate(log(x),x, algorithm="maxima")

[Out] x*log(x) - x

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log(x) dx = x \log(x) - x$$

[In] integrate(log(x),x, algorithm="giac")

[Out] x*log(x) - x

Mupad [B] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \log(x) dx = x (\ln(x) - 1)$$

[In] int(log(x),x)

[Out] x*(log(x) - 1)

3.84 $\int \frac{1}{1-e^{-x}} dx$

| | |
|---|-----|
| Optimal result | 446 |
| Rubi [A] (verified) | 446 |
| Mathematica [A] (verified) | 447 |
| Maple [A] (verified) | 447 |
| Fricas [A] (verification not implemented) | 448 |
| Sympy [A] (verification not implemented) | 448 |
| Maxima [A] (verification not implemented) | 448 |
| Giac [A] (verification not implemented) | 449 |
| Mupad [B] (verification not implemented) | 449 |

Optimal result

Integrand size = 11, antiderivative size = 6

$$\int \frac{1}{1-e^{-x}} dx = \log(-1 + e^x)$$

[Out] ln(-1+exp(x))

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 12, normalized size of antiderivative = 2.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.364$, Rules used = {2320, 36, 31, 29}

$$\int \frac{1}{1-e^{-x}} dx = x + \log(1 - e^{-x})$$

[In] Int[(1 - E^(-x))^(-1), x]

[Out] x + Log[1 - E^(-x)]

Rule 29

Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]

Rule 31

Int[((a_) + (b_.)*(x_))(-1), x_Symbol] :> Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 36

Int[1/(((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))), x_Symbol] :> Dist[b/(b*c - a*d), Int[1/(a + b*x), x], x] - Dist[d/(b*c - a*d), Int[1/(c + d*x), x],

```
x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0]
```

Rule 2320

```
Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_) [v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= -\text{Subst}\left(\int \frac{1}{(1-x)x} dx, x, e^{-x}\right) \\ &= -\text{Subst}\left(\int \frac{1}{1-x} dx, x, e^{-x}\right) - \text{Subst}\left(\int \frac{1}{x} dx, x, e^{-x}\right) \\ &= x + \log(1 - e^{-x}) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 - e^{-x}} dx = \log(-1 + e^x)$$

```
[In] Integrate[(1 - E^(-x))^(-1), x]
```

```
[Out] Log[-1 + E^x]
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.67

| method | result | size |
|-------------------|-----------------------------------|------|
| norman | $x + \ln(-1 + e^{-x})$ | 10 |
| risch | $x + \ln(-1 + e^{-x})$ | 10 |
| parallelrisch | $x + \ln(-1 + e^{-x})$ | 10 |
| derivativedivides | $-\ln(e^{-x}) + \ln(-1 + e^{-x})$ | 16 |
| default | $-\ln(e^{-x}) + \ln(-1 + e^{-x})$ | 16 |

```
[In] int(1/(1-exp(-x)), x, method=_RETURNVERBOSE)
```

[Out] $x + \ln(-1 + \exp(-x))$

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.50

$$\int \frac{1}{1 - e^{-x}} dx = x + \log(e^{(-x)} - 1)$$

[In] `integrate(1/(1-exp(-x)),x, algorithm="fricas")`

[Out] $x + \log(e^{(-x)} - 1)$

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.33

$$\int \frac{1}{1 - e^{-x}} dx = x + \log(-1 + e^{-x})$$

[In] `integrate(1/(1-exp(-x)),x)`

[Out] $x + \log(-1 + \exp(-x))$

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.50

$$\int \frac{1}{1 - e^{-x}} dx = x + \log(e^{(-x)} - 1)$$

[In] `integrate(1/(1-exp(-x)),x, algorithm="maxima")`

[Out] $x + \log(e^{(-x)} - 1)$

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.67

$$\int \frac{1}{1 - e^{-x}} dx = x + \log(|e^{(-x)} - 1|)$$

```
[In] integrate(1/(1-exp(-x)),x, algorithm="giac")
```

```
[Out] x + log(abs(e^(-x) - 1))
```

Mupad [B] (verification not implemented)

Time = 15.70 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.17

$$\int \frac{1}{1 - e^{-x}} dx = \ln(1 - e^x)$$

```
[In] int(-1/(exp(-x) - 1),x)
```

```
[Out] log(1 - exp(x))
```

3.85 $\int \cos^2(x) \sin^2(x) dx$

| | |
|---|-----|
| Optimal result | 450 |
| Rubi [A] (verified) | 450 |
| Mathematica [A] (verified) | 451 |
| Maple [A] (verified) | 451 |
| Fricas [A] (verification not implemented) | 452 |
| Sympy [A] (verification not implemented) | 452 |
| Maxima [A] (verification not implemented) | 452 |
| Giac [A] (verification not implemented) | 452 |
| Mupad [B] (verification not implemented) | 453 |

Optimal result

Integrand size = 9, antiderivative size = 14

$$\int \cos^2(x) \sin^2(x) dx = \frac{1}{32}(4x - \sin(4x))$$

[Out] 1/8*x-1/32*sin(4*x)

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.71, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {2648, 2715, 8}

$$\int \cos^2(x) \sin^2(x) dx = \frac{x}{8} - \frac{1}{4} \sin(x) \cos^3(x) + \frac{1}{8} \sin(x) \cos(x)$$

[In] Int[Cos[x]^2*Sin[x]^2,x]

[Out] x/8 + (Cos[x]*Sin[x])/8 - (Cos[x]^3*Sin[x])/4

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 2648

Int[(cos[(e_.) + (f_.)*(x_.)]*(b_.))^n_*((a_.)*sin[(e_.) + (f_.)*(x_.)])^m, x_Symbol] := Simp[(-a)*(b*Cos[e + f*x])^(n + 1)*((a*Sin[e + f*x])^(m - 1)/(b*f*(m + n))), x] + Dist[a^2*((m - 1)/(m + n)), Int[(b*Cos[e + f*x])^n*(a*Sin[e + f*x])^(m - 2), x], x] /; FreeQ[{a, b, e, f, n}, x] && GtQ[m, 1] && NeQ[m + n, 0] && IntegersQ[2*m, 2*n]

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2*n]
```

Rubi steps

$$\begin{aligned} \text{integral} &= -\frac{1}{4} \cos^3(x) \sin(x) + \frac{1}{4} \int \cos^2(x) dx \\ &= \frac{1}{8} \cos(x) \sin(x) - \frac{1}{4} \cos^3(x) \sin(x) + \frac{\int 1 dx}{8} \\ &= \frac{x}{8} + \frac{1}{8} \cos(x) \sin(x) - \frac{1}{4} \cos^3(x) \sin(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \cos^2(x) \sin^2(x) dx = \frac{x}{8} - \frac{1}{32} \sin(4x)$$

```
[In] Integrate[Cos[x]^2*Sin[x]^2,x]
```

```
[Out] x/8 - Sin[4*x]/32
```

Maple [A] (verified)

Time = 0.07 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.79

| method | result | size |
|---------------|--|------|
| risch | $\frac{x}{8} - \frac{\sin(4x)}{32}$ | 11 |
| parallelrisch | $\frac{x}{8} - \frac{\sin(4x)}{32}$ | 11 |
| default | $-\frac{\cos(x)^3 \sin(x)}{4} + \frac{\cos(x) \sin(x)}{8} + \frac{x}{8}$ | 19 |
| norman | $\frac{\frac{x}{8} + \frac{7 \tan(\frac{x}{2})^3}{4} - \frac{7 \tan(\frac{x}{2})^5}{4} + \frac{\tan(\frac{x}{2})^7}{4} + \frac{x \tan(\frac{x}{2})^2}{2} + \frac{3x \tan(\frac{x}{2})^4}{4} + \frac{x \tan(\frac{x}{2})^6}{2} + \frac{x \tan(\frac{x}{2})^8}{8} - \frac{\tan(\frac{x}{2})}{4}}{(1 + \tan(\frac{x}{2})^2)^4}$ | 82 |

```
[In] int(sin(x)^2*cos(x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] 1/8*x-1/32*sin(4*x)
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.36

$$\int \cos^2(x) \sin^2(x) dx = -\frac{1}{8} (2 \cos(x)^3 - \cos(x)) \sin(x) + \frac{1}{8} x$$

[In] integrate(sin(x)^2*cos(x)^2,x, algorithm="fricas")

[Out] -1/8*(2*cos(x)^3 - cos(x))*sin(x) + 1/8*x

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \cos^2(x) \sin^2(x) dx = \frac{x}{8} - \frac{\sin(2x) \cos(2x)}{16}$$

[In] integrate(sin(x)**2*cos(x)**2,x)

[Out] x/8 - sin(2*x)*cos(2*x)/16

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \cos^2(x) \sin^2(x) dx = \frac{1}{8} x - \frac{1}{32} \sin(4x)$$

[In] integrate(sin(x)^2*cos(x)^2,x, algorithm="maxima")

[Out] 1/8*x - 1/32*sin(4*x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \cos^2(x) \sin^2(x) dx = \frac{1}{8} x - \frac{1}{32} \sin(4x)$$

[In] integrate(sin(x)^2*cos(x)^2,x, algorithm="giac")

[Out] 1/8*x - 1/32*sin(4*x)

Mupad [B] (verification not implemented)

Time = 17.68 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.29

$$\int \cos^2(x) \sin^2(x) dx = \frac{\cos(x) \sin(x)^3}{4} - \frac{\cos(x) \sin(x)}{8} + \frac{x}{8}$$

[In] int(cos(x)^2*sin(x)^2,x)

[Out] x/8 - (cos(x)*sin(x))/8 + (cos(x)*sin(x)^3)/4

$$3.86 \quad \int \frac{\pi \sin(\pi\sqrt{x})}{\sqrt{x}} dx$$

| | |
|---|-----|
| Optimal result | 454 |
| Rubi [A] (verified) | 454 |
| Mathematica [A] (verified) | 455 |
| Maple [A] (verified) | 455 |
| Fricas [A] (verification not implemented) | 456 |
| Sympy [A] (verification not implemented) | 456 |
| Maxima [A] (verification not implemented) | 456 |
| Giac [A] (verification not implemented) | 456 |
| Mupad [B] (verification not implemented) | 457 |

Optimal result

Integrand size = 15, antiderivative size = 10

$$\int \frac{\pi \sin(\pi\sqrt{x})}{\sqrt{x}} dx = -2 \cos(\pi\sqrt{x})$$

[Out] -2*cos(Pi*x^(1/2))

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.200$, Rules used = {12, 3460, 2718}

$$\int \frac{\pi \sin(\pi\sqrt{x})}{\sqrt{x}} dx = -2 \cos(\pi\sqrt{x})$$

[In] Int[(Pi*Sin[Pi*Sqrt[x]])/Sqrt[x],x]

[Out] -2*Cos[Pi*Sqrt[x]]

Rule 12

Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]

Rule 2718

Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Cos[c + d*x]/d, x] /; FreeQ[{c, d}, x]

Rule 3460

```
Int[(x_)^(m_.)*((a_.) + (b_.)*Sin[(c_.) + (d_.)*(x_)^(n_)])^(p_.), x_Symbol
] :> Dist[1/n, Subst[Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*Sin[c + d*x])^p
, x], x, x^n], x] /; FreeQ[{a, b, c, d, m, n, p}, x] && IntegerQ[Simplify[(
m + 1)/n]] && (EqQ[p, 1] || EqQ[m, n - 1] || (IntegerQ[p] && GtQ[Simplify[(
m + 1)/n], 0]))
```

Rubi steps

$$\begin{aligned} \text{integral} &= \pi \int \frac{\sin(\pi\sqrt{x})}{\sqrt{x}} dx \\ &= (2\pi) \text{Subst} \left(\int \sin(\pi x) dx, x, \sqrt{x} \right) \\ &= -2 \cos(\pi\sqrt{x}) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{\pi \sin(\pi\sqrt{x})}{\sqrt{x}} dx = -2 \cos(\pi\sqrt{x})$$

```
[In] Integrate[(Pi*Sin[Pi*Sqrt[x]])/Sqrt[x], x]
```

```
[Out] -2*Cos[Pi*Sqrt[x]]
```

Maple [A] (verified)

Time = 0.07 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

| method | result | size |
|-------------------|--|------|
| derivativedivides | $-2 \cos(\pi\sqrt{x})$ | 9 |
| default | $-2 \cos(\pi\sqrt{x})$ | 9 |
| meijerg | $2\sqrt{\pi} \left(\frac{1}{\sqrt{\pi}} - \frac{\cos(\pi\sqrt{x})}{\sqrt{\pi}} \right)$ | 21 |

```
[In] int(Pi*sin(Pi*x^(1/2))/x^(1/2), x, method=_RETURNVERBOSE)
```

```
[Out] -2*cos(Pi*x^(1/2))
```

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \frac{\pi \sin(\pi\sqrt{x})}{\sqrt{x}} dx = -2 \cos(\pi\sqrt{x})$$

[In] integrate(pi*sin(pi*x^(1/2))/x^(1/2),x, algorithm="fricas")

[Out] -2*cos(pi*sqrt(x))

Sympy [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{\pi \sin(\pi\sqrt{x})}{\sqrt{x}} dx = -2 \cos(\pi\sqrt{x})$$

[In] integrate(pi*sin(pi*x**(1/2))/x**(1/2),x)

[Out] -2*cos(pi*sqrt(x))

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \frac{\pi \sin(\pi\sqrt{x})}{\sqrt{x}} dx = -2 \cos(\pi\sqrt{x})$$

[In] integrate(pi*sin(pi*x^(1/2))/x^(1/2),x, algorithm="maxima")

[Out] -2*cos(pi*sqrt(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \frac{\pi \sin(\pi\sqrt{x})}{\sqrt{x}} dx = -2 \cos(\pi\sqrt{x})$$

[In] integrate(pi*sin(pi*x^(1/2))/x^(1/2),x, algorithm="giac")

[Out] -2*cos(pi*sqrt(x))

Mupad [B] (verification not implemented)

Time = 17.25 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \frac{\pi \sin(\pi\sqrt{x})}{\sqrt{x}} dx = -2 \cos(\Pi\sqrt{x})$$

[In] `int((Pi*sin(Pi*x^(1/2)))/x^(1/2),x)`

[Out] `-2*cos(Pi*x^(1/2))`

3.87 $\int \tan^2(x) dx$

| | |
|---|-----|
| Optimal result | 458 |
| Rubi [A] (verified) | 458 |
| Mathematica [A] (verified) | 459 |
| Maple [A] (verified) | 459 |
| Fricas [A] (verification not implemented) | 459 |
| Sympy [B] (verification not implemented) | 460 |
| Maxima [A] (verification not implemented) | 460 |
| Giac [A] (verification not implemented) | 460 |
| Mupad [B] (verification not implemented) | 460 |

Optimal result

Integrand size = 4, antiderivative size = 6

$$\int \tan^2(x) dx = -x + \tan(x)$$

[Out] -x+tan(x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3554, 8}

$$\int \tan^2(x) dx = \tan(x) - x$$

[In] Int[Tan[x]^2,x]

[Out] -x + Tan[x]

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 3554

Int[((b_.)*tan[(c_.) + (d_.)*(x_.)])^(n_), x_Symbol] := Simp[b*((b*Tan[c + d*x])^(n - 1)/(d*(n - 1))), x] - Dist[b^2, Int[(b*Tan[c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1]

Rubi steps

$$\begin{aligned} \text{integral} &= \tan(x) - \int 1 \, dx \\ &= -x + \tan(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.33

$$\int \tan^2(x) \, dx = -\arctan(\tan(x)) + \tan(x)$$

[In] Integrate[Tan[x]^2,x]

[Out] -ArcTan[Tan[x]] + Tan[x]

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.17

| method | result | size |
|-------------------|-------------------------------|------|
| norman | $-x + \tan(x)$ | 7 |
| parallelrisch | $-x + \tan(x)$ | 7 |
| derivativedivides | $\tan(x) - \arctan(\tan(x))$ | 9 |
| default | $\tan(x) - \arctan(\tan(x))$ | 9 |
| risch | $-x + \frac{2i}{e^{2ix} + 1}$ | 17 |

[In] int(tan(x)^2,x,method=_RETURNVERBOSE)

[Out] -x+tan(x)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \tan^2(x) \, dx = -x + \tan(x)$$

[In] integrate(tan(x)^2,x, algorithm="fricas")

[Out] -x + tan(x)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 7 vs. 2(3) = 6.

Time = 0.02 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.17

$$\int \tan^2(x) dx = -x + \frac{\sin(x)}{\cos(x)}$$

[In] integrate(tan(x)**2,x)

[Out] -x + sin(x)/cos(x)

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \tan^2(x) dx = -x + \tan(x)$$

[In] integrate(tan(x)^2,x, algorithm="maxima")

[Out] -x + tan(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \tan^2(x) dx = -x + \tan(x)$$

[In] integrate(tan(x)^2,x, algorithm="giac")

[Out] -x + tan(x)

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \tan^2(x) dx = \tan(x) - x$$

[In] int(tan(x)^2,x)

[Out] tan(x) - x

3.88 $\int e^{\sqrt[4]{x}} dx$

| | |
|---|-----|
| Optimal result | 461 |
| Rubi [A] (verified) | 461 |
| Mathematica [A] (verified) | 462 |
| Maple [A] (verified) | 462 |
| Fricas [A] (verification not implemented) | 463 |
| Sympy [A] (verification not implemented) | 463 |
| Maxima [A] (verification not implemented) | 463 |
| Giac [A] (verification not implemented) | 464 |
| Mupad [B] (verification not implemented) | 464 |

Optimal result

Integrand size = 7, antiderivative size = 30

$$\int e^{\sqrt[4]{x}} dx = 4e^{\sqrt[4]{x}}(-6 + 6\sqrt[4]{x} - 3\sqrt{x} + x^{3/4})$$

[Out] 4*exp(x^(1/4))*(-6+6*x^(1/4)-3*x^(1/2)+x^(3/4))

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 52, normalized size of antiderivative = 1.73, number of steps used = 5, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.429$, Rules used = {2238, 2207, 2225}

$$\int e^{\sqrt[4]{x}} dx = 4e^{\sqrt[4]{x}}x^{3/4} - 12e^{\sqrt[4]{x}}\sqrt{x} + 24e^{\sqrt[4]{x}}\sqrt[4]{x} - 24e^{\sqrt[4]{x}}$$

[In] Int[E^x^(1/4),x]

[Out] -24*E^x^(1/4) + 24*E^x^(1/4)*x^(1/4) - 12*E^x^(1/4)*Sqrt[x] + 4*E^x^(1/4)*x^(3/4)

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])), x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m] && !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_)))^((n_.), x_Symbol] := Simp[(F^(c*(a +
b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2238

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)))^((n_.), x_Symbol] := With[{k =
Denominator[n]}, Dist[k/d, Subst[Int[x^(k - 1)*F^(a + b*x^(k*n)), x], x, (c
+ d*x)^(1/k)], x]] /; FreeQ[{F, a, b, c, d}, x] && IntegerQ[2/n] && !Inte
gerQ[n]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= 4\text{Subst}\left(\int e^x x^3 dx, x, \sqrt[4]{x}\right) \\
&= 4e^{\sqrt[4]{x}} x^{3/4} - 12\text{Subst}\left(\int e^x x^2 dx, x, \sqrt[4]{x}\right) \\
&= -12e^{\sqrt[4]{x}} \sqrt{x} + 4e^{\sqrt[4]{x}} x^{3/4} + 24\text{Subst}\left(\int e^x x dx, x, \sqrt[4]{x}\right) \\
&= 24e^{\sqrt[4]{x}} \sqrt[4]{x} - 12e^{\sqrt[4]{x}} \sqrt{x} + 4e^{\sqrt[4]{x}} x^{3/4} - 24\text{Subst}\left(\int e^x dx, x, \sqrt[4]{x}\right) \\
&= -24e^{\sqrt[4]{x}} + 24e^{\sqrt[4]{x}} \sqrt[4]{x} - 12e^{\sqrt[4]{x}} \sqrt{x} + 4e^{\sqrt[4]{x}} x^{3/4}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.03

$$\int e^{\sqrt[4]{x}} dx = e^{\sqrt[4]{x}} (-24 + 24\sqrt[4]{x} - 12\sqrt{x} + 4x^{3/4})$$

[In] Integrate[E^x^(1/4), x]

[Out] E^x^(1/4)*(-24 + 24*x^(1/4) - 12*Sqrt[x] + 4*x^(3/4))

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.87

| method | result | size |
|-------------------|--|------|
| meijerg | $24 - \left(-4x^{\frac{3}{4}} + 12\sqrt{x} - 24x^{\frac{1}{4}} + 24\right) e^{x^{\frac{1}{4}}}$ | 26 |
| derivativedivides | $4e^{x^{\frac{1}{4}}}x^{\frac{3}{4}} - 12\sqrt{x}e^{x^{\frac{1}{4}}} + 24x^{\frac{1}{4}}e^{x^{\frac{1}{4}}} - 24e^{x^{\frac{1}{4}}}$ | 35 |
| default | $4e^{x^{\frac{1}{4}}}x^{\frac{3}{4}} - 12\sqrt{x}e^{x^{\frac{1}{4}}} + 24x^{\frac{1}{4}}e^{x^{\frac{1}{4}}} - 24e^{x^{\frac{1}{4}}}$ | 35 |

[In] `int(exp(x^(1/4)),x,method=_RETURNVERBOSE)`

[Out] `24-(-4*x^(3/4)+12*x^(1/2)-24*x^(1/4)+24)*exp(x^(1/4))`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.70

$$\int e^{\sqrt[4]{x}} dx = 4 \left(x^{\frac{3}{4}} - 3\sqrt{x} + 6x^{\frac{1}{4}} - 6 \right) e^{\left(x^{\frac{1}{4}}\right)}$$

[In] `integrate(exp(x^(1/4)),x, algorithm="fricas")`

[Out] `4*(x^(3/4) - 3*sqrt(x) + 6*x^(1/4) - 6)*e^(x^(1/4))`

Sympy [A] (verification not implemented)

Time = 0.14 (sec) , antiderivative size = 48, normalized size of antiderivative = 1.60

$$\int e^{\sqrt[4]{x}} dx = 4x^{\frac{3}{4}}e^{\sqrt[4]{x}} + 24\sqrt[4]{x}e^{\sqrt[4]{x}} - 12\sqrt{x}e^{\sqrt[4]{x}} - 24e^{\sqrt[4]{x}}$$

[In] `integrate(exp(x**(1/4)),x)`

[Out] `4*x**(3/4)*exp(x**(1/4)) + 24*x**(1/4)*exp(x**(1/4)) - 12*sqrt(x)*exp(x**(1/4)) - 24*exp(x**(1/4))`

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.70

$$\int e^{\sqrt[4]{x}} dx = 4 \left(x^{\frac{3}{4}} - 3\sqrt{x} + 6x^{\frac{1}{4}} - 6 \right) e^{\left(x^{\frac{1}{4}}\right)}$$

[In] `integrate(exp(x^(1/4)),x, algorithm="maxima")`

[Out] `4*(x^(3/4) - 3*sqrt(x) + 6*x^(1/4) - 6)*e^(x^(1/4))`

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.70

$$\int e^{\sqrt[4]{x}} dx = 4 \left(x^{\frac{3}{4}} - 3\sqrt{x} + 6x^{\frac{1}{4}} - 6 \right) e^{(x^{\frac{1}{4}})}$$

[In] integrate(exp(x^(1/4)),x, algorithm="giac")

[Out] 4*(x^(3/4) - 3*sqrt(x) + 6*x^(1/4) - 6)*e^(x^(1/4))

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 28, normalized size of antiderivative = 0.93

$$\int e^{\sqrt[4]{x}} dx = -4x e^{x^{1/4}} \left(\frac{6}{x} + \frac{3}{\sqrt{x}} - \frac{1}{x^{1/4}} - \frac{6}{x^{3/4}} \right)$$

[In] int(exp(x^(1/4)),x)

[Out] -4*x*exp(x^(1/4))*(6/x + 3/x^(1/2) - 1/x^(1/4) - 6/x^(3/4))

3.89 $\int \cos(x) \cot(x) dx$

| | |
|---|-----|
| Optimal result | 465 |
| Rubi [A] (verified) | 465 |
| Mathematica [B] (verified) | 466 |
| Maple [A] (verified) | 466 |
| Fricas [B] (verification not implemented) | 467 |
| Sympy [B] (verification not implemented) | 467 |
| Maxima [B] (verification not implemented) | 467 |
| Giac [B] (verification not implemented) | 468 |
| Mupad [B] (verification not implemented) | 468 |

Optimal result

Integrand size = 5, antiderivative size = 8

$$\int \cos(x) \cot(x) dx = -\operatorname{arctanh}(\cos(x)) + \cos(x)$$

[Out] $-\operatorname{arctanh}(\cos(x)) + \cos(x)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.600$, Rules used = {2672, 327, 212}

$$\int \cos(x) \cot(x) dx = \cos(x) - \operatorname{arctanh}(\cos(x))$$

[In] $\operatorname{Int}[\operatorname{Cos}[x] * \operatorname{Cot}[x], x]$

[Out] $-\operatorname{ArcTanh}[\operatorname{Cos}[x]] + \operatorname{Cos}[x]$

Rule 212

$\operatorname{Int}[(a_ + (b_ * (x_)^2)^{-1}), x_Symbol] \rightarrow \operatorname{Simp}[(1/(\operatorname{Rt}[a, 2] * \operatorname{Rt}[-b, 2])) * \operatorname{ArcTanh}[\operatorname{Rt}[-b, 2] * (x/\operatorname{Rt}[a, 2])], x] /;$ $\operatorname{FreeQ}\{a, b\}, x \ \&\& \operatorname{NegQ}[a/b] \ \&\& (\operatorname{GtQ}[a, 0] \ || \ \operatorname{LtQ}[b, 0])$

Rule 327

$\operatorname{Int}[(c * (x_))^{(m_)} * ((a_ + (b_ * (x_)^{(n_)}))^{(p_)}), x_Symbol] \rightarrow \operatorname{Simp}[c^{(n - 1)} * (c * x)^{(m - n + 1)} * ((a + b * x^n)^{(p + 1)} / (b * (m + n * p + 1))), x] - \operatorname{Dist}[a * c^n * ((m - n + 1) / (b * (m + n * p + 1))), \operatorname{Int}[(c * x)^{(m - n)} * (a + b * x^n)^p, x], x] /;$ $\operatorname{FreeQ}\{a, b, c, p\}, x \ \&\& \operatorname{IGtQ}[n, 0] \ \&\& \operatorname{GtQ}[m, n - 1] \ \&\& \operatorname{NeQ}[m + n * p]$

+ 1, 0] && IntBinomialQ[a, b, c, n, m, p, x]

Rule 2672

```
Int[((a_.)*sin[(e_.) + (f_.)*(x_.)]^(m_.)*tan[(e_.) + (f_.)*(x_.)]^(n_.), x_
Symbol] :> With[{ff = FreeFactors[Sin[e + f*x], x]}, Dist[ff/f, Subst[Int[(
ff*x)^(m + n)/(a^2 - ff^2*x^2)^((n + 1)/2), x], x, a*(Sin[e + f*x]/ff)], x]
] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n + 1)/2]
```

Rubi steps

$$\begin{aligned} \text{integral} &= -\text{Subst}\left(\int \frac{x^2}{1-x^2} dx, x, \cos(x)\right) \\ &= \cos(x) - \text{Subst}\left(\int \frac{1}{1-x^2} dx, x, \cos(x)\right) \\ &= -\text{arctanh}(\cos(x)) + \cos(x) \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 19 vs. 2(8) = 16.

Time = 0.01 (sec) , antiderivative size = 19, normalized size of antiderivative = 2.38

$$\int \cos(x) \cot(x) dx = \cos(x) - \log\left(\cos\left(\frac{x}{2}\right)\right) + \log\left(\sin\left(\frac{x}{2}\right)\right)$$

[In] Integrate[Cos[x]*Cot[x],x]

[Out] Cos[x] - Log[Cos[x/2]] + Log[Sin[x/2]]

Maple [A] (verified)

Time = 0.10 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.50

| method | result | size |
|---------|---|------|
| default | $\cos(x) + \ln(-\cot(x) + \csc(x))$ | 12 |
| risch | $\frac{e^{ix}}{2} + \frac{e^{-ix}}{2} + \ln(-1 + e^{ix}) - \ln(e^{ix} + 1)$ | 34 |

[In] int(cos(x)*cot(x),x,method=_RETURNVERBOSE)

[Out] cos(x)+ln(-cot(x)+csc(x))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 21 vs. $2(8) = 16$.

Time = 0.27 (sec) , antiderivative size = 21, normalized size of antiderivative = 2.62

$$\int \cos(x) \cot(x) dx = \cos(x) - \frac{1}{2} \log\left(\frac{1}{2} \cos(x) + \frac{1}{2}\right) + \frac{1}{2} \log\left(-\frac{1}{2} \cos(x) + \frac{1}{2}\right)$$

[In] integrate(cos(x)*cot(x),x, algorithm="fricas")

[Out] cos(x) - 1/2*log(1/2*cos(x) + 1/2) + 1/2*log(-1/2*cos(x) + 1/2)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 19 vs. $2(7) = 14$.

Time = 0.05 (sec) , antiderivative size = 19, normalized size of antiderivative = 2.38

$$\int \cos(x) \cot(x) dx = \frac{\log(\cos(x) - 1)}{2} - \frac{\log(\cos(x) + 1)}{2} + \cos(x)$$

[In] integrate(cos(x)*cot(x),x)

[Out] log(cos(x) - 1)/2 - log(cos(x) + 1)/2 + cos(x)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 17 vs. $2(8) = 16$.

Time = 0.20 (sec) , antiderivative size = 17, normalized size of antiderivative = 2.12

$$\int \cos(x) \cot(x) dx = \cos(x) - \frac{1}{2} \log(\cos(x) + 1) + \frac{1}{2} \log(\cos(x) - 1)$$

[In] integrate(cos(x)*cot(x),x, algorithm="maxima")

[Out] cos(x) - 1/2*log(cos(x) + 1) + 1/2*log(cos(x) - 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 19 vs. 2(8) = 16.

Time = 0.28 (sec) , antiderivative size = 19, normalized size of antiderivative = 2.38

$$\int \cos(x) \cot(x) dx = \cos(x) - \frac{1}{2} \log(\cos(x) + 1) + \frac{1}{2} \log(-\cos(x) + 1)$$

[In] integrate(cos(x)*cot(x),x, algorithm="giac")

[Out] cos(x) - 1/2*log(cos(x) + 1) + 1/2*log(-cos(x) + 1)

Mupad [B] (verification not implemented)

Time = 16.47 (sec) , antiderivative size = 18, normalized size of antiderivative = 2.25

$$\int \cos(x) \cot(x) dx = \ln\left(\tan\left(\frac{x}{2}\right)\right) + \frac{2}{\tan\left(\frac{x}{2}\right)^2 + 1}$$

[In] int(cos(x)*cot(x),x)

[Out] log(tan(x/2)) + 2/(tan(x/2)^2 + 1)

3.90 $\int (2 \log(x) + \log^2(x)) dx$

| | |
|---|-----|
| Optimal result | 469 |
| Rubi [A] (verified) | 469 |
| Mathematica [A] (verified) | 470 |
| Maple [A] (verified) | 470 |
| Fricas [A] (verification not implemented) | 471 |
| Sympy [A] (verification not implemented) | 471 |
| Maxima [B] (verification not implemented) | 471 |
| Giac [A] (verification not implemented) | 471 |
| Mupad [B] (verification not implemented) | 472 |

Optimal result

Integrand size = 9, antiderivative size = 6

$$\int (2 \log(x) + \log^2(x)) dx = x \log^2(x)$$

[Out] $x \cdot \ln(x)^2$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {2332, 2333}

$$\int (2 \log(x) + \log^2(x)) dx = x \log^2(x)$$

[In] `Int[2*Log[x] + Log[x]^2,x]`

[Out] $x \cdot \text{Log}[x]^2$

Rule 2332

`Int[Log[(c_.)*(x_)^(n_.)], x_Symbol] := Simp[x*Log[c*x^n], x] - Simp[n*x, x] /;` `FreeQ[{c, n}, x]`

Rule 2333

`Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_.), x_Symbol] := Simp[x*(a + b*Log[c*x^n])^p, x] - Dist[b*n*p, Int[(a + b*Log[c*x^n])^(p - 1), x], x] /;` `FreeQ[{a, b, c, n}, x] && GtQ[p, 0] && IntegerQ[2*p]`

Rubi steps

$$\begin{aligned}
 \text{integral} &= 2 \int \log(x) dx + \int \log^2(x) dx \\
 &= -2x + 2x \log(x) + x \log^2(x) - 2 \int \log(x) dx \\
 &= x \log^2(x)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (2\log(x) + \log^2(x)) dx = x \log^2(x)$$

[In] Integrate[2*Log[x] + Log[x]^2,x]

[Out] x*Log[x]^2

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.17

| method | result | size |
|---------------|--------------|------|
| default | $x \ln(x)^2$ | 7 |
| norman | $x \ln(x)^2$ | 7 |
| risch | $x \ln(x)^2$ | 7 |
| parallelrisch | $x \ln(x)^2$ | 7 |
| parts | $x \ln(x)^2$ | 7 |

[In] int(2*ln(x)+ln(x)^2,x,method=_RETURNVERBOSE)

[Out] x*ln(x)^2

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (2\log(x) + \log^2(x)) dx = x \log(x)^2$$

[In] integrate(2*log(x)+log(x)^2,x, algorithm="fricas")

[Out] x*log(x)^2

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int (2\log(x) + \log^2(x)) dx = x \log(x)^2$$

[In] integrate(2*ln(x)+ln(x)**2,x)

[Out] x*log(x)**2

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 21 vs. 2(6) = 12.

Time = 0.20 (sec) , antiderivative size = 21, normalized size of antiderivative = 3.50

$$\int (2\log(x) + \log^2(x)) dx = (\log(x)^2 - 2\log(x) + 2)x + 2x\log(x) - 2x$$

[In] integrate(2*log(x)+log(x)^2,x, algorithm="maxima")

[Out] (log(x)^2 - 2*log(x) + 2)*x + 2*x*log(x) - 2*x

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (2\log(x) + \log^2(x)) dx = x \log(x)^2$$

[In] integrate(2*log(x)+log(x)^2,x, algorithm="giac")

[Out] x*log(x)^2

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (2 \log(x) + \log^2(x)) dx = x \ln(x)^2$$

[In] int(2*log(x) + log(x)^2,x)

[Out] x*log(x)^2

3.91 $\int \frac{x^3}{1+x^2} dx$

| | |
|---|-----|
| Optimal result | 473 |
| Rubi [A] (verified) | 473 |
| Mathematica [A] (verified) | 474 |
| Maple [A] (verified) | 474 |
| Fricas [A] (verification not implemented) | 475 |
| Sympy [A] (verification not implemented) | 475 |
| Maxima [A] (verification not implemented) | 475 |
| Giac [A] (verification not implemented) | 475 |
| Mupad [B] (verification not implemented) | 476 |

Optimal result

Integrand size = 11, antiderivative size = 18

$$\int \frac{x^3}{1+x^2} dx = \frac{x^2}{2} - \frac{1}{2} \log(1+x^2)$$

[Out] 1/2*x^2-1/2*ln(x^2+1)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {272, 45}

$$\int \frac{x^3}{1+x^2} dx = \frac{x^2}{2} - \frac{1}{2} \log(x^2+1)$$

[In] Int[x^3/(1 + x^2),x]

[Out] x^2/2 - Log[1 + x^2]/2

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x], x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rule 272

Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b

, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int \frac{x}{1+x} dx, x, x^2 \right) \\ &= \frac{1}{2} \text{Subst} \left(\int \left(1 + \frac{1}{-1-x} \right) dx, x, x^2 \right) \\ &= \frac{x^2}{2} - \frac{1}{2} \log(1+x^2) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00

$$\int \frac{x^3}{1+x^2} dx = \frac{x^2}{2} - \frac{1}{2} \log(1+x^2)$$

[In] Integrate[x^3/(1 + x^2),x]

[Out] x^2/2 - Log[1 + x^2]/2

Maple [A] (verified)

Time = 0.15 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.83

| method | result | size |
|--------------|--|------|
| default | $\frac{x^2}{2} - \frac{\ln(x^2+1)}{2}$ | 15 |
| norman | $\frac{x^2}{2} - \frac{\ln(x^2+1)}{2}$ | 15 |
| meijerg | $\frac{x^2}{2} - \frac{\ln(x^2+1)}{2}$ | 15 |
| risch | $\frac{x^2}{2} - \frac{\ln(x^2+1)}{2}$ | 15 |
| parallelrisc | $\frac{x^2}{2} - \frac{\ln(x^2+1)}{2}$ | 15 |

[In] int(x^3/(x^2+1),x,method=_RETURNVERBOSE)

[Out] 1/2*x^2-1/2*ln(x^2+1)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.78

$$\int \frac{x^3}{1+x^2} dx = \frac{1}{2}x^2 - \frac{1}{2}\log(x^2+1)$$

[In] integrate(x^3/(x^2+1),x, algorithm="fricas")

[Out] 1/2*x^2 - 1/2*log(x^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.67

$$\int \frac{x^3}{1+x^2} dx = \frac{x^2}{2} - \frac{\log(x^2+1)}{2}$$

[In] integrate(x**3/(x**2+1),x)

[Out] x**2/2 - log(x**2 + 1)/2

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.78

$$\int \frac{x^3}{1+x^2} dx = \frac{1}{2}x^2 - \frac{1}{2}\log(x^2+1)$$

[In] integrate(x^3/(x^2+1),x, algorithm="maxima")

[Out] 1/2*x^2 - 1/2*log(x^2 + 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.78

$$\int \frac{x^3}{1+x^2} dx = \frac{1}{2}x^2 - \frac{1}{2}\log(x^2+1)$$

[In] integrate(x^3/(x^2+1),x, algorithm="giac")

[Out] 1/2*x^2 - 1/2*log(x^2 + 1)

Mupad [B] (verification not implemented)

Time = 16.80 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.78

$$\int \frac{x^3}{1+x^2} dx = \frac{x^2}{2} - \frac{\ln(x^2+1)}{2}$$

[In] int(x^3/(x^2 + 1),x)

[Out] x^2/2 - log(x^2 + 1)/2

3.92 $\int \frac{1}{2-2x+x^2} dx$

| | |
|---|-----|
| Optimal result | 477 |
| Rubi [A] (verified) | 477 |
| Mathematica [A] (verified) | 478 |
| Maple [A] (verified) | 478 |
| Fricas [A] (verification not implemented) | 478 |
| Sympy [A] (verification not implemented) | 479 |
| Maxima [A] (verification not implemented) | 479 |
| Giac [A] (verification not implemented) | 479 |
| Mupad [B] (verification not implemented) | 479 |

Optimal result

Integrand size = 10, antiderivative size = 8

$$\int \frac{1}{2-2x+x^2} dx = -\arctan(1-x)$$

[Out] arctan(-1+x)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.200$, Rules used = {631, 210}

$$\int \frac{1}{2-2x+x^2} dx = -\arctan(1-x)$$

[In] Int[(2 - 2*x + x^2)^(-1),x]

[Out] -ArcTan[1 - x]

Rule 210

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(-Rt[-a, 2]*Rt[-b, 2])^(-1)*ArcTan[Rt[-b, 2]*(x/Rt[-a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (LtQ[a, 0] || LtQ[b, 0])

Rule 631

Int[((a_) + (b_.)*(x_) + (c_.)*(x_)^2)^(-1), x_Symbol] := With[{q = 1 - 4*Simplify[a*(c/b^2)]}, Dist[-2/b, Subst[Int[1/(q - x^2), x], x, 1 + 2*c*(x/b)], x] /; RationalQ[q] && (EqQ[q^2, 1] || !RationalQ[b^2 - 4*a*c])] /; Free

$Q\{a, b, c, x\} \ \&\& \ \text{NeQ}[b^2 - 4ac, 0]$

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{1}{-1-x^2} dx, x, 1-x\right) \\ &= -\arctan(1-x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \frac{1}{2-2x+x^2} dx = -\arctan(1-x)$$

[In] Integrate[(2 - 2*x + x^2)^(-1),x]

[Out] -ArcTan[1 - x]

Maple [A] (verified)

Time = 0.30 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.62

| method | result | size |
|---------------|---|------|
| default | $\arctan(-1+x)$ | 5 |
| risch | $\arctan(-1+x)$ | 5 |
| parallelrisch | $\frac{i \ln(x-1+i)}{2} - \frac{i \ln(x-1-i)}{2}$ | 20 |

[In] int(1/(x^2-2*x+2),x,method=_RETURNVERBOSE)

[Out] arctan(-1+x)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 4, normalized size of antiderivative = 0.50

$$\int \frac{1}{2-2x+x^2} dx = \arctan(x-1)$$

[In] integrate(1/(x^2-2*x+2),x, algorithm="fricas")

[Out] arctan(x - 1)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 3, normalized size of antiderivative = 0.38

$$\int \frac{1}{2 - 2x + x^2} dx = \operatorname{atan}(x - 1)$$

[In] integrate(1/(x**2-2*x+2),x)

[Out] atan(x - 1)

Maxima [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 4, normalized size of antiderivative = 0.50

$$\int \frac{1}{2 - 2x + x^2} dx = \operatorname{arctan}(x - 1)$$

[In] integrate(1/(x^2-2*x+2),x, algorithm="maxima")

[Out] arctan(x - 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 4, normalized size of antiderivative = 0.50

$$\int \frac{1}{2 - 2x + x^2} dx = \operatorname{arctan}(x - 1)$$

[In] integrate(1/(x^2-2*x+2),x, algorithm="giac")

[Out] arctan(x - 1)

Mupad [B] (verification not implemented)

Time = 16.31 (sec) , antiderivative size = 4, normalized size of antiderivative = 0.50

$$\int \frac{1}{2 - 2x + x^2} dx = \operatorname{atan}(x - 1)$$

[In] int(1/(x^2 - 2*x + 2),x)

[Out] atan(x - 1)

3.93 $\int \log(\sin(x)) \sin(x) dx$

| | |
|---|-----|
| Optimal result | 480 |
| Rubi [A] (verified) | 480 |
| Mathematica [A] (verified) | 481 |
| Maple [A] (verified) | 482 |
| Fricas [A] (verification not implemented) | 482 |
| Sympy [B] (verification not implemented) | 482 |
| Maxima [B] (verification not implemented) | 483 |
| Giac [A] (verification not implemented) | 483 |
| Mupad [F(-1)] | 484 |

Optimal result

Integrand size = 6, antiderivative size = 15

$$\int \log(\sin(x)) \sin(x) dx = -\operatorname{arctanh}(\cos(x)) + \cos(x) - \cos(x) \log(\sin(x))$$

[Out] $-\operatorname{arctanh}(\cos(x)) + \cos(x) - \cos(x) \ln(\sin(x))$

Rubi [A] (verified)

Time = 0.02 (sec), antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.833$, Rules used = {2718, 2634, 2672, 327, 212}

$$\int \log(\sin(x)) \sin(x) dx = -\operatorname{arctanh}(\cos(x)) + \cos(x) - \cos(x) \log(\sin(x))$$

[In] $\operatorname{Int}[\operatorname{Log}[\operatorname{Sin}[x]] * \operatorname{Sin}[x], x]$

[Out] $-\operatorname{ArcTanh}[\operatorname{Cos}[x]] + \operatorname{Cos}[x] - \operatorname{Cos}[x] * \operatorname{Log}[\operatorname{Sin}[x]]$

Rule 212

$\operatorname{Int}[(a + (b \cdot x)^2)^{-1}, x_Symbol] \rightarrow \operatorname{Simp}[(1/(\operatorname{Rt}[a, 2] * \operatorname{Rt}[-b, 2])) * \operatorname{ArcTanh}[\operatorname{Rt}[-b, 2] * (x/\operatorname{Rt}[a, 2])], x] /; \operatorname{FreeQ}\{a, b\}, x \ \&\& \operatorname{NegQ}[a/b] \ \&\& (\operatorname{GtQ}[a, 0] \ || \ \operatorname{LtQ}[b, 0])$

Rule 327

$\operatorname{Int}[(c \cdot x)^m * (a + (b \cdot x)^n)^p, x_Symbol] \rightarrow \operatorname{Simp}[c^{(n-1)} * (c \cdot x)^{(m-n+1)} * ((a + b \cdot x^n)^{(p+1}) / (b * (m + n * p + 1))), x] - \operatorname{Dist}[a * c^n * ((m - n + 1) / (b * (m + n * p + 1))), \operatorname{Int}[(c \cdot x)^{(m-n)} * (a + b \cdot x^n)^p, x],$

`x] /; FreeQ[{a, b, c, p}, x] && IGtQ[n, 0] && GtQ[m, n - 1] && NeQ[m + n*p + 1, 0] && IntBinomialQ[a, b, c, n, m, p, x]`

Rule 2634

`Int[Log[u_]*(v_), x_Symbol] := With[{w = IntHide[v, x]}, Dist[Log[u], w, x] - Int[SimplifyIntegrand[w*(D[u, x]/u), x], x] /; InverseFunctionFreeQ[w, x]] /; InverseFunctionFreeQ[u, x]`

Rule 2672

`Int[((a_)*sin[(e_) + (f_)*(x_)])^(m_)*tan[(e_) + (f_)*(x_)^(n_)], x_Symbol] := With[{ff = FreeFactors[Sin[e + f*x], x]}, Dist[ff/f, Subst[Int[(ff*x)^(m + n)/(a^2 - ff^2*x^2)^((n + 1)/2), x], x, a*(Sin[e + f*x]/ff)], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n + 1)/2]`

Rule 2718

`Int[sin[(c_) + (d_)*(x_)], x_Symbol] := Simp[-Cos[c + d*x]/d, x] /; FreeQ[{c, d}, x]`

Rubi steps

$$\begin{aligned}
 \text{integral} &= -\cos(x) \log(\sin(x)) + \int \cos(x) \cot(x) dx \\
 &= -\cos(x) \log(\sin(x)) - \text{Subst}\left(\int \frac{x^2}{1-x^2} dx, x, \cos(x)\right) \\
 &= \cos(x) - \cos(x) \log(\sin(x)) - \text{Subst}\left(\int \frac{1}{1-x^2} dx, x, \cos(x)\right) \\
 &= -\text{arctanh}(\cos(x)) + \cos(x) - \cos(x) \log(\sin(x))
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.73

$$\int \log(\sin(x)) \sin(x) dx = \cos(x) - \log\left(\cos\left(\frac{x}{2}\right)\right) + \log\left(\sin\left(\frac{x}{2}\right)\right) - \cos(x) \log(\sin(x))$$

`[In] Integrate[Log[Sin[x]]*Sin[x],x]`

`[Out] Cos[x] - Log[Cos[x/2]] + Log[Sin[x/2]] - Cos[x]*Log[Sin[x]]`

Maple [A] (verified)

Time = 0.24 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.33

| method | result |
|--------------|--|
| parallelrisc | $-\cos(x) \ln(\sin(x)) + \cos(x) + \ln(-\cot(x) + \csc(x)) + 1$ |
| norman | $\frac{2 \tan(\frac{x}{2})^2 \ln\left(\frac{2 \tan(\frac{x}{2})}{1 + \tan(\frac{x}{2})^2}\right) + 2}{1 + \tan(\frac{x}{2})^2} + \ln\left(1 + \tan\left(\frac{x}{2}\right)^2\right)$ |
| default | $-\frac{e^{ix} \ln(i(1 - e^{2ix})e^{-ix})}{2} + \frac{e^{ix}}{2} + \ln(-1 + e^{ix}) - \ln(e^{ix} + 1) - \frac{e^{-ix} \ln(i(1 - e^{2ix})e^{-ix})}{2} + \frac{e^{-ix}}{2} + \frac{\ln(2)(e^{ix} + 1)}{2}$ |
| risc | $\ln(e^{ix}) \cos(x) + \frac{e^{-ix} \ln(2)}{2} - \frac{e^{-ix} \ln(e^{2ix} - 1)}{2} - \frac{e^{ix} \ln(e^{2ix} - 1)}{2} + \frac{e^{ix} \ln(2)}{2} + \frac{e^{ix}}{2} - \frac{ie^{-ix} \operatorname{csgn}(\sin(x))^2 \operatorname{csgn}(ie^{-ix})}{4}$ |

```
[In] int(sin(x)*ln(sin(x)),x,method=_RETURNVERBOSE)
```

```
[Out] -cos(x)*ln(sin(x))+cos(x)+ln(-cot(x)+csc(x))+1
```

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.87

$$\int \log(\sin(x)) \sin(x) dx = -\cos(x) \log(\sin(x)) + \cos(x) - \frac{1}{2} \log\left(\frac{1}{2} \cos(x) + \frac{1}{2}\right) + \frac{1}{2} \log\left(-\frac{1}{2} \cos(x) + \frac{1}{2}\right)$$

```
[In] integrate(sin(x)*log(sin(x)),x, algorithm="fricas")
```

```
[Out] -cos(x)*log(sin(x)) + cos(x) - 1/2*log(1/2*cos(x) + 1/2) + 1/2*log(-1/2*cos(x) + 1/2)
```

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 105 vs. 2(15) = 30.

Time = 0.57 (sec) , antiderivative size = 105, normalized size of antiderivative = 7.00

$$\int \log(\sin(x)) \sin(x) dx = \frac{2 \log\left(\frac{\tan(\frac{x}{2})}{\tan^2(\frac{x}{2})+1}\right) \tan^2\left(\frac{x}{2}\right)}{\tan^2\left(\frac{x}{2}\right)+1} + \frac{\log(\tan^2\left(\frac{x}{2}\right)+1) \tan^2\left(\frac{x}{2}\right)}{\tan^2\left(\frac{x}{2}\right)+1} + \frac{\log(\tan^2\left(\frac{x}{2}\right)+1)}{\tan^2\left(\frac{x}{2}\right)+1} + \frac{2 \log(2) \tan^2\left(\frac{x}{2}\right)}{\tan^2\left(\frac{x}{2}\right)+1} + \frac{2}{\tan^2\left(\frac{x}{2}\right)+1}$$

```
[In] integrate(sin(x)*ln(sin(x)),x)
```

[Out] $2*\log(\tan(x/2)/(\tan(x/2)**2 + 1))*\tan(x/2)**2/(\tan(x/2)**2 + 1) + \log(\tan(x/2)**2 + 1)*\tan(x/2)**2/(\tan(x/2)**2 + 1) + \log(\tan(x/2)**2 + 1)/(\tan(x/2)**2 + 1) + 2*\log(2)*\tan(x/2)**2/(\tan(x/2)**2 + 1) + 2/(\tan(x/2)**2 + 1)$

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 89 vs. $2(15) = 30$.

Time = 0.19 (sec) , antiderivative size = 89, normalized size of antiderivative = 5.93

$$\int \log(\sin(x)) \sin(x) dx = -\frac{2 \log\left(\frac{2 \sin(x)}{\left(\frac{\sin(x)^2}{(\cos(x)+1)^2 + 1}\right)(\cos(x)+1)}\right)}{\frac{\sin(x)^2}{(\cos(x)+1)^2} + 1} + \frac{2}{\frac{\sin(x)^2}{(\cos(x)+1)^2} + 1} - \log\left(\frac{\sin(x)^2}{(\cos(x)+1)^2} + 1\right) + \log\left(\frac{\sin(x)^2}{(\cos(x)+1)^2}\right)$$

[In] `integrate(sin(x)*log(sin(x)),x, algorithm="maxima")`

[Out] $-2*\log(2*\sin(x)/((\sin(x)^2/(\cos(x) + 1)^2 + 1)*(\cos(x) + 1)))/(\sin(x)^2/(\cos(x) + 1)^2 + 1) + 2/(\sin(x)^2/(\cos(x) + 1)^2 + 1) - \log(\sin(x)^2/(\cos(x) + 1)^2 + 1) + \log(\sin(x)^2/(\cos(x) + 1)^2)$

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.73

$$\int \log(\sin(x)) \sin(x) dx = -\cos(x) \log(\sin(x)) + \cos(x) - \frac{1}{2} \log(\cos(x) + 1) + \frac{1}{2} \log(-\cos(x) + 1)$$

[In] `integrate(sin(x)*log(sin(x)),x, algorithm="giac")`

[Out] $-\cos(x)*\log(\sin(x)) + \cos(x) - 1/2*\log(\cos(x) + 1) + 1/2*\log(-\cos(x) + 1)$

Mupad [F(-1)]

Timed out.

$$\int \log(\sin(x)) \sin(x) dx = \int \ln(\sin(x)) \sin(x) dx$$

```
[In] int(log(sin(x))*sin(x),x)
```

```
[Out] int(log(sin(x))*sin(x), x)
```


3.94 $\int \frac{x}{1-x^4} dx$

| | |
|---|-----|
| Optimal result | 485 |
| Rubi [A] (verified) | 485 |
| Mathematica [B] (verified) | 486 |
| Maple [A] (verified) | 486 |
| Fricas [B] (verification not implemented) | 487 |
| Sympy [B] (verification not implemented) | 487 |
| Maxima [B] (verification not implemented) | 487 |
| Giac [B] (verification not implemented) | 488 |
| Mupad [B] (verification not implemented) | 488 |

Optimal result

Integrand size = 11, antiderivative size = 8

$$\int \frac{x}{1-x^4} dx = \frac{\operatorname{arctanh}(x^2)}{2}$$

[Out] 1/2*arctanh(x^2)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {281, 212}

$$\int \frac{x}{1-x^4} dx = \frac{\operatorname{arctanh}(x^2)}{2}$$

[In] Int[x/(1 - x^4),x]

[Out] ArcTanh[x^2]/2

Rule 212

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])

Rule 281

Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := With[{k = GCD[m + 1, n]}, Dist[1/k, Subst[Int[x^((m + 1)/k - 1)*(a + b*x^(n/k))^p, x], x, x^k], x] /; k != 1] /; FreeQ[{a, b, p}, x] && IGtQ[n, 0] && IntegerQ[m]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{1-x^2} dx, x, x^2 \right) \\ &= \frac{\text{arctanh}(x^2)}{2} \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 23 vs. 2(8) = 16.

Time = 0.01 (sec) , antiderivative size = 23, normalized size of antiderivative = 2.88

$$\int \frac{x}{1-x^4} dx = -\frac{1}{4} \log(1-x^2) + \frac{1}{4} \log(1+x^2)$$

[In] Integrate[x/(1 - x^4),x]

[Out] -1/4*Log[1 - x^2] + Log[1 + x^2]/4

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

| method | result | size |
|-------------|--|------|
| meijerg | $\frac{\text{arctanh}(x^2)}{2}$ | 7 |
| risch | $\frac{\ln(x^2+1)}{4} - \frac{\ln(x^2-1)}{4}$ | 18 |
| default | $-\frac{\ln(-1+x)}{4} - \frac{\ln(1+x)}{4} + \frac{\ln(x^2+1)}{4}$ | 22 |
| norman | $-\frac{\ln(-1+x)}{4} - \frac{\ln(1+x)}{4} + \frac{\ln(x^2+1)}{4}$ | 22 |
| parallelsch | $-\frac{\ln(-1+x)}{4} - \frac{\ln(1+x)}{4} + \frac{\ln(x^2+1)}{4}$ | 22 |

[In] int(x/(-x^4+1),x,method=_RETURNVERBOSE)

[Out] 1/2*arctanh(x^2)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 17 vs. $2(6) = 12$.

Time = 0.24 (sec) , antiderivative size = 17, normalized size of antiderivative = 2.12

$$\int \frac{x}{1-x^4} dx = \frac{1}{4} \log(x^2+1) - \frac{1}{4} \log(x^2-1)$$

[In] integrate(x/(-x^4+1),x, algorithm="fricas")

[Out] 1/4*log(x^2 + 1) - 1/4*log(x^2 - 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(5) = 10$.

Time = 0.04 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.88

$$\int \frac{x}{1-x^4} dx = -\frac{\log(x^2-1)}{4} + \frac{\log(x^2+1)}{4}$$

[In] integrate(x/(-x**4+1),x)

[Out] -log(x**2 - 1)/4 + log(x**2 + 1)/4

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 17 vs. $2(6) = 12$.

Time = 0.19 (sec) , antiderivative size = 17, normalized size of antiderivative = 2.12

$$\int \frac{x}{1-x^4} dx = \frac{1}{4} \log(x^2+1) - \frac{1}{4} \log(x^2-1)$$

[In] integrate(x/(-x^4+1),x, algorithm="maxima")

[Out] 1/4*log(x^2 + 1) - 1/4*log(x^2 - 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 18 vs. 2(6) = 12.

Time = 0.27 (sec) , antiderivative size = 18, normalized size of antiderivative = 2.25

$$\int \frac{x}{1-x^4} dx = \frac{1}{4} \log(x^2+1) - \frac{1}{4} \log(|x^2-1|)$$

[In] integrate(x/(-x^4+1),x, algorithm="giac")

[Out] 1/4*log(x^2 + 1) - 1/4*log(abs(x^2 - 1))

Mupad [B] (verification not implemented)

Time = 16.74 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{x}{1-x^4} dx = \frac{\operatorname{atanh}(x^2)}{2}$$

[In] int(-x/(x^4 - 1),x)

[Out] atanh(x^2)/2

3.95 $\int \sqrt{12 - 3x^2} dx$

| | |
|---|-----|
| Optimal result | 489 |
| Rubi [A] (verified) | 489 |
| Mathematica [A] (verified) | 490 |
| Maple [A] (verified) | 490 |
| Fricas [A] (verification not implemented) | 491 |
| Sympy [A] (verification not implemented) | 491 |
| Maxima [A] (verification not implemented) | 491 |
| Giac [A] (verification not implemented) | 491 |
| Mupad [B] (verification not implemented) | 492 |

Optimal result

Integrand size = 11, antiderivative size = 35

$$\int \sqrt{12 - 3x^2} dx = \frac{1}{2}\sqrt{3}x\sqrt{4 - x^2} + 2\sqrt{3} \arcsin\left(\frac{x}{2}\right)$$

[Out] $1/2*3^{(1/2)}*x*(-x^2+4)^{(1/2)}+2*3^{(1/2)}*\arcsin(1/2*x)$

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 35, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {201, 222}

$$\int \sqrt{12 - 3x^2} dx = 2\sqrt{3} \arcsin\left(\frac{x}{2}\right) + \frac{1}{2}\sqrt{3}\sqrt{4 - x^2}x$$

[In] `Int[Sqrt[12 - 3*x^2], x]`

[Out] `(Sqrt[3]*x*Sqrt[4 - x^2])/2 + 2*Sqrt[3]*ArcSin[x/2]`

Rule 201

```
Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] :> Simp[x*((a + b*x^n)^p/(n*p
+ 1)), x] + Dist[a*n*(p/(n*p + 1)), Int[(a + b*x^n)^(p - 1), x], x] /; Free
Q[{a, b}, x] && IGtQ[n, 0] && GtQ[p, 0] && (IntegerQ[2*p] || (EqQ[n, 2] &&
IntegerQ[4*p]) || (EqQ[n, 2] && IntegerQ[3*p]) || LtQ[Denominator[p + 1/n],
Denominator[p]])
```

Rule 222

```
Int[1/Sqrt[(a_) + (b_.)*(x_)^2], x_Symbol] :> Simp[ArcSin[Rt[-b, 2]*(x/Sqrt
[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2}\sqrt{3}x\sqrt{4-x^2} + 6 \int \frac{1}{\sqrt{12-3x^2}} dx \\ &= \frac{1}{2}\sqrt{3}x\sqrt{4-x^2} + 2\sqrt{3} \arcsin\left(\frac{x}{2}\right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 43, normalized size of antiderivative = 1.23

$$\int \sqrt{12-3x^2} dx = \frac{1}{2}\sqrt{3} \left(x\sqrt{4-x^2} - 8 \arctan\left(\frac{\sqrt{4-x^2}}{2+x}\right) \right)$$

[In] Integrate[Sqrt[12 - 3*x^2], x]

[Out] (Sqrt[3]*(x*Sqrt[4 - x^2] - 8*ArcTan[Sqrt[4 - x^2]/(2 + x)]))/2

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.66

| method | result | size |
|----------------|---|------|
| default | $\frac{x\sqrt{-3x^2+12}}{2} + 2\sqrt{3} \arcsin\left(\frac{x}{2}\right)$ | 23 |
| risch | $-\frac{3x(x^2-4)}{2\sqrt{-3x^2+12}} + 2\sqrt{3} \arcsin\left(\frac{x}{2}\right)$ | 28 |
| meijerg | $\frac{i\sqrt{3} \left(-i\sqrt{\pi} x \sqrt{-\frac{x^2}{4}+1} - 2i\sqrt{\pi} \arcsin\left(\frac{x}{2}\right) \right)}{\sqrt{\pi}}$ | 37 |
| pseudoelliptic | $\frac{x\sqrt{-3x^2+12}}{2} - 2\sqrt{3} \arctan\left(\frac{\sqrt{-3x^2+12}\sqrt{3}}{3x}\right)$ | 37 |
| trager | $\frac{x\sqrt{-3x^2+12}}{2} + 2 \text{RootOf}(_Z^2 + 3) \ln(\text{RootOf}(_Z^2 + 3) \sqrt{-3x^2 + 12} + 3x)$ | 43 |

[In] int((-3*x^2+12)^(1/2), x, method=_RETURNVERBOSE)

[Out] 1/2*x*(-3*x^2+12)^(1/2)+2*3^(1/2)*arcsin(1/2*x)

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.03

$$\int \sqrt{12 - 3x^2} dx = \frac{1}{2} \sqrt{-3x^2 + 12}x - 2\sqrt{3} \arctan\left(\frac{\sqrt{3}\sqrt{-3x^2 + 12}}{3x}\right)$$

[In] integrate((-3*x^2+12)^(1/2),x, algorithm="fricas")

[Out] 1/2*sqrt(-3*x^2 + 12)*x - 2*sqrt(3)*arctan(1/3*sqrt(3)*sqrt(-3*x^2 + 12)/x)

Sympy [A] (verification not implemented)

Time = 0.13 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.77

$$\int \sqrt{12 - 3x^2} dx = \frac{\sqrt{3}x\sqrt{4 - x^2}}{2} + 2\sqrt{3} \operatorname{asin}\left(\frac{x}{2}\right)$$

[In] integrate((-3*x**2+12)**(1/2),x)

[Out] sqrt(3)*x*sqrt(4 - x**2)/2 + 2*sqrt(3)*asin(x/2)

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.63

$$\int \sqrt{12 - 3x^2} dx = \frac{1}{2} \sqrt{-3x^2 + 12}x + 2\sqrt{3} \arcsin\left(\frac{1}{2}x\right)$$

[In] integrate((-3*x^2+12)^(1/2),x, algorithm="maxima")

[Out] 1/2*sqrt(-3*x^2 + 12)*x + 2*sqrt(3)*arcsin(1/2*x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.66

$$\int \sqrt{12 - 3x^2} dx = \frac{1}{2} \sqrt{3} \left(\sqrt{-x^2 + 4}x + 4 \arcsin\left(\frac{1}{2}x\right) \right)$$

[In] integrate((-3*x^2+12)^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(3)*(sqrt(-x^2 + 4)*x + 4*arcsin(1/2*x))

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.71

$$\int \sqrt{12 - 3x^2} dx = 2\sqrt{3} \operatorname{asin}\left(\frac{x}{2}\right) + \frac{\sqrt{3}x\sqrt{4 - x^2}}{2}$$

[In] int((12 - 3*x^2)^(1/2),x)

[Out] 2*3^(1/2)*asin(x/2) + (3^(1/2)*x*(4 - x^2)^(1/2))/2

3.96 $\int \sec^5(x) \tan^3(x) dx$

| | |
|---|-----|
| Optimal result | 493 |
| Rubi [A] (verified) | 493 |
| Mathematica [A] (verified) | 494 |
| Maple [A] (verified) | 494 |
| Fricas [A] (verification not implemented) | 495 |
| Sympy [A] (verification not implemented) | 495 |
| Maxima [A] (verification not implemented) | 495 |
| Giac [A] (verification not implemented) | 495 |
| Mupad [B] (verification not implemented) | 496 |

Optimal result

Integrand size = 9, antiderivative size = 17

$$\int \sec^5(x) \tan^3(x) dx = -\frac{1}{5} \sec^5(x) + \frac{\sec^7(x)}{7}$$

[Out] $-1/5*\sec(x)^5+1/7*\sec(x)^7$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {2686, 14}

$$\int \sec^5(x) \tan^3(x) dx = \frac{\sec^7(x)}{7} - \frac{\sec^5(x)}{5}$$

[In] $\text{Int}[\text{Sec}[x]^5*\text{Tan}[x]^3, x]$

[Out] $-1/5*\text{Sec}[x]^5 + \text{Sec}[x]^7/7$

Rule 14

$\text{Int}[(u_*)*((c_*)*(x_))^{(m_*)}, x_Symbol] \rightarrow \text{Int}[\text{ExpandIntegrand}[(c*x)^m*u, x], x] /;$ FreeQ[{c, m}, x] && SumQ[u] && !LinearQ[u, x] && !MatchQ[u, (a_)+ (b_)*(v_)] /; FreeQ[{a, b}, x] && InverseFunctionQ[v]

Rule 2686

$\text{Int}[(a_*)*\sec[(e_*) + (f_*)*(x_)]^{(m_*)}*((b_*)*\tan[(e_*) + (f_*)*(x_)]^{(n_*)}, x_Symbol] \rightarrow \text{Dist}[a/f, \text{Subst}[\text{Int}[(a*x)^{(m-1)}*(-1+x^2)^{((n-1)/2)}, x], x, \text{Sec}[e+f*x]], x] /;$ FreeQ[{a, e, f, m}, x] && IntegerQ[(n-1)/2]

`&& !(IntegerQ[m/2] && LtQ[0, m, n + 1])`

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int x^4(-1+x^2) dx, x, \sec(x)\right) \\ &= \text{Subst}\left(\int (-x^4+x^6) dx, x, \sec(x)\right) \\ &= -\frac{1}{5}\sec^5(x) + \frac{\sec^7(x)}{7} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00

$$\int \sec^5(x) \tan^3(x) dx = -\frac{1}{5}\sec^5(x) + \frac{\sec^7(x)}{7}$$

[In] `Integrate[Sec[x]^5*Tan[x]^3,x]`

[Out] `-1/5*Sec[x]^5 + Sec[x]^7/7`

Maple [A] (verified)

Time = 3.79 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.82

| method | result | size |
|-------------------|---|------|
| derivativedivides | $-\frac{\sec(x)^5}{5} + \frac{\sec(x)^7}{7}$ | 14 |
| default | $-\frac{\sec(x)^5}{5} + \frac{\sec(x)^7}{7}$ | 14 |
| risch | $-\frac{32(7e^{9ix}-6e^{7ix}+7e^{5ix})}{35(e^{2ix}+1)^7}$ | 34 |

[In] `int(sec(x)^5*tan(x)^3,x,method=_RETURNVERBOSE)`

[Out] `-1/5*sec(x)^5+1/7*sec(x)^7`

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.82

$$\int \sec^5(x) \tan^3(x) dx = -\frac{7 \cos(x)^2 - 5}{35 \cos(x)^7}$$

[In] integrate(sec(x)^5*tan(x)^3,x, algorithm="fricas")

[Out] -1/35*(7*cos(x)^2 - 5)/cos(x)^7

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.82

$$\int \sec^5(x) \tan^3(x) dx = \frac{5 - 7 \cos^2(x)}{35 \cos^7(x)}$$

[In] integrate(sec(x)**5*tan(x)**3,x)

[Out] (5 - 7*cos(x)**2)/(35*cos(x)**7)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.82

$$\int \sec^5(x) \tan^3(x) dx = -\frac{7 \cos(x)^2 - 5}{35 \cos(x)^7}$$

[In] integrate(sec(x)^5*tan(x)^3,x, algorithm="maxima")

[Out] -1/35*(7*cos(x)^2 - 5)/cos(x)^7

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.82

$$\int \sec^5(x) \tan^3(x) dx = -\frac{7 \cos(x)^2 - 5}{35 \cos(x)^7}$$

[In] integrate(sec(x)^5*tan(x)^3,x, algorithm="giac")

[Out] -1/35*(7*cos(x)^2 - 5)/cos(x)^7

Mupad [B] (verification not implemented)

Time = 16.45 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.76

$$\int \sec^5(x) \tan^3(x) dx = \frac{1}{7 \cos(x)^7} - \frac{1}{5 \cos(x)^5}$$

[In] int(tan(x)^3/cos(x)^5,x)

[Out] 1/(7*cos(x)^7) - 1/(5*cos(x)^5)

3.97 $\int \frac{1}{1-\sin(x)} dx$

| | |
|---|-----|
| Optimal result | 497 |
| Rubi [A] (verified) | 497 |
| Mathematica [B] (verified) | 498 |
| Maple [A] (verified) | 498 |
| Fricas [A] (verification not implemented) | 498 |
| Sympy [A] (verification not implemented) | 499 |
| Maxima [A] (verification not implemented) | 499 |
| Giac [A] (verification not implemented) | 499 |
| Mupad [B] (verification not implemented) | 499 |

Optimal result

Integrand size = 8, antiderivative size = 11

$$\int \frac{1}{1-\sin(x)} dx = \frac{\cos(x)}{1-\sin(x)}$$

[Out] $\cos(x)/(1-\sin(x))$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.125$, Rules used = {2727}

$$\int \frac{1}{1-\sin(x)} dx = \frac{\cos(x)}{1-\sin(x)}$$

[In] $\text{Int}[(1 - \text{Sin}[x])^{-1}, x]$

[Out] $\text{Cos}[x]/(1 - \text{Sin}[x])$

Rule 2727

$\text{Int}[(a_.) + (b_.)\sin[(c_.) + (d_.)\cdot(x_.)])^{-1}, x_Symbol] \rightarrow \text{Simp}[-\text{Cos}[c + d\cdot x]/(d\cdot(b + a\cdot\text{Sin}[c + d\cdot x])], x] \text{ /; FreeQ}\{a, b, c, d\}, x \ \&\& \ \text{EqQ}[a^2 - b^2, 0]$

Rubi steps

$$\text{integral} = \frac{\cos(x)}{1-\sin(x)}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 25 vs. $2(11) = 22$.

Time = 0.02 (sec) , antiderivative size = 25, normalized size of antiderivative = 2.27

$$\int \frac{1}{1 - \sin(x)} dx = \frac{2 \sin\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right) - \sin\left(\frac{x}{2}\right)}$$

[In] Integrate[(1 - Sin[x])^(-1),x]

[Out] (2*Sin[x/2])/(Cos[x/2] - Sin[x/2])

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

| method | result | size |
|--------------|---|------|
| default | $-\frac{2}{\tan\left(\frac{x}{2}\right)-1}$ | 11 |
| norman | $-\frac{2}{\tan\left(\frac{x}{2}\right)-1}$ | 11 |
| parallelrisc | $-\frac{2}{\tan\left(\frac{x}{2}\right)-1}$ | 11 |
| risc | $\frac{2}{e^{ix}-i}$ | 13 |

[In] int(1/(1-sin(x)),x,method=_RETURNVERBOSE)

[Out] -2/(tan(1/2*x)-1)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.55

$$\int \frac{1}{1 - \sin(x)} dx = \frac{\cos(x) + \sin(x) + 1}{\cos(x) - \sin(x) + 1}$$

[In] integrate(1/(1-sin(x)),x, algorithm="fricas")

[Out] (cos(x) + sin(x) + 1)/(cos(x) - sin(x) + 1)

Sympy [A] (verification not implemented)

Time = 0.18 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.73

$$\int \frac{1}{1 - \sin(x)} dx = -\frac{2}{\tan\left(\frac{x}{2}\right) - 1}$$

[In] integrate(1/(1-sin(x)),x)

[Out] -2/(tan(x/2) - 1)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.36

$$\int \frac{1}{1 - \sin(x)} dx = -\frac{2}{\frac{\sin(x)}{\cos(x)+1} - 1}$$

[In] integrate(1/(1-sin(x)),x, algorithm="maxima")

[Out] -2/(sin(x)/(cos(x) + 1) - 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.91

$$\int \frac{1}{1 - \sin(x)} dx = -\frac{2}{\tan\left(\frac{1}{2}x\right) - 1}$$

[In] integrate(1/(1-sin(x)),x, algorithm="giac")

[Out] -2/(tan(1/2*x) - 1)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.91

$$\int \frac{1}{1 - \sin(x)} dx = -\frac{2}{\tan\left(\frac{x}{2}\right) - 1}$$

[In] int(-1/(sin(x) - 1),x)

[Out] -2/(tan(x/2) - 1)

3.98 $\int \frac{1}{x\sqrt{-2+x^2}} dx$

| | |
|---|-----|
| Optimal result | 500 |
| Rubi [A] (verified) | 500 |
| Mathematica [A] (verified) | 501 |
| Maple [A] (verified) | 501 |
| Fricas [A] (verification not implemented) | 502 |
| Sympy [C] (verification not implemented) | 502 |
| Maxima [A] (verification not implemented) | 503 |
| Giac [A] (verification not implemented) | 503 |
| Mupad [B] (verification not implemented) | 503 |

Optimal result

Integrand size = 13, antiderivative size = 22

$$\int \frac{1}{x\sqrt{-2+x^2}} dx = \frac{\arctan\left(\frac{\sqrt{-2+x^2}}{\sqrt{2}}\right)}{\sqrt{2}}$$

[Out] 1/2*arctan(1/2*(x^2-2)^(1/2)*2^(1/2))*2^(1/2)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.231$, Rules used = {272, 65, 209}

$$\int \frac{1}{x\sqrt{-2+x^2}} dx = \frac{\arctan\left(\frac{\sqrt{x^2-2}}{\sqrt{2}}\right)}{\sqrt{2}}$$

[In] Int[1/(x*Sqrt[-2 + x^2]),x]

[Out] ArcTan[Sqrt[-2 + x^2]/Sqrt[2]]/Sqrt[2]

Rule 65

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] :> With[
{p = Denominator[m]}, Dist[p/b, Subst[Int[x^(p*(m + 1) - 1)*(c - a*(d/b) +
d*(x^p/b))^(n), x], x, (a + b*x)^(1/p)], x]] /; FreeQ[{a, b, c, d}, x] && NeQ
[b*c - a*d, 0] && LtQ[-1, m, 0] && LeQ[-1, n, 0] && LeQ[Denominator[n], Den
ominator[m]] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 209


```
Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])
```

Rule 272

```
Int[(x_)^(m_)*((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{\sqrt{-2 + xx}} dx, x, x^2 \right) \\ &= \text{Subst} \left(\int \frac{1}{2 + x^2} dx, x, \sqrt{-2 + x^2} \right) \\ &= \frac{\arctan \left(\frac{\sqrt{-2 + x^2}}{\sqrt{2}} \right)}{\sqrt{2}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \frac{1}{x\sqrt{-2 + x^2}} dx = \frac{\arctan \left(\frac{\sqrt{-2 + x^2}}{\sqrt{2}} \right)}{\sqrt{2}}$$

```
[In] Integrate[1/(x*Sqrt[-2 + x^2]),x]
```

```
[Out] ArcTan[Sqrt[-2 + x^2]/Sqrt[2]]/Sqrt[2]
```

Maple [A] (verified)

Time = 0.23 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.82

| method | result | size |
|----------------|---|------|
| default | $-\frac{\sqrt{2} \arctan\left(\frac{\sqrt{2}}{\sqrt{x^2-2}}\right)}{2}$ | 18 |
| pseudoelliptic | $\frac{\arctan\left(\frac{\sqrt{x^2-2}\sqrt{2}}{2}\right)\sqrt{2}}{2}$ | 19 |
| trager | $-\frac{\text{RootOf}(-Z^2+2) \ln\left(\frac{-\text{RootOf}(-Z^2+2)+\sqrt{x^2-2}}{x}\right)}{2}$ | 30 |
| meijerg | $\frac{\sqrt{2} \sqrt{-\text{signum}\left(-1+\frac{x^2}{2}\right)} \left((-3 \ln(2)+2 \ln(x)+i\pi)\sqrt{\pi}-2\sqrt{\pi} \ln\left(\frac{1}{2}+\frac{\sqrt{1-\frac{x^2}{2}}}{2}\right) \right)}{4\sqrt{\pi} \sqrt{\text{signum}\left(-1+\frac{x^2}{2}\right)}}$ | 68 |

```
[In] int(1/x/(x^2-2)^(1/2),x,method=_RETURNVERBOSE)
```

```
[Out] -1/2*2^(1/2)*arctan(1/(x^2-2)^(1/2)*2^(1/2))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.09

$$\int \frac{1}{x\sqrt{-2+x^2}} dx = \sqrt{2} \arctan\left(-\frac{1}{2}\sqrt{2}x + \frac{1}{2}\sqrt{2}\sqrt{x^2-2}\right)$$

```
[In] integrate(1/x/(x^2-2)^(1/2),x, algorithm="fricas")
```

```
[Out] sqrt(2)*arctan(-1/2*sqrt(2)*x + 1/2*sqrt(2)*sqrt(x^2 - 2))
```

Sympy [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.50 (sec) , antiderivative size = 39, normalized size of antiderivative = 1.77

$$\int \frac{1}{x\sqrt{-2+x^2}} dx = \begin{cases} \frac{\sqrt{2}i \operatorname{acosh}\left(\frac{\sqrt{2}}{x}\right)}{2} & \text{for } \frac{1}{|x^2|} > \frac{1}{2} \\ -\frac{\sqrt{2} \operatorname{asin}\left(\frac{\sqrt{2}}{x}\right)}{2} & \text{otherwise} \end{cases}$$

```
[In] integrate(1/x/(x**2-2)**(1/2),x)
```

```
[Out] Piecewise((sqrt(2)*I*acosh(sqrt(2)/x)/2, 1/Abs(x**2) > 1/2), (-sqrt(2)*asin(sqrt(2)/x)/2, True))
```

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.64

$$\int \frac{1}{x\sqrt{-2+x^2}} dx = -\frac{1}{2} \sqrt{2} \arcsin\left(\frac{\sqrt{2}}{|x|}\right)$$

[In] integrate(1/x/(x^2-2)^(1/2),x, algorithm="maxima")

[Out] -1/2*sqrt(2)*arcsin(sqrt(2)/abs(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.82

$$\int \frac{1}{x\sqrt{-2+x^2}} dx = \frac{1}{2} \sqrt{2} \arctan\left(\frac{1}{2} \sqrt{2} \sqrt{x^2-2}\right)$$

[In] integrate(1/x/(x^2-2)^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(2)*arctan(1/2*sqrt(2)*sqrt(x^2 - 2))

Mupad [B] (verification not implemented)

Time = 17.03 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.82

$$\int \frac{1}{x\sqrt{-2+x^2}} dx = \frac{\sqrt{2} \operatorname{atan}\left(\frac{\sqrt{2}\sqrt{x^2-2}}{2}\right)}{2}$$

[In] int(1/(x*(x^2 - 2)^(1/2)),x)

[Out] (2^(1/2)*atan((2^(1/2)*(x^2 - 2)^(1/2))/2))/2

3.99 $\int \log(x^2) dx$

| | |
|---|-----|
| Optimal result | 504 |
| Rubi [A] (verified) | 504 |
| Mathematica [A] (verified) | 505 |
| Maple [A] (verified) | 505 |
| Fricas [A] (verification not implemented) | 505 |
| Sympy [A] (verification not implemented) | 506 |
| Maxima [A] (verification not implemented) | 506 |
| Giac [A] (verification not implemented) | 506 |
| Mupad [B] (verification not implemented) | 506 |

Optimal result

Integrand size = 4, antiderivative size = 10

$$\int \log(x^2) dx = -2x + x \log(x^2)$$

[Out] -2*x+x*ln(x^2)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {2332}

$$\int \log(x^2) dx = x \log(x^2) - 2x$$

[In] Int[Log[x^2],x]

[Out] -2*x + x*Log[x^2]

Rule 2332

Int[Log[(c_.)*(x_)^(n_.)], x_Symbol] := Simp[x*Log[c*x^n], x] - Simp[n*x, x] /; FreeQ[{c, n}, x]

Rubi steps

$$\text{integral} = -2x + x \log(x^2)$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \log(x^2) dx = -2x + x \log(x^2)$$

[In] Integrate[Log[x^2],x]

[Out] -2*x + x*Log[x^2]

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

| method | result | size |
|---------------|--------------------|------|
| default | $-2x + x \ln(x^2)$ | 11 |
| norman | $-2x + x \ln(x^2)$ | 11 |
| risch | $-2x + x \ln(x^2)$ | 11 |
| parallelrisch | $-2x + x \ln(x^2)$ | 11 |
| parts | $-2x + x \ln(x^2)$ | 11 |

[In] int(ln(x^2),x,method=_RETURNVERBOSE)

[Out] -2*x+x*ln(x^2)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \log(x^2) dx = x \log(x^2) - 2x$$

[In] integrate(log(x^2),x, algorithm="fricas")

[Out] x*log(x^2) - 2*x

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \log(x^2) dx = x \log(x^2) - 2x$$

[In] integrate(ln(x**2),x)

[Out] x*log(x**2) - 2*x

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \log(x^2) dx = x \log(x^2) - 2x$$

[In] integrate(log(x^2),x, algorithm="maxima")

[Out] x*log(x^2) - 2*x

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \log(x^2) dx = x \log(x^2) - 2x$$

[In] integrate(log(x^2),x, algorithm="giac")

[Out] x*log(x^2) - 2*x

Mupad [B] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \log(x^2) dx = x (\ln(x^2) - 2)$$

[In] int(log(x^2),x)

[Out] x*(log(x^2) - 2)

3.100 $\int \sin(\sqrt[3]{x}) dx$

| | |
|---|-----|
| Optimal result | 507 |
| Rubi [A] (verified) | 507 |
| Mathematica [A] (verified) | 508 |
| Maple [A] (verified) | 508 |
| Fricas [A] (verification not implemented) | 509 |
| Sympy [A] (verification not implemented) | 509 |
| Maxima [A] (verification not implemented) | 509 |
| Giac [A] (verification not implemented) | 510 |
| Mupad [B] (verification not implemented) | 510 |

Optimal result

Integrand size = 6, antiderivative size = 35

$$\int \sin(\sqrt[3]{x}) dx = 6 \cos(\sqrt[3]{x}) - 3x^{2/3} \cos(\sqrt[3]{x}) + 6\sqrt[3]{x} \sin(\sqrt[3]{x})$$

[Out] $6*\cos(x^{(1/3)})-3*x^{(2/3)}*\cos(x^{(1/3)})+6*x^{(1/3)}*\sin(x^{(1/3)})$

Rubi [A] (verified)

Time = 0.03 (sec), antiderivative size = 35, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3442, 3377, 2718}

$$\int \sin(\sqrt[3]{x}) dx = -3x^{2/3} \cos(\sqrt[3]{x}) + 6\sqrt[3]{x} \sin(\sqrt[3]{x}) + 6 \cos(\sqrt[3]{x})$$

[In] $\text{Int}[\text{Sin}[x^{(1/3)}], x]$

[Out] $6*\text{Cos}[x^{(1/3)}] - 3*x^{(2/3)}*\text{Cos}[x^{(1/3)}] + 6*x^{(1/3)}*\text{Sin}[x^{(1/3)}]$

Rule 2718

$\text{Int}[\sin[(c_.) + (d_.)*(x_.)], x_Symbol] \rightarrow \text{Simp}[-\text{Cos}[c + d*x]/d, x] /; \text{FreeQ}[\{c, d\}, x]$

Rule 3377

$\text{Int}[(c_. + (d_.)*(x_.))^{(m_.)}*\sin[(e_.) + (f_.)*(x_.)], x_Symbol] \rightarrow \text{Simp}[-(c + d*x)^m*(\text{Cos}[e + f*x]/f), x] + \text{Dist}[d*(m/f), \text{Int}[(c + d*x)^{(m-1)}*\text{Cos}[e + f*x], x], x] /; \text{FreeQ}[\{c, d, e, f\}, x] \ \&\& \ \text{GtQ}[m, 0]$

Rule 3442

```
Int[((a_.) + (b_.)*Sin[(c_.) + (d_.)*((e_.) + (f_.)*(x_))^(n_)]^(p_.), x_Symbol]
:> Dist[1/(n*f), Subst[Int[x^(1/n - 1)*(a + b*Sin[c + d*x])^p, x], x, (e + f*x)^n], x]
/; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[p, 0] && IntegerQ[1/n]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= 3\text{Subst}\left(\int x^2 \sin(x) dx, x, \sqrt[3]{x}\right) \\
&= -3x^{2/3} \cos(\sqrt[3]{x}) + 6\text{Subst}\left(\int x \cos(x) dx, x, \sqrt[3]{x}\right) \\
&= -3x^{2/3} \cos(\sqrt[3]{x}) + 6\sqrt[3]{x} \sin(\sqrt[3]{x}) - 6\text{Subst}\left(\int \sin(x) dx, x, \sqrt[3]{x}\right) \\
&= 6 \cos(\sqrt[3]{x}) - 3x^{2/3} \cos(\sqrt[3]{x}) + 6\sqrt[3]{x} \sin(\sqrt[3]{x})
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.83

$$\int \sin(\sqrt[3]{x}) dx = -3(-2 + x^{2/3}) \cos(\sqrt[3]{x}) + 6\sqrt[3]{x} \sin(\sqrt[3]{x})$$

[In] Integrate[Sin[x^(1/3)],x]

[Out] -3*(-2 + x^(2/3))*Cos[x^(1/3)] + 6*x^(1/3)*Sin[x^(1/3)]

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.74

| method | result | size |
|-------------------|--|------|
| derivativedivides | $6 \cos\left(x^{\frac{1}{3}}\right) - 3x^{\frac{2}{3}} \cos\left(x^{\frac{1}{3}}\right) + 6x^{\frac{1}{3}} \sin\left(x^{\frac{1}{3}}\right)$ | 26 |
| default | $6 \cos\left(x^{\frac{1}{3}}\right) - 3x^{\frac{2}{3}} \cos\left(x^{\frac{1}{3}}\right) + 6x^{\frac{1}{3}} \sin\left(x^{\frac{1}{3}}\right)$ | 26 |
| meijerg | $12\sqrt{\pi} \left(-\frac{1}{2\sqrt{\pi}} + \frac{\left(-\frac{x^{\frac{2}{3}}}{2} + 1\right) \cos\left(x^{\frac{1}{3}}\right)}{2\sqrt{\pi}} + \frac{x^{\frac{1}{3}} \sin\left(x^{\frac{1}{3}}\right)}{2\sqrt{\pi}} \right)$ | 40 |

[In] int(sin(x^(1/3)),x,method=_RETURNVERBOSE)

[Out] $6*\cos(x^{(1/3)})-3*x^{(2/3)}*\cos(x^{(1/3)})+6*x^{(1/3)}*\sin(x^{(1/3)})$

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.60

$$\int \sin(\sqrt[3]{x}) dx = -3 \left(x^{\frac{2}{3}} - 2 \right) \cos \left(x^{\frac{1}{3}} \right) + 6 x^{\frac{1}{3}} \sin \left(x^{\frac{1}{3}} \right)$$

[In] `integrate(sin(x^(1/3)),x, algorithm="fricas")`

[Out] $-3*(x^{(2/3)} - 2)*\cos(x^{(1/3)}) + 6*x^{(1/3)}*\sin(x^{(1/3)})$

Sympy [A] (verification not implemented)

Time = 0.15 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.97

$$\int \sin(\sqrt[3]{x}) dx = -3x^{\frac{2}{3}} \cos(\sqrt[3]{x}) + 6\sqrt[3]{x} \sin(\sqrt[3]{x}) + 6 \cos(\sqrt[3]{x})$$

[In] `integrate(sin(x**(1/3)),x)`

[Out] $-3*x^{(2/3)}*\cos(x^{(1/3)}) + 6*x^{(1/3)}*\sin(x^{(1/3)}) + 6*\cos(x^{(1/3)})$

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.60

$$\int \sin(\sqrt[3]{x}) dx = -3 \left(x^{\frac{2}{3}} - 2 \right) \cos \left(x^{\frac{1}{3}} \right) + 6 x^{\frac{1}{3}} \sin \left(x^{\frac{1}{3}} \right)$$

[In] `integrate(sin(x^(1/3)),x, algorithm="maxima")`

[Out] $-3*(x^{(2/3)} - 2)*\cos(x^{(1/3)}) + 6*x^{(1/3)}*\sin(x^{(1/3)})$

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.60

$$\int \sin(\sqrt[3]{x}) dx = -3 \left(x^{\frac{2}{3}} - 2 \right) \cos \left(x^{\frac{1}{3}} \right) + 6 x^{\frac{1}{3}} \sin \left(x^{\frac{1}{3}} \right)$$

[In] integrate(sin(x^(1/3)),x, algorithm="giac")

[Out] -3*(x^(2/3) - 2)*cos(x^(1/3)) + 6*x^(1/3)*sin(x^(1/3))

Mupad [B] (verification not implemented)

Time = 16.28 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.60

$$\int \sin(\sqrt[3]{x}) dx = 6 x^{1/3} \sin(x^{1/3}) - 3 \cos(x^{1/3}) (x^{2/3} - 2)$$

[In] int(sin(x^(1/3)),x)

[Out] 6*x^(1/3)*sin(x^(1/3)) - 3*cos(x^(1/3))*(x^(2/3) - 2)

3.101 $\int e^{1+x-x^2}(1-2x) dx$

| | |
|---|-----|
| Optimal result | 511 |
| Rubi [A] (verified) | 511 |
| Mathematica [A] (verified) | 512 |
| Maple [A] (verified) | 512 |
| Fricas [A] (verification not implemented) | 512 |
| Sympy [A] (verification not implemented) | 513 |
| Maxima [A] (verification not implemented) | 513 |
| Giac [A] (verification not implemented) | 513 |
| Mupad [B] (verification not implemented) | 513 |

Optimal result

Integrand size = 16, antiderivative size = 10

$$\int e^{1+x-x^2}(1-2x) dx = e^{1+x-x^2}$$

[Out] $\exp(-x^2+x+1)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.062$, Rules used = {2268}

$$\int e^{1+x-x^2}(1-2x) dx = e^{-x^2+x+1}$$

[In] $\text{Int}[E^{(1+x-x^2)}*(1-2*x), x]$

[Out] $E^{(1+x-x^2)}$

Rule 2268

$\text{Int}[(F_)^{((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)*((d_.) + (e_.)*(x_))}, x_Symbol]$
 $\rightarrow \text{Simp}[e*(F^{(a+b*x+c*x^2)/(2*c*Log[F])}), x] /;$ $\text{FreeQ}[\{F, a, b, c, d, e\}, x] \ \&\& \ \text{EqQ}[b*e - 2*c*d, 0]$

Rubi steps

$$\text{integral} = e^{1+x-x^2}$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int e^{1+x-x^2}(1-2x) dx = e^{1+x-x^2}$$

[In] Integrate[E^(1 + x - x^2)*(1 - 2*x),x]

[Out] E^(1 + x - x^2)

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

| method | result | size |
|-------------------|--|------|
| gospers | e^{-x^2+x+1} | 10 |
| derivativedivides | e^{-x^2+x+1} | 10 |
| default | e^{-x^2+x+1} | 10 |
| norman | e^{-x^2+x+1} | 10 |
| risch | e^{-x^2+x+1} | 10 |
| parallelrisch | e^{-x^2+x+1} | 10 |
| parts | $-\sqrt{\pi} e^{\frac{5}{4}} \operatorname{erf}\left(x - \frac{1}{2}\right) x + \frac{\sqrt{\pi} e^{\frac{5}{4}} \operatorname{erf}\left(x - \frac{1}{2}\right)}{2} + \frac{e^{\frac{5}{4}} \left(2 \operatorname{erf}\left(x - \frac{1}{2}\right) x \sqrt{\pi} - \operatorname{erf}\left(x - \frac{1}{2}\right) \sqrt{\pi} + 2 e^{-(x - \frac{1}{2})^2}\right)}{2}$ | 59 |

[In] int(exp(-x^2+x+1)*(1-2*x),x,method=_RETURNVERBOSE)

[Out] exp(-x^2+x+1)

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int e^{1+x-x^2}(1-2x) dx = e^{(-x^2+x+1)}$$

[In] integrate(exp(-x^2+x+1)*(1-2*x),x, algorithm="fricas")

[Out] e^(-x^2 + x + 1)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.70

$$\int e^{1+x-x^2}(1-2x) dx = e^{-x^2+x+1}$$

[In] integrate(exp(-x**2+x+1)*(1-2*x),x)

[Out] exp(-x**2 + x + 1)

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int e^{1+x-x^2}(1-2x) dx = e^{(-x^2+x+1)}$$

[In] integrate(exp(-x^2+x+1)*(1-2*x),x, algorithm="maxima")

[Out] e^(-x^2 + x + 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int e^{1+x-x^2}(1-2x) dx = e^{(-x^2+x+1)}$$

[In] integrate(exp(-x^2+x+1)*(1-2*x),x, algorithm="giac")

[Out] e^(-x^2 + x + 1)

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

$$\int e^{1+x-x^2}(1-2x) dx = e e^{-x^2} e^x$$

[In] int(-exp(x - x^2 + 1)*(2*x - 1),x)

[Out] exp(1)*exp(-x^2)*exp(x)

3.102 $\int e^{\sqrt{x}} \sqrt{x} dx$

| | |
|---|-----|
| Optimal result | 514 |
| Rubi [A] (verified) | 514 |
| Mathematica [C] (verified) | 515 |
| Maple [A] (verified) | 515 |
| Fricas [A] (verification not implemented) | 516 |
| Sympy [A] (verification not implemented) | 516 |
| Maxima [A] (verification not implemented) | 516 |
| Giac [A] (verification not implemented) | 516 |
| Mupad [B] (verification not implemented) | 517 |

Optimal result

Integrand size = 13, antiderivative size = 34

$$\int e^{\sqrt{x}} \sqrt{x} dx = 4e^{\sqrt{x}} - 4e^{\sqrt{x}} \sqrt{x} + 2e^{\sqrt{x}} x$$

[Out] $4*\exp(x^{(1/2)})-4*x^{(1/2)}*\exp(x^{(1/2)})+2*\exp(x^{(1/2)})*x$

Rubi [A] (verified)

Time = 0.03 (sec), antiderivative size = 34, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.231$, Rules used = {2247, 2207, 2225}

$$\int e^{\sqrt{x}} \sqrt{x} dx = 2e^{\sqrt{x}} x - 4e^{\sqrt{x}} \sqrt{x} + 4e^{\sqrt{x}}$$

[In] $\text{Int}[E^{\text{Sqrt}[x]} * \text{Sqrt}[x], x]$

[Out] $4 * E^{\text{Sqrt}[x]} - 4 * E^{\text{Sqrt}[x]} * \text{Sqrt}[x] + 2 * E^{\text{Sqrt}[x]} * x$

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m_
_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m]
] && !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a +
b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2247

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^(n_))*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] :> With[{k = Denominator[n]}, Dist[k/d, Subst[Int[x^(k*(m + 1) - 1)*F^(a + b*x^(k*n)), x], x, (c + d*x)^(1/k)], x]] /; FreeQ[{F, a, b, c, d, m, n}, x] && IntegerQ[2*((m + 1)/n)] && LtQ[0, (m + 1)/n, 5] && !IntegerQ[n]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= 2\text{Subst}\left(\int e^x x^2 dx, x, \sqrt{x}\right) \\
 &= 2e^{\sqrt{x}}x - 4\text{Subst}\left(\int e^x x dx, x, \sqrt{x}\right) \\
 &= -4e^{\sqrt{x}}\sqrt{x} + 2e^{\sqrt{x}}x + 4\text{Subst}\left(\int e^x dx, x, \sqrt{x}\right) \\
 &= 4e^{\sqrt{x}} - 4e^{\sqrt{x}}\sqrt{x} + 2e^{\sqrt{x}}x
 \end{aligned}$$

Mathematica [C] (verified)

Result contains higher order function than in optimal. Order 4 vs. order 3 in optimal.

Time = 0.00 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.32

$$\int e^{\sqrt{x}}\sqrt{x} dx = 2\Gamma(3, -\sqrt{x})$$

[In] Integrate[E^Sqrt[x]*Sqrt[x], x]

[Out] 2*Gamma[3, -Sqrt[x]]

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.56

| method | result | size |
|-------------------|--|------|
| meijerg | $-4 + \frac{2(3x-6\sqrt{x}+6)e^{\sqrt{x}}}{3}$ | 19 |
| derivativedivides | $4e^{\sqrt{x}} - 4\sqrt{x}e^{\sqrt{x}} + 2e^{\sqrt{x}}x$ | 24 |
| default | $4e^{\sqrt{x}} - 4\sqrt{x}e^{\sqrt{x}} + 2e^{\sqrt{x}}x$ | 24 |

[In] int(x^(1/2)*exp(x^(1/2)), x, method=_RETURNVERBOSE)

[Out] -4+2/3*(3*x-6*x^(1/2)+6)*exp(x^(1/2))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.41

$$\int e^{\sqrt{x}} \sqrt{x} dx = 2(x - 2\sqrt{x} + 2)e^{\sqrt{x}}$$

[In] integrate(x^(1/2)*exp(x^(1/2)),x, algorithm="fricas")

[Out] 2*(x - 2*sqrt(x) + 2)*e^sqrt(x)

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 31, normalized size of antiderivative = 0.91

$$\int e^{\sqrt{x}} \sqrt{x} dx = -4\sqrt{x}e^{\sqrt{x}} + 2xe^{\sqrt{x}} + 4e^{\sqrt{x}}$$

[In] integrate(x**(1/2)*exp(x**(1/2)),x)

[Out] -4*sqrt(x)*exp(sqrt(x)) + 2*x*exp(sqrt(x)) + 4*exp(sqrt(x))

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.41

$$\int e^{\sqrt{x}} \sqrt{x} dx = 2(x - 2\sqrt{x} + 2)e^{\sqrt{x}}$$

[In] integrate(x^(1/2)*exp(x^(1/2)),x, algorithm="maxima")

[Out] 2*(x - 2*sqrt(x) + 2)*e^sqrt(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.41

$$\int e^{\sqrt{x}} \sqrt{x} dx = 2(x - 2\sqrt{x} + 2)e^{\sqrt{x}}$$

[In] integrate(x^(1/2)*exp(x^(1/2)),x, algorithm="giac")

[Out] 2*(x - 2*sqrt(x) + 2)*e^sqrt(x)

Mupad [B] (verification not implemented)

Time = 17.72 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.68

$$\int e^{\sqrt{x}} \sqrt{x} dx = 4 e^{\sqrt{x}} + 2 x e^{\sqrt{x}} - 4 \sqrt{x} e^{\sqrt{x}}$$

[In] `int(x^(1/2)*exp(x^(1/2)),x)`

[Out] `4*exp(x^(1/2)) + 2*x*exp(x^(1/2)) - 4*x^(1/2)*exp(x^(1/2))`

3.103 $\int \cos(3x) \sin(2x) dx$

| | |
|---|-----|
| Optimal result | 518 |
| Rubi [A] (verified) | 518 |
| Mathematica [A] (verified) | 519 |
| Maple [A] (verified) | 519 |
| Fricas [A] (verification not implemented) | 519 |
| Sympy [B] (verification not implemented) | 520 |
| Maxima [A] (verification not implemented) | 520 |
| Giac [A] (verification not implemented) | 520 |
| Mupad [B] (verification not implemented) | 520 |

Optimal result

Integrand size = 9, antiderivative size = 15

$$\int \cos(3x) \sin(2x) dx = \frac{\cos(x)}{2} - \frac{1}{10} \cos(5x)$$

[Out] 1/2*cos(x)-1/10*cos(5*x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {4369}

$$\int \cos(3x) \sin(2x) dx = \frac{\cos(x)}{2} - \frac{1}{10} \cos(5x)$$

[In] Int[Cos[3*x]*Sin[2*x],x]

[Out] Cos[x]/2 - Cos[5*x]/10

Rule 4369

Int[cos[(c_.) + (d_.)*(x_)]*sin[(a_.) + (b_.)*(x_)], x_Symbol] :> Simp[-Cos[a - c + (b - d)*x]/(2*(b - d)), x] - Simp[Cos[a + c + (b + d)*x]/(2*(b + d)), x] /; FreeQ[{a, b, c, d}, x] && NeQ[b^2 - d^2, 0]

Rubi steps

$$\text{integral} = \frac{\cos(x)}{2} - \frac{1}{10} \cos(5x)$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int \cos(3x) \sin(2x) dx = \frac{\cos(x)}{2} - \frac{1}{10} \cos(5x)$$

[In] Integrate[Cos[3*x]*Sin[2*x],x]

[Out] Cos[x]/2 - Cos[5*x]/10

Maple [A] (verified)

Time = 0.10 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.80

| method | result | size |
|---------------|---|------|
| default | $\frac{\cos(x)}{2} - \frac{\cos(5x)}{10}$ | 12 |
| risch | $\frac{\cos(x)}{2} - \frac{\cos(5x)}{10}$ | 12 |
| parallelrisch | $\frac{\cos(x)}{2} - \frac{\cos(5x)}{10} - \frac{2}{5}$ | 13 |
| norman | $\frac{-\frac{4 \tan(x)^2}{5} - \frac{4 \tan\left(\frac{3x}{2}\right)^2}{5} + \frac{12 \tan(x) \tan\left(\frac{3x}{2}\right)}{5}}{\left(1 + \tan(x)^2\right) \left(1 + \tan\left(\frac{3x}{2}\right)^2\right)}$ | 43 |

[In] int(sin(2*x)*cos(3*x),x,method=_RETURNVERBOSE)

[Out] 1/2*cos(x)-1/10*cos(5*x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \cos(3x) \sin(2x) dx = -\frac{8}{5} \cos(x)^5 + 2 \cos(x)^3$$

[In] integrate(sin(2*x)*cos(3*x),x, algorithm="fricas")

[Out] -8/5*cos(x)^5 + 2*cos(x)^3

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 26 vs. $2(10) = 20$.

Time = 0.13 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.73

$$\int \cos(3x) \sin(2x) dx = \frac{3 \sin(2x) \sin(3x)}{5} + \frac{2 \cos(2x) \cos(3x)}{5}$$

[In] integrate(sin(2*x)*cos(3*x),x)

[Out] 3*sin(2*x)*sin(3*x)/5 + 2*cos(2*x)*cos(3*x)/5

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.73

$$\int \cos(3x) \sin(2x) dx = -\frac{1}{10} \cos(5x) + \frac{1}{2} \cos(x)$$

[In] integrate(sin(2*x)*cos(3*x),x, algorithm="maxima")

[Out] -1/10*cos(5*x) + 1/2*cos(x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.73

$$\int \cos(3x) \sin(2x) dx = -\frac{1}{10} \cos(5x) + \frac{1}{2} \cos(x)$$

[In] integrate(sin(2*x)*cos(3*x),x, algorithm="giac")

[Out] -1/10*cos(5*x) + 1/2*cos(x)

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \cos(3x) \sin(2x) dx = 2 \cos(x)^3 - \frac{8 \cos(x)^5}{5}$$

[In] int(cos(3*x)*sin(2*x),x)

[Out] 2*cos(x)^3 - (8*cos(x)^5)/5

3.104 $\int (1 + 2 \sin(x)) dx$

| | |
|---|-----|
| Optimal result | 521 |
| Rubi [A] (verified) | 521 |
| Mathematica [A] (verified) | 522 |
| Maple [A] (verified) | 522 |
| Fricas [A] (verification not implemented) | 522 |
| Sympy [A] (verification not implemented) | 523 |
| Maxima [A] (verification not implemented) | 523 |
| Giac [A] (verification not implemented) | 523 |
| Mupad [B] (verification not implemented) | 523 |

Optimal result

Integrand size = 6, antiderivative size = 6

$$\int (1 + 2 \sin(x)) dx = x - 2 \cos(x)$$

[Out] x-2*cos(x)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {2718}

$$\int (1 + 2 \sin(x)) dx = x - 2 \cos(x)$$

[In] Int[1 + 2*Sin[x],x]

[Out] x - 2*Cos[x]

Rule 2718

Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Cos[c + d*x]/d, x] /; FreeQ[{c, d}, x]

Rubi steps

$$\begin{aligned} \text{integral} &= x + 2 \int \sin(x) dx \\ &= x - 2 \cos(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (1 + 2 \sin(x)) dx = x - 2 \cos(x)$$

[In] Integrate[1 + 2*Sin[x],x]

[Out] x - 2*Cos[x]

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.17

| method | result | size |
|--------------|---|------|
| default | $x - 2 \cos(x)$ | 7 |
| risch | $x - 2 \cos(x)$ | 7 |
| parts | $x - 2 \cos(x)$ | 7 |
| parallelrisc | $-2 - 2 \cos(x) + x$ | 8 |
| norman | $\frac{x + x \tan(\frac{x}{2})^2 - 4}{1 + \tan(\frac{x}{2})^2}$ | 23 |

[In] int(1+2*sin(x),x,method=_RETURNVERBOSE)

[Out] x-2*cos(x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (1 + 2 \sin(x)) dx = x - 2 \cos(x)$$

[In] integrate(1+2*sin(x),x, algorithm="fricas")

[Out] x - 2*cos(x)

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int (1 + 2 \sin(x)) dx = x - 2 \cos(x)$$

[In] integrate(1+2*sin(x),x)

[Out] x - 2*cos(x)

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (1 + 2 \sin(x)) dx = x - 2 \cos(x)$$

[In] integrate(1+2*sin(x),x, algorithm="maxima")

[Out] x - 2*cos(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (1 + 2 \sin(x)) dx = x - 2 \cos(x)$$

[In] integrate(1+2*sin(x),x, algorithm="giac")

[Out] x - 2*cos(x)

Mupad [B] (verification not implemented)

Time = 18.42 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int (1 + 2 \sin(x)) dx = x - 2 \cos(x)$$

[In] int(2*sin(x) + 1,x)

[Out] x - 2*cos(x)

3.105 $\int (1 - x)^{2014} x dx$

| | |
|---|------|
| Optimal result | 524 |
| Rubi [A] (verified) | 524 |
| Mathematica [B] (verified) | 525 |
| Maple [B] (verified) | 525 |
| Fricas [F(-2)] | 525 |
| Sympy [B] (verification not implemented) | 526 |
| Maxima [B] (verification not implemented) | 792 |
| Giac [B] (verification not implemented) | 1057 |
| Mupad [B] (verification not implemented) | 1323 |

Optimal result

Integrand size = 9, antiderivative size = 23

$$\int (1 - x)^{2014} x dx = -\frac{(1 - x)^{2015}}{2015} + \frac{(1 - x)^{2016}}{2016}$$

[Out] -1/2015*(1-x)^2015+1/2016*(1-x)^2016

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {45}

$$\int (1 - x)^{2014} x dx = \frac{(1 - x)^{2016}}{2016} - \frac{(1 - x)^{2015}}{2015}$$

[In] Int[(1 - x)^2014*x,x]

[Out] -1/2015*(1 - x)^2015 + (1 - x)^2016/2016

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] :> Int [ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x], x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && Le Q[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rubi steps

$$\begin{aligned} \text{integral} &= \int ((1 - x)^{2014} - (1 - x)^{2015}) dx \\ &= -\frac{(1 - x)^{2015}}{2015} + \frac{(1 - x)^{2016}}{2016} \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 12138 vs. $2(23) = 46$.

Time = 0.13 (sec) , antiderivative size = 12138, normalized size of antiderivative = 527.74

$$\int (1-x)^{2014} x dx = \text{Result too large to show}$$

[In] Integrate[(1 - x)^2014*x,x]

[Out] Result too large to show

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 10075 vs. $2(19) = 38$.

Time = 7.62 (sec) , antiderivative size = 10076, normalized size of antiderivative = 438.09

| method | result | size |
|---------------|---------------------------------|-------|
| gospers | Expression too large to display | 10076 |
| default | Expression too large to display | 10077 |
| risch | Expression too large to display | 10077 |
| parallelrisch | Expression too large to display | 10077 |

[In] int(x*(1-x)^2014,x,method=_RETURNVERBOSE)

[Out] result too large to display

Fricas [F(-2)]

Exception generated.

$$\int (1-x)^{2014} x dx = \text{Exception raised: RuntimeError}$$

[In] integrate(x*(1-x)^2014,x, algorithm="fricas")

[Out] Exception raised: RuntimeError >> System error: Heap exhausted (no more space for allocation).2293760 bytes available, 2557536 requested.PROCEED WITH CAUTION.

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 12024 vs. $2(12) = 24$.

Time = 2.41 (sec) , antiderivative size = 12024, normalized size of antiderivative = 522.78

$$\int (1-x)^{2014} x dx = \text{Too large to display}$$

[In] integrate(x*(1-x)**2014,x)

[Out] $x^{2016}/2016 - 2014x^{2015}/2015 + 2013x^{2014}/2 - 2026084x^{2013}/3 + 1358826667x^{2012}/4 - 136629987582x^{2011} + 1373131035323509x^{2010}/30 - 91953985549170536x^{2009}/7 + 26377651026988133103x^{2008}/8 - 6617491558542444915874x^{2007}/9 + 294992994835264731661117x^{2006}/2 - 134422910799097740606580164x^{2005}/5 + 53876689232818214844524454823x^{2004}/12 - 691762702790623489451562620638x^{2003} + 2571973087266166342850029070691063x^{2002}/26 - 39588591248274824267756569403940400x^{2001}/3 + 131961937837090040663501674882660163383x^{2000}/80 - 193964593913505209402992927651733959950x^{1999} + 387541161559807075301489477559812273935075x^{1998}/18 - 2262922530915969121458419278661196219696900x^{1997} + 903358447595910292527771972191922410542659825x^{1996}/4 - 21454757739792727450218123378990236305630977010x^{1995} + 3889161470317168646281025630946632817062982660525x^{1994}/2 - 168502105628944447818705199670044187130493533353400x^{1993} + 111885369941148961252482398045233357984870743212666075x^{1992}/8 - 1113818576786312843600553552092286915421060813044865230x^{1991} + 170499877545918079073432876733170209565984828166917578371x^{1990}/2 - 734769036554419859459683303160816263037237362099897570964140x^{1989}/117 + 1783541483599579507954055928245847409394570340210724349640535x^{1988}/4 - 30550827847475767604775649853836796394905428348789090875481890x^{1987} + 12134785744398256314996786936077927810352871698504752093214631735x^{1986}/6 - 129502922523593280492136994687090590798244450408627036948442699584x^{1985} + 7964945723407916692243386031594277710664745455362659645679567475797155x^{1984}/992 - 1447441656241185612618749471839715621192639755423719013224856987762340x^{1983}/3 + 28125770905652554308973525362902431630707416661449962135634978911861255x^{1982} - 1591918227609528492506862969541498328323111814372651235402040612137475080x^{1981} + 1575998643333880780933185120941293056782727079281496851166395104490693223777x^{1980}/18 - 4683033812006962024438255993532176273777170532620461943334529407905781402420x^{1979} + 243764171383939582809061001601068990795547409624002219219883316766423225728865x^{1978} - 37070895655847111385453234444800707383220081936223576743436134792982165581556720x^{1977}/3 + 31742564123997639240757908526821868866411524435554862316447839037129021749036585525x^{1976}/52 - 29405041309901956341188419072725681104134131163443548404833409099760693787449612268x^{1975} + 4146109760683970391004500755905823687091180545350679873368223491236430795491757775525x^{1974}/3 - 63412964778336184585839720798751223807459136568252263550556300343764105256910301716600x^{1973} + 5684106108$

463777496364455720240876368514714260586800253709270268295316442312451914078
575*x**1972/2 - 11203370255912948436822167508990647463957738482038571840497
16971541571645243688771886809300*x**1971/9 + 533107094617355816419170566510
6340855860384427916943943845315658965048010562527907902040665*x**1970 - 223
337786925829485322981480991438350221372508041201117237722302034525923462936
129127215408800*x**1969 + 7325477519756409982503977849372489274131358529905
6307138160140869975075852658475240572087079675*x**1968/8 - 2573073313780892
656182942719993545807672157537925368302641529369583213434895514150007213443
740700*x**1967/7 + 14453316646020616414051419806563949347846356733759521758
169481834749898741394522590424547417732285*x**1966 - 5568776441971192794764
184941493796213809180355530995922882422723933577110995591886912082290923107
76*x**1965 + 42065669602328983454644988159758954775468201354159354767262170
532890818036890454346362487193259926655*x**1964/2 - 10127108905672074866716
134495513810074049503443438355901587873018991904643082375127060735008804049
547340*x**1963/13 + 2547356732218368808068451666327803104686436046670043326
85617284023675830425396294703455768279984362513795*x**1962/9 - 100916469754
973309008528860784251421869215186502357434768819760899018319803591237124743
9438789779967687120*x**1961 + 988981146158764563555753732295712954085089773
602729130230773532270173159028459930987702066483515289307875639*x**1960/28
- 3641754812942163592621144153796255272209301318341529098880465874988579919
304712880932120180334504864257742540*x**1959/3 + 40980195768992485650787266
723287875856054581998136074879102742342919244118363195990927194823828420896
033237685*x**1958 - 1359291901349214321338405479553195610468798911828009406
507555490127093365391727648159674832991084850660654090760*x**1957 + 2658774
264104553320301560515549261476451402947200764401168959260797239752004089733
92729321685058600107994356274635*x**1956/6 - 142019189244195789127950631390
460924702985156427711687275353798579924104732347757064326148866436684837694
7188162908*x**1955 + 447589392099830459773388933347137149207859948603354912
05908266637912877071032782750326842694817487942770394173511915*x**1954 - 38
711996373295014474180005820501525886753131039512588036622439427768797965385
4440427570625898672156578726484398554499520*x**1953/279 + 13542257542778944
996769373450066325282668737464309001404102270882813485497266111918338452965
92767838728398462456726127035*x**1952/32 - 12702373809987426624340314409852
063181590871122340067949516737937236636832392098826529661162300180137739462
76932756951550*x**1951 + 29273190127335381667652982547362460846021882334440
59759876936150885113595062674145198800608483955919610555723691231136673893*
x**1950/78 - 10917227810673924532402382010342478295040439181878629707236530
83082062995026551931500896668273578132567287194686620435707700*x**1949 + 12
509855394627302042783221470525617047235426888752380053732209582469965253702
8677802942598435431566626026163170035711657244725*x**1948/4 - 2647465437841
737210100208694325733754694872498006835059887479619866896900664280654992168
697046858412152882849614103838882430950*x**1947/3 + 49066346491187991322794
654762749160875350330767824371315097121737719619618162161095285413406632427
073155847679960818475120936725*x**1946/2 - 67207055421441746509983680089501
568330247767733306066284052273385971623261659832475951702004856160902276812

1632340400995785171560*x**1945 + 130650481167752188630147723690863430777639
350675312562143200559764657340779296723767492662220227411333038004390176684
2241361416833025*x**1944/72 - 482979105150904776446052619096774027551994988
212645244496688368551670768013144791913698647822912181123422663879082922229
313126363150*x**1943 + 2534986955408511273432118384104805559705200092869716
936038027299365567292936173047938907052564034781832848091845979078168938458
7918675*x**1942/2 - 3280272249617880148524828222478850369252326033276593220
740012739073943831286681516279881003741696637423877221043410358035346819415
82860*x**1941 + 33493297228403700784340463845071022167302455253699818146999
162248415507133713302409086933982097790892327365396749208301930204162253372
499*x**1940/4 - 21085547419605426869001381205935316681990714698706703864563
285782705764532655837011562448080610018950339417531708326931966040064986512
2690*x**1939 + 104778923125999715895253836353422399000870646273100318545146
946315227126537566744527821094554818045836971301315847685625064337826200864
22685*x**1938/2 - 166989706330477827732598651718323647750615341498594705620
252271630468987979314086879857215399987916830706626223523239036318661738635
2918832240*x**1937/13 + 497372284924294575441365498658765315095234113472803
022220072662139862254847685340483120176219499134721541125409453539904506352
88403547705900545*x**1936/16 - 22278127645568737827033344014380764943381398
378835204601743340790123021476873621833250432561552276871035835950151758194
5091682771183229263060774*x**1935/3 + 3502917670514845863706934675633682500
559156654697209192295075434082469207259550356567853880653637793358187848400
882770517455718009807583130441485*x**1934/2 - 40789988222522813628826522641
904858105414774868941671851919551413758304412564347797952826964814508228140
753175025142457398846542533392493956884060*x**1933 + 3752677911099225381437
231130414937325643488445618497239794131710457378573679857378749829311936478
954600399845667501535905635777830292297421148241415*x**1932/4 - 21312997361
608352321698434139345663177211463089049300526783998776441732309371104577919
416250611181750930311829486631472604104034700826616705883444510*x**1931 + 9
566063689511698994426096593229849550925629792617984152659017985102907848830
47572854409635769193159330745482628544693163893897032812078126775858977851*
x**1930/2 - 106051332747062716153981523591140664190773331079539823955626798
124474369489915426982421135097173763834399253102379290831726752191742939144
00463709655240*x**1929 + 18587901320950812354838056479021455466741389246616
233564261066028514146086553767286721856951335234957150307376690944899648743
11072989408506830389176131365*x**1928/8 - 503074103924739203832921950265678
903469646809737722994267668902246100484097147918485888728108165493846791576
4627516212713689261840931072861590960055090530*x**1927 + 645946975305026638
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+ 2124961599913227308890449941329789613696659687449575037149029991134757264
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*148/4 - 357767779296076238729358991319075481592092232082269895333657997074
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8671841794904293951538612869143582087068611*x**134/2 - 79950737038220672539
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452696644349*x**130/130 - 1833972793440014843864470923911648781120671565474
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1264*x**129 + 3978545587252087286418382831891491258090567036171238375262811
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32 - 8358323889134575192285485997562813279023796226934653343778348660736321
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3600*x**117/39 + 5985551046863248779632127896229619942609402215412892972813
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14 - 1288408509275026015648775827938522824671078317321034452185058775310826
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31 + 9015173003170154387140715707544827296850570529235942049087251696421998
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*88/8 - 4730505506352382567034445554376606390252337382178643599680448464058
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+ 1420761026303826593501254566985236220893296866928560988828060064355915046
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75*x**48/8 - 52202938000956078886469248605722378608654143139711643256784684
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7335969565012105426885525739601486445952425095287950506903727683168764*x**3
5 + 468526219023995099543728590093781041803808556197803508569386322105715*x
**34 - 23369391019030241979717448586715892975865021278284060758423523515840
*x**33/3 + 4016614081395822840263936475841794105226800532205072942854043104
285*x**32/32 - 607044949329343502306892162595737144366770861290439235695825
15430*x**31/31 + 1772840234697982030906331592676372324938202918169460003542
69179*x**30/6 - 43072667660086681416602124668047849902182879847235374849622
0*x**29 + 24235339736884069811152244621357765502593557718011855782735*x**28
/4 - 739204262127182957202900707405247749534444026257442224310*x**27/9 + 27
859457115346091351868117113263106138232815059953852675*x**26/26 - 134329878
60739451380107178517695922598042944478933048*x**25 + 1292497995302072380114
060851351264306203931237514475*x**24/8 - 1860967030038543098399354614829805
279553643440650*x**23 + 40979624122759930542850746738524480260071568425*x**
22/2 - 215193156868532873121545871404114707177843300*x**21 + 86034137866277
17071693066401827832481358665*x**20/4 - 20407117012268258610346466440832430
838950*x**19 + 3299048445927251016587541872066504084575*x**18/18 - 15532700
21329371046270213634848720400*x**17 + 198041927719494808399452238443211851*
x**16/16 - 1385600693689618849371479929137914*x**15/15 + 128534387169723455
4147940565063*x**14/2 - 53903587230438193983238645764*x**13/13 + 2958779738
19770525856100351*x**12/12 - 134154601595905928749082*x**11 + 6620790407774
021408853*x**10/10 - 26390793852611943832*x**9/9 + 91999779366675103*x**8/8

- 274762905027402*x**7/7 + 683489813501*x**6/6 - 1359502364*x**5/5 + 2027091*x**4/4 - 2014*x**3/3 + x**2/2

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 10076 vs. 2(15) = 30.

Time = 2.29 (sec) , antiderivative size = 10076, normalized size of antiderivative = 438.09

$$\int (1-x)^{2014} x dx = \text{Too large to display}$$

[In] integrate(x*(1-x)^2014,x, algorithm="maxima")

[Out] 1/2016*x^2016 - 2014/2015*x^2015 + 2013/2*x^2014 - 2026084/3*x^2013 + 1358826667/4*x^2012 - 136629987582*x^2011 + 1373131035323509/30*x^2010 - 91953985549170536/7*x^2009 + 26377651026988133103/8*x^2008 - 6617491558542444915874/9*x^2007 + 294992994835264731661117/2*x^2006 - 134422910799097740606580164/5*x^2005 + 53876689232818214844524454823/12*x^2004 - 691762702790623489451562620638*x^2003 + 2571973087266166342850029070691063/26*x^2002 - 39588591248274824267756569403940400/3*x^2001 + 131961937837090040663501674882660163383/80*x^2000 - 193964593913505209402992927651733959950*x^1999 + 387541161559807075301489477559812273935075/18*x^1998 - 2262922530915969121458419278661196219696900*x^1997 + 903358447595910292527771972191922410542659825/4*x^1996 - 21454757739792727450218123378990236305630977010*x^1995 + 3889161470317168646281025630946632817062982660525/2*x^1994 - 168502105628944447818705199670044187130493533353400*x^1993 + 111885369941148961252482398045233357984870743212666075/8*x^1992 - 1113818576786312843600553552092286915421060813044865230*x^1991 + 170499877545918079073432876733170209565984828166917578371/2*x^1990 - 734769036554419859459683303160816263037237362099897570964140/117*x^1989 + 1783541483599579507954055928245847409394570340210724349640535/4*x^1988 - 30550827847475767604775649853836796394905428348789090875481890*x^1987 + 12134785744398256314996786936077927810352871698504752093214631735/6*x^1986 - 129502922523593280492136994687090590798244450408627036948442699584*x^1985 + 7964945723407916692243386031594277710664745455362659645679567475797155/992*x^1984 - 1447441656241185612618749471839715621192639755423719013224856987762340/3*x^1983 + 28125770905652554308973525362902431630707416661449962135634978911861255*x^1982 - 1591918227609528492506862969541498328323111814372651235402040612137475080*x^1981 + 1575998643333880780933185120941293056782727079281496851166395104490693223777/18*x^1980 - 4683033812006962024438255993532176273777170532620461943334529407905781402420*x^1979 + 243764171383939582809061001601068990795547409624002219219883316766423225728865*x^1978 - 37070895655847111385453234444800707383220081936223576743436134792982165581556720/3*x^1977 + 31742564123997639240757908526821868866411524435554862316447839037129021749036585525/52*x^1976 - 29405041309901956341188419072725681104134131163443548404833409099760693787449612268*x^1975 + 41461097606839703910

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- 6341296477833618458583972079875122380745913656825226355055630034376410525
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5 + 24765968121566009837816566150869575559776638753886737943421121446027860

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/4*x¹⁹⁰⁴ - 218799373628669596586068895065988429689677764245054243576426945
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/15*x¹⁸⁹⁰ - 12524218652925458700821426637617929738727720060676686915121843
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86568791899788748321641019989600/7*x⁴⁹ + 175036829399365159724294336004324
8581007492887166063261562545308026857430134696663094503351675/8*x⁴⁸ - 5220
293800095607888646924860572237860865414313971164325678468441863918942731230
660493856100*x⁴⁷ + 1218375787596801002481598552208153065077284404551866315
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232914423375289832343197049516115649315934376805057370360/9*x⁴⁵ + 12400637
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0 - 92677239139617778463633086112001768458050204840558941858590336982455413
95389180/39*x³⁹ + 45621013359664969974381674553563746380552625979201224639
02722670894111963565*x³⁸ - 85232162402553403882597176828694815902921202818
168164792741687909306436040*x³⁷ + 2787263896750168132019276363463630974603

```

1049911496912476414264101654503705/18*x^36 - 273359695650121054268855257396
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0093781041803808556197803508569386322105715*x^34 - 233693910190302419797174
48586715892975865021278284060758423523515840/3*x^33 + 401661408139582284026
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30689216259573714436677086129043923569582515430/31*x^31 + 17728402346979820
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66021246680478499021828798472353748496220*x^29 + 24235339736884069811152244
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7749534444026257442224310/9*x^27 + 2785945711534609135186811711326310613823
2815059953852675/26*x^26 - 134329878607394513801071785176959225980429444789
33048*x^25 + 1292497995302072380114060851351264306203931237514475/8*x^24 -
1860967030038543098399354614829805279553643440650*x^23 + 409796241227599305
42850746738524480260071568425/2*x^22 - 215193156868532873121545871404114707
177843300*x^21 + 8603413786627717071693066401827832481358665/4*x^20 - 20407
117012268258610346466440832430838950*x^19 + 3299048445927251016587541872066
504084575/18*x^18 - 1553270021329371046270213634848720400*x^17 + 1980419277
19494808399452238443211851/16*x^16 - 1385600693689618849371479929137914/15*
x^15 + 1285343871697234554147940565063/2*x^14 - 539035872304381939832386457
64/13*x^13 + 295877973819770525856100351/12*x^12 - 134154601595905928749082
*x^11 + 6620790407774021408853/10*x^10 - 26390793852611943832/9*x^9 + 91999
779366675103/8*x^8 - 274762905027402/7*x^7 + 683489813501/6*x^6 - 135950236
4/5*x^5 + 2027091/4*x^4 - 2014/3*x^3 + 1/2*x^2

```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 10076 vs. $2(15) = 30$.

Time = 1.64 (sec) , antiderivative size = 10076, normalized size of antiderivative = 438.09

$$\int (1-x)^{2014} x dx = \text{Too large to display}$$

```
[In] integrate(x*(1-x)^2014,x, algorithm="giac")
```

```

[Out] 1/2016*x^2016 - 2014/2015*x^2015 + 2013/2*x^2014 - 2026084/3*x^2013 + 13588
26667/4*x^2012 - 136629987582*x^2011 + 1373131035323509/30*x^2010 - 9195398
5549170536/7*x^2009 + 26377651026988133103/8*x^2008 - 661749155854244491587
4/9*x^2007 + 294992994835264731661117/2*x^2006 - 13442291079909774060658016
4/5*x^2005 + 53876689232818214844524454823/12*x^2004 - 69176270279062348945
1562620638*x^2003 + 2571973087266166342850029070691063/26*x^2002 - 39588591
248274824267756569403940400/3*x^2001 + 131961937837090040663501674882660163
383/80*x^2000 - 193964593913505209402992927651733959950*x^1999 + 3875411615
59807075301489477559812273935075/18*x^1998 - 226292253091596912145841927866
1196219696900*x^1997 + 903358447595910292527771972191922410542659825/4*x^19
96 - 21454757739792727450218123378990236305630977010*x^1995 + 3889161470317

```

168646281025630946632817062982660525/2*x¹⁹⁹⁴ - 168502105628944447818705199
 670044187130493533353400*x¹⁹⁹³ + 11188536994114896125248239804523335798487
 0743212666075/8*x¹⁹⁹² - 11138185767863128436005535520922869154210608130448
 65230*x¹⁹⁹¹ + 170499877545918079073432876733170209565984828166917578371/2*
 x¹⁹⁹⁰ - 734769036554419859459683303160816263037237362099897570964140/117*x¹⁹⁸⁹
 + 1783541483599579507954055928245847409394570340210724349640535/4*x¹⁹⁸⁸
 - 30550827847475767604775649853836796394905428348789090875481890*x¹⁹⁸⁷
 + 12134785744398256314996786936077927810352871698504752093214631735/6*x¹⁹⁸⁶
 - 129502922523593280492136994687090590798244450408627036948442699584*x¹⁹⁸⁵
 + 796494572340791669224338603159427771066474545536265964567956747579715
 5/992*x¹⁹⁸⁴ - 144744165624118561261874947183971562119263975542371901322485
 6987762340/3*x¹⁹⁸³ + 28125770905652554308973525362902431630707416661449962
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 72651235402040612137475080*x¹⁹⁸¹ + 157599864333388078093318512094129305678
 2727079281496851166395104490693223777/18*x¹⁹⁸⁰ - 4683033812006962024438255
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 9582809061001601068990795547409624002219219883316766423225728865*x¹⁹⁷⁸ - 3
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 - 6341296477833618458583972079875122380745913656825226355055630034376410525
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 201117237722302034525923462936129127215408800*x¹⁹⁶⁹ + 73254775197564099825
 039778493724892741313585299056307138160140869975075852658475240572087079675
 /8*x¹⁹⁶⁸ - 257307331378089265618294271999354580767215753792536830264152936
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 - 55687764419711927947641849414937962138091803555309959228824227239335771
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 *x¹⁹⁶² - 10091646975497330900852886078425142186921518650235743476881976089
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 98880465874988579919304712880932120180334504864257742540/3*x¹⁹⁵⁹ + 4098019
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*x¹⁹⁵⁷ + 26587742641045533203015605155492614764514029472007644011689592607
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+ 12509855394627302042783221470525617047235426888752380053732209582469
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2499/4*x¹⁹⁴⁰ - 21085547419605426869001381205935316681990714698706703864563
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/4*x¹⁹⁰⁴ - 218799373628669596586068895065988429689677764245054243576426945
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542069262630592590023180784906443421395963388*x⁸⁵ + 1613010184470407595335
526586351319513352716421472476804261589497503689392104754854667197477424794
16484636554733507316147160937110261139661292234095/4*x⁸⁴ - 173125208811949
830101644661316573414319048216317454300820776563971437937982933567258391915
6891713082146760745523841450055230546836303408128604810*x⁸³ + 146785479209
364984459524939848074641772008116415144306557631200290056909357487624874286
686152583890978796283352546044703525045607239738351560145/2*x⁸² - 92153578
678671097526508144837148975980895132901076337545991068418295848921917773870
73601886888222076953810113816652820893140962613577218740880/3*x⁸¹ + 203061
553018187449405001934852932609263687312477268417340494781958910171229804350
8949172812472373728320503819501128147413746867071772748716353/16*x⁸⁰ - 517
530081602720540493590862763399734764303744313826567004914064970461739605312
2527268302130164914777811155771390183027985082491899854087290*x⁷⁹ + 541474

971859193162680170832161981525038056359934813726709819789682717365328365055
6135720993772476194259590739141122008812049672897628554005/26*x⁷⁸ - 826884
212533546151725544361017071242431008419557125641747579834615912334613954392
6102920815925497627584085306552285071359231398033926380*x⁷⁷ + 129551175457
982339289609839524514010445986804746131323415417079351787675865317054186772
5656862988301662997630096024044685283812361528075/4*x⁷⁶ - 1251237868410943
974179573651873375914044701682796226280076087333461195069666053774251088630
2932244905637469812227441571887405393648006*x⁷⁵ + 953395403116029484598375
280987381792161152018441470048072004084769121135416489605870892399985443271
889736788793181209203155628499775/2*x⁷⁴ - 17906537369137561227660035311517
883616757795649490451907189270100782850307387448515852884986225374377387452
007875370958038385735400*x⁷³ + 4774155513592591555707919908415493353171587
183709311328958949945080118988847178274571270724465335154218063979260187637
6292671433425/72*x⁷² - 242000713966096823852821893326394536168587641014990
979417883700463889589933960302125340490758226916829186052028106111469675730
50*x⁷¹ + 17406570220524274556672653874702787148581865413778311674764531619
03678022443799031143801298230147798482135470394496902202233745/2*x⁷⁰ - 925
116391434933865810967066876412617262339824586149969539304286489974251002934
65847619461150661033929288814888879270834535100/3*x⁶⁹ + 430488090107873259
818426213931800894794439446094714670570137669247810822803334433117470677718
2288117074346652487104612755725/4*x⁶⁸ - 3698855418400816320013127375167369
442878177546221712323807038166499802755223430568740204317559350962496968934
7698638992150*x⁶⁷ + 750979736463196040729937982230950765675266350293499168
7729441125923841957574843881987687553832621651130209655441844886285/6*x⁶⁶
- 5419679492261302026385200814870213624145438345531762325127141519887631715
15396216598598876258141019210217078157976299328/13*x⁶⁵ + 43729483608153435
919860098788015299477607916978547774908172376505240880898399028747069325312
836685720086675107521140955/32*x⁶⁴ - 3966393071034325253502049776690730111
347656868802519266047381088910737496453426643725108871912624555109902504083
55020/9*x⁶³ + 433380205049042191209154364034529620661578680393724597390540
35950995007957666662663014879434664551817603080072765505/31*x⁶² - 43608758
212137908637037041368616455896515401154875646041562067117683962558551000122
106289314156607422014755010120*x⁶¹ + 8023922331568728690424146824419766092
615487155235043461328316950743587998375513775023544746505604811443307938723
/6*x⁶⁰ - 40306201573749708914942493769982282928011419675881669518117698582
500723513660635783875838606075113158649252180*x⁵⁹ + 1193597935019198611187
978642425860461826832485382604122692312883774346916068830951192054218169759
831923298185*x⁵⁸ - 1041564195734224520872237347357458096239636740690120682
00871342696302592176232850527169933656145185086023280/3*x⁵⁷ + 277661883811
802200079461231629730538410821529087034722627322839585806655163681961226766
78742518295514003655/28*x⁵⁶ - 27803517177390605543166114705865187657845000
362894395293450342288505047292826157167021290660534754211788*x⁵⁵ + 6884747
924914510292076896395480548931584962288297414396908575243883130552037737694
687993737296874662535/9*x⁵⁴ - 20646501336742252531531364924594923698367998
865317749034837661608546186836049694448645739059743220280*x⁵³ + 1420761026

303826593501254566985236220893296866928560988828060064355915046279081570638
 7330111630836155/26*x⁵² - 141771294347535458115177824376114974893309072187
 65264569456269663782019121679205414745627013551700*x⁵¹ + 36041349397201537
 113919571018912647228726283967135703111974789308027737319507969818361466843
 2001*x⁵⁰ - 628217289224226080858500765817345873694117811904464285487250303
 86568791899788748321641019989600/7*x⁴⁹ + 175036829399365159724294336004324
 8581007492887166063261562545308026857430134696663094503351675/8*x⁴⁸ - 5220
 293800095607888646924860572237860865414313971164325678468441863918942731230
 660493856100*x⁴⁷ + 1218375787596801002481598552208153065077284404551866315
 25159575750851782872175599723510325*x⁴⁶ - 25022755901531458437572353827187
 232914423375289832343197049516115649315934376805057370360/9*x⁴⁵ + 12400637
 375136602351277097715391054482299985449276124348528595714698052106516257346
 7975/2*x⁴⁴ - 1350580385745496831949933201596121399550346722041883909291767
 045861101633260767075100*x⁴³ + 8615838833656502079634289457280221549454556
 6325077483430358420243635916175956446425/3*x⁴² - 5958468350537377171466751
 58515211369891269121852959440827424703135981637030387280*x⁴¹ + 48216553099
 743249479632266116691446379359277623627638961692920056398514049169497/4*x⁴⁰
 0 - 92677239139617778463633086112001768458050204840558941858590336982455413
 95389180/39*x³⁹ + 45621013359664969974381674553563746380552625979201224639
 02722670894111963565*x³⁸ - 85232162402553403882597176828694815902921202818
 168164792741687909306436040*x³⁷ + 2787263896750168132019276363463630974603
 1049911496912476414264101654503705/18*x³⁶ - 273359695650121054268855257396
 01486445952425095287950506903727683168764*x³⁵ + 46852621902399509954372859
 0093781041803808556197803508569386322105715*x³⁴ - 233693910190302419797174
 48586715892975865021278284060758423523515840/3*x³³ + 401661408139582284026
 3936475841794105226800532205072942854043104285/32*x³² - 607044949329343502
 30689216259573714436677086129043923569582515430/31*x³¹ + 17728402346979820
 3090633159267637232493820291816946000354269179/6*x³⁰ - 4307266766008668141
 66021246680478499021828798472353748496220*x²⁹ + 24235339736884069811152244
 621357765502593557718011855782735/4*x²⁸ - 73920426212718295720290070740524
 7749534444026257442224310/9*x²⁷ + 2785945711534609135186811711326310613823
 2815059953852675/26*x²⁶ - 134329878607394513801071785176959225980429444789
 33048*x²⁵ + 1292497995302072380114060851351264306203931237514475/8*x²⁴ -
 1860967030038543098399354614829805279553643440650*x²³ + 409796241227599305
 42850746738524480260071568425/2*x²² - 215193156868532873121545871404114707
 177843300*x²¹ + 8603413786627717071693066401827832481358665/4*x²⁰ - 20407
 117012268258610346466440832430838950*x¹⁹ + 3299048445927251016587541872066
 504084575/18*x¹⁸ - 1553270021329371046270213634848720400*x¹⁷ + 1980419277
 19494808399452238443211851/16*x¹⁶ - 1385600693689618849371479929137914/15*
 x¹⁵ + 1285343871697234554147940565063/2*x¹⁴ - 539035872304381939832386457
 64/13*x¹³ + 295877973819770525856100351/12*x¹² - 134154601595905928749082
 *x¹¹ + 6620790407774021408853/10*x¹⁰ - 26390793852611943832/9*x⁹ + 91999
 779366675103/8*x⁸ - 274762905027402/7*x⁷ + 683489813501/6*x⁶ - 135950236
 4/5*x⁵ + 2027091/4*x⁴ - 2014/3*x³ + 1/2*x²

Mupad [B] (verification not implemented)

Time = 34.75 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.65

$$\int (1-x)^{2014} x dx = \frac{(x-1)^{2015}}{2015} + \frac{(x-1)^{2016}}{2016}$$

[In] `int(x*(x - 1)^2014,x)`

[Out] `(x - 1)^2015/2015 + (x - 1)^2016/2016`

3.106 $\int \operatorname{arcsinh}(x) dx$

| | |
|---|------|
| Optimal result | 1324 |
| Rubi [A] (verified) | 1324 |
| Mathematica [A] (verified) | 1325 |
| Maple [A] (verified) | 1325 |
| Fricas [A] (verification not implemented) | 1325 |
| Sympy [A] (verification not implemented) | 1326 |
| Maxima [A] (verification not implemented) | 1326 |
| Giac [A] (verification not implemented) | 1326 |
| Mupad [B] (verification not implemented) | 1326 |

Optimal result

Integrand size = 2, antiderivative size = 16

$$\int \operatorname{arcsinh}(x) dx = -\sqrt{1+x^2} + x \operatorname{arcsinh}(x)$$

[Out] $x \operatorname{arcsinh}(x) - (x^2 + 1)^{1/2}$

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 16, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 1.000$, Rules used = {5772, 267}

$$\int \operatorname{arcsinh}(x) dx = x \operatorname{arcsinh}(x) - \sqrt{x^2 + 1}$$

[In] `Int[ArcSinh[x],x]`

[Out] `-Sqrt[1 + x^2] + x*ArcSinh[x]`

Rule 267

`Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_.))^(p_), x_Symbol] := Simp[(a + b*x^n)^(p + 1)/(b*n*(p + 1)), x] /; FreeQ[{a, b, m, n, p}, x] && EqQ[m, n - 1] && NeQ[p, -1]`

Rule 5772

`Int[((a_.) + ArcSinh[(c_.)*(x_)])*(b_.))^(n_.), x_Symbol] := Simp[x*(a + b*ArcSinh[c*x])^n, x] - Dist[b*c*n, Int[x*((a + b*ArcSinh[c*x])^(n - 1)/Sqrt[1 + c^2*x^2]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]`

Rubi steps

$$\begin{aligned} \text{integral} &= x \operatorname{arcsinh}(x) - \int \frac{x}{\sqrt{1+x^2}} dx \\ &= -\sqrt{1+x^2} + x \operatorname{arcsinh}(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \operatorname{arcsinh}(x) dx = -\sqrt{1+x^2} + x \operatorname{arcsinh}(x)$$

[In] Integrate[ArcSinh[x],x]

[Out] -Sqrt[1 + x^2] + x*ArcSinh[x]

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.94

| method | result | size |
|---------|--|------|
| lookup | $x \operatorname{arcsinh}(x) - \sqrt{x^2 + 1}$ | 15 |
| default | $x \operatorname{arcsinh}(x) - \sqrt{x^2 + 1}$ | 15 |
| parts | $x \operatorname{arcsinh}(x) - \sqrt{x^2 + 1}$ | 15 |

[In] int(arcsinh(x),x,method=_RETURNVERBOSE)

[Out] x*arcsinh(x)-(x^2+1)^(1/2)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.38

$$\int \operatorname{arcsinh}(x) dx = x \log(x + \sqrt{x^2 + 1}) - \sqrt{x^2 + 1}$$

[In] integrate(arcsinh(x),x, algorithm="fricas")

[Out] x*log(x + sqrt(x^2 + 1)) - sqrt(x^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \operatorname{arcsinh}(x) dx = x \operatorname{asinh}(x) - \sqrt{x^2 + 1}$$

[In] integrate(asinh(x),x)

[Out] x*asinh(x) - sqrt(x**2 + 1)

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.88

$$\int \operatorname{arcsinh}(x) dx = x \operatorname{arsinh}(x) - \sqrt{x^2 + 1}$$

[In] integrate(arcsinh(x),x, algorithm="maxima")

[Out] x*arcsinh(x) - sqrt(x^2 + 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.38

$$\int \operatorname{arcsinh}(x) dx = x \log(x + \sqrt{x^2 + 1}) - \sqrt{x^2 + 1}$$

[In] integrate(arcsinh(x),x, algorithm="giac")

[Out] x*log(x + sqrt(x^2 + 1)) - sqrt(x^2 + 1)

Mupad [B] (verification not implemented)

Time = 19.88 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.88

$$\int \operatorname{arcsinh}(x) dx = x \operatorname{asinh}(x) - \sqrt{x^2 + 1}$$

[In] int(asinh(x),x)

[Out] x*asinh(x) - (x^2 + 1)^(1/2)

3.107 $\int \frac{x^2}{-1+x} dx$

| | |
|---|------|
| Optimal result | 1327 |
| Rubi [A] (verified) | 1327 |
| Mathematica [A] (verified) | 1328 |
| Maple [A] (verified) | 1328 |
| Fricas [A] (verification not implemented) | 1328 |
| Sympy [A] (verification not implemented) | 1329 |
| Maxima [A] (verification not implemented) | 1329 |
| Giac [A] (verification not implemented) | 1329 |
| Mupad [B] (verification not implemented) | 1329 |

Optimal result

Integrand size = 9, antiderivative size = 15

$$\int \frac{x^2}{-1+x} dx = x + \frac{x^2}{2} + \log(1-x)$$

[Out] $x+1/2*x^2+\ln(1-x)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {45}

$$\int \frac{x^2}{-1+x} dx = \frac{x^2}{2} + x + \log(1-x)$$

[In] $\text{Int}[x^2/(-1 + x), x]$

[Out] $x + x^2/2 + \text{Log}[1 - x]$

Rule 45

$\text{Int}[(a_. + (b_.)(x_.))^{(m_.)}((c_.) + (d_.)(x_.))^{(n_.)}, x_Symbol] \rightarrow \text{Int}[\text{ExpandIntegrand}[(a + b*x)^m*(c + d*x)^n, x], x] /;$ FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(1 + \frac{1}{-1+x} + x \right) dx \\ &= x + \frac{x^2}{2} + \log(1-x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.07

$$\int \frac{x^2}{-1+x} dx = -\frac{3}{2} + x + \frac{x^2}{2} + \log(-1+x)$$

[In] Integrate[x^2/(-1 + x),x]

[Out] -3/2 + x + x^2/2 + Log[-1 + x]

Maple [A] (verified)

Time = 0.17 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.80

| method | result | size |
|--------------|---------------------------------|------|
| default | $x + \frac{x^2}{2} + \ln(-1+x)$ | 12 |
| norman | $x + \frac{x^2}{2} + \ln(-1+x)$ | 12 |
| risch | $x + \frac{x^2}{2} + \ln(-1+x)$ | 12 |
| parallelrisc | $x + \frac{x^2}{2} + \ln(-1+x)$ | 12 |
| meijerg | $\frac{x(3x+6)}{6} + \ln(1-x)$ | 16 |

[In] int(x^2/(-1+x),x,method=_RETURNVERBOSE)

[Out] x+1/2*x^2+ln(-1+x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.73

$$\int \frac{x^2}{-1+x} dx = \frac{1}{2}x^2 + x + \log(x-1)$$

[In] integrate(x^2/(-1+x),x, algorithm="fricas")

[Out] 1/2*x^2 + x + log(x - 1)

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.67

$$\int \frac{x^2}{-1+x} dx = \frac{x^2}{2} + x + \log(x-1)$$

[In] integrate(x**2/(-1+x),x)

[Out] x**2/2 + x + log(x - 1)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.73

$$\int \frac{x^2}{-1+x} dx = \frac{1}{2}x^2 + x + \log(x-1)$$

[In] integrate(x^2/(-1+x),x, algorithm="maxima")

[Out] 1/2*x^2 + x + log(x - 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.80

$$\int \frac{x^2}{-1+x} dx = \frac{1}{2}x^2 + x + \log(|x-1|)$$

[In] integrate(x^2/(-1+x),x, algorithm="giac")

[Out] 1/2*x^2 + x + log(abs(x - 1))

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.73

$$\int \frac{x^2}{-1+x} dx = x + \ln(x-1) + \frac{x^2}{2}$$

[In] int(x^2/(x - 1),x)

[Out] x + log(x - 1) + x^2/2

3.108 $\int x \arctan(x) dx$

| | |
|---|------|
| Optimal result | 1330 |
| Rubi [A] (verified) | 1330 |
| Mathematica [A] (verified) | 1331 |
| Maple [A] (verified) | 1331 |
| Fricas [A] (verification not implemented) | 1332 |
| Sympy [A] (verification not implemented) | 1332 |
| Maxima [A] (verification not implemented) | 1332 |
| Giac [A] (verification not implemented) | 1333 |
| Mupad [B] (verification not implemented) | 1333 |

Optimal result

Integrand size = 4, antiderivative size = 21

$$\int x \arctan(x) dx = -\frac{x}{2} + \frac{\arctan(x)}{2} + \frac{1}{2}x^2 \arctan(x)$$

[Out] $-1/2*x+1/2*\arctan(x)+1/2*x^2*\arctan(x)$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 21, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.750$, Rules used = {4946, 327, 209}

$$\int x \arctan(x) dx = \frac{1}{2}x^2 \arctan(x) + \frac{\arctan(x)}{2} - \frac{x}{2}$$

[In] $\text{Int}[x*\text{ArcTan}[x], x]$

[Out] $-1/2*x + \text{ArcTan}[x]/2 + (x^2*\text{ArcTan}[x])/2$

Rule 209

$\text{Int}[(a_ + (b_)*(x_)^2)^{-1}, x_Symbol] \rightarrow \text{Simp}[(1/(\text{Rt}[a, 2]*\text{Rt}[b, 2]))*\text{ArcTan}[\text{Rt}[b, 2]*(x/\text{Rt}[a, 2])], x] /;$ $\text{FreeQ}\{a, b\}, x \ \&\& \ \text{PosQ}[a/b] \ \&\& \ (\text{GtQ}[a, 0] \ || \ \text{GtQ}[b, 0])$

Rule 327

$\text{Int}[(c_)*(x_)^{(m_)}*((a_ + (b_)*(x_)^{(n_)})^{(p_)}, x_Symbol] \rightarrow \text{Simp}[c^{(n-1)}*(c*x)^{(m-n+1)}*((a + b*x^n)^{(p+1)}/(b*(m+n*p+1))), x] - \text{Dist}[a*c^n*((m-n+1)/(b*(m+n*p+1))), \text{Int}[(c*x)^{(m-n)}*(a + b*x^n)^p, x], x] /;$ $\text{FreeQ}\{a, b, c, p\}, x \ \&\& \ \text{IGtQ}[n, 0] \ \&\& \ \text{GtQ}[m, n-1] \ \&\& \ \text{NeQ}[m+n*p]$

+ 1, 0] && IntBinomialQ[a, b, c, n, m, p, x]

Rule 4946

```
Int[((a_.) + ArcTan[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*(x_)^(m_.), x_Symbol] :>
Simp[x^(m + 1)*((a + b*ArcTan[c*x^n])^p/(m + 1)), x] - Dist[b*c*n*(p/(m +
1)), Int[x^(m + n)*((a + b*ArcTan[c*x^n])^(p - 1)/(1 + c^2*x^(2*n))), x], x
] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1] &&
IntegerQ[m])) && NeQ[m, -1]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2}x^2 \arctan(x) - \frac{1}{2} \int \frac{x^2}{1+x^2} dx \\ &= -\frac{x}{2} + \frac{1}{2}x^2 \arctan(x) + \frac{1}{2} \int \frac{1}{1+x^2} dx \\ &= -\frac{x}{2} + \frac{\arctan(x)}{2} + \frac{1}{2}x^2 \arctan(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.76

$$\int x \arctan(x) dx = \frac{1}{2}(-x + (1 + x^2) \arctan(x))$$

[In] Integrate[x*ArcTan[x],x]

[Out] (-x + (1 + x^2)*ArcTan[x])/2

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.76

| method | result | size |
|---------------|--|------|
| default | $-\frac{x}{2} + \frac{\arctan(x)}{2} + \frac{x^2 \arctan(x)}{2}$ | 16 |
| meijerg | $-\frac{x}{2} + \frac{(3x^2+3) \arctan(x)}{6}$ | 16 |
| parallelrisch | $-\frac{x}{2} + \frac{\arctan(x)}{2} + \frac{x^2 \arctan(x)}{2}$ | 16 |
| parts | $-\frac{x}{2} + \frac{\arctan(x)}{2} + \frac{x^2 \arctan(x)}{2}$ | 16 |
| risch | $-\frac{ix^2 \ln(ix+1)}{4} + \frac{ix^2 \ln(-ix+1)}{4} - \frac{x}{2} + \frac{\arctan(x)}{2}$ | 35 |

[In] `int(x*arctan(x),x,method=_RETURNVERBOSE)`

[Out] `-1/2*x+1/2*arctan(x)+1/2*x^2*arctan(x)`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.62

$$\int x \arctan(x) dx = \frac{1}{2} (x^2 + 1) \arctan(x) - \frac{1}{2} x$$

[In] `integrate(x*arctan(x),x, algorithm="fricas")`

[Out] `1/2*(x^2 + 1)*arctan(x) - 1/2*x`

Sympy [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.71

$$\int x \arctan(x) dx = \frac{x^2 \operatorname{atan}(x)}{2} - \frac{x}{2} + \frac{\operatorname{atan}(x)}{2}$$

[In] `integrate(x*atan(x),x)`

[Out] `x**2*atan(x)/2 - x/2 + atan(x)/2`

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.71

$$\int x \arctan(x) dx = \frac{1}{2} x^2 \arctan(x) - \frac{1}{2} x + \frac{1}{2} \arctan(x)$$

[In] `integrate(x*arctan(x),x, algorithm="maxima")`

[Out] `1/2*x^2*arctan(x) - 1/2*x + 1/2*arctan(x)`

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.71

$$\int x \arctan(x) dx = \frac{1}{2} x^2 \arctan(x) - \frac{1}{2} x + \frac{1}{2} \arctan(x)$$

[In] integrate(x*arctan(x),x, algorithm="giac")

[Out] 1/2*x^2*arctan(x) - 1/2*x + 1/2*arctan(x)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.67

$$\int x \arctan(x) dx = \operatorname{atan}(x) \left(\frac{x^2}{2} + \frac{1}{2} \right) - \frac{x}{2}$$

[In] int(x*atan(x),x)

[Out] atan(x)*(x^2/2 + 1/2) - x/2

$$3.109 \quad \int \frac{1}{-2014-15x+x^2} dx$$

| | |
|---|------|
| Optimal result | 1334 |
| Rubi [A] (verified) | 1334 |
| Mathematica [A] (verified) | 1335 |
| Maple [A] (verified) | 1335 |
| Fricas [A] (verification not implemented) | 1335 |
| Sympy [A] (verification not implemented) | 1336 |
| Maxima [A] (verification not implemented) | 1336 |
| Giac [A] (verification not implemented) | 1336 |
| Mupad [B] (verification not implemented) | 1336 |

Optimal result

Integrand size = 10, antiderivative size = 19

$$\int \frac{1}{-2014-15x+x^2} dx = \frac{1}{91} \log(53-x) - \frac{1}{91} \log(38+x)$$

[Out] 1/91*ln(53-x)-1/91*ln(38+x)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.200$, Rules used = {630, 31}

$$\int \frac{1}{-2014-15x+x^2} dx = \frac{1}{91} \log(53-x) - \frac{1}{91} \log(x+38)$$

[In] Int[(-2014 - 15*x + x^2)^(-1), x]

[Out] Log[53 - x]/91 - Log[38 + x]/91

Rule 31

Int[((a_) + (b_.)*(x_))^(n_), x_Symbol] := Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 630

Int[((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^(n_), x_Symbol] := With[{q = Rt[b^2 - 4*a*c, 2]}, Dist[c/q, Int[1/Simp[b/2 - q/2 + c*x, x], x], x] - Dist[c/q, Int[1/Simp[b/2 + q/2 + c*x, x], x], x] /; FreeQ[{a, b, c}, x] && NeQ[b^2 - 4*a*c, 0] && PosQ[b^2 - 4*a*c] && PerfectSquareQ[b^2 - 4*a*c]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{91} \int \frac{1}{-53+x} dx - \frac{1}{91} \int \frac{1}{38+x} dx \\ &= \frac{1}{91} \log(53-x) - \frac{1}{91} \log(38+x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int \frac{1}{-2014 - 15x + x^2} dx = \frac{1}{91} \log(53-x) - \frac{1}{91} \log(38+x)$$

[In] Integrate[(-2014 - 15*x + x^2)^(-1),x]

[Out] Log[53 - x]/91 - Log[38 + x]/91

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.74

| method | result | size |
|---------------|---|------|
| default | $\frac{\ln(x-53)}{91} - \frac{\ln(38+x)}{91}$ | 14 |
| norman | $\frac{\ln(x-53)}{91} - \frac{\ln(38+x)}{91}$ | 14 |
| risch | $\frac{\ln(x-53)}{91} - \frac{\ln(38+x)}{91}$ | 14 |
| parallelrisch | $\frac{\ln(x-53)}{91} - \frac{\ln(38+x)}{91}$ | 14 |

[In] int(1/(x^2-15*x-2014),x,method=_RETURNVERBOSE)

[Out] 1/91*ln(x-53)-1/91*ln(38+x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.68

$$\int \frac{1}{-2014 - 15x + x^2} dx = -\frac{1}{91} \log(x+38) + \frac{1}{91} \log(x-53)$$

[In] integrate(1/(x^2-15*x-2014),x, algorithm="fricas")

[Out] -1/91*log(x + 38) + 1/91*log(x - 53)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.63

$$\int \frac{1}{-2014 - 15x + x^2} dx = \frac{\log(x - 53)}{91} - \frac{\log(x + 38)}{91}$$

[In] integrate(1/(x**2-15*x-2014),x)

[Out] log(x - 53)/91 - log(x + 38)/91

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.68

$$\int \frac{1}{-2014 - 15x + x^2} dx = -\frac{1}{91} \log(x + 38) + \frac{1}{91} \log(x - 53)$$

[In] integrate(1/(x^2-15*x-2014),x, algorithm="maxima")

[Out] -1/91*log(x + 38) + 1/91*log(x - 53)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.79

$$\int \frac{1}{-2014 - 15x + x^2} dx = -\frac{1}{91} \log(|x + 38|) + \frac{1}{91} \log(|x - 53|)$$

[In] integrate(1/(x^2-15*x-2014),x, algorithm="giac")

[Out] -1/91*log(abs(x + 38)) + 1/91*log(abs(x - 53))

Mupad [B] (verification not implemented)

Time = 0.17 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.42

$$\int \frac{1}{-2014 - 15x + x^2} dx = -\frac{2 \operatorname{atanh}\left(\frac{2x}{91} - \frac{15}{91}\right)}{91}$$

[In] int(-1/(15*x - x^2 + 2014),x)

[Out] -(2*atanh((2*x)/91 - 15/91))/91

3.110 $\int e^x(-2(1+x)\arctan(x) + \log(1+x^2)) dx$

| | |
|---|------|
| Optimal result | 1337 |
| Rubi [A] (verified) | 1337 |
| Mathematica [A] (verified) | 1339 |
| Maple [A] (verified) | 1339 |
| Fricas [A] (verification not implemented) | 1340 |
| Sympy [A] (verification not implemented) | 1340 |
| Maxima [A] (verification not implemented) | 1340 |
| Giac [A] (verification not implemented) | 1340 |
| Mupad [B] (verification not implemented) | 1341 |

Optimal result

Integrand size = 18, antiderivative size = 19

$$\int e^x(-2(1+x)\arctan(x) + \log(1+x^2)) dx = -2e^x x \arctan(x) + e^x \log(1+x^2)$$

[Out] $-2*\exp(x)*x*\arctan(x)+\exp(x)*\ln(x^2+1)$

Rubi [A] (verified)

Time = 0.28 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.47, number of steps used = 13, number of rules used = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.444$, Rules used = {6874, 2207, 2225, 5315, 6857, 2209, 2634, 12}

$$\begin{aligned} \int e^x(-2(1+x)\arctan(x) + \log(1+x^2)) dx \\ = 2e^x \arctan(x) - 2e^x(x+1)\arctan(x) + e^x \log(x^2+1) \end{aligned}$$

[In] $\text{Int}[E^x*(-2*(1+x)*\text{ArcTan}[x] + \text{Log}[1+x^2]),x]$

[Out] $2*E^x*\text{ArcTan}[x] - 2*E^x*(1+x)*\text{ArcTan}[x] + E^x*\text{Log}[1+x^2]$

Rule 12

$\text{Int}[(a_*)(u_), x_Symbol] \rightarrow \text{Dist}[a, \text{Int}[u, x], x] /; \text{FreeQ}[a, x] \&\& \text{!MatchQ}[u, (b_*)(v_)] /; \text{FreeQ}[b, x]$

Rule 2207

$\text{Int}[(b_*)(F_)^((g_)*((e_.) + (f_)*(x_)))^{(n_)*((c_.) + (d_)*(x_))^{(m_)}], x_Symbol] \rightarrow \text{Simp}[(c + d*x)^m*((b*F^{(g*(e + f*x)))^n/(f*g*n*\text{Log}[F])), x] - \text{Dist}[d*(m/(f*g*n*\text{Log}[F])), \text{Int}[(c + d*x)^{(m-1)}*(b*F^{(g*(e + f*x)))^n]$

```
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m] && !TrueQ[$UseGamma]
```

Rule 2209

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol] := Simp[(F^(g*(e - c*(f/d)))/d)*ExpIntegralEi[f*g*(c + d*x)*(Log[F]/d)], x] /; FreeQ[{F, c, d, e, f, g}, x] && !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] := Simp[(F^(c*(a + b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2634

```
Int[Log[u_]*(v_), x_Symbol] := With[{w = IntHide[v, x]}, Dist[Log[u], w, x] - Int[SimplifyIntegrand[w*(D[u, x]/u), x], x] /; InverseFunctionFreeQ[w, x]] /; InverseFunctionFreeQ[u, x]
```

Rule 5315

```
Int[((a_.) + ArcTan[u_]*(b_.))*(v_), x_Symbol] := With[{w = IntHide[v, x]}, Dist[a + b*ArcTan[u], w, x] - Dist[b, Int[SimplifyIntegrand[w*(D[u, x]/(1 + u^2)), x], x], x] /; InverseFunctionFreeQ[w, x]] /; FreeQ[{a, b}, x] && InverseFunctionFreeQ[u, x] && !MatchQ[v, ((c_.) + (d_.)*x)^(m_.) /; FreeQ[{c, d, m}, x]] && FalseQ[FunctionOfLinear[v*(a + b*ArcTan[u]), x]]
```

Rule 6857

```
Int[(u_)/((a_) + (b_.)*(x_)^(n_)), x_Symbol] := With[{v = RationalFunctionExpand[u/(a + b*x^n), x]}, Int[v, x] /; SumQ[v]] /; FreeQ[{a, b}, x] && IGtQ[n, 0]
```

Rule 6874

```
Int[u_, x_Symbol] := With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int (-2e^x(1+x)\arctan(x) + e^x \log(1+x^2)) dx \\ &= -\left(2 \int e^x(1+x)\arctan(x) dx\right) + \int e^x \log(1+x^2) dx \end{aligned}$$

$$\begin{aligned}
&= 2e^x \arctan(x) - 2e^x(1+x) \arctan(x) + e^x \log(1+x^2) + 2 \int \frac{e^x x}{1+x^2} dx - \int \frac{2e^x x}{1+x^2} dx \\
&= 2e^x \arctan(x) - 2e^x(1+x) \arctan(x) + e^x \log(1+x^2) \\
&\quad - 2 \int \frac{e^x x}{1+x^2} dx + 2 \int \left(-\frac{e^x}{2(i-x)} + \frac{e^x}{2(i+x)} \right) dx \\
&= 2e^x \arctan(x) - 2e^x(1+x) \arctan(x) + e^x \log(1+x^2) \\
&\quad - 2 \int \left(-\frac{e^x}{2(i-x)} + \frac{e^x}{2(i+x)} \right) dx - \int \frac{e^x}{i-x} dx + \int \frac{e^x}{i+x} dx \\
&= 2e^x \arctan(x) - 2e^x(1+x) \arctan(x) + e^i \operatorname{ExpIntegralEi}(-i+x) \\
&\quad + e^{-i} \operatorname{ExpIntegralEi}(i+x) + e^x \log(1+x^2) + \int \frac{e^x}{i-x} dx - \int \frac{e^x}{i+x} dx \\
&= 2e^x \arctan(x) - 2e^x(1+x) \arctan(x) + e^x \log(1+x^2)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.84

$$\int e^x (-2(1+x) \arctan(x) + \log(1+x^2)) dx = e^x (-2x \arctan(x) + \log(1+x^2))$$

[In] Integrate[E^x*(-2*(1+x)*ArcTan[x] + Log[1+x^2]),x]

[Out] E^x*(-2*x*ArcTan[x] + Log[1+x^2])

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.95

| method | result |
|---------------|---|
| parallelrisch | $-2e^x x \arctan(x) + e^x \ln(x^2 + 1)$ |
| risch | $\frac{i\pi \operatorname{csgn}(i(i+x)) \operatorname{csgn}(i(x-i)(i+x))^2 e^x}{2} + e^x \ln(x-i) - i(i+x) e^x \ln(i+x) - \frac{i\pi \operatorname{csgn}(i(x-i)) \operatorname{csgn}(i(i+x))}{2}$ |

[In] int(exp(x)*(ln(x^2+1)-2*(1+x)*arctan(x)),x,method=_RETURNVERBOSE)

[Out] -2*exp(x)*x*arctan(x)+exp(x)*ln(x^2+1)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.89

$$\int e^x (-2(1+x) \arctan(x) + \log(1+x^2)) dx = -2x \arctan(x) e^x + e^x \log(x^2 + 1)$$

[In] integrate(exp(x)*(log(x^2+1)-2*(1+x)*arctan(x)),x, algorithm="fricas")

[Out] -2*x*arctan(x)*e^x + e^x*log(x^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.79 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int e^x (-2(1+x) \arctan(x) + \log(1+x^2)) dx = -2xe^x \operatorname{atan}(x) + e^x \log(x^2 + 1)$$

[In] integrate(exp(x)*(ln(x**2+1)-2*(1+x)*atan(x)),x)

[Out] -2*x*exp(x)*atan(x) + exp(x)*log(x**2 + 1)

Maxima [A] (verification not implemented)

none

Time = 0.34 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.89

$$\int e^x (-2(1+x) \arctan(x) + \log(1+x^2)) dx = -2x \arctan(x) e^x + e^x \log(x^2 + 1)$$

[In] integrate(exp(x)*(log(x^2+1)-2*(1+x)*arctan(x)),x, algorithm="maxima")

[Out] -2*x*arctan(x)*e^x + e^x*log(x^2 + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.42

$$\begin{aligned} \int e^x (-2(1+x) \arctan(x) + \log(1+x^2)) dx \\ = -\pi x e^x \operatorname{sgn}(x) + 2x \arctan\left(\frac{1}{x}\right) e^x + e^x \log(x^2 + 1) \end{aligned}$$

[In] integrate(exp(x)*(log(x^2+1)-2*(1+x)*arctan(x)),x, algorithm="giac")

[Out] -pi*x*e^x*sgn(x) + 2*x*arctan(1/x)*e^x + e^x*log(x^2 + 1)

Mupad [B] (verification not implemented)

Time = 21.30 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.79

$$\int e^x(-2(1+x)\arctan(x) + \log(1+x^2)) dx = e^x(\ln(x^2+1) - 2x\operatorname{atan}(x))$$

[In] `int(exp(x)*(log(x^2 + 1) - 2*atan(x)*(x + 1)),x)`

[Out] `exp(x)*(log(x^2 + 1) - 2*x*atan(x))`

3.111 $\int \arcsin(x)^2 dx$

| | |
|---|------|
| Optimal result | 1342 |
| Rubi [A] (verified) | 1342 |
| Mathematica [A] (verified) | 1343 |
| Maple [A] (verified) | 1343 |
| Fricas [A] (verification not implemented) | 1344 |
| Sympy [A] (verification not implemented) | 1344 |
| Maxima [A] (verification not implemented) | 1344 |
| Giac [A] (verification not implemented) | 1344 |
| Mupad [B] (verification not implemented) | 1345 |

Optimal result

Integrand size = 4, antiderivative size = 25

$$\int \arcsin(x)^2 dx = -2x + 2\sqrt{1-x^2} \arcsin(x) + x \arcsin(x)^2$$

[Out] $-2*x+2*(-x^2+1)^{(1/2)}*\arcsin(x)+x*\arcsin(x)^2$

Rubi [A] (verified)

Time = 0.04 (sec), antiderivative size = 25, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.750$, Rules used = {4715, 4767, 8}

$$\int \arcsin(x)^2 dx = 2\sqrt{1-x^2} \arcsin(x) + x \arcsin(x)^2 - 2x$$

[In] `Int[ArcSin[x]^2,x]`

[Out] $-2*x + 2*\text{Sqrt}[1 - x^2]*\text{ArcSin}[x] + x*\text{ArcSin}[x]^2$

Rule 8

`Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]`

Rule 4715

`Int[((a_.) + ArcSin[(c_.)*(x_)]*(b_.))^(n_.), x_Symbol] := Simp[x*(a + b*ArcSin[c*x])^n, x] - Dist[b*c*n, Int[x*((a + b*ArcSin[c*x])^(n - 1)/Sqrt[1 - c^2*x^2]), x], x] /; FreeQ[{a, b, c}, x] && GtQ[n, 0]`

Rule 4767

```
Int[((a_.) + ArcSin[(c_.)*(x_)]*(b_.))^(n_.)*(x_)*((d_) + (e_.)*(x_)^2)^(p_
.), x_Symbol] :> Simp[(d + e*x^2)^(p + 1)*((a + b*ArcSin[c*x])^n/(2*e*(p +
1))), x] + Dist[b*(n/(2*c*(p + 1)))*Simp[(d + e*x^2)^p/(1 - c^2*x^2)^p], In
t[(1 - c^2*x^2)^(p + 1/2)*(a + b*ArcSin[c*x])^(n - 1), x], x] /; FreeQ[{a,
b, c, d, e, p}, x] && EqQ[c^2*d + e, 0] && GtQ[n, 0] && NeQ[p, -1]
```

Rubi steps

$$\begin{aligned} \text{integral} &= x \arcsin(x)^2 - 2 \int \frac{x \arcsin(x)}{\sqrt{1-x^2}} dx \\ &= 2\sqrt{1-x^2} \arcsin(x) + x \arcsin(x)^2 - 2 \int 1 dx \\ &= -2x + 2\sqrt{1-x^2} \arcsin(x) + x \arcsin(x)^2 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00

$$\int \arcsin(x)^2 dx = -2x + 2\sqrt{1-x^2} \arcsin(x) + x \arcsin(x)^2$$

```
[In] Integrate[ArcSin[x]^2,x]
```

```
[Out] -2*x + 2*Sqrt[1 - x^2]*ArcSin[x] + x*ArcSin[x]^2
```

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.96

| method | result | size |
|---------|--|------|
| default | $-2x + 2\sqrt{-x^2 + 1} \arcsin(x) + x \arcsin(x)^2$ | 24 |

```
[In] int(arcsin(x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] -2*x+2*(-x^2+1)^(1/2)*arcsin(x)+x*arcsin(x)^2
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.92

$$\int \arcsin(x)^2 dx = x \arcsin(x)^2 + 2\sqrt{-x^2 + 1} \arcsin(x) - 2x$$

[In] integrate(arcsin(x)^2,x, algorithm="fricas")

[Out] x*arcsin(x)^2 + 2*sqrt(-x^2 + 1)*arcsin(x) - 2*x

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.88

$$\int \arcsin(x)^2 dx = x \operatorname{asin}^2(x) - 2x + 2\sqrt{1 - x^2} \operatorname{asin}(x)$$

[In] integrate(asin(x)**2,x)

[Out] x*asin(x)**2 - 2*x + 2*sqrt(1 - x**2)*asin(x)

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.92

$$\int \arcsin(x)^2 dx = x \arcsin(x)^2 + 2\sqrt{-x^2 + 1} \arcsin(x) - 2x$$

[In] integrate(arcsin(x)^2,x, algorithm="maxima")

[Out] x*arcsin(x)^2 + 2*sqrt(-x^2 + 1)*arcsin(x) - 2*x

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.92

$$\int \arcsin(x)^2 dx = x \arcsin(x)^2 + 2\sqrt{-x^2 + 1} \arcsin(x) - 2x$$

[In] integrate(arcsin(x)^2,x, algorithm="giac")

[Out] x*arcsin(x)^2 + 2*sqrt(-x^2 + 1)*arcsin(x) - 2*x

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.88

$$\int \arcsin(x)^2 dx = 2 \arcsin(x) \sqrt{1-x^2} + x (\arcsin(x)^2 - 2)$$

[In] `int(asin(x)^2,x)`

[Out] `2*asin(x)*(1 - x^2)^(1/2) + x*(asin(x)^2 - 2)`

3.112 $\int \frac{\sqrt{-1+x^2}}{x} dx$

| | |
|---|------|
| Optimal result | 1346 |
| Rubi [A] (verified) | 1346 |
| Mathematica [A] (verified) | 1347 |
| Maple [A] (verified) | 1348 |
| Fricas [A] (verification not implemented) | 1348 |
| Sympy [C] (verification not implemented) | 1348 |
| Maxima [A] (verification not implemented) | 1349 |
| Giac [A] (verification not implemented) | 1349 |
| Mupad [B] (verification not implemented) | 1349 |

Optimal result

Integrand size = 13, antiderivative size = 22

$$\int \frac{\sqrt{-1+x^2}}{x} dx = \sqrt{-1+x^2} - \arctan\left(\sqrt{-1+x^2}\right)$$

[Out] $(x^2-1)^{(1/2)}-\arctan((x^2-1)^{(1/2)})$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.308$, Rules used = {272, 52, 65, 209}

$$\int \frac{\sqrt{-1+x^2}}{x} dx = \sqrt{x^2-1} - \arctan\left(\sqrt{x^2-1}\right)$$

[In] `Int[Sqrt[-1 + x^2]/x,x]`

[Out] `Sqrt[-1 + x^2] - ArcTan[Sqrt[-1 + x^2]]`

Rule 52

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] :> Simp[
(a + b*x)^(m + 1)*((c + d*x)^n/(b*(m + n + 1))), x] + Dist[n*((b*c - a*d)/(
b*(m + n + 1))], Int[(a + b*x)^m*(c + d*x)^(n - 1), x], x] /; FreeQ[{a, b,
c, d}, x] && NeQ[b*c - a*d, 0] && GtQ[n, 0] && NeQ[m + n + 1, 0] && !(IGtQ
[m, 0] && (!IntegerQ[n] || (GtQ[m, 0] && LtQ[m - n, 0]))) && !ILtQ[m + n
+ 2, 0] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 65

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] := With[
{p = Denominator[m]}, Dist[p/b, Subst[Int[x^(p*(m + 1) - 1)*(c - a*(d/b) +
d*(x^p/b))^(n), x], x, (a + b*x)^(1/p)], x] /; FreeQ[{a, b, c, d}, x] && NeQ
[b*c - a*d, 0] && LtQ[-1, m, 0] && LeQ[-1, n, 0] && LeQ[Denominator[n], Den
ominator[m]] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 209

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*A
rcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a
, 0] || GtQ[b, 0])
```

Rule 272

```
Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[
Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b
, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \frac{1}{2} \text{Subst} \left(\int \frac{\sqrt{-1+x}}{x} dx, x, x^2 \right) \\
&= \sqrt{-1+x^2} - \frac{1}{2} \text{Subst} \left(\int \frac{1}{\sqrt{-1+xx}} dx, x, x^2 \right) \\
&= \sqrt{-1+x^2} - \text{Subst} \left(\int \frac{1}{1+x^2} dx, x, \sqrt{-1+x^2} \right) \\
&= \sqrt{-1+x^2} - \arctan \left(\sqrt{-1+x^2} \right)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \frac{\sqrt{-1+x^2}}{x} dx = \sqrt{-1+x^2} - \arctan \left(\sqrt{-1+x^2} \right)$$

```
[In] Integrate[Sqrt[-1 + x^2]/x,x]
```

```
[Out] Sqrt[-1 + x^2] - ArcTan[Sqrt[-1 + x^2]]
```

Maple [A] (verified)

Time = 0.24 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.77

| method | result | size |
|----------------|---|------|
| default | $\sqrt{x^2 - 1} + \arctan\left(\frac{1}{\sqrt{x^2 - 1}}\right)$ | 17 |
| pseudoelliptic | $\sqrt{x^2 - 1} - \arctan(\sqrt{x^2 - 1})$ | 19 |
| trager | $\sqrt{x^2 - 1} + \text{RootOf}(-Z^2 + 1) \ln\left(\frac{-\text{RootOf}(-Z^2 + 1) + \sqrt{x^2 - 1}}{x}\right)$ | 37 |
| meijerg | $-\frac{\sqrt{\text{signum}(x^2 - 1)} \left(-2(2 - 2\ln(2) + 2\ln(x) + i\pi)\sqrt{\pi} + 4\sqrt{\pi} - 4\sqrt{\pi}\sqrt{-x^2 + 1} + 4\sqrt{\pi} \ln\left(\frac{1}{2} + \frac{\sqrt{-x^2 + 1}}{2}\right) \right)}{4\sqrt{\pi}\sqrt{-\text{signum}(x^2 - 1)}}$ | 82 |

[In] int((x^2-1)^(1/2)/x,x,method=_RETURNVERBOSE)

[Out] (x^2-1)^(1/2)+arctan(1/(x^2-1)^(1/2))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \frac{\sqrt{-1 + x^2}}{x} dx = \sqrt{x^2 - 1} - 2 \arctan(-x + \sqrt{x^2 - 1})$$

[In] integrate((x^2-1)^(1/2)/x,x, algorithm="fricas")

[Out] sqrt(x^2 - 1) - 2*arctan(-x + sqrt(x^2 - 1))

Sympy [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.70 (sec) , antiderivative size = 68, normalized size of antiderivative = 3.09

$$\int \frac{\sqrt{-1 + x^2}}{x} dx = \begin{cases} -\frac{ix}{\sqrt{-1 + \frac{1}{x^2}}} - i \operatorname{acosh}\left(\frac{1}{x}\right) + \frac{i}{x\sqrt{-1 + \frac{1}{x^2}}} & \text{for } \frac{1}{|x^2|} > 1 \\ \frac{x}{\sqrt{1 - \frac{1}{x^2}}} + \operatorname{asin}\left(\frac{1}{x}\right) - \frac{1}{x\sqrt{1 - \frac{1}{x^2}}} & \text{otherwise} \end{cases}$$

[In] integrate((x**2-1)**(1/2)/x,x)

```
[Out] Piecewise((-I*x/sqrt(-1 + x**(-2)) - I*acosh(1/x) + I/(x*sqrt(-1 + x**(-2))), 1/Abs(x**2) > 1), (x/sqrt(1 - 1/x**2) + asin(1/x) - 1/(x*sqrt(1 - 1/x**2))), True))
```


Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.59

$$\int \frac{\sqrt{-1+x^2}}{x} dx = \sqrt{x^2-1} + \arcsin\left(\frac{1}{|x|}\right)$$

[In] integrate((x^2-1)^(1/2)/x,x, algorithm="maxima")

[Out] sqrt(x^2 - 1) + arcsin(1/abs(x))

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.82

$$\int \frac{\sqrt{-1+x^2}}{x} dx = \sqrt{x^2-1} - \arctan\left(\sqrt{x^2-1}\right)$$

[In] integrate((x^2-1)^(1/2)/x,x, algorithm="giac")

[Out] sqrt(x^2 - 1) - arctan(sqrt(x^2 - 1))

Mupad [B] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.18

$$\int \frac{\sqrt{-1+x^2}}{x} dx = \sqrt{x^2-1} - \ln\left(\frac{\sqrt{x^2-1} + 1i}{x}\right) 1i$$

[In] int((x^2 - 1)^(1/2)/x,x)

[Out] (x^2 - 1)^(1/2) - log((x^2 - 1)^(1/2) + 1i)/x*1i

3.113 $\int x \sec^2(4x) dx$

| | |
|---|------|
| Optimal result | 1350 |
| Rubi [A] (verified) | 1350 |
| Mathematica [A] (verified) | 1351 |
| Maple [A] (verified) | 1351 |
| Fricas [A] (verification not implemented) | 1352 |
| Sympy [F] | 1352 |
| Maxima [B] (verification not implemented) | 1352 |
| Giac [B] (verification not implemented) | 1353 |
| Mupad [B] (verification not implemented) | 1353 |

Optimal result

Integrand size = 8, antiderivative size = 19

$$\int x \sec^2(4x) dx = \frac{1}{16} \log(\cos(4x)) + \frac{1}{4} x \tan(4x)$$

[Out] 1/16*ln(cos(4*x))+1/4*x*tan(4*x)

Rubi [A] (verified)

Time = 0.02 (sec), antiderivative size = 19, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {4269, 3556}

$$\int x \sec^2(4x) dx = \frac{1}{4} x \tan(4x) + \frac{1}{16} \log(\cos(4x))$$

[In] Int[x*Sec[4*x]^2,x]

[Out] Log[Cos[4*x]]/16 + (x*Tan[4*x])/4

Rule 3556

Int[tan[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Log[RemoveContent[Cos[c + d*x], x]]/d, x] /; FreeQ[{c, d}, x]

Rule 4269

Int[csc[(e_.) + (f_.)*(x_)]^2*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] := Simp[(-(c + d*x)^m)*(Cot[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Cot[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{4}x \tan(4x) - \frac{1}{4} \int \tan(4x) dx \\ &= \frac{1}{16} \log(\cos(4x)) + \frac{1}{4}x \tan(4x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int x \sec^2(4x) dx = \frac{1}{16} \log(\cos(4x)) + \frac{1}{4}x \tan(4x)$$

[In] Integrate[x*Sec[4*x]^2,x]

[Out] Log[Cos[4*x]]/16 + (x*Tan[4*x])/4

Maple [A] (verified)

Time = 0.13 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.84

| method | result | size |
|------------------|--|------|
| derivativdivides | $\frac{\ln(\cos(4x))}{16} + \frac{x \tan(4x)}{4}$ | 16 |
| default | $\frac{\ln(\cos(4x))}{16} + \frac{x \tan(4x)}{4}$ | 16 |
| risch | $-\frac{ix}{2} + \frac{ix}{2e^{8ix}+2} + \frac{\ln(e^{8ix}+1)}{16}$ | 29 |
| norman | $-\frac{x \tan(2x)}{2(\tan(2x)^2-1)} + \frac{\ln(\tan(2x)-1)}{16} + \frac{\ln(\tan(2x)+1)}{16} - \frac{\ln(1+\tan(2x)^2)}{16}$ | 48 |
| parallelrisch | $\frac{\ln(\tan(2x)-1) \cos(4x) + \ln(\tan(2x)+1) \cos(4x) - \ln(\sec(2x)^2) \cos(4x) + 4x \sin(4x)}{16 \cos(4x)}$ | 54 |

[In] int(x*sec(4*x)^2,x,method=_RETURNVERBOSE)

[Out] 1/16*ln(cos(4*x))+1/4*x*tan(4*x)

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.47

$$\int x \sec^2(4x) dx = \frac{\cos(4x) \log(-\cos(4x)) + 4x \sin(4x)}{16 \cos(4x)}$$

[In] integrate(x*sec(4*x)^2,x, algorithm="fricas")

[Out] 1/16*(cos(4*x)*log(-cos(4*x)) + 4*x*sin(4*x))/cos(4*x)

Sympy [F]

$$\int x \sec^2(4x) dx = \int x \sec^2(4x) dx$$

[In] integrate(x*sec(4*x)**2,x)

[Out] Integral(x*sec(4*x)**2, x)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 74 vs. 2(15) = 30.

Time = 0.28 (sec) , antiderivative size = 74, normalized size of antiderivative = 3.89

$$\int x \sec^2(4x) dx = \frac{(\cos(8x)^2 + \sin(8x)^2 + 2 \cos(8x) + 1) \log(\cos(8x)^2 + \sin(8x)^2 + 2 \cos(8x) + 1) + 16x \sin(8x)}{32(\cos(8x)^2 + \sin(8x)^2 + 2 \cos(8x) + 1)}$$

[In] integrate(x*sec(4*x)^2,x, algorithm="maxima")

[Out] 1/32*((cos(8*x)^2 + sin(8*x)^2 + 2*cos(8*x) + 1)*log(cos(8*x)^2 + sin(8*x)^2 + 2*cos(8*x) + 1) + 16*x*sin(8*x))/(cos(8*x)^2 + sin(8*x)^2 + 2*cos(8*x) + 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 103 vs. $2(15) = 30$.

Time = 0.28 (sec) , antiderivative size = 103, normalized size of antiderivative = 5.42

$$\int x \sec^2(4x) dx = \frac{\log\left(\frac{4(\tan(2x)^4 - 2\tan(2x)^2 + 1)}{\tan(2x)^4 + 2\tan(2x)^2 + 1}\right) \tan(2x)^2 - 16x \tan(2x) - \log\left(\frac{4(\tan(2x)^4 - 2\tan(2x)^2 + 1)}{\tan(2x)^4 + 2\tan(2x)^2 + 1}\right)}{32(\tan(2x)^2 - 1)}$$

[In] integrate(x*sec(4*x)^2,x, algorithm="giac")

[Out] 1/32*(log(4*(tan(2*x))^4 - 2*tan(2*x)^2 + 1)/(tan(2*x)^4 + 2*tan(2*x)^2 + 1))*tan(2*x)^2 - 16*x*tan(2*x) - log(4*(tan(2*x))^4 - 2*tan(2*x)^2 + 1)/(tan(2*x)^4 + 2*tan(2*x)^2 + 1))/(tan(2*x)^2 - 1)

Mupad [B] (verification not implemented)

Time = 20.91 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.79

$$\int x \sec^2(4x) dx = \frac{\ln(\cos(4x))}{16} + \frac{x \tan(4x)}{4}$$

[In] int(x/cos(4*x)^2,x)

[Out] log(cos(4*x))/16 + (x*tan(4*x))/4

$$3.114 \quad \int \frac{2}{6-11x+6x^2-x^3} dx$$

| | |
|---|------|
| Optimal result | 1354 |
| Rubi [A] (verified) | 1354 |
| Mathematica [A] (verified) | 1355 |
| Maple [A] (verified) | 1355 |
| Fricas [A] (verification not implemented) | 1356 |
| Sympy [A] (verification not implemented) | 1356 |
| Maxima [A] (verification not implemented) | 1356 |
| Giac [A] (verification not implemented) | 1356 |
| Mupad [B] (verification not implemented) | 1357 |

Optimal result

Integrand size = 19, antiderivative size = 25

$$\int \frac{2}{6-11x+6x^2-x^3} dx = -\log(1-x) + 2\log(2-x) - \log(3-x)$$

[Out] -ln(1-x)+2*ln(2-x)-ln(-x+3)

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.105$, Rules used = {12, 2083}

$$\int \frac{2}{6-11x+6x^2-x^3} dx = -\log(1-x) + 2\log(2-x) - \log(3-x)$$

[In] Int[2/(6 - 11*x + 6*x^2 - x^3),x]

[Out] -Log[1 - x] + 2*Log[2 - x] - Log[3 - x]

Rule 12

```
Int[(a_)*(u_), x_Symbol] :> Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_) /; FreeQ[b, x]]
```

Rule 2083

```
Int[(P_)^(p_), x_Symbol] :> With[{u = Factor[P]}, Int[ExpandIntegrand[u^p, x], x] /; !SumQ[NonfreeFactors[u, x]]] /; PolyQ[P, x] && ILtQ[p, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= 2 \int \frac{1}{6 - 11x + 6x^2 - x^3} dx \\ &= 2 \int \left(-\frac{1}{2(-3 + x)} + \frac{1}{-2 + x} - \frac{1}{2(-1 + x)} \right) dx \\ &= -\log(1 - x) + 2 \log(2 - x) - \log(3 - x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.96

$$\int \frac{2}{6 - 11x + 6x^2 - x^3} dx = -2 \left(-\log(2 - x) + \frac{1}{2} \log(3 - 4x + x^2) \right)$$

[In] Integrate[2/(6 - 11*x + 6*x^2 - x^3),x]

[Out] -2*(-Log[2 - x] + Log[3 - 4*x + x^2]/2)

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.76

| method | result | size |
|---------------|--|------|
| risch | $2 \ln(-2 + x) - \ln(x^2 - 4x + 3)$ | 19 |
| default | $-\ln(-1 + x) + 2 \ln(-2 + x) - \ln(-3 + x)$ | 20 |
| norman | $-\ln(-1 + x) + 2 \ln(-2 + x) - \ln(-3 + x)$ | 20 |
| parallelrisch | $-\ln(-1 + x) + 2 \ln(-2 + x) - \ln(-3 + x)$ | 20 |

[In] int(2/(-x^3+6*x^2-11*x+6),x,method=_RETURNVERBOSE)

[Out] 2*ln(-2+x)-ln(x^2-4*x+3)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.72

$$\int \frac{2}{6 - 11x + 6x^2 - x^3} dx = -\log(x^2 - 4x + 3) + 2 \log(x - 2)$$

[In] integrate(2/(-x^3+6*x^2-11*x+6),x, algorithm="fricas")

[Out] -log(x^2 - 4*x + 3) + 2*log(x - 2)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.60

$$\int \frac{2}{6 - 11x + 6x^2 - x^3} dx = 2 \log(x - 2) - \log(x^2 - 4x + 3)$$

[In] integrate(2/(-x**3+6*x**2-11*x+6),x)

[Out] 2*log(x - 2) - log(x**2 - 4*x + 3)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.76

$$\int \frac{2}{6 - 11x + 6x^2 - x^3} dx = -\log(x - 1) + 2 \log(x - 2) - \log(x - 3)$$

[In] integrate(2/(-x^3+6*x^2-11*x+6),x, algorithm="maxima")

[Out] -log(x - 1) + 2*log(x - 2) - log(x - 3)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.88

$$\int \frac{2}{6 - 11x + 6x^2 - x^3} dx = -\log(|x - 1|) + 2 \log(|x - 2|) - \log(|x - 3|)$$

[In] integrate(2/(-x^3+6*x^2-11*x+6),x, algorithm="giac")

[Out] -log(abs(x - 1)) + 2*log(abs(x - 2)) - log(abs(x - 3))

Mupad [B] (verification not implemented)

Time = 19.62 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.72

$$\int \frac{2}{6 - 11x + 6x^2 - x^3} dx = 2 \ln(x - 2) - \ln(x^2 - 4x + 3)$$

[In] int(-2/(11*x - 6*x^2 + x^3 - 6),x)

[Out] 2*log(x - 2) - log(x^2 - 4*x + 3)

3.115 $\int \frac{1}{1-\log(1-x)} dx$

| | |
|---|------|
| Optimal result | 1358 |
| Rubi [A] (verified) | 1358 |
| Mathematica [A] (verified) | 1359 |
| Maple [A] (verified) | 1359 |
| Fricas [A] (verification not implemented) | 1360 |
| Sympy [F] | 1360 |
| Maxima [A] (verification not implemented) | 1360 |
| Giac [A] (verification not implemented) | 1360 |
| Mupad [F(-1)] | 1361 |

Optimal result

Integrand size = 12, antiderivative size = 11

$$\int \frac{1}{1-\log(1-x)} dx = e \operatorname{ExpIntegralEi}(-1 + \log(1-x))$$

[Out] $\exp(1)*\operatorname{Ei}(-1+\ln(1-x))$

Rubi [A] (verified)

Time = 0.02 (sec), antiderivative size = 11, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {2436, 2336, 2209}

$$\int \frac{1}{1-\log(1-x)} dx = e \operatorname{ExpIntegralEi}(\log(1-x) - 1)$$

[In] $\operatorname{Int}[(1 - \operatorname{Log}[1 - x])^{-1}, x]$

[Out] $E*\operatorname{ExpIntegralEi}[-1 + \operatorname{Log}[1 - x]]$

Rule 2209

$\operatorname{Int}[(F_)^{\wedge}((g_.) * ((e_.) + (f_.) * (x_))) / ((c_.) + (d_.) * (x_)), x_Symbol] \rightarrow \operatorname{Simp}[(F^{\wedge}(g * (e - c * (f/d))) / d) * \operatorname{ExpIntegralEi}[f * g * (c + d * x) * (\operatorname{Log}[F] / d)], x] /;$ $\operatorname{FreeQ}\{F, c, d, e, f, g\}, x \&\& \operatorname{!TrueQ}\{\$UseGamma\}$

Rule 2336

$\operatorname{Int}(((a_.) + \operatorname{Log}[(c_.) * (x_)^{\wedge}(n_.)]) * (b_.)^{\wedge}(p_)), x_Symbol] \rightarrow \operatorname{Dist}[1 / (n * c^{\wedge}(1/n)), \operatorname{Subst}[\operatorname{Int}[E^{\wedge}(x/n) * (a + b * x)^{\wedge}p, x], x, \operatorname{Log}[c * x^{\wedge}n]], x] /;$ $\operatorname{FreeQ}\{a, b, c, p\}, x \&\& \operatorname{IntegerQ}[1/n]$

Rule 2436

```
Int[((a_.) + Log[(c_.)*((d_) + (e_.)*(x_))^(n_.)]*(b_.))^(p_.), x_Symbol] :
> Dist[1/e, Subst[Int[(a + b*Log[c*x^n])^p, x], x, d + e*x], x] /; FreeQ[{a
, b, c, d, e, n, p}, x]
```

Rubi steps

$$\begin{aligned} \text{integral} &= -\text{Subst}\left(\int \frac{1}{1 - \log(x)} dx, x, 1 - x\right) \\ &= -\text{Subst}\left(\int \frac{e^x}{1 - x} dx, x, \log(1 - x)\right) \\ &= e \text{ExpIntegralEi}(-1 + \log(1 - x)) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 - \log(1 - x)} dx = e \text{ExpIntegralEi}(-1 + \log(1 - x))$$

```
[In] Integrate[(1 - Log[1 - x])^(-1),x]
```

```
[Out] E*ExpIntegralEi[-1 + Log[1 - x]]
```

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.55

| method | result | size |
|-------------------|----------------------------------|------|
| derivativedivides | $-e \text{Ei}_1(1 - \ln(1 - x))$ | 17 |
| default | $-e \text{Ei}_1(1 - \ln(1 - x))$ | 17 |
| risch | $-e \text{Ei}_1(1 - \ln(1 - x))$ | 17 |

```
[In] int(1/(1-ln(1-x)),x,method=_RETURNVERBOSE)
```

```
[Out] -exp(1)*Ei(1,1-ln(1-x))
```

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 - \log(1 - x)} dx = e \log_integral(-(x - 1)e^{(-1)})$$

[In] integrate(1/(1-log(1-x)),x, algorithm="fricas")

[Out] e*log_integral(-(x - 1)*e^(-1))

Sympy [F]

$$\int \frac{1}{1 - \log(1 - x)} dx = - \int \frac{1}{\log(1 - x) - 1} dx$$

[In] integrate(1/(1-ln(1-x)),x)

[Out] -Integral(1/(log(1 - x) - 1), x)

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.45

$$\int \frac{1}{1 - \log(1 - x)} dx = -eE_1(-\log(-x + 1) + 1)$$

[In] integrate(1/(1-log(1-x)),x, algorithm="maxima")

[Out] -e*exp_integral_e(1, -log(-x + 1) + 1)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.09

$$\int \frac{1}{1 - \log(1 - x)} dx = Ei(\log(-x + 1) - 1) e$$

[In] integrate(1/(1-log(1-x)),x, algorithm="giac")

[Out] Ei(log(-x + 1) - 1)*e

Mupad [F(-1)]

Timed out.

$$\int \frac{1}{1 - \log(1 - x)} dx = - \int \frac{1}{\ln(1 - x) - 1} dx$$

```
[In] int(-1/(log(1 - x) - 1),x)
```

```
[Out] -int(1/(log(1 - x) - 1), x)
```

3.116 $\int \sqrt{x + \sqrt{1 + x^2}} dx$

| | |
|---|------|
| Optimal result | 1362 |
| Rubi [A] (verified) | 1362 |
| Mathematica [A] (verified) | 1363 |
| Maple [C] (verified) | 1363 |
| Fricas [A] (verification not implemented) | 1364 |
| Sympy [A] (verification not implemented) | 1364 |
| Maxima [F] | 1364 |
| Giac [F] | 1364 |
| Mupad [F(-1)] | 1365 |

Optimal result

Integrand size = 15, antiderivative size = 37

$$\int \sqrt{x + \sqrt{1 + x^2}} dx = -\frac{1}{\sqrt{x + \sqrt{1 + x^2}}} + \frac{1}{3} \left(x + \sqrt{1 + x^2} \right)^{3/2}$$

[Out] $-1/(x+(x^2+1)^{(1/2)})^{(1/2)}+1/3*(x+(x^2+1)^{(1/2)})^{(3/2)}$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.133$, Rules used = {2142, 14}

$$\int \sqrt{x + \sqrt{1 + x^2}} dx = \frac{1}{3} \left(\sqrt{x^2 + 1} + x \right)^{3/2} - \frac{1}{\sqrt{\sqrt{x^2 + 1} + x}}$$

[In] Int[Sqrt[x + Sqrt[1 + x^2]],x]

[Out] $-(1/\text{Sqrt}[x + \text{Sqrt}[1 + x^2]]) + (x + \text{Sqrt}[1 + x^2])^{(3/2)}/3$

Rule 14

```
Int[(u_)*((c_)*(x_))^(m_), x_Symbol] := Int[ExpandIntegrand[(c*x)^m*u, x], x] /; FreeQ[{c, m}, x] && SumQ[u] && !LinearQ[u, x] && !MatchQ[u, (a_ + (b_)*(v_)) /; FreeQ[{a, b}, x] && InverseFunctionQ[v]]
```

Rule 2142

```
Int[((g_) + (h_)*((d_) + (e_)*(x_) + (f_)*Sqrt[(a_) + (c_)*(x_)^2])^(n_))^(p_), x_Symbol] := Dist[1/(2*e), Subst[Int[(g + h*x^n)^p*((d^2 + a*f^2 - 2*d*x + x^2)/(d - x)^2), x], x, d + e*x + f*Sqrt[a + c*x^2]], x] /; Fre
```

$eQ[\{a, c, d, e, f, g, h, n\}, x] \&\& EqQ[e^2 - c*f^2, 0] \&\& IntegerQ[p]$

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int \frac{1+x^2}{x^{3/2}} dx, x, x + \sqrt{1+x^2} \right) \\ &= \frac{1}{2} \text{Subst} \left(\int \left(\frac{1}{x^{3/2}} + \sqrt{x} \right) dx, x, x + \sqrt{1+x^2} \right) \\ &= -\frac{1}{\sqrt{x + \sqrt{1+x^2}}} + \frac{1}{3} \left(x + \sqrt{1+x^2} \right)^{3/2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.00

$$\int \sqrt{x + \sqrt{1+x^2}} dx = -\frac{1}{\sqrt{x + \sqrt{1+x^2}}} + \frac{1}{3} \left(x + \sqrt{1+x^2} \right)^{3/2}$$

[In] Integrate[Sqrt[x + Sqrt[1 + x^2]],x]

[Out] -(1/Sqrt[x + Sqrt[1 + x^2]]) + (x + Sqrt[1 + x^2])^(3/2)/3

Maple [C] (verified)

Result contains higher order function than in optimal. Order 3 vs. order 2.

Time = 0.03 (sec) , antiderivative size = 57, normalized size of antiderivative = 1.54

| method | result | size |
|---------|---|------|
| meijerg | $\frac{16\sqrt{\pi} \sqrt{2} x^{\frac{3}{2}} \left(-\frac{1}{x^2} + 1\right) \cosh\left(\frac{\operatorname{arcsinh}\left(\frac{1}{x}\right)}{2}\right)}{3} + \frac{16\sqrt{\pi} \sqrt{2} \sqrt{x} \sqrt{\frac{1}{x^2} + 1} \sinh\left(\frac{\operatorname{arcsinh}\left(\frac{1}{x}\right)}{2}\right)}{8\sqrt{\pi}}$ | 57 |

[In] int((x+(x^2+1)^(1/2))^(1/2),x,method=_RETURNVERBOSE)

[Out] 1/8/Pi^(1/2)*(16/3*Pi^(1/2)*2^(1/2)*x^(3/2)*(-1/x^2+1)*cosh(1/2*arcsinh(1/x))+16/3*Pi^(1/2)*2^(1/2)*x^(1/2)*(1/x^2+1)^(1/2)*sinh(1/2*arcsinh(1/x)))

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.70

$$\int \sqrt{x + \sqrt{1 + x^2}} dx = \frac{2}{3} (2x - \sqrt{x^2 + 1}) \sqrt{x + \sqrt{x^2 + 1}}$$

[In] integrate((x+(x^2+1)^(1/2))^(1/2),x, algorithm="fricas")

[Out] 2/3*(2*x - sqrt(x^2 + 1))*sqrt(x + sqrt(x^2 + 1))

Sympy [A] (verification not implemented)

Time = 0.12 (sec) , antiderivative size = 42, normalized size of antiderivative = 1.14

$$\int \sqrt{x + \sqrt{1 + x^2}} dx = \frac{4x\sqrt{x + \sqrt{x^2 + 1}}}{3} - \frac{2\sqrt{x + \sqrt{x^2 + 1}}\sqrt{x^2 + 1}}{3}$$

[In] integrate((x+(x**2+1)**(1/2))**(1/2),x)

[Out] 4*x*sqrt(x + sqrt(x**2 + 1))/3 - 2*sqrt(x + sqrt(x**2 + 1))*sqrt(x**2 + 1)/3

Maxima [F]

$$\int \sqrt{x + \sqrt{1 + x^2}} dx = \int \sqrt{x + \sqrt{x^2 + 1}} dx$$

[In] integrate((x+(x^2+1)^(1/2))^(1/2),x, algorithm="maxima")

[Out] integrate(sqrt(x + sqrt(x^2 + 1)), x)

Giac [F]

$$\int \sqrt{x + \sqrt{1 + x^2}} dx = \int \sqrt{x + \sqrt{x^2 + 1}} dx$$

[In] integrate((x+(x^2+1)^(1/2))^(1/2),x, algorithm="giac")

[Out] integrate(sqrt(x + sqrt(x^2 + 1)), x)

Mupad [F(-1)]

Timed out.

$$\int \sqrt{x + \sqrt{1 + x^2}} dx = \int \sqrt{x + \sqrt{x^2 + 1}} dx$$

```
[In] int((x + (x^2 + 1)^(1/2))^(1/2), x)
```

```
[Out] int((x + (x^2 + 1)^(1/2))^(1/2), x)
```

3.117 $\int \frac{1}{2+\cos(x)} dx$

| | |
|---|------|
| Optimal result | 1366 |
| Rubi [A] (verified) | 1366 |
| Mathematica [A] (verified) | 1367 |
| Maple [A] (verified) | 1367 |
| Fricas [A] (verification not implemented) | 1367 |
| Sympy [A] (verification not implemented) | 1368 |
| Maxima [A] (verification not implemented) | 1368 |
| Giac [B] (verification not implemented) | 1368 |
| Mupad [B] (verification not implemented) | 1369 |

Optimal result

Integrand size = 6, antiderivative size = 20

$$\int \frac{1}{2 + \cos(x)} dx = \frac{2 \arctan\left(\frac{\tan\left(\frac{x}{2}\right)}{\sqrt{3}}\right)}{\sqrt{3}}$$

[Out] 2/3*arctan(1/3*tan(1/2*x)*3^(1/2))*3^(1/2)

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 30, normalized size of antiderivative = 1.50, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {2736}

$$\int \frac{1}{2 + \cos(x)} dx = \frac{x}{\sqrt{3}} - \frac{2 \arctan\left(\frac{\sin(x)}{\cos(x) + \sqrt{3} + 2}\right)}{\sqrt{3}}$$

[In] Int[(2 + Cos[x])^(-1), x]

[Out] x/Sqrt[3] - (2*ArcTan[Sin[x]/(2 + Sqrt[3] + Cos[x])])/Sqrt[3]

Rule 2736

Int[((a_) + (b_)*sin[(c_) + (d_)*(x_)])^(-1), x_Symbol] :> With[{q = Rt[a^2 - b^2, 2]}, Simp[x/q, x] + Simp[(2/(d*q))*ArcTan[b*(Cos[c + d*x]/(a + q + b*Sin[c + d*x]))], x] /; FreeQ[{a, b, c, d}, x] && GtQ[a^2 - b^2, 0] && PosQ[a]

Rubi steps

$$\text{integral} = \frac{x}{\sqrt{3}} - \frac{2 \arctan\left(\frac{\sin(x)}{2 + \sqrt{3} + \cos(x)}\right)}{\sqrt{3}}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{1}{2 + \cos(x)} dx = \frac{2 \arctan\left(\frac{\tan\left(\frac{x}{2}\right)}{\sqrt{3}}\right)}{\sqrt{3}}$$

[In] Integrate[(2 + Cos[x])^(-1),x]

[Out] (2*ArcTan[Tan[x/2]/Sqrt[3]])/Sqrt[3]

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

| method | result | size |
|---------|---|------|
| default | $\frac{2 \arctan\left(\frac{\tan\left(\frac{x}{2}\right)\sqrt{3}}{3}\right)\sqrt{3}}{3}$ | 16 |
| risch | $\frac{i\sqrt{3} \ln(e^{ix}+2+\sqrt{3})}{3} - \frac{i\sqrt{3} \ln(e^{ix}+2-\sqrt{3})}{3}$ | 38 |

[In] int(1/(2+cos(x)),x,method=_RETURNVERBOSE)

[Out] 2/3*arctan(1/3*tan(1/2*x)*3^(1/2))*3^(1/2)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.15

$$\int \frac{1}{2 + \cos(x)} dx = -\frac{1}{3} \sqrt{3} \arctan\left(\frac{2\sqrt{3} \cos(x) + \sqrt{3}}{3 \sin(x)}\right)$$

[In] integrate(1/(2+cos(x)),x, algorithm="fricas")

[Out] -1/3*sqrt(3)*arctan(1/3*(2*sqrt(3)*cos(x) + sqrt(3))/sin(x))

Sympy [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.60

$$\int \frac{1}{2 + \cos(x)} dx = \frac{2\sqrt{3} \left(\operatorname{atan} \left(\frac{\sqrt{3} \tan \left(\frac{x}{2} \right)}{3} \right) + \pi \left\lfloor \frac{\frac{x}{2} - \frac{\pi}{2}}{\pi} \right\rfloor \right)}{3}$$

[In] integrate(1/(2+cos(x)),x)

[Out] 2*sqrt(3)*(atan(sqrt(3)*tan(x/2)/3) + pi*floor((x/2 - pi/2)/pi))/3

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.95

$$\int \frac{1}{2 + \cos(x)} dx = \frac{2}{3} \sqrt{3} \arctan \left(\frac{\sqrt{3} \sin(x)}{3(\cos(x) + 1)} \right)$$

[In] integrate(1/(2+cos(x)),x, algorithm="maxima")

[Out] 2/3*sqrt(3)*arctan(1/3*sqrt(3)*sin(x)/(cos(x) + 1))

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 40 vs. 2(15) = 30.

Time = 0.27 (sec) , antiderivative size = 40, normalized size of antiderivative = 2.00

$$\int \frac{1}{2 + \cos(x)} dx = \frac{1}{3} \sqrt{3} \left(x + 2 \arctan \left(-\frac{\sqrt{3} \sin(x) - \sin(x)}{\sqrt{3} \cos(x) + \sqrt{3} - \cos(x) + 1} \right) \right)$$

[In] integrate(1/(2+cos(x)),x, algorithm="giac")

[Out] 1/3*sqrt(3)*(x + 2*arctan(-(sqrt(3)*sin(x) - sin(x))/(sqrt(3)*cos(x) + sqrt(3) - cos(x) + 1)))

Mupad [B] (verification not implemented)

Time = 21.01 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.60

$$\int \frac{1}{2 + \cos(x)} dx = \frac{2\sqrt{3} \left(\frac{x}{2} - \operatorname{atan}\left(\tan\left(\frac{x}{2}\right)\right) \right)}{3} + \frac{2\sqrt{3} \operatorname{atan}\left(\frac{\sqrt{3}\tan\left(\frac{x}{2}\right)}{3}\right)}{3}$$

[In] `int(1/(cos(x) + 2),x)`

[Out] `(2*3^(1/2)*(x/2 - atan(tan(x/2)))/3 + (2*3^(1/2)*atan((3^(1/2)*tan(x/2))/3))/3`

3.118 $\int (\cos^4(x) - \sin^4(x)) dx$

| | |
|---|------|
| Optimal result | 1370 |
| Rubi [B] (verified) | 1370 |
| Mathematica [A] (verified) | 1371 |
| Maple [A] (verified) | 1371 |
| Fricas [A] (verification not implemented) | 1372 |
| Sympy [B] (verification not implemented) | 1372 |
| Maxima [A] (verification not implemented) | 1372 |
| Giac [A] (verification not implemented) | 1372 |
| Mupad [B] (verification not implemented) | 1373 |

Optimal result

Integrand size = 11, antiderivative size = 5

$$\int (\cos^4(x) - \sin^4(x)) dx = \cos(x) \sin(x)$$

[Out] `cos(x)*sin(x)`

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 29 vs. 2(5) = 10.

Time = 0.03 (sec) , antiderivative size = 29, normalized size of antiderivative = 5.80, number of steps used = 7, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {2715, 8}

$$\int (\cos^4(x) - \sin^4(x)) dx = \frac{1}{4} \sin(x) \cos^3(x) + \frac{1}{4} \sin^3(x) \cos(x) + \frac{3}{4} \sin(x) \cos(x)$$

[In] `Int[Cos[x]^4 - Sin[x]^4,x]`

[Out] `(3*Cos[x]*Sin[x])/4 + (Cos[x]^3*Sin[x])/4 + (Cos[x]*Sin[x]^3)/4`

Rule 8

`Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]`

Rule 2715

`Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] := Simp[(-b)*Cos[c + d*x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2`

*n]

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \cos^4(x) dx - \int \sin^4(x) dx \\
&= \frac{1}{4} \cos^3(x) \sin(x) + \frac{1}{4} \cos(x) \sin^3(x) + \frac{3}{4} \int \cos^2(x) dx - \frac{3}{4} \int \sin^2(x) dx \\
&= \frac{3}{4} \cos(x) \sin(x) + \frac{1}{4} \cos^3(x) \sin(x) + \frac{1}{4} \cos(x) \sin^3(x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.60

$$\int (\cos^4(x) - \sin^4(x)) dx = \frac{1}{2} \sin(2x)$$

[In] Integrate[Cos[x]^4 - Sin[x]^4,x]

[Out] Sin[2*x]/2

Maple [A] (verified)

Time = 0.24 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

| method | result | size |
|---------------|---|------|
| risch | $\frac{\sin(2x)}{2}$ | 7 |
| parallelrisch | $\frac{\sin(2x)}{2}$ | 7 |
| default | $\frac{(\cos(x)^3 + \frac{3\cos(x)}{2}) \sin(x)}{4} + \frac{(\sin(x)^3 + \frac{3\sin(x)}{2}) \cos(x)}{4}$ | 28 |
| parts | $\frac{(\cos(x)^3 + \frac{3\cos(x)}{2}) \sin(x)}{4} + \frac{(\sin(x)^3 + \frac{3\sin(x)}{2}) \cos(x)}{4}$ | 28 |
| norman | $\frac{2 \tan(\frac{x}{2})^3 - 2 \tan(\frac{x}{2})^5 - 2 \tan(\frac{x}{2})^7 + 2 \tan(\frac{x}{2})}{(1 + \tan(\frac{x}{2})^2)^4}$ | 43 |

[In] int(cos(x)^4-sin(x)^4,x,method=_RETURNVERBOSE)

[Out] 1/2*sin(2*x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int (\cos^4(x) - \sin^4(x)) dx = \cos(x) \sin(x)$$

[In] integrate(cos(x)^4-sin(x)^4,x, algorithm="fricas")

[Out] cos(x)*sin(x)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 29 vs. 2(5) = 10.

Time = 0.02 (sec) , antiderivative size = 29, normalized size of antiderivative = 5.80

$$\int (\cos^4(x) - \sin^4(x)) dx = \frac{\sin^3(x) \cos(x)}{4} + \frac{\sin(x) \cos^3(x)}{4} + \frac{3 \sin(x) \cos(x)}{4}$$

[In] integrate(cos(x)**4-sin(x)**4,x)

[Out] sin(x)**3*cos(x)/4 + sin(x)*cos(x)**3/4 + 3*sin(x)*cos(x)/4

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.20

$$\int (\cos^4(x) - \sin^4(x)) dx = \frac{1}{2} \sin(2x)$$

[In] integrate(cos(x)^4-sin(x)^4,x, algorithm="maxima")

[Out] 1/2*sin(2*x)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.20

$$\int (\cos^4(x) - \sin^4(x)) dx = \frac{1}{2} \sin(2x)$$

[In] integrate(cos(x)^4-sin(x)^4,x, algorithm="giac")

[Out] 1/2*sin(2*x)

Mupad [B] (verification not implemented)

Time = 20.29 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.20

$$\int (\cos^4(x) - \sin^4(x)) dx = \frac{\sin(2x)}{2}$$

[In] int(cos(x)^4 - sin(x)^4,x)

[Out] sin(2*x)/2

3.119 $\int \frac{x}{\sqrt{2+4x}} dx$

| | |
|---|------|
| Optimal result | 1374 |
| Rubi [B] (verified) | 1374 |
| Mathematica [A] (verified) | 1375 |
| Maple [A] (verified) | 1375 |
| Fricas [A] (verification not implemented) | 1376 |
| Sympy [B] (verification not implemented) | 1376 |
| Maxima [C] (verification not implemented) | 1376 |
| Giac [C] (verification not implemented) | 1377 |
| Mupad [B] (verification not implemented) | 1377 |

Optimal result

Integrand size = 11, antiderivative size = 16

$$\int \frac{x}{\sqrt{2+4x}} dx = \frac{1}{6}(-1+x)\sqrt{2+4x}$$

[Out] 1/6*(-1+x)*(4*x+2)^(1/2)

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 37 vs. 2(16) = 32.

Time = 0.01 (sec), antiderivative size = 37, normalized size of antiderivative = 2.31, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.091$, Rules used = {45}

$$\int \frac{x}{\sqrt{2+4x}} dx = \frac{(2x+1)^{3/2}}{6\sqrt{2}} - \frac{\sqrt{2x+1}}{2\sqrt{2}}$$

[In] Int[x/Sqrt[2 + 4*x], x]

[Out] -1/2*Sqrt[1 + 2*x]/Sqrt[2] + (1 + 2*x)^(3/2)/(6*Sqrt[2])

Rule 45

```
Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int
[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x], x] /; FreeQ[{a, b, c, d, n},
x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && Le
Q[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(-\frac{1}{2\sqrt{2+4x}} + \frac{1}{4}\sqrt{2+4x} \right) dx \\ &= -\frac{\sqrt{1+2x}}{2\sqrt{2}} + \frac{(1+2x)^{3/2}}{6\sqrt{2}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \frac{x}{\sqrt{2+4x}} dx = \frac{1}{3}(-1+x)\sqrt{\frac{1}{2}+x}$$

[In] Integrate[x/Sqrt[2 + 4*x],x]

[Out] ((-1 + x)*Sqrt[1/2 + x])/3

Maple [A] (verified)

Time = 0.17 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.81

| method | result | size |
|-------------------|--|------|
| pseudoelliptic | $\frac{(-1+x)\sqrt{4x+2}}{6}$ | 13 |
| trager | $\frac{(\frac{x}{3}-\frac{1}{3})\sqrt{4x+2}}{2}$ | 15 |
| gospers | $\frac{(1+2x)(-1+x)}{3\sqrt{4x+2}}$ | 18 |
| risch | $\frac{(1+2x)(-1+x)}{3\sqrt{4x+2}}$ | 18 |
| derivativedivides | $\frac{(4x+2)^{\frac{3}{2}}}{24} - \frac{\sqrt{4x+2}}{4}$ | 20 |
| default | $\frac{(4x+2)^{\frac{3}{2}}}{24} - \frac{\sqrt{4x+2}}{4}$ | 20 |
| meijerg | $\frac{\sqrt{2} \left(\frac{4\sqrt{\pi}}{3} - \frac{\sqrt{\pi}(-8x+8)\sqrt{1+2x}}{6} \right)}{8\sqrt{\pi}}$ | 32 |

[In] int(x/(4*x+2)^(1/2),x,method=_RETURNVERBOSE)

[Out] 1/6*(-1+x)*(4*x+2)^(1/2)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{x}{\sqrt{2+4x}} dx = \frac{1}{6} \sqrt{4x+2}(x-1)$$

[In] integrate(x/(4*x+2)^(1/2),x, algorithm="fricas")

[Out] 1/6*sqrt(4*x + 2)*(x - 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 31 vs. 2(14) = 28.

Time = 0.53 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.94

$$\int \frac{x}{\sqrt{2+4x}} dx = \frac{\sqrt{2}x\sqrt{2x+1}}{6} - \frac{\sqrt{2}\sqrt{2x+1}}{6}$$

[In] integrate(x/(4*x+2)**(1/2),x)

[Out] sqrt(2)*x*sqrt(2*x + 1)/6 - sqrt(2)*sqrt(2*x + 1)/6

Maxima [C] (verification not implemented)

Result contains higher order function than in optimal. Order 3 vs. order 2.

Time = 0.18 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.19

$$\int \frac{x}{\sqrt{2+4x}} dx = \frac{1}{24} (4x+2)^{\frac{3}{2}} - \frac{1}{4} \sqrt{4x+2}$$

[In] integrate(x/(4*x+2)^(1/2),x, algorithm="maxima")

[Out] 1/24*(4*x + 2)^(3/2) - 1/4*sqrt(4*x + 2)

Giac [C] (verification not implemented)

Result contains higher order function than in optimal. Order 3 vs. order 2.

Time = 0.26 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.38

$$\int \frac{x}{\sqrt{2+4x}} dx = \frac{1}{12} \sqrt{2} \left((2x+1)^{\frac{3}{2}} - 3\sqrt{2x+1} \right)$$

[In] integrate(x/(4*x+2)^(1/2),x, algorithm="giac")

[Out] 1/12*sqrt(2)*((2*x + 1)^(3/2) - 3*sqrt(2*x + 1))

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.88

$$\int \frac{x}{\sqrt{2+4x}} dx = \frac{\sqrt{4x+2}(4x-4)}{24}$$

[In] int(x/(4*x + 2)^(1/2),x)

[Out] ((4*x + 2)^(1/2)*(4*x - 4))/24

3.120 $\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx$

| | |
|---|------|
| Optimal result | 1378 |
| Rubi [A] (verified) | 1378 |
| Mathematica [A] (verified) | 1379 |
| Maple [A] (verified) | 1379 |
| Fricas [A] (verification not implemented) | 1379 |
| Sympy [A] (verification not implemented) | 1380 |
| Maxima [A] (verification not implemented) | 1380 |
| Giac [A] (verification not implemented) | 1380 |
| Mupad [B] (verification not implemented) | 1380 |

Optimal result

Integrand size = 12, antiderivative size = 8

$$\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx = 2 \sin(\sqrt{x})$$

[Out] 2*sin(x^(1/2))

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {3461, 2717}

$$\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx = 2 \sin(\sqrt{x})$$

[In] Int[Cos[Sqrt[x]]/Sqrt[x],x]

[Out] 2*Sin[Sqrt[x]]

Rule 2717

Int[sin[Pi/2 + (c_.) + (d_.)*(x_.)], x_Symbol] := Simp[Sin[c + d*x]/d, x] /;
FreeQ[{c, d}, x]

Rule 3461

Int[((a_.) + Cos[(c_.) + (d_.)*(x_)^(n_)])*(b_.))^(p_.)*(x_)^(m_.), x_Symbol] := Dist[1/n, Subst[Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*Cos[c + d*x])^p, x], x, x^n], x] /; FreeQ[{a, b, c, d, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]] && (EqQ[p, 1] || EqQ[m, n - 1] || (IntegerQ[p] && GtQ[Simplify[(

m + 1)/n], 0]))

Rubi steps

$$\begin{aligned}\text{integral} &= 2\text{Subst}\left(\int \cos(x) dx, x, \sqrt{x}\right) \\ &= 2 \sin(\sqrt{x})\end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx = 2 \sin(\sqrt{x})$$

[In] Integrate[Cos[Sqrt[x]]/Sqrt[x], x]

[Out] 2*Sin[Sqrt[x]]

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

| method | result | size |
|--------------------|--------------------|------|
| derivativeldivides | $2 \sin(\sqrt{x})$ | 7 |
| default | $2 \sin(\sqrt{x})$ | 7 |
| meijerg | $2 \sin(\sqrt{x})$ | 7 |

[In] int(cos(x^(1/2))/x^(1/2), x, method=_RETURNVERBOSE)

[Out] 2*sin(x^(1/2))

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx = 2 \sin(\sqrt{x})$$

[In] integrate(cos(x^(1/2))/x^(1/2), x, algorithm="fricas")

[Out] 2*sin(sqrt(x))

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx = 2 \sin(\sqrt{x})$$

[In] integrate(cos(x**(1/2))/x**(1/2),x)

[Out] 2*sin(sqrt(x))

Maxima [A] (verification not implemented)

none

Time = 0.17 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx = 2 \sin(\sqrt{x})$$

[In] integrate(cos(x^(1/2))/x^(1/2),x, algorithm="maxima")

[Out] 2*sin(sqrt(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx = 2 \sin(\sqrt{x})$$

[In] integrate(cos(x^(1/2))/x^(1/2),x, algorithm="giac")

[Out] 2*sin(sqrt(x))

Mupad [B] (verification not implemented)

Time = 20.12 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx = 2 \sin(\sqrt{x})$$

[In] int(cos(x^(1/2))/x^(1/2),x)

[Out] 2*sin(x^(1/2))

3.121 $\int \sec(x) dx$

| | |
|---|------|
| Optimal result | 1381 |
| Rubi [A] (verified) | 1381 |
| Mathematica [A] (verified) | 1382 |
| Maple [A] (verified) | 1382 |
| Fricas [B] (verification not implemented) | 1382 |
| Sympy [B] (verification not implemented) | 1383 |
| Maxima [A] (verification not implemented) | 1383 |
| Giac [B] (verification not implemented) | 1383 |
| Mupad [B] (verification not implemented) | 1384 |

Optimal result

Integrand size = 2, antiderivative size = 3

$$\int \sec(x) dx = \operatorname{arctanh}(\sin(x))$$

[Out] $\operatorname{arctanh}(\sin(x))$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3855}

$$\int \sec(x) dx = \operatorname{arctanh}(\sin(x))$$

[In] $\operatorname{Int}[\operatorname{Sec}[x], x]$

[Out] $\operatorname{ArcTanh}[\operatorname{Sin}[x]]$

Rule 3855

$\operatorname{Int}[\operatorname{csc}[(c_.) + (d_.)*(x_.)], x_Symbol] \rightarrow \operatorname{Simp}[-\operatorname{ArcTanh}[\operatorname{Cos}[c + d*x]]/d, x]$
 /; $\operatorname{FreeQ}\{c, d\}, x]$

Rubi steps

$$\text{integral} = \operatorname{arctanh}(\sin(x))$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \sec(x) dx = \operatorname{arctanh}(\sin(x))$$

[In] Integrate[Sec[x],x]

[Out] ArcTanh[Sin[x]]

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 7, normalized size of antiderivative = 2.33

| method | result | size |
|---------------|--|------|
| lookup | $\ln(\sec(x) + \tan(x))$ | 7 |
| default | $\ln(\sec(x) + \tan(x))$ | 7 |
| norman | $-\ln\left(\tan\left(\frac{x}{2}\right) - 1\right) + \ln\left(1 + \tan\left(\frac{x}{2}\right)\right)$ | 18 |
| parallelrisch | $-\ln\left(\tan\left(\frac{x}{2}\right) - 1\right) + \ln\left(1 + \tan\left(\frac{x}{2}\right)\right)$ | 18 |
| risch | $\ln(i + e^{ix}) - \ln(e^{ix} - i)$ | 22 |

[In] int(sec(x),x,method=_RETURNVERBOSE)

[Out] ln(sec(x)+tan(x))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 17 vs. $2(3) = 6$.

Time = 0.25 (sec) , antiderivative size = 17, normalized size of antiderivative = 5.67

$$\int \sec(x) dx = \frac{1}{2} \log(\sin(x) + 1) - \frac{1}{2} \log(-\sin(x) + 1)$$

[In] integrate(sec(x),x, algorithm="fricas")

[Out] 1/2*log(sin(x) + 1) - 1/2*log(-sin(x) + 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(3) = 6$.

Time = 0.06 (sec) , antiderivative size = 15, normalized size of antiderivative = 5.00

$$\int \sec(x) dx = -\frac{\log(\sin(x) - 1)}{2} + \frac{\log(\sin(x) + 1)}{2}$$

[In] integrate(sec(x),x)

[Out] -log(sin(x) - 1)/2 + log(sin(x) + 1)/2

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 6, normalized size of antiderivative = 2.00

$$\int \sec(x) dx = \log(\sec(x) + \tan(x))$$

[In] integrate(sec(x),x, algorithm="maxima")

[Out] log(sec(x) + tan(x))

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 25 vs. $2(3) = 6$.

Time = 0.26 (sec) , antiderivative size = 25, normalized size of antiderivative = 8.33

$$\int \sec(x) dx = \frac{1}{4} \log\left(\left|\frac{1}{\sin(x)} + \sin(x) + 2\right|\right) - \frac{1}{4} \log\left(\left|\frac{1}{\sin(x)} + \sin(x) - 2\right|\right)$$

[In] integrate(sec(x),x, algorithm="giac")

[Out] 1/4*log(abs(1/sin(x) + sin(x) + 2)) - 1/4*log(abs(1/sin(x) + sin(x) - 2))

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 11, normalized size of antiderivative = 3.67

$$\int \sec(x) dx = \ln\left(\frac{1}{\cos(x)}\right) + \ln(\sin(x) + 1)$$

[In] `int(1/cos(x),x)`

[Out] `log(1/cos(x)) + log(sin(x) + 1)`

3.122 $\int e^{\sin(x)} \cos(x) dx$

| | |
|---|------|
| Optimal result | 1385 |
| Rubi [A] (verified) | 1385 |
| Mathematica [A] (verified) | 1386 |
| Maple [A] (verified) | 1386 |
| Fricas [A] (verification not implemented) | 1386 |
| Sympy [F] | 1387 |
| Maxima [A] (verification not implemented) | 1387 |
| Giac [A] (verification not implemented) | 1387 |
| Mupad [B] (verification not implemented) | 1387 |

Optimal result

Integrand size = 7, antiderivative size = 4

$$\int e^{\sin(x)} \cos(x) dx = e^{\sin(x)}$$

[Out] exp(sin(x))

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.286$, Rules used = {4419, 2225}

$$\int e^{\sin(x)} \cos(x) dx = e^{\sin(x)}$$

[In] Int[E^Sin[x]*Cos[x],x]

[Out] E^Sin[x]

Rule 2225

Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] :> Simp[(F^(c*(a + b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]

Rule 4419

Int[(u_)*(F_)[(c_.)*((a_.) + (b_.)*(x_))], x_Symbol] :> With[{d = FreeFactors[Sin[c*(a + b*x)], x]}, Dist[d/(b*c), Subst[Int[SubstFor[1, Sin[c*(a + b*x)]]/d, u, x], x], Sin[c*(a + b*x)]/d, x] /; FunctionOfQ[Sin[c*(a + b*x)]/d, u, x, True] /; FreeQ[{a, b, c}, x] && (EqQ[F, Cos] || EqQ[F, cos])

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst} \left(\int e^x dx, x, \sin(x) \right) \\ &= e^{\sin(x)} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int e^{\sin(x)} \cos(x) dx = e^{\sin(x)}$$

[In] Integrate[E^Sin[x]*Cos[x],x]

[Out] E^Sin[x]

Maple [A] (verified)

Time = 0.44 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

| method | result | size |
|------------------|---------------|------|
| derivativdivides | $e^{\sin(x)}$ | 4 |
| default | $e^{\sin(x)}$ | 4 |
| risch | $e^{\sin(x)}$ | 4 |

[In] int(exp(sin(x))/tan(x)/csc(x),x,method=_RETURNVERBOSE)

[Out] exp(sin(x))

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 3, normalized size of antiderivative = 0.75

$$\int e^{\sin(x)} \cos(x) dx = e^{\sin(x)}$$

[In] integrate(exp(sin(x))/tan(x)/csc(x),x, algorithm="fricas")

[Out] e^sin(x)

Sympy [F]

$$\int e^{\sin(x)} \cos(x) dx = \int \frac{e^{\sin(x)}}{\tan(x) \csc(x)} dx$$

[In] integrate(exp(sin(x))/tan(x)/csc(x),x)

[Out] Integral(exp(sin(x))/(tan(x)*csc(x)), x)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 3, normalized size of antiderivative = 0.75

$$\int e^{\sin(x)} \cos(x) dx = e^{\sin(x)}$$

[In] integrate(exp(sin(x))/tan(x)/csc(x),x, algorithm="maxima")

[Out] e^{sin(x)}

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 3, normalized size of antiderivative = 0.75

$$\int e^{\sin(x)} \cos(x) dx = e^{\sin(x)}$$

[In] integrate(exp(sin(x))/tan(x)/csc(x),x, algorithm="giac")

[Out] e^{sin(x)}

Mupad [B] (verification not implemented)

Time = 17.48 (sec) , antiderivative size = 3, normalized size of antiderivative = 0.75

$$\int e^{\sin(x)} \cos(x) dx = e^{\sin(x)}$$

[In] int((exp(sin(x))*sin(x))/tan(x),x)

[Out] exp(sin(x))

3.123 $\int x \log^2(x) dx$

| | |
|---|------|
| Optimal result | 1388 |
| Rubi [A] (verified) | 1388 |
| Mathematica [A] (verified) | 1389 |
| Maple [A] (verified) | 1389 |
| Fricas [A] (verification not implemented) | 1390 |
| Sympy [A] (verification not implemented) | 1390 |
| Maxima [A] (verification not implemented) | 1390 |
| Giac [A] (verification not implemented) | 1390 |
| Mupad [B] (verification not implemented) | 1391 |

Optimal result

Integrand size = 6, antiderivative size = 28

$$\int x \log^2(x) dx = \frac{x^2}{4} - \frac{1}{2}x^2 \log(x) + \frac{1}{2}x^2 \log^2(x)$$

[Out] 1/4*x^2-1/2*x^2*ln(x)+1/2*x^2*ln(x)^2

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {2342, 2341}

$$\int x \log^2(x) dx = \frac{x^2}{4} + \frac{1}{2}x^2 \log^2(x) - \frac{1}{2}x^2 \log(x)$$

[In] Int[x*Log[x]^2,x]

[Out] x^2/4 - (x^2*Log[x])/2 + (x^2*Log[x]^2)/2

Rule 2341

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*((d_.)*(x_))^(m_.), x_Symbol] :>
Simp[(d*x)^(m + 1)*((a + b*Log[c*x^n])/(d*(m + 1))), x] - Simp[b*n*((d*x)^(
m + 1)/(d*(m + 1)^2)), x] /; FreeQ[{a, b, c, d, m, n}, x] && NeQ[m, -1]
```

Rule 2342

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*((d_.)*(x_))^(m_.), x_Symbo
l] :> Simp[(d*x)^(m + 1)*((a + b*Log[c*x^n])^p/(d*(m + 1))), x] - Dist[b*n*
(p/(m + 1)), Int[(d*x)^m*(a + b*Log[c*x^n])^(p - 1), x], x] /; FreeQ[{a, b,
```


c, d, m, n}, x] && NeQ[m, -1] && GtQ[p, 0]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2}x^2 \log^2(x) - \int x \log(x) dx \\ &= \frac{x^2}{4} - \frac{1}{2}x^2 \log(x) + \frac{1}{2}x^2 \log^2(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.00

$$\int x \log^2(x) dx = \frac{x^2}{4} - \frac{1}{2}x^2 \log(x) + \frac{1}{2}x^2 \log^2(x)$$

[In] Integrate[x*Log[x]^2,x]

[Out] x^2/4 - (x^2*Log[x])/2 + (x^2*Log[x]^2)/2

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.82

| method | result | size |
|---------------|---|------|
| default | $\frac{x^2}{4} - \frac{x^2 \ln(x)}{2} + \frac{x^2 \ln(x)^2}{2}$ | 23 |
| norman | $\frac{x^2}{4} - \frac{x^2 \ln(x)}{2} + \frac{x^2 \ln(x)^2}{2}$ | 23 |
| risch | $\frac{x^2}{4} - \frac{x^2 \ln(x)}{2} + \frac{x^2 \ln(x)^2}{2}$ | 23 |
| parallelrisch | $\frac{x^2}{4} - \frac{x^2 \ln(x)}{2} + \frac{x^2 \ln(x)^2}{2}$ | 23 |
| parts | $\frac{x^2}{4} - \frac{x^2 \ln(x)}{2} + \frac{x^2 \ln(x)^2}{2}$ | 23 |

[In] int(x*ln(x)^2,x,method=_RETURNVERBOSE)

[Out] 1/4*x^2-1/2*x^2*ln(x)+1/2*x^2*ln(x)^2

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.79

$$\int x \log^2(x) dx = \frac{1}{2} x^2 \log(x)^2 - \frac{1}{2} x^2 \log(x) + \frac{1}{4} x^2$$

[In] integrate(x*log(x)^2,x, algorithm="fricas")

[Out] 1/2*x^2*log(x)^2 - 1/2*x^2*log(x) + 1/4*x^2

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.79

$$\int x \log^2(x) dx = \frac{x^2 \log(x)^2}{2} - \frac{x^2 \log(x)}{2} + \frac{x^2}{4}$$

[In] integrate(x*ln(x)**2,x)

[Out] x**2*log(x)**2/2 - x**2*log(x)/2 + x**2/4

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.61

$$\int x \log^2(x) dx = \frac{1}{4} (2 \log(x)^2 - 2 \log(x) + 1) x^2$$

[In] integrate(x*log(x)^2,x, algorithm="maxima")

[Out] 1/4*(2*log(x)^2 - 2*log(x) + 1)*x^2

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.79

$$\int x \log^2(x) dx = \frac{1}{2} x^2 \log(x)^2 - \frac{1}{2} x^2 \log(x) + \frac{1}{4} x^2$$

[In] integrate(x*log(x)^2,x, algorithm="giac")

[Out] 1/2*x^2*log(x)^2 - 1/2*x^2*log(x) + 1/4*x^2

Mupad [B] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.61

$$\int x \log^2(x) dx = \frac{x^2 (2 \ln(x)^2 - 2 \ln(x) + 1)}{4}$$

[In] int(x*log(x)^2,x)

[Out] (x^2*(2*log(x)^2 - 2*log(x) + 1))/4

3.124 $\int \frac{1}{5+4\sqrt{x}+x} dx$

| | |
|---|------|
| Optimal result | 1392 |
| Rubi [A] (verified) | 1392 |
| Mathematica [A] (verified) | 1393 |
| Maple [A] (verified) | 1394 |
| Fricas [A] (verification not implemented) | 1394 |
| Sympy [A] (verification not implemented) | 1394 |
| Maxima [A] (verification not implemented) | 1395 |
| Giac [A] (verification not implemented) | 1395 |
| Mupad [B] (verification not implemented) | 1395 |

Optimal result

Integrand size = 12, antiderivative size = 22

$$\int \frac{1}{5+4\sqrt{x}+x} dx = -4 \arctan(2 + \sqrt{x}) + \log(5 + 4\sqrt{x} + x)$$

[Out] $-4*\arctan(2+x^{(1/2)})+\ln(5+4*x^{(1/2)}+x)$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.417$, Rules used = {1355, 648, 632, 210, 642}

$$\int \frac{1}{5+4\sqrt{x}+x} dx = \log(x + 4\sqrt{x} + 5) - 4 \arctan(\sqrt{x} + 2)$$

[In] $\text{Int}[(5 + 4*\text{Sqrt}[x] + x)^{-1}, x]$

[Out] $-4*\text{ArcTan}[2 + \text{Sqrt}[x]] + \text{Log}[5 + 4*\text{Sqrt}[x] + x]$

Rule 210

$\text{Int}[(a_ + (b_.)*(x_)^2)^{-1}, x_Symbol] := \text{Simp}[(-\text{Rt}[-a, 2]*\text{Rt}[-b, 2])^{-1})*\text{ArcTan}[\text{Rt}[-b, 2]*(x/\text{Rt}[-a, 2])], x] /;$ $\text{FreeQ}\{a, b, x\} \ \&\& \ \text{PosQ}[a/b] \ \& \ \& \ (\text{LtQ}[a, 0] \ || \ \text{LtQ}[b, 0])$

Rule 632

$\text{Int}[(a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^{-1}, x_Symbol] := \text{Dist}[-2, \text{Subst}[\text{Int}[1/\text{Simp}[b^2 - 4*a*c - x^2, x], x], x, b + 2*c*x], x] /;$ $\text{FreeQ}\{a, b, c\},$

$x]$ && NeQ[$b^2 - 4ac$, 0]

Rule 642

Int[((d_) + (e_)*(x_))/((a_) + (b_)*(x_) + (c_)*(x_)^2), x_Symbol] := Simp[d*(Log[RemoveContent[a + b*x + c*x^2, x]]/b), x] /; FreeQ[{a, b, c, d, e}, x] && EqQ[2*c*d - b*e, 0]

Rule 648

Int[((d_) + (e_)*(x_))/((a_) + (b_)*(x_) + (c_)*(x_)^2), x_Symbol] := Dist[(2*c*d - b*e)/(2*c), Int[1/(a + b*x + c*x^2), x], x] + Dist[e/(2*c), Int[(b + 2*c*x)/(a + b*x + c*x^2), x], x] /; FreeQ[{a, b, c, d, e}, x] && NeQ[2*c*d - b*e, 0] && NeQ[b^2 - 4*a*c, 0] && !NiceSqrtQ[b^2 - 4*a*c]

Rule 1355

Int[((a_) + (c_)*(x_)^(n2_)) + (b_)*(x_)^(n_)]^(p_), x_Symbol] := With[{k = Denominator[n]}, Dist[k, Subst[Int[x^(k - 1)*(a + b*x^(k*n) + c*x^(2*k*n))]^p, x], x, x^(1/k)], x] /; FreeQ[{a, b, c, p}, x] && EqQ[n2, 2*n] && FractionQ[n]

Rubi steps

$$\begin{aligned}
 \text{integral} &= 2\text{Subst}\left(\int \frac{x}{5 + 4x + x^2} dx, x, \sqrt{x}\right) \\
 &= -\left(4\text{Subst}\left(\int \frac{1}{5 + 4x + x^2} dx, x, \sqrt{x}\right)\right) + \text{Subst}\left(\int \frac{4 + 2x}{5 + 4x + x^2} dx, x, \sqrt{x}\right) \\
 &= \log(5 + 4\sqrt{x} + x) + 8\text{Subst}\left(\int \frac{1}{-4 - x^2} dx, x, 4 + 2\sqrt{x}\right) \\
 &= -4 \arctan(2 + \sqrt{x}) + \log(5 + 4\sqrt{x} + x)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \frac{1}{5 + 4\sqrt{x} + x} dx = -4 \arctan(2 + \sqrt{x}) + \log(5 + 4\sqrt{x} + x)$$

[In] Integrate[(5 + 4*Sqrt[x] + x)^(-1), x]

[Out] -4*ArcTan[2 + Sqrt[x]] + Log[5 + 4*Sqrt[x] + x]

Maple [A] (verified)

Time = 0.11 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.86

| method | result |
|-------------------|---|
| derivativedivides | $-4 \arctan(2 + \sqrt{x}) + \ln(5 + 4\sqrt{x} + x)$ |
| default | $2 \arctan\left(\frac{x}{4} - \frac{3}{4}\right) + \frac{\ln(x^2 - 6x + 25)}{2} - \frac{\ln(5 + x - 4\sqrt{x})}{2} - 2 \arctan(-2 + \sqrt{x}) + \frac{\ln(5 + 4\sqrt{x} + x)}{2} - 2 \arctan\left(\frac{x}{4} - \frac{3}{4}\right)$ |
| trager | $\text{RootOf}(_Z^2 - 2_Z + 5) \ln(5 + 4\sqrt{x} + x) - \ln\left(79 \text{RootOf}(_Z^2 - 2_Z + 5)^2 x - 93\right)$ |

[In] int(1/(5+4*x^(1/2)+x),x,method=_RETURNVERBOSE)

[Out] -4*arctan(2+x^(1/2))+ln(5+4*x^(1/2)+x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.82

$$\int \frac{1}{5 + 4\sqrt{x} + x} dx = -4 \arctan(\sqrt{x} + 2) + \log(x + 4\sqrt{x} + 5)$$

[In] integrate(1/(5+4*x^(1/2)+x),x, algorithm="fricas")

[Out] -4*arctan(sqrt(x) + 2) + log(x + 4*sqrt(x) + 5)

Sympy [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.91

$$\int \frac{1}{5 + 4\sqrt{x} + x} dx = \log(4\sqrt{x} + x + 5) - 4 \operatorname{atan}(\sqrt{x} + 2)$$

[In] integrate(1/(5+4*x**(1/2)+x),x)

[Out] log(4*sqrt(x) + x + 5) - 4*atan(sqrt(x) + 2)

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.82

$$\int \frac{1}{5 + 4\sqrt{x} + x} dx = -4 \arctan(\sqrt{x} + 2) + \log(x + 4\sqrt{x} + 5)$$

[In] integrate(1/(5+4*x^(1/2)+x),x, algorithm="maxima")

[Out] -4*arctan(sqrt(x) + 2) + log(x + 4*sqrt(x) + 5)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.82

$$\int \frac{1}{5 + 4\sqrt{x} + x} dx = -4 \arctan(\sqrt{x} + 2) + \log(x + 4\sqrt{x} + 5)$$

[In] integrate(1/(5+4*x^(1/2)+x),x, algorithm="giac")

[Out] -4*arctan(sqrt(x) + 2) + log(x + 4*sqrt(x) + 5)

Mupad [B] (verification not implemented)

Time = 0.14 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.82

$$\int \frac{1}{5 + 4\sqrt{x} + x} dx = \ln(x + 4\sqrt{x} + 5) - 4 \operatorname{atan}(\sqrt{x} + 2)$$

[In] int(1/(x + 4*x^(1/2) + 5),x)

[Out] log(x + 4*x^(1/2) + 5) - 4*atan(x^(1/2) + 2)

3.125 $\int 2015^x dx$

| | |
|---|------|
| Optimal result | 1396 |
| Rubi [A] (verified) | 1396 |
| Mathematica [A] (verified) | 1397 |
| Maple [A] (verified) | 1397 |
| Fricas [A] (verification not implemented) | 1397 |
| Sympy [A] (verification not implemented) | 1398 |
| Maxima [A] (verification not implemented) | 1398 |
| Giac [A] (verification not implemented) | 1398 |
| Mupad [B] (verification not implemented) | 1398 |

Optimal result

Integrand size = 3, antiderivative size = 8

$$\int 2015^x dx = \frac{2015^x}{\log(2015)}$$

[Out] 2015^x/ln(2015)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {2225}

$$\int 2015^x dx = \frac{2015^x}{\log(2015)}$$

[In] Int[2015^x, x]

[Out] 2015^x/Log[2015]

Rule 2225

Int[((F_)^((c_)*((a_) + (b_)*(x_))))^(n_), x_Symbol] :> Simp[(F^(c*(a + b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]

Rubi steps

$$\text{integral} = \frac{2015^x}{\log(2015)}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int 2015^x dx = \frac{2015^x}{\log(2015)}$$

[In] Integrate[2015^x,x]

[Out] 2015^x/Log[2015]

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.12

| method | result | size |
|-------------------|--|------|
| gospers | $\frac{2015^x}{\ln(2015)}$ | 9 |
| derivativedivides | $\frac{2015^x}{\ln(2015)}$ | 9 |
| default | $\frac{2015^x}{\ln(2015)}$ | 9 |
| parallelrisch | $\frac{2015^x}{\ln(2015)}$ | 9 |
| norman | $\frac{e^x \ln(2015)}{\ln(2015)}$ | 11 |
| meijerg | $-\frac{1-e^x \ln(2015)}{\ln(2015)}$ | 16 |
| risch | $\frac{31^x 13^x 5^x}{\ln(5)+\ln(13)+\ln(31)}$ | 20 |

[In] int(2015^x,x,method=_RETURNVERBOSE)

[Out] 2015^x/ln(2015)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int 2015^x dx = \frac{2015^x}{\log(2015)}$$

[In] integrate(2015^x,x, algorithm="fricas")

[Out] 2015^x/log(2015)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.62

$$\int 2015^x dx = \frac{2015^x}{\log(2015)}$$

[In] integrate(2015**x,x)

[Out] 2015**x/log(2015)

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int 2015^x dx = \frac{2015^x}{\log(2015)}$$

[In] integrate(2015^x,x, algorithm="maxima")

[Out] 2015^x/log(2015)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int 2015^x dx = \frac{2015^x}{\log(2015)}$$

[In] integrate(2015^x,x, algorithm="giac")

[Out] 2015^x/log(2015)

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int 2015^x dx = \frac{2015^x}{\ln(2015)}$$

[In] int(2015^x,x)

[Out] 2015^x/log(2015)

3.126 $\int \frac{x}{(-3+x)(5+x)^2} dx$

| | |
|---|------|
| Optimal result | 1399 |
| Rubi [A] (verified) | 1399 |
| Mathematica [A] (verified) | 1400 |
| Maple [A] (verified) | 1400 |
| Fricas [A] (verification not implemented) | 1401 |
| Sympy [A] (verification not implemented) | 1401 |
| Maxima [A] (verification not implemented) | 1401 |
| Giac [A] (verification not implemented) | 1401 |
| Mupad [B] (verification not implemented) | 1402 |

Optimal result

Integrand size = 12, antiderivative size = 22

$$\int \frac{x}{(-3+x)(5+x)^2} dx = -\frac{5}{8(5+x)} - \frac{3}{32} \operatorname{arctanh}\left(\frac{1+x}{4}\right)$$

[Out] -5/(8*x+40)-3/32*arctanh(1/4+1/4*x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.27, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.083$, Rules used = {78}

$$\int \frac{x}{(-3+x)(5+x)^2} dx = -\frac{5}{8(x+5)} + \frac{3}{64} \log(3-x) - \frac{3}{64} \log(x+5)$$

[In] Int[x/((-3 + x)*(5 + x)^2),x]

[Out] -5/(8*(5 + x)) + (3*Log[3 - x])/64 - (3*Log[5 + x])/64

Rule 78

```
Int[((a_.) + (b_.)*(x_))*((c_) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] :> Int[ExpandIntegrand[(a + b*x)*(c + d*x)^n*(e + f*x)^p, x], x] /; FreeQ[{a, b, c, d, e, f, n}, x] && NeQ[b*c - a*d, 0] && ((ILtQ[n, 0] && ILtQ[p, 0]) || EqQ[p, 1] || (IGtQ[p, 0] && (!IntegerQ[n] || LeQ[9*p + 5*(n + 2), 0]) || GeQ[n + p + 1, 0] || (GeQ[n + p + 2, 0] && RationalQ[a, b, c, d, e, f])))
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(\frac{3}{64(-3+x)} + \frac{5}{8(5+x)^2} - \frac{3}{64(5+x)} \right) dx \\ &= -\frac{5}{8(5+x)} + \frac{3}{64} \log(3-x) - \frac{3}{64} \log(5+x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.27

$$\int \frac{x}{(-3+x)(5+x)^2} dx = -\frac{5}{8(5+x)} + \frac{3}{64} \log(3-x) - \frac{3}{64} \log(5+x)$$

[In] Integrate[x/((-3+x)*(5+x)^2),x]

[Out] -5/(8*(5+x)) + (3*Log[3-x])/64 - (3*Log[5+x])/64

Maple [A] (verified)

Time = 0.23 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.95

| method | result | size |
|---------------|---|------|
| default | $-\frac{5}{8(5+x)} - \frac{3 \ln(5+x)}{64} + \frac{3 \ln(-3+x)}{64}$ | 21 |
| norman | $-\frac{5}{8(5+x)} - \frac{3 \ln(5+x)}{64} + \frac{3 \ln(-3+x)}{64}$ | 21 |
| risch | $-\frac{5}{8(5+x)} - \frac{3 \ln(5+x)}{64} + \frac{3 \ln(-3+x)}{64}$ | 21 |
| paralletrisch | $-\frac{3 \ln(5+x)x - 3 \ln(-3+x)x + 40 + 15 \ln(5+x) - 15 \ln(-3+x)}{64(5+x)}$ | 36 |

[In] int(x/(-3+x)/(5+x)^2,x,method=_RETURNVERBOSE)

[Out] -5/8/(5+x)-3/64*ln(5+x)+3/64*ln(-3+x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.23

$$\int \frac{x}{(-3+x)(5+x)^2} dx = -\frac{3(x+5)\log(x+5) - 3(x+5)\log(x-3) + 40}{64(x+5)}$$

[In] integrate(x/(-3+x)/(5+x)^2,x, algorithm="fricas")

[Out] -1/64*(3*(x + 5)*log(x + 5) - 3*(x + 5)*log(x - 3) + 40)/(x + 5)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \frac{x}{(-3+x)(5+x)^2} dx = \frac{3\log(x-3)}{64} - \frac{3\log(x+5)}{64} - \frac{5}{8x+40}$$

[In] integrate(x/(-3+x)/(5+x)**2,x)

[Out] 3*log(x - 3)/64 - 3*log(x + 5)/64 - 5/(8*x + 40)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.91

$$\int \frac{x}{(-3+x)(5+x)^2} dx = -\frac{5}{8(x+5)} - \frac{3}{64}\log(x+5) + \frac{3}{64}\log(x-3)$$

[In] integrate(x/(-3+x)/(5+x)^2,x, algorithm="maxima")

[Out] -5/8/(x + 5) - 3/64*log(x + 5) + 3/64*log(x - 3)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.95

$$\int \frac{x}{(-3+x)(5+x)^2} dx = -\frac{5}{8(x+5)} + \frac{3}{64}\log\left(\left|-\frac{8}{x+5} + 1\right|\right)$$

[In] integrate(x/(-3+x)/(5+x)^2,x, algorithm="giac")

[Out] -5/8/(x + 5) + 3/64*log(abs(-8/(x + 5) + 1))

Mupad [B] (verification not implemented)

Time = 16.61 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \frac{x}{(-3+x)(5+x)^2} dx = -\frac{3 \ln\left(\frac{x+5}{x-3}\right)}{64} - \frac{5}{8(x+5)}$$

[In] int(x/((x - 3)*(x + 5)^2),x)

[Out] - (3*log((x + 5)/(x - 3)))/64 - 5/(8*(x + 5))

3.127 $\int \frac{\log(1+\log(x))}{x} dx$

| | |
|---|------|
| Optimal result | 1403 |
| Rubi [A] (verified) | 1403 |
| Mathematica [A] (verified) | 1404 |
| Maple [A] (verified) | 1404 |
| Fricas [A] (verification not implemented) | 1405 |
| Sympy [A] (verification not implemented) | 1405 |
| Maxima [A] (verification not implemented) | 1405 |
| Giac [A] (verification not implemented) | 1405 |
| Mupad [B] (verification not implemented) | 1406 |

Optimal result

Integrand size = 9, antiderivative size = 15

$$\int \frac{\log(1 + \log(x))}{x} dx = -\log(x) + (1 + \log(x)) \log(1 + \log(x))$$

[Out] $-\ln(x) + (\ln(x) + 1) * \ln(\ln(x) + 1)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {2436, 2332}

$$\int \frac{\log(1 + \log(x))}{x} dx = (\log(x) + 1) \log(\log(x) + 1) - \log(x)$$

[In] `Int[Log[1 + Log[x]]/x,x]`

[Out] `-Log[x] + (1 + Log[x])*Log[1 + Log[x]]`

Rule 2332

`Int[Log[(c_.)*(x_)^(n_.)], x_Symbol] := Simp[x*Log[c*x^n], x] - Simp[n*x, x] /; FreeQ[{c, n}, x]`

Rule 2436

`Int[((a_.) + Log[(c_.)*((d_) + (e_.)*(x_)^(n_.))]*(b_.))^(p_.), x_Symbol] :> Dist[1/e, Subst[Int[(a + b*Log[c*x^n])^p, x], x, d + e*x], x] /; FreeQ[{a, b, c, d, e, n, p}, x]`

Rubi steps

$$\begin{aligned}
\text{integral} &= \text{Subst}\left(\int \log(1+x) dx, x, \log(x)\right) \\
&= \text{Subst}\left(\int \log(x) dx, x, 1+\log(x)\right) \\
&= -\log(x) + (1+\log(x))\log(1+\log(x))
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int \frac{\log(1+\log(x))}{x} dx = -\log(x) + (1+\log(x))\log(1+\log(x))$$

[In] Integrate[Log[1 + Log[x]]/x,x]

[Out] -Log[x] + (1 + Log[x])*Log[1 + Log[x]]

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.13

| method | result | size |
|-------------------|--|------|
| derivativedivides | $(\ln(x) + 1) \ln(\ln(x) + 1) - \ln(x) - 1$ | 17 |
| default | $(\ln(x) + 1) \ln(\ln(x) + 1) - \ln(x) - 1$ | 17 |
| norman | $-\ln(x) + \ln(\ln(x) + 1) \ln(x) + \ln(\ln(x) + 1)$ | 19 |
| risch | $-\ln(x) + \ln(\ln(x) + 1) \ln(x) + \ln(\ln(x) + 1)$ | 19 |

[In] int(ln(ln(x)+1)/x,x,method=_RETURNVERBOSE)

[Out] (ln(x)+1)*ln(ln(x)+1)-ln(x)-1

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int \frac{\log(1 + \log(x))}{x} dx = (\log(x) + 1) \log(\log(x) + 1) - \log(x)$$

[In] integrate(log(log(x)+1)/x,x, algorithm="fricas")

[Out] (log(x) + 1)*log(log(x) + 1) - log(x)

Sympy [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.27

$$\int \frac{\log(1 + \log(x))}{x} dx = \log(x) \log(\log(x) + 1) - \log(x) + \log(\log(x) + 1)$$

[In] integrate(ln(ln(x)+1)/x,x)

[Out] log(x)*log(log(x) + 1) - log(x) + log(log(x) + 1)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.07

$$\int \frac{\log(1 + \log(x))}{x} dx = (\log(x) + 1) \log(\log(x) + 1) - \log(x) - 1$$

[In] integrate(log(log(x)+1)/x,x, algorithm="maxima")

[Out] (log(x) + 1)*log(log(x) + 1) - log(x) - 1

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.07

$$\int \frac{\log(1 + \log(x))}{x} dx = (\log(x) + 1) \log(\log(x) + 1) - \log(x) - 1$$

[In] integrate(log(log(x)+1)/x,x, algorithm="giac")

[Out] (log(x) + 1)*log(log(x) + 1) - log(x) - 1

Mupad [B] (verification not implemented)

Time = 15.22 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.20

$$\int \frac{\log(1 + \log(x))}{x} dx = \ln(\ln(x) + 1) - \ln(x) + \ln(\ln(x) + 1) \ln(x)$$

[In] int(log(log(x) + 1)/x,x)

[Out] log(log(x) + 1) - log(x) + log(log(x) + 1)*log(x)

3.128 $\int \sqrt{\csc(x) - \sin(x)} dx$

| | |
|---|------|
| Optimal result | 1407 |
| Rubi [A] (verified) | 1407 |
| Mathematica [A] (verified) | 1408 |
| Maple [A] (verified) | 1408 |
| Fricas [A] (verification not implemented) | 1409 |
| Sympy [F] | 1409 |
| Maxima [B] (verification not implemented) | 1409 |
| Giac [F] | 1410 |
| Mupad [B] (verification not implemented) | 1410 |

Optimal result

Integrand size = 11, antiderivative size = 13

$$\int \sqrt{\csc(x) - \sin(x)} dx = 2\sqrt{\cos(x) \cot(x)} \tan(x)$$

[Out] $2*(\cos(x)*\cot(x))^{(1/2)}*\tan(x)$

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.273$, Rules used = {4482, 4485, 2669}

$$\int \sqrt{\csc(x) - \sin(x)} dx = 2 \tan(x) \sqrt{\cos(x) \cot(x)}$$

[In] `Int[Sqrt[Csc[x] - Sin[x]],x]`

[Out] `2*Sqrt[Cos[x]*Cot[x]]*Tan[x]`

Rule 2669

`Int[((a_.)*sin[(e_.) + (f_.)*(x_.)])^(m_.)*((b_.)*tan[(e_.) + (f_.)*(x_.)])^(n_.), x_Symbol] := Simp[(-b)*(a*Sin[e + f*x])^m*((b*Tan[e + f*x])^(n - 1)/(f*m)), x] /; FreeQ[{a, b, e, f, m, n}, x] && EqQ[m + n - 1, 0]`

Rule 4482

`Int[u_, x_Symbol] := Int[TrigSimplify[u], x] /; TrigSimplifyQ[u]`

Rule 4485

```
Int[(u_.)*((v_)^(m_.)*(w_)^(n_.))^(p_), x_Symbol] := With[{uu = ActivateTrig[u], vv = ActivateTrig[v], ww = ActivateTrig[w]}, Dist[(vv^m*ww^n)^FracPart[p]/(vv^(m*FracPart[p])*ww^(n*FracPart[p]))], Int[uu*vv^(m*p)*ww^(n*p), x], x]] /; FreeQ[{m, n, p}, x] && !IntegerQ[p] && (!InertTrigFreeQ[v] || !InertTrigFreeQ[w])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \sqrt{\cos(x) \cot(x)} dx \\ &= \frac{\sqrt{\cos(x) \cot(x)} \int \sqrt{\cos(x)} \sqrt{\cot(x)} dx}{\sqrt{\cos(x)} \sqrt{\cot(x)}} \\ &= 2\sqrt{\cos(x) \cot(x)} \tan(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \sqrt{\csc(x) - \sin(x)} dx = 2\sqrt{\cos(x) \cot(x)} \tan(x)$$

[In] Integrate[Sqrt[Csc[x] - Sin[x]], x]

[Out] 2*Sqrt[Cos[x]*Cot[x]]*Tan[x]

Maple [A] (verified)

Time = 0.44 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.92

| method | result | size |
|---------|--|------|
| default | $2\sqrt{\cos(x) \cot(x)} \tan(x)$ | 12 |
| risch | $-\frac{i\sqrt{2} \sqrt{\frac{i(e^{2ix}+1)^2 e^{-ix}}{e^{2ix}-1}} (e^{2ix}-1)}{e^{2ix}+1}$ | 51 |

[In] int((csc(x)-sin(x))^(1/2), x, method=_RETURNVERBOSE)

[Out] 2*(cos(x)*cot(x))^(1/2)*tan(x)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.46

$$\int \sqrt{\csc(x) - \sin(x)} dx = \frac{2 \sqrt{\frac{\cos(x)^2}{\sin(x)}} \sin(x)}{\cos(x)}$$

[In] integrate((csc(x)-sin(x))^(1/2),x, algorithm="fricas")

[Out] 2*sqrt(cos(x)^2/sin(x))*sin(x)/cos(x)

Sympy [F]

$$\int \sqrt{\csc(x) - \sin(x)} dx = \int \sqrt{-\sin(x) + \csc(x)} dx$$

[In] integrate((csc(x)-sin(x))**(1/2),x)

[Out] Integral(sqrt(-sin(x) + csc(x)), x)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 188 vs. 2(11) = 22.

Time = 0.36 (sec) , antiderivative size = 188, normalized size of antiderivative = 14.46

$$\int \sqrt{\csc(x) - \sin(x)} dx$$

$$= \frac{((\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) + \sin(\frac{3}{2}x) + \sin(\frac{1}{2}x)) \cos(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1)) - (\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) - \sin(\frac{3}{2}x) - \sin(\frac{1}{2}x)) \sin(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1))) \cos(\frac{1}{2} \arctan(\sin(x), \cos(x) + 1)) - ((\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) - \sin(\frac{3}{2}x) - \sin(\frac{1}{2}x)) \cos(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1)) + (\cos(\frac{3}{2}x) - \cos(\frac{1}{2}x) + \sin(\frac{3}{2}x) + \sin(\frac{1}{2}x)) \sin(\frac{1}{2} \arctan(\sin(x), \cos(x) - 1))) \sin(\frac{1}{2} \arctan(\sin(x), \cos(x) + 1))}{((\cos(x)^2 + \sin(x)^2 + 2\cos(x) + 1)^{1/4} (\cos(x)^2 + \sin(x)^2 - 2\cos(x) + 1)^{1/4})}$$

[In] integrate((csc(x)-sin(x))^(1/2),x, algorithm="maxima")

```
[Out] (((cos(3/2*x) - cos(1/2*x) + sin(3/2*x) + sin(1/2*x))*cos(1/2*arctan2(sin(x), cos(x) - 1)) - (cos(3/2*x) - cos(1/2*x) - sin(3/2*x) - sin(1/2*x))*sin(1/2*arctan2(sin(x), cos(x) - 1)))*cos(1/2*arctan2(sin(x), cos(x) + 1)) - ((cos(3/2*x) - cos(1/2*x) - sin(3/2*x) - sin(1/2*x))*cos(1/2*arctan2(sin(x), cos(x) - 1)) + (cos(3/2*x) - cos(1/2*x) + sin(3/2*x) + sin(1/2*x))*sin(1/2*arctan2(sin(x), cos(x) - 1)))*sin(1/2*arctan2(sin(x), cos(x) + 1)))/((cos(x)^2 + sin(x)^2 + 2*cos(x) + 1)^(1/4)*(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1)^(1/4))
```

Giac [F]

$$\int \sqrt{\csc(x) - \sin(x)} dx = \int \sqrt{\csc(x) - \sin(x)} dx$$

[In] integrate((csc(x)-sin(x))^(1/2),x, algorithm="giac")

[Out] integrate(sqrt(csc(x) - sin(x)), x)

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.15

$$\int \sqrt{\csc(x) - \sin(x)} dx = \frac{2 |\cos(x)|}{\cos(x) \sqrt{\frac{1}{\sin(x)}}}$$

[In] int((1/sin(x) - sin(x))^(1/2),x)

[Out] (2*abs(cos(x)))/(cos(x)*(1/sin(x))^(1/2))

3.129 $\int \frac{1}{\sqrt{25+x^2}} dx$

| | |
|---|------|
| Optimal result | 1411 |
| Rubi [A] (verified) | 1411 |
| Mathematica [B] (verified) | 1412 |
| Maple [A] (verified) | 1412 |
| Fricas [B] (verification not implemented) | 1412 |
| Sympy [A] (verification not implemented) | 1413 |
| Maxima [A] (verification not implemented) | 1413 |
| Giac [B] (verification not implemented) | 1413 |
| Mupad [B] (verification not implemented) | 1413 |

Optimal result

Integrand size = 9, antiderivative size = 6

$$\int \frac{1}{\sqrt{25+x^2}} dx = \operatorname{arcsinh}\left(\frac{x}{5}\right)$$

[Out] $\operatorname{arcsinh}(1/5*x)$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {221}

$$\int \frac{1}{\sqrt{25+x^2}} dx = \operatorname{arcsinh}\left(\frac{x}{5}\right)$$

[In] $\operatorname{Int}[1/\operatorname{Sqrt}[25 + x^2], x]$

[Out] $\operatorname{ArcSinh}[x/5]$

Rule 221

$\operatorname{Int}[1/\operatorname{Sqrt}[(a_) + (b_)*(x_)^2], x_Symbol] \rightarrow \operatorname{Simp}[\operatorname{ArcSinh}[\operatorname{Rt}[b, 2]*(x/\operatorname{Sqrt}[a])]/\operatorname{Rt}[b, 2], x] /; \operatorname{FreeQ}\{a, b\}, x \ \&\& \operatorname{GtQ}[a, 0] \ \&\& \operatorname{PosQ}[b]$

Rubi steps

$$\text{integral} = \operatorname{arcsinh}\left(\frac{x}{5}\right)$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 16 vs. $2(6) = 12$.

Time = 0.02 (sec) , antiderivative size = 16, normalized size of antiderivative = 2.67

$$\int \frac{1}{\sqrt{25 + x^2}} dx = -\log\left(-x + \sqrt{25 + x^2}\right)$$

[In] Integrate[1/Sqrt[25 + x^2],x]

[Out] -Log[-x + Sqrt[25 + x^2]]

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

| method | result | size |
|----------------|--|------|
| default | $\operatorname{arcsinh}\left(\frac{x}{5}\right)$ | 5 |
| meijerg | $\operatorname{arcsinh}\left(\frac{x}{5}\right)$ | 5 |
| pseudoelliptic | $\operatorname{arctanh}\left(\frac{\sqrt{x^2+25}}{x}\right)$ | 13 |
| trager | $-\ln\left(x - \sqrt{x^2 + 25}\right)$ | 15 |

[In] int(1/(x^2+25)^(1/2),x,method=_RETURNVERBOSE)

[Out] arcsinh(1/5*x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 14 vs. $2(4) = 8$.

Time = 0.26 (sec) , antiderivative size = 14, normalized size of antiderivative = 2.33

$$\int \frac{1}{\sqrt{25 + x^2}} dx = -\log\left(-x + \sqrt{x^2 + 25}\right)$$

[In] integrate(1/(x^2+25)^(1/2),x, algorithm="fricas")

[Out] -log(-x + sqrt(x^2 + 25))

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 3, normalized size of antiderivative = 0.50

$$\int \frac{1}{\sqrt{25 + x^2}} dx = \operatorname{asinh}\left(\frac{x}{5}\right)$$

[In] integrate(1/(x**2+25)**(1/2),x)

[Out] asinh(x/5)

Maxima [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 4, normalized size of antiderivative = 0.67

$$\int \frac{1}{\sqrt{25 + x^2}} dx = \operatorname{arsinh}\left(\frac{1}{5}x\right)$$

[In] integrate(1/(x^2+25)^(1/2),x, algorithm="maxima")

[Out] arcsinh(1/5*x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 25 vs. 2(4) = 8.

Time = 0.27 (sec) , antiderivative size = 25, normalized size of antiderivative = 4.17

$$\int \frac{1}{\sqrt{25 + x^2}} dx = \frac{1}{2} \sqrt{x^2 + 25}x - \frac{25}{2} \log\left(-x + \sqrt{x^2 + 25}\right)$$

[In] integrate(1/(x^2+25)^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(x^2 + 25)*x - 25/2*log(-x + sqrt(x^2 + 25))

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 4, normalized size of antiderivative = 0.67

$$\int \frac{1}{\sqrt{25 + x^2}} dx = \operatorname{asinh}\left(\frac{x}{5}\right)$$

[In] int(1/(x^2 + 25)^(1/2),x)

[Out] asinh(x/5)

$$3.130 \quad \int \frac{-1+\log^2(x)}{x \log^2(x)} dx$$

| | |
|---|------|
| Optimal result | 1414 |
| Rubi [A] (verified) | 1414 |
| Mathematica [A] (verified) | 1415 |
| Maple [A] (verified) | 1415 |
| Fricas [A] (verification not implemented) | 1416 |
| Sympy [A] (verification not implemented) | 1416 |
| Maxima [A] (verification not implemented) | 1416 |
| Giac [A] (verification not implemented) | 1416 |
| Mupad [B] (verification not implemented) | 1417 |

Optimal result

Integrand size = 14, antiderivative size = 7

$$\int \frac{-1 + \log^2(x)}{x \log^2(x)} dx = \frac{1}{\log(x)} + \log(x)$$

[Out] 1/ln(x)+ln(x)

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.071$, Rules used = {14}

$$\int \frac{-1 + \log^2(x)}{x \log^2(x)} dx = \log(x) + \frac{1}{\log(x)}$$

[In] Int[(-1 + Log[x]^2)/(x*Log[x]^2),x]

[Out] Log[x]^(-1) + Log[x]

Rule 14

```
Int[(u_)*((c_.)*(x_))^(m_.), x_Symbol] := Int[ExpandIntegrand[(c*x)^m*u, x]
, x] /; FreeQ[{c, m}, x] && SumQ[u] && !LinearQ[u, x] && !MatchQ[u, (a_)
+ (b_.)*(v_)] /; FreeQ[{a, b}, x] && InverseFunctionQ[v]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{-1+x^2}{x^2} dx, x, \log(x)\right) \\ &= \text{Subst}\left(\int \left(1 - \frac{1}{x^2}\right) dx, x, \log(x)\right) \\ &= \frac{1}{\log(x)} + \log(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{-1 + \log^2(x)}{x \log^2(x)} dx = \frac{1}{\log(x)} + \log(x)$$

[In] Integrate[(-1 + Log[x]^2)/(x*Log[x]^2), x]

[Out] Log[x]^(-1) + Log[x]

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.14

| method | result | size |
|-------------------|-----------------------------|------|
| derivativedivides | $\frac{1}{\ln(x)} + \ln(x)$ | 8 |
| default | $\frac{1}{\ln(x)} + \ln(x)$ | 8 |
| risch | $\frac{1}{\ln(x)} + \ln(x)$ | 8 |
| parts | $\frac{1}{\ln(x)} + \ln(x)$ | 8 |
| norman | $\frac{1+\ln(x)^2}{\ln(x)}$ | 12 |
| parallelrisch | $\frac{1+\ln(x)^2}{\ln(x)}$ | 12 |

[In] int((ln(x)^2-1)/x/ln(x)^2,x,method=_RETURNVERBOSE)

[Out] 1/ln(x)+ln(x)

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.57

$$\int \frac{-1 + \log^2(x)}{x \log^2(x)} dx = \frac{\log(x)^2 + 1}{\log(x)}$$

[In] integrate((log(x)^2-1)/x/log(x)^2,x, algorithm="fricas")

[Out] (log(x)^2 + 1)/log(x)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{-1 + \log^2(x)}{x \log^2(x)} dx = \log(x) + \frac{1}{\log(x)}$$

[In] integrate((ln(x)**2-1)/x/ln(x)**2,x)

[Out] log(x) + 1/log(x)

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{-1 + \log^2(x)}{x \log^2(x)} dx = \frac{1}{\log(x)} + \log(x)$$

[In] integrate((log(x)^2-1)/x/log(x)^2,x, algorithm="maxima")

[Out] 1/log(x) + log(x)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{-1 + \log^2(x)}{x \log^2(x)} dx = \frac{1}{\log(x)} + \log(x)$$

[In] integrate((log(x)^2-1)/x/log(x)^2,x, algorithm="giac")

[Out] 1/log(x) + log(x)

Mupad [B] (verification not implemented)

Time = 17.16 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{-1 + \log^2(x)}{x \log^2(x)} dx = \ln(x) + \frac{1}{\ln(x)}$$

[In] int((log(x)^2 - 1)/(x*log(x)^2),x)

[Out] log(x) + 1/log(x)

3.131 $\int e^{3x} \arctan(e^x) dx$

| | |
|---|------|
| Optimal result | 1418 |
| Rubi [A] (verified) | 1418 |
| Mathematica [A] (verified) | 1420 |
| Maple [C] (verified) | 1420 |
| Fricas [A] (verification not implemented) | 1420 |
| Sympy [A] (verification not implemented) | 1421 |
| Maxima [A] (verification not implemented) | 1421 |
| Giac [A] (verification not implemented) | 1421 |
| Mupad [B] (verification not implemented) | 1421 |

Optimal result

Integrand size = 10, antiderivative size = 35

$$\int e^{3x} \arctan(e^x) dx = -\frac{e^{2x}}{6} + \frac{1}{3}e^{3x} \arctan(e^x) + \frac{1}{6} \log(1 + e^{2x})$$

[Out] $-1/6*\exp(2*x)+1/3*\exp(3*x)*\arctan(\exp(x))+1/6*\ln(\exp(2*x)+1)$

Rubi [A] (verified)

Time = 0.05 (sec), antiderivative size = 35, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {2225, 5315, 12, 2280, 45}

$$\int e^{3x} \arctan(e^x) dx = \frac{1}{3}e^{3x} \arctan(e^x) - \frac{e^{2x}}{6} + \frac{1}{6} \log(e^{2x} + 1)$$

[In] $\text{Int}[E^{(3*x)}*\text{ArcTan}[E^x], x]$

[Out] $-1/6*E^{(2*x)} + (E^{(3*x)}*\text{ArcTan}[E^x])/3 + \text{Log}[1 + E^{(2*x)}]/6$

Rule 12

$\text{Int}[(a_*)*(u_), x_Symbol] \rightarrow \text{Dist}[a, \text{Int}[u, x], x] /; \text{FreeQ}[a, x] \ \&\& \ !\text{MatchQ}[u, (b_*)*(v_)] /; \text{FreeQ}[b, x]$

Rule 45

$\text{Int}[(a_*) + (b_*)*(x_)^{(m_*)}*((c_*) + (d_*)*(x_)^{(n_*)}), x_Symbol] \rightarrow \text{Int}[\text{ExpandIntegrand}[(a + b*x)^m*(c + d*x)^n, x], x] /; \text{FreeQ}[\{a, b, c, d, n\}, x] \ \&\& \ \text{NeQ}[b*c - a*d, 0] \ \&\& \ \text{IGtQ}[m, 0] \ \&\& \ (\ !\text{IntegerQ}[n] \ || \ (\text{EqQ}[c, 0] \ \&\& \ \text{Le}$

$Q[7*m + 4*n + 4, 0] \parallel LtQ[9*m + 5*(n + 1), 0] \parallel GtQ[m + n + 2, 0]$

Rule 2225

$\text{Int}[(F_)^((c_.) * ((a_.) + (b_.) * (x_)))^((n_)), x_Symbol] \rightarrow \text{Simp}[(F^{(c*(a + b*x))})^n / (b*c*n*\text{Log}[F]), x] \text{ ; FreeQ}\{F, a, b, c, n\}, x]$

Rule 2280

$\text{Int}[(a_.) + (b_.) * (F_)^((e_.) * ((c_.) + (d_.) * (x_)))^((p_.) * (G_)^((h_.) * ((f_.) + (g_.) * (x_))), x_Symbol] \rightarrow \text{With}\{m = \text{FullSimplify}[g*h*(\text{Log}[G]/(d*e*\text{Log}[F]))]\}, \text{Dist}[\text{Denominator}[m] * (G^{(f*h - c*g*(h/d))/(d*e*\text{Log}[F])}), \text{Subst}[\text{Int}[x^{(\text{Numerator}[m] - 1) * (a + b*x^{\text{Denominator}[m]})^p}, x], x, F^{(e*((c + d*x)/\text{Denominator}[m])}], x] \text{ ; LeQ}[m, -1] \parallel \text{GeQ}[m, 1] \text{ ; FreeQ}\{F, G, a, b, c, d, e, f, g, h, p\}, x]$

Rule 5315

$\text{Int}[(a_.) + \text{ArcTan}[u_]* (b_.) * (v_), x_Symbol] \rightarrow \text{With}\{w = \text{IntHide}[v, x]\}, \text{Dist}[a + b*\text{ArcTan}[u], w, x] - \text{Dist}[b, \text{Int}[\text{SimplifyIntegrand}[w*(D[u, x]/(1 + u^2))], x], x] \text{ ; InverseFunctionFreeQ}[w, x] \text{ ; FreeQ}\{a, b\}, x \ \&\& \ \text{InverseFunctionFreeQ}[u, x] \ \&\& \ !\text{MatchQ}[v, ((c_.) + (d_.) * x)^{(m_.)} \text{ ; FreeQ}\{c, d, m\}, x] \ \&\& \ \text{FalseQ}[\text{FunctionOfLinear}[v*(a + b*\text{ArcTan}[u]), x]]]$

Rubi steps

$$\begin{aligned}
 \text{integral} &= \frac{1}{3} e^{3x} \arctan(e^x) - \int \frac{e^{4x}}{3(1 + e^{2x})} dx \\
 &= \frac{1}{3} e^{3x} \arctan(e^x) - \frac{1}{3} \int \frac{e^{4x}}{1 + e^{2x}} dx \\
 &= \frac{1}{3} e^{3x} \arctan(e^x) - \frac{1}{6} \text{Subst}\left(\int \frac{x}{1 + x} dx, x, e^{2x}\right) \\
 &= \frac{1}{3} e^{3x} \arctan(e^x) - \frac{1}{6} \text{Subst}\left(\int \left(1 + \frac{1}{-1 - x}\right) dx, x, e^{2x}\right) \\
 &= -\frac{e^{2x}}{6} + \frac{1}{3} e^{3x} \arctan(e^x) + \frac{1}{6} \log(1 + e^{2x})
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 31, normalized size of antiderivative = 0.89

$$\int e^{3x} \arctan(e^x) dx = \frac{1}{6}(-e^{2x} + 2e^{3x} \arctan(e^x) + \log(1 + e^{2x}))$$

[In] Integrate[E^(3*x)*ArcTan[E^x],x]

[Out] (-E^(2*x) + 2*E^(3*x)*ArcTan[E^x] + Log[1 + E^(2*x)])/6

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 0.22 (sec) , antiderivative size = 47, normalized size of antiderivative = 1.34

| method | result | size |
|--------|---|------|
| risch | $-\frac{ie^{3x} \ln(1+ie^x)}{6} + \frac{ie^{3x} \ln(1-ie^x)}{6} - \frac{e^{2x}}{6} + \frac{\ln(e^{2x}+1)}{6}$ | 47 |

[In] int(exp(3*x)*arctan(exp(x)),x,method=_RETURNVERBOSE)

[Out] -1/6*I*exp(3*x)*ln(1+I*exp(x))+1/6*I*exp(3*x)*ln(1-I*exp(x))-1/6*exp(2*x)+1/6*ln(exp(2*x)+1)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.71

$$\int e^{3x} \arctan(e^x) dx = \frac{1}{3} \arctan(e^x) e^{(3x)} - \frac{1}{6} e^{(2x)} + \frac{1}{6} \log(e^{(2x)} + 1)$$

[In] integrate(exp(3*x)*arctan(exp(x)),x, algorithm="fricas")

[Out] 1/3*arctan(e^x)*e^(3*x) - 1/6*e^(2*x) + 1/6*log(e^(2*x) + 1)

Sympy [A] (verification not implemented)

Time = 3.33 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.77

$$\int e^{3x} \arctan(e^x) dx = \frac{e^{3x} \operatorname{atan}(e^x)}{3} - \frac{e^{2x}}{6} + \frac{\log(e^{2x} + 1)}{6}$$

[In] integrate(exp(3*x)*atan(exp(x)),x)

[Out] exp(3*x)*atan(exp(x))/3 - exp(2*x)/6 + log(exp(2*x) + 1)/6

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.71

$$\int e^{3x} \arctan(e^x) dx = \frac{1}{3} \arctan(e^x) e^{(3x)} - \frac{1}{6} e^{(2x)} + \frac{1}{6} \log(e^{(2x)} + 1)$$

[In] integrate(exp(3*x)*arctan(exp(x)),x, algorithm="maxima")

[Out] 1/3*arctan(e^x)*e^(3*x) - 1/6*e^(2*x) + 1/6*log(e^(2*x) + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.71

$$\int e^{3x} \arctan(e^x) dx = \frac{1}{3} \arctan(e^x) e^{(3x)} - \frac{1}{6} e^{(2x)} + \frac{1}{6} \log(e^{(2x)} + 1)$$

[In] integrate(exp(3*x)*arctan(exp(x)),x, algorithm="giac")

[Out] 1/3*arctan(e^x)*e^(3*x) - 1/6*e^(2*x) + 1/6*log(e^(2*x) + 1)

Mupad [B] (verification not implemented)

Time = 15.27 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.71

$$\int e^{3x} \arctan(e^x) dx = \frac{\ln(e^{2x} + 1)}{6} - \frac{e^{2x}}{6} + \frac{\operatorname{atan}(e^x) e^{3x}}{3}$$

[In] int(atan(exp(x))*exp(3*x),x)

[Out] log(exp(2*x) + 1)/6 - exp(2*x)/6 + (atan(exp(x))*exp(3*x))/3

3.132 $\int \frac{1}{\cos^4(x) + \sin^4(x)} dx$

| | |
|---|------|
| Optimal result | 1422 |
| Rubi [A] (verified) | 1422 |
| Mathematica [A] (verified) | 1423 |
| Maple [C] (verified) | 1424 |
| Fricas [A] (verification not implemented) | 1424 |
| Sympy [F(-1)] | 1424 |
| Maxima [A] (verification not implemented) | 1425 |
| Giac [A] (verification not implemented) | 1425 |
| Mupad [B] (verification not implemented) | 1425 |

Optimal result

Integrand size = 11, antiderivative size = 71

$$\int \frac{1}{\cos^4(x) + \sin^4(x)} dx = \sqrt{2}x + \frac{\arctan\left(\frac{1-2\cos^2(x)}{1+\sqrt{2}-2\cos(x)\sin(x)}\right)}{\sqrt{2}} - \frac{\arctan\left(\frac{1-2\cos^2(x)}{1+\sqrt{2}+2\cos(x)\sin(x)}\right)}{\sqrt{2}}$$

[Out] $x*2^{(1/2)}+1/2*\arctan((1-2*\cos(x)^2)/(1+2^{(1/2)}-2*\cos(x)*\sin(x)))*2^{(1/2)}-1/2*\arctan((1-2*\cos(x)^2)/(1+2^{(1/2)}+2*\cos(x)*\sin(x)))*2^{(1/2)}$

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 71, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.273$, Rules used = {1176, 631, 210}

$$\int \frac{1}{\cos^4(x) + \sin^4(x)} dx = \frac{\arctan\left(\frac{1-2\cos^2(x)}{-2\sin(x)\cos(x)+\sqrt{2}+1}\right)}{\sqrt{2}} - \frac{\arctan\left(\frac{1-2\cos^2(x)}{2\sin(x)\cos(x)+\sqrt{2}+1}\right)}{\sqrt{2}} + \sqrt{2}x$$

[In] Int[(Cos[x]^4 + Sin[x]^4)^(-1), x]

[Out] Sqrt[2]*x + ArcTan[(1 - 2*Cos[x]^2)/(1 + Sqrt[2] - 2*Cos[x]*Sin[x])]/Sqrt[2] - ArcTan[(1 - 2*Cos[x]^2)/(1 + Sqrt[2] + 2*Cos[x]*Sin[x])]/Sqrt[2]

Rule 210

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(-(Rt[-a, 2]*Rt[-b, 2])^(-1))*ArcTan[Rt[-b, 2]*(x/Rt[-a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (LtQ[a, 0] || LtQ[b, 0])

Rule 631

```
Int[((a_) + (b_)*(x_) + (c_)*(x_)^2)^(-1), x_Symbol] := With[{q = 1 - 4*Simplify[a*(c/b^2)]}, Dist[-2/b, Subst[Int[1/(q - x^2), x], x, 1 + 2*c*(x/b)], x] /; RationalQ[q] && (EqQ[q^2, 1] || !RationalQ[b^2 - 4*a*c])] /; FreeQ[{a, b, c}, x] && NeQ[b^2 - 4*a*c, 0]
```

Rule 1176

```
Int[((d_) + (e_)*(x_)^2)/((a_) + (c_)*(x_)^4), x_Symbol] := With[{q = Rt[2*(d/e), 2]}, Dist[e/(2*c), Int[1/Simp[d/e + q*x + x^2, x], x], x] + Dist[e/(2*c), Int[1/Simp[d/e - q*x + x^2, x], x], x]] /; FreeQ[{a, c, d, e}, x] & EqQ[c*d^2 - a*e^2, 0] && PosQ[d*e]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \text{Subst}\left(\int \frac{1+x^2}{1+x^4} dx, x, \tan(x)\right) \\
 &= \frac{1}{2} \text{Subst}\left(\int \frac{1}{1-\sqrt{2}x+x^2} dx, x, \tan(x)\right) + \frac{1}{2} \text{Subst}\left(\int \frac{1}{1+\sqrt{2}x+x^2} dx, x, \tan(x)\right) \\
 &= \frac{\text{Subst}\left(\int \frac{1}{-1-x^2} dx, x, 1-\sqrt{2}\tan(x)\right)}{\sqrt{2}} - \frac{\text{Subst}\left(\int \frac{1}{-1-x^2} dx, x, 1+\sqrt{2}\tan(x)\right)}{\sqrt{2}} \\
 &= \sqrt{2}x + \frac{\arctan\left(\frac{1-2\cos^2(x)}{1+\sqrt{2}-2\cos(x)\sin(x)}\right)}{\sqrt{2}} - \frac{\arctan\left(\frac{1-2\cos^2(x)}{1+\sqrt{2}+2\cos(x)\sin(x)}\right)}{\sqrt{2}}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 32, normalized size of antiderivative = 0.45

$$\int \frac{1}{\cos^4(x) + \sin^4(x)} dx = \frac{-\arctan(1 - \sqrt{2}\tan(x)) + \arctan(1 + \sqrt{2}\tan(x))}{\sqrt{2}}$$

```
[In] Integrate[(Cos[x]^4 + Sin[x]^4)^(-1), x]
```

```
[Out] (-ArcTan[1 - Sqrt[2]*Tan[x]] + ArcTan[1 + Sqrt[2]*Tan[x]])/Sqrt[2]
```

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 0.19 (sec) , antiderivative size = 40, normalized size of antiderivative = 0.56

| method | result |
|---------|--|
| risch | $\frac{i\sqrt{2} \ln(e^{4ix} + 2\sqrt{2} + 3)}{4} - \frac{i\sqrt{2} \ln(e^{4ix} - 2\sqrt{2} + 3)}{4}$ |
| default | $\frac{\sqrt{2} \left(\ln\left(\frac{\tan(x)^2 + \tan(x)\sqrt{2} + 1}{\tan(x)^2 - \tan(x)\sqrt{2} + 1}\right) + 2 \arctan(\tan(x)\sqrt{2} + 1) + 2 \arctan(\tan(x)\sqrt{2} - 1) \right)}{8} + \frac{\sqrt{2} \left(\ln\left(\frac{\tan(x)^2 - \tan(x)\sqrt{2} + 1}{\tan(x)^2 + \tan(x)\sqrt{2} + 1}\right) + 2 \arctan(\tan(x)\sqrt{2} + 1) \right)}{8}$ |

[In] int(1/(sin(x)^4+cos(x)^4),x,method=_RETURNVERBOSE)

[Out] 1/4*I*2^(1/2)*ln(exp(4*I*x)+2*2^(1/2)+3)-1/4*I*2^(1/2)*ln(exp(4*I*x)-2*2^(1/2)+3)

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 47, normalized size of antiderivative = 0.66

$$\int \frac{1}{\cos^4(x) + \sin^4(x)} dx = -\frac{1}{4} \sqrt{2} \arctan \left(\frac{6 \sqrt{2} \cos(x)^4 - 6 \sqrt{2} \cos(x)^2 + \sqrt{2}}{4 (2 \cos(x)^3 - \cos(x)) \sin(x)} \right)$$

[In] integrate(1/(sin(x)^4+cos(x)^4),x, algorithm="fricas")

[Out] -1/4*sqrt(2)*arctan(1/4*(6*sqrt(2)*cos(x)^4 - 6*sqrt(2)*cos(x)^2 + sqrt(2))/(2*cos(x)^3 - cos(x))*sin(x))

Sympy [F(-1)]

Timed out.

$$\int \frac{1}{\cos^4(x) + \sin^4(x)} dx = \text{Timed out}$$

[In] integrate(1/(sin(x)**4+cos(x)**4),x)

[Out] Timed out

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 39, normalized size of antiderivative = 0.55

$$\int \frac{1}{\cos^4(x) + \sin^4(x)} dx = \frac{1}{2} \sqrt{2} \arctan \left(\frac{1}{2} \sqrt{2} (\sqrt{2} + 2 \tan(x)) \right) + \frac{1}{2} \sqrt{2} \arctan \left(-\frac{1}{2} \sqrt{2} (\sqrt{2} - 2 \tan(x)) \right)$$

[In] integrate(1/(sin(x)^4+cos(x)^4),x, algorithm="maxima")

[Out] 1/2*sqrt(2)*arctan(1/2*sqrt(2)*(sqrt(2) + 2*tan(x))) + 1/2*sqrt(2)*arctan(-1/2*sqrt(2)*(sqrt(2) - 2*tan(x)))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 48, normalized size of antiderivative = 0.68

$$\int \frac{1}{\cos^4(x) + \sin^4(x)} dx = \frac{1}{2} \sqrt{2} \left(2x + \arctan \left(-\frac{\sqrt{2} \sin(4x) - \sin(4x)}{\sqrt{2} \cos(4x) + \sqrt{2} - \cos(4x) + 1} \right) \right)$$

[In] integrate(1/(sin(x)^4+cos(x)^4),x, algorithm="giac")

[Out] 1/2*sqrt(2)*(2*x + arctan(-(sqrt(2)*sin(4*x) - sin(4*x))/(sqrt(2)*cos(4*x) + sqrt(2) - cos(4*x) + 1)))

Mupad [B] (verification not implemented)

Time = 18.24 (sec) , antiderivative size = 44, normalized size of antiderivative = 0.62

$$\int \frac{1}{\cos^4(x) + \sin^4(x)} dx = \sqrt{2} (x - \operatorname{atan}(\tan(x))) + \frac{\sqrt{2} \left(\operatorname{atan} \left(\frac{\sqrt{2} \tan(x)}{2} \right) + \operatorname{atan} \left(\frac{\sqrt{2} \tan(x)^3}{2} + \frac{\sqrt{2} \tan(x)}{2} \right) \right)}{2}$$

[In] int(1/(cos(x)^4 + sin(x)^4),x)

[Out] 2^(1/2)*(x - atan(tan(x))) + (2^(1/2)*(atan((2^(1/2)*tan(x))/2) + atan((2^(1/2)*tan(x)^3)/2 + (2^(1/2)*tan(x))/2)))/2

3.133 $\int \frac{1+e^x}{1-e^x} dx$

| | |
|---|------|
| Optimal result | 1426 |
| Rubi [A] (verified) | 1426 |
| Mathematica [A] (verified) | 1427 |
| Maple [A] (verified) | 1427 |
| Fricas [A] (verification not implemented) | 1428 |
| Sympy [A] (verification not implemented) | 1428 |
| Maxima [A] (verification not implemented) | 1428 |
| Giac [A] (verification not implemented) | 1428 |
| Mupad [B] (verification not implemented) | 1429 |

Optimal result

Integrand size = 15, antiderivative size = 12

$$\int \frac{1+e^x}{1-e^x} dx = x - 2 \log(1-e^x)$$

[Out] x-2*ln(1-exp(x))

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.133$, Rules used = {2320, 78}

$$\int \frac{1+e^x}{1-e^x} dx = x - 2 \log(1-e^x)$$

[In] Int[(1 + E^x)/(1 - E^x), x]

[Out] x - 2*Log[1 - E^x]

Rule 78

```
Int[((a_.) + (b_.)*(x_))*((c_) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] :> Int[ExpandIntegrand[(a + b*x)*(c + d*x)^n*(e + f*x)^p, x], x] /; FreeQ[{a, b, c, d, e, f, n}, x] && NeQ[b*c - a*d, 0] && ((ILtQ[n, 0] && ILtQ[p, 0]) || EqQ[p, 1] || (IGtQ[p, 0] && (!IntegerQ[n] || LeQ[9*p + 5*(n + 2), 0] || GeQ[n + p + 1, 0] || (GeQ[n + p + 2, 0] && RationalQ[a, b, c, d, e, f])))
```

Rule 2320

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_)[v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{1+x}{(1-x)x} dx, x, e^x\right) \\ &= \text{Subst}\left(\int \left(-\frac{2}{-1+x} + \frac{1}{x}\right) dx, x, e^x\right) \\ &= x - 2 \log(1 - e^x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.08

$$\int \frac{1+e^x}{1-e^x} dx = \log(e^x) - 2 \log(-1 + e^x)$$

[In] Integrate[(1 + E^x)/(1 - E^x), x]

[Out] Log[E^x] - 2*Log[-1 + E^x]

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

| method | result | size |
|-------------------|------------------------------|------|
| norman | $x - 2 \ln(e^x - 1)$ | 10 |
| risch | $x - 2 \ln(e^x - 1)$ | 10 |
| parallelrisch | $x - 2 \ln(e^x - 1)$ | 10 |
| derivativedivides | $-2 \ln(e^x - 1) + \ln(e^x)$ | 12 |
| default | $-2 \ln(e^x - 1) + \ln(e^x)$ | 12 |

[In] int((exp(x)+1)/(1-exp(x)), x, method=_RETURNVERBOSE)

[Out] x-2*ln(exp(x)-1)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.75

$$\int \frac{1 + e^x}{1 - e^x} dx = x - 2 \log(e^x - 1)$$

[In] integrate((exp(x)+1)/(1-exp(x)),x, algorithm="fricas")

[Out] x - 2*log(e^x - 1)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{1 + e^x}{1 - e^x} dx = x - 2 \log(e^x - 1)$$

[In] integrate((exp(x)+1)/(1-exp(x)),x)

[Out] x - 2*log(exp(x) - 1)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.75

$$\int \frac{1 + e^x}{1 - e^x} dx = x - 2 \log(e^x - 1)$$

[In] integrate((exp(x)+1)/(1-exp(x)),x, algorithm="maxima")

[Out] x - 2*log(e^x - 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int \frac{1 + e^x}{1 - e^x} dx = x - 2 \log(|e^x - 1|)$$

[In] integrate((exp(x)+1)/(1-exp(x)),x, algorithm="giac")

[Out] x - 2*log(abs(e^x - 1))

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.75

$$\int \frac{1 + e^x}{1 - e^x} dx = x - 2 \ln(e^x - 1)$$

[In] `int(-(exp(x) + 1)/(exp(x) - 1),x)`

[Out] `x - 2*log(exp(x) - 1)`

3.134 $\int \tan^4(x) dx$

| | |
|---|------|
| Optimal result | 1430 |
| Rubi [A] (verified) | 1430 |
| Mathematica [A] (verified) | 1431 |
| Maple [A] (verified) | 1431 |
| Fricas [A] (verification not implemented) | 1432 |
| Sympy [A] (verification not implemented) | 1432 |
| Maxima [A] (verification not implemented) | 1432 |
| Giac [A] (verification not implemented) | 1432 |
| Mupad [B] (verification not implemented) | 1433 |

Optimal result

Integrand size = 4, antiderivative size = 14

$$\int \tan^4(x) dx = x - \tan(x) + \frac{\tan^3(x)}{3}$$

[Out] x-tan(x)+1/3*tan(x)^3

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3554, 8}

$$\int \tan^4(x) dx = x + \frac{\tan^3(x)}{3} - \tan(x)$$

[In] Int[Tan[x]^4,x]

[Out] x - Tan[x] + Tan[x]^3/3

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 3554

Int[((b_.)*tan[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] := Simp[b*((b*Tan[c + d*x])^(n - 1)/(d*(n - 1))), x] - Dist[b^2, Int[(b*Tan[c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{\tan^3(x)}{3} - \int \tan^2(x) dx \\ &= -\tan(x) + \frac{\tan^3(x)}{3} + \int 1 dx \\ &= x - \tan(x) + \frac{\tan^3(x)}{3} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.14

$$\int \tan^4(x) dx = \arctan(\tan(x)) - \tan(x) + \frac{\tan^3(x)}{3}$$

[In] Integrate[Tan[x]^4,x]

[Out] ArcTan[Tan[x]] - Tan[x] + Tan[x]^3/3

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.93

| method | result | size |
|-------------------|--|------|
| norman | $x - \tan(x) + \frac{\tan(x)^3}{3}$ | 13 |
| parallelrisc | $x - \tan(x) + \frac{\tan(x)^3}{3}$ | 13 |
| derivativedivides | $\frac{\tan(x)^3}{3} - \tan(x) + \arctan(\tan(x))$ | 15 |
| default | $\frac{\tan(x)^3}{3} - \tan(x) + \arctan(\tan(x))$ | 15 |
| risc | $x - \frac{4i(3e^{4ix} + 3e^{2ix} + 2)}{3(e^{2ix} + 1)^3}$ | 31 |

[In] int(tan(x)^4,x,method=_RETURNVERBOSE)

[Out] x-tan(x)+1/3*tan(x)^3

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.86

$$\int \tan^4(x) dx = \frac{1}{3} \tan(x)^3 + x - \tan(x)$$

[In] integrate(tan(x)^4,x, algorithm="fricas")

[Out] 1/3*tan(x)^3 + x - tan(x)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.36

$$\int \tan^4(x) dx = x + \frac{\sin^3(x)}{3 \cos^3(x)} - \frac{\sin(x)}{\cos(x)}$$

[In] integrate(tan(x)**4,x)

[Out] x + sin(x)**3/(3*cos(x)**3) - sin(x)/cos(x)

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.86

$$\int \tan^4(x) dx = \frac{1}{3} \tan(x)^3 + x - \tan(x)$$

[In] integrate(tan(x)^4,x, algorithm="maxima")

[Out] 1/3*tan(x)^3 + x - tan(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.86

$$\int \tan^4(x) dx = \frac{1}{3} \tan(x)^3 + x - \tan(x)$$

[In] integrate(tan(x)^4,x, algorithm="giac")

[Out] 1/3*tan(x)^3 + x - tan(x)

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.86

$$\int \tan^4(x) dx = \frac{\tan(x)^3}{3} - \tan(x) + x$$

[In] int(tan(x)^4,x)

[Out] x - tan(x) + tan(x)^3/3

3.135 $\int \sin(x) \tan^2(x) dx$

| | |
|---|------|
| Optimal result | 1434 |
| Rubi [A] (verified) | 1434 |
| Mathematica [A] (verified) | 1435 |
| Maple [B] (verified) | 1435 |
| Fricas [B] (verification not implemented) | 1436 |
| Sympy [A] (verification not implemented) | 1436 |
| Maxima [A] (verification not implemented) | 1436 |
| Giac [A] (verification not implemented) | 1436 |
| Mupad [B] (verification not implemented) | 1437 |

Optimal result

Integrand size = 7, antiderivative size = 5

$$\int \sin(x) \tan^2(x) dx = \cos(x) + \sec(x)$$

[Out] $\cos(x) + \sec(x)$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.286$, Rules used = {2670, 14}

$$\int \sin(x) \tan^2(x) dx = \cos(x) + \sec(x)$$

[In] $\text{Int}[\text{Sin}[x] * \text{Tan}[x]^2, x]$

[Out] $\text{Cos}[x] + \text{Sec}[x]$

Rule 14

$\text{Int}[(u_*) * ((c_*) * (x_*))^{(m_*)}, x_Symbol] \rightarrow \text{Int}[\text{ExpandIntegrand}[(c*x)^m * u, x], x] /;$ $\text{FreeQ}\{c, m\}, x \ \&\& \ \text{SumQ}[u] \ \&\& \ !\text{LinearQ}[u, x] \ \&\& \ !\text{MatchQ}[u, (a_*) + (b_*) * (v_*)] /;$ $\text{FreeQ}\{a, b\}, x \ \&\& \ \text{InverseFunctionQ}[v]$

Rule 2670

$\text{Int}[\sin[(e_*) + (f_*) * (x_*)]^{(m_*)} * \tan[(e_*) + (f_*) * (x_*)]^{(n_*)}, x_Symbol] \rightarrow \text{Dist}[-f^{(-1)}, \text{Subst}[\text{Int}[(1 - x^2)^{(m+n-1)/2} / x^n, x], x, \text{Cos}[e + f * x]], x] /;$ $\text{FreeQ}\{e, f\}, x \ \&\& \ \text{IntegersQ}[m, n, (m+n-1)/2]$

Rubi steps

$$\begin{aligned} \text{integral} &= -\text{Subst}\left(\int \frac{1-x^2}{x^2} dx, x, \cos(x)\right) \\ &= -\text{Subst}\left(\int \left(-1 + \frac{1}{x^2}\right) dx, x, \cos(x)\right) \\ &= \cos(x) + \sec(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \sin(x) \tan^2(x) dx = \cos(x) + \sec(x)$$

[In] Integrate[Sin[x]*Tan[x]^2,x]

[Out] Cos[x] + Sec[x]

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 19 vs. 2(5) = 10.

Time = 0.22 (sec) , antiderivative size = 20, normalized size of antiderivative = 4.00

| method | result | size |
|---------|---|------|
| default | $\frac{\sin(x)^4}{\cos(x)} + (2 + \sin(x)^2) \cos(x)$ | 20 |
| risch | $\frac{e^{3ix} + 7 \cos(x) + 5i \sin(x)}{2e^{2ix} + 2}$ | 27 |

[In] int(sin(x)*tan(x)^2,x,method=_RETURNVERBOSE)

[Out] sin(x)^4/cos(x)+(2+sin(x)^2)*cos(x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 11 vs. $2(5) = 10$.

Time = 0.26 (sec) , antiderivative size = 11, normalized size of antiderivative = 2.20

$$\int \sin(x) \tan^2(x) dx = \frac{\cos(x)^2 + 1}{\cos(x)}$$

[In] integrate(sin(x)*tan(x)^2,x, algorithm="fricas")

[Out] (cos(x)^2 + 1)/cos(x)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int \sin(x) \tan^2(x) dx = \cos(x) + \frac{1}{\cos(x)}$$

[In] integrate(sin(x)*tan(x)**2,x)

[Out] cos(x) + 1/cos(x)

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int \sin(x) \tan^2(x) dx = \frac{1}{\cos(x)} + \cos(x)$$

[In] integrate(sin(x)*tan(x)^2,x, algorithm="maxima")

[Out] 1/cos(x) + cos(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int \sin(x) \tan^2(x) dx = \frac{1}{\cos(x)} + \cos(x)$$

[In] integrate(sin(x)*tan(x)^2,x, algorithm="giac")

[Out] 1/cos(x) + cos(x)

Mupad [B] (verification not implemented)

Time = 15.42 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int \sin(x) \tan^2(x) dx = \cos(x) + \frac{1}{\cos(x)}$$

[In] `int(sin(x)*tan(x)^2,x)`

[Out] `cos(x) + 1/cos(x)`

3.136 $\int \frac{1+x}{3+2x+x^2} dx$

| | |
|---|------|
| Optimal result | 1438 |
| Rubi [A] (verified) | 1438 |
| Mathematica [A] (verified) | 1439 |
| Maple [A] (verified) | 1439 |
| Fricas [A] (verification not implemented) | 1439 |
| Sympy [A] (verification not implemented) | 1440 |
| Maxima [A] (verification not implemented) | 1440 |
| Giac [A] (verification not implemented) | 1440 |
| Mupad [B] (verification not implemented) | 1440 |

Optimal result

Integrand size = 14, antiderivative size = 13

$$\int \frac{1+x}{3+2x+x^2} dx = \frac{1}{2} \log(3+2x+x^2)$$

[Out] 1/2*ln(x^2+2*x+3)

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.071$, Rules used = {642}

$$\int \frac{1+x}{3+2x+x^2} dx = \frac{1}{2} \log(x^2+2x+3)$$

[In] Int[(1 + x)/(3 + 2*x + x^2), x]

[Out] Log[3 + 2*x + x^2]/2

Rule 642

```
Int[((d_) + (e_.)*(x_))/((a_.) + (b_.)*(x_) + (c_.)*(x_)^2), x_Symbol] :> S
imp[d*(Log[RemoveContent[a + b*x + c*x^2, x]]/b), x] /; FreeQ[{a, b, c, d,
e}, x] && EqQ[2*c*d - b*e, 0]
```

Rubi steps

$$\text{integral} = \frac{1}{2} \log(3+2x+x^2)$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \frac{1+x}{3+2x+x^2} dx = \frac{1}{2} \log(3+2x+x^2)$$

[In] Integrate[(1 + x)/(3 + 2*x + x^2),x]

[Out] Log[3 + 2*x + x^2]/2

Maple [A] (verified)

Time = 0.47 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.92

| method | result | size |
|---------------|---------------------------|------|
| default | $\frac{\ln(x^2+2x+3)}{2}$ | 12 |
| norman | $\frac{\ln(x^2+2x+3)}{2}$ | 12 |
| risch | $\frac{\ln(x^2+2x+3)}{2}$ | 12 |
| parallelrisch | $\frac{\ln(x^2+2x+3)}{2}$ | 12 |

[In] int((1+x)/(x^2+2*x+3),x,method=_RETURNVERBOSE)

[Out] 1/2*ln(x^2+2*x+3)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{1+x}{3+2x+x^2} dx = \frac{1}{2} \log(x^2+2x+3)$$

[In] integrate((1+x)/(x^2+2*x+3),x, algorithm="fricas")

[Out] 1/2*log(x^2 + 2*x + 3)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.77

$$\int \frac{1+x}{3+2x+x^2} dx = \frac{\log(x^2+2x+3)}{2}$$

[In] integrate((1+x)/(x**2+2*x+3),x)

[Out] log(x**2 + 2*x + 3)/2

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{1+x}{3+2x+x^2} dx = \frac{1}{2} \log(x^2+2x+3)$$

[In] integrate((1+x)/(x^2+2*x+3),x, algorithm="maxima")

[Out] 1/2*log(x^2 + 2*x + 3)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{1+x}{3+2x+x^2} dx = \frac{1}{2} \log(x^2+2x+3)$$

[In] integrate((1+x)/(x^2+2*x+3),x, algorithm="giac")

[Out] 1/2*log(x^2 + 2*x + 3)

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{1+x}{3+2x+x^2} dx = \frac{\ln(x^2+2x+3)}{2}$$

[In] int((x + 1)/(2*x + x^2 + 3),x)

[Out] log(2*x + x^2 + 3)/2

3.137 $\int \tanh(x) dx$

| | | |
|---|-----------|------|
| Optimal result | | 1441 |
| Rubi [A] (verified) | | 1441 |
| Mathematica [A] (verified) | | 1442 |
| Maple [A] (verified) | | 1442 |
| Fricas [B] (verification not implemented) | | 1442 |
| Sympy [B] (verification not implemented) | | 1443 |
| Maxima [A] (verification not implemented) | | 1443 |
| Giac [B] (verification not implemented) | | 1443 |
| Mupad [B] (verification not implemented) | | 1443 |

Optimal result

Integrand size = 2, antiderivative size = 3

$$\int \tanh(x) dx = \log(\cosh(x))$$

[Out] ln(cosh(x))

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3556}

$$\int \tanh(x) dx = \log(\cosh(x))$$

[In] Int[Tanh[x],x]

[Out] Log[Cosh[x]]

Rule 3556

Int[tan[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Log[RemoveContent[Cos[c + d *x], x]]/d, x] /; FreeQ[{c, d}, x]

Rubi steps

$$\text{integral} = \log(\cosh(x))$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \tanh(x) dx = \log(\cosh(x))$$

[In] Integrate[Tanh[x],x]

[Out] Log[Cosh[x]]

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

| method | result | size |
|-------------------|--------------------------|------|
| lookup | $\ln(\cosh(x))$ | 4 |
| derivativedivides | $\ln(\cosh(x))$ | 4 |
| default | $\ln(\cosh(x))$ | 4 |
| risch | $-x + \ln(e^{2x} + 1)$ | 12 |
| parallelrisch | $-\ln(1 - \tanh(x)) - x$ | 14 |

[In] int(tanh(x),x,method=_RETURNVERBOSE)

[Out] ln(cosh(x))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 18 vs. $2(3) = 6$.

Time = 0.23 (sec) , antiderivative size = 18, normalized size of antiderivative = 6.00

$$\int \tanh(x) dx = -x + \log\left(\frac{2 \cosh(x)}{\cosh(x) - \sinh(x)}\right)$$

[In] integrate(tanh(x),x, algorithm="fricas")

[Out] -x + log(2*cosh(x)/(cosh(x) - sinh(x)))

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 7 vs. $2(3) = 6$.

Time = 0.05 (sec) , antiderivative size = 7, normalized size of antiderivative = 2.33

$$\int \tanh(x) dx = x - \log(\tanh(x) + 1)$$

[In] integrate(tanh(x),x)

[Out] x - log(tanh(x) + 1)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \tanh(x) dx = \log(\cosh(x))$$

[In] integrate(tanh(x),x, algorithm="maxima")

[Out] log(cosh(x))

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 11 vs. $2(3) = 6$.

Time = 0.28 (sec) , antiderivative size = 11, normalized size of antiderivative = 3.67

$$\int \tanh(x) dx = -x + \log(e^{(2x)} + 1)$$

[In] integrate(tanh(x),x, algorithm="giac")

[Out] -x + log(e^(2*x) + 1)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \tanh(x) dx = \ln(\cosh(x))$$

[In] int(tanh(x),x)

[Out] log(cosh(x))

3.138 $\int (-x + x^3) dx$

| | |
|---|------|
| Optimal result | 1444 |
| Rubi [A] (verified) | 1444 |
| Mathematica [A] (verified) | 1445 |
| Maple [A] (verified) | 1445 |
| Fricas [A] (verification not implemented) | 1445 |
| Sympy [A] (verification not implemented) | 1446 |
| Maxima [A] (verification not implemented) | 1446 |
| Giac [A] (verification not implemented) | 1446 |
| Mupad [B] (verification not implemented) | 1446 |

Optimal result

Integrand size = 7, antiderivative size = 15

$$\int (-x + x^3) dx = -\frac{x^2}{2} + \frac{x^4}{4}$$

[Out] $-1/2*x^2+1/4*x^4$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int (-x + x^3) dx = \frac{x^4}{4} - \frac{x^2}{2}$$

[In] $\text{Int}[-x + x^3, x]$

[Out] $-1/2*x^2 + x^4/4$

Rubi steps

$$\text{integral} = -\frac{x^2}{2} + \frac{x^4}{4}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int (-x + x^3) dx = -\frac{x^2}{2} + \frac{x^4}{4}$$

`[In] Integrate[-x + x^3,x]``[Out] -1/2*x^2 + x^4/4`**Maple [A] (verified)**

Time = 0.01 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.73

| method | result | size |
|---------------|------------------------------------|------|
| gospers | $\frac{x^2(x^2-2)}{4}$ | 11 |
| default | $-\frac{1}{2}x^2 + \frac{1}{4}x^4$ | 12 |
| norman | $-\frac{1}{2}x^2 + \frac{1}{4}x^4$ | 12 |
| risch | $-\frac{1}{2}x^2 + \frac{1}{4}x^4$ | 12 |
| parallelrisch | $-\frac{1}{2}x^2 + \frac{1}{4}x^4$ | 12 |
| parts | $-\frac{1}{2}x^2 + \frac{1}{4}x^4$ | 12 |

`[In] int(x^3-x,x,method=_RETURNVERBOSE)``[Out] 1/4*x^2*(x^2-2)`**Fricas [A] (verification not implemented)**

none

Time = 0.24 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.73

$$\int (-x + x^3) dx = \frac{1}{4}x^4 - \frac{1}{2}x^2$$

`[In] integrate(x^3-x,x, algorithm="fricas")``[Out] 1/4*x^4 - 1/2*x^2`

Sympy [A] (verification not implemented)

Time = 0.01 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.53

$$\int (-x + x^3) dx = \frac{x^4}{4} - \frac{x^2}{2}$$

[In] integrate(x**3-x,x)

[Out] x**4/4 - x**2/2

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.73

$$\int (-x + x^3) dx = \frac{1}{4} x^4 - \frac{1}{2} x^2$$

[In] integrate(x^3-x,x, algorithm="maxima")

[Out] 1/4*x^4 - 1/2*x^2

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.73

$$\int (-x + x^3) dx = \frac{1}{4} x^4 - \frac{1}{2} x^2$$

[In] integrate(x^3-x,x, algorithm="giac")

[Out] 1/4*x^4 - 1/2*x^2

Mupad [B] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.67

$$\int (-x + x^3) dx = \frac{x^2(x^2 - 2)}{4}$$

[In] int(x^3 - x,x)

[Out] (x^2*(x^2 - 2))/4

3.139 $\int \log(\sqrt{x}) dx$

| | |
|---|------|
| Optimal result | 1447 |
| Rubi [A] (verified) | 1447 |
| Mathematica [A] (verified) | 1448 |
| Maple [A] (verified) | 1448 |
| Fricas [A] (verification not implemented) | 1448 |
| Sympy [A] (verification not implemented) | 1449 |
| Maxima [A] (verification not implemented) | 1449 |
| Giac [A] (verification not implemented) | 1449 |
| Mupad [B] (verification not implemented) | 1449 |

Optimal result

Integrand size = 6, antiderivative size = 14

$$\int \log(\sqrt{x}) dx = -\frac{x}{2} + x \log(\sqrt{x})$$

[Out] $-1/2*x+1/2*x*\ln(x)$

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 14, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {2332}

$$\int \log(\sqrt{x}) dx = x \log(\sqrt{x}) - \frac{x}{2}$$

[In] `Int[Log[Sqrt[x]],x]`

[Out] $-1/2*x + x*\text{Log}[\text{Sqrt}[x]]$

Rule 2332

`Int[Log[(c_.)*(x_)^(n_.)], x_Symbol] := Simp[x*Log[c*x^n], x] - Simp[n*x, x] /; FreeQ[{c, n}, x]`

Rubi steps

$$\text{integral} = -\frac{x}{2} + x \log(\sqrt{x})$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.86

$$\int \log(\sqrt{x}) dx = \frac{1}{2}(-x + x \log(x))$$

[In] Integrate[Log[Sqrt[x]],x]

[Out] (-x + x*Log[x])/2

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

| method | result | size |
|---------------|-------------------------------------|------|
| lookup | $-\frac{x}{2} + \frac{x \ln(x)}{2}$ | 10 |
| default | $-\frac{x}{2} + \frac{x \ln(x)}{2}$ | 10 |
| norman | $-\frac{x}{2} + \frac{x \ln(x)}{2}$ | 10 |
| risch | $-\frac{x}{2} + \frac{x \ln(x)}{2}$ | 10 |
| parallelrisch | $-\frac{x}{2} + \frac{x \ln(x)}{2}$ | 10 |
| parts | $-\frac{x}{2} + \frac{x \ln(x)}{2}$ | 10 |

[In] int(1/2*ln(x),x,method=_RETURNVERBOSE)

[Out] -1/2*x+1/2*x*ln(x)

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.64

$$\int \log(\sqrt{x}) dx = \frac{1}{2} x \log(x) - \frac{1}{2} x$$

[In] integrate(1/2*log(x),x, algorithm="fricas")

[Out] 1/2*x*log(x) - 1/2*x

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.57

$$\int \log(\sqrt{x}) dx = \frac{x \log(x)}{2} - \frac{x}{2}$$

[In] integrate(1/2*ln(x),x)

[Out] x*log(x)/2 - x/2

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.64

$$\int \log(\sqrt{x}) dx = \frac{1}{2} x \log(x) - \frac{1}{2} x$$

[In] integrate(1/2*log(x),x, algorithm="maxima")

[Out] 1/2*x*log(x) - 1/2*x

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.64

$$\int \log(\sqrt{x}) dx = \frac{1}{2} x \log(x) - \frac{1}{2} x$$

[In] integrate(1/2*log(x),x, algorithm="giac")

[Out] 1/2*x*log(x) - 1/2*x

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.50

$$\int \log(\sqrt{x}) dx = \frac{x(\ln(x) - 1)}{2}$$

[In] int(log(x)/2,x)

[Out] (x*(log(x) - 1))/2

$$3.140 \quad \int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x} \right) dx$$

| | |
|---|------|
| Optimal result | 1450 |
| Rubi [F] | 1450 |
| Mathematica [A] (verified) | 1451 |
| Maple [A] (verified) | 1451 |
| Fricas [B] (verification not implemented) | 1451 |
| Sympy [A] (verification not implemented) | 1452 |
| Maxima [A] (verification not implemented) | 1452 |
| Giac [A] (verification not implemented) | 1452 |
| Mupad [B] (verification not implemented) | 1452 |

Optimal result

Integrand size = 29, antiderivative size = 11

$$\int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x} \right) dx = e^{e^{-x}+e^x}$$

[Out] exp(exp(x)+exp(-x))

Rubi [F]

$$\int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x} \right) dx = \int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x} \right) dx$$

[In] Int[-E^(E^(-x) + E^x - x) + E^(E^(-x) + E^x + x), x]

[Out] Defer[Subst][Defer[Int][E^(x^(-1) + x), x], x, E^x] - Defer[Subst][Defer[Int][E^(x^(-1) + x)/x^2, x], x, E^x]

Rubi steps

$$\begin{aligned} \text{integral} &= - \int e^{e^{-x}+e^x-x} dx + \int e^{e^{-x}+e^x+x} dx \\ &= \text{Subst} \left(\int e^{\frac{1}{x}+x} dx, x, e^x \right) - \text{Subst} \left(\int \frac{e^{\frac{1}{x}+x}}{x^2} dx, x, e^x \right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x} \right) dx = e^{e^{-x}+e^x}$$

[In] Integrate[-E^(E^(-x) + E^x - x) + E^(E^(-x) + E^x + x), x]

[Out] E^(E^(-x) + E^x)

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.82

| method | result | size |
|--------|-----------------------|------|
| risch | $e^{e^x+e^{-x}}$ | 9 |
| norman | $e^{e^x+e^{-x}-x}e^x$ | 15 |

[In] int(exp(exp(x)+exp(-x)+x)-exp(exp(x)+exp(-x)-x), x, method=_RETURNVERBOSE)

[Out] exp(exp(x)+exp(-x))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 20 vs. 2(8) = 16.

Time = 0.24 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.82

$$\int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x} \right) dx = e^{((xe^x+e^{(2x)}+1)e^{(-x)}-x)}$$

[In] integrate(exp(exp(x)+exp(-x)+x)-exp(exp(x)+exp(-x)-x), x, algorithm="fricas")

[Out] e^((x*e^x + e^(2*x) + 1)*e^(-x) - x)

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.27

$$\int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x} \right) dx = e^x e^{-x+e^x+e^{-x}}$$

[In] integrate(exp(exp(x)+exp(-x)+x)-exp(exp(x)+exp(-x)-x),x)

[Out] exp(x)*exp(-x + exp(x) + exp(-x))

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.73

$$\int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x} \right) dx = e^{(e^{-x}+e^x)}$$

[In] integrate(exp(exp(x)+exp(-x)+x)-exp(exp(x)+exp(-x)-x),x, algorithm="maxima")

[Out] e^(e^(-x) + e^x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.09

$$\int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x} \right) dx = e^{((e^{2x}+1)e^{-x})}$$

[In] integrate(exp(exp(x)+exp(-x)+x)-exp(exp(x)+exp(-x)-x),x, algorithm="giac")

[Out] e^((e^(2*x) + 1)*e^(-x))

Mupad [B] (verification not implemented)

Time = 14.76 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.73

$$\int \left(-e^{e^{-x}+e^x-x} + e^{e^{-x}+e^x+x} \right) dx = e^{e^{-x}+e^x}$$

[In] int(exp(x + exp(-x) + exp(x)) - exp(exp(-x) - x + exp(x)),x)

[Out] exp(exp(-x) + exp(x))

3.141 $\int \frac{\log(\log(x))}{x \log(x)} dx$

| | |
|---|------|
| Optimal result | 1453 |
| Rubi [A] (verified) | 1453 |
| Mathematica [A] (verified) | 1454 |
| Maple [A] (verified) | 1454 |
| Fricas [A] (verification not implemented) | 1454 |
| Sympy [A] (verification not implemented) | 1455 |
| Maxima [A] (verification not implemented) | 1455 |
| Giac [A] (verification not implemented) | 1455 |
| Mupad [B] (verification not implemented) | 1455 |

Optimal result

Integrand size = 11, antiderivative size = 9

$$\int \frac{\log(\log(x))}{x \log(x)} dx = \frac{1}{2} \log^2(\log(x))$$

[Out] 1/2*ln(ln(x))^2

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.091$, Rules used = {2338}

$$\int \frac{\log(\log(x))}{x \log(x)} dx = \frac{1}{2} \log^2(\log(x))$$

[In] Int[Log[Log[x]]/(x*Log[x]),x]

[Out] Log[Log[x]]^2/2

Rule 2338

Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))/(x_), x_Symbol] :> Simp[(a + b*Log[c*x^n])^2/(2*b*n), x] /; FreeQ[{a, b, c, n}, x]

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{\log(x)}{x} dx, x, \log(x)\right) \\ &= \frac{1}{2} \log^2(\log(x)) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int \frac{\log(\log(x))}{x \log(x)} dx = \frac{1}{2} \log^2(\log(x))$$

[In] Integrate[Log[Log[x]]/(x*Log[x]),x]

[Out] Log[Log[x]]^2/2

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.89

| method | result | size |
|------------------|---------------------------|------|
| derivativdivides | $\frac{\ln(\ln(x))^2}{2}$ | 8 |
| default | $\frac{\ln(\ln(x))^2}{2}$ | 8 |
| norman | $\frac{\ln(\ln(x))^2}{2}$ | 8 |
| risch | $\frac{\ln(\ln(x))^2}{2}$ | 8 |

[In] int(ln(ln(x))/x/ln(x),x,method=_RETURNVERBOSE)

[Out] 1/2*ln(ln(x))^2

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \frac{\log(\log(x))}{x \log(x)} dx = \frac{1}{2} \log(\log(x))^2$$

[In] integrate(log(log(x))/x/log(x),x, algorithm="fricas")

[Out] 1/2*log(log(x))^2

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \frac{\log(\log(x))}{x \log(x)} dx = \frac{\log(\log(x))^2}{2}$$

[In] integrate(ln(ln(x))/x/ln(x),x)

[Out] log(log(x))**2/2

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \frac{\log(\log(x))}{x \log(x)} dx = \frac{1}{2} \log(\log(x))^2$$

[In] integrate(log(log(x))/x/log(x),x, algorithm="maxima")

[Out] 1/2*log(log(x))^2

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \frac{\log(\log(x))}{x \log(x)} dx = \frac{1}{2} \log(\log(x))^2$$

[In] integrate(log(log(x))/x/log(x),x, algorithm="giac")

[Out] 1/2*log(log(x))^2

Mupad [B] (verification not implemented)

Time = 15.85 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \frac{\log(\log(x))}{x \log(x)} dx = \frac{\ln(\ln(x))^2}{2}$$

[In] int(log(log(x))/(x*log(x)),x)

[Out] log(log(x))^2/2

3.142 $\int \frac{1}{1+\tan^2(x)} dx$

| | |
|---|------|
| Optimal result | 1456 |
| Rubi [A] (verified) | 1456 |
| Mathematica [A] (verified) | 1457 |
| Maple [A] (verified) | 1457 |
| Fricas [A] (verification not implemented) | 1458 |
| Sympy [B] (verification not implemented) | 1458 |
| Maxima [A] (verification not implemented) | 1458 |
| Giac [A] (verification not implemented) | 1459 |
| Mupad [B] (verification not implemented) | 1459 |

Optimal result

Integrand size = 8, antiderivative size = 14

$$\int \frac{1}{1+\tan^2(x)} dx = \frac{x}{2} + \frac{1}{2} \cos(x) \sin(x)$$

[Out] 1/2*x+1/2*cos(x)*sin(x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.375$, Rules used = {3738, 2715, 8}

$$\int \frac{1}{1+\tan^2(x)} dx = \frac{x}{2} + \frac{1}{2} \sin(x) \cos(x)$$

[In] Int[(1 + Tan[x]^2)^(-1),x]

[Out] x/2 + (Cos[x]*Sin[x])/2

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 2715

Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] := Simp[(-b)*Cos[c + d*x]*((b*SIN[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*SIN[c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2*n]

Rule 3738

`Int[(u_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)]^2)^(p_), x_Symbol] := Int[ActivateTrig[u*(a*sec[e + f*x]^2)^p], x] /; FreeQ[{a, b, e, f, p}, x] && EqQ[a, b]`

Rubi steps

$$\begin{aligned} \text{integral} &= \int \cos^2(x) dx \\ &= \frac{1}{2} \cos(x) \sin(x) + \frac{\int 1 dx}{2} \\ &= \frac{x}{2} + \frac{1}{2} \cos(x) \sin(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 + \tan^2(x)} dx = \frac{x}{2} + \frac{1}{4} \sin(2x)$$

[In] `Integrate[(1 + Tan[x]^2)^(-1), x]`

[Out] `x/2 + Sin[2*x]/4`

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.79

| method | result | size |
|------------------|---|------|
| risch | $\frac{x}{2} + \frac{\sin(2x)}{4}$ | 11 |
| derivativdivides | $\frac{\tan(x)}{2+2\tan(x)^2} + \frac{\arctan(\tan(x))}{2}$ | 19 |
| default | $\frac{\tan(x)}{2+2\tan(x)^2} + \frac{\arctan(\tan(x))}{2}$ | 19 |
| parallelrisch | $\frac{x \tan(x)^2 + x + \tan(x)}{2+2\tan(x)^2}$ | 21 |
| norman | $\frac{\frac{x}{2} + \frac{x \tan(x)^2}{2} + \frac{\tan(x)}{2}}{1+\tan(x)^2}$ | 25 |

[In] `int(1/(1+tan(x)^2), x, method=_RETURNVERBOSE)`

[Out] `1/2*x+1/4*sin(2*x)`

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.43

$$\int \frac{1}{1 + \tan^2(x)} dx = \frac{x \tan(x)^2 + x + \tan(x)}{2(\tan(x)^2 + 1)}$$

[In] integrate(1/(1+tan(x)^2),x, algorithm="fricas")

[Out] 1/2*(x*tan(x)^2 + x + tan(x))/(tan(x)^2 + 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 36 vs. 2(10) = 20.

Time = 0.19 (sec) , antiderivative size = 36, normalized size of antiderivative = 2.57

$$\int \frac{1}{1 + \tan^2(x)} dx = \frac{x \tan^2(x)}{2 \tan^2(x) + 2} + \frac{x}{2 \tan^2(x) + 2} + \frac{\tan(x)}{2 \tan^2(x) + 2}$$

[In] integrate(1/(1+tan(x)**2),x)

[Out] x*tan(x)**2/(2*tan(x)**2 + 2) + x/(2*tan(x)**2 + 2) + tan(x)/(2*tan(x)**2 + 2)

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.14

$$\int \frac{1}{1 + \tan^2(x)} dx = \frac{1}{2}x + \frac{\tan(x)}{2(\tan(x)^2 + 1)}$$

[In] integrate(1/(1+tan(x)^2),x, algorithm="maxima")

[Out] 1/2*x + 1/2*tan(x)/(tan(x)^2 + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.14

$$\int \frac{1}{1 + \tan^2(x)} dx = \frac{1}{2}x + \frac{\tan(x)}{2(\tan(x)^2 + 1)}$$

[In] integrate(1/(1+tan(x)^2),x, algorithm="giac")

[Out] 1/2*x + 1/2*tan(x)/(tan(x)^2 + 1)

Mupad [B] (verification not implemented)

Time = 13.51 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \frac{1}{1 + \tan^2(x)} dx = \frac{x}{2} + \frac{\sin(2x)}{4}$$

[In] int(1/(tan(x)^2 + 1),x)

[Out] x/2 + sin(2*x)/4

3.143 $\int \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) dx$

| | |
|---|------|
| Optimal result | 1460 |
| Rubi [A] (verified) | 1460 |
| Mathematica [A] (verified) | 1461 |
| Maple [A] (verified) | 1462 |
| Fricas [A] (verification not implemented) | 1462 |
| Sympy [A] (verification not implemented) | 1462 |
| Maxima [A] (verification not implemented) | 1463 |
| Giac [A] (verification not implemented) | 1463 |
| Mupad [B] (verification not implemented) | 1463 |

Optimal result

Integrand size = 10, antiderivative size = 45

$$\int \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) dx = 9\sqrt{9-x^{2/3}} - \frac{1}{3}(9-x^{2/3})^{3/2} + x \arcsin\left(\frac{\sqrt[3]{x}}{3}\right)$$

[Out] $9*(9-x^{(2/3)})^{(1/2)}-1/3*(9-x^{(2/3)})^{(3/2)}+x*\arcsin(1/3*x^{(1/3)})$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 45, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.400$, Rules used = {4924, 12, 272, 45}

$$\int \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) dx = x \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) - \frac{1}{3}(9-x^{2/3})^{3/2} + 9\sqrt{9-x^{2/3}}$$

[In] `Int[ArcSin[x^(1/3)/3],x]`

[Out] `9*sqrt[9 - x^(2/3)] - (9 - x^(2/3))^(3/2)/3 + x*ArcSin[x^(1/3)/3]`

Rule 12

`Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]`

Rule 45

`Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x], x] /; FreeQ[{a, b, c, d, n},`

$x]$ && NeQ[$b*c - a*d$, 0] && IGtQ[m , 0] && (!IntegerQ[n] || (EqQ[c , 0] && LeQ[$7*m + 4*n + 4$, 0]) || LtQ[$9*m + 5*(n + 1)$, 0] || GtQ[$m + n + 2$, 0])

Rule 272

Int[(x)^(m .)*(a .) + (b .)*(x)^(n .)^(p .), x _Symbol] := Dist[$1/n$, Subst[Int[x ^(Simplify[($m + 1$)/ n] - 1)*($a + b*x$)^ p , x], x , x^n], x] /; FreeQ[{ a , b , m , n , p }, x] && IntegerQ[Simplify[($m + 1$)/ n]]

Rule 4924

Int[ArcSin[u], x _Symbol] := Simp[x *ArcSin[u], x] - Int[SimplifyIntegrand[x *(D[u , x]/Sqrt[$1 - u^2$]), x], x] /; InverseFunctionFreeQ[u , x] && !FunctionOfExponentialQ[u , x]

Rubi steps

$$\begin{aligned}
 \text{integral} &= x \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) - \int \frac{\sqrt[3]{x}}{3\sqrt{9-x^{2/3}}} dx \\
 &= x \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) - \frac{1}{3} \int \frac{\sqrt[3]{x}}{\sqrt{9-x^{2/3}}} dx \\
 &= x \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) - \frac{1}{2} \text{Subst}\left(\int \frac{x}{\sqrt{9-x}} dx, x, x^{2/3}\right) \\
 &= x \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) - \frac{1}{2} \text{Subst}\left(\int \left(\frac{9}{\sqrt{9-x}} - \sqrt{9-x}\right) dx, x, x^{2/3}\right) \\
 &= 9\sqrt{9-x^{2/3}} - \frac{1}{3}(9-x^{2/3})^{3/2} + x \arcsin\left(\frac{\sqrt[3]{x}}{3}\right)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 39, normalized size of antiderivative = 0.87

$$\int \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) dx = -\frac{1}{3}(-18 - x^{2/3}) \sqrt{9 - x^{2/3}} + x \arcsin\left(\frac{\sqrt[3]{x}}{3}\right)$$

[In] Integrate[ArcSin[x^(1/3)/3], x]

[Out] -1/3*((-18 - x^(2/3))*Sqrt[9 - x^(2/3)]) + x*ArcSin[x^(1/3)/3]

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.76

| method | result | size |
|-------------------|--|------|
| derivativedivides | $x \arcsin\left(\frac{x^{\frac{1}{3}}}{3}\right) + x^{\frac{2}{3}} \sqrt{-\frac{x^{\frac{2}{3}}}{9} + 1} + 18 \sqrt{-\frac{x^{\frac{2}{3}}}{9} + 1}$ | 34 |
| default | $x \arcsin\left(\frac{x^{\frac{1}{3}}}{3}\right) + x^{\frac{2}{3}} \sqrt{-\frac{x^{\frac{2}{3}}}{9} + 1} + 18 \sqrt{-\frac{x^{\frac{2}{3}}}{9} + 1}$ | 34 |
| parts | $x \arcsin\left(\frac{x^{\frac{1}{3}}}{3}\right) + \frac{x^{\frac{2}{3}} \sqrt{9 - x^{\frac{2}{3}}}}{3} + 6 \sqrt{9 - x^{\frac{2}{3}}}$ | 35 |

[In] int(arcsin(1/3*x^(1/3)),x,method=_RETURNVERBOSE)

[Out] x*arcsin(1/3*x^(1/3))+x^(2/3)*(-1/9*x^(2/3)+1)^(1/2)+18*(-1/9*x^(2/3)+1)^(1/2)

Fricas [A] (verification not implemented)

none

Time = 4.29 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.56

$$\int \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) dx = x \arcsin\left(\frac{1}{3} x^{\frac{1}{3}}\right) + \frac{1}{3} (x^{\frac{2}{3}} + 18) \sqrt{-x^{\frac{2}{3}} + 9}$$

[In] integrate(arcsin(1/3*x^(1/3)),x, algorithm="fricas")

[Out] x*arcsin(1/3*x^(1/3)) + 1/3*(x^(2/3) + 18)*sqrt(-x^(2/3) + 9)

Sympy [A] (verification not implemented)

Time = 0.17 (sec) , antiderivative size = 37, normalized size of antiderivative = 0.82

$$\int \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) dx = \frac{x^{\frac{2}{3}} \sqrt{9 - x^{\frac{2}{3}}}}{3} + x \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) + 6 \sqrt{9 - x^{\frac{2}{3}}}$$

[In] integrate(asin(1/3*x**(1/3)),x)

[Out] x**(2/3)*sqrt(9 - x**(2/3))/3 + x*asin(x**(1/3)/3) + 6*sqrt(9 - x**(2/3))

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 33, normalized size of antiderivative = 0.73

$$\int \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) dx = x \arcsin\left(\frac{1}{3} x^{\frac{1}{3}}\right) + x^{\frac{2}{3}} \sqrt{-\frac{1}{9} x^{\frac{2}{3}} + 1} + 18 \sqrt{-\frac{1}{9} x^{\frac{2}{3}} + 1}$$

[In] integrate(arcsin(1/3*x^(1/3)),x, algorithm="maxima")

[Out] x*arcsin(1/3*x^(1/3)) + x^(2/3)*sqrt(-1/9*x^(2/3) + 1) + 18*sqrt(-1/9*x^(2/3) + 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 49, normalized size of antiderivative = 1.09

$$\int \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) dx = x^{\frac{1}{3}} \left(x^{\frac{2}{3}} - 9\right) \arcsin\left(\frac{1}{3} x^{\frac{1}{3}}\right) - 9 \left(-\frac{1}{9} x^{\frac{2}{3}} + 1\right)^{\frac{3}{2}} + 9 x^{\frac{1}{3}} \arcsin\left(\frac{1}{3} x^{\frac{1}{3}}\right) + 27 \sqrt{-\frac{1}{9} x^{\frac{2}{3}} + 1}$$

[In] integrate(arcsin(1/3*x^(1/3)),x, algorithm="giac")

[Out] x^(1/3)*(x^(2/3) - 9)*arcsin(1/3*x^(1/3)) - 9*(-1/9*x^(2/3) + 1)^(3/2) + 9*x^(1/3)*arcsin(1/3*x^(1/3)) + 27*sqrt(-1/9*x^(2/3) + 1)

Mupad [B] (verification not implemented)

Time = 14.14 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.56

$$\int \arcsin\left(\frac{\sqrt[3]{x}}{3}\right) dx = x \operatorname{asin}\left(\frac{x^{1/3}}{3}\right) + \frac{\sqrt{9 - x^{2/3}} (x^{2/3} + 18)}{3}$$

[In] int(asin(x^(1/3)/3),x)

[Out] x*asin(x^(1/3)/3) + ((9 - x^(2/3))^(1/2)*(x^(2/3) + 18))/3

3.144 $\int \log(x) dx$

| | |
|---|------|
| Optimal result | 1464 |
| Rubi [A] (verified) | 1464 |
| Mathematica [A] (verified) | 1465 |
| Maple [A] (verified) | 1465 |
| Fricas [A] (verification not implemented) | 1465 |
| Sympy [A] (verification not implemented) | 1466 |
| Maxima [A] (verification not implemented) | 1466 |
| Giac [A] (verification not implemented) | 1466 |
| Mupad [B] (verification not implemented) | 1466 |

Optimal result

Integrand size = 2, antiderivative size = 8

$$\int \log(x) dx = -x + x \log(x)$$

[Out] x*ln(x)-x

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {2332}

$$\int \log(x) dx = x \log(x) - x$$

[In] Int[Log[x],x]

[Out] -x + x*Log[x]

Rule 2332

Int[Log[(c_.)*(x_)^(n_.)], x_Symbol] := Simp[x*Log[c*x^n], x] - Simp[n*x, x] /; FreeQ[{c, n}, x]

Rubi steps

$$\text{integral} = -x + x \log(x)$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log(x) dx = -x + x \log(x)$$

[In] Integrate[Log[x],x]

[Out] -x + x*Log[x]

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.12

| method | result | size |
|---------------|----------------|------|
| lookup | $x \ln(x) - x$ | 9 |
| default | $x \ln(x) - x$ | 9 |
| norman | $x \ln(x) - x$ | 9 |
| risch | $x \ln(x) - x$ | 9 |
| parallelrisch | $x \ln(x) - x$ | 9 |
| parts | $x \ln(x) - x$ | 9 |

[In] int(ln(x),x,method=_RETURNVERBOSE)

[Out] x*ln(x)-x

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log(x) dx = x \log(x) - x$$

[In] integrate(log(x),x, algorithm="fricas")

[Out] x*log(x) - x

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.62

$$\int \log(x) dx = x \log(x) - x$$

[In] integrate(ln(x),x)

[Out] x*log(x) - x

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log(x) dx = x \log(x) - x$$

[In] integrate(log(x),x, algorithm="maxima")

[Out] x*log(x) - x

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \log(x) dx = x \log(x) - x$$

[In] integrate(log(x),x, algorithm="giac")

[Out] x*log(x) - x

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \log(x) dx = x (\ln(x) - 1)$$

[In] int(log(x),x)

[Out] x*(log(x) - 1)

3.145 $\int e^x (\cos(x) - \sin(x)) dx$

| | |
|---|------|
| Optimal result | 1467 |
| Rubi [A] (verified) | 1467 |
| Mathematica [A] (verified) | 1468 |
| Maple [A] (verified) | 1468 |
| Fricas [A] (verification not implemented) | 1468 |
| Sympy [A] (verification not implemented) | 1469 |
| Maxima [B] (verification not implemented) | 1469 |
| Giac [B] (verification not implemented) | 1469 |
| Mupad [B] (verification not implemented) | 1469 |

Optimal result

Integrand size = 11, antiderivative size = 6

$$\int e^x (\cos(x) - \sin(x)) dx = e^x \cos(x)$$

[Out] `exp(x)*cos(x)`

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.091$, Rules used = {2326}

$$\int e^x (\cos(x) - \sin(x)) dx = e^x \cos(x)$$

[In] `Int[E^x*(Cos[x] - Sin[x]),x]`

[Out] `E^x*Cos[x]`

Rule 2326

`Int[(y_)*(F_)^(u_)*((v_) + (w_)), x_Symbol] :> With[{z = v*(y/(Log[F]*D[u, x]))}, Simp[F^u*z, x] /; EqQ[D[z, x], w*y]] /; FreeQ[F, x]`

Rubi steps

$$\text{integral} = e^x \cos(x)$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int e^x(\cos(x) - \sin(x)) dx = e^x \cos(x)$$

[In] Integrate[E^x*(Cos[x] - Sin[x]),x]

[Out] E^x*Cos[x]

Maple [A] (verified)

Time = 0.09 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

| method | result | size |
|---------------|--|------|
| default | $e^x \cos(x)$ | 6 |
| parallelrisch | $e^x \cos(x)$ | 6 |
| parts | $e^x \cos(x)$ | 6 |
| risch | $\frac{e^{(1+i)x}}{2} + \frac{e^{(1-i)x}}{2}$ | 18 |
| norman | $\frac{-e^x \tan(\frac{x}{2})^2 + e^x}{1 + \tan(\frac{x}{2})^2}$ | 25 |

[In] int(exp(x)*(cos(x)-sin(x)),x,method=_RETURNVERBOSE)

[Out] exp(x)*cos(x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int e^x(\cos(x) - \sin(x)) dx = \cos(x) e^x$$

[In] integrate(exp(x)*(cos(x)-sin(x)),x, algorithm="fricas")

[Out] cos(x)*e^x

Sympy [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int e^x(\cos(x) - \sin(x)) dx = e^x \cos(x)$$

[In] integrate(exp(x)*(cos(x)-sin(x)),x)

[Out] exp(x)*cos(x)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 21 vs. 2(5) = 10.

Time = 0.19 (sec) , antiderivative size = 21, normalized size of antiderivative = 3.50

$$\int e^x(\cos(x) - \sin(x)) dx = \frac{1}{2}(\cos(x) + \sin(x))e^x + \frac{1}{2}(\cos(x) - \sin(x))e^x$$

[In] integrate(exp(x)*(cos(x)-sin(x)),x, algorithm="maxima")

[Out] 1/2*(cos(x) + sin(x))*e^x + 1/2*(cos(x) - sin(x))*e^x

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 21 vs. 2(5) = 10.

Time = 0.29 (sec) , antiderivative size = 21, normalized size of antiderivative = 3.50

$$\int e^x(\cos(x) - \sin(x)) dx = \frac{1}{2}(\cos(x) + \sin(x))e^x + \frac{1}{2}(\cos(x) - \sin(x))e^x$$

[In] integrate(exp(x)*(cos(x)-sin(x)),x, algorithm="giac")

[Out] 1/2*(cos(x) + sin(x))*e^x + 1/2*(cos(x) - sin(x))*e^x

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int e^x(\cos(x) - \sin(x)) dx = e^x \cos(x)$$

[In] int(exp(x)*(cos(x) - sin(x)),x)

[Out] exp(x)*cos(x)

3.146 $\int e^{-x^2} x^3 dx$

| | |
|---|------|
| Optimal result | 1470 |
| Rubi [A] (verified) | 1470 |
| Mathematica [A] (verified) | 1471 |
| Maple [A] (verified) | 1471 |
| Fricas [A] (verification not implemented) | 1472 |
| Sympy [A] (verification not implemented) | 1472 |
| Maxima [A] (verification not implemented) | 1472 |
| Giac [A] (verification not implemented) | 1473 |
| Mupad [B] (verification not implemented) | 1473 |

Optimal result

Integrand size = 11, antiderivative size = 26

$$\int e^{-x^2} x^3 dx = -\frac{e^{-x^2}}{2} - \frac{1}{2}e^{-x^2} x^2$$

[Out] $-1/2/\exp(x^2)-1/2*x^2/\exp(x^2)$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {2243, 2240}

$$\int e^{-x^2} x^3 dx = -\frac{1}{2}e^{-x^2} x^2 - \frac{e^{-x^2}}{2}$$

[In] $\text{Int}[x^3/E^x^2, x]$

[Out] $-1/2*1/E^x^2 - x^2/(2*E^x^2)$

Rule 2240

$\text{Int}[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^(n_))*((e_.) + (f_.)*(x_))^(m_.), x_Symbol] := \text{Simp}[(e + f*x)^n*(F^(a + b*(c + d*x)^n)/(b*f*n*(c + d*x)^n * \text{Log}[F])), x] /;$ $\text{FreeQ}\{F, a, b, c, d, e, f, n\}, x\} \ \&\& \ \text{EqQ}[m, n - 1] \ \&\& \ \text{EqQ}[d*e - c*f, 0]$

Rule 2243

$\text{Int}[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^(n_))*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] := \text{Simp}[(c + d*x)^(m - n + 1)*(F^(a + b*(c + d*x)^n)/(b*d*n*L$

```
og[F])), x] - Dist[(m - n + 1)/(b*n*Log[F]), Int[(c + d*x)^(m - n)*F^(a + b
*(c + d*x)^n), x], x] /; FreeQ[{F, a, b, c, d}, x] && IntegerQ[2*((m + 1)/n
)] && LtQ[0, (m + 1)/n, 5] && IntegerQ[n] && (LtQ[0, n, m + 1] || LtQ[m, n,
0])
```

Rubi steps

$$\begin{aligned} \text{integral} &= -\frac{1}{2}e^{-x^2}x^2 + \int e^{-x^2}x dx \\ &= -\frac{e^{-x^2}}{2} - \frac{1}{2}e^{-x^2}x^2 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.62

$$\int e^{-x^2}x^3 dx = -\frac{1}{2}e^{-x^2}(1 + x^2)$$

[In] Integrate[x^3/E^x^2,x]

[Out] -1/2*(1 + x^2)/E^x^2

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.54

| method | result | size |
|--------------|--|------|
| gospers | $-\frac{(x^2+1)e^{-x^2}}{2}$ | 14 |
| risch | $\left(-\frac{x^2}{2} - \frac{1}{2}\right)e^{-x^2}$ | 15 |
| meijerg | $\frac{1}{2} - \frac{(2x^2+2)e^{-x^2}}{4}$ | 18 |
| default | $-\frac{x^2e^{-x^2}}{2} - \frac{e^{-x^2}}{2}$ | 21 |
| norman | $-\frac{x^2e^{-x^2}}{2} - \frac{e^{-x^2}}{2}$ | 21 |
| paralelrisch | $-\frac{x^2e^{-x^2}}{2} - \frac{e^{-x^2}}{2}$ | 21 |
| parts | $\frac{\sqrt{\pi} \operatorname{erf}(x)x^3}{2} - \frac{3\sqrt{\pi} \left(\frac{\operatorname{erf}(x)x^3}{3} - \frac{2 \left(-\frac{x^2e^{-x^2}}{2} - \frac{e^{-x^2}}{2} \right)}{3\sqrt{\pi}} \right)}{2}$ | 50 |

[In] int(x^3*exp(-x^2),x,method=_RETURNVERBOSE)

[Out] $-1/2*(x^2+1)*\exp(-x^2)$

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.50

$$\int e^{-x^2} x^3 dx = -\frac{1}{2} (x^2 + 1) e^{(-x^2)}$$

[In] `integrate(x^3*exp(-x^2),x, algorithm="fricas")`

[Out] $-1/2*(x^2 + 1)*e^{(-x^2)}$

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.46

$$\int e^{-x^2} x^3 dx = \frac{(-x^2 - 1) e^{-x^2}}{2}$$

[In] `integrate(x**3*exp(-x**2),x)`

[Out] $(-x**2 - 1)*\exp(-x**2)/2$

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.50

$$\int e^{-x^2} x^3 dx = -\frac{1}{2} (x^2 + 1) e^{(-x^2)}$$

[In] `integrate(x^3*exp(-x^2),x, algorithm="maxima")`

[Out] $-1/2*(x^2 + 1)*e^{(-x^2)}$

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.50

$$\int e^{-x^2} x^3 dx = -\frac{1}{2} (x^2 + 1) e^{(-x^2)}$$

```
[In] integrate(x^3*exp(-x^2),x, algorithm="giac")
```

```
[Out] -1/2*(x^2 + 1)*e^(-x^2)
```

Mupad [B] (verification not implemented)

Time = 16.55 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.50

$$\int e^{-x^2} x^3 dx = -\frac{e^{-x^2} (x^2 + 1)}{2}$$

```
[In] int(x^3*exp(-x^2),x)
```

```
[Out] -(exp(-x^2)*(x^2 + 1))/2
```

$$3.147 \quad \int \left((1 + 2e^{x^2}x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx$$

| | |
|---|------|
| Optimal result | 1474 |
| Rubi [F] | 1474 |
| Mathematica [C] (verified) | 1475 |
| Maple [A] (verified) | 1475 |
| Fricas [A] (verification not implemented) | 1476 |
| Sympy [F] | 1476 |
| Maxima [C] (verification not implemented) | 1476 |
| Giac [A] (verification not implemented) | 1477 |
| Mupad [B] (verification not implemented) | 1477 |

Optimal result

Integrand size = 25, antiderivative size = 10

$$\int \left((1 + 2e^{x^2}x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx = (e^{x^2} + x) \cos(x)$$

[Out] (exp(x^2)+x)*cos(x)

Rubi [F]

$$\begin{aligned} & \int \left((1 + 2e^{x^2}x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx \\ &= \int \left((1 + 2e^{x^2}x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx \end{aligned}$$

[In] Int[(1 + 2*E^x^2*x)*Cos[x] - (E^x^2 + x)*Sin[x], x]

[Out] x*Cos[x] - (I/4)*E^(1/4)*Sqrt[Pi]*Erfi[(-I + 2*x)/2] + (I/4)*E^(1/4)*Sqrt[Pi]*Erfi[(I + 2*x)/2] + 2*Defer[Int][E^x^2*x*Cos[x], x]

Rubi steps

$$\begin{aligned} \text{integral} &= \int (1 + 2e^{x^2}x) \cos(x) dx - \int (e^{x^2} + x) \sin(x) dx \\ &= \int (\cos(x) + 2e^{x^2}x \cos(x)) dx - \int (e^{x^2} \sin(x) + x \sin(x)) dx \\ &= 2 \int e^{x^2}x \cos(x) dx + \int \cos(x) dx - \int e^{x^2} \sin(x) dx - \int x \sin(x) dx \end{aligned}$$

$$\begin{aligned}
&= x \cos(x) + \sin(x) + 2 \int e^{x^2} x \cos(x) dx - \int \left(\frac{1}{2} i e^{-ix+x^2} - \frac{1}{2} i e^{ix+x^2} \right) dx - \int \cos(x) dx \\
&= x \cos(x) - \frac{1}{2} i \int e^{-ix+x^2} dx + \frac{1}{2} i \int e^{ix+x^2} dx + 2 \int e^{x^2} x \cos(x) dx \\
&= x \cos(x) + 2 \int e^{x^2} x \cos(x) dx - \frac{1}{2} (i\sqrt[4]{e}) \int e^{\frac{1}{4}(-i+2x)^2} dx + \frac{1}{2} (i\sqrt[4]{e}) \int e^{\frac{1}{4}(i+2x)^2} dx \\
&= x \cos(x) - \frac{1}{4} i\sqrt[4]{e}\sqrt{\pi} \operatorname{erfi}\left(\frac{1}{2}(-i+2x)\right) + \frac{1}{4} i\sqrt[4]{e}\sqrt{\pi} \operatorname{erfi}\left(\frac{1}{2}(i+2x)\right) + 2 \int e^{x^2} x \cos(x) dx
\end{aligned}$$

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 0.63 (sec) , antiderivative size = 27, normalized size of antiderivative = 2.70

$$\int \left((1 + 2e^{x^2}x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx = \frac{1}{2} e^{-ix} (1 + e^{2ix}) (e^{x^2} + x)$$

[In] Integrate[(1 + 2*E^x^2*x)*Cos[x] - (E^x^2 + x)*Sin[x], x]

[Out] ((1 + E^((2*I)*x))*(E^x^2 + x))/(2*E^(I*x))

Maple [A] (verified)

Time = 0.21 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

| method | result | size |
|---------------|---|------|
| parallelrisch | $(e^{x^2} + x) \cos(x)$ | 10 |
| risch | $\frac{e^{x(x-i)}}{2} + \frac{e^{x(i+x)}}{2} + x \cos(x)$ | 24 |
| norman | $\frac{x - x \tan(\frac{x}{2})^2 - e^{x^2} \tan(\frac{x}{2})^2 + e^{x^2}}{1 + \tan(\frac{x}{2})^2}$ | 39 |

[In] int((2*exp(x^2)*x+1)*cos(x)-(exp(x^2)+x)*sin(x), x, method=_RETURNVERBOSE)

[Out] (exp(x^2)+x)*cos(x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \left((1 + 2e^{x^2} x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx = x \cos(x) + \cos(x) e^{(x^2)}$$

```
[In] integrate((2*exp(x^2)*x+1)*cos(x)-(exp(x^2)+x)*sin(x),x, algorithm="fricas")
```

```
[Out] x*cos(x) + cos(x)*e^(x^2)
```

Sympy [F]

$$\begin{aligned} & \int \left((1 + 2e^{x^2} x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx \\ &= \int \left(-(x + e^{x^2}) \sin(x) + (2xe^{x^2} + 1) \cos(x) \right) dx \end{aligned}$$

```
[In] integrate((2*exp(x**2)*x+1)*cos(x)-(exp(x**2)+x)*sin(x),x)
```

```
[Out] Integral(-(x + exp(x**2))*sin(x) + (2*x*exp(x**2) + 1)*cos(x), x)
```

Maxima [C] (verification not implemented)

Result contains higher order function than in optimal. Order 9 vs. order 3.

Time = 0.28 (sec) , antiderivative size = 473, normalized size of antiderivative = 47.30

$$\begin{aligned} & \int \left((1 + 2e^{x^2} x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx \\ &= -\frac{1}{4} \sqrt{\pi} \left(\operatorname{erf} \left(ix + \frac{1}{2} \right) - \operatorname{erf} \left(ix - \frac{1}{2} \right) \right) e^{\frac{1}{4}} + x \cos(x) \\ & \quad + \frac{2(16x^4 + 8x^2 + 1)^{\frac{1}{4}} \left(e^{(x^2+ix-\frac{1}{4})} + e^{(x^2-ix-\frac{1}{4})} + e^{(\bar{x}^2+i\bar{x}-\frac{1}{4})} + e^{(\bar{x}^2-i\bar{x}-\frac{1}{4})} \right) e^{\frac{1}{4}} - \left(2 \left(i \sqrt{\pi} \left(\operatorname{erf} \left(\sqrt{-x^2} \right) \right) \right)} \right)}{\dots} \end{aligned}$$

```
[In] integrate((2*exp(x^2)*x+1)*cos(x)-(exp(x^2)+x)*sin(x),x, algorithm="maxima")
```

```
[Out] -1/4*sqrt(pi)*(erf(I*x + 1/2) - erf(I*x - 1/2))*e^(1/4) + x*cos(x) + 1/8*(2
*(16*x^4 + 8*x^2 + 1)^(1/4)*(e^(x^2 + I*x - 1/4) + e^(x^2 - I*x - 1/4) + e^
(conjugate(x)^2 + I*conjugate(x) - 1/4) + e^(conjugate(x)^2 - I*conjugate(x
```


) - 1/4))*e^(1/4) - ((2*(I*sqrt(pi))*(conjugate(erf(sqrt(-x^2 + I*x + 1/4))) - 1) - I*sqrt(pi)*(conjugate(erf(sqrt(-x^2 - I*x + 1/4)))) - 1) - I*sqrt(pi)*(erf(sqrt(-x^2 + I*x + 1/4)) - 1) + I*sqrt(pi)*(erf(sqrt(-x^2 - I*x + 1/4)) - 1))*x - sqrt(pi)*(conjugate(erf(sqrt(-x^2 + I*x + 1/4))) - 1) - sqrt(pi)*(conjugate(erf(sqrt(-x^2 - I*x + 1/4)))) - 1) - sqrt(pi)*(erf(sqrt(-x^2 + I*x + 1/4)) - 1) - sqrt(pi)*(erf(sqrt(-x^2 - I*x + 1/4)) - 1))*cos(1/2*arctan2(4*x, -4*x^2 + 1)) - (2*(sqrt(pi)*(conjugate(erf(sqrt(-x^2 + I*x + 1/4))) - 1) + sqrt(pi)*(conjugate(erf(sqrt(-x^2 - I*x + 1/4)))) - 1) + sqrt(pi)*(erf(sqrt(-x^2 + I*x + 1/4)) - 1) + sqrt(pi)*(erf(sqrt(-x^2 - I*x + 1/4)) - 1))*x + I*sqrt(pi)*(conjugate(erf(sqrt(-x^2 + I*x + 1/4))) - 1) - I*sqrt(pi)*(conjugate(erf(sqrt(-x^2 - I*x + 1/4)))) - 1) - I*sqrt(pi)*(erf(sqrt(-x^2 + I*x + 1/4)) - 1) + I*sqrt(pi)*(erf(sqrt(-x^2 - I*x + 1/4)) - 1))*sin(1/2*arctan2(4*x, -4*x^2 + 1)))*e^(1/4))/(16*x^4 + 8*x^2 + 1)^(1/4)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \left((1 + 2e^{x^2}x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx = x \cos(x) + \cos(x) e^{(x^2)}$$

[In] integrate((2*exp(x^2)*x+1)*cos(x)-(exp(x^2)+x)*sin(x),x, algorithm="giac")

[Out] x*cos(x) + cos(x)*e^(x^2)

Mupad [B] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int \left((1 + 2e^{x^2}x) \cos(x) - (e^{x^2} + x) \sin(x) \right) dx = \cos(x) (x + e^{x^2})$$

[In] int(cos(x)*(2*x*exp(x^2) + 1) - sin(x)*(x + exp(x^2)),x)

[Out] cos(x)*(x + exp(x^2))

$$3.148 \quad \int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}} \right) (1 + \sqrt[3]{x} + \sqrt{x}) dx$$

| | |
|---|------|
| Optimal result | 1478 |
| Rubi [A] (verified) | 1478 |
| Mathematica [A] (verified) | 1479 |
| Maple [A] (verified) | 1479 |
| Fricas [A] (verification not implemented) | 1479 |
| Sympy [A] (verification not implemented) | 1480 |
| Maxima [A] (verification not implemented) | 1480 |
| Giac [A] (verification not implemented) | 1480 |
| Mupad [B] (verification not implemented) | 1481 |

Optimal result

Integrand size = 25, antiderivative size = 56

$$\int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}} \right) (1 + \sqrt[3]{x} + \sqrt{x}) dx = 2\sqrt{x} + \frac{3x^{2/3}}{2} + \frac{6x^{5/6}}{5} + 3x + \frac{6x^{7/6}}{7} + \frac{3x^{4/3}}{4} + \frac{2x^{3/2}}{3}$$

[Out] 2*x^(1/2)+3/2*x^(2/3)+6/5*x^(5/6)+3*x+6/7*x^(7/6)+3/4*x^(4/3)+2/3*x^(3/2)

Rubi [A] (verified)

Time = 0.10 (sec) , antiderivative size = 56, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.040$, Rules used = {6874}

$$\int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}} \right) (1 + \sqrt[3]{x} + \sqrt{x}) dx = \frac{2x^{3/2}}{3} + \frac{3x^{4/3}}{4} + \frac{6x^{7/6}}{7} + \frac{6x^{5/6}}{5} + \frac{3x^{2/3}}{2} + 3x + 2\sqrt{x}$$

[In] Int[(1 + 1/Sqrt[x] + x^(-1/3))*(1 + x^(1/3) + Sqrt[x]),x]

[Out] 2*Sqrt[x] + (3*x^(2/3))/2 + (6*x^(5/6))/5 + 3*x + (6*x^(7/6))/7 + (3*x^(4/3))/4 + (2*x^(3/2))/3

Rule 6874

```
Int[u_, x_Symbol] := With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned} \text{integral} &= 6\text{Subst}\left(\int x^2(1+x+x^3)(1+x^2+x^3) dx, x, \sqrt[6]{x}\right) \\ &= 6\text{Subst}\left(\int (x^2+x^3+x^4+3x^5+x^6+x^7+x^8) dx, x, \sqrt[6]{x}\right) \\ &= 2\sqrt{x} + \frac{3x^{2/3}}{2} + \frac{6x^{5/6}}{5} + 3x + \frac{6x^{7/6}}{7} + \frac{3x^{4/3}}{4} + \frac{2x^{3/2}}{3} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 50, normalized size of antiderivative = 0.89

$$\int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}}\right) (1 + \sqrt[3]{x} + \sqrt{x}) dx = \frac{1}{420} (840\sqrt{x} + 630x^{2/3} + 504x^{5/6} + 1260x + 360x^{7/6} + 315x^{4/3} + 280x^{3/2})$$

[In] Integrate[(1 + 1/Sqrt[x] + x^(-1/3))*(1 + x^(1/3) + Sqrt[x]), x]

[Out] (840*Sqrt[x] + 630*x^(2/3) + 504*x^(5/6) + 1260*x + 360*x^(7/6) + 315*x^(4/3) + 280*x^(3/2))/420

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 35, normalized size of antiderivative = 0.62

$$2\sqrt{x} + \frac{3x^{2/3}}{2} + \frac{6x^{5/6}}{5} + 3x + \frac{6x^{7/6}}{7} + \frac{3x^{4/3}}{4} + \frac{2x^{3/2}}{3}$$

[In] int((1+x^(1/2)+x^(1/3))*(1+1/x^(1/2)+1/x^(1/3)), x)

[Out] 2*x^(1/2)+3/2*x^(2/3)+6/5*x^(5/6)+3*x+6/7*x^(7/6)+3/4*x^(4/3)+2/3*x^(3/2)

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 32, normalized size of antiderivative = 0.57

$$\int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}}\right) (1 + \sqrt[3]{x} + \sqrt{x}) dx = \frac{2}{3} (x + 3)\sqrt{x} + \frac{3}{4} x^{4/3} + \frac{6}{7} x^{7/6} + 3x + \frac{6}{5} x^{5/6} + \frac{3}{2} x^{3/2}$$

[In] integrate((1+x^(1/2)+x^(1/3))*(1+1/x^(1/2)+1/x^(1/3)), x, algorithm="fricas")

[Out] 2/3*(x + 3)*sqrt(x) + 3/4*x^(4/3) + 6/7*x^(7/6) + 3*x + 6/5*x^(5/6) + 3/2*x^(3/2)

Sympy [A] (verification not implemented)

Time = 4.52 (sec) , antiderivative size = 51, normalized size of antiderivative = 0.91

$$\int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}}\right) (1 + \sqrt[3]{x} + \sqrt{x}) dx = \frac{6x^{\frac{7}{6}}}{7} + \frac{6x^{\frac{5}{6}}}{5} + \frac{3x^{\frac{4}{3}}}{4} + \frac{3x^{\frac{2}{3}}}{2} + \frac{2x^{\frac{3}{2}}}{3} + 2\sqrt{x} + 3x$$

[In] integrate((1+x**(1/2)+x**(1/3))*(1+1/x**(1/2)+1/x**(1/3)),x)

[Out] 6*x**(7/6)/7 + 6*x**(5/6)/5 + 3*x**(4/3)/4 + 3*x**(2/3)/2 + 2*x**(3/2)/3 + 2*sqrt(x) + 3*x

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.61

$$\int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}}\right) (1 + \sqrt[3]{x} + \sqrt{x}) dx = \frac{2}{3}x^{\frac{3}{2}} + \frac{3}{4}x^{\frac{4}{3}} + \frac{6}{7}x^{\frac{7}{6}} + 3x + \frac{6}{5}x^{\frac{5}{6}} + \frac{3}{2}x^{\frac{2}{3}} + 2\sqrt{x}$$

[In] integrate((1+x^(1/2)+x^(1/3))*(1+1/x^(1/2)+1/x^(1/3)),x, algorithm="maxima")

[Out] 2/3*x^(3/2) + 3/4*x^(4/3) + 6/7*x^(7/6) + 3*x + 6/5*x^(5/6) + 3/2*x^(2/3) + 2*sqrt(x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.61

$$\int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}}\right) (1 + \sqrt[3]{x} + \sqrt{x}) dx = \frac{2}{3}x^{\frac{3}{2}} + \frac{3}{4}x^{\frac{4}{3}} + \frac{6}{7}x^{\frac{7}{6}} + 3x + \frac{6}{5}x^{\frac{5}{6}} + \frac{3}{2}x^{\frac{2}{3}} + 2\sqrt{x}$$

[In] integrate((1+x^(1/2)+x^(1/3))*(1+1/x^(1/2)+1/x^(1/3)),x, algorithm="giac")

[Out] 2/3*x^(3/2) + 3/4*x^(4/3) + 6/7*x^(7/6) + 3*x + 6/5*x^(5/6) + 3/2*x^(2/3) + 2*sqrt(x)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.61

$$\int \left(1 + \frac{1}{\sqrt{x}} + \frac{1}{\sqrt[3]{x}}\right) (1 + \sqrt[3]{x} + \sqrt{x}) dx = 3x + 2\sqrt{x} + \frac{3x^{2/3}}{2} + \frac{2x^{3/2}}{3} + \frac{3x^{4/3}}{4} + \frac{6x^{5/6}}{5} + \frac{6x^{7/6}}{7}$$

[In] `int((1/x^(1/2) + 1/x^(1/3) + 1)*(x^(1/2) + x^(1/3) + 1),x)`

[Out] `3*x + 2*x^(1/2) + (3*x^(2/3))/2 + (2*x^(3/2))/3 + (3*x^(4/3))/4 + (6*x^(5/6))/5 + (6*x^(7/6))/7`

3.149 $\int \cos(x) \cos(\sin(x)) \sin(\sin(x)) dx$

| | |
|---|------|
| Optimal result | 1482 |
| Rubi [A] (verified) | 1482 |
| Mathematica [A] (verified) | 1483 |
| Maple [A] (verified) | 1483 |
| Fricas [B] (verification not implemented) | 1484 |
| Sympy [A] (verification not implemented) | 1484 |
| Maxima [A] (verification not implemented) | 1484 |
| Giac [A] (verification not implemented) | 1485 |
| Mupad [B] (verification not implemented) | 1485 |

Optimal result

Integrand size = 9, antiderivative size = 9

$$\int \cos(x) \cos(\sin(x)) \sin(\sin(x)) dx = \frac{1}{2} \sin^2(\sin(x))$$

[Out] 1/2*sin(sin(x))^2

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {4419, 2644, 30}

$$\int \cos(x) \cos(\sin(x)) \sin(\sin(x)) dx = \frac{1}{2} \sin^2(\sin(x))$$

[In] Int[Cos[x]*Cos[Sin[x]]*Sin[Sin[x]],x]

[Out] Sin[Sin[x]]^2/2

Rule 30

Int[(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rule 2644

Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_Symbol] :> Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] && !(IntegerQ[(m - 1)/2] && LtQ[0, m, n])

Rule 4419

```
Int[(u_)*(F_)[(c_)*((a_) + (b_)*(x_))], x_Symbol] :> With[{d = FreeFactors[Sin[c*(a + b*x)], x]}, Dist[d/(b*c), Subst[Int[SubstFor[1, Sin[c*(a + b*x)]]/d, u, x], x], x, Sin[c*(a + b*x)]/d, x] /; FunctionOfQ[Sin[c*(a + b*x)]/d, u, x, True] /; FreeQ[{a, b, c}, x] && (EqQ[F, Cos] || EqQ[F, cos])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \cos(x) \sin(x) dx, x, \sin(x)\right) \\ &= \text{Subst}\left(\int x dx, x, \sin(\sin(x))\right) \\ &= \frac{1}{2} \sin^2(\sin(x)) \end{aligned}$$

Mathematica [A] (verified)

Time = 2.05 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int \cos(x) \cos(\sin(x)) \sin(\sin(x)) dx = -\frac{1}{2} \cos^2(\sin(x))$$

[In] Integrate[Cos[x]*Cos[Sin[x]]*Sin[Sin[x]],x]

[Out] -1/2*Cos[Sin[x]]^2

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.89

| method | result | size |
|------------------|---|------|
| derivativdivides | $\frac{\sin(\sin(x))^2}{2}$ | 8 |
| default | $\frac{\sin(\sin(x))^2}{2}$ | 8 |
| risch | $-\frac{\cos(2 \sin(x))}{4}$ | 8 |
| parallelrisch | $-\frac{3}{4} - \frac{\cos(2 \sin(x))}{4}$ | 10 |
| norman | $\frac{2 \tan\left(\frac{\tan\left(\frac{x}{2}\right)}{1+\tan\left(\frac{x}{2}\right)^2}\right)^2 + 2 \tan\left(\frac{x}{2}\right)^2 \tan\left(\frac{\tan\left(\frac{x}{2}\right)}{1+\tan\left(\frac{x}{2}\right)^2}\right)^2}{\left(1+\tan\left(\frac{\tan\left(\frac{x}{2}\right)}{1+\tan\left(\frac{x}{2}\right)^2}\right)^2\right)^2 (1+\tan\left(\frac{x}{2}\right)^2)}$ | 81 |

[In] int(sin(sin(x))*cos(sin(x))*cos(x),x,method=_RETURNVERBOSE)

[Out] $1/2*\sin(\sin(x))^2$

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 21 vs. $2(7) = 14$.

Time = 0.24 (sec) , antiderivative size = 21, normalized size of antiderivative = 2.33

$$\int \cos(x) \cos(\sin(x)) \sin(\sin(x)) dx = -\frac{1}{2} \cos \left(\frac{2 \tan \left(\frac{1}{2} x \right)}{\tan \left(\frac{1}{2} x \right)^2 + 1} \right)^2$$

[In] `integrate(sin(sin(x))*cos(sin(x))*cos(x),x, algorithm="fricas")`

[Out] $-1/2*\cos(2*\tan(1/2*x)/(\tan(1/2*x)^2 + 1))^2$

Sympy [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.89

$$\int \cos(x) \cos(\sin(x)) \sin(\sin(x)) dx = -\frac{\cos^2(\sin(x))}{2}$$

[In] `integrate(sin(sin(x))*cos(sin(x))*cos(x),x)`

[Out] $-\cos(\sin(x))^2/2$

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \cos(x) \cos(\sin(x)) \sin(\sin(x)) dx = -\frac{1}{2} \cos(\sin(x))^2$$

[In] `integrate(sin(sin(x))*cos(sin(x))*cos(x),x, algorithm="maxima")`

[Out] $-1/2*\cos(\sin(x))^2$

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \cos(x) \cos(\sin(x)) \sin(\sin(x)) dx = -\frac{1}{2} \cos(\sin(x))^2$$

[In] integrate(sin(sin(x))*cos(sin(x))*cos(x),x, algorithm="giac")

[Out] -1/2*cos(sin(x))^2

Mupad [B] (verification not implemented)

Time = 0.15 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \cos(x) \cos(\sin(x)) \sin(\sin(x)) dx = \frac{\sin(\sin(x))^2}{2}$$

[In] int(cos(sin(x))*sin(sin(x))*cos(x),x)

[Out] sin(sin(x))^2/2

$$3.150 \quad \int \left(\frac{-\cos(x) + \sin(x)}{x} + \frac{\cos(x) + \sin(x)}{x^2} \right) dx$$

| | |
|---|------|
| Optimal result | 1486 |
| Rubi [A] (verified) | 1486 |
| Mathematica [A] (verified) | 1487 |
| Maple [A] (verified) | 1488 |
| Fricas [A] (verification not implemented) | 1488 |
| Sympy [A] (verification not implemented) | 1488 |
| Maxima [C] (verification not implemented) | 1489 |
| Giac [C] (verification not implemented) | 1489 |
| Mupad [B] (verification not implemented) | 1489 |

Optimal result

Integrand size = 21, antiderivative size = 15

$$\int \left(\frac{-\cos(x) + \sin(x)}{x} + \frac{\cos(x) + \sin(x)}{x^2} \right) dx = -\frac{\cos(x)}{x} - \frac{\sin(x)}{x}$$

[Out] $-\cos(x)/x - \sin(x)/x$

Rubi [A] (verified)

Time = 0.10 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 11, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.190$, Rules used = {14, 3383, 3380, 3378}

$$\int \left(\frac{-\cos(x) + \sin(x)}{x} + \frac{\cos(x) + \sin(x)}{x^2} \right) dx = -\frac{\sin(x)}{x} - \frac{\cos(x)}{x}$$

[In] $\text{Int}[(-\text{Cos}[x] + \text{Sin}[x])/x + (\text{Cos}[x] + \text{Sin}[x])/x^2, x]$

[Out] $-(\text{Cos}[x]/x) - \text{Sin}[x]/x$

Rule 14

```
Int[(u_)*((c_)*(x_)^(m_)), x_Symbol] := Int[ExpandIntegrand[(c*x)^m*u, x], x] /; FreeQ[{c, m}, x] && SumQ[u] && !LinearQ[u, x] && !MatchQ[u, (a_ + (b_)*(v_)) /; FreeQ[{a, b}, x] && InverseFunctionQ[v]]
```

Rule 3378

```
Int[((c_) + (d_)*(x_)^(m_))*sin[(e_) + (f_)*(x_)], x_Symbol] := Simp[(c + d*x)^(m + 1)*(Sin[e + f*x]/(d*(m + 1))), x] - Dist[f/(d*(m + 1)), Int[(c
```

```
+ d*x)^(m + 1)*Cos[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && LtQ[m, -1
]
```

Rule 3380

```
Int[sin[(e_.) + (f_.)*(x_.)]/((c_.) + (d_.)*(x_.)), x_Symbol] :> Simp[SinInte
gral[e + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*e - c*f, 0]
```

Rule 3383

```
Int[sin[(e_.) + (f_.)*(x_.)]/((c_.) + (d_.)*(x_.)), x_Symbol] :> Simp[CosInte
gral[e - Pi/2 + f*x]/d, x] /; FreeQ[{c, d, e, f}, x] && EqQ[d*(e - Pi/2) -
c*f, 0]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \frac{-\cos(x) + \sin(x)}{x} dx + \int \frac{\cos(x) + \sin(x)}{x^2} dx \\
&= \int \left(\frac{\cos(x)}{x^2} + \frac{\sin(x)}{x^2} \right) dx + \int \left(-\frac{\cos(x)}{x} + \frac{\sin(x)}{x} \right) dx \\
&= \int \frac{\cos(x)}{x^2} dx - \int \frac{\cos(x)}{x} dx + \int \frac{\sin(x)}{x^2} dx + \int \frac{\sin(x)}{x} dx \\
&= -\frac{\cos(x)}{x} - \text{CosIntegral}(x) - \frac{\sin(x)}{x} + \text{Si}(x) + \int \frac{\cos(x)}{x} dx - \int \frac{\sin(x)}{x} dx \\
&= -\frac{\cos(x)}{x} - \frac{\sin(x)}{x}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int \left(\frac{-\cos(x) + \sin(x)}{x} + \frac{\cos(x) + \sin(x)}{x^2} \right) dx = -\frac{\cos(x)}{x} - \frac{\sin(x)}{x}$$

```
[In] Integrate[(-Cos[x] + Sin[x])/x + (Cos[x] + Sin[x])/x^2,x]
```

```
[Out] -(Cos[x]/x) - Sin[x]/x
```

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.93

| method | result |
|--------------|--|
| parallelrisc | $\frac{-\cos(x)-\sin(x)}{x}$ |
| default | $-\frac{\cos(x)}{x} - \frac{\sin(x)}{x}$ |
| parts | $-\frac{\cos(x)}{x} - \frac{\sin(x)}{x}$ |
| risc | $\frac{i(2i \cos(x)+2i \sin(x))}{2x}$ |
| norman | $\frac{-1+\tan(\frac{x}{2})^2-2 \tan(\frac{x}{2})}{(1+\tan(\frac{x}{2})^2)x}$ |
| meijerg | $\frac{\sqrt{\pi} \left(-\frac{4 \cos(x)}{x\sqrt{\pi}} - \frac{4 \operatorname{Si}(x)}{\sqrt{\pi}} \right)}{4} + \frac{\sqrt{\pi} \left(\frac{4\gamma-4+4 \ln(x)}{\sqrt{\pi}} + \frac{4}{\sqrt{\pi}} - \frac{4\gamma}{\sqrt{\pi}} - \frac{4 \ln(2)}{\sqrt{\pi}} - \frac{4 \ln(\frac{x}{2})}{\sqrt{\pi}} - \frac{4 \sin(x)}{\sqrt{\pi} x} + \frac{4 \operatorname{Ci}(x)}{\sqrt{\pi}} \right)}{4} + \operatorname{Si}(x) - \frac{\sqrt{\pi} \left(\frac{2\gamma+2 \ln(x)}{\sqrt{\pi}} \right)}{4}$ |

[In] `int((cos(x)+sin(x))/x^2+(sin(x)-cos(x))/x,x,method=_RETURNVERBOSE)`[Out] `1/x*(-cos(x)-sin(x))`**Fricas [A] (verification not implemented)**

none

Time = 0.23 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.67

$$\int \left(\frac{-\cos(x) + \sin(x)}{x} + \frac{\cos(x) + \sin(x)}{x^2} \right) dx = -\frac{\cos(x) + \sin(x)}{x}$$

[In] `integrate((cos(x)+sin(x))/x^2+(sin(x)-cos(x))/x,x, algorithm="fricas")`[Out] `-(cos(x) + sin(x))/x`**Sympy [A] (verification not implemented)**

Time = 1.29 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.27

$$\int \left(\frac{-\cos(x) + \sin(x)}{x} + \frac{\cos(x) + \sin(x)}{x^2} \right) dx = -\log(x) + \frac{\log(x^2)}{2} - \frac{\sin(x)}{x} - \frac{\cos(x)}{x}$$

[In] `integrate((cos(x)+sin(x))/x**2+(sin(x)-cos(x))/x,x)`[Out] `-log(x) + log(x**2)/2 - sin(x)/x - cos(x)/x`

Maxima [C] (verification not implemented)

Result contains higher order function than in optimal. Order 4 vs. order 3.

Time = 0.24 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.80

$$\int \left(\frac{-\cos(x) + \sin(x)}{x} + \frac{\cos(x) + \sin(x)}{x^2} \right) dx$$

$$= -\left(\frac{1}{2}i + \frac{1}{2}\right) \text{Ei}(ix) + \left(\frac{1}{2}i - \frac{1}{2}\right) \text{Ei}(-ix) - \left(\frac{1}{2}i - \frac{1}{2}\right) \Gamma(-1, ix) + \left(\frac{1}{2}i + \frac{1}{2}\right) \Gamma(-1, -ix)$$

[In] integrate((cos(x)+sin(x))/x^2+(sin(x)-cos(x))/x,x, algorithm="maxima")

[Out] -(1/2*I + 1/2)*Ei(I*x) + (1/2*I - 1/2)*Ei(-I*x) - (1/2*I - 1/2)*gamma(-1, I*x) + (1/2*I + 1/2)*gamma(-1, -I*x)

Giac [C] (verification not implemented)

Result contains higher order function than in optimal. Order 4 vs. order 3.

Time = 0.27 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.93

$$\int \left(\frac{-\cos(x) + \sin(x)}{x} + \frac{\cos(x) + \sin(x)}{x^2} \right) dx$$

$$= \frac{x \text{Ci}(x) - x \text{Si}(x) - \cos(x) - \sin(x)}{x} - \text{Ci}(x) + \text{Si}(x)$$

[In] integrate((cos(x)+sin(x))/x^2+(sin(x)-cos(x))/x,x, algorithm="giac")

[Out] (x*cos_integral(x) - x*sin_integral(x) - cos(x) - sin(x))/x - cos_integral(x) + sin_integral(x)

Mupad [B] (verification not implemented)

Time = 16.15 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.93

$$\int \left(\frac{-\cos(x) + \sin(x)}{x} + \frac{\cos(x) + \sin(x)}{x^2} \right) dx = -\frac{\sqrt{2} \sin\left(x + \frac{\pi}{4}\right)}{x}$$

[In] int((cos(x) + sin(x))/x^2 - (cos(x) - sin(x))/x,x)

[Out] -(2^(1/2)*sin(x + pi/4))/x

3.151 $\int x^3 \sqrt{1+x^2} dx$

| | |
|---|------|
| Optimal result | 1490 |
| Rubi [A] (verified) | 1490 |
| Mathematica [A] (verified) | 1491 |
| Maple [A] (verified) | 1491 |
| Fricas [A] (verification not implemented) | 1492 |
| Sympy [A] (verification not implemented) | 1492 |
| Maxima [A] (verification not implemented) | 1492 |
| Giac [A] (verification not implemented) | 1492 |
| Mupad [B] (verification not implemented) | 1493 |

Optimal result

Integrand size = 13, antiderivative size = 27

$$\int x^3 \sqrt{1+x^2} dx = -\frac{1}{3}(1+x^2)^{3/2} + \frac{1}{5}(1+x^2)^{5/2}$$

[Out] $-1/3*(x^2+1)^{(3/2)}+1/5*(x^2+1)^{(5/2)}$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.154$, Rules used = {272, 45}

$$\int x^3 \sqrt{1+x^2} dx = \frac{1}{5}(x^2+1)^{5/2} - \frac{1}{3}(x^2+1)^{3/2}$$

[In] $\text{Int}[x^3 \sqrt{1+x^2}, x]$

[Out] $-1/3*(1+x^2)^{(3/2)} + (1+x^2)^{(5/2)}/5$

Rule 45

```
Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int
[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x], x] /; FreeQ[{a, b, c, d, n},
x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && Le
Q[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])
```

Rule 272

```
Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[
Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b
```

, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int x \sqrt{1+x} dx, x, x^2 \right) \\ &= \frac{1}{2} \text{Subst} \left(\int \left(-\sqrt{1+x} + (1+x)^{3/2} \right) dx, x, x^2 \right) \\ &= -\frac{1}{3} (1+x^2)^{3/2} + \frac{1}{5} (1+x^2)^{5/2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.74

$$\int x^3 \sqrt{1+x^2} dx = \frac{1}{15} (1+x^2)^{3/2} (-2+3x^2)$$

[In] Integrate[x^3*Sqrt[1 + x^2],x]

[Out] ((1 + x^2)^(3/2)*(-2 + 3*x^2))/15

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.63

| method | result | size |
|----------------|--|------|
| gosper | $\frac{(x^2+1)^{\frac{3}{2}}(3x^2-2)}{15}$ | 17 |
| pseudoelliptic | $\frac{(x^2+1)^{\frac{3}{2}}(3x^2-2)}{15}$ | 17 |
| risch | $\frac{(3x^4+x^2-2)\sqrt{x^2+1}}{15}$ | 20 |
| trager | $\left(\frac{1}{5}x^4 + \frac{1}{15}x^2 - \frac{2}{15}\right)\sqrt{x^2+1}$ | 21 |
| default | $\frac{x^2(x^2+1)^{\frac{3}{2}}}{5} - \frac{2(x^2+1)^{\frac{3}{2}}}{15}$ | 23 |
| meijerg | $-\frac{\frac{8\sqrt{\pi}}{15} + \frac{4\sqrt{\pi}(x^2+1)^{\frac{3}{2}}(-3x^2+2)}{15}}{4\sqrt{\pi}}$ | 31 |

[In] int(x^3*(x^2+1)^(1/2),x,method=_RETURNVERBOSE)

[Out] 1/15*(x^2+1)^(3/2)*(3*x^2-2)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int x^3 \sqrt{1+x^2} dx = \frac{1}{15} (3x^4 + x^2 - 2) \sqrt{x^2 + 1}$$

[In] integrate(x^3*(x^2+1)^(1/2),x, algorithm="fricas")

[Out] 1/15*(3*x^4 + x^2 - 2)*sqrt(x^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.13 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.37

$$\int x^3 \sqrt{1+x^2} dx = \frac{x^4 \sqrt{x^2 + 1}}{5} + \frac{x^2 \sqrt{x^2 + 1}}{15} - \frac{2\sqrt{x^2 + 1}}{15}$$

[In] integrate(x**3*(x**2+1)**(1/2),x)

[Out] x**4*sqrt(x**2 + 1)/5 + x**2*sqrt(x**2 + 1)/15 - 2*sqrt(x**2 + 1)/15

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.81

$$\int x^3 \sqrt{1+x^2} dx = \frac{1}{5} (x^2 + 1)^{\frac{3}{2}} x^2 - \frac{2}{15} (x^2 + 1)^{\frac{3}{2}}$$

[In] integrate(x^3*(x^2+1)^(1/2),x, algorithm="maxima")

[Out] 1/5*(x^2 + 1)^(3/2)*x^2 - 2/15*(x^2 + 1)^(3/2)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int x^3 \sqrt{1+x^2} dx = \frac{1}{5} (x^2 + 1)^{\frac{5}{2}} - \frac{1}{3} (x^2 + 1)^{\frac{3}{2}}$$

[In] integrate(x^3*(x^2+1)^(1/2),x, algorithm="giac")

[Out] 1/5*(x^2 + 1)^(5/2) - 1/3*(x^2 + 1)^(3/2)

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.74

$$\int x^3 \sqrt{1+x^2} dx = \sqrt{x^2+1} \left(\frac{x^4}{5} + \frac{x^2}{15} - \frac{2}{15} \right)$$

[In] int(x^3*(x^2 + 1)^(1/2),x)

[Out] (x^2 + 1)^(1/2)*(x^2/15 + x^4/5 - 2/15)

3.152 $\int \frac{x}{1+x^2+x^4} dx$

| | |
|---|------|
| Optimal result | 1494 |
| Rubi [A] (verified) | 1494 |
| Mathematica [A] (verified) | 1495 |
| Maple [A] (verified) | 1495 |
| Fricas [A] (verification not implemented) | 1496 |
| Sympy [A] (verification not implemented) | 1496 |
| Maxima [A] (verification not implemented) | 1496 |
| Giac [A] (verification not implemented) | 1496 |
| Mupad [B] (verification not implemented) | 1497 |

Optimal result

Integrand size = 12, antiderivative size = 20

$$\int \frac{x}{1+x^2+x^4} dx = \frac{\arctan\left(\frac{1+2x^2}{\sqrt{3}}\right)}{\sqrt{3}}$$

[Out] 1/3*arctan(1/3*(2*x^2+1)*3^(1/2))*3^(1/2)

Rubi [A] (verified)

Time = 0.02 (sec), antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {1121, 632, 210}

$$\int \frac{x}{1+x^2+x^4} dx = \frac{\arctan\left(\frac{2x^2+1}{\sqrt{3}}\right)}{\sqrt{3}}$$

[In] Int[x/(1 + x^2 + x^4), x]

[Out] ArcTan[(1 + 2*x^2)/Sqrt[3]]/Sqrt[3]

Rule 210

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(-(Rt[-a, 2]*Rt[-b, 2])^(-1))*ArcTan[Rt[-b, 2]*(x/Rt[-a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] & & (LtQ[a, 0] || LtQ[b, 0])

Rule 632

Int[((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^(-1), x_Symbol] := Dist[-2, Subst[Int[1/Simp[b^2 - 4*a*c - x^2, x], x], x, b + 2*c*x], x] /; FreeQ[{a, b, c},

`x] && NeQ[b^2 - 4*a*c, 0]`

Rule 1121

`Int[(x_)*((a_) + (b_)*(x_)^2 + (c_)*(x_)^4)^(p_), x_Symbol] := Dist[1/2, Subst[Int[(a + b*x + c*x^2)^p, x], x, x^2], x] /; FreeQ[{a, b, c, p}, x]`

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{1+x+x^2} dx, x, x^2 \right) \\ &= -\text{Subst} \left(\int \frac{1}{-3-x^2} dx, x, 1+2x^2 \right) \\ &= \frac{\arctan \left(\frac{1+2x^2}{\sqrt{3}} \right)}{\sqrt{3}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{x}{1+x^2+x^4} dx = \frac{\arctan \left(\frac{1+2x^2}{\sqrt{3}} \right)}{\sqrt{3}}$$

[In] `Integrate[x/(1 + x^2 + x^4), x]`

[Out] `ArcTan[(1 + 2*x^2)/Sqrt[3]]/Sqrt[3]`

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.95

| method | result | size |
|---------|--|------|
| default | $\frac{\arctan \left(\frac{(2x^2+1)\sqrt{3}}{3} \right) \sqrt{3}}{3}$ | 19 |
| risch | $\frac{\arctan \left(\frac{(2x^2+1)\sqrt{3}}{3} \right) \sqrt{3}}{3}$ | 19 |

[In] `int(x/(x^4+x^2+1), x, method=_RETURNVERBOSE)`

[Out] `1/3*arctan(1/3*(2*x^2+1)*3^(1/2))*3^(1/2)`

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.90

$$\int \frac{x}{1+x^2+x^4} dx = \frac{1}{3} \sqrt{3} \arctan \left(\frac{1}{3} \sqrt{3} (2x^2 + 1) \right)$$

[In] integrate(x/(x^4+x^2+1),x, algorithm="fricas")

[Out] 1/3*sqrt(3)*arctan(1/3*sqrt(3)*(2*x^2 + 1))

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.30

$$\int \frac{x}{1+x^2+x^4} dx = \frac{\sqrt{3} \operatorname{atan} \left(\frac{2\sqrt{3}x^2}{3} + \frac{\sqrt{3}}{3} \right)}{3}$$

[In] integrate(x/(x**4+x**2+1),x)

[Out] sqrt(3)*atan(2*sqrt(3)*x**2/3 + sqrt(3)/3)/3

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.90

$$\int \frac{x}{1+x^2+x^4} dx = \frac{1}{3} \sqrt{3} \arctan \left(\frac{1}{3} \sqrt{3} (2x^2 + 1) \right)$$

[In] integrate(x/(x^4+x^2+1),x, algorithm="maxima")

[Out] 1/3*sqrt(3)*arctan(1/3*sqrt(3)*(2*x^2 + 1))

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.90

$$\int \frac{x}{1+x^2+x^4} dx = \frac{1}{3} \sqrt{3} \arctan \left(\frac{1}{3} \sqrt{3} (2x^2 + 1) \right)$$

[In] integrate(x/(x^4+x^2+1),x, algorithm="giac")

[Out] 1/3*sqrt(3)*arctan(1/3*sqrt(3)*(2*x^2 + 1))

Mupad [B] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{x}{1+x^2+x^4} dx = \frac{\sqrt{3} \operatorname{atan}\left(\frac{2\sqrt{3}x^2 + \sqrt{3}}{3}\right)}{3}$$

[In] int(x/(x^2 + x^4 + 1),x)

[Out] (3^(1/2)*atan(3^(1/2)/3 + (2*3^(1/2)*x^2)/3))/3

3.153 $\int e^{e^{2016x}+6048x} dx$

| | |
|---|------|
| Optimal result | 1498 |
| Rubi [A] (verified) | 1498 |
| Mathematica [A] (verified) | 1499 |
| Maple [A] (verified) | 1499 |
| Fricas [A] (verification not implemented) | 1500 |
| Sympy [A] (verification not implemented) | 1500 |
| Maxima [A] (verification not implemented) | 1500 |
| Giac [A] (verification not implemented) | 1501 |
| Mupad [B] (verification not implemented) | 1501 |

Optimal result

Integrand size = 11, antiderivative size = 42

$$\int e^{e^{2016x}+6048x} dx = \frac{e^{e^{2016x}}}{1008} - \frac{e^{e^{2016x}+2016x}}{1008} + \frac{e^{e^{2016x}+4032x}}{2016}$$

[Out] 1/1008*exp(exp(1)^(2016*x))-1/1008*exp(exp(1)^(2016*x)+2016*x)+1/2016*exp(exp(1)^(2016*x)+4032*x)

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 42, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.273$, Rules used = {2320, 2207, 2225}

$$\int e^{e^{2016x}+6048x} dx = \frac{e^{e^{2016x}}}{1008} - \frac{e^{2016x+e^{2016x}}}{1008} + \frac{e^{4032x+e^{2016x}}}{2016}$$

[In] Int[E^(E^(2016*x) + 6048*x), x]

[Out] E^E^(2016*x)/1008 - E^(E^(2016*x) + 2016*x)/1008 + E^(E^(2016*x) + 4032*x)/2016

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])), x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m] && !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*(a_.) + (b_.)*(x_)))^(n_.), x_Symbol] := Simp[(F^(c*(a +
b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2320

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*(a_.) + (b_.)*x))*
(F_) [v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \frac{\text{Subst}\left(\int e^x x^2 dx, x, e^{2016x}\right)}{2016} \\
 &= \frac{e^{e^{2016x}+4032x}}{2016} - \frac{\text{Subst}\left(\int e^x x dx, x, e^{2016x}\right)}{1008} \\
 &= -\frac{e^{e^{2016x}+2016x}}{1008} + \frac{e^{e^{2016x}+4032x}}{2016} + \frac{\text{Subst}\left(\int e^x dx, x, e^{2016x}\right)}{1008} \\
 &= \frac{e^{e^{2016x}}}{1008} - \frac{e^{e^{2016x}+2016x}}{1008} + \frac{e^{e^{2016x}+4032x}}{2016}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.60

$$\int e^{e^{2016x}+6048x} dx = \frac{e^{e^{2016x}}(2 - 2e^{2016x} + e^{4032x})}{2016}$$

```
[In] Integrate[E^(E^(2016*x) + 6048*x), x]
```

```
[Out] (E^E^(2016*x))*(2 - 2*E^(2016*x) + E^(4032*x))/2016
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.48

| method | result | size |
|--------|--|------|
| risch | $\frac{(e^{4032x} - 2e^{2016x} + 2)e^{e^{2016x}}}{2016}$ | 20 |

```
[In] int(exp(exp(2016*x)+6048*x), x, method=_RETURNVERBOSE)
```

[Out] $1/2016*(\exp(4032*x)-2*\exp(2016*x)+2)*\exp(\exp(2016*x))$

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.45

$$\int e^{e^{2016x}+6048x} dx = \frac{1}{2016} (e^{(4032x)} - 2e^{(2016x)} + 2)e^{(e^{(2016x)})}$$

[In] `integrate(exp(exp(2016*x)+6048*x),x, algorithm="fricas")`

[Out] $1/2016*(e^{(4032*x)} - 2*e^{(2016*x)} + 2)*e^{(e^{(2016*x)})}$

Sympy [A] (verification not implemented)

Time = 0.41 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.81

$$\int e^{e^{2016x}+6048x} dx = \frac{e^{4032x}e^{2016x}}{2016} - \frac{e^{2016x}e^{2016x}}{1008} + \frac{e^{e^{2016x}}}{1008}$$

[In] `integrate(exp(exp(2016*x)+6048*x),x)`

[Out] $\exp(4032*x)*\exp(\exp(2016*x))/2016 - \exp(2016*x)*\exp(\exp(2016*x))/1008 + \exp(\exp(2016*x))/1008$

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.45

$$\int e^{e^{2016x}+6048x} dx = \frac{1}{2016} (e^{(4032x)} - 2e^{(2016x)} + 2)e^{(e^{(2016x)})}$$

[In] `integrate(exp(exp(2016*x)+6048*x),x, algorithm="maxima")`

[Out] $1/2016*(e^{(4032*x)} - 2*e^{(2016*x)} + 2)*e^{(e^{(2016*x)})}$

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.90

$$\int e^{e^{2016x}+6048x} dx = \frac{1}{2016} \left(e^{(10080x+e^{(2016x)})} - 2e^{(8064x+e^{(2016x)})} + 2e^{(6048x+e^{(2016x)})} \right) e^{(-6048x)}$$

[In] integrate(exp(exp(2016*x)+6048*x),x, algorithm="giac")

[Out] 1/2016*(e^(10080*x + e^(2016*x)) - 2*e^(8064*x + e^(2016*x)) + 2*e^(6048*x + e^(2016*x)))*e^(-6048*x)

Mupad [B] (verification not implemented)

Time = 15.59 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.71

$$\int e^{e^{2016x}+6048x} dx = \frac{e^{e^{2016x}}}{1008} - \frac{e^{2016x} e^{e^{2016x}}}{1008} + \frac{e^{4032x} e^{e^{2016x}}}{2016}$$

[In] int(exp(6048*x + exp(2016*x)),x)

[Out] exp(exp(2016*x))/1008 - (exp(2016*x)*exp(exp(2016*x)))/1008 + (exp(4032*x)*exp(exp(2016*x)))/2016

3.154 $\int (1 - \cot(x)) dx$

| | |
|---|------|
| Optimal result | 1502 |
| Rubi [A] (verified) | 1502 |
| Mathematica [A] (verified) | 1503 |
| Maple [A] (verified) | 1503 |
| Fricas [A] (verification not implemented) | 1503 |
| Sympy [A] (verification not implemented) | 1504 |
| Maxima [A] (verification not implemented) | 1504 |
| Giac [A] (verification not implemented) | 1504 |
| Mupad [B] (verification not implemented) | 1504 |

Optimal result

Integrand size = 6, antiderivative size = 7

$$\int (1 - \cot(x)) dx = x - \log(\sin(x))$$

[Out] x-ln(sin(x))

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {3556}

$$\int (1 - \cot(x)) dx = x - \log(\sin(x))$$

[In] Int[1 - Cot[x],x]

[Out] x - Log[Sin[x]]

Rule 3556

Int[tan[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Log[RemoveContent[Cos[c + d*x], x]]/d, x] /; FreeQ[{c, d}, x]

Rubi steps

$$\begin{aligned} \text{integral} &= x - \int \cot(x) dx \\ &= x - \log(\sin(x)) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.71

$$\int (1 - \cot(x)) dx = x - \log(\cos(x)) - \log(\tan(x))$$

[In] Integrate[1 - Cot[x], x]

[Out] x - Log[Cos[x]] - Log[Tan[x]]

Maple [A] (verified)

Time = 0.12 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.14

| method | result | size |
|---------------|---|------|
| default | $x - \ln(\sin(x))$ | 8 |
| parts | $x - \ln(\sin(x))$ | 8 |
| risch | $x + ix - \ln(e^{2ix} - 1)$ | 17 |
| norman | $x - \ln\left(\tan\left(\frac{x}{2}\right)\right) + \ln\left(1 + \tan\left(\frac{x}{2}\right)^2\right)$ | 19 |
| parallelrisch | $-\ln\left(-\frac{\cot(x)}{2} + \frac{\csc(x)}{2}\right) + \ln\left(\frac{1}{1+\cos(x)}\right) + x$ | 22 |

[In] int(1-cos(x)/sin(x),x,method=_RETURNVERBOSE)

[Out] x-ln(sin(x))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.29

$$\int (1 - \cot(x)) dx = x - \log\left(\frac{1}{2} \sin(x)\right)$$

[In] integrate(1-cos(x)/sin(x),x, algorithm="fricas")

[Out] x - log(1/2*sin(x))

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.71

$$\int (1 - \cot(x)) dx = x - \log(\sin(x))$$

[In] integrate(1-cos(x)/sin(x),x)

[Out] x - log(sin(x))

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int (1 - \cot(x)) dx = x - \log(\sin(x))$$

[In] integrate(1-cos(x)/sin(x),x, algorithm="maxima")

[Out] x - log(sin(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.14

$$\int (1 - \cot(x)) dx = x - \log(|\sin(x)|)$$

[In] integrate(1-cos(x)/sin(x),x, algorithm="giac")

[Out] x - log(abs(sin(x)))

Mupad [B] (verification not implemented)

Time = 15.06 (sec) , antiderivative size = 26, normalized size of antiderivative = 3.71

$$\int (1 - \cot(x)) dx = -\ln(\tan(x)) + \ln(\tan(x) - i) \left(\frac{1}{2} - \frac{1}{2}i\right) + \ln(\tan(x) + i) \left(\frac{1}{2} + \frac{1}{2}i\right)$$

[In] int(1 - cos(x)/sin(x),x)

[Out] log(tan(x) - 1i)*(1/2 - 1i/2) - log(tan(x)) + log(tan(x) + 1i)*(1/2 + 1i/2)

3.155 $\int \frac{1}{1-x+x^2-x^3} dx$

| | |
|---|------|
| Optimal result | 1505 |
| Rubi [A] (verified) | 1505 |
| Mathematica [A] (verified) | 1506 |
| Maple [A] (verified) | 1506 |
| Fricas [A] (verification not implemented) | 1507 |
| Sympy [A] (verification not implemented) | 1507 |
| Maxima [A] (verification not implemented) | 1507 |
| Giac [A] (verification not implemented) | 1508 |
| Mupad [B] (verification not implemented) | 1508 |

Optimal result

Integrand size = 15, antiderivative size = 27

$$\int \frac{1}{1-x+x^2-x^3} dx = \frac{\arctan(x)}{2} - \frac{1}{2} \log(1-x) + \frac{1}{4} \log(1+x^2)$$

[Out] 1/2*arctan(x)-1/2*ln(1-x)+1/4*ln(x^2+1)

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.267$, Rules used = {2083, 649, 209, 266}

$$\int \frac{1}{1-x+x^2-x^3} dx = \frac{\arctan(x)}{2} + \frac{1}{4} \log(x^2+1) - \frac{1}{2} \log(1-x)$$

[In] Int[(1 - x + x^2 - x^3)^(-1), x]

[Out] ArcTan[x]/2 - Log[1 - x]/2 + Log[1 + x^2]/4

Rule 209

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])

Rule 266

Int[(x_)^(m_.)/((a_) + (b_.)*(x_)^(n_.)), x_Symbol] := Simp[Log[RemoveContent[a + b*x^n, x]]/(b*n), x] /; FreeQ[{a, b, m, n}, x] && EqQ[m, n - 1]

Rule 649

```
Int[((d_) + (e_.)*(x_))/((a_) + (c_.)*(x_)^2), x_Symbol] := Dist[d, Int[1/(a + c*x^2), x], x] + Dist[e, Int[x/(a + c*x^2), x], x] /; FreeQ[{a, c, d, e}, x] && !NiceSqrtQ[(-a)*c]
```

Rule 2083

```
Int[(P_)^(p_), x_Symbol] := With[{u = Factor[P]}, Int[ExpandIntegrand[u^p, x], x] /; !SumQ[NonfreeFactors[u, x]]] /; PolyQ[P, x] && ILtQ[p, 0]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \left(-\frac{1}{2(-1+x)} + \frac{1+x}{2(1+x^2)} \right) dx \\
 &= -\frac{1}{2} \log(1-x) + \frac{1}{2} \int \frac{1+x}{1+x^2} dx \\
 &= -\frac{1}{2} \log(1-x) + \frac{1}{2} \int \frac{1}{1+x^2} dx + \frac{1}{2} \int \frac{x}{1+x^2} dx \\
 &= \frac{\arctan(x)}{2} - \frac{1}{2} \log(1-x) + \frac{1}{4} \log(1+x^2)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.00

$$\int \frac{1}{1-x+x^2-x^3} dx = \frac{\arctan(x)}{2} - \frac{1}{2} \log(1-x) + \frac{1}{4} \log(1+x^2)$$

[In] Integrate[(1 - x + x^2 - x^3)^(-1),x]

[Out] ArcTan[x]/2 - Log[1 - x]/2 + Log[1 + x^2]/4

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.74

| method | result | size |
|---------------|--|------|
| default | $-\frac{\ln(-1+x)}{2} + \frac{\ln(x^2+1)}{4} + \frac{\arctan(x)}{2}$ | 20 |
| risch | $-\frac{\ln(-1+x)}{2} + \frac{\ln(x^2+1)}{4} + \frac{\arctan(x)}{2}$ | 20 |
| parallelrisch | $-\frac{\ln(-1+x)}{2} + \frac{\ln(x-i)}{4} - \frac{i \ln(x-i)}{4} + \frac{\ln(i+x)}{4} + \frac{i \ln(i+x)}{4}$ | 38 |

[In] `int(1/(-x^3+x^2-x+1),x,method=_RETURNVERBOSE)`

[Out] `-1/2*ln(-1+x)+1/4*ln(x^2+1)+1/2*arctan(x)`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int \frac{1}{1-x+x^2-x^3} dx = \frac{1}{2} \arctan(x) + \frac{1}{4} \log(x^2+1) - \frac{1}{2} \log(x-1)$$

[In] `integrate(1/(-x^3+x^2-x+1),x, algorithm="fricas")`

[Out] `1/2*arctan(x) + 1/4*log(x^2 + 1) - 1/2*log(x - 1)`

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int \frac{1}{1-x+x^2-x^3} dx = -\frac{\log(x-1)}{2} + \frac{\log(x^2+1)}{4} + \frac{\operatorname{atan}(x)}{2}$$

[In] `integrate(1/(-x**3+x**2-x+1),x)`

[Out] `-log(x - 1)/2 + log(x**2 + 1)/4 + atan(x)/2`

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int \frac{1}{1-x+x^2-x^3} dx = \frac{1}{2} \arctan(x) + \frac{1}{4} \log(x^2+1) - \frac{1}{2} \log(x-1)$$

[In] `integrate(1/(-x^3+x^2-x+1),x, algorithm="maxima")`

[Out] `1/2*arctan(x) + 1/4*log(x^2 + 1) - 1/2*log(x - 1)`

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.74

$$\int \frac{1}{1-x+x^2-x^3} dx = \frac{1}{2} \arctan(x) + \frac{1}{4} \log(x^2+1) - \frac{1}{2} \log(|x-1|)$$

[In] integrate(1/(-x^3+x^2-x+1),x, algorithm="giac")

[Out] 1/2*arctan(x) + 1/4*log(x^2 + 1) - 1/2*log(abs(x - 1))

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.93

$$\int \frac{1}{1-x+x^2-x^3} dx = -\frac{\ln(x-1)}{2} + \ln(x-i) \left(\frac{1}{4} - \frac{1}{4}i\right) + \ln(x+1i) \left(\frac{1}{4} + \frac{1}{4}i\right)$$

[In] int(-1/(x - x^2 + x^3 - 1),x)

[Out] log(x - 1i)*(1/4 - 1i/4) - log(x - 1)/2 + log(x + 1i)*(1/4 + 1i/4)

3.156 $\int \frac{1}{2+\cosh(x)} dx$

| | |
|---|------|
| Optimal result | 1509 |
| Rubi [A] (verified) | 1509 |
| Mathematica [A] (verified) | 1510 |
| Maple [A] (verified) | 1510 |
| Fricas [B] (verification not implemented) | 1510 |
| Sympy [A] (verification not implemented) | 1511 |
| Maxima [B] (verification not implemented) | 1511 |
| Giac [A] (verification not implemented) | 1511 |
| Mupad [B] (verification not implemented) | 1512 |

Optimal result

Integrand size = 6, antiderivative size = 20

$$\int \frac{1}{2 + \cosh(x)} dx = \frac{2 \coth^{-1}(\sqrt{3} \coth(\frac{x}{2}))}{\sqrt{3}}$$

[Out] 2/3*arccoth(3^(1/2)*coth(1/2*x))*3^(1/2)

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 30, normalized size of antiderivative = 1.50, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {2736}

$$\int \frac{1}{2 + \cosh(x)} dx = \frac{x}{\sqrt{3}} - \frac{2 \operatorname{arctanh}\left(\frac{\sinh(x)}{\cosh(x) + \sqrt{3} + 2}\right)}{\sqrt{3}}$$

[In] Int[(2 + Cosh[x])^(-1), x]

[Out] x/Sqrt[3] - (2*ArcTanh[Sinh[x]/(2 + Sqrt[3] + Cosh[x])])/Sqrt[3]

Rule 2736

Int[((a_) + (b_)*sin[(c_.) + (d_.)*(x_)])^(-1), x_Symbol] :> With[{q = Rt[a^2 - b^2, 2]}, Simp[x/q, x] + Simp[(2/(d*q))*ArcTan[b*(Cos[c + d*x]/(a + q + b*Sin[c + d*x]))], x] /; FreeQ[{a, b, c, d}, x] && GtQ[a^2 - b^2, 0] && PosQ[a]

Rubi steps

$$\text{integral} = \frac{x}{\sqrt{3}} - \frac{2 \operatorname{arctanh}\left(\frac{\sinh(x)}{2 + \sqrt{3} + \cosh(x)}\right)}{\sqrt{3}}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{1}{2 + \cosh(x)} dx = \frac{2 \operatorname{arctanh}\left(\frac{\tanh\left(\frac{x}{2}\right)}{\sqrt{3}}\right)}{\sqrt{3}}$$

[In] Integrate[(2 + Cosh[x])^(-1), x]

[Out] (2*ArcTanh[Tanh[x/2]/Sqrt[3]])/Sqrt[3]

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

| method | result | size |
|---------|--|------|
| default | $\frac{2\sqrt{3} \operatorname{arctanh}\left(\frac{\tanh\left(\frac{x}{2}\right)\sqrt{3}}{3}\right)}{3}$ | 16 |
| risch | $\frac{\sqrt{3} \ln(e^x + 2 - \sqrt{3})}{3} - \frac{\sqrt{3} \ln(e^x + 2 + \sqrt{3})}{3}$ | 30 |

[In] int(1/(2+cosh(x)),x,method=_RETURNVERBOSE)

[Out] 2/3*3^(1/2)*arctanh(1/3*tanh(1/2*x)*3^(1/2))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 39 vs. 2(14) = 28.

Time = 0.24 (sec) , antiderivative size = 39, normalized size of antiderivative = 1.95

$$\int \frac{1}{2 + \cosh(x)} dx = \frac{1}{3} \sqrt{3} \log \left(-\frac{2(\sqrt{3} - 2) \cosh(x) - (2\sqrt{3} - 3) \sinh(x) + \sqrt{3} - 2}{\cosh(x) + 2} \right)$$

[In] integrate(1/(2+cosh(x)),x, algorithm="fricas")

[Out] 1/3*sqrt(3)*log(-(2*(sqrt(3) - 2)*cosh(x) - (2*sqrt(3) - 3)*sinh(x) + sqrt(3) - 2)/(cosh(x) + 2))

Sympy [A] (verification not implemented)

Time = 0.16 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.80

$$\int \frac{1}{2 + \cosh(x)} dx = -\frac{\sqrt{3} \log\left(\tanh\left(\frac{x}{2}\right) - \sqrt{3}\right)}{3} + \frac{\sqrt{3} \log\left(\tanh\left(\frac{x}{2}\right) + \sqrt{3}\right)}{3}$$

[In] integrate(1/(2+cosh(x)),x)

[Out] -sqrt(3)*log(tanh(x/2) - sqrt(3))/3 + sqrt(3)*log(tanh(x/2) + sqrt(3))/3

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 30 vs. 2(14) = 28.

Time = 0.28 (sec) , antiderivative size = 30, normalized size of antiderivative = 1.50

$$\int \frac{1}{2 + \cosh(x)} dx = -\frac{1}{3} \sqrt{3} \log\left(-\frac{\sqrt{3} - e^{(-x)} - 2}{\sqrt{3} + e^{(-x)} + 2}\right)$$

[In] integrate(1/(2+cosh(x)),x, algorithm="maxima")

[Out] -1/3*sqrt(3)*log(-(sqrt(3) - e^(-x) - 2)/(sqrt(3) + e^(-x) + 2))

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.30

$$\int \frac{1}{2 + \cosh(x)} dx = \frac{1}{3} \sqrt{3} \log\left(-\frac{\sqrt{3} - e^x - 2}{\sqrt{3} + e^x + 2}\right)$$

[In] integrate(1/(2+cosh(x)),x, algorithm="giac")

[Out] 1/3*sqrt(3)*log(-(sqrt(3) - e^x - 2)/(sqrt(3) + e^x + 2))

Mupad [B] (verification not implemented)

Time = 0.15 (sec) , antiderivative size = 42, normalized size of antiderivative = 2.10

$$\int \frac{1}{2 + \cosh(x)} dx = \frac{\sqrt{3} \left(\ln \left(-2e^x - \frac{\sqrt{3}(4e^x+2)}{3} \right) - \ln \left(\frac{\sqrt{3}(4e^x+2)}{3} - 2e^x \right) \right)}{3}$$

[In] int(1/(cosh(x) + 2),x)

[Out] (3^(1/2)*(log(- 2*exp(x) - (3^(1/2)*(4*exp(x) + 2))/3) - log((3^(1/2)*(4*exp(x) + 2))/3 - 2*exp(x))))/3

3.157 $\int \frac{x^2}{\sqrt{2+x^3}} dx$

| | |
|---|------|
| Optimal result | 1513 |
| Rubi [A] (verified) | 1513 |
| Mathematica [A] (verified) | 1514 |
| Maple [A] (verified) | 1514 |
| Fricas [A] (verification not implemented) | 1514 |
| Sympy [A] (verification not implemented) | 1515 |
| Maxima [A] (verification not implemented) | 1515 |
| Giac [A] (verification not implemented) | 1515 |
| Mupad [B] (verification not implemented) | 1515 |

Optimal result

Integrand size = 13, antiderivative size = 13

$$\int \frac{x^2}{\sqrt{2+x^3}} dx = \frac{2\sqrt{2+x^3}}{3}$$

[Out] $2/3*(x^3+2)^{(1/2)}$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.077$, Rules used = {267}

$$\int \frac{x^2}{\sqrt{2+x^3}} dx = \frac{2\sqrt{x^3+2}}{3}$$

[In] `Int[x^2/Sqrt[2 + x^3],x]`

[Out] `(2*Sqrt[2 + x^3])/3`

Rule 267

`Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_.))^(p_), x_Symbol] := Simp[(a + b*x^n)^(p + 1)/(b*n*(p + 1)), x] /; FreeQ[{a, b, m, n, p}, x] && EqQ[m, n - 1] && NeQ[p, -1]`

Rubi steps

$$\text{integral} = \frac{2\sqrt{2+x^3}}{3}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \frac{x^2}{\sqrt{2+x^3}} dx = \frac{2\sqrt{2+x^3}}{3}$$

[In] Integrate[x^2/Sqrt[2 + x^3],x]

[Out] (2*Sqrt[2 + x^3])/3

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.77

| method | result | size |
|------------------|---|------|
| gospers | $\frac{2\sqrt{x^3+2}}{3}$ | 10 |
| derivativdivides | $\frac{2\sqrt{x^3+2}}{3}$ | 10 |
| default | $\frac{2\sqrt{x^3+2}}{3}$ | 10 |
| trager | $\frac{2\sqrt{x^3+2}}{3}$ | 10 |
| risch | $\frac{2\sqrt{x^3+2}}{3}$ | 10 |
| elliptic | $\frac{2\sqrt{x^3+2}}{3}$ | 10 |
| pseudoelliptic | $\frac{2\sqrt{x^3+2}}{3}$ | 10 |
| meijerg | $\frac{\sqrt{2} \left(-2\sqrt{\pi} + 2\sqrt{\pi} \sqrt{1 + \frac{x^3}{2}} \right)}{3\sqrt{\pi}}$ | 29 |

[In] int(x^2/(x^3+2)^(1/2),x,method=_RETURNVERBOSE)

[Out] 2/3*(x^3+2)^(1/2)

Fricas [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.69

$$\int \frac{x^2}{\sqrt{2+x^3}} dx = \frac{2}{3} \sqrt{x^3+2}$$

[In] integrate(x^2/(x^3+2)^(1/2),x, algorithm="fricas")

[Out] 2/3*sqrt(x^3 + 2)

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.77

$$\int \frac{x^2}{\sqrt{2+x^3}} dx = \frac{2\sqrt{x^3+2}}{3}$$

[In] integrate(x**2/(x**3+2)**(1/2),x)

[Out] 2*sqrt(x**3 + 2)/3

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.69

$$\int \frac{x^2}{\sqrt{2+x^3}} dx = \frac{2}{3} \sqrt{x^3+2}$$

[In] integrate(x^2/(x^3+2)^(1/2),x, algorithm="maxima")

[Out] 2/3*sqrt(x^3 + 2)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.69

$$\int \frac{x^2}{\sqrt{2+x^3}} dx = \frac{2}{3} \sqrt{x^3+2}$$

[In] integrate(x^2/(x^3+2)^(1/2),x, algorithm="giac")

[Out] 2/3*sqrt(x^3 + 2)

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.69

$$\int \frac{x^2}{\sqrt{2+x^3}} dx = \frac{2\sqrt{x^3+2}}{3}$$

[In] int(x^2/(x^3 + 2)^(1/2),x)

[Out] (2*(x^3 + 2)^(1/2))/3

3.158 $\int \frac{\log(x)}{x^2} dx$

| | |
|---|------|
| Optimal result | 1516 |
| Rubi [A] (verified) | 1516 |
| Mathematica [A] (verified) | 1517 |
| Maple [A] (verified) | 1517 |
| Fricas [A] (verification not implemented) | 1517 |
| Sympy [A] (verification not implemented) | 1518 |
| Maxima [A] (verification not implemented) | 1518 |
| Giac [A] (verification not implemented) | 1518 |
| Mupad [B] (verification not implemented) | 1518 |

Optimal result

Integrand size = 6, antiderivative size = 13

$$\int \frac{\log(x)}{x^2} dx = -\frac{1}{x} - \frac{\log(x)}{x}$$

[Out] $-1/x - \ln(x)/x$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {2341}

$$\int \frac{\log(x)}{x^2} dx = -\frac{1}{x} - \frac{\log(x)}{x}$$

[In] `Int[Log[x]/x^2,x]`

[Out] $-x^{-1} - \text{Log}[x]/x$

Rule 2341

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*((d_.)*(x_))^(m_.), x_Symbol] :>
Simp[(d*x)^(m + 1)*((a + b*Log[c*x^n])/(d*(m + 1))), x] - Simp[b*n*((d*x)^(
m + 1)/(d*(m + 1)^2)), x] /; FreeQ[{a, b, c, d, m, n}, x] && NeQ[m, -1]
```

Rubi steps

$$\text{integral} = -\frac{1}{x} - \frac{\log(x)}{x}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \frac{\log(x)}{x^2} dx = -\frac{1}{x} - \frac{\log(x)}{x}$$

[In] Integrate[Log[x]/x^2,x]

[Out] -x^(-1) - Log[x]/x

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

| method | result | size |
|---------------|-----------------------------------|------|
| norman | $-\frac{\ln(x)-1}{x}$ | 11 |
| parallelrisch | $-\frac{\ln(x)-1}{x}$ | 11 |
| default | $-\frac{1}{x} - \frac{\ln(x)}{x}$ | 14 |
| risch | $-\frac{1}{x} - \frac{\ln(x)}{x}$ | 14 |
| parts | $-\frac{1}{x} - \frac{\ln(x)}{x}$ | 14 |

[In] int(ln(x)/x^2,x,method=_RETURNVERBOSE)

[Out] (-ln(x)-1)/x

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.69

$$\int \frac{\log(x)}{x^2} dx = -\frac{\log(x) + 1}{x}$$

[In] integrate(log(x)/x^2,x, algorithm="fricas")

[Out] -(log(x) + 1)/x

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.62

$$\int \frac{\log(x)}{x^2} dx = -\frac{\log(x)}{x} - \frac{1}{x}$$

[In] integrate(ln(x)/x**2,x)

[Out] -log(x)/x - 1/x

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \frac{\log(x)}{x^2} dx = -\frac{\log(x)}{x} - \frac{1}{x}$$

[In] integrate(log(x)/x^2,x, algorithm="maxima")

[Out] -log(x)/x - 1/x

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \frac{\log(x)}{x^2} dx = -\frac{\log(x)}{x} - \frac{1}{x}$$

[In] integrate(log(x)/x^2,x, algorithm="giac")

[Out] -log(x)/x - 1/x

Mupad [B] (verification not implemented)

Time = 13.95 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.69

$$\int \frac{\log(x)}{x^2} dx = -\frac{\ln(x) + 1}{x}$$

[In] int(log(x)/x^2,x)

[Out] -(log(x) + 1)/x

3.159 $\int \operatorname{sech}(x) dx$

| | |
|---|------|
| Optimal result | 1519 |
| Rubi [A] (verified) | 1519 |
| Mathematica [A] (verified) | 1520 |
| Maple [A] (verified) | 1520 |
| Fricas [B] (verification not implemented) | 1520 |
| Sympy [B] (verification not implemented) | 1521 |
| Maxima [A] (verification not implemented) | 1521 |
| Giac [A] (verification not implemented) | 1521 |
| Mupad [B] (verification not implemented) | 1521 |

Optimal result

Integrand size = 2, antiderivative size = 3

$$\int \operatorname{sech}(x) dx = \arctan(\sinh(x))$$

[Out] $\arctan(\sinh(x))$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3855}

$$\int \operatorname{sech}(x) dx = \arctan(\sinh(x))$$

[In] $\text{Int}[\text{Sech}[x], x]$

[Out] $\text{ArcTan}[\text{Sinh}[x]]$

Rule 3855

$\text{Int}[\text{csc}[(c_.) + (d_.)*(x_.)], x_Symbol] \rightarrow \text{Simp}[-\text{ArcTanh}[\text{Cos}[c + d*x]]/d, x]$
 /; $\text{FreeQ}\{c, d\}, x]$

Rubi steps

$$\text{integral} = \arctan(\sinh(x))$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \operatorname{sech}(x) dx = \arctan(\sinh(x))$$

[In] Integrate[Sech[x],x]

[Out] ArcTan[Sinh[x]]

Maple [A] (verified)

Time = 0.09 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

| method | result | size |
|---------------|---|------|
| lookup | $\arctan(\sinh(x))$ | 4 |
| default | $\arctan(\sinh(x))$ | 4 |
| risch | $i \ln(e^x + i) - i \ln(e^x - i)$ | 20 |
| parallelrisch | $-i(\ln(\tanh(\frac{x}{2}) - i) - \ln(\tanh(\frac{x}{2}) + i))$ | 23 |

[In] int(sech(x),x,method=_RETURNVERBOSE)

[Out] arctan(sinh(x))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 8 vs. 2(3) = 6.

Time = 0.23 (sec) , antiderivative size = 8, normalized size of antiderivative = 2.67

$$\int \operatorname{sech}(x) dx = 2 \arctan(\cosh(x) + \sinh(x))$$

[In] integrate(sech(x),x, algorithm="fricas")

[Out] 2*arctan(cosh(x) + sinh(x))

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 7 vs. $2(3) = 6$.

Time = 0.17 (sec) , antiderivative size = 7, normalized size of antiderivative = 2.33

$$\int \operatorname{sech}(x) dx = 2 \operatorname{atan} \left(\tanh \left(\frac{x}{2} \right) \right)$$

[In] integrate(sech(x),x)

[Out] 2*atan(tanh(x/2))

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \operatorname{sech}(x) dx = \operatorname{arctan}(\sinh(x))$$

[In] integrate(sech(x),x, algorithm="maxima")

[Out] arctan(sinh(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.67

$$\int \operatorname{sech}(x) dx = 2 \operatorname{arctan}(e^x)$$

[In] integrate(sech(x),x, algorithm="giac")

[Out] 2*arctan(e^x)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.67

$$\int \operatorname{sech}(x) dx = 2 \operatorname{atan}(e^x)$$

[In] int(1/cosh(x),x)

[Out] 2*atan(exp(x))

3.160 $\int e^{x^2} x^3 dx$

| | |
|---|------|
| Optimal result | 1522 |
| Rubi [A] (verified) | 1522 |
| Mathematica [A] (verified) | 1523 |
| Maple [A] (verified) | 1523 |
| Fricas [A] (verification not implemented) | 1524 |
| Sympy [A] (verification not implemented) | 1524 |
| Maxima [A] (verification not implemented) | 1524 |
| Giac [A] (verification not implemented) | 1525 |
| Mupad [B] (verification not implemented) | 1525 |

Optimal result

Integrand size = 9, antiderivative size = 22

$$\int e^{x^2} x^3 dx = -\frac{e^{x^2}}{2} + \frac{1}{2}e^{x^2} x^2$$

[Out] $-1/2*\exp(x^2)+1/2*x^2*\exp(x^2)$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {2243, 2240}

$$\int e^{x^2} x^3 dx = \frac{1}{2}e^{x^2} x^2 - \frac{e^{x^2}}{2}$$

[In] Int[E^x^2*x^3,x]

[Out] $-1/2*E^x^2 + (E^x^2*x^2)/2$

Rule 2240

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^(n_))*((e_.) + (f_.)*(x_))^(m_.), x_Symbol] := Simp[(e + f*x)^n*(F^(a + b*(c + d*x)^n)/(b*f*n*(c + d*x)^n *Log[F])), x] /; FreeQ[{F, a, b, c, d, e, f, n}, x] && EqQ[m, n - 1] && EqQ[d*e - c*f, 0]
```

Rule 2243

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^(n_))*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] := Simp[(c + d*x)^(m - n + 1)*(F^(a + b*(c + d*x)^n)/(b*d*n*L
```

```
og[F])), x] - Dist[(m - n + 1)/(b*n*Log[F]), Int[(c + d*x)^(m - n)*F^(a + b
*(c + d*x)^n), x], x] /; FreeQ[{F, a, b, c, d}, x] && IntegerQ[2*((m + 1)/n
)] && LtQ[0, (m + 1)/n, 5] && IntegerQ[n] && (LtQ[0, n, m + 1] || LtQ[m, n,
0])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2}e^{x^2}x^2 - \int e^{x^2}x dx \\ &= -\frac{e^{x^2}}{2} + \frac{1}{2}e^{x^2}x^2 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.64

$$\int e^{x^2}x^3 dx = \frac{1}{2}e^{x^2}(-1 + x^2)$$

[In] Integrate[E^x^2*x^3,x]

[Out] (E^x^2*(-1 + x^2))/2

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.55

| method | result | size |
|-------------------|---|------|
| gosper | $\frac{(x^2-1)e^{x^2}}{2}$ | 12 |
| risch | $\left(\frac{x^2}{2} - \frac{1}{2}\right)e^{x^2}$ | 13 |
| meijerg | $\frac{1}{2} - \frac{(-2x^2+2)e^{x^2}}{4}$ | 16 |
| derivativedivides | $-\frac{e^{x^2}}{2} + \frac{x^2e^{x^2}}{2}$ | 17 |
| default | $-\frac{e^{x^2}}{2} + \frac{x^2e^{x^2}}{2}$ | 17 |
| norman | $-\frac{e^{x^2}}{2} + \frac{x^2e^{x^2}}{2}$ | 17 |
| parallelrisc | $-\frac{e^{x^2}}{2} + \frac{x^2e^{x^2}}{2}$ | 17 |
| parts | $\frac{\sqrt{\pi} \operatorname{erfi}(x)x^3}{2} - \frac{3\sqrt{\pi} \left(\frac{x^3 \operatorname{erfi}(x)}{3} - \frac{2 \left(-\frac{e^{x^2}}{2} + \frac{x^2e^{x^2}}{2} \right)}{3\sqrt{\pi}} \right)}{2}$ | 46 |

[In] `int(x^3*exp(x^2),x,method=_RETURNVERBOSE)`

[Out] $\frac{1}{2}(x^2-1)\exp(x^2)$

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.50

$$\int e^{x^2} x^3 dx = \frac{1}{2} (x^2 - 1) e^{(x^2)}$$

[In] `integrate(x^3*exp(x^2),x, algorithm="fricas")`

[Out] $\frac{1}{2}(x^2 - 1)*e^{(x^2)}$

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.45

$$\int e^{x^2} x^3 dx = \frac{(x^2 - 1) e^{x^2}}{2}$$

[In] `integrate(x**3*exp(x**2),x)`

[Out] $(x**2 - 1)*\exp(x**2)/2$

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.50

$$\int e^{x^2} x^3 dx = \frac{1}{2} (x^2 - 1) e^{(x^2)}$$

[In] `integrate(x^3*exp(x^2),x, algorithm="maxima")`

[Out] $\frac{1}{2}(x^2 - 1)*e^{(x^2)}$

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.50

$$\int e^{x^2} x^3 dx = \frac{1}{2} (x^2 - 1) e^{(x^2)}$$

```
[In] integrate(x^3*exp(x^2),x, algorithm="giac")
```

```
[Out] 1/2*(x^2 - 1)*e^(x^2)
```

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.50

$$\int e^{x^2} x^3 dx = \frac{e^{x^2} (x^2 - 1)}{2}$$

```
[In] int(x^3*exp(x^2),x)
```

```
[Out] (exp(x^2)*(x^2 - 1))/2
```

3.161 $\int \frac{1}{x\sqrt{-1+x^2}} dx$

| | |
|---|------|
| Optimal result | 1526 |
| Rubi [A] (verified) | 1526 |
| Mathematica [A] (verified) | 1527 |
| Maple [A] (verified) | 1527 |
| Fricas [A] (verification not implemented) | 1528 |
| Sympy [C] (verification not implemented) | 1528 |
| Maxima [A] (verification not implemented) | 1528 |
| Giac [A] (verification not implemented) | 1529 |
| Mupad [B] (verification not implemented) | 1529 |

Optimal result

Integrand size = 13, antiderivative size = 10

$$\int \frac{1}{x\sqrt{-1+x^2}} dx = \arctan\left(\sqrt{-1+x^2}\right)$$

[Out] arctan((x^2-1)^(1/2))

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.231$, Rules used = {272, 65, 209}

$$\int \frac{1}{x\sqrt{-1+x^2}} dx = \arctan\left(\sqrt{x^2-1}\right)$$

[In] Int[1/(x*Sqrt[-1 + x^2]),x]

[Out] ArcTan[Sqrt[-1 + x^2]]

Rule 65

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] := With[
{p = Denominator[m]}, Dist[p/b, Subst[Int[x^(p*(m + 1) - 1)*(c - a*(d/b) +
d*(x^p/b))^(n), x], x, (a + b*x)^(1/p)], x]] /; FreeQ[{a, b, c, d}, x] && NeQ
[b*c - a*d, 0] && LtQ[-1, m, 0] && LeQ[-1, n, 0] && LeQ[Denominator[n], Den
ominator[m]] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 209

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*A
rcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a
```

, 0] || GtQ[b, 0])

Rule 272

```
Int[(x_)^(m_)*((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[
Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b
, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{\sqrt{-1 + xx}} dx, x, x^2 \right) \\ &= \text{Subst} \left(\int \frac{1}{1 + x^2} dx, x, \sqrt{-1 + x^2} \right) \\ &= \arctan \left(\sqrt{-1 + x^2} \right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{1}{x\sqrt{-1 + x^2}} dx = \arctan \left(\sqrt{-1 + x^2} \right)$$

[In] Integrate[1/(x*Sqrt[-1 + x^2]),x]

[Out] ArcTan[Sqrt[-1 + x^2]]

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

| method | result | size |
|----------------|---|------|
| pseudoelliptic | $\arctan(\sqrt{x^2 - 1})$ | 9 |
| default | $-\arctan\left(\frac{1}{\sqrt{x^2 - 1}}\right)$ | 11 |
| trager | $\text{RootOf}(_Z^2 + 1) \ln\left(\frac{\text{RootOf}(_Z^2 + 1) + \sqrt{x^2 - 1}}{x}\right)$ | 27 |
| meijerg | $\frac{\sqrt{-\text{signum}(x^2 - 1)} \left((2 \ln(x) - 2 \ln(2) + i\pi) \sqrt{\pi} - 2\sqrt{\pi} \ln\left(\frac{1}{2} + \frac{\sqrt{-x^2 + 1}}{2}\right) \right)}{2\sqrt{\pi} \sqrt{\text{signum}(x^2 - 1)}}$ | 61 |

[In] int(1/x/(x^2-1)^(1/2),x,method=_RETURNVERBOSE)

[Out] $\arctan((x^2-1)^{(1/2)})$

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.40

$$\int \frac{1}{x\sqrt{-1+x^2}} dx = 2 \arctan\left(-x + \sqrt{x^2-1}\right)$$

[In] `integrate(1/x/(x^2-1)^(1/2),x, algorithm="fricas")`

[Out] `2*arctan(-x + sqrt(x^2 - 1))`

Sympy [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.48 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.70

$$\int \frac{1}{x\sqrt{-1+x^2}} dx = \begin{cases} i \operatorname{acosh}\left(\frac{1}{x}\right) & \text{for } \frac{1}{|x^2|} > 1 \\ -\operatorname{asin}\left(\frac{1}{x}\right) & \text{otherwise} \end{cases}$$

[In] `integrate(1/x/(x**2-1)**(1/2),x)`

[Out] `Piecewise((I*acosh(1/x), 1/Abs(x**2) > 1), (-asin(1/x), True))`

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.70

$$\int \frac{1}{x\sqrt{-1+x^2}} dx = -\arcsin\left(\frac{1}{|x|}\right)$$

[In] `integrate(1/x/(x^2-1)^(1/2),x, algorithm="maxima")`

[Out] `-arcsin(1/abs(x))`

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \frac{1}{x\sqrt{-1+x^2}} dx = \arctan(\sqrt{x^2-1})$$

[In] integrate(1/x/(x^2-1)^(1/2),x, algorithm="giac")

[Out] arctan(sqrt(x^2 - 1))

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \frac{1}{x\sqrt{-1+x^2}} dx = \operatorname{atan}(\sqrt{x^2-1})$$

[In] int(1/(x*(x^2 - 1)^(1/2)),x)

[Out] atan((x^2 - 1)^(1/2))

3.162 $\int \frac{1}{x(1+x^2)} dx$

| | |
|---|------|
| Optimal result | 1530 |
| Rubi [A] (verified) | 1530 |
| Mathematica [A] (verified) | 1531 |
| Maple [A] (verified) | 1531 |
| Fricas [A] (verification not implemented) | 1532 |
| Sympy [A] (verification not implemented) | 1532 |
| Maxima [A] (verification not implemented) | 1532 |
| Giac [A] (verification not implemented) | 1533 |
| Mupad [B] (verification not implemented) | 1533 |

Optimal result

Integrand size = 11, antiderivative size = 13

$$\int \frac{1}{x(1+x^2)} dx = \log(x) - \frac{1}{2} \log(1+x^2)$$

[Out] $\ln(x) - 1/2 * \ln(x^2 + 1)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.364$, Rules used = {272, 36, 29, 31}

$$\int \frac{1}{x(1+x^2)} dx = \log(x) - \frac{1}{2} \log(x^2 + 1)$$

[In] $\text{Int}[1/(x*(1 + x^2)), x]$

[Out] $\text{Log}[x] - \text{Log}[1 + x^2]/2$

Rule 29

$\text{Int}[(x_)^{(-1)}, x_Symbol] \text{ :> } \text{Simp}[\text{Log}[x], x]$

Rule 31

$\text{Int}[((a_) + (b_)*(x_))^{(-1)}, x_Symbol] \text{ :> } \text{Simp}[\text{Log}[\text{RemoveContent}[a + b*x, x]]/b, x] \text{ /; FreeQ}\{a, b\}, x]$

Rule 36

```
Int[1/(((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))), x_Symbol] := Dist[b/(b*c
- a*d), Int[1/(a + b*x), x], x] - Dist[d/(b*c - a*d), Int[1/(c + d*x), x],
x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0]
```

Rule 272

```
Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[
Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b
, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{x(1+x)} dx, x, x^2 \right) \\ &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{x} dx, x, x^2 \right) - \frac{1}{2} \text{Subst} \left(\int \frac{1}{1+x} dx, x, x^2 \right) \\ &= \log(x) - \frac{1}{2} \log(1+x^2) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \frac{1}{x(1+x^2)} dx = \log(x) - \frac{1}{2} \log(1+x^2)$$

[In] Integrate[1/(x*(1 + x^2)),x]

[Out] Log[x] - Log[1 + x^2]/2

Maple [A] (verified)

Time = 0.16 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.92

| method | result | size |
|---------------|---------------------------------|------|
| default | $\ln(x) - \frac{\ln(x^2+1)}{2}$ | 12 |
| norman | $\ln(x) - \frac{\ln(x^2+1)}{2}$ | 12 |
| meijerg | $\ln(x) - \frac{\ln(x^2+1)}{2}$ | 12 |
| risch | $\ln(x) - \frac{\ln(x^2+1)}{2}$ | 12 |
| parallelrisch | $\ln(x) - \frac{\ln(x^2+1)}{2}$ | 12 |

```
[In] int(1/x/(x^2+1),x,method=_RETURNVERBOSE)
```

```
[Out] ln(x)-1/2*ln(x^2+1)
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{1}{x(1+x^2)} dx = -\frac{1}{2} \log(x^2 + 1) + \log(x)$$

```
[In] integrate(1/x/(x^2+1),x, algorithm="fricas")
```

```
[Out] -1/2*log(x^2 + 1) + log(x)
```

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.77

$$\int \frac{1}{x(1+x^2)} dx = \log(x) - \frac{\log(x^2 + 1)}{2}$$

```
[In] integrate(1/x/(x**2+1),x)
```

```
[Out] log(x) - log(x**2 + 1)/2
```

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.15

$$\int \frac{1}{x(1+x^2)} dx = -\frac{1}{2} \log(x^2 + 1) + \frac{1}{2} \log(x^2)$$

```
[In] integrate(1/x/(x^2+1),x, algorithm="maxima")
```

```
[Out] -1/2*log(x^2 + 1) + 1/2*log(x^2)
```


Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.15

$$\int \frac{1}{x(1+x^2)} dx = -\frac{1}{2} \log(x^2 + 1) + \frac{1}{2} \log(x^2)$$

[In] integrate(1/x/(x^2+1),x, algorithm="giac")

[Out] -1/2*log(x^2 + 1) + 1/2*log(x^2)

Mupad [B] (verification not implemented)

Time = 13.30 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{1}{x(1+x^2)} dx = \ln(x) - \frac{\ln(x^2 + 1)}{2}$$

[In] int(1/(x*(x^2 + 1)),x)

[Out] log(x) - log(x^2 + 1)/2

3.163 $\int \operatorname{arccosh}(x) dx$

| | |
|---|------|
| Optimal result | 1534 |
| Rubi [A] (verified) | 1534 |
| Mathematica [A] (verified) | 1535 |
| Maple [A] (verified) | 1535 |
| Fricas [A] (verification not implemented) | 1535 |
| Sympy [F] | 1536 |
| Maxima [A] (verification not implemented) | 1536 |
| Giac [A] (verification not implemented) | 1536 |
| Mupad [B] (verification not implemented) | 1536 |

Optimal result

Integrand size = 2, antiderivative size = 21

$$\int \operatorname{arccosh}(x) dx = -\sqrt{-1+x}\sqrt{1+x} + x\operatorname{arccosh}(x)$$

[Out] $-(-1+x)^{(1/2)}*(1+x)^{(1/2)}+x*\operatorname{arccosh}(x)$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 21, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 1.000$, Rules used = {5879, 75}

$$\int \operatorname{arccosh}(x) dx = x\operatorname{arccosh}(x) - \sqrt{x-1}\sqrt{x+1}$$

[In] `Int[ArcCosh[x], x]`

[Out] `-(Sqrt[-1 + x]*Sqrt[1 + x]) + x*ArcCosh[x]`

Rule 75

```
Int[((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.), x_Symbol]
:> Simp[b*(c + d*x)^(n + 1)*((e + f*x)^(p + 1)/(d*f*(n + p + 2))), x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 2, 0] && EqQ[a*d*f*(n + p + 2) - b*(d*e*(n + 1) + c*f*(p + 1)), 0]
```

Rule 5879

```
Int[((a_.) + ArcCosh[(c_.)*(x_)])*(b_.))^(n_.), x_Symbol]
:> Simp[x*(a + b*ArcCosh[c*x])^n, x] - Dist[b*c*n, Int[x*((a + b*ArcCosh[c*x])^(n - 1))/(Sqrt[
```

$1 + c*x]*\text{Sqrt}[-1 + c*x]))$, $x]$, $x]$ /; $\text{FreeQ}[\{a, b, c\}, x]$ && $\text{GtQ}[n, 0]$

Rubi steps

$$\begin{aligned} \text{integral} &= \text{arccosh}(x) - \int \frac{x}{\sqrt{-1+x}\sqrt{1+x}} dx \\ &= -\sqrt{-1+x}\sqrt{1+x} + \text{arccosh}(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.00

$$\int \text{arccosh}(x) dx = -\sqrt{-1+x}\sqrt{1+x} + \text{arccosh}(x)$$

[In] `Integrate[ArcCosh[x], x]`

[Out] `-(Sqrt[-1 + x]*Sqrt[1 + x]) + x*ArcCosh[x]`

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.86

| method | result | size |
|---------|--|------|
| lookup | $-\sqrt{-1+x}\sqrt{1+x} + x \text{arccosh}(x)$ | 18 |
| default | $-\sqrt{-1+x}\sqrt{1+x} + x \text{arccosh}(x)$ | 18 |
| parts | $-\sqrt{-1+x}\sqrt{1+x} + x \text{arccosh}(x)$ | 18 |

[In] `int(arccosh(x), x, method=_RETURNVERBOSE)`

[Out] `-(-1+x)^(1/2)*(1+x)^(1/2)+x*arccosh(x)`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.05

$$\int \text{arccosh}(x) dx = x \log(x + \sqrt{x^2 - 1}) - \sqrt{x^2 - 1}$$

[In] `integrate(arccosh(x), x, algorithm="fricas")`

[Out] `x*log(x + sqrt(x^2 - 1)) - sqrt(x^2 - 1)`

Sympy [F]

$$\int \operatorname{arccosh}(x) dx = \int \operatorname{acosh}(x) dx$$

[In] integrate(acosh(x),x)

[Out] Integral(acosh(x), x)

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.67

$$\int \operatorname{arccosh}(x) dx = x \operatorname{arcosh}(x) - \sqrt{x^2 - 1}$$

[In] integrate(arccosh(x),x, algorithm="maxima")

[Out] x*arccosh(x) - sqrt(x^2 - 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.05

$$\int \operatorname{arccosh}(x) dx = x \log(x + \sqrt{x^2 - 1}) - \sqrt{x^2 - 1}$$

[In] integrate(arccosh(x),x, algorithm="giac")

[Out] x*log(x + sqrt(x^2 - 1)) - sqrt(x^2 - 1)

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.81

$$\int \operatorname{arccosh}(x) dx = x \operatorname{acosh}(x) - \sqrt{x - 1} \sqrt{x + 1}$$

[In] int(acosh(x),x)

[Out] x*acosh(x) - (x - 1)^(1/2)*(x + 1)^(1/2)

3.164 $\int e^{-3-5x-2x^2} dx$

| | |
|---|------|
| Optimal result | 1537 |
| Rubi [A] (verified) | 1537 |
| Mathematica [A] (verified) | 1538 |
| Maple [A] (verified) | 1538 |
| Fricas [A] (verification not implemented) | 1538 |
| Sympy [A] (verification not implemented) | 1539 |
| Maxima [A] (verification not implemented) | 1539 |
| Giac [A] (verification not implemented) | 1539 |
| Mupad [B] (verification not implemented) | 1539 |

Optimal result

Integrand size = 12, antiderivative size = 34

$$\int e^{-3-5x-2x^2} dx = \frac{\sqrt[8]{e}\sqrt{\pi}\operatorname{erf}\left(\frac{5+4x}{2\sqrt{2}}\right)}{2\sqrt{2}}$$

[Out] $1/4*\exp(1/8)*\text{Pi}^{(1/2)}*\operatorname{erf}(1/4*(5+4*x)*2^{(1/2)})*2^{(1/2)}$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {2266, 2236}

$$\int e^{-3-5x-2x^2} dx = \frac{\sqrt[8]{e}\sqrt{\pi}\operatorname{erf}\left(\frac{4x+5}{2\sqrt{2}}\right)}{2\sqrt{2}}$$

[In] $\text{Int}[E^{(-3 - 5*x - 2*x^2)}, x]$

[Out] $(E^{(1/8)}*\text{Sqrt}[\text{Pi}]*\text{Erf}[(5 + 4*x)/(2*\text{Sqrt}[2])])/(2*\text{Sqrt}[2])$

Rule 2236

$\text{Int}[(F_)^{((a_.) + (b_.)*((c_.) + (d_.)*(x_))^{2})}, x_Symbol] \rightarrow \text{Simp}[F^a*\text{Sqrt}[\text{Pi}]*(\text{Erf}[(c + d*x)*\text{Rt}[(-b)*\text{Log}[F], 2]]/(2*d*\text{Rt}[(-b)*\text{Log}[F], 2])), x] /; \text{FreeQ}\{F, a, b, c, d, x\} \&\& \text{NegQ}[b]$

Rule 2266

$\text{Int}[(F_)^{((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)}, x_Symbol] \rightarrow \text{Dist}[F^{(a - b^2/(4*c))}, \text{Int}[F^{((b + 2*c*x)^2/(4*c))}, x], x] /; \text{FreeQ}\{F, a, b, c, x\}$

Rubi steps

$$\begin{aligned} \text{integral} &= \sqrt[8]{e} \int e^{-\frac{1}{8}(-5-4x)^2} dx \\ &= \frac{\sqrt[8]{e} \sqrt{\pi} \operatorname{erf}\left(\frac{5+4x}{2\sqrt{2}}\right)}{2\sqrt{2}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.00

$$\int e^{-3-5x-2x^2} dx = \frac{\sqrt[8]{e} \sqrt{\pi} \operatorname{erf}\left(\frac{5+4x}{2\sqrt{2}}\right)}{2\sqrt{2}}$$

[In] Integrate[E^(-3 - 5*x - 2*x^2), x]

[Out] (E^(1/8)*Sqrt[Pi]*Erf[(5 + 4*x)/(2*Sqrt[2])])/(2*Sqrt[2])

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.68

| method | result | size |
|---------|--|------|
| default | $\frac{\sqrt{\pi} e^{\frac{1}{8}} \sqrt{2} \operatorname{erf}\left(x\sqrt{2} + \frac{5\sqrt{2}}{4}\right)}{4}$ | 23 |
| risch | $\frac{\sqrt{\pi} e^{\frac{1}{8}} \sqrt{2} \operatorname{erf}\left(x\sqrt{2} + \frac{5\sqrt{2}}{4}\right)}{4}$ | 23 |

[In] int(exp(-2*x^2-5*x-3), x, method=_RETURNVERBOSE)

[Out] 1/4*Pi^(1/2)*exp(1/8)*2^(1/2)*erf(x*2^(1/2)+5/4*2^(1/2))

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.62

$$\int e^{-3-5x-2x^2} dx = \frac{1}{4} \sqrt{2} \sqrt{\pi} \operatorname{erf}\left(\frac{1}{4} \sqrt{2}(4x+5)\right) e^{\frac{1}{8}}$$

[In] integrate(exp(-2*x^2-5*x-3), x, algorithm="fricas")

[Out] 1/4*sqrt(2)*sqrt(pi)*erf(1/4*sqrt(2)*(4*x + 5))*e^(1/8)

Sympy [A] (verification not implemented)

Time = 0.24 (sec) , antiderivative size = 32, normalized size of antiderivative = 0.94

$$\int e^{-3-5x-2x^2} dx = \frac{\sqrt{2}\sqrt{\pi}e^{\frac{1}{8}} \operatorname{erf}\left(\sqrt{2}x + \frac{5\sqrt{2}}{4}\right)}{4}$$

[In] integrate(exp(-2*x**2-5*x-3),x)

[Out] sqrt(2)*sqrt(pi)*exp(1/8)*erf(sqrt(2)*x + 5*sqrt(2)/4)/4

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.65

$$\int e^{-3-5x-2x^2} dx = \frac{1}{4} \sqrt{2}\sqrt{\pi} \operatorname{erf}\left(\sqrt{2}x + \frac{5}{4}\sqrt{2}\right) e^{\frac{1}{8}}$$

[In] integrate(exp(-2*x^2-5*x-3),x, algorithm="maxima")

[Out] 1/4*sqrt(2)*sqrt(pi)*erf(sqrt(2)*x + 5/4*sqrt(2))*e^(1/8)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.62

$$\int e^{-3-5x-2x^2} dx = \frac{1}{4} \sqrt{2}\sqrt{\pi} \operatorname{erf}\left(\frac{1}{4}\sqrt{2}(4x + 5)\right) e^{\frac{1}{8}}$$

[In] integrate(exp(-2*x^2-5*x-3),x, algorithm="giac")

[Out] 1/4*sqrt(2)*sqrt(pi)*erf(1/4*sqrt(2)*(4*x + 5))*e^(1/8)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.65

$$\int e^{-3-5x-2x^2} dx = \frac{\sqrt{2}\sqrt{\pi}e^{1/8} \operatorname{erf}\left(\sqrt{2}x + \frac{5\sqrt{2}}{4}\right)}{4}$$

[In] int(exp(- 5*x - 2*x^2 - 3),x)

[Out] (2^(1/2)*pi^(1/2)*exp(1/8)*erf(2^(1/2)*x + (5*2^(1/2))/4))/4

3.165 $\int \sin(\sqrt{x}) dx$

| | |
|---|------|
| Optimal result | 1540 |
| Rubi [A] (verified) | 1540 |
| Mathematica [A] (verified) | 1541 |
| Maple [A] (verified) | 1541 |
| Fricas [A] (verification not implemented) | 1542 |
| Sympy [A] (verification not implemented) | 1542 |
| Maxima [A] (verification not implemented) | 1542 |
| Giac [A] (verification not implemented) | 1542 |
| Mupad [B] (verification not implemented) | 1543 |

Optimal result

Integrand size = 6, antiderivative size = 22

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

[Out] $-2x^{(1/2)}*\cos(x^{(1/2)})+2*\sin(x^{(1/2)})$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3442, 3377, 2717}

$$\int \sin(\sqrt{x}) dx = 2 \sin(\sqrt{x}) - 2\sqrt{x} \cos(\sqrt{x})$$

[In] `Int[Sin[Sqrt[x]],x]`

[Out] $-2*\text{Sqrt}[x]*\text{Cos}[\text{Sqrt}[x]] + 2*\text{Sin}[\text{Sqrt}[x]]$

Rule 2717

`Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] := Simp[Sin[c + d*x]/d, x] /;`
`FreeQ[{c, d}, x]`

Rule 3377

`Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] := Simp[(-c + d*x)^m*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Cos[e + f*x], x], x] /;`
`FreeQ[{c, d, e, f}, x] && GtQ[m, 0]`

Rule 3442


```
Int[((a_.) + (b_.)*Sin[(c_.) + (d_.)*((e_.) + (f_.)*(x_))^(n_)]^(p_.), x_Symbol]
:> Dist[1/(n*f), Subst[Int[x^(1/n - 1)*(a + b*Sin[c + d*x])^p, x], x, (e + f*x)^n], x]
/; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[p, 0] && IntegerQ[1/n]
```

Rubi steps

$$\begin{aligned} \text{integral} &= 2\text{Subst}\left(\int x \sin(x) dx, x, \sqrt{x}\right) \\ &= -2\sqrt{x} \cos(\sqrt{x}) + 2\text{Subst}\left(\int \cos(x) dx, x, \sqrt{x}\right) \\ &= -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x}) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

```
[In] Integrate[Sin[Sqrt[x]], x]
```

```
[Out] -2*Sqrt[x]*Cos[Sqrt[x]] + 2*Sin[Sqrt[x]]
```

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.77

| method | result | size |
|-------------------|--|------|
| derivativedivides | $-2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$ | 17 |
| default | $-2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$ | 17 |
| meijerg | $4\sqrt{\pi} \left(-\frac{\sqrt{x} \cos(\sqrt{x})}{2\sqrt{\pi}} + \frac{\sin(\sqrt{x})}{2\sqrt{\pi}} \right)$ | 28 |

```
[In] int(sin(x^(1/2)), x, method=_RETURNVERBOSE)
```

```
[Out] -2*x^(1/2)*cos(x^(1/2))+2*sin(x^(1/2))
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.73

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

[In] integrate(sin(x^(1/2)),x, algorithm="fricas")

[Out] -2*sqrt(x)*cos(sqrt(x)) + 2*sin(sqrt(x))

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.91

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

[In] integrate(sin(x**(1/2)),x)

[Out] -2*sqrt(x)*cos(sqrt(x)) + 2*sin(sqrt(x))

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.73

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

[In] integrate(sin(x^(1/2)),x, algorithm="maxima")

[Out] -2*sqrt(x)*cos(sqrt(x)) + 2*sin(sqrt(x))

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.73

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

[In] integrate(sin(x^(1/2)),x, algorithm="giac")

[Out] -2*sqrt(x)*cos(sqrt(x)) + 2*sin(sqrt(x))

Mupad [B] (verification not implemented)

Time = 13.61 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.73

$$\int \sin(\sqrt{x}) dx = 2 \sin(\sqrt{x}) - 2\sqrt{x} \cos(\sqrt{x})$$

[In] int(sin(x^(1/2)),x)

[Out] 2*sin(x^(1/2)) - 2*x^(1/2)*cos(x^(1/2))

$$3.166 \quad \int \frac{1}{\left(\frac{1}{x} + x\right)^2} dx$$

| | |
|---|------|
| Optimal result | 1544 |
| Rubi [A] (verified) | 1544 |
| Mathematica [A] (verified) | 1545 |
| Maple [A] (verified) | 1545 |
| Fricas [A] (verification not implemented) | 1546 |
| Sympy [A] (verification not implemented) | 1546 |
| Maxima [A] (verification not implemented) | 1546 |
| Giac [A] (verification not implemented) | 1546 |
| Mupad [B] (verification not implemented) | 1547 |

Optimal result

Integrand size = 7, antiderivative size = 19

$$\int \frac{1}{\left(\frac{1}{x} + x\right)^2} dx = -\frac{x}{2(1+x^2)} + \frac{\arctan(x)}{2}$$

[Out] $-x/(2*x^2+2)+1/2*\arctan(x)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.429$, Rules used = {1607, 294, 209}

$$\int \frac{1}{\left(\frac{1}{x} + x\right)^2} dx = \frac{\arctan(x)}{2} - \frac{x}{2(x^2 + 1)}$$

[In] $\text{Int}[(x^{(-1)} + x)^{(-2)}, x]$

[Out] $-1/2*x/(1 + x^2) + \text{ArcTan}[x]/2$

Rule 209

$\text{Int}[(a + (b \cdot x)^2)^{-1}, x_Symbol] \rightarrow \text{Simp}[(1/(\text{Rt}[a, 2] \cdot \text{Rt}[b, 2])) \cdot \text{ArcTan}[\text{Rt}[b, 2] \cdot (x/\text{Rt}[a, 2])], x] /; \text{FreeQ}\{a, b, x\} \ \&\& \ \text{PosQ}[a/b] \ \&\& \ (\text{GtQ}[a, 0] \ || \ \text{GtQ}[b, 0])$

Rule 294

$\text{Int}[(c \cdot x)^m \cdot (a + (b \cdot x)^n)^p, x_Symbol] \rightarrow \text{Simp}[c^{n-1} \cdot (c \cdot x)^{m-n+1} \cdot (a + b \cdot x^n)^{p+1} / (b \cdot n \cdot (p+1)), x] - \text{Dist}[c^n$

```

*((m - n + 1)/(b*n*(p + 1))), Int[(c*x)^(m - n)*(a + b*x^n)^(p + 1), x], x]
;/; FreeQ[{a, b, c}, x] && IGtQ[n, 0] && LtQ[p, -1] && GtQ[m + 1, n] && !I
LtQ[(m + n*(p + 1) + 1)/n, 0] && IntBinomialQ[a, b, c, n, m, p, x]

```

Rule 1607

```

Int[(u_.)*((a_.)*(x_)^(p_.) + (b_.)*(x_)^(q_.))^(n_.), x_Symbol] := Int[u*x
^(n*p)*(a + b*x^(q - p))^n, x] /; FreeQ[{a, b, p, q}, x] && IntegerQ[n] &&
PosQ[q - p]

```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \frac{x^2}{(1+x^2)^2} dx \\
 &= -\frac{x}{2(1+x^2)} + \frac{1}{2} \int \frac{1}{1+x^2} dx \\
 &= -\frac{x}{2(1+x^2)} + \frac{\arctan(x)}{2}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int \frac{1}{\left(\frac{1}{x} + x\right)^2} dx = -\frac{x}{2(1+x^2)} + \frac{\arctan(x)}{2}$$

```
[In] Integrate[(x^(-1) + x)^(-2),x]
```

```
[Out] -1/2*x/(1 + x^2) + ArcTan[x]/2
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.84

| method | result | size |
|--------------|--|------|
| default | $-\frac{x}{2(x^2+1)} + \frac{\arctan(x)}{2}$ | 16 |
| risch | $-\frac{x}{2(x^2+1)} + \frac{\arctan(x)}{2}$ | 16 |
| parallelrisc | $-\frac{i \ln(x-i)x^2 - i \ln(i+x)x^2 + i \ln(x-i) - i \ln(i+x) + 2x}{4(x^2+1)}$ | 52 |

```
[In] int(1/(x+1/x)^2,x,method=_RETURNVERBOSE)
```

```
[Out] -1/2/(x^2+1)*x+1/2*arctan(x)
```

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.11

$$\int \frac{1}{\left(\frac{1}{x} + x\right)^2} dx = \frac{(x^2 + 1) \arctan(x) - x}{2(x^2 + 1)}$$

[In] integrate(1/(x+1/x)^2,x, algorithm="fricas")

[Out] 1/2*((x^2 + 1)*arctan(x) - x)/(x^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.63

$$\int \frac{1}{\left(\frac{1}{x} + x\right)^2} dx = -\frac{x}{2x^2 + 2} + \frac{\operatorname{atan}(x)}{2}$$

[In] integrate(1/(x+1/x)**2,x)

[Out] -x/(2*x**2 + 2) + atan(x)/2

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.79

$$\int \frac{1}{\left(\frac{1}{x} + x\right)^2} dx = -\frac{x}{2(x^2 + 1)} + \frac{1}{2} \arctan(x)$$

[In] integrate(1/(x+1/x)^2,x, algorithm="maxima")

[Out] -1/2*x/(x^2 + 1) + 1/2*arctan(x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.79

$$\int \frac{1}{\left(\frac{1}{x} + x\right)^2} dx = -\frac{x}{2(x^2 + 1)} + \frac{1}{2} \arctan(x)$$

[In] integrate(1/(x+1/x)^2,x, algorithm="giac")

[Out] -1/2*x/(x^2 + 1) + 1/2*arctan(x)

Mupad [B] (verification not implemented)

Time = 13.51 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.89

$$\int \frac{1}{\left(\frac{1}{x} + x\right)^2} dx = \frac{\operatorname{atan}(x)}{2} - \frac{x}{2(x^2 + 1)}$$

[In] int(1/(x + 1/x)^2,x)

[Out] atan(x)/2 - x/(2*(x^2 + 1))

3.167 $\int \frac{e^{-x}(2+x)}{x^3} dx$

| | |
|---|------|
| Optimal result | 1548 |
| Rubi [A] (verified) | 1548 |
| Mathematica [A] (verified) | 1549 |
| Maple [A] (verified) | 1549 |
| Fricas [A] (verification not implemented) | 1549 |
| Sympy [A] (verification not implemented) | 1550 |
| Maxima [C] (verification not implemented) | 1550 |
| Giac [A] (verification not implemented) | 1550 |
| Mupad [B] (verification not implemented) | 1550 |

Optimal result

Integrand size = 12, antiderivative size = 10

$$\int \frac{e^{-x}(2+x)}{x^3} dx = -\frac{e^{-x}}{x^2}$$

[Out] $-1/\exp(x)/x^2$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.083$, Rules used = {2228}

$$\int \frac{e^{-x}(2+x)}{x^3} dx = -\frac{e^{-x}}{x^2}$$

[In] `Int[(2 + x)/(E^x*x^3), x]`

[Out] `-(1/(E^x*x^2))`

Rule 2228

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] :> With[{b = Coefficient[v, x, 1], d = Coefficient[u, x, 0], e = Coefficient[u, x, 1], f = Coefficient[w, x, 0], g = Coefficient[w, x, 1]}, Simp[g*u^(m + 1)*(F^(c*v)/(b*c*e*Log[F])), x] /; EqQ[e*g*(m + 1) - b*c*(e*f - d*g)*Log[F], 0]] /; FreeQ[{F, c, m}, x] && LinearQ[{u, v, w}, x]
```

Rubi steps

$$\text{integral} = -\frac{e^{-x}}{x^2}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{e^{-x}(2+x)}{x^3} dx = -\frac{e^{-x}}{x^2}$$

[In] Integrate[(2 + x)/(E^x*x^3),x]

[Out] -(1/(E^x*x^2))

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

| method | result | size |
|-------------------|--|------|
| gosper | $-\frac{e^{-x}}{x^2}$ | 10 |
| derivativedivides | $-\frac{e^{-x}}{x^2}$ | 10 |
| default | $-\frac{e^{-x}}{x^2}$ | 10 |
| norman | $-\frac{e^{-x}}{x^2}$ | 10 |
| risch | $-\frac{e^{-x}}{x^2}$ | 10 |
| parallelrisch | $-\frac{e^{-x}}{x^2}$ | 10 |
| meijerg | $-\frac{1}{x^2} + \frac{1}{x} - \frac{1}{2} + \frac{9x^2-12x+6}{6x^2} - \frac{(3-3x)e^{-x}}{3x^2} + \frac{-2x+2}{2x} - \frac{e^{-x}}{x}$ | 59 |

[In] int((2+x)*exp(-x)/x^3,x,method=_RETURNVERBOSE)

[Out] -1/x^2*exp(-x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int \frac{e^{-x}(2+x)}{x^3} dx = -\frac{e^{(-x)}}{x^2}$$

[In] integrate((2+x)*exp(-x)/x^3,x, algorithm="fricas")

[Out] -e^(-x)/x^2

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \frac{e^{-x}(2+x)}{x^3} dx = -\frac{e^{-x}}{x^2}$$

[In] integrate((2+x)*exp(-x)/x**3,x)

[Out] -exp(-x)/x**2

Maxima [C] (verification not implemented)

Result contains higher order function than in optimal. Order 4 vs. order 3.

Time = 0.23 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

$$\int \frac{e^{-x}(2+x)}{x^3} dx = -\Gamma(-1, x) - 2\Gamma(-2, x)$$

[In] integrate((2+x)*exp(-x)/x^3,x, algorithm="maxima")

[Out] -gamma(-1, x) - 2*gamma(-2, x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int \frac{e^{-x}(2+x)}{x^3} dx = -\frac{e^{(-x)}}{x^2}$$

[In] integrate((2+x)*exp(-x)/x^3,x, algorithm="giac")

[Out] -e^(-x)/x^2

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int \frac{e^{-x}(2+x)}{x^3} dx = -\frac{e^{-x}}{x^2}$$

[In] int((exp(-x)*(x + 2))/x^3,x)

[Out] -exp(-x)/x^2

3.168 $\int \frac{1}{\sqrt{(1-x)x}} dx$

| | |
|---|------|
| Optimal result | 1551 |
| Rubi [A] (verified) | 1551 |
| Mathematica [B] (verified) | 1552 |
| Maple [A] (verified) | 1552 |
| Fricas [B] (verification not implemented) | 1553 |
| Sympy [A] (verification not implemented) | 1553 |
| Maxima [A] (verification not implemented) | 1553 |
| Giac [B] (verification not implemented) | 1553 |
| Mupad [B] (verification not implemented) | 1554 |

Optimal result

Integrand size = 11, antiderivative size = 8

$$\int \frac{1}{\sqrt{(1-x)x}} dx = -\arcsin(1-2x)$$

[Out] arcsin(-1+2*x)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.273$, Rules used = {1976, 633, 222}

$$\int \frac{1}{\sqrt{(1-x)x}} dx = -\arcsin(1-2x)$$

[In] Int[1/Sqrt[(1-x)*x],x]

[Out] -ArcSin[1-2*x]

Rule 222

Int[1/Sqrt[(a_) + (b_)*(x_)^2], x_Symbol] :> Simp[ArcSin[Rt[-b, 2]*(x/Sqrt[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]

Rule 633

Int[((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^(p_), x_Symbol] :> Dist[1/(2*c*(-4*(c/(b^2 - 4*a*c)))^p), Subst[Int[Simp[1 - x^2/(b^2 - 4*a*c), x]^p, x], x, b + 2*c*x], x] /; FreeQ[{a, b, c, p}, x] && GtQ[4*a - b^2/c, 0]

Rule 1976

`Int[(u_)*((e_)*((a_)+(b_)*(x_)^(n_)))*((c_)+(d_)*(x_)^(n_)))^(p_)`
`, x_Symbol] := Int[u*(a*c*e + (b*c + a*d)*e*x^n + b*d*e*x^(2*n))^p, x] /; FreeQ[{a, b, c, d, e, n, p}, x]`

Rubi steps

$$\begin{aligned} \text{integral} &= \int \frac{1}{\sqrt{x-x^2}} dx \\ &= -\text{Subst}\left(\int \frac{1}{\sqrt{1-x^2}} dx, x, 1-2x\right) \\ &= -\arcsin(1-2x) \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 40 vs. 2(8) = 16.

Time = 0.05 (sec) , antiderivative size = 40, normalized size of antiderivative = 5.00

$$\int \frac{1}{\sqrt{(1-x)x}} dx = -\frac{2\sqrt{-1+x}\sqrt{x} \log(\sqrt{-1+x}-\sqrt{x})}{\sqrt{-((-1+x)x)}}$$

[In] Integrate[1/Sqrt[(1-x)*x],x]

[Out] (-2*Sqrt[-1+x]*Sqrt[x]*Log[Sqrt[-1+x]-Sqrt[x]])/Sqrt[-((-1+x)*x)]

Maple [A] (verified)

Time = 0.28 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

| method | result | size |
|----------------|--|------|
| default | $\arcsin(-1+2x)$ | 7 |
| meijerg | $2 \arcsin(\sqrt{x})$ | 7 |
| pseudoelliptic | $-2 \arctan\left(\frac{\sqrt{-(-1+x)x}}{x}\right)$ | 16 |
| trager | $\text{RootOf}(_Z^2+1) \ln(-2 \text{RootOf}(_Z^2+1)x + 2\sqrt{-x^2+x} + \text{RootOf}(_Z^2+1))$ | 36 |

[In] int(1/(x*(1-x))^(1/2),x,method=_RETURNVERBOSE)

[Out] arcsin(-1+2*x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 16 vs. $2(6) = 12$.

Time = 0.25 (sec) , antiderivative size = 16, normalized size of antiderivative = 2.00

$$\int \frac{1}{\sqrt{(1-x)x}} dx = -2 \arctan \left(\frac{\sqrt{-x^2+x}}{x} \right)$$

[In] integrate(1/(x*(1-x))^(1/2),x, algorithm="fricas")

[Out] -2*arctan(sqrt(-x^2 + x)/x)

Sympy [A] (verification not implemented)

Time = 0.45 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.62

$$\int \frac{1}{\sqrt{(1-x)x}} dx = \operatorname{asin}(2x - 1)$$

[In] integrate(1/(x*(1-x))**(1/2),x)

[Out] asin(2*x - 1)

Maxima [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{1}{\sqrt{(1-x)x}} dx = \arcsin(2x - 1)$$

[In] integrate(1/(x*(1-x))^(1/2),x, algorithm="maxima")

[Out] arcsin(2*x - 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 25 vs. $2(6) = 12$.

Time = 0.27 (sec) , antiderivative size = 25, normalized size of antiderivative = 3.12

$$\int \frac{1}{\sqrt{(1-x)x}} dx = \frac{1}{4} \sqrt{-x^2+x}(2x - 1) + \frac{1}{8} \arcsin(2x - 1)$$

[In] integrate(1/(x*(1-x))^(1/2),x, algorithm="giac")

[Out] 1/4*sqrt(-x^2 + x)*(2*x - 1) + 1/8*arcsin(2*x - 1)

Mupad [B] (verification not implemented)

Time = 0.01 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{1}{\sqrt{(1-x)x}} dx = \text{asin}(2x - 1)$$

[In] `int(1/(-x*(x - 1))^(1/2),x)`

[Out] `asin(2*x - 1)`

3.169 $\int e^{-x} \tanh(x) dx$

| | |
|---|------|
| Optimal result | 1555 |
| Rubi [A] (verified) | 1555 |
| Mathematica [A] (verified) | 1556 |
| Maple [A] (verified) | 1556 |
| Fricas [B] (verification not implemented) | 1557 |
| Sympy [F] | 1557 |
| Maxima [A] (verification not implemented) | 1557 |
| Giac [A] (verification not implemented) | 1557 |
| Mupad [B] (verification not implemented) | 1558 |

Optimal result

Integrand size = 8, antiderivative size = 12

$$\int e^{-x} \tanh(x) dx = e^{-x} + 2 \arctan(e^x)$$

[Out] `exp(-x)+2*arctan(exp(x))`

Rubi [A] (verified)

Time = 0.02 (sec), antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.375$, Rules used = {2320, 464, 209}

$$\int e^{-x} \tanh(x) dx = 2 \arctan(e^x) + e^{-x}$$

[In] `Int[Tanh[x]/E^x,x]`

[Out] `E^(-x) + 2*ArcTan[E^x]`

Rule 209

`Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])`

Rule 464

`Int[((e_)*(x_))^(m_)*((a_) + (b_)*(x_)^(n_))^(p_)*((c_) + (d_)*(x_)^(n_)), x_Symbol] := Simp[c*(e*x)^(m+1)*((a + b*x^n)^(p+1)/(a*e^(m+1))), x] + Dist[(a*d*(m+1) - b*c*(m+n*(p+1)+1))/(a*e^n*(m+1)), Int[(e*x)^(m+n)*(a + b*x^n)^p, x], x] /; FreeQ[{a, b, c, d, e, p}, x] && NeQ[b*c`

```
- a*d, 0] && (IntegerQ[n] || GtQ[e, 0]) && ((GtQ[n, 0] && LtQ[m, -1]) || (
LtQ[n, 0] && GtQ[m + n, -1])) && !ILtQ[p, -1]
```

Rule 2320

```
Int[u_, x_Symbol] :=> With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_) [v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{-1+x^2}{x^2(1+x^2)} dx, x, e^x\right) \\ &= e^{-x} + 2\text{Subst}\left(\int \frac{1}{1+x^2} dx, x, e^x\right) \\ &= e^{-x} + 2\arctan(e^x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int e^{-x} \tanh(x) dx = e^{-x} + 2\arctan(e^x)$$

```
[In] Integrate[Tanh[x]/E^x,x]
```

```
[Out] E^(-x) + 2*ArcTan[E^x]
```

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.58

| method | result | size |
|---------|---|------|
| default | $\frac{2}{\tanh(\frac{x}{2})+1} + 2\arctan\left(\tanh\left(\frac{x}{2}\right)\right)$ | 19 |
| risch | $e^{-x} + i\ln(e^x + i) - i\ln(e^x - i)$ | 24 |

```
[In] int(tanh(x)/exp(x),x,method=_RETURNVERBOSE)
```

```
[Out] 2/(tanh(1/2*x)+1)+2*arctan(tanh(1/2*x))
```


Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 23 vs. $2(10) = 20$.

Time = 0.24 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.92

$$\int e^{-x} \tanh(x) dx = \frac{2(\cosh(x) + \sinh(x)) \arctan(\cosh(x) + \sinh(x)) + 1}{\cosh(x) + \sinh(x)}$$

[In] integrate(tanh(x)/exp(x),x, algorithm="fricas")

[Out] (2*(cosh(x) + sinh(x))*arctan(cosh(x) + sinh(x)) + 1)/(cosh(x) + sinh(x))

Sympy [F]

$$\int e^{-x} \tanh(x) dx = \int e^{-x} \tanh(x) dx$$

[In] integrate(tanh(x)/exp(x),x)

[Out] Integral(exp(-x)*tanh(x), x)

Maxima [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int e^{-x} \tanh(x) dx = -2 \arctan(e^{-x}) + e^{-x}$$

[In] integrate(tanh(x)/exp(x),x, algorithm="maxima")

[Out] -2*arctan(e^(-x)) + e^(-x)

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int e^{-x} \tanh(x) dx = 2 \arctan(e^x) + e^{-x}$$

[In] integrate(tanh(x)/exp(x),x, algorithm="giac")

[Out] 2*arctan(e^x) + e^(-x)

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int e^{-x} \tanh(x) dx = e^{-x} - 2 \operatorname{atan}(e^{-x})$$

[In] `int(exp(-x)*tanh(x),x)`

[Out] `exp(-x) - 2*atan(exp(-x))`

3.170 $\int \sqrt{1 + \sin(x)} dx$

| | |
|---|------|
| Optimal result | 1559 |
| Rubi [A] (verified) | 1559 |
| Mathematica [B] (verified) | 1560 |
| Maple [A] (verified) | 1560 |
| Fricas [B] (verification not implemented) | 1560 |
| Sympy [F] | 1561 |
| Maxima [F] | 1561 |
| Giac [B] (verification not implemented) | 1561 |
| Mupad [B] (verification not implemented) | 1561 |

Optimal result

Integrand size = 8, antiderivative size = 12

$$\int \sqrt{1 + \sin(x)} dx = -\frac{2 \cos(x)}{\sqrt{1 + \sin(x)}}$$

[Out] $-2*\cos(x)/(1+\sin(x))^{1/2}$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.125$, Rules used = {2725}

$$\int \sqrt{1 + \sin(x)} dx = -\frac{2 \cos(x)}{\sqrt{\sin(x) + 1}}$$

[In] `Int[Sqrt[1 + Sin[x]],x]`

[Out] `(-2*Cos[x])/Sqrt[1 + Sin[x]]`

Rule 2725

`Int[Sqrt[(a_) + (b_.)*sin[(c_.) + (d_.)*(x_)]], x_Symbol] :> Simp[-2*b*(Cos [c + d*x]/(d*Sqrt[a + b*Sin[c + d*x]])), x] /; FreeQ[{a, b, c, d}, x] && Eq Q[a^2 - b^2, 0]`

Rubi steps

$$\text{integral} = -\frac{2 \cos(x)}{\sqrt{1 + \sin(x)}}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 40 vs. $2(12) = 24$.

Time = 0.02 (sec) , antiderivative size = 40, normalized size of antiderivative = 3.33

$$\int \sqrt{1 + \sin(x)} dx = \frac{2(-\cos(\frac{x}{2}) + \sin(\frac{x}{2})) \sqrt{1 + \sin(x)}}{\cos(\frac{x}{2}) + \sin(\frac{x}{2})}$$

[In] Integrate[Sqrt[1 + Sin[x]],x]

[Out] (2*(-Cos[x/2] + Sin[x/2])*Sqrt[1 + Sin[x]])/(Cos[x/2] + Sin[x/2])

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.42

| method | result | size |
|---------|--|------|
| default | $\frac{2(-1+\sin(x))\sqrt{1+\sin(x)}}{\cos(x)}$ | 17 |
| risch | $-\frac{i\sqrt{2}\sqrt{2+2\sin(x)}(e^{ix}-i)(i+e^{ix})}{e^{2ix}-1+2ie^{ix}}$ | 48 |

[In] int((1+sin(x))^(1/2),x,method=_RETURNVERBOSE)

[Out] 2*(-1+sin(x))*(1+sin(x))^(1/2)/cos(x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 24 vs. $2(10) = 20$.

Time = 0.24 (sec) , antiderivative size = 24, normalized size of antiderivative = 2.00

$$\int \sqrt{1 + \sin(x)} dx = -\frac{2(\cos(x) - \sin(x) + 1)\sqrt{\sin(x) + 1}}{\cos(x) + \sin(x) + 1}$$

[In] integrate((1+sin(x))^(1/2),x, algorithm="fricas")

[Out] -2*(cos(x) - sin(x) + 1)*sqrt(sin(x) + 1)/(cos(x) + sin(x) + 1)

Sympy [F]

$$\int \sqrt{1 + \sin(x)} dx = \int \sqrt{\sin(x) + 1} dx$$

[In] integrate((1+sin(x))**(1/2),x)

[Out] Integral(sqrt(sin(x) + 1), x)

Maxima [F]

$$\int \sqrt{1 + \sin(x)} dx = \int \sqrt{\sin(x) + 1} dx$$

[In] integrate((1+sin(x))^(1/2),x, algorithm="maxima")

[Out] integrate(sqrt(sin(x) + 1), x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 22 vs. 2(10) = 20.

Time = 0.28 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.83

$$\int \sqrt{1 + \sin(x)} dx = 2\sqrt{2}\operatorname{sgn}\left(\cos\left(-\frac{1}{4}\pi + \frac{1}{2}x\right)\right)\sin\left(-\frac{1}{4}\pi + \frac{1}{2}x\right)$$

[In] integrate((1+sin(x))^(1/2),x, algorithm="giac")

[Out] 2*sqrt(2)*sgn(cos(-1/4*pi + 1/2*x))*sin(-1/4*pi + 1/2*x)

Mupad [B] (verification not implemented)

Time = 13.45 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.33

$$\int \sqrt{1 + \sin(x)} dx = \frac{2(\sin(x) - 1)\sqrt{\sin(x) + 1}}{\cos(x)}$$

[In] int((sin(x) + 1)^(1/2),x)

[Out] (2*(sin(x) - 1)*(sin(x) + 1)^(1/2))/cos(x)

3.171 $\int \frac{1}{1+\sqrt{x}} dx$

| | |
|---|------|
| Optimal result | 1562 |
| Rubi [A] (verified) | 1562 |
| Mathematica [A] (verified) | 1563 |
| Maple [A] (verified) | 1563 |
| Fricas [A] (verification not implemented) | 1564 |
| Sympy [A] (verification not implemented) | 1564 |
| Maxima [A] (verification not implemented) | 1564 |
| Giac [A] (verification not implemented) | 1564 |
| Mupad [B] (verification not implemented) | 1565 |

Optimal result

Integrand size = 9, antiderivative size = 18

$$\int \frac{1}{1+\sqrt{x}} dx = 2\sqrt{x} - 2\log(1+\sqrt{x})$$

[Out] $2*x^{(1/2)}-2*\ln(1+x^{(1/2)})$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 18, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {196, 45}

$$\int \frac{1}{1+\sqrt{x}} dx = 2\sqrt{x} - 2\log(\sqrt{x} + 1)$$

[In] `Int[(1 + Sqrt[x])^(-1), x]`

[Out] `2*Sqrt[x] - 2*Log[1 + Sqrt[x]]`

Rule 45

```
Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int
[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x] /; FreeQ[{a, b, c, d, n},
x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && Le
Q[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])
```

Rule 196

```
Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[Int[x^(1/n
- 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b, p}, x] && FractionQ[n] &&
```

IntegerQ[1/n]

Rubi steps

$$\begin{aligned}
\text{integral} &= 2\text{Subst}\left(\int \frac{x}{1+x} dx, x, \sqrt{x}\right) \\
&= 2\text{Subst}\left(\int \left(1 + \frac{1}{-1-x}\right) dx, x, \sqrt{x}\right) \\
&= 2\sqrt{x} - 2\log(1 + \sqrt{x})
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00

$$\int \frac{1}{1+\sqrt{x}} dx = 2\sqrt{x} - 2\log(1 + \sqrt{x})$$

[In] Integrate[(1 + Sqrt[x])^(-1),x]

[Out] 2*Sqrt[x] - 2*Log[1 + Sqrt[x]]

Maple [A] (verified)

Time = 0.15 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.83

| method | result | size |
|-------------------|--|------|
| derivativedivides | $2\sqrt{x} - 2\ln(1 + \sqrt{x})$ | 15 |
| meijerg | $2\sqrt{x} - 2\ln(1 + \sqrt{x})$ | 15 |
| trager | $2\sqrt{x} - \ln(2\sqrt{x} + 1 + x)$ | 18 |
| default | $2\sqrt{x} + \ln(-1 + \sqrt{x}) - \ln(1 + \sqrt{x}) - \ln(-1 + x)$ | 27 |

[In] int(1/(1+x^(1/2)),x,method=_RETURNVERBOSE)

[Out] 2*x^(1/2)-2*ln(1+x^(1/2))

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.78

$$\int \frac{1}{1 + \sqrt{x}} dx = 2\sqrt{x} - 2 \log(\sqrt{x} + 1)$$

[In] integrate(1/(1+x^(1/2)),x, algorithm="fricas")

[Out] 2*sqrt(x) - 2*log(sqrt(x) + 1)

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.83

$$\int \frac{1}{1 + \sqrt{x}} dx = 2\sqrt{x} - 2 \log(\sqrt{x} + 1)$$

[In] integrate(1/(1+x**(1/2)),x)

[Out] 2*sqrt(x) - 2*log(sqrt(x) + 1)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.83

$$\int \frac{1}{1 + \sqrt{x}} dx = 2\sqrt{x} - 2 \log(\sqrt{x} + 1) + 2$$

[In] integrate(1/(1+x^(1/2)),x, algorithm="maxima")

[Out] 2*sqrt(x) - 2*log(sqrt(x) + 1) + 2

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.78

$$\int \frac{1}{1 + \sqrt{x}} dx = 2\sqrt{x} - 2 \log(\sqrt{x} + 1)$$

[In] integrate(1/(1+x^(1/2)),x, algorithm="giac")

[Out] 2*sqrt(x) - 2*log(sqrt(x) + 1)

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.78

$$\int \frac{1}{1 + \sqrt{x}} dx = 2\sqrt{x} - 2 \ln(\sqrt{x} + 1)$$

[In] int(1/(x^(1/2) + 1),x)

[Out] 2*x^(1/2) - 2*log(x^(1/2) + 1)

3.172 $\int e^{-x^2} \sin^2\left(\frac{\pi}{4} + x\right) dx$

| | |
|---|------|
| Optimal result | 1566 |
| Rubi [A] (verified) | 1566 |
| Mathematica [A] (verified) | 1567 |
| Maple [A] (verified) | 1567 |
| Fricas [A] (verification not implemented) | 1568 |
| Sympy [F] | 1568 |
| Maxima [A] (verification not implemented) | 1568 |
| Giac [F] | 1569 |
| Mupad [F(-1)] | 1569 |

Optimal result

Integrand size = 18, antiderivative size = 52

$$\int e^{-x^2} \sin^2\left(\frac{\pi}{4} + x\right) dx = \frac{1}{4}\sqrt{\pi}\operatorname{erf}(x) - \frac{\sqrt{\pi}\operatorname{erfi}(1 - ix)}{8e} - \frac{\sqrt{\pi}\operatorname{erfi}(1 + ix)}{8e}$$

[Out] 1/4*Pi^(1/2)*erf(x)+1/8*Pi^(1/2)*erfi(-1+I*x)*exp(-1)-1/8*Pi^(1/2)*erfi(1+I*x)*exp(-1)

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 52, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {4560, 2236, 2266}

$$\int e^{-x^2} \sin^2\left(\frac{\pi}{4} + x\right) dx = \frac{1}{4}\sqrt{\pi}\operatorname{erf}(x) - \frac{\sqrt{\pi}\operatorname{erfi}(1 - ix)}{8e} - \frac{\sqrt{\pi}\operatorname{erfi}(1 + ix)}{8e}$$

[In] Int[Sin[Pi/4 + x]^2/E^x^2,x]

[Out] (Sqrt[Pi]*Erf[x])/4 - (Sqrt[Pi]*Erfi[1 - I*x])/(8*E) - (Sqrt[Pi]*Erfi[1 + I*x])/(8*E)

Rule 2236

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_)) ^2), x_Symbol] := Simp[F^a*Sqrt[Pi]*(Erf[(c + d*x)*Rt[(-b)*Log[F], 2]]/(2*d*Rt[(-b)*Log[F], 2])), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 2266

`Int[(F_)^((a_.) + (b_.)*(x_) + (c_.)*(x_)^2), x_Symbol] := Dist[F^(a - b^2/(4*c)), Int[F^((b + 2*c*x)^2/(4*c)), x], x] /; FreeQ[{F, a, b, c}, x]`

Rule 4560

`Int[(F_)^(u_)*Sin[v_]^(n_), x_Symbol] := Int[ExpandTrigToExp[F^u, Sin[v]^n, x], x] /; FreeQ[F, x] && (LinearQ[u, x] || PolyQ[u, x, 2]) && (LinearQ[v, x] || PolyQ[v, x, 2]) && IGtQ[n, 0]`

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \left(\frac{e^{-x^2}}{2} + \frac{1}{4} i e^{-2ix-x^2} - \frac{1}{4} i e^{2ix-x^2} \right) dx \\
 &= \frac{1}{4} i \int e^{-2ix-x^2} dx - \frac{1}{4} i \int e^{2ix-x^2} dx + \frac{1}{2} \int e^{-x^2} dx \\
 &= \frac{1}{4} \sqrt{\pi} \operatorname{erf}(x) + \frac{i \int e^{-\frac{1}{4}(-2i-2x)^2} dx}{4e} - \frac{i \int e^{-\frac{1}{4}(2i-2x)^2} dx}{4e} \\
 &= \frac{1}{4} \sqrt{\pi} \operatorname{erf}(x) - \frac{\sqrt{\pi} \operatorname{erfi}(1-ix)}{8e} - \frac{\sqrt{\pi} \operatorname{erfi}(1+ix)}{8e}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.73

$$\int e^{-x^2} \sin^2 \left(\frac{\pi}{4} + x \right) dx = \frac{\sqrt{\pi} (2e \operatorname{erf}(x) - \operatorname{erfi}(1-ix) - \operatorname{erfi}(1+ix))}{8e}$$

[In] `Integrate[Sin[Pi/4 + x]^2/E^x^2,x]`

[Out] `(Sqrt[Pi]*(2*E*Erf[x] - Erfi[1 - I*x] - Erfi[1 + I*x]))/(8*E)`

Maple [A] (verified)

Time = 0.17 (sec) , antiderivative size = 35, normalized size of antiderivative = 0.67

| method | result | size |
|--------|---|------|
| risch | $\frac{i\sqrt{\pi}e^{-1}\operatorname{erf}(i+x)}{8} - \frac{i\sqrt{\pi}e^{-1}\operatorname{erf}(x-i)}{8} + \frac{\sqrt{\pi}\operatorname{erf}(x)}{4}$ | 35 |

[In] `int(sin(x+1/4*Pi)^2/exp(x^2),x,method=_RETURNVERBOSE)`

[Out] `1/8*I*Pi^(1/2)*exp(-1)*erf(I+x)-1/8*I*Pi^(1/2)*exp(-1)*erf(x-I)+1/4*Pi^(1/2)*erf(x)`

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 43, normalized size of antiderivative = 0.83

$$\int e^{-x^2} \sin^2\left(\frac{\pi}{4} + x\right) dx$$

$$= \frac{1}{8} \sqrt{\pi} \left(\left(\operatorname{erf}(-x + i) e^{\frac{1}{2}i\pi-1} + 2 \operatorname{erf}(x) \right) e^{\frac{1}{2}i\pi+1} - \operatorname{erf}(x + i) \right) e^{(-\frac{1}{2}i\pi-1)}$$

[In] integrate(sin(x+1/4*pi)^2/exp(x^2),x, algorithm="fricas")

[Out] 1/8*sqrt(pi)*((erf(-x + I))*e^(1/2*I*pi - 1) + 2*erf(x))*e^(1/2*I*pi + 1) - erf(x + I))*e^(-1/2*I*pi - 1)

Sympy [F]

$$\int e^{-x^2} \sin^2\left(\frac{\pi}{4} + x\right) dx = \int e^{-x^2} \sin^2\left(x + \frac{\pi}{4}\right) dx$$

[In] integrate(sin(x+1/4*pi)**2/exp(x**2),x)

[Out] Integral(exp(-x**2)*sin(x + pi/4)**2, x)

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.50

$$\int e^{-x^2} \sin^2\left(\frac{\pi}{4} + x\right) dx = \frac{1}{8} \sqrt{\pi} (2 \operatorname{erf}(x) e + i \operatorname{erf}(x + i) - i \operatorname{erf}(x - i)) e^{(-1)}$$

[In] integrate(sin(x+1/4*pi)^2/exp(x^2),x, algorithm="maxima")

[Out] 1/8*sqrt(pi)*(2*erf(x)*e + I*erf(x + I) - I*erf(x - I))*e^(-1)

Giac [F]

$$\int e^{-x^2} \sin^2\left(\frac{\pi}{4} + x\right) dx = \int e^{(-x^2)} \sin\left(\frac{1}{4}\pi + x\right)^2 dx$$

[In] integrate(sin(x+1/4*pi)^2/exp(x^2),x, algorithm="giac")

[Out] integrate(e^(-x^2)*sin(1/4*pi + x)^2, x)

Mupad [F(-1)]

Timed out.

$$\int e^{-x^2} \sin^2\left(\frac{\pi}{4} + x\right) dx = \int e^{-x^2} \sin\left(\frac{\Pi}{4} + x\right)^2 dx$$

[In] int(exp(-x^2)*sin(Pi/4 + x)^2,x)

[Out] int(exp(-x^2)*sin(Pi/4 + x)^2, x)

3.173 $\int 3e^{-2x^3-x^6} x^2(1+x^3)^2 dx$

| | |
|---|------|
| Optimal result | 1570 |
| Rubi [A] (verified) | 1570 |
| Mathematica [A] (verified) | 1571 |
| Maple [F] | 1572 |
| Fricas [A] (verification not implemented) | 1572 |
| Sympy [F] | 1572 |
| Maxima [C] (verification not implemented) | 1572 |
| Giac [A] (verification not implemented) | 1573 |
| Mupad [B] (verification not implemented) | 1573 |

Optimal result

Integrand size = 25, antiderivative size = 39

$$\int 3e^{-2x^3-x^6} x^2(1+x^3)^2 dx = -\frac{1}{2}e^{-2x^3-x^6}(1+x^3) + \frac{1}{4}e\sqrt{\pi}\operatorname{erf}(1+x^3)$$

[Out] $-1/2*\exp(-x^6-2*x^3)*(x^3+1)+1/4*\exp(1)*\text{Pi}^{(1/2)}*\operatorname{erf}(x^3+1)$

Rubi [A] (verified)

Time = 0.22 (sec), antiderivative size = 39, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.200$, Rules used = {12, 6847, 2269, 2266, 2236}

$$\int 3e^{-2x^3-x^6} x^2(1+x^3)^2 dx = \frac{1}{4}e\sqrt{\pi}\operatorname{erf}(x^3+1) - \frac{1}{2}e^{-x^6-2x^3}(x^3+1)$$

[In] $\text{Int}[3*\text{E}^{(-2*x^3 - x^6)}*x^2*(1 + x^3)^2, x]$

[Out] $-1/2*(\text{E}^{(-2*x^3 - x^6)}*(1 + x^3)) + (\text{E}*\text{Sqrt}[\text{Pi}]*\text{Erf}[1 + x^3])/4$

Rule 12

$\text{Int}[(a_*)*(u_*), x_Symbol] \rightarrow \text{Dist}[a, \text{Int}[u, x], x] /; \text{FreeQ}[a, x] \ \&\& \ !\text{Match} \text{Q}[u, (b_*)*(v_*)] /; \text{FreeQ}[b, x]$

Rule 2236

$\text{Int}[(F_)^((a_*) + (b_*)*((c_*) + (d_*)*(x_*))^2), x_Symbol] \rightarrow \text{Simp}[F^a*\text{Sqrt}[\text{Pi}]*(\text{Erf}[(c + d*x)*\text{Rt}[(-b)*\text{Log}[F], 2]]/(2*d*\text{Rt}[(-b)*\text{Log}[F], 2])), x] /; \text{FreeQ}[\{F, a, b, c, d\}, x] \ \&\& \ \text{NegQ}[b]$

Rule 2266

Int[(F_)^((a_.) + (b_.)*(x_) + (c_.)*(x_)^2), x_Symbol] := Dist[F^(a - b^2/(4*c)), Int[F^((b + 2*c*x)^2/(4*c)), x], x] /; FreeQ[{F, a, b, c}, x]

Rule 2269

Int[(F_)^((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)*((d_.) + (e_.)*(x_))^(m_), x_Symbol] := Simp[e*(d + e*x)^(m - 1)*(F^(a + b*x + c*x^2)/(2*c*Log[F])), x] - Dist[(m - 1)*(e^2/(2*c*Log[F])), Int[(d + e*x)^(m - 2)*F^(a + b*x + c*x^2), x], x] /; FreeQ[{F, a, b, c, d, e}, x] && EqQ[b*e - 2*c*d, 0] && GtQ[m, 1]

Rule 6847

Int[(u_)*(x_)^(m_.), x_Symbol] := Dist[1/(m + 1), Subst[Int[SubstFor[x^(m + 1), u, x], x], x, x^(m + 1)], x] /; FreeQ[m, x] && NeQ[m, -1] && FunctionOfQ[x^(m + 1), u, x]

Rubi steps

$$\begin{aligned}
 \text{integral} &= 3 \int e^{-2x^3-x^6} x^2 (1+x^3)^2 dx \\
 &= \text{Subst} \left(\int e^{-2x-x^2} (1+x)^2 dx, x, x^3 \right) \\
 &= -\frac{1}{2} e^{-2x^3-x^6} (1+x^3) + \frac{1}{2} \text{Subst} \left(\int e^{-2x-x^2} dx, x, x^3 \right) \\
 &= -\frac{1}{2} e^{-2x^3-x^6} (1+x^3) + \frac{1}{2} e \text{Subst} \left(\int e^{-\frac{1}{4}(-2-2x)^2} dx, x, x^3 \right) \\
 &= -\frac{1}{2} e^{-2x^3-x^6} (1+x^3) + \frac{1}{4} e \sqrt{\pi} \text{erf}(1+x^3)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.70 (sec) , antiderivative size = 37, normalized size of antiderivative = 0.95

$$\int 3e^{-2x^3-x^6} x^2 (1+x^3)^2 dx = \frac{1}{4} \left(-2e^{-x^3(2+x^3)} (1+x^3) + e\sqrt{\pi} \text{erf}(1+x^3) \right)$$

[In] Integrate[3*E^(-2*x^3 - x^6)*x^2*(1 + x^3)^2,x]

[Out] ((-2*(1 + x^3))/E^(x^3*(2 + x^3)) + E*Sqrt[Pi]*Erf[1 + x^3])/4

Maple [F]

$$\int 3x^2(x^3 + 1)^2 e^{-x^6 - 2x^3} dx$$

[In] `int(3*x^2*(x^3+1)^2*exp(-x^6-2*x^3),x)`

[Out] `int(3*x^2*(x^3+1)^2*exp(-x^6-2*x^3),x)`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 33, normalized size of antiderivative = 0.85

$$\int 3e^{-2x^3-x^6} x^2(1+x^3)^2 dx = \frac{1}{4} \sqrt{\pi} \operatorname{erf}(x^3+1) e - \frac{1}{2} (x^3+1) e^{-(x^6-2x^3)}$$

[In] `integrate(3*x^2*(x^3+1)^2*exp(-x^6-2*x^3),x, algorithm="fricas")`

[Out] `1/4*sqrt(pi)*erf(x^3 + 1)*e - 1/2*(x^3 + 1)*e^(-x^6 - 2*x^3)`

Sympy [F]

$$\int 3e^{-2x^3-x^6} x^2(1+x^3)^2 dx = 3 \left(\int x^2 e^{-2x^3} e^{-x^6} dx + \int 2x^5 e^{-2x^3} e^{-x^6} dx + \int x^8 e^{-2x^3} e^{-x^6} dx \right)$$

[In] `integrate(3*x**2*(x**3+1)**2*exp(-x**6-2*x**3),x)`

[Out] `3*(Integral(x**2*exp(-2*x**3)*exp(-x**6), x) + Integral(2*x**5*exp(-2*x**3)*exp(-x**6), x) + Integral(x**8*exp(-2*x**3)*exp(-x**6), x))`

Maxima [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.33 (sec) , antiderivative size = 137, normalized size of antiderivative = 3.51

$$\int 3e^{-2x^3-x^6} x^2(1+x^3)^2 dx = \frac{1}{2} \sqrt{\pi} \operatorname{erf}(x^3+1) e + \frac{1}{2} i \left(\frac{i(x^3+1)^3 \Gamma\left(\frac{3}{2}, (x^3+1)^2\right)}{((x^3+1)^2)^{\frac{3}{2}}} - \frac{i\sqrt{\pi}(x^3+1) \left(\operatorname{erf}\left(\sqrt{(x^3+1)^2}\right) - 1 \right)}{\sqrt{(x^3+1)^2}} - 2i e^{-(x^3+1)^2} \right) e + i \left(\frac{i\sqrt{\pi}(x^3+1) \left(\operatorname{erf}\left(\sqrt{(x^3+1)^2}\right) - 1 \right)}{\sqrt{(x^3+1)^2}} + i e^{-(x^3+1)^2} \right) e$$

[In] integrate(3*x^2*(x^3+1)^2*exp(-x^6-2*x^3),x, algorithm="maxima")

[Out] 1/2*sqrt(pi)*erf(x^3 + 1)*e + 1/2*I*(I*(x^3 + 1)^3*gamma(3/2, (x^3 + 1)^2)/((x^3 + 1)^2)^(3/2) - I*sqrt(pi)*(x^3 + 1)*(erf(sqrt((x^3 + 1)^2)) - 1)/sqrt((x^3 + 1)^2) - 2*I*e^(-(x^3 + 1)^2))*e + I*(I*sqrt(pi)*(x^3 + 1)*(erf(sqrt((x^3 + 1)^2)) - 1)/sqrt((x^3 + 1)^2) + I*e^(-(x^3 + 1)^2))*e

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 33, normalized size of antiderivative = 0.85

$$\int 3e^{-2x^3-x^6} x^2(1+x^3)^2 dx = \frac{1}{4} \sqrt{\pi} \operatorname{erf}(x^3+1) e - \frac{1}{2} (x^3+1) e^{(-x^6-2x^3)}$$

[In] integrate(3*x^2*(x^3+1)^2*exp(-x^6-2*x^3),x, algorithm="giac")

[Out] 1/4*sqrt(pi)*erf(x^3 + 1)*e - 1/2*(x^3 + 1)*e^(-x^6 - 2*x^3)

Mupad [B] (verification not implemented)

Time = 14.61 (sec) , antiderivative size = 45, normalized size of antiderivative = 1.15

$$\int 3e^{-2x^3-x^6} x^2(1+x^3)^2 dx = \frac{\sqrt{\pi} e \operatorname{erf}(x^3+1)}{4} - \frac{x^3 e^{-x^6-2x^3}}{2} - \frac{e^{-x^6-2x^3}}{2}$$

[In] int(3*x^2*exp(- 2*x^3 - x^6)*(x^3 + 1)^2,x)

[Out] (pi^(1/2)*exp(1)*erf(x^3 + 1))/4 - (x^3*exp(- 2*x^3 - x^6))/2 - exp(- 2*x^3 - x^6)/2

3.174 $\int e^{2x} \cos(3x) dx$

| | |
|---|------|
| Optimal result | 1574 |
| Rubi [A] (verified) | 1574 |
| Mathematica [A] (verified) | 1575 |
| Maple [A] (verified) | 1575 |
| Fricas [A] (verification not implemented) | 1575 |
| Sympy [A] (verification not implemented) | 1576 |
| Maxima [A] (verification not implemented) | 1576 |
| Giac [A] (verification not implemented) | 1576 |
| Mupad [B] (verification not implemented) | 1576 |

Optimal result

Integrand size = 10, antiderivative size = 27

$$\int e^{2x} \cos(3x) dx = \frac{2}{13} e^{2x} \cos(3x) + \frac{3}{13} e^{2x} \sin(3x)$$

[Out] 2/13*exp(2*x)*cos(3*x)+3/13*exp(2*x)*sin(3*x)

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 27, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.100$, Rules used = {4518}

$$\int e^{2x} \cos(3x) dx = \frac{3}{13} e^{2x} \sin(3x) + \frac{2}{13} e^{2x} \cos(3x)$$

[In] Int[E^(2*x)*Cos[3*x], x]

[Out] (2*E^(2*x)*Cos[3*x])/13 + (3*E^(2*x)*Sin[3*x])/13

Rule 4518

```
Int[Cos[(d_.) + (e_.)*(x_)]*(F_)^((c_.)*((a_.) + (b_.)*(x_))), x_Symbol] :>
Simp[b*c*Log[F]*F^(c*(a + b*x))*(Cos[d + e*x]/(e^2 + b^2*c^2*Log[F]^2)), x
] + Simp[e*F^(c*(a + b*x))*(Sin[d + e*x]/(e^2 + b^2*c^2*Log[F]^2)), x] /; F
reeQ[{F, a, b, c, d, e}, x] && NeQ[e^2 + b^2*c^2*Log[F]^2, 0]
```

Rubi steps

$$\text{integral} = \frac{2}{13} e^{2x} \cos(3x) + \frac{3}{13} e^{2x} \sin(3x)$$

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.81

$$\int e^{2x} \cos(3x) dx = \frac{1}{13} e^{2x} (2 \cos(3x) + 3 \sin(3x))$$

[In] Integrate[E^(2*x)*Cos[3*x],x]

[Out] (E^(2*x)*(2*Cos[3*x] + 3*Sin[3*x]))/13

Maple [A] (verified)

Time = 0.07 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.74

| method | result | size |
|---------------|--|------|
| parallelrisch | $\frac{e^{2x}(2 \cos(3x) + 3 \sin(3x))}{13}$ | 20 |
| default | $\frac{2 e^{2x} \cos(3x)}{13} + \frac{3 e^{2x} \sin(3x)}{13}$ | 22 |
| risch | $\frac{e^{(2+3i)x}}{13} - \frac{3ie^{(2+3i)x}}{26} + \frac{e^{(2-3i)x}}{13} + \frac{3ie^{(2-3i)x}}{26}$ | 36 |
| norman | $\frac{6 e^{2x} \tan\left(\frac{3x}{2}\right) - \frac{2 e^{2x} \tan\left(\frac{3x}{2}\right)^2}{13} + \frac{2 e^{2x}}{13}}{1 + \tan\left(\frac{3x}{2}\right)^2}$ | 41 |

[In] int(exp(2*x)*cos(3*x),x,method=_RETURNVERBOSE)

[Out] 1/13*exp(2*x)*(2*cos(3*x)+3*sin(3*x))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.78

$$\int e^{2x} \cos(3x) dx = \frac{2}{13} \cos(3x) e^{(2x)} + \frac{3}{13} e^{(2x)} \sin(3x)$$

[In] integrate(exp(2*x)*cos(3*x),x, algorithm="fricas")

[Out] 2/13*cos(3*x)*e^(2*x) + 3/13*e^(2*x)*sin(3*x)

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.96

$$\int e^{2x} \cos(3x) dx = \frac{3e^{2x} \sin(3x)}{13} + \frac{2e^{2x} \cos(3x)}{13}$$

[In] integrate(exp(2*x)*cos(3*x),x)

[Out] 3*exp(2*x)*sin(3*x)/13 + 2*exp(2*x)*cos(3*x)/13

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int e^{2x} \cos(3x) dx = \frac{1}{13} (2 \cos(3x) + 3 \sin(3x))e^{(2x)}$$

[In] integrate(exp(2*x)*cos(3*x),x, algorithm="maxima")

[Out] 1/13*(2*cos(3*x) + 3*sin(3*x))*e^(2*x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int e^{2x} \cos(3x) dx = \frac{1}{13} (2 \cos(3x) + 3 \sin(3x))e^{(2x)}$$

[In] integrate(exp(2*x)*cos(3*x),x, algorithm="giac")

[Out] 1/13*(2*cos(3*x) + 3*sin(3*x))*e^(2*x)

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.70

$$\int e^{2x} \cos(3x) dx = \frac{e^{2x} (2 \cos(3x) + 3 \sin(3x))}{13}$$

[In] int(cos(3*x)*exp(2*x),x)

[Out] (exp(2*x)*(2*cos(3*x) + 3*sin(3*x)))/13

3.175 $\int \cos^{\cos(x)}(x)(1 + \log(\cos(x))) \sin(x) dx$

| | |
|---|------|
| Optimal result | 1577 |
| Rubi [A] (verified) | 1577 |
| Mathematica [A] (verified) | 1578 |
| Maple [F] | 1578 |
| Fricas [A] (verification not implemented) | 1579 |
| Sympy [F] | 1579 |
| Maxima [A] (verification not implemented) | 1579 |
| Giac [F] | 1579 |
| Mupad [B] (verification not implemented) | 1580 |

Optimal result

Integrand size = 13, antiderivative size = 7

$$\int \cos^{\cos(x)}(x)(1 + \log(\cos(x))) \sin(x) dx = -\cos^{\cos(x)}(x)$$

[Out] $-\cos(x)^{\cos(x)}$

Rubi [A] (verified)

Time = 0.05 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.231$, Rules used = {4420, 6874, 2633}

$$\int \cos^{\cos(x)}(x)(1 + \log(\cos(x))) \sin(x) dx = -\cos^{\cos(x)}(x)$$

[In] `Int[Cos[x]^Cos[x]*(1 + Log[Cos[x]])*Sin[x], x]`

[Out] $-\text{Cos}[x]^{\text{Cos}[x]}$

Rule 2633

`Int[Log[u]*(u)^((a_.)*(x_)), x_Symbol] := Simp[u^(a*x)/a, x] - Int[SimplifyIntegrand[x*u^(a*x - 1)*D[u, x], x], x] /; FreeQ[a, x] && InverseFunctionFreeQ[u, x]`

Rule 4420

`Int[(u_)*(F_)[(c_.)*((a_.) + (b_.)*(x_))], x_Symbol] := With[{d = FreeFactors[Cos[c*(a + b*x)], x]}, Dist[-d/(b*c), Subst[Int[SubstFor[1, Cos[c*(a + b*x)]]/d, u, x], x], x, Cos[c*(a + b*x)]/d, x] /; FunctionOfQ[Cos[c*(a + b*x)`

```
)]/d, u, x, True]] /; FreeQ[{a, b, c}, x] && (EqQ[F, Sin] || EqQ[F, sin])
```

Rule 6874

```
Int[u_, x_Symbol] :=> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= -\text{Subst}\left(\int x^x(1 + \log(x)) dx, x, \cos(x)\right) \\
 &= -\text{Subst}\left(\int (x^x + x^x \log(x)) dx, x, \cos(x)\right) \\
 &= -\text{Subst}\left(\int x^x dx, x, \cos(x)\right) - \text{Subst}\left(\int x^x \log(x) dx, x, \cos(x)\right) \\
 &= -\cos^{\cos(x)}(x)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \cos^{\cos(x)}(x)(1 + \log(\cos(x))) \sin(x) dx = -\cos^{\cos(x)}(x)$$

```
[In] Integrate[Cos[x]^Cos[x]*(1 + Log[Cos[x]])*Sin[x], x]
```

```
[Out] -Cos[x]^Cos[x]
```

Maple [F]

$$\int \cos(x)^{1+\cos(x)} \tan(x) (1 + \ln(\cos(x))) dx$$

```
[In] int(cos(x)^(1+cos(x))*tan(x)*(1+ln(cos(x))), x)
```

```
[Out] int(cos(x)^(1+cos(x))*tan(x)*(1+ln(cos(x))), x)
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.86

$$\int \cos^{\cos(x)}(x)(1 + \log(\cos(x))) \sin(x) dx = -\frac{\cos(x)^{\cos(x)+1}}{\cos(x)}$$

[In] integrate(cos(x)^(1+cos(x))*tan(x)*(1+log(cos(x))),x, algorithm="fricas")

[Out] -cos(x)^(cos(x) + 1)/cos(x)

Sympy [F]

$$\int \cos^{\cos(x)}(x)(1 + \log(\cos(x))) \sin(x) dx = \int (\log(\cos(x)) + 1) \cos^{\cos(x)+1}(x) \tan(x) dx$$

[In] integrate(cos(x)**(1+cos(x))*tan(x)*(1+ln(cos(x))),x)

[Out] Integral((log(cos(x)) + 1)*cos(x)**(cos(x) + 1)*tan(x), x)

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \cos^{\cos(x)}(x)(1 + \log(\cos(x))) \sin(x) dx = -\cos(x)^{\cos(x)}$$

[In] integrate(cos(x)^(1+cos(x))*tan(x)*(1+log(cos(x))),x, algorithm="maxima")

[Out] -cos(x)^cos(x)

Giac [F]

$$\int \cos^{\cos(x)}(x)(1 + \log(\cos(x))) \sin(x) dx = \int \cos(x)^{\cos(x)+1} (\log(\cos(x)) + 1) \tan(x) dx$$

[In] integrate(cos(x)^(1+cos(x))*tan(x)*(1+log(cos(x))),x, algorithm="giac")

[Out] integrate(cos(x)^(cos(x) + 1)*(log(cos(x)) + 1)*tan(x), x)

Mupad [B] (verification not implemented)

Time = 17.65 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \cos^{\cos(x)}(x)(1 + \log(\cos(x))) \sin(x) dx = -\cos(x)^{\cos(x)}$$

[In] `int(cos(x)^(cos(x) + 1)*tan(x)*(log(cos(x)) + 1),x)`

[Out] `-cos(x)^cos(x)`

3.176 $\int \frac{e^x}{2+e^x} dx$

| | | |
|---|-----------|------|
| Optimal result | | 1581 |
| Rubi [A] (verified) | | 1581 |
| Mathematica [A] (verified) | | 1582 |
| Maple [A] (verified) | | 1582 |
| Fricas [A] (verification not implemented) | | 1582 |
| Sympy [A] (verification not implemented) | | 1583 |
| Maxima [A] (verification not implemented) | | 1583 |
| Giac [A] (verification not implemented) | | 1583 |
| Mupad [B] (verification not implemented) | | 1583 |

Optimal result

Integrand size = 11, antiderivative size = 6

$$\int \frac{e^x}{2+e^x} dx = \log(2+e^x)$$

[Out] ln(exp(x)+2)

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {2278, 31}

$$\int \frac{e^x}{2+e^x} dx = \log(e^x+2)$$

[In] Int[E^x/(2 + E^x),x]

[Out] Log[2 + E^x]

Rule 31

Int[((a_) + (b_)*(x_))^(n_), x_Symbol] := Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 2278

Int[((F_)^((e_)*((c_) + (d_)*(x_))))^(n_)*((a_) + (b_)*((F_)^((e_)*((c_) + (d_)*(x_))))^(n_))^(p_), x_Symbol] := Dist[1/(d*e*n*Log[F]), Subst[Int[(a + b*x)^p, x], x, (F^(e*(c + d*x)))^n], x] /; FreeQ[{F, a, b, c, d, e, n, p}, x]

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{1}{2+x} dx, x, e^x\right) \\ &= \log(2 + e^x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \frac{e^x}{2 + e^x} dx = \log(2 + e^x)$$

[In] Integrate[E^x/(2 + E^x), x]

[Out] Log[2 + E^x]

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

| method | result | size |
|-------------------|----------------|------|
| derivativedivides | $\ln(e^x + 2)$ | 6 |
| default | $\ln(e^x + 2)$ | 6 |
| norman | $\ln(e^x + 2)$ | 6 |
| risch | $\ln(e^x + 2)$ | 6 |
| parallelrisc | $\ln(e^x + 2)$ | 6 |

[In] int(exp(x)/(exp(x)+2), x, method=_RETURNVERBOSE)

[Out] ln(exp(x)+2)

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int \frac{e^x}{2 + e^x} dx = \log(e^x + 2)$$

[In] integrate(exp(x)/(exp(x)+2), x, algorithm="fricas")

[Out] log(e^x + 2)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int \frac{e^x}{2 + e^x} dx = \log(e^x + 2)$$

[In] integrate(exp(x)/(exp(x)+2),x)

[Out] log(exp(x) + 2)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int \frac{e^x}{2 + e^x} dx = \log(e^x + 2)$$

[In] integrate(exp(x)/(exp(x)+2),x, algorithm="maxima")

[Out] log(e^x + 2)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int \frac{e^x}{2 + e^x} dx = \log(e^x + 2)$$

[In] integrate(exp(x)/(exp(x)+2),x, algorithm="giac")

[Out] log(e^x + 2)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int \frac{e^x}{2 + e^x} dx = \ln(e^x + 2)$$

[In] int(exp(x)/(exp(x) + 2),x)

[Out] log(exp(x) + 2)

3.177 $\int \sin(2018x) dx$

| | |
|---|------|
| Optimal result | 1584 |
| Rubi [A] (verified) | 1584 |
| Mathematica [A] (verified) | 1585 |
| Maple [A] (verified) | 1585 |
| Fricas [A] (verification not implemented) | 1585 |
| Sympy [A] (verification not implemented) | 1586 |
| Maxima [A] (verification not implemented) | 1586 |
| Giac [A] (verification not implemented) | 1586 |
| Mupad [B] (verification not implemented) | 1586 |

Optimal result

Integrand size = 4, antiderivative size = 8

$$\int \sin(2018x) dx = -\frac{\cos(2018x)}{2018}$$

[Out] -1/2018*cos(2018*x)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {2718}

$$\int \sin(2018x) dx = -\frac{\cos(2018x)}{2018}$$

[In] Int[Sin[2018*x],x]

[Out] -1/2018*Cos[2018*x]

Rule 2718

Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Cos[c + d*x]/d, x] /; FreeQ[{c, d}, x]

Rubi steps

$$\text{integral} = -\frac{\cos(2018x)}{2018}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \sin(2018x) dx = -\frac{\cos(2018x)}{2018}$$

[In] Integrate[Sin[2018*x],x]

[Out] -1/2018*Cos[2018*x]

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

| method | result | size |
|-------------------|--|------|
| derivativedivides | $-\frac{\cos(2018x)}{2018}$ | 7 |
| default | $-\frac{\cos(2018x)}{2018}$ | 7 |
| risch | $-\frac{\cos(2018x)}{2018}$ | 7 |
| parallelrisc | $-\frac{\cos(2018x)}{2018} - \frac{1}{2018}$ | 9 |
| norman | $-\frac{1}{1009(1+\tan(1009x)^2)}$ | 13 |
| meijerg | $\frac{\sqrt{\pi} \left(\frac{1}{\sqrt{\pi}} - \frac{\cos(2018x)}{\sqrt{\pi}} \right)}{2018}$ | 19 |

[In] int(sin(2018*x),x,method=_RETURNVERBOSE)

[Out] -1/2018*cos(2018*x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \sin(2018x) dx = -\frac{1}{2018} \cos(2018x)$$

[In] integrate(sin(2018*x),x, algorithm="fricas")

[Out] -1/2018*cos(2018*x)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int \sin(2018x) dx = -\frac{\cos(2018x)}{2018}$$

[In] integrate(sin(2018*x),x)

[Out] -cos(2018*x)/2018

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \sin(2018x) dx = -\frac{1}{2018} \cos(2018x)$$

[In] integrate(sin(2018*x),x, algorithm="maxima")

[Out] -1/2018*cos(2018*x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \sin(2018x) dx = -\frac{1}{2018} \cos(2018x)$$

[In] integrate(sin(2018*x),x, algorithm="giac")

[Out] -1/2018*cos(2018*x)

Mupad [B] (verification not implemented)

Time = 13.96 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \sin(2018x) dx = -\frac{\cos(2018x)}{2018}$$

[In] int(sin(2018*x),x)

[Out] -cos(2018*x)/2018

3.178 $\int \frac{1}{\cot(x)+\tan(x)} dx$

| | |
|---|------|
| Optimal result | 1587 |
| Rubi [A] (verified) | 1587 |
| Mathematica [A] (verified) | 1588 |
| Maple [A] (verified) | 1588 |
| Fricas [B] (verification not implemented) | 1588 |
| Sympy [A] (verification not implemented) | 1589 |
| Maxima [A] (verification not implemented) | 1589 |
| Giac [A] (verification not implemented) | 1589 |
| Mupad [B] (verification not implemented) | 1589 |

Optimal result

Integrand size = 7, antiderivative size = 8

$$\int \frac{1}{\cot(x) + \tan(x)} dx = \frac{\sin^2(x)}{2}$$

[Out] 1/2*sin(x)^2

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.143$, Rules used = {267}

$$\int \frac{1}{\cot(x) + \tan(x)} dx = -\frac{1}{2} \cos^2(x)$$

[In] Int[(Cot[x] + Tan[x])^(-1),x]

[Out] -1/2*Cos[x]^2

Rule 267

Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] :> Simp[(a + b*x^n)^(p + 1)/(b*n*(p + 1)), x] /; FreeQ[{a, b, m, n, p}, x] && EqQ[m, n - 1] && NeQ[p, -1]

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{x}{(1+x^2)^2} dx, x, \tan(x)\right) \\ &= -\frac{1}{2} \cos^2(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \frac{1}{\cot(x) + \tan(x)} dx = -\frac{1}{2} \cos^2(x)$$

[In] Integrate[(Cot[x] + Tan[x])^(-1), x]

[Out] -1/2*Cos[x]^2

Maple [A] (verified)

Time = 0.06 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

| method | result | size |
|---------------|-------------------------------------|------|
| default | $-\frac{\cos(x)^2}{2}$ | 7 |
| risch | $-\frac{\cos(2x)}{4}$ | 7 |
| parallelrisch | $-\frac{\cos(2x)}{4} - \frac{1}{4}$ | 9 |
| norman | $-\frac{1}{2(1+\tan(x)^2)}$ | 11 |

[In] int(1/(tan(x)+cot(x)), x, method=_RETURNVERBOSE)

[Out] -1/2*cos(x)^2

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 16 vs. 2(6) = 12.

Time = 0.26 (sec) , antiderivative size = 16, normalized size of antiderivative = 2.00

$$\int \frac{1}{\cot(x) + \tan(x)} dx = \frac{\tan(x)^2 - 1}{4(\tan(x)^2 + 1)}$$

[In] integrate(1/(tan(x)+cot(x)), x, algorithm="fricas")

[Out] 1/4*(tan(x)^2 - 1)/(tan(x)^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.25

$$\int \frac{1}{\cot(x) + \tan(x)} dx = -\frac{1}{2 \tan^2(x) + 2}$$

[In] integrate(1/(tan(x)+cot(x)),x)

[Out] -1/(2*tan(x)**2 + 2)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.25

$$\int \frac{1}{\cot(x) + \tan(x)} dx = -\frac{1}{2 (\tan(x)^2 + 1)}$$

[In] integrate(1/(tan(x)+cot(x)),x, algorithm="maxima")

[Out] -1/2/(tan(x)^2 + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{1}{\cot(x) + \tan(x)} dx = -\frac{1}{2} \cos(x)^2$$

[In] integrate(1/(tan(x)+cot(x)),x, algorithm="giac")

[Out] -1/2*cos(x)^2

Mupad [B] (verification not implemented)

Time = 13.52 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{1}{\cot(x) + \tan(x)} dx = \frac{\sin(x)^2}{2}$$

[In] int(1/(cot(x) + tan(x)),x)

[Out] sin(x)^2/2

3.179 $\int \frac{x^5}{2+x^{12}} dx$

| | |
|---|------|
| Optimal result | 1590 |
| Rubi [A] (verified) | 1590 |
| Mathematica [A] (verified) | 1591 |
| Maple [A] (verified) | 1591 |
| Fricas [A] (verification not implemented) | 1592 |
| Sympy [A] (verification not implemented) | 1592 |
| Maxima [A] (verification not implemented) | 1592 |
| Giac [A] (verification not implemented) | 1592 |
| Mupad [B] (verification not implemented) | 1593 |

Optimal result

Integrand size = 11, antiderivative size = 19

$$\int \frac{x^5}{2+x^{12}} dx = \frac{\arctan\left(\frac{x^6}{\sqrt{2}}\right)}{6\sqrt{2}}$$

[Out] 1/12*arctan(1/2*2^(1/2)*x^6)*2^(1/2)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {281, 209}

$$\int \frac{x^5}{2+x^{12}} dx = \frac{\arctan\left(\frac{x^6}{\sqrt{2}}\right)}{6\sqrt{2}}$$

[In] Int[x^5/(2 + x^12),x]

[Out] ArcTan[x^6/Sqrt[2]]/(6*Sqrt[2])

Rule 209

Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])

Rule 281

Int[(x_)^(m_)*((a_) + (b_)*(x_)^(n_))^(p_), x_Symbol] := With[{k = GCD[m + 1, n]}, Dist[1/k, Subst[Int[x^((m + 1)/k - 1)*(a + b*x^(n/k))^p, x], x, x

$x^k], x] /; k \neq 1] /; \text{FreeQ}[\{a, b, p\}, x] \ \&\& \ \text{IGtQ}[n, 0] \ \&\& \ \text{IntegerQ}[m]$

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{6} \text{Subst} \left(\int \frac{1}{2+x^2} dx, x, x^6 \right) \\ &= \frac{\arctan \left(\frac{x^6}{\sqrt{2}} \right)}{6\sqrt{2}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int \frac{x^5}{2+x^{12}} dx = \frac{\arctan \left(\frac{x^6}{\sqrt{2}} \right)}{6\sqrt{2}}$$

[In] Integrate[x^5/(2 + x^12),x]

[Out] ArcTan[x^6/Sqrt[2]]/(6*Sqrt[2])

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.79

| method | result | size |
|---------|---|------|
| default | $\frac{\arctan \left(\frac{x^6 \sqrt{2}}{2} \right) \sqrt{2}}{12}$ | 15 |
| meijerg | $\frac{\arctan \left(\frac{x^6 \sqrt{2}}{2} \right) \sqrt{2}}{12}$ | 15 |
| risch | $\frac{\arctan \left(\frac{x^6 \sqrt{2}}{2} \right) \sqrt{2}}{12}$ | 15 |

[In] int(x^5/(x^12+2),x,method=_RETURNVERBOSE)

[Out] 1/12*arctan(1/2*x^6*2^(1/2))*2^(1/2)

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.74

$$\int \frac{x^5}{2+x^{12}} dx = \frac{1}{12} \sqrt{2} \arctan \left(\frac{1}{2} \sqrt{2} x^6 \right)$$

[In] integrate(x^5/(x^12+2),x, algorithm="fricas")

[Out] 1/12*sqrt(2)*arctan(1/2*sqrt(2)*x^6)

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.89

$$\int \frac{x^5}{2+x^{12}} dx = \frac{\sqrt{2} \operatorname{atan} \left(\frac{\sqrt{2} x^6}{2} \right)}{12}$$

[In] integrate(x**5/(x**12+2),x)

[Out] sqrt(2)*atan(sqrt(2)*x**6/2)/12

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.74

$$\int \frac{x^5}{2+x^{12}} dx = \frac{1}{12} \sqrt{2} \arctan \left(\frac{1}{2} \sqrt{2} x^6 \right)$$

[In] integrate(x^5/(x^12+2),x, algorithm="maxima")

[Out] 1/12*sqrt(2)*arctan(1/2*sqrt(2)*x^6)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.74

$$\int \frac{x^5}{2+x^{12}} dx = \frac{1}{12} \sqrt{2} \arctan \left(\frac{1}{2} \sqrt{2} x^6 \right)$$

[In] integrate(x^5/(x^12+2),x, algorithm="giac")

[Out] 1/12*sqrt(2)*arctan(1/2*sqrt(2)*x^6)

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.74

$$\int \frac{x^5}{2+x^{12}} dx = \frac{\sqrt{2} \operatorname{atan}\left(\frac{\sqrt{2}x^6}{2}\right)}{12}$$

[In] int(x^5/(x^12 + 2),x)

[Out] (2^(1/2)*atan((2^(1/2)*x^6)/2))/12

3.180 $\int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx$

| | |
|---|------|
| Optimal result | 1594 |
| Rubi [F] | 1594 |
| Mathematica [A] (verified) | 1594 |
| Maple [B] (verified) | 1595 |
| Fricas [B] (verification not implemented) | 1595 |
| Sympy [A] (verification not implemented) | 1595 |
| Maxima [B] (verification not implemented) | 1596 |
| Giac [B] (verification not implemented) | 1596 |
| Mupad [B] (verification not implemented) | 1596 |

Optimal result

Integrand size = 11, antiderivative size = 5

$$\int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx = \cosh(x) \sin(x)$$

[Out] `cosh(x)*sin(x)`

Rubi [F]

$$\int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx = \int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx$$

[In] `Int[Cos[x]*Cosh[x] + Sin[x]*Sinh[x],x]`

[Out] `Defer[Int][Cos[x]*Cosh[x], x] + Defer[Int][Sin[x]*Sinh[x], x]`

Rubi steps

$$\text{integral} = \int \cos(x) \cosh(x) dx + \int \sin(x) \sinh(x) dx$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx = \cosh(x) \sin(x)$$

[In] `Integrate[Cos[x]*Cosh[x] + Sin[x]*Sinh[x],x]`

[Out] `Cosh[x]*Sin[x]`

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(5) = 10$.

Time = 0.87 (sec) , antiderivative size = 16, normalized size of antiderivative = 3.20

| method | result |
|---------|--|
| default | $\frac{e^x \sin(x)}{2} + \frac{e^{-x} \sin(x)}{2}$ |
| parts | $\frac{e^x \sin(x)}{2} + \frac{e^{-x} \sin(x)}{2}$ |
| risch | $\frac{ie^{(1-i)x}}{4} + \frac{ie^{(-1-i)x}}{4} - \frac{ie^{(1+i)x}}{4} - \frac{ie^{(-1+i)x}}{4}$ |
| meijerg | $\pi^{\frac{3}{2}} \left(\frac{e^x \cos(x)}{4\pi^{\frac{3}{2}}} + \frac{e^x \sin(x)}{4\pi^{\frac{3}{2}}} - \frac{e^{-x} \cos(x)}{4\pi^{\frac{3}{2}}} + \frac{e^{-x} \sin(x)}{4\pi^{\frac{3}{2}}} \right) + \pi^{\frac{3}{2}} \left(-\frac{e^x \cos(x)}{4\pi^{\frac{3}{2}}} + \frac{e^x \sin(x)}{4\pi^{\frac{3}{2}}} + \frac{e^{-x} \cos(x)}{4\pi^{\frac{3}{2}}} + \frac{e^{-x} \sin(x)}{4\pi^{\frac{3}{2}}} \right)$ |

[In] `int(cos(x)*cosh(x)+sin(x)*sinh(x),x,method=_RETURNVERBOSE)`

[Out] `1/2*exp(x)*sin(x)+1/2*exp(-x)*sin(x)`

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 34 vs. $2(5) = 10$.

Time = 0.25 (sec) , antiderivative size = 34, normalized size of antiderivative = 6.80

$$\int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx$$

$$= \frac{2 \cosh(x) \sin(x) \sinh(x) + \sin(x) \sinh(x)^2 + (\cosh(x)^2 + 1) \sin(x)}{2(\cosh(x) + \sinh(x))}$$

[In] `integrate(cos(x)*cosh(x)+sin(x)*sinh(x),x, algorithm="fricas")`

[Out] `1/2*(2*cosh(x)*sin(x)*sinh(x) + sin(x)*sinh(x)^2 + (cosh(x)^2 + 1)*sin(x))/(cosh(x) + sinh(x))`

Sympy [A] (verification not implemented)

Time = 0.14 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx = \sin(x) \cosh(x)$$

[In] `integrate(cos(x)*cosh(x)+sin(x)*sinh(x),x)`

[Out] `sin(x)*cosh(x)`

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 52 vs. $2(5) = 10$.

Time = 0.22 (sec) , antiderivative size = 52, normalized size of antiderivative = 10.40

$$\int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx = \frac{1}{4} ((e^{2x} - 1) \cos(x) + (e^{2x} + 1) \sin(x)) e^{-x} - \frac{1}{4} ((e^{2x} - 1) \cos(x) - (e^{2x} + 1) \sin(x)) e^{-x}$$

[In] integrate(cos(x)*cosh(x)+sin(x)*sinh(x),x, algorithm="maxima")

[Out] 1/4*((e^(2*x) - 1)*cos(x) + (e^(2*x) + 1)*sin(x))*e^(-x) - 1/4*((e^(2*x) - 1)*cos(x) - (e^(2*x) + 1)*sin(x))*e^(-x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 45 vs. $2(5) = 10$.

Time = 0.27 (sec) , antiderivative size = 45, normalized size of antiderivative = 9.00

$$\int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx = \frac{1}{4} (\cos(x) + \sin(x)) e^{-x} - \frac{1}{4} (\cos(x) - \sin(x)) e^{-x} + \frac{1}{4} (\cos(x) + \sin(x)) e^x - \frac{1}{4} (\cos(x) - \sin(x)) e^x$$

[In] integrate(cos(x)*cosh(x)+sin(x)*sinh(x),x, algorithm="giac")

[Out] 1/4*(cos(x) + sin(x))*e^(-x) - 1/4*(cos(x) - sin(x))*e^(-x) + 1/4*(cos(x) + sin(x))*e^x - 1/4*(cos(x) - sin(x))*e^x

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int (\cos(x) \cosh(x) + \sin(x) \sinh(x)) dx = \cosh(x) \sin(x)$$

[In] int(cos(x)*cosh(x) + sin(x)*sinh(x),x)

[Out] cosh(x)*sin(x)

3.181 $\int \frac{e^x + \cos(x)}{e^x + \sin(x)} dx$

| | |
|---|------|
| Optimal result | 1597 |
| Rubi [A] (verified) | 1597 |
| Mathematica [A] (verified) | 1598 |
| Maple [A] (verified) | 1598 |
| Fricas [A] (verification not implemented) | 1598 |
| Sympy [A] (verification not implemented) | 1599 |
| Maxima [A] (verification not implemented) | 1599 |
| Giac [B] (verification not implemented) | 1599 |
| Mupad [B] (verification not implemented) | 1600 |

Optimal result

Integrand size = 15, antiderivative size = 7

$$\int \frac{e^x + \cos(x)}{e^x + \sin(x)} dx = \log(e^x + \sin(x))$$

[Out] ln(exp(x)+sin(x))

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.067$, Rules used = {6816}

$$\int \frac{e^x + \cos(x)}{e^x + \sin(x)} dx = \log(e^x + \sin(x))$$

[In] Int[(E^x + Cos[x])/(E^x + Sin[x]),x]

[Out] Log[E^x + Sin[x]]

Rule 6816

Int[(u_)/(y_), x_Symbol] :> With[{q = DerivativeDivides[y, u, x]}, Simp[q*Log[RemoveContent[y, x]], x] /; !FalseQ[q]]

Rubi steps

$$\text{integral} = \log(e^x + \sin(x))$$

Mathematica [A] (verified)

Time = 0.11 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{e^x + \cos(x)}{e^x + \sin(x)} dx = \log(e^x + \sin(x))$$

[In] Integrate[(E^x + Cos[x])/(E^x + Sin[x]),x]

[Out] Log[E^x + Sin[x]]

Maple [A] (verified)

Time = 0.26 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

| method | result | size |
|-------------------|---|------|
| derivativedivides | $\ln(e^x + \sin(x))$ | 7 |
| default | $\ln(e^x + \sin(x))$ | 7 |
| risch | $-ix + \ln(e^{2ix} + 2ie^{(1+i)x} - 1)$ | 23 |
| parallelrisc | $-\ln\left(\frac{1}{1+\cos(x)}\right) + \ln\left(\frac{e^x + \sin(x)}{1+\cos(x)}\right)$ | 24 |
| norman | $-\ln\left(1 + \tan\left(\frac{x}{2}\right)^2\right) + \ln\left(e^x \tan\left(\frac{x}{2}\right)^2 + e^x + 2 \tan\left(\frac{x}{2}\right)\right)$ | 32 |

[In] int((exp(x)+cos(x))/(exp(x)+sin(x)),x,method=_RETURNVERBOSE)

[Out] ln(exp(x)+sin(x))

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.86

$$\int \frac{e^x + \cos(x)}{e^x + \sin(x)} dx = \log(e^x + \sin(x))$$

[In] integrate((exp(x)+cos(x))/(exp(x)+sin(x)),x, algorithm="fricas")

[Out] log(e^x + sin(x))

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{e^x + \cos(x)}{e^x + \sin(x)} dx = \log(e^x + \sin(x))$$

[In] integrate((exp(x)+cos(x))/(exp(x)+sin(x)),x)

[Out] log(exp(x) + sin(x))

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.86

$$\int \frac{e^x + \cos(x)}{e^x + \sin(x)} dx = \log(e^x + \sin(x))$$

[In] integrate((exp(x)+cos(x))/(exp(x)+sin(x)),x, algorithm="maxima")

[Out] log(e^x + sin(x))

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 77 vs. 2(6) = 12.

Time = 0.28 (sec) , antiderivative size = 77, normalized size of antiderivative = 11.00

$$\int \frac{e^x + \cos(x)}{e^x + \sin(x)} dx = \frac{1}{2} \log \left(\frac{4 \left(e^{(2x)} \tan \left(\frac{1}{2} x \right)^4 + 4 e^x \tan \left(\frac{1}{2} x \right)^3 + 2 e^{(2x)} \tan \left(\frac{1}{2} x \right)^2 + 4 e^x \tan \left(\frac{1}{2} x \right) + 4 \tan \left(\frac{1}{2} x \right)^2 + e^{(2x)} \right)}{\tan \left(\frac{1}{2} x \right)^4 + 2 \tan \left(\frac{1}{2} x \right)^2 + 1} \right)$$

[In] integrate((exp(x)+cos(x))/(exp(x)+sin(x)),x, algorithm="giac")

[Out] 1/2*log(4*(e^(2*x))*tan(1/2*x)^4 + 4*e^x*tan(1/2*x)^3 + 2*e^(2*x)*tan(1/2*x)^2 + 4*e^x*tan(1/2*x) + 4*tan(1/2*x)^2 + e^(2*x))/(tan(1/2*x)^4 + 2*tan(1/2*x)^2 + 1))

Mupad [B] (verification not implemented)

Time = 14.08 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.86

$$\int \frac{e^x + \cos(x)}{e^x + \sin(x)} dx = \ln(e^x + \sin(x))$$

```
[In] int((cos(x) + exp(x))/(exp(x) + sin(x)),x)
```

```
[Out] log(exp(x) + sin(x))
```

3.182 $\int \cos(x) \sin(\cos(\sin(x))) \sin(\sin(x)) dx$

| | | |
|---|-----------|------|
| Optimal result | | 1601 |
| Rubi [A] (verified) | | 1601 |
| Mathematica [A] (verified) | | 1602 |
| Maple [A] (verified) | | 1602 |
| Fricas [B] (verification not implemented) | | 1603 |
| Sympy [A] (verification not implemented) | | 1603 |
| Maxima [A] (verification not implemented) | | 1603 |
| Giac [A] (verification not implemented) | | 1604 |
| Mupad [B] (verification not implemented) | | 1604 |

Optimal result

Integrand size = 10, antiderivative size = 4

$$\int \cos(x) \sin(\cos(\sin(x))) \sin(\sin(x)) dx = \cos(\cos(\sin(x)))$$

[Out] $\cos(\cos(\sin(x)))$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.300$, Rules used = {4419, 4420, 2718}

$$\int \cos(x) \sin(\cos(\sin(x))) \sin(\sin(x)) dx = \cos(\cos(\sin(x)))$$

[In] `Int[Cos[x]*Sin[Cos[Sin[x]]]*Sin[Sin[x]],x]`

[Out] `Cos[Cos[Sin[x]]]`

Rule 2718

`Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Cos[c + d*x]/d, x] /; FreeQ[{c, d}, x]`

Rule 4419

`Int[(u_)*(F_)[(c_.)*((a_.) + (b_.)*(x_))], x_Symbol] := With[{d = FreeFactors[Sin[c*(a + b*x)], x]}, Dist[d/(b*c), Subst[Int[SubstFor[1, Sin[c*(a + b*x)]]/d, u, x], x], x, Sin[c*(a + b*x)]/d, x] /; FunctionOfQ[Sin[c*(a + b*x)]/d, u, x, True] /; FreeQ[{a, b, c}, x] && (EqQ[F, Cos] || EqQ[F, cos])`

Rule 4420

```
Int[(u_)*(F_)[(c_.)*((a_.) + (b_.)*(x_))], x_Symbol] := With[{d = FreeFactors[Cos[c*(a + b*x)], x]}, Dist[-d/(b*c), Subst[Int[SubstFor[1, Cos[c*(a + b*x)]]/d, u, x], x], x, Cos[c*(a + b*x)]/d, x] /; FunctionOfQ[Cos[c*(a + b*x)]/d, u, x, True]] /; FreeQ[{a, b, c}, x] && (EqQ[F, Sin] || EqQ[F, sin])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \sin(x) \sin(\cos(x)) dx, x, \sin(x)\right) \\ &= -\text{Subst}\left(\int \sin(x) dx, x, \cos(\sin(x))\right) \\ &= \cos(\cos(\sin(x))) \end{aligned}$$

Mathematica [A] (verified)

Time = 9.25 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \cos(x) \sin(\cos(\sin(x))) \sin(\sin(x)) dx = \cos(\cos(\sin(x)))$$

```
[In] Integrate[Cos[x]*Sin[Cos[Sin[x]]]*Sin[Sin[x]],x]
```

```
[Out] Cos[Cos[Sin[x]]]
```

Maple [A] (verified)

Time = 8.37 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.25

| method | result | size |
|-------------------|----------------------------|------|
| derivativedivides | $\cos(\cos(\sin(x)))$ | 5 |
| default | $\cos(\cos(\sin(x)))$ | 5 |
| risch | $\cos(\cos(\sin(x)))$ | 5 |
| parallelrisch | $-1 + \cos(\cos(\sin(x)))$ | 7 |

```
[In] int(sin(cos(sin(x)))*sin(sin(x))*cos(x),x,method=_RETURNVERBOSE)
```

```
[Out] cos(cos(sin(x)))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 44 vs. $2(4) = 8$.

Time = 0.26 (sec) , antiderivative size = 44, normalized size of antiderivative = 11.00

$$\int \cos(x) \sin(\cos(\sin(x))) \sin(\sin(x)) dx = \cos \left(\frac{\tan \left(\frac{\tan(\frac{1}{2}x)}{\tan(\frac{1}{2}x)^2 + 1} \right)^2 - 1}{\tan \left(\frac{\tan(\frac{1}{2}x)}{\tan(\frac{1}{2}x)^2 + 1} \right)^2 + 1} \right)$$

[In] integrate(sin(cos(sin(x)))*sin(sin(x))*cos(x),x, algorithm="fricas")

[Out] cos((tan(tan(1/2*x)/(tan(1/2*x)^2 + 1))^2 - 1)/(tan(tan(1/2*x)/(tan(1/2*x)^2 + 1))^2 + 1))

Sympy [A] (verification not implemented)

Time = 0.90 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.25

$$\int \cos(x) \sin(\cos(\sin(x))) \sin(\sin(x)) dx = \cos(\cos(\sin(x)))$$

[In] integrate(sin(cos(sin(x)))*sin(sin(x))*cos(x),x)

[Out] cos(cos(sin(x)))

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \cos(x) \sin(\cos(\sin(x))) \sin(\sin(x)) dx = \cos(\cos(\sin(x)))$$

[In] integrate(sin(cos(sin(x)))*sin(sin(x))*cos(x),x, algorithm="maxima")

[Out] cos(cos(sin(x)))

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \cos(x) \sin(\cos(\sin(x))) \sin(\sin(x)) dx = \cos(\cos(\sin(x)))$$

[In] integrate(sin(cos(sin(x)))*sin(sin(x))*cos(x),x, algorithm="giac")

[Out] cos(cos(sin(x)))

Mupad [B] (verification not implemented)

Time = 14.97 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \cos(x) \sin(\cos(\sin(x))) \sin(\sin(x)) dx = \cos(\cos(\sin(x)))$$

[In] int(sin(sin(x))*sin(cos(sin(x)))*cos(x),x)

[Out] cos(cos(sin(x)))

3.183 $\int \frac{1}{1+\sin(x)} dx$

| | |
|---|------|
| Optimal result | 1605 |
| Rubi [A] (verified) | 1605 |
| Mathematica [B] (verified) | 1606 |
| Maple [A] (verified) | 1606 |
| Fricas [A] (verification not implemented) | 1606 |
| Sympy [A] (verification not implemented) | 1607 |
| Maxima [A] (verification not implemented) | 1607 |
| Giac [A] (verification not implemented) | 1607 |
| Mupad [B] (verification not implemented) | 1607 |

Optimal result

Integrand size = 6, antiderivative size = 10

$$\int \frac{1}{1+\sin(x)} dx = -\frac{\cos(x)}{1+\sin(x)}$$

[Out] `-cos(x)/(1+sin(x))`

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {2727}

$$\int \frac{1}{1+\sin(x)} dx = -\frac{\cos(x)}{\sin(x)+1}$$

[In] `Int[(1 + Sin[x])^(-1),x]`

[Out] `-(Cos[x]/(1 + Sin[x]))`

Rule 2727

`Int[((a_) + (b_)*sin[(c_) + (d_)*(x_)])^(-1), x_Symbol] := Simp[-Cos[c + d*x]/(d*(b + a*Sin[c + d*x])), x] /; FreeQ[{a, b, c, d}, x] && EqQ[a^2 - b^2, 0]`

Rubi steps

$$\text{integral} = -\frac{\cos(x)}{1+\sin(x)}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 23 vs. $2(10) = 20$.

Time = 0.01 (sec) , antiderivative size = 23, normalized size of antiderivative = 2.30

$$\int \frac{1}{1 + \sin(x)} dx = \frac{2 \sin\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right) + \sin\left(\frac{x}{2}\right)}$$

[In] Integrate[(1 + Sin[x])^(-1),x]

[Out] (2*Sin[x/2])/(Cos[x/2] + Sin[x/2])

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

| method | result | size |
|---------------|---|------|
| default | $-\frac{2}{1+\tan\left(\frac{x}{2}\right)}$ | 11 |
| norman | $-\frac{2}{1+\tan\left(\frac{x}{2}\right)}$ | 11 |
| parallelrisch | $-\frac{2}{1+\tan\left(\frac{x}{2}\right)}$ | 11 |
| risch | $-\frac{2}{i+e^{ix}}$ | 13 |

[In] int(1/(1+sin(x)),x,method=_RETURNVERBOSE)

[Out] -2/(1+tan(1/2*x))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.80

$$\int \frac{1}{1 + \sin(x)} dx = -\frac{\cos(x) - \sin(x) + 1}{\cos(x) + \sin(x) + 1}$$

[In] integrate(1/(1+sin(x)),x, algorithm="fricas")

[Out] -(cos(x) - sin(x) + 1)/(cos(x) + sin(x) + 1)

Sympy [A] (verification not implemented)

Time = 0.18 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \frac{1}{1 + \sin(x)} dx = -\frac{2}{\tan\left(\frac{x}{2}\right) + 1}$$

[In] integrate(1/(1+sin(x)),x)

[Out] -2/(tan(x/2) + 1)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.50

$$\int \frac{1}{1 + \sin(x)} dx = -\frac{2}{\frac{\sin(x)}{\cos(x)+1} + 1}$$

[In] integrate(1/(1+sin(x)),x, algorithm="maxima")

[Out] -2/(sin(x)/(cos(x) + 1) + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 + \sin(x)} dx = -\frac{2}{\tan\left(\frac{1}{2}x\right) + 1}$$

[In] integrate(1/(1+sin(x)),x, algorithm="giac")

[Out] -2/(tan(1/2*x) + 1)

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 + \sin(x)} dx = -\frac{2}{\tan\left(\frac{x}{2}\right) + 1}$$

[In] int(1/(sin(x) + 1),x)

[Out] -2/(tan(x/2) + 1)

3.184 $\int \frac{\cos(x)}{1-\cos(2x)} dx$

| | |
|---|------|
| Optimal result | 1608 |
| Rubi [A] (verified) | 1608 |
| Mathematica [A] (verified) | 1609 |
| Maple [A] (verified) | 1609 |
| Fricas [A] (verification not implemented) | 1610 |
| Sympy [F] | 1610 |
| Maxima [B] (verification not implemented) | 1610 |
| Giac [A] (verification not implemented) | 1610 |
| Mupad [B] (verification not implemented) | 1611 |

Optimal result

Integrand size = 13, antiderivative size = 6

$$\int \frac{\cos(x)}{1-\cos(2x)} dx = -\frac{\csc(x)}{2}$$

[Out] -1/2*csc(x)

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.231$, Rules used = {4441, 12, 30}

$$\int \frac{\cos(x)}{1-\cos(2x)} dx = -\frac{\csc(x)}{2}$$

[In] Int[Cos[x]/(1 - Cos[2*x]),x]

[Out] -1/2*Csc[x]

Rule 12

Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]

Rule 30

Int[(x_)^(m_.), x_Symbol] := Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rule 4441

```
Int[(u_)*(F_)[(c_.)*((a_.) + (b_.)*(x_))], x_Symbol] := With[{d = FreeFactors[Sin[c*(a + b*x)], x]}, Dist[d/(b*c), Subst[Int[SubstFor[1, Sin[c*(a + b*x)]]/d, u, x], x], x, Sin[c*(a + b*x)]/d, x] /; FunctionOfQ[Sin[c*(a + b*x)]/d, u, x] /; FreeQ[{a, b, c}, x] && (EqQ[F, Cos] || EqQ[F, cos])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{1}{2x^2} dx, x, \sin(x)\right) \\ &= \frac{1}{2} \text{Subst}\left(\int \frac{1}{x^2} dx, x, \sin(x)\right) \\ &= -\frac{\csc(x)}{2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x)}{1 - \cos(2x)} dx = -\frac{\csc(x)}{2}$$

```
[In] Integrate[Cos[x]/(1 - Cos[2*x]),x]
```

```
[Out] -1/2*Csc[x]
```

Maple [A] (verified)

Time = 0.17 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.17

| method | result | size |
|---------|------------------------------|------|
| default | $-\frac{1}{2\sin(x)}$ | 7 |
| risch | $-\frac{ie^{ix}}{e^{2ix}-1}$ | 18 |

```
[In] int(cos(x)/(1-cos(2*x)),x,method=_RETURNVERBOSE)
```

```
[Out] -1/2/sin(x)
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x)}{1 - \cos(2x)} dx = -\frac{1}{2 \sin(x)}$$

[In] integrate(cos(x)/(1-cos(2*x)),x, algorithm="fricas")

[Out] -1/2/sin(x)

Sympy [F]

$$\int \frac{\cos(x)}{1 - \cos(2x)} dx = -\int \frac{\cos(x)}{\cos(2x) - 1} dx$$

[In] integrate(cos(x)/(1-cos(2*x)),x)

[Out] -Integral(cos(x)/(cos(2*x) - 1), x)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 42 vs. 2(4) = 8.

Time = 0.19 (sec) , antiderivative size = 42, normalized size of antiderivative = 7.00

$$\int \frac{\cos(x)}{1 - \cos(2x)} dx = -\frac{\cos(x) \sin(2x) - \cos(2x) \sin(x) + \sin(x)}{\cos(2x)^2 + \sin(2x)^2 - 2 \cos(2x) + 1}$$

[In] integrate(cos(x)/(1-cos(2*x)),x, algorithm="maxima")

[Out] -(cos(x)*sin(2*x) - cos(2*x)*sin(x) + sin(x))/(cos(2*x)^2 + sin(2*x)^2 - 2*cos(2*x) + 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x)}{1 - \cos(2x)} dx = -\frac{1}{2 \sin(x)}$$

[In] integrate(cos(x)/(1-cos(2*x)),x, algorithm="giac")

[Out] -1/2/sin(x)

Mupad [B] (verification not implemented)

Time = 15.08 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x)}{1 - \cos(2x)} dx = -\frac{1}{2 \sin(x)}$$

[In] int(-cos(x)/(cos(2*x) - 1),x)

[Out] -1/(2*sin(x))

3.185 $\int e^x \left(\frac{1}{x} + \log(x) \right) dx$

| | |
|---|------|
| Optimal result | 1612 |
| Rubi [A] (verified) | 1612 |
| Mathematica [A] (verified) | 1613 |
| Maple [A] (verified) | 1613 |
| Fricas [A] (verification not implemented) | 1613 |
| Sympy [A] (verification not implemented) | 1614 |
| Maxima [A] (verification not implemented) | 1614 |
| Giac [A] (verification not implemented) | 1614 |
| Mupad [B] (verification not implemented) | 1614 |

Optimal result

Integrand size = 10, antiderivative size = 6

$$\int e^x \left(\frac{1}{x} + \log(x) \right) dx = e^x \log(x)$$

[Out] exp(x)*ln(x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.100$, Rules used = {2326}

$$\int e^x \left(\frac{1}{x} + \log(x) \right) dx = e^x \log(x)$$

[In] Int[E^x*(x^(-1) + Log[x]),x]

[Out] E^x*Log[x]

Rule 2326

Int[(y_.)*(F_)^(u_)*((v_) + (w_)), x_Symbol] :> With[{z = v*(y/(Log[F]*D[u, x]))}, Simp[F^u*z, x] /; EqQ[D[z, x], w*y]] /; FreeQ[F, x]

Rubi steps

$$\text{integral} = e^x \log(x)$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int e^x \left(\frac{1}{x} + \log(x) \right) dx = e^x \log(x)$$

[In] Integrate[E^x*(x^(-1) + Log[x]),x]

[Out] E^x*Log[x]

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

| method | result | size |
|---------------|--------------|------|
| norman | $e^x \ln(x)$ | 6 |
| risch | $e^x \ln(x)$ | 6 |
| parallelrisch | $e^x \ln(x)$ | 6 |

[In] int(exp(x)*(1/x+ln(x)),x,method=_RETURNVERBOSE)

[Out] exp(x)*ln(x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int e^x \left(\frac{1}{x} + \log(x) \right) dx = e^x \log(x)$$

[In] integrate(exp(x)*(1/x+log(x)),x, algorithm="fricas")

[Out] e^x*log(x)

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int e^x \left(\frac{1}{x} + \log(x) \right) dx = e^x \log(x)$$

[In] integrate(exp(x)*(1/x+ln(x)),x)

[Out] exp(x)*log(x)

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int e^x \left(\frac{1}{x} + \log(x) \right) dx = e^x \log(x)$$

[In] integrate(exp(x)*(1/x+log(x)),x, algorithm="maxima")

[Out] e^x*log(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int e^x \left(\frac{1}{x} + \log(x) \right) dx = e^x \log(x)$$

[In] integrate(exp(x)*(1/x+log(x)),x, algorithm="giac")

[Out] e^x*log(x)

Mupad [B] (verification not implemented)

Time = 15.99 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int e^x \left(\frac{1}{x} + \log(x) \right) dx = e^x \ln(x)$$

[In] int(exp(x)*(log(x) + 1/x),x)

[Out] exp(x)*log(x)

3.186 $\int \tanh^2(x) dx$

| | |
|---|------|
| Optimal result | 1615 |
| Rubi [A] (verified) | 1615 |
| Mathematica [A] (verified) | 1616 |
| Maple [A] (verified) | 1616 |
| Fricas [B] (verification not implemented) | 1616 |
| Sympy [A] (verification not implemented) | 1617 |
| Maxima [A] (verification not implemented) | 1617 |
| Giac [A] (verification not implemented) | 1617 |
| Mupad [B] (verification not implemented) | 1617 |

Optimal result

Integrand size = 4, antiderivative size = 6

$$\int \tanh^2(x) dx = x - \tanh(x)$$

[Out] x-tanh(x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3554, 8}

$$\int \tanh^2(x) dx = x - \tanh(x)$$

[In] Int[Tanh[x]^2,x]

[Out] x - Tanh[x]

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 3554

Int[((b_.)*tan[(c_.) + (d_.)*(x_)]^(n_)), x_Symbol] := Simp[b*((b*Tan[c + d*x])^(n - 1)/(d*(n - 1))), x] - Dist[b^2, Int[(b*Tan[c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1]

Rubi steps

$$\begin{aligned} \text{integral} &= -\tanh(x) + \int 1 dx \\ &= x - \tanh(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.33

$$\int \tanh^2(x) dx = \operatorname{arctanh}(\tanh(x)) - \tanh(x)$$

[In] Integrate[Tanh[x]^2,x]

[Out] ArcTanh[Tanh[x]] - Tanh[x]

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.17

| method | result | size |
|-------------------|---|------|
| parallelrisch | $x - \tanh(x)$ | 7 |
| risch | $x + \frac{2}{e^{2x}+1}$ | 13 |
| derivativedivides | $-\tanh(x) - \frac{\ln(\tanh(x)-1)}{2} + \frac{\ln(\tanh(x)+1)}{2}$ | 20 |
| default | $-\tanh(x) - \frac{\ln(\tanh(x)-1)}{2} + \frac{\ln(\tanh(x)+1)}{2}$ | 20 |

[In] int(tanh(x)^2,x,method=_RETURNVERBOSE)

[Out] x-tanh(x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 16 vs. 2(6) = 12.

Time = 0.24 (sec) , antiderivative size = 16, normalized size of antiderivative = 2.67

$$\int \tanh^2(x) dx = \frac{(x+1)\cosh(x) - \sinh(x)}{\cosh(x)}$$

[In] integrate(tanh(x)^2,x, algorithm="fricas")

[Out] ((x + 1)*cosh(x) - sinh(x))/cosh(x)

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 3, normalized size of antiderivative = 0.50

$$\int \tanh^2(x) dx = x - \tanh(x)$$

[In] integrate(tanh(x)**2,x)

[Out] x - tanh(x)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 12, normalized size of antiderivative = 2.00

$$\int \tanh^2(x) dx = x - \frac{2}{e^{(-2x)} + 1}$$

[In] integrate(tanh(x)^2,x, algorithm="maxima")

[Out] x - 2/(e^(-2*x) + 1)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 12, normalized size of antiderivative = 2.00

$$\int \tanh^2(x) dx = x + \frac{2}{e^{(2x)} + 1}$$

[In] integrate(tanh(x)^2,x, algorithm="giac")

[Out] x + 2/(e^(2*x) + 1)

Mupad [B] (verification not implemented)

Time = 16.60 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \tanh^2(x) dx = x - \tanh(x)$$

[In] int(tanh(x)^2,x)

[Out] x - tanh(x)

$$3.187 \quad \int \frac{-\sin^2(x) + \sin(2x)}{-\cos^2(x) + \cos(2x)} dx$$

| | |
|---|------|
| Optimal result | 1618 |
| Rubi [A] (verified) | 1618 |
| Mathematica [A] (verified) | 1619 |
| Maple [A] (verified) | 1620 |
| Fricas [A] (verification not implemented) | 1620 |
| Sympy [A] (verification not implemented) | 1620 |
| Maxima [B] (verification not implemented) | 1620 |
| Giac [B] (verification not implemented) | 1621 |
| Mupad [B] (verification not implemented) | 1621 |

Optimal result

Integrand size = 25, antiderivative size = 7

$$\int \frac{-\sin^2(x) + \sin(2x)}{-\cos^2(x) + \cos(2x)} dx = x - 2 \log(\sin(x))$$

[Out] x-2*ln(sin(x))

Rubi [A] (verified)

Time = 0.11 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.71, number of steps used = 6, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.160$, Rules used = {815, 649, 209, 266}

$$\int \frac{-\sin^2(x) + \sin(2x)}{-\cos^2(x) + \cos(2x)} dx = x - 2 \log(\tan(x)) - 2 \log(\cos(x))$$

[In] Int[(-Sin[x]^2 + Sin[2*x])/(-Cos[x]^2 + Cos[2*x]),x]

[Out] x - 2*Log[Cos[x]] - 2*Log[Tan[x]]

Rule 209

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])

Rule 266

Int[(x_)^(m_)/((a_) + (b_.)*(x_)^(n_)), x_Symbol] := Simp[Log[RemoveContent[a + b*x^n, x]]/(b*n), x] /; FreeQ[{a, b, m, n}, x] && EqQ[m, n - 1]

Rule 649

```
Int[((d_) + (e_)*(x_))/((a_) + (c_)*(x_)^2), x_Symbol] := Dist[d, Int[1/(a + c*x^2), x], x] + Dist[e, Int[x/(a + c*x^2), x], x] /; FreeQ[{a, c, d, e}, x] && !NiceSqrtQ[(-a)*c]
```

Rule 815

```
Int[(((d_) + (e_)*(x_)^(m_))*((f_) + (g_)*(x_)))/((a_) + (c_)*(x_)^2), x_Symbol] := Int[ExpandIntegrand[(d + e*x)^m*(f + g*x)/(a + c*x^2), x], x] /; FreeQ[{a, c, d, e, f, g}, x] && NeQ[c*d^2 + a*e^2, 0] && IntegerQ[m]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \text{Subst}\left(\int \frac{-2+x}{x(1+x^2)} dx, x, \tan(x)\right) \\
&= \text{Subst}\left(\int \left(-\frac{2}{x} + \frac{1+2x}{1+x^2}\right) dx, x, \tan(x)\right) \\
&= -2\log(\tan(x)) + \text{Subst}\left(\int \frac{1+2x}{1+x^2} dx, x, \tan(x)\right) \\
&= -2\log(\tan(x)) + 2\text{Subst}\left(\int \frac{x}{1+x^2} dx, x, \tan(x)\right) + \text{Subst}\left(\int \frac{1}{1+x^2} dx, x, \tan(x)\right) \\
&= x - 2\log(\cos(x)) - 2\log(\tan(x))
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.71

$$\int \frac{-\sin^2(x) + \sin(2x)}{-\cos^2(x) + \cos(2x)} dx = x - 2\log(\cos(x)) - 2\log(\tan(x))$$

```
[In] Integrate[(-Sin[x]^2 + Sin[2*x])/(-Cos[x]^2 + Cos[2*x]),x]
```

```
[Out] x - 2*Log[Cos[x]] - 2*Log[Tan[x]]
```

Maple [A] (verified)

Time = 0.36 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.14

| method | result | size |
|---------|--------------------------------|------|
| default | $x - 2 \ln(\sin(x))$ | 8 |
| risch | $2ix - 2 \ln(e^{2ix} - 1) + x$ | 17 |

[In] `int((sin(2*x)-sin(x)^2)/(cos(2*x)-cos(x)^2),x,method=_RETURNVERBOSE)`

[Out] `x-2*ln(sin(x))`

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.29

$$\int \frac{-\sin^2(x) + \sin(2x)}{-\cos^2(x) + \cos(2x)} dx = x - 2 \log\left(\frac{1}{2} \sin(x)\right)$$

[In] `integrate((sin(2*x)-sin(x)^2)/(cos(2*x)-cos(x)^2),x, algorithm="fricas")`

[Out] `x - 2*log(1/2*sin(x))`

Sympy [A] (verification not implemented)

Time = 1.45 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.14

$$\int \frac{-\sin^2(x) + \sin(2x)}{-\cos^2(x) + \cos(2x)} dx = x - \log(\cos^2(x) - 1)$$

[In] `integrate((sin(2*x)-sin(x)**2)/(cos(2*x)-cos(x)**2),x)`

[Out] `x - log(cos(x)**2 - 1)`

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 36 vs. $2(7) = 14$.

Time = 0.19 (sec) , antiderivative size = 36, normalized size of antiderivative = 5.14

$$\int \frac{-\sin^2(x) + \sin(2x)}{-\cos^2(x) + \cos(2x)} dx = x - \log(\cos(x)^2 + \sin(x)^2 + 2 \cos(x) + 1) - \log(\cos(x)^2 + \sin(x)^2 - 2 \cos(x) + 1)$$

[In] `integrate((sin(2*x)-sin(x)^2)/(cos(2*x)-cos(x)^2),x, algorithm="maxima")`

[Out] `x - log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) - log(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1)`

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 21 vs. 2(7) = 14.

Time = 0.27 (sec) , antiderivative size = 21, normalized size of antiderivative = 3.00

$$\int \frac{-\sin^2(x) + \sin(2x)}{-\cos^2(x) + \cos(2x)} dx = x + 2 \log \left(\tan \left(\frac{1}{2} x \right)^2 + 1 \right) - 2 \log \left(\left| \tan \left(\frac{1}{2} x \right) \right| \right)$$

[In] integrate((sin(2*x)-sin(x)^2)/(cos(2*x)-cos(x)^2),x, algorithm="giac")

[Out] x + 2*log(tan(1/2*x)^2 + 1) - 2*log(abs(tan(1/2*x)))

Mupad [B] (verification not implemented)

Time = 16.11 (sec) , antiderivative size = 26, normalized size of antiderivative = 3.71

$$\int \frac{-\sin^2(x) + \sin(2x)}{-\cos^2(x) + \cos(2x)} dx = -2 \ln(\tan(x)) + \ln(\tan(x) - i) \left(1 - \frac{1}{2}i \right) + \ln(\tan(x) + i) \left(1 + \frac{1}{2}i \right)$$

[In] int((sin(2*x) - sin(x)^2)/(cos(2*x) - cos(x)^2),x)

[Out] log(tan(x) - 1i)*(1 - 1i/2) - 2*log(tan(x)) + log(tan(x) + 1i)*(1 + 1i/2)

$$3.188 \quad \int \frac{1}{x^{9/25} + x^{41/25}} dx$$

| | |
|---|------|
| Optimal result | 1622 |
| Rubi [A] (verified) | 1622 |
| Mathematica [A] (verified) | 1623 |
| Maple [F(-1)] | 1623 |
| Fricas [A] (verification not implemented) | 1624 |
| Sympy [F(-1)] | 1624 |
| Maxima [F] | 1624 |
| Giac [A] (verification not implemented) | 1624 |
| Mupad [B] (verification not implemented) | 1625 |

Optimal result

Integrand size = 13, antiderivative size = 10

$$\int \frac{1}{x^{9/25} + x^{41/25}} dx = \frac{25}{16} \arctan(x^{16/25})$$

[Out] 25/16*arctan(x^(16/25))

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.308$, Rules used = {1607, 348, 281, 209}

$$\int \frac{1}{x^{9/25} + x^{41/25}} dx = \frac{25}{16} \arctan(x^{16/25})$$

[In] Int[(x^(9/25) + x^(41/25))^(-1), x]

[Out] (25*ArcTan[x^(16/25)])/16

Rule 209

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])

Rule 281

Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := With[{k = GCD[m + 1, n]}, Dist[1/k, Subst[Int[x^((m + 1)/k - 1)*(a + b*x^(n/k))^p, x], x, x^k], x] /; k != 1] /; FreeQ[{a, b, p}, x] && IGtQ[n, 0] && IntegerQ[m]

Rule 348

`Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := With[{k = Denominator[n]}, Dist[k, Subst[Int[x^(k*(m + 1) - 1)*(a + b*x^(k*n))^p, x], x, x^(1/k)], x] /; FreeQ[{a, b, m, p}, x] && FractionQ[n]`

Rule 1607

`Int[(u_.)*((a_.)*(x_)^(p_.) + (b_.)*(x_)^(q_.))^(n_.), x_Symbol] := Int[u*x^(n*p)*(a + b*x^(q - p))^n, x] /; FreeQ[{a, b, p, q}, x] && IntegerQ[n] && PosQ[q - p]`

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \frac{1}{x^{9/25} (1 + x^{32/25})} dx \\
 &= 25 \text{Subst} \left(\int \frac{x^{15}}{1 + x^{32}} dx, x, \sqrt[25]{x} \right) \\
 &= \frac{25}{16} \text{Subst} \left(\int \frac{1}{1 + x^2} dx, x, x^{16/25} \right) \\
 &= \frac{25}{16} \arctan(x^{16/25})
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{1}{x^{9/25} + x^{41/25}} dx = \frac{25}{16} \arctan(x^{16/25})$$

[In] Integrate[(x^(9/25) + x^(41/25))^(-1), x]

[Out] (25*ArcTan[x^(16/25)])/16

Maple [F(-1)]

Timed out.

hanged

[In] int(1/(x^(41/25)+x^(9/25)), x)

[Out] int(1/(x^(41/25)+x^(9/25)), x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.60

$$\int \frac{1}{x^{9/25} + x^{41/25}} dx = \frac{25}{16} \arctan \left(x^{\frac{16}{25}} \right)$$

[In] integrate(1/(x^(41/25)+x^(9/25)),x, algorithm="fricas")

[Out] 25/16*arctan(x^(16/25))

Sympy [F(-1)]

Timed out.

$$\int \frac{1}{x^{9/25} + x^{41/25}} dx = \text{Timed out}$$

[In] integrate(1/(x**(41/25)+x**(9/25)),x)

[Out] Timed out

Maxima [F]

$$\int \frac{1}{x^{9/25} + x^{41/25}} dx = \int \frac{1}{x^{\frac{41}{25}} + x^{\frac{9}{25}}} dx$$

[In] integrate(1/(x^(41/25)+x^(9/25)),x, algorithm="maxima")

[Out] 25/16*x^(16/25) - integrate(x^(23/25)/(x^(32/25) + 1), x)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.60

$$\int \frac{1}{x^{9/25} + x^{41/25}} dx = \frac{25}{16} \arctan \left(x^{\frac{16}{25}} \right)$$

[In] integrate(1/(x^(41/25)+x^(9/25)),x, algorithm="giac")

[Out] 25/16*arctan(x^(16/25))

Mupad [B] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.60

$$\int \frac{1}{x^{9/25} + x^{41/25}} dx = \frac{25 \operatorname{atan}(x^{16/25})}{16}$$

[In] `int(1/(x^(9/25) + x^(41/25)),x)`

[Out] `(25*atan(x^(16/25)))/16`

$$3.189 \quad \int \frac{\cos(x)}{2 - \cos^2(x)} dx$$

| | |
|---|------|
| Optimal result | 1626 |
| Rubi [A] (verified) | 1626 |
| Mathematica [A] (verified) | 1627 |
| Maple [A] (verified) | 1627 |
| Fricas [A] (verification not implemented) | 1628 |
| Sympy [B] (verification not implemented) | 1628 |
| Maxima [A] (verification not implemented) | 1629 |
| Giac [A] (verification not implemented) | 1629 |
| Mupad [B] (verification not implemented) | 1629 |

Optimal result

Integrand size = 13, antiderivative size = 3

$$\int \frac{\cos(x)}{2 - \cos^2(x)} dx = \arctan(\sin(x))$$

[Out] arctan(sin(x))

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.154$, Rules used = {3265, 209}

$$\int \frac{\cos(x)}{2 - \cos^2(x)} dx = \arctan(\sin(x))$$

[In] Int[Cos[x]/(2 - Cos[x]^2), x]

[Out] ArcTan[Sin[x]]

Rule 209

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] :> Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])

Rule 3265

Int[sin[(e_.) + (f_.)*(x_)]^(m_.)*((a_) + (b_.)*sin[(e_.) + (f_.)*(x_)]^2)^(p_.), x_Symbol] :> With[{ff = FreeFactors[Cos[e + f*x], x]}, Dist[-ff/f, Subst[Int[(1 - ff^2*x^2)^((m - 1)/2)*(a + b - b*ff^2*x^2)^p, x], x, Cos[e +

`f*x]/ff], x]] /; FreeQ[{a, b, e, f, p}, x] && IntegerQ[(m - 1)/2]`

Rubi steps

$$\begin{aligned}\text{integral} &= \text{Subst}\left(\int \frac{1}{1+x^2} dx, x, \sin(x)\right) \\ &= \arctan(\sin(x))\end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x)}{2 - \cos^2(x)} dx = \arctan(\sin(x))$$

[In] Integrate[Cos[x]/(2 - Cos[x]^2), x]

[Out] ArcTan[Sin[x]]

Maple [A] (verified)

Time = 0.24 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

| method | result | size |
|---------------|--|------|
| default | $\arctan(\sin(x))$ | 4 |
| parallemrisch | $\frac{i\left(\ln\left(-\frac{2i(\sin(x)+i)}{1+\cos(x)}\right) - \ln\left(\frac{2+2i\sin(x)}{1+\cos(x)}\right)\right)}{2}$ | 37 |
| risch | $\frac{i \ln(e^{2ix} - 2e^{ix} - 1)}{2} - \frac{i \ln(e^{2ix} + 2e^{ix} - 1)}{2}$ | 38 |

[In] int(cos(x)/(2-cos(x)^2), x, method=_RETURNVERBOSE)

[Out] arctan(sin(x))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x)}{2 - \cos^2(x)} dx = \arctan(\sin(x))$$

[In] integrate(cos(x)/(2-cos(x)^2),x, algorithm="fricas")

[Out] arctan(sin(x))

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 219 vs. 2(3) = 6.

Time = 9.12 (sec) , antiderivative size = 219, normalized size of antiderivative = 73.00

$$\int \frac{\cos(x)}{2 - \cos^2(x)} dx = \frac{1607521\sqrt{3 - 2\sqrt{2}}\left(\operatorname{atan}\left(\frac{\tan\left(\frac{x}{2}\right)}{\sqrt{3 - 2\sqrt{2}}}\right) + \pi\left\lfloor\frac{\frac{x}{2} - \frac{\pi}{2}}{\pi}\right\rfloor\right)}{470832\sqrt{2} + 665857} + \frac{1136689\sqrt{2}\sqrt{3 - 2\sqrt{2}}\left(\operatorname{atan}\left(\frac{\tan\left(\frac{x}{2}\right)}{\sqrt{3 - 2\sqrt{2}}}\right) + \pi\left\lfloor\frac{\frac{x}{2} - \frac{\pi}{2}}{\pi}\right\rfloor\right)}{470832\sqrt{2} + 665857} - \frac{195025\sqrt{2}\sqrt{2\sqrt{2} + 3}\left(\operatorname{atan}\left(\frac{\tan\left(\frac{x}{2}\right)}{\sqrt{2\sqrt{2} + 3}}\right) + \pi\left\lfloor\frac{\frac{x}{2} - \frac{\pi}{2}}{\pi}\right\rfloor\right)}{470832\sqrt{2} + 665857} - \frac{275807\sqrt{2\sqrt{2} + 3}\left(\operatorname{atan}\left(\frac{\tan\left(\frac{x}{2}\right)}{\sqrt{2\sqrt{2} + 3}}\right) + \pi\left\lfloor\frac{\frac{x}{2} - \frac{\pi}{2}}{\pi}\right\rfloor\right)}{470832\sqrt{2} + 665857}$$

[In] integrate(cos(x)/(2-cos(x)**2),x)

```
[Out] 1607521*sqrt(3 - 2*sqrt(2))*(atan(tan(x/2)/sqrt(3 - 2*sqrt(2))) + pi*floor((x/2 - pi/2)/pi))/(470832*sqrt(2) + 665857) + 1136689*sqrt(2)*sqrt(3 - 2*sqrt(2))*(atan(tan(x/2)/sqrt(3 - 2*sqrt(2))) + pi*floor((x/2 - pi/2)/pi))/(470832*sqrt(2) + 665857) - 195025*sqrt(2)*sqrt(2*sqrt(2) + 3)*(atan(tan(x/2)/sqrt(2*sqrt(2) + 3)) + pi*floor((x/2 - pi/2)/pi))/(470832*sqrt(2) + 665857) - 275807*sqrt(2*sqrt(2) + 3)*(atan(tan(x/2)/sqrt(2*sqrt(2) + 3)) + pi*floor((x/2 - pi/2)/pi))/(470832*sqrt(2) + 665857)
```


Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x)}{2 - \cos^2(x)} dx = \arctan(\sin(x))$$

[In] integrate(cos(x)/(2-cos(x)^2),x, algorithm="maxima")

[Out] arctan(sin(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x)}{2 - \cos^2(x)} dx = \arctan(\sin(x))$$

[In] integrate(cos(x)/(2-cos(x)^2),x, algorithm="giac")

[Out] arctan(sin(x))

Mupad [B] (verification not implemented)

Time = 16.48 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x)}{2 - \cos^2(x)} dx = \operatorname{atan}(\sin(x))$$

[In] int(-cos(x)/(cos(x)^2 - 2),x)

[Out] atan(sin(x))

$$3.190 \quad \int \frac{1}{(1+x^2)^{3/2}} dx$$

| | |
|---|------|
| Optimal result | 1630 |
| Rubi [A] (verified) | 1630 |
| Mathematica [A] (verified) | 1631 |
| Maple [A] (verified) | 1631 |
| Fricas [B] (verification not implemented) | 1631 |
| Sympy [A] (verification not implemented) | 1632 |
| Maxima [A] (verification not implemented) | 1632 |
| Giac [A] (verification not implemented) | 1632 |
| Mupad [B] (verification not implemented) | 1632 |

Optimal result

Integrand size = 9, antiderivative size = 11

$$\int \frac{1}{(1+x^2)^{3/2}} dx = \frac{x}{\sqrt{1+x^2}}$$

[Out] $x/(x^2+1)^{(1/2)}$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {197}

$$\int \frac{1}{(1+x^2)^{3/2}} dx = \frac{x}{\sqrt{x^2+1}}$$

[In] `Int[(1 + x^2)^(-3/2), x]`

[Out] `x/Sqrt[1 + x^2]`

Rule 197

`Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Simp[x*((a + b*x^n)^(p + 1)/a), x] /; FreeQ[{a, b, n, p}, x] && EqQ[1/n + p + 1, 0]`

Rubi steps

$$\text{integral} = \frac{x}{\sqrt{1+x^2}}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \frac{1}{(1+x^2)^{3/2}} dx = \frac{x}{\sqrt{1+x^2}}$$

[In] Integrate[(1 + x^2)^(-3/2),x]

[Out] x/Sqrt[1 + x^2]

Maple [A] (verified)

Time = 0.23 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.91

| method | result | size |
|----------------|--------------------------|------|
| gosper | $\frac{x}{\sqrt{x^2+1}}$ | 10 |
| default | $\frac{x}{\sqrt{x^2+1}}$ | 10 |
| trager | $\frac{x}{\sqrt{x^2+1}}$ | 10 |
| meijerg | $\frac{x}{\sqrt{x^2+1}}$ | 10 |
| risch | $\frac{x}{\sqrt{x^2+1}}$ | 10 |
| pseudoelliptic | $\frac{x}{\sqrt{x^2+1}}$ | 10 |

[In] int(1/(x^2+1)^(3/2),x,method=_RETURNVERBOSE)

[Out] x/(x^2+1)^(1/2)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 22 vs. 2(9) = 18.

Time = 0.24 (sec) , antiderivative size = 22, normalized size of antiderivative = 2.00

$$\int \frac{1}{(1+x^2)^{3/2}} dx = \frac{x^2 + \sqrt{x^2+1}x + 1}{x^2 + 1}$$

[In] integrate(1/(x^2+1)^(3/2),x, algorithm="fricas")

[Out] (x^2 + sqrt(x^2 + 1)*x + 1)/(x^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.36 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.73

$$\int \frac{1}{(1+x^2)^{3/2}} dx = \frac{x}{\sqrt{x^2+1}}$$

[In] integrate(1/(x**2+1)**(3/2),x)

[Out] x/sqrt(x**2 + 1)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.82

$$\int \frac{1}{(1+x^2)^{3/2}} dx = \frac{x}{\sqrt{x^2+1}}$$

[In] integrate(1/(x^2+1)^(3/2),x, algorithm="maxima")

[Out] x/sqrt(x^2 + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.82

$$\int \frac{1}{(1+x^2)^{3/2}} dx = \frac{x}{\sqrt{x^2+1}}$$

[In] integrate(1/(x^2+1)^(3/2),x, algorithm="giac")

[Out] x/sqrt(x^2 + 1)

Mupad [B] (verification not implemented)

Time = 16.45 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.82

$$\int \frac{1}{(1+x^2)^{3/2}} dx = \frac{x}{\sqrt{x^2+1}}$$

[In] int(1/(x^2 + 1)^(3/2),x)

[Out] x/(x^2 + 1)^(1/2)

$$3.191 \quad \int \frac{1}{\sqrt{x^{3/2}-x^2}} dx$$

| | |
|---|------|
| Optimal result | 1633 |
| Rubi [A] (verified) | 1633 |
| Mathematica [A] (verified) | 1634 |
| Maple [A] (verified) | 1634 |
| Fricas [A] (verification not implemented) | 1635 |
| Sympy [F] | 1635 |
| Maxima [F] | 1635 |
| Giac [A] (verification not implemented) | 1635 |
| Mupad [F(-1)] | 1636 |

Optimal result

Integrand size = 15, antiderivative size = 20

$$\int \frac{1}{\sqrt{x^{3/2}-x^2}} dx = 4 \arctan\left(\frac{x}{\sqrt{x^{3/2}-x^2}}\right)$$

[Out] 4*arctan(x/(x^(3/2)-x^2)^(1/2))

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.133$, Rules used = {2033, 209}

$$\int \frac{1}{\sqrt{x^{3/2}-x^2}} dx = 4 \arctan\left(\frac{x}{\sqrt{x^{3/2}-x^2}}\right)$$

[In] Int[1/Sqrt[x^(3/2) - x^2], x]

[Out] 4*ArcTan[x/Sqrt[x^(3/2) - x^2]]

Rule 209

Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a, 0] || GtQ[b, 0])

Rule 2033

Int[1/Sqrt[(a_)*(x_)^2 + (b_)*(x_)^(n_)], x_Symbol] := Dist[2/(2 - n), Subst[Int[1/(1 - a*x^2), x], x, x/Sqrt[a*x^2 + b*x^n]], x] /; FreeQ[{a, b, n}, x] && NeQ[n, 2]

Rubi steps

$$\begin{aligned} \text{integral} &= 4\text{Subst}\left(\int \frac{1}{1+x^2} dx, x, \frac{x}{\sqrt{x^{3/2}-x^2}}\right) \\ &= 4 \arctan\left(\frac{x}{\sqrt{x^{3/2}-x^2}}\right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.11 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{1}{\sqrt{x^{3/2}-x^2}} dx = 4 \arctan\left(\frac{x}{\sqrt{x^{3/2}-x^2}}\right)$$

[In] Integrate[1/Sqrt[x^(3/2) - x^2],x]

[Out] 4*ArcTan[x/Sqrt[x^(3/2) - x^2]]

Maple [A] (verified)

Time = 0.25 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.35

| method | result | size |
|-------------------|--|------|
| meijerg | $4 \arcsin\left(x^{\frac{1}{4}}\right)$ | 7 |
| derivativedivides | $\frac{2\sqrt{x}\sqrt{-\sqrt{x}(-1+\sqrt{x})} \arcsin(2\sqrt{x}-1)}{\sqrt{x^{\frac{3}{2}}-x^2}}$ | 37 |
| default | $\frac{2x(-1+\sqrt{x}) \ln\left(\sqrt{x}-\frac{1}{2}+\sqrt{x-\sqrt{x}}\right)}{\sqrt{x^{\frac{3}{2}}-x^2} \sqrt{\sqrt{x}(-1+\sqrt{x})}}$ | 46 |

[In] int(1/(x^(3/2)-x^2)^(1/2),x,method=_RETURNVERBOSE)

[Out] 4*arcsin(x^(1/4))

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.90

$$\int \frac{1}{\sqrt{x^{3/2} - x^2}} dx = -4 \arctan \left(\frac{\sqrt{-x^2 + x^{3/2}}}{x} \right)$$

[In] integrate(1/(x^(3/2)-x^2)^(1/2),x, algorithm="fricas")

[Out] -4*arctan(sqrt(-x^2 + x^(3/2))/x)

Sympy [F]

$$\int \frac{1}{\sqrt{x^{3/2} - x^2}} dx = \int \frac{1}{\sqrt{x^{3/2} - x^2}} dx$$

[In] integrate(1/(x**(3/2)-x**2)**(1/2),x)

[Out] Integral(1/sqrt(x**(3/2) - x**2), x)

Maxima [F]

$$\int \frac{1}{\sqrt{x^{3/2} - x^2}} dx = \int \frac{1}{\sqrt{-x^2 + x^{3/2}}} dx$$

[In] integrate(1/(x^(3/2)-x^2)^(1/2),x, algorithm="maxima")

[Out] integrate(1/sqrt(-x^2 + x^(3/2)), x)

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.75

$$\int \frac{1}{\sqrt{x^{3/2} - x^2}} dx = (\pi + 2 \arcsin(2\sqrt{x} - 1)) \operatorname{sgn}(x)$$

[In] integrate(1/(x^(3/2)-x^2)^(1/2),x, algorithm="giac")

[Out] (pi + 2*arcsin(2*sqrt(x) - 1))*sgn(x)

Mupad [F(-1)]

Timed out.

$$\int \frac{1}{\sqrt{x^{3/2} - x^2}} dx = \int \frac{1}{\sqrt{x^{3/2} - x^2}} dx$$

```
[In] int(1/(x^(3/2) - x^2)^(1/2), x)
```

```
[Out] int(1/(x^(3/2) - x^2)^(1/2), x)
```


3.192 $\int \frac{-1+x}{x+x^2 \log(x)} dx$

| | |
|---|------|
| Optimal result | 1637 |
| Rubi [A] (verified) | 1637 |
| Mathematica [A] (verified) | 1638 |
| Maple [A] (verified) | 1638 |
| Fricas [A] (verification not implemented) | 1638 |
| Sympy [A] (verification not implemented) | 1639 |
| Maxima [A] (verification not implemented) | 1639 |
| Giac [A] (verification not implemented) | 1639 |
| Mupad [B] (verification not implemented) | 1639 |

Optimal result

Integrand size = 14, antiderivative size = 7

$$\int \frac{-1+x}{x+x^2 \log(x)} dx = \log\left(\frac{1}{x} + \log(x)\right)$$

[Out] $\ln(1/x+\ln(x))$

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.143$, Rules used = {2641, 6816}

$$\int \frac{-1+x}{x+x^2 \log(x)} dx = \log\left(\frac{1}{x} + \log(x)\right)$$

[In] $\text{Int}[(-1 + x)/(x + x^2 \cdot \text{Log}[x]), x]$

[Out] $\text{Log}[x^{(-1)} + \text{Log}[x]]$

Rule 2641

$\text{Int}[(u_*)*((a_*)*(x_)^{(m_*)} + \text{Log}[(c_*)*(x_)^{(n_*)}]^{(q_*)}*(b_*)*(x_)^{(r_*)})^{(p_*)}, x_Symbol] \rightarrow \text{Int}[u*x^{(p*r)}*(a*x^{(m-r)} + b*\text{Log}[c*x^n]^q)^p, x] /;$
 $\text{FreeQ}\{a, b, c, m, n, p, q, r\}, x \ \&\& \ \text{IntegerQ}[p]$

Rule 6816

$\text{Int}[(u_)/(y_), x_Symbol] \rightarrow \text{With}\{q = \text{DerivativeDivides}[y, u, x]\}, \text{Simp}[q*\text{Log}[\text{RemoveContent}[y, x]], x] /; \text{!FalseQ}[q]$

Rubi steps

$$\begin{aligned} \text{integral} &= \int \frac{-1+x}{x^2 \left(\frac{1}{x} + \log(x)\right)} dx \\ &= \log\left(\frac{1}{x} + \log(x)\right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.08 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.71

$$\int \frac{-1+x}{x+x^2 \log(x)} dx = -\log(x) + \log(1+x \log(x))$$

[In] Integrate[(-1 + x)/(x + x^2*Log[x]),x]

[Out] -Log[x] + Log[1 + x*Log[x]]

Maple [A] (verified)

Time = 0.23 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.14

| method | result | size |
|---------------|--|------|
| risch | $\ln\left(\frac{1}{x} + \ln(x)\right)$ | 8 |
| default | $-\ln(x) + \ln(x \ln(x) + 1)$ | 13 |
| norman | $-\ln(x) + \ln(x \ln(x) + 1)$ | 13 |
| parallelrisch | $-\ln(x) + \ln(x \ln(x) + 1)$ | 13 |

[In] int((-1+x)/(x+x^2*ln(x)),x,method=_RETURNVERBOSE)

[Out] ln(1/x+ln(x))

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.57

$$\int \frac{-1+x}{x+x^2 \log(x)} dx = \log\left(\frac{x \log(x) + 1}{x}\right)$$

[In] integrate((-1+x)/(x+x^2*log(x)),x, algorithm="fricas")

[Out] log((x*log(x) + 1)/x)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{-1+x}{x+x^2 \log(x)} dx = \log\left(\log(x) + \frac{1}{x}\right)$$

[In] integrate((-1+x)/(x+x**2*ln(x)),x)

[Out] log(log(x) + 1/x)

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.57

$$\int \frac{-1+x}{x+x^2 \log(x)} dx = \log\left(\frac{x \log(x) + 1}{x}\right)$$

[In] integrate((-1+x)/(x+x^2*log(x)),x, algorithm="maxima")

[Out] log((x*log(x) + 1)/x)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.71

$$\int \frac{-1+x}{x+x^2 \log(x)} dx = \log(x \log(x) + 1) - \log(x)$$

[In] integrate((-1+x)/(x+x^2*log(x)),x, algorithm="giac")

[Out] log(x*log(x) + 1) - log(x)

Mupad [B] (verification not implemented)

Time = 16.32 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.71

$$\int \frac{-1+x}{x+x^2 \log(x)} dx = \ln(x \ln(x) + 1) - \ln(x)$$

[In] int((x - 1)/(x + x^2*log(x)),x)

[Out] log(x*log(x) + 1) - log(x)

3.193 $\int \csc(x) \sec(x) dx$

| | |
|---|------|
| Optimal result | 1640 |
| Rubi [A] (verified) | 1640 |
| Mathematica [B] (verified) | 1641 |
| Maple [A] (verified) | 1641 |
| Fricas [B] (verification not implemented) | 1641 |
| Sympy [B] (verification not implemented) | 1642 |
| Maxima [B] (verification not implemented) | 1642 |
| Giac [B] (verification not implemented) | 1642 |
| Mupad [B] (verification not implemented) | 1643 |

Optimal result

Integrand size = 5, antiderivative size = 3

$$\int \csc(x) \sec(x) dx = \log(\tan(x))$$

[Out] $\ln(\tan(x))$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.400$, Rules used = {2700, 29}

$$\int \csc(x) \sec(x) dx = \log(\tan(x))$$

[In] `Int[Csc[x]*Sec[x],x]`

[Out] `Log[Tan[x]]`

Rule 29

`Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]`

Rule 2700

`Int[csc[(e_.) + (f_.)*(x_)]^(m_.)*sec[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] :> Dist[1/f, Subst[Int[(1 + x^2)^((m + n)/2 - 1)/x^m, x], x, Tan[e + f*x]], x] /; FreeQ[{e, f}, x] && IntegersQ[m, n, (m + n)/2]`

Rubi steps

$$\begin{aligned}\text{integral} &= \text{Subst}\left(\int \frac{1}{x} dx, x, \tan(x)\right) \\ &= \log(\tan(x))\end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 9 vs. $2(3) = 6$.

Time = 0.00 (sec) , antiderivative size = 9, normalized size of antiderivative = 3.00

$$\int \csc(x) \sec(x) dx = -\log(\cos(x)) + \log(\sin(x))$$

[In] Integrate[Csc[x]*Sec[x],x]

[Out] -Log[Cos[x]] + Log[Sin[x]]

Maple [A] (verified)

Time = 0.12 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

| method | result | size |
|---------------|---|------|
| default | $\ln(\tan(x))$ | 4 |
| risch | $\ln(e^{2ix} - 1) - \ln(e^{2ix} + 1)$ | 20 |
| norman | $-\ln\left(\tan\left(\frac{x}{2}\right) - 1\right) - \ln\left(1 + \tan\left(\frac{x}{2}\right)\right) + \ln\left(\tan\left(\frac{x}{2}\right)\right)$ | 25 |
| parallelrisch | $-\ln\left(\tan\left(\frac{x}{2}\right) - 1\right) - \ln\left(1 + \tan\left(\frac{x}{2}\right)\right) + \ln\left(\tan\left(\frac{x}{2}\right)\right)$ | 25 |

[In] int(csc(x)*sec(x),x,method=_RETURNVERBOSE)

[Out] ln(tan(x))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 19 vs. $2(3) = 6$.

Time = 0.25 (sec) , antiderivative size = 19, normalized size of antiderivative = 6.33

$$\int \csc(x) \sec(x) dx = -\frac{1}{2} \log(\cos(x)^2) + \frac{1}{2} \log\left(-\frac{1}{4} \cos(x)^2 + \frac{1}{4}\right)$$

[In] integrate(csc(x)*sec(x),x, algorithm="fricas")

[Out] -1/2*log(cos(x)^2) + 1/2*log(-1/4*cos(x)^2 + 1/4)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 14 vs. $2(3) = 6$.

Time = 0.05 (sec) , antiderivative size = 14, normalized size of antiderivative = 4.67

$$\int \csc(x) \sec(x) dx = -\frac{\log(\sin^2(x) - 1)}{2} + \log(\sin(x))$$

[In] `integrate(csc(x)*sec(x),x)`

[Out] `-log(sin(x)**2 - 1)/2 + log(sin(x))`

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 17 vs. $2(3) = 6$.

Time = 0.19 (sec) , antiderivative size = 17, normalized size of antiderivative = 5.67

$$\int \csc(x) \sec(x) dx = -\frac{1}{2} \log(\sin(x)^2 - 1) + \frac{1}{2} \log(\sin(x)^2)$$

[In] `integrate(csc(x)*sec(x),x, algorithm="maxima")`

[Out] `-1/2*log(sin(x)^2 - 1) + 1/2*log(sin(x)^2)`

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 16 vs. $2(3) = 6$.

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 5.33

$$\int \csc(x) \sec(x) dx = -\frac{1}{2} \log(-\sin(x)^2 + 1) + \log(|\sin(x)|)$$

[In] `integrate(csc(x)*sec(x),x, algorithm="giac")`

[Out] `-1/2*log(-sin(x)^2 + 1) + log(abs(sin(x)))`

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \csc(x) \sec(x) dx = \ln(\tan(x))$$

[In] `int(1/(cos(x)*sin(x)),x)`

[Out] `log(tan(x))`

3.194 $\int \tan(\cos(x)) dx$

| | |
|------------------------|------|
| Optimal result | 1644 |
| Rubi [N/A] | 1644 |
| Mathematica [N/A] | 1645 |
| Maple [N/A] (verified) | 1645 |
| Fricas [N/A] | 1645 |
| Sympy [N/A] | 1645 |
| Maxima [N/A] | 1646 |
| Giac [N/A] | 1646 |
| Mupad [N/A] | 1646 |

Optimal result

Integrand size = 3, antiderivative size = 3

$$\int \tan(\cos(x)) dx = \text{Int}(\tan(\cos(x)), x)$$

[Out] CannotIntegrate(tan(cos(x)), x)

Rubi [N/A]

Not integrable

Time = 0.14 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 0, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \tan(\cos(x)) dx = \int \tan(\cos(x)) dx$$

[In] Int[Tan[Cos[x]], x]

[Out] Defer[Int][Tan[Cos[x]], x]

Rubi steps

$$\text{integral} = \int \tan(\cos(x)) dx$$

Mathematica [N/A]

Not integrable

Time = 0.04 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.67

$$\int \tan(\cos(x)) dx = \int \tan(\cos(x)) dx$$

[In] Integrate[Tan[Cos[x]],x]

[Out] Integrate[Tan[Cos[x]], x]

Maple [N/A] (verified)

Not integrable

Time = 0.03 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \tan(\cos(x)) dx$$

[In] int(tan(cos(x)),x)

[Out] int(tan(cos(x)),x)

Fricas [N/A]

Not integrable

Time = 0.25 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.67

$$\int \tan(\cos(x)) dx = \int \tan(\cos(x)) dx$$

[In] integrate(tan(cos(x)),x, algorithm="fricas")

[Out] integral(tan(cos(x)), x)

Sympy [N/A]

Not integrable

Time = 1.38 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.67

$$\int \tan(\cos(x)) dx = \int \tan(\cos(x)) dx$$

[In] integrate(tan(cos(x)),x)

[Out] Integral(tan(cos(x)), x)

Maxima [N/A]

Not integrable

Time = 0.45 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.67

$$\int \tan(\cos(x)) dx = \int \tan(\cos(x)) dx$$

[In] integrate(tan(cos(x)),x, algorithm="maxima")

[Out] integrate(tan(cos(x)), x)

Giac [N/A]

Not integrable

Time = 0.27 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.67

$$\int \tan(\cos(x)) dx = \int \tan(\cos(x)) dx$$

[In] integrate(tan(cos(x)),x, algorithm="giac")

[Out] integrate(tan(cos(x)), x)

Mupad [N/A]

Not integrable

Time = 15.88 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.67

$$\int \tan(\cos(x)) dx = \int \tan(\cos(x)) dx$$

[In] int(tan(cos(x)),x)

[Out] int(tan(cos(x)), x)

3.195 $\int \frac{1+x}{x(x+\log(x))} dx$

| | |
|---|------|
| Optimal result | 1647 |
| Rubi [A] (verified) | 1647 |
| Mathematica [A] (verified) | 1648 |
| Maple [A] (verified) | 1648 |
| Fricas [A] (verification not implemented) | 1648 |
| Sympy [A] (verification not implemented) | 1649 |
| Maxima [A] (verification not implemented) | 1649 |
| Giac [A] (verification not implemented) | 1649 |
| Mupad [B] (verification not implemented) | 1649 |

Optimal result

Integrand size = 13, antiderivative size = 5

$$\int \frac{1+x}{x(x+\log(x))} dx = \log(x + \log(x))$$

[Out] $\ln(x+\ln(x))$

Rubi [A] (verified)

Time = 0.05 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.077$, Rules used = {6816}

$$\int \frac{1+x}{x(x+\log(x))} dx = \log(x + \log(x))$$

[In] $\text{Int}[(1+x)/(x*(x+\text{Log}[x])),x]$

[Out] $\text{Log}[x + \text{Log}[x]]$

Rule 6816

$\text{Int}[(u_)/(y_), x_Symbol] \rightarrow \text{With}[\{q = \text{DerivativeDivides}[y, u, x]\}, \text{Simp}[q*\text{Log}[\text{RemoveContent}[y, x]], x] /; \text{!FalseQ}[q]]$

Rubi steps

$$\text{integral} = \log(x + \log(x))$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1+x}{x(x+\log(x))} dx = \log(x+\log(x))$$

[In] Integrate[(1 + x)/(x*(x + Log[x])),x]

[Out] Log[x + Log[x]]

Maple [A] (verified)

Time = 0.29 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.20

| method | result | size |
|--------------|-------------------|------|
| default | $\ln(x + \ln(x))$ | 6 |
| norman | $\ln(x + \ln(x))$ | 6 |
| risch | $\ln(x + \ln(x))$ | 6 |
| parallelrisk | $\ln(x + \ln(x))$ | 6 |

[In] int((1+x)/x/(x+ln(x)),x,method=_RETURNVERBOSE)

[Out] ln(x+ln(x))

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1+x}{x(x+\log(x))} dx = \log(x+\log(x))$$

[In] integrate((1+x)/x/(x+log(x)),x, algorithm="fricas")

[Out] log(x + log(x))

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1+x}{x(x+\log(x))} dx = \log(x + \log(x))$$

[In] integrate((1+x)/x/(x+ln(x)),x)

[Out] log(x + log(x))

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1+x}{x(x+\log(x))} dx = \log(x + \log(x))$$

[In] integrate((1+x)/x/(x+log(x)),x, algorithm="maxima")

[Out] log(x + log(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1+x}{x(x+\log(x))} dx = \log(x + \log(x))$$

[In] integrate((1+x)/x/(x+log(x)),x, algorithm="giac")

[Out] log(x + log(x))

Mupad [B] (verification not implemented)

Time = 16.58 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1+x}{x(x+\log(x))} dx = \ln(x + \ln(x))$$

[In] int((x + 1)/(x*(x + log(x))),x)

[Out] log(x + log(x))

3.196 $\int (e^{-e^x+x} + e^{e^x+x}) dx$

| | |
|---|------|
| Optimal result | 1650 |
| Rubi [B] (verified) | 1650 |
| Mathematica [B] (verified) | 1651 |
| Maple [B] (verified) | 1651 |
| Fricas [B] (verification not implemented) | 1652 |
| Sympy [F(-1)] | 1652 |
| Maxima [B] (verification not implemented) | 1652 |
| Giac [B] (verification not implemented) | 1652 |
| Mupad [B] (verification not implemented) | 1653 |

Optimal result

Integrand size = 17, antiderivative size = 6

$$\int (e^{-e^x+x} + e^{e^x+x}) dx = 2 \sinh(e^x)$$

[Out] 2*sinh(exp(x))

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 15 vs. 2(6) = 12.

Time = 0.02 (sec) , antiderivative size = 15, normalized size of antiderivative = 2.50, number of steps used = 5, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.118$, Rules used = {2320, 2225}

$$\int (e^{-e^x+x} + e^{e^x+x}) dx = e^{e^x} - e^{-e^x}$$

[In] Int[E^(-E^x + x) + E^(E^x + x), x]

[Out] -E^(-E^x) + E^E^x

Rule 2225

Int[((F_)^((c_)*((a_) + (b_)*(x_))))^(n_), x_Symbol] := Simp[(F^(c*(a + b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]

Rule 2320

Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x], Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x] /; FunctionOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_)*(v_)^(n_))^(m_) /; FreeQ[

```
{a, m, n}, x] && IntegerQ[m*n]] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_)[v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int e^{-e^x+x} dx + \int e^{e^x+x} dx \\ &= \text{Subst}\left(\int e^{-x} dx, x, e^x\right) + \text{Subst}\left(\int e^x dx, x, e^x\right) \\ &= -e^{-e^x} + e^{e^x} \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 15 vs. 2(6) = 12.

Time = 0.02 (sec) , antiderivative size = 15, normalized size of antiderivative = 2.50

$$\int (e^{-e^x+x} + e^{e^x+x}) dx = -e^{-e^x} + e^{e^x}$$

```
[In] Integrate[E^(-E^x + x) + E^(E^x + x), x]
```

```
[Out] -E^(-E^x) + E^E^x
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 11 vs. 2(5) = 10.

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 2.00

| method | result | size |
|---------|----------------------------------|------|
| default | $-e^{-e^x} + e^{e^x}$ | 12 |
| parts | $-e^{-e^x} + e^{e^x}$ | 12 |
| risch | $(e^{e^x+x} - e^{x-e^x}) e^{-x}$ | 21 |

```
[In] int(exp(exp(x)+x)+exp(x-exp(x)),x,method=_RETURNVERBOSE)
```

```
[Out] -1/exp(exp(x))+exp(exp(x))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 27 vs. $2(5) = 10$.

Time = 0.25 (sec) , antiderivative size = 27, normalized size of antiderivative = 4.50

$$\int (e^{-e^x+x} + e^{e^x+x}) dx = -(e^{(2x)} - e^{(2x+2e^x)})e^{(-2x-e^x)}$$

[In] integrate(exp(exp(x)+x)+exp(x-exp(x)),x, algorithm="fricas")

[Out] -(e^(2*x) - e^(2*x + 2*e^x))*e^(-2*x - e^x)

Sympy [F(-1)]

Timed out.

$$\int (e^{-e^x+x} + e^{e^x+x}) dx = \text{Timed out}$$

[In] integrate(exp(exp(x)+x)+exp(x-exp(x)),x)

[Out] Timed out

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 11 vs. $2(5) = 10$.

Time = 0.18 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.83

$$\int (e^{-e^x+x} + e^{e^x+x}) dx = -e^{(-e^x)} + e^{(e^x)}$$

[In] integrate(exp(exp(x)+x)+exp(x-exp(x)),x, algorithm="maxima")

[Out] -e^(-e^x) + e^(e^x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 11 vs. $2(5) = 10$.

Time = 0.28 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.83

$$\int (e^{-e^x+x} + e^{e^x+x}) dx = -e^{(-e^x)} + e^{(e^x)}$$

[In] integrate(exp(exp(x)+x)+exp(x-exp(x)),x, algorithm="giac")

[Out] -e^(-e^x) + e^(e^x)

Mupad [B] (verification not implemented)

Time = 16.61 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.83

$$\int (e^{-e^x+x} + e^{e^x+x}) dx = 2 \sinh(e^x)$$

[In] `int(exp(x + exp(x)) + exp(x - exp(x)),x)`

[Out] `2*sinh(exp(x))`

3.197 $\int \frac{1}{1-x^2} dx$

| | |
|---|------|
| Optimal result | 1654 |
| Rubi [A] (verified) | 1654 |
| Mathematica [B] (verified) | 1655 |
| Maple [A] (verified) | 1655 |
| Fricas [B] (verification not implemented) | 1655 |
| Sympy [B] (verification not implemented) | 1656 |
| Maxima [B] (verification not implemented) | 1656 |
| Giac [B] (verification not implemented) | 1656 |
| Mupad [B] (verification not implemented) | 1657 |

Optimal result

Integrand size = 9, antiderivative size = 2

$$\int \frac{1}{1-x^2} dx = \operatorname{arctanh}(x)$$

[Out] $\operatorname{arctanh}(x)$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 2, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {212}

$$\int \frac{1}{1-x^2} dx = \operatorname{arctanh}(x)$$

[In] $\operatorname{Int}[(1-x^2)^{-1}, x]$

[Out] $\operatorname{ArcTanh}[x]$

Rule 212

$\operatorname{Int}[(a_+ + (b_+)(x^2)^{-1}), x_Symbol] \rightarrow \operatorname{Simp}[(1/(\operatorname{Rt}[a, 2]*\operatorname{Rt}[-b, 2]))*\operatorname{ArcTanh}[\operatorname{Rt}[-b, 2]*(x/\operatorname{Rt}[a, 2])], x] /; \operatorname{FreeQ}\{a, b\}, x \ \&\& \operatorname{NegQ}[a/b] \ \&\& (\operatorname{GtQ}[a, 0] \ || \ \operatorname{LtQ}[b, 0])$

Rubi steps

$$\text{integral} = \operatorname{arctanh}(x)$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 19 vs. $2(2) = 4$.

Time = 0.00 (sec) , antiderivative size = 19, normalized size of antiderivative = 9.50

$$\int \frac{1}{1-x^2} dx = -\frac{1}{2} \log(1-x) + \frac{1}{2} \log(1+x)$$

[In] Integrate[(1 - x^2)^(-1),x]

[Out] -1/2*Log[1 - x] + Log[1 + x]/2

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.50

| method | result | size |
|---------------|---|------|
| default | $\operatorname{arctanh}(x)$ | 3 |
| meijerg | $\operatorname{arctanh}(x)$ | 3 |
| norman | $-\frac{\ln(-1+x)}{2} + \frac{\ln(1+x)}{2}$ | 14 |
| risch | $-\frac{\ln(-1+x)}{2} + \frac{\ln(1+x)}{2}$ | 14 |
| parallelrisch | $-\frac{\ln(-1+x)}{2} + \frac{\ln(1+x)}{2}$ | 14 |

[In] int(1/(-x^2+1),x,method=_RETURNVERBOSE)

[Out] arctanh(x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 13 vs. $2(2) = 4$.

Time = 0.23 (sec) , antiderivative size = 13, normalized size of antiderivative = 6.50

$$\int \frac{1}{1-x^2} dx = \frac{1}{2} \log(x+1) - \frac{1}{2} \log(x-1)$$

[In] integrate(1/(-x^2+1),x, algorithm="fricas")

[Out] 1/2*log(x + 1) - 1/2*log(x - 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 12 vs. $2(2) = 4$.

Time = 0.05 (sec) , antiderivative size = 12, normalized size of antiderivative = 6.00

$$\int \frac{1}{1-x^2} dx = -\frac{\log(x-1)}{2} + \frac{\log(x+1)}{2}$$

[In] `integrate(1/(-x**2+1),x)`

[Out] `-log(x - 1)/2 + log(x + 1)/2`

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 13 vs. $2(2) = 4$.

Time = 0.19 (sec) , antiderivative size = 13, normalized size of antiderivative = 6.50

$$\int \frac{1}{1-x^2} dx = \frac{1}{2} \log(x+1) - \frac{1}{2} \log(x-1)$$

[In] `integrate(1/(-x^2+1),x, algorithm="maxima")`

[Out] `1/2*log(x + 1) - 1/2*log(x - 1)`

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(2) = 4$.

Time = 0.28 (sec) , antiderivative size = 15, normalized size of antiderivative = 7.50

$$\int \frac{1}{1-x^2} dx = \frac{1}{2} \log(|x+1|) - \frac{1}{2} \log(|x-1|)$$

[In] `integrate(1/(-x^2+1),x, algorithm="giac")`

[Out] `1/2*log(abs(x + 1)) - 1/2*log(abs(x - 1))`

Mupad [B] (verification not implemented)

Time = 16.29 (sec) , antiderivative size = 2, normalized size of antiderivative = 1.00

$$\int \frac{1}{1-x^2} dx = \operatorname{atanh}(x)$$

[In] `int(-1/(x^2 - 1),x)`

[Out] `atanh(x)`

3.198 $\int 2^{\log(x)} dx$

| | |
|---|------|
| Optimal result | 1658 |
| Rubi [A] (verified) | 1658 |
| Mathematica [A] (verified) | 1659 |
| Maple [A] (verified) | 1659 |
| Fricas [A] (verification not implemented) | 1660 |
| Sympy [A] (verification not implemented) | 1660 |
| Maxima [A] (verification not implemented) | 1660 |
| Giac [A] (verification not implemented) | 1661 |
| Mupad [B] (verification not implemented) | 1661 |

Optimal result

Integrand size = 4, antiderivative size = 12

$$\int 2^{\log(x)} dx = \frac{2^{\log(x)} x}{1 + \log(2)}$$

[Out] $2^{\ln(x)} * x / (1 + \ln(2))$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.08, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {2306, 30}

$$\int 2^{\log(x)} dx = \frac{x^{1+\log(2)}}{1 + \log(2)}$$

[In] Int[2^Log[x], x]

[Out] $x^{(1 + \text{Log}[2])} / (1 + \text{Log}[2])$

Rule 30

Int[(x_)^(m_), x_Symbol] :> Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rule 2306

Int[(u_)*(F_)^((a_)*(Log[z_]*(b_) + (v_))), x_Symbol] :> Int[u*F^(a*v)*z^(a*b*Log[F]), x] /; FreeQ[{F, a, b}, x]

Rubi steps

$$\begin{aligned} \text{integral} &= \int x^{\log(2)} dx \\ &= \frac{x^{1+\log(2)}}{1+\log(2)} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int 2^{\log(x)} dx = \frac{2^{\log(x)} x}{1 + \log(2)}$$

[In] Integrate[2^Log[x],x]

[Out] (2^Log[x]*x)/(1 + Log[2])

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.08

| method | result | size |
|---------------|--|------|
| gospers | $\frac{2^{\ln(x)} x}{1+\ln(2)}$ | 13 |
| risch | $\frac{x x^{\ln(2)}}{1+\ln(2)}$ | 13 |
| parallelrisch | $\frac{2^{\ln(x)} x}{1+\ln(2)}$ | 13 |
| norman | $\frac{x e^{\ln(x) \ln(2)}}{1+\ln(2)}$ | 15 |

[In] int(2^ln(x),x,method=_RETURNVERBOSE)

[Out] 2^ln(x)*x/(1+ln(2))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int 2^{\log(x)} dx = \frac{x e^{(\log(2) \log(x))}}{\log(2) + 1}$$

[In] integrate(2^log(x),x, algorithm="fricas")

[Out] x*e^(log(2)*log(x))/(log(2) + 1)

Sympy [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int 2^{\log(x)} dx = \frac{2^{\log(x)} x}{\log(2) + 1}$$

[In] integrate(2**ln(x),x)

[Out] 2**log(x)*x/(log(2) + 1)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 24, normalized size of antiderivative = 2.00

$$\int 2^{\log(x)} dx = \frac{2^{\left(\frac{1}{\log(2)}+1\right) \log(x)}}{\left(\frac{1}{\log(2)} + 1\right) \log(2)}$$

[In] integrate(2^log(x),x, algorithm="maxima")

[Out] 2^((1/log(2) + 1)*log(x))/((1/log(2) + 1)*log(2))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int 2^{\log(x)} dx = \frac{x e^{(\log(2) \log(x))}}{\log(2) + 1}$$

```
[In] integrate(2^log(x),x, algorithm="giac")
```

```
[Out] x*e^(log(2)*log(x))/(log(2) + 1)
```

Mupad [B] (verification not implemented)

Time = 16.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.08

$$\int 2^{\log(x)} dx = \frac{x^{\ln(2)+1}}{\ln(2) + 1}$$

```
[In] int(2^log(x),x)
```

```
[Out] x^(log(2) + 1)/(log(2) + 1)
```

3.199 $\int (\cos(3x) + \sin(2x)(\cos(3x) - \sin(2019x))) dx$

| | |
|---|------|
| Optimal result | 1662 |
| Rubi [A] (verified) | 1662 |
| Mathematica [A] (verified) | 1663 |
| Maple [A] (verified) | 1664 |
| Fricas [F(-1)] | 1664 |
| Sympy [A] (verification not implemented) | 1664 |
| Maxima [A] (verification not implemented) | 1665 |
| Giac [A] (verification not implemented) | 1665 |
| Mupad [B] (verification not implemented) | 1665 |

Optimal result

Integrand size = 21, antiderivative size = 39

$$\int (\cos(3x) + \sin(2x)(\cos(3x) - \sin(2019x))) dx$$

$$= \frac{\cos(x)}{2} - \frac{1}{10} \cos(5x) + \frac{1}{3} \sin(3x) - \frac{\sin(2017x)}{4034} + \frac{\sin(2021x)}{4042}$$

[Out] 1/2*cos(x)-1/10*cos(5*x)+1/3*sin(3*x)-1/4034*sin(2017*x)+1/4042*sin(2021*x)

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 39, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.190$, Rules used = {2717, 4486, 4369, 4367}

$$\int (\cos(3x) + \sin(2x)(\cos(3x) - \sin(2019x))) dx$$

$$= \frac{1}{3} \sin(3x) - \frac{\sin(2017x)}{4034} + \frac{\sin(2021x)}{4042} + \frac{\cos(x)}{2} - \frac{1}{10} \cos(5x)$$

[In] Int[Cos[3*x] + Sin[2*x]*(Cos[3*x] - Sin[2019*x]),x]

[Out] Cos[x]/2 - Cos[5*x]/10 + Sin[3*x]/3 - Sin[2017*x]/4034 + Sin[2021*x]/4042

Rule 2717

Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] := Simp[Sin[c + d*x]/d, x] /;
FreeQ[{c, d}, x]

Rule 4367

```
Int[sin[(a_.) + (b_.)*(x_)]*sin[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[Sin[
a - c + (b - d)*x]/(2*(b - d)), x] - Simp[Sin[a + c + (b + d)*x]/(2*(b + d)
), x] /; FreeQ[{a, b, c, d}, x] && NeQ[b^2 - d^2, 0]
```

Rule 4369

```
Int[cos[(c_.) + (d_.)*(x_)]*sin[(a_.) + (b_.)*(x_)], x_Symbol] := Simp[-Cos
[a - c + (b - d)*x]/(2*(b - d)), x] - Simp[Cos[a + c + (b + d)*x]/(2*(b + d)
)), x] /; FreeQ[{a, b, c, d}, x] && NeQ[b^2 - d^2, 0]
```

Rule 4486

```
Int[u_, x_Symbol] := With[{v = ExpandTrig[u, x]}, Int[v, x] /; SumQ[v]] /;
!InertTrigFreeQ[u]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \cos(3x) dx + \int \sin(2x)(\cos(3x) - \sin(2019x)) dx \\
&= \frac{1}{3} \sin(3x) + \int (\cos(3x) \sin(2x) - \sin(2x) \sin(2019x)) dx \\
&= \frac{1}{3} \sin(3x) + \int \cos(3x) \sin(2x) dx - \int \sin(2x) \sin(2019x) dx \\
&= \frac{\cos(x)}{2} - \frac{1}{10} \cos(5x) + \frac{1}{3} \sin(3x) - \frac{\sin(2017x)}{4034} + \frac{\sin(2021x)}{4042}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 39, normalized size of antiderivative = 1.00

$$\begin{aligned}
&\int (\cos(3x) + \sin(2x)(\cos(3x) - \sin(2019x))) dx \\
&= \frac{\cos(x)}{2} - \frac{1}{10} \cos(5x) + \frac{1}{3} \sin(3x) - \frac{\sin(2017x)}{4034} + \frac{\sin(2021x)}{4042}
\end{aligned}$$

```
[In] Integrate[Cos[3*x] + Sin[2*x]*(Cos[3*x] - Sin[2019*x]),x]
```

```
[Out] Cos[x]/2 - Cos[5*x]/10 + Sin[3*x]/3 - Sin[2017*x]/4034 + Sin[2021*x]/4042
```

Maple [A] (verified)

Time = 1.46 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.77

| method | result | size |
|--------------|---|------|
| default | $\frac{\cos(x)}{2} - \frac{\cos(5x)}{10} + \frac{\sin(3x)}{3} - \frac{\sin(2017x)}{4034} + \frac{\sin(2021x)}{4042}$ | 30 |
| risch | $\frac{\cos(x)}{2} - \frac{\cos(5x)}{10} + \frac{\sin(3x)}{3} - \frac{\sin(2017x)}{4034} + \frac{\sin(2021x)}{4042}$ | 30 |
| parts | $\frac{\cos(x)}{2} - \frac{\cos(5x)}{10} + \frac{\sin(3x)}{3} - \frac{\sin(2017x)}{4034} + \frac{\sin(2021x)}{4042}$ | 30 |
| parallelrisc | $-\frac{2}{5} - \frac{\sin(2017x)}{4034} + \frac{\sin(2021x)}{4042} - \frac{\cos(5x)}{10} + \frac{\sin(3x)}{3} + \frac{\cos(x)}{2}$ | 31 |

[In] `int(cos(3*x)+sin(2*x)*(-sin(2019*x)+cos(3*x)),x,method=_RETURNVERBOSE)`[Out] `1/2*cos(x)-1/10*cos(5*x)+1/3*sin(3*x)-1/4034*sin(2017*x)+1/4042*sin(2021*x)`**Fricas [F(-1)]**

Timed out.

$$\int (\cos(3x) + \sin(2x)(\cos(3x) - \sin(2019x))) dx = \text{Timed out}$$

[In] `integrate(cos(3*x)+sin(2*x)*(-sin(2019*x)+cos(3*x)),x, algorithm="fricas")`

[Out] Timed out

Sympy [A] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 60, normalized size of antiderivative = 1.54

$$\begin{aligned} & \int (\cos(3x) + \sin(2x)(\cos(3x) - \sin(2019x))) dx \\ &= \frac{3 \sin(2x) \sin(3x)}{5} + \frac{2019 \sin(2x) \cos(2019x)}{4076357} \\ &+ \frac{\sin(3x)}{3} - \frac{2 \sin(2019x) \cos(2x)}{4076357} + \frac{2 \cos(2x) \cos(3x)}{5} \end{aligned}$$

[In] `integrate(cos(3*x)+sin(2*x)*(-sin(2019*x)+cos(3*x)),x)`[Out] `3*sin(2*x)*sin(3*x)/5 + 2019*sin(2*x)*cos(2019*x)/4076357 + sin(3*x)/3 - 2*sin(2019*x)*cos(2*x)/4076357 + 2*cos(2*x)*cos(3*x)/5`

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.74

$$\int (\cos(3x) + \sin(2x)(\cos(3x) - \sin(2019x))) dx$$

$$= -\frac{1}{10} \cos(5x) + \frac{1}{2} \cos(x) + \frac{1}{4042} \sin(2021x) - \frac{1}{4034} \sin(2017x) + \frac{1}{3} \sin(3x)$$

[In] integrate(cos(3*x)+sin(2*x)*(-sin(2019*x)+cos(3*x)),x, algorithm="maxima")

[Out] -1/10*cos(5*x) + 1/2*cos(x) + 1/4042*sin(2021*x) - 1/4034*sin(2017*x) + 1/3*sin(3*x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.74

$$\int (\cos(3x) + \sin(2x)(\cos(3x) - \sin(2019x))) dx$$

$$= -\frac{1}{10} \cos(5x) + \frac{1}{2} \cos(x) + \frac{1}{4042} \sin(2021x) - \frac{1}{4034} \sin(2017x) + \frac{1}{3} \sin(3x)$$

[In] integrate(cos(3*x)+sin(2*x)*(-sin(2019*x)+cos(3*x)),x, algorithm="giac")

[Out] -1/10*cos(5*x) + 1/2*cos(x) + 1/4042*sin(2021*x) - 1/4034*sin(2017*x) + 1/3*sin(3*x)

Mupad [B] (verification not implemented)

Time = 17.42 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.74

$$\int (\cos(3x) + \sin(2x)(\cos(3x) - \sin(2019x))) dx$$

$$= \frac{\sin(3x)}{3} - \frac{\cos(5x)}{10} - \frac{\sin(2017x)}{4034} + \frac{\sin(2021x)}{4042} + \frac{\cos(x)}{2}$$

[In] int(cos(3*x) + sin(2*x)*(cos(3*x) - sin(2019*x)),x)

[Out] sin(3*x)/3 - cos(5*x)/10 - sin(2017*x)/4034 + sin(2021*x)/4042 + cos(x)/2

3.200 $\int \cos(x) \cos(\sin(x)) \cos(\sin(\sin(x))) dx$

| | |
|---|------|
| Optimal result | 1666 |
| Rubi [A] (verified) | 1666 |
| Mathematica [A] (verified) | 1667 |
| Maple [A] (verified) | 1667 |
| Fricas [B] (verification not implemented) | 1668 |
| Sympy [A] (verification not implemented) | 1668 |
| Maxima [A] (verification not implemented) | 1668 |
| Giac [A] (verification not implemented) | 1669 |
| Mupad [B] (verification not implemented) | 1669 |

Optimal result

Integrand size = 10, antiderivative size = 4

$$\int \cos(x) \cos(\sin(x)) \cos(\sin(\sin(x))) dx = \sin(\sin(\sin(x)))$$

[Out] $\sin(\sin(\sin(x)))$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.200$, Rules used = {4419, 2717}

$$\int \cos(x) \cos(\sin(x)) \cos(\sin(\sin(x))) dx = \sin(\sin(\sin(x)))$$

[In] `Int[Cos[x]*Cos[Sin[x]]*Cos[Sin[Sin[x]]],x]`

[Out] `Sin[Sin[Sin[x]]]`

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] := Simp[Sin[c + d*x]/d, x] /;
FreeQ[{c, d}, x]
```

Rule 4419

```
Int[(u_)*(F_)[(c_.)*((a_.) + (b_.)*(x_))], x_Symbol] := With[{d = FreeFacto
rs[Sin[c*(a + b*x)], x]}, Dist[d/(b*c), Subst[Int[SubstFor[1, Sin[c*(a + b*
x)]]/d, u, x], x], x, Sin[c*(a + b*x)]/d, x] /; FunctionOfQ[Sin[c*(a + b*x)
]/d, u, x, True]] /; FreeQ[{a, b, c}, x] && (EqQ[F, Cos] || EqQ[F, cos])
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \text{Subst}\left(\int \cos(x) \cos(\sin(x)) dx, x, \sin(x)\right) \\
 &= \text{Subst}\left(\int \cos(x) dx, x, \sin(\sin(x))\right) \\
 &= \sin(\sin(\sin(x)))
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \cos(x) \cos(\sin(x)) \cos(\sin(\sin(x))) dx = \sin(\sin(\sin(x)))$$

[In] Integrate[Cos[x]*Cos[Sin[x]]*Cos[Sin[Sin[x]]],x]

[Out] Sin[Sin[Sin[x]]]

Maple [A] (verified)

Time = 10.37 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.25

| method | result | size |
|-------------------|-----------------------|------|
| derivativedivides | $\sin(\sin(\sin(x)))$ | 5 |
| default | $\sin(\sin(\sin(x)))$ | 5 |
| risch | $\sin(\sin(\sin(x)))$ | 5 |
| parallelrisch | $\sin(\sin(\sin(x)))$ | 5 |

[In] int(cos(x)*cos(sin(x))*cos(sin(sin(x))),x,method=_RETURNVERBOSE)

[Out] sin(sin(sin(x)))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 41 vs. $2(4) = 8$.

Time = 0.25 (sec) , antiderivative size = 41, normalized size of antiderivative = 10.25

$$\int \cos(x) \cos(\sin(x)) \cos(\sin(\sin(x))) dx = \sin \left(\frac{2 \tan \left(\frac{\tan(\frac{1}{2}x)}{\tan(\frac{1}{2}x)^2 + 1} \right)}{\tan \left(\frac{\tan(\frac{1}{2}x)}{\tan(\frac{1}{2}x)^2 + 1} \right)^2 + 1} \right)$$

[In] integrate(cos(x)*cos(sin(x))*cos(sin(sin(x))),x, algorithm="fricas")

[Out] sin(2*tan(tan(1/2*x)/(tan(1/2*x)^2 + 1))/(tan(tan(1/2*x)/(tan(1/2*x)^2 + 1))^2 + 1))

Sympy [A] (verification not implemented)

Time = 0.85 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.25

$$\int \cos(x) \cos(\sin(x)) \cos(\sin(\sin(x))) dx = \sin(\sin(\sin(x)))$$

[In] integrate(cos(x)*cos(sin(x))*cos(sin(sin(x))),x)

[Out] sin(sin(sin(x)))

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \cos(x) \cos(\sin(x)) \cos(\sin(\sin(x))) dx = \sin(\sin(\sin(x)))$$

[In] integrate(cos(x)*cos(sin(x))*cos(sin(sin(x))),x, algorithm="maxima")

[Out] sin(sin(sin(x)))

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \cos(x) \cos(\sin(x)) \cos(\sin(\sin(x))) dx = \sin(\sin(\sin(x)))$$

```
[In] integrate(cos(x)*cos(sin(x))*cos(sin(sin(x))),x, algorithm="giac")
```

```
[Out] sin(sin(sin(x)))
```

Mupad [B] (verification not implemented)

Time = 0.34 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.00

$$\int \cos(x) \cos(\sin(x)) \cos(\sin(\sin(x))) dx = \sin(\sin(\sin(x)))$$

```
[In] int(cos(sin(x))*cos(sin(sin(x)))*cos(x),x)
```

```
[Out] sin(sin(sin(x)))
```

3.201 $\int \frac{e^{-\frac{2019}{4x^2}}}{x^2} dx$

| | |
|---|------|
| Optimal result | 1670 |
| Rubi [A] (verified) | 1670 |
| Mathematica [A] (verified) | 1671 |
| Maple [A] (verified) | 1671 |
| Fricas [A] (verification not implemented) | 1672 |
| Sympy [A] (verification not implemented) | 1672 |
| Maxima [A] (verification not implemented) | 1672 |
| Giac [F] | 1673 |
| Mupad [B] (verification not implemented) | 1673 |

Optimal result

Integrand size = 13, antiderivative size = 24

$$\int \frac{e^{-\frac{2019}{4x^2}}}{x^2} dx = -\sqrt{\frac{\pi}{2019}} \operatorname{erf}\left(\frac{\sqrt{2019}}{2x}\right)$$

[Out] $-1/2019*2019^{(1/2)}*Pi^{(1/2)}*erf(1/2*2019^{(1/2)}/x)$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.154$, Rules used = {2242, 2236}

$$\int \frac{e^{-\frac{2019}{4x^2}}}{x^2} dx = -\sqrt{\frac{\pi}{2019}} \operatorname{erf}\left(\frac{\sqrt{2019}}{2x}\right)$$

[In] $\text{Int}[1/(E^{(2019/(4*x^2))}*x^2), x]$

[Out] $-(\text{Sqrt}[Pi/2019]*\text{Erf}[\text{Sqrt}[2019]/(2*x)])$

Rule 2236

$\text{Int}[(F_)^{((a_.) + (b_.)*((c_.) + (d_.)*(x_))^{2})}, x_Symbol] \rightarrow \text{Simp}[F^a*\text{Sqrt}[Pi]*(\text{Erf}[(c + d*x)*\text{Rt}[(-b)*\text{Log}[F], 2]]/(2*d*\text{Rt}[(-b)*\text{Log}[F], 2])), x] /;$ FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 2242

$\text{Int}[(F_)^{((a_.) + (b_.)*((c_.) + (d_.)*(x_))^{n_})}*((c_.) + (d_.)*(x_))^{m_.}, x_Symbol] \rightarrow \text{Dist}[1/(d*(m + 1)), \text{Subst}[\text{Int}[F^{(a + b*x^2)}, x], x, (c + d$

$*x)^{(m + 1)}, x] /; \text{FreeQ}\{F, a, b, c, d, m, n\}, x] \ \&\& \ \text{EqQ}[n, 2*(m + 1)]$

Rubi steps

$$\begin{aligned} \text{integral} &= -\text{Subst}\left(\int e^{-\frac{2019x^2}{4}} dx, x, \frac{1}{x}\right) \\ &= -\sqrt{\frac{\pi}{2019}} \text{erf}\left(\frac{\sqrt{2019}}{2x}\right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.00

$$\int \frac{e^{-\frac{2019}{4x^2}}}{x^2} dx = -\sqrt{\frac{\pi}{2019}} \text{erf}\left(\frac{\sqrt{2019}}{2x}\right)$$

[In] Integrate[1/(E^(2019/(4*x^2))*x^2),x]

[Out] -(Sqrt[Pi/2019]*Erf[Sqrt[2019]/(2*x)])

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.75

| method | result | size |
|------------------|--|------|
| derivativdivides | $-\frac{\sqrt{2019} \sqrt{\pi} \text{erf}\left(\frac{\sqrt{2019}}{2x}\right)}{2019}$ | 18 |
| default | $-\frac{\sqrt{2019} \sqrt{\pi} \text{erf}\left(\frac{\sqrt{2019}}{2x}\right)}{2019}$ | 18 |
| meijerg | $-\frac{\sqrt{2019} \sqrt{\pi} \text{erf}\left(\frac{\sqrt{2019}}{2x}\right)}{2019}$ | 18 |
| risch | $-\frac{\sqrt{2019} \sqrt{\pi} \text{erf}\left(\frac{\sqrt{2019}}{2x}\right)}{2019}$ | 18 |

[In] int(exp(-2019/4/x^2)/x^2,x,method=_RETURNVERBOSE)

[Out] -1/2019*2019^(1/2)*Pi^(1/2)*erf(1/2*2019^(1/2)/x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.71

$$\int \frac{e^{-\frac{2019}{4x^2}}}{x^2} dx = -\frac{1}{2019} \sqrt{2019} \sqrt{\pi} \operatorname{erf} \left(\frac{\sqrt{2019}}{2x} \right)$$

[In] integrate(exp(-2019/4/x^2)/x^2,x, algorithm="fricas")

[Out] -1/2019*sqrt(2019)*sqrt(pi)*erf(1/2*sqrt(2019)/x)

Sympy [A] (verification not implemented)

Time = 0.39 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.92

$$\int \frac{e^{-\frac{2019}{4x^2}}}{x^2} dx = -\frac{\sqrt{2019} \sqrt{\pi} \operatorname{erf} \left(\frac{\sqrt{2019}}{2x} \right)}{2019}$$

[In] integrate(exp(-2019/4/x**2)/x**2,x)

[Out] -sqrt(2019)*sqrt(pi)*erf(sqrt(2019)/(2*x))/2019

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.21

$$\int \frac{e^{-\frac{2019}{4x^2}}}{x^2} dx = -\frac{\sqrt{2019} \sqrt{\pi} \sqrt{x^2} \left(\operatorname{erf} \left(\frac{1}{2} \sqrt{2019} \sqrt{\frac{1}{x^2}} \right) - 1 \right)}{2019 x}$$

[In] integrate(exp(-2019/4/x^2)/x^2,x, algorithm="maxima")

[Out] -1/2019*sqrt(2019)*sqrt(pi)*sqrt(x^2)*(erf(1/2*sqrt(2019)*sqrt(x^(-2)))) - 1)/x

Giac [F]

$$\int \frac{e^{-\frac{2019}{4x^2}}}{x^2} dx = \int \frac{e^{\left(-\frac{2019}{4x^2}\right)}}{x^2} dx$$

[In] integrate(exp(-2019/4/x^2)/x^2,x, algorithm="giac")

[Out] integrate(e^(-2019/4/x^2)/x^2, x)

Mupad [B] (verification not implemented)

Time = 15.66 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.71

$$\int \frac{e^{-\frac{2019}{4x^2}}}{x^2} dx = -\frac{\sqrt{2019} \sqrt{\pi} \operatorname{erf}\left(\frac{\sqrt{2019}}{2x}\right)}{2019}$$

[In] int(exp(-2019/(4*x^2))/x^2,x)

[Out] -(2019^(1/2)*pi^(1/2)*erf(2019^(1/2)/(2*x)))/2019

3.202 $\int \sin(\sqrt{x}) dx$

| | |
|---|------|
| Optimal result | 1674 |
| Rubi [A] (verified) | 1674 |
| Mathematica [A] (verified) | 1675 |
| Maple [A] (verified) | 1675 |
| Fricas [A] (verification not implemented) | 1676 |
| Sympy [A] (verification not implemented) | 1676 |
| Maxima [A] (verification not implemented) | 1676 |
| Giac [A] (verification not implemented) | 1676 |
| Mupad [B] (verification not implemented) | 1677 |

Optimal result

Integrand size = 6, antiderivative size = 22

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

[Out] $-2x^{(1/2)}*\cos(x^{(1/2)})+2*\sin(x^{(1/2)})$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3442, 3377, 2717}

$$\int \sin(\sqrt{x}) dx = 2 \sin(\sqrt{x}) - 2\sqrt{x} \cos(\sqrt{x})$$

[In] `Int[Sin[Sqrt[x]],x]`

[Out] $-2*\text{Sqrt}[x]*\text{Cos}[\text{Sqrt}[x]] + 2*\text{Sin}[\text{Sqrt}[x]]$

Rule 2717

`Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] := Simp[Sin[c + d*x]/d, x] /;`
`FreeQ[{c, d}, x]`

Rule 3377

`Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] := Simp[(-`
`(c + d*x)^m*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co`
`s[e + f*x], x], x] /;` `FreeQ[{c, d, e, f}, x] && GtQ[m, 0]`

Rule 3442

```
Int[((a_.) + (b_.)*Sin[(c_.) + (d_.)*((e_.) + (f_.)*(x_))^(n_)]^(p_.), x_Symbol] :> Dist[1/(n*f), Subst[Int[x^(1/n - 1)*(a + b*Sin[c + d*x])^p, x], x, (e + f*x)^n], x] /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[p, 0] && IntegerQ[1/n]
```

Rubi steps

$$\begin{aligned} \text{integral} &= 2\text{Subst}\left(\int x \sin(x) dx, x, \sqrt{x}\right) \\ &= -2\sqrt{x} \cos(\sqrt{x}) + 2\text{Subst}\left(\int \cos(x) dx, x, \sqrt{x}\right) \\ &= -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x}) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

```
[In] Integrate[Sin[Sqrt[x]], x]
```

```
[Out] -2*Sqrt[x]*Cos[Sqrt[x]] + 2*Sin[Sqrt[x]]
```

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.77

| method | result | size |
|-------------------|--|------|
| derivativedivides | $-2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$ | 17 |
| default | $-2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$ | 17 |
| meijerg | $4\sqrt{\pi} \left(-\frac{\sqrt{x} \cos(\sqrt{x})}{2\sqrt{\pi}} + \frac{\sin(\sqrt{x})}{2\sqrt{\pi}} \right)$ | 28 |

```
[In] int(sin(x^(1/2)), x, method=_RETURNVERBOSE)
```

```
[Out] -2*x^(1/2)*cos(x^(1/2))+2*sin(x^(1/2))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.73

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

[In] integrate(sin(x^(1/2)),x, algorithm="fricas")

[Out] -2*sqrt(x)*cos(sqrt(x)) + 2*sin(sqrt(x))

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.91

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

[In] integrate(sin(x**(1/2)),x)

[Out] -2*sqrt(x)*cos(sqrt(x)) + 2*sin(sqrt(x))

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.73

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

[In] integrate(sin(x^(1/2)),x, algorithm="maxima")

[Out] -2*sqrt(x)*cos(sqrt(x)) + 2*sin(sqrt(x))

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.73

$$\int \sin(\sqrt{x}) dx = -2\sqrt{x} \cos(\sqrt{x}) + 2 \sin(\sqrt{x})$$

[In] integrate(sin(x^(1/2)),x, algorithm="giac")

[Out] -2*sqrt(x)*cos(sqrt(x)) + 2*sin(sqrt(x))

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.73

$$\int \sin(\sqrt{x}) dx = 2 \sin(\sqrt{x}) - 2\sqrt{x} \cos(\sqrt{x})$$

[In] `int(sin(x^(1/2)),x)`

[Out] `2*sin(x^(1/2)) - 2*x^(1/2)*cos(x^(1/2))`

3.203 $\int \frac{\sqrt{x}}{1+x} dx$

| | |
|---|------|
| Optimal result | 1678 |
| Rubi [A] (verified) | 1678 |
| Mathematica [A] (verified) | 1679 |
| Maple [A] (verified) | 1679 |
| Fricas [A] (verification not implemented) | 1680 |
| Sympy [A] (verification not implemented) | 1680 |
| Maxima [A] (verification not implemented) | 1681 |
| Giac [A] (verification not implemented) | 1681 |
| Mupad [B] (verification not implemented) | 1681 |

Optimal result

Integrand size = 11, antiderivative size = 16

$$\int \frac{\sqrt{x}}{1+x} dx = 2\sqrt{x} - 2 \arctan(\sqrt{x})$$

[Out] $2*x^{(1/2)}-2*\arctan(x^{(1/2)})$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.273$, Rules used = {52, 65, 209}

$$\int \frac{\sqrt{x}}{1+x} dx = 2\sqrt{x} - 2 \arctan(\sqrt{x})$$

[In] `Int[Sqrt[x]/(1 + x),x]`

[Out] `2*Sqrt[x] - 2*ArcTan[Sqrt[x]]`

Rule 52

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] :> Simp[
(a + b*x)^(m + 1)*((c + d*x)^n/(b*(m + n + 1))), x] + Dist[n*((b*c - a*d)/(
b*(m + n + 1))), Int[(a + b*x)^m*(c + d*x)^(n - 1), x], x] /; FreeQ[{a, b,
c, d}, x] && NeQ[b*c - a*d, 0] && GtQ[n, 0] && NeQ[m + n + 1, 0] && !(IGtQ
[m, 0] && (!IntegerQ[n] || (GtQ[m, 0] && LtQ[m - n, 0]))) && !ILtQ[m + n
+ 2, 0] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 65

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] := With[
{p = Denominator[m]}, Dist[p/b, Subst[Int[x^(p*(m + 1) - 1)*(c - a*(d/b) +
d*(x^p/b))^n, x], x, (a + b*x)^(1/p)], x]] /; FreeQ[{a, b, c, d}, x] && NeQ
[b*c - a*d, 0] && LtQ[-1, m, 0] && LeQ[-1, n, 0] && LeQ[Denominator[n], Den
ominator[m]] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 209

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*A
rcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a
, 0] || GtQ[b, 0])
```

Rubi steps

$$\begin{aligned} \text{integral} &= 2\sqrt{x} - \int \frac{1}{\sqrt{x}(1+x)} dx \\ &= 2\sqrt{x} - 2\text{Subst}\left(\int \frac{1}{1+x^2} dx, x, \sqrt{x}\right) \\ &= 2\sqrt{x} - 2\arctan(\sqrt{x}) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \frac{\sqrt{x}}{1+x} dx = 2\sqrt{x} - 2\arctan(\sqrt{x})$$

```
[In] Integrate[Sqrt[x]/(1 + x),x]
```

```
[Out] 2*Sqrt[x] - 2*ArcTan[Sqrt[x]]
```

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.81

| method | result | size |
|------------------|---|------|
| derivativdivides | $2\sqrt{x} - 2 \arctan(\sqrt{x})$ | 13 |
| default | $2\sqrt{x} - 2 \arctan(\sqrt{x})$ | 13 |
| meijerg | $2\sqrt{x} - 2 \arctan(\sqrt{x})$ | 13 |
| risch | $2\sqrt{x} - 2 \arctan(\sqrt{x})$ | 13 |
| trager | $2\sqrt{x} + \text{RootOf}(-Z^2 + 1) \ln\left(-\frac{2\text{RootOf}(-Z^2 + 1)\sqrt{x-x+1}}{1+x}\right)$ | 38 |

[In] `int(x^(1/2)/(1+x),x,method=_RETURNVERBOSE)`

[Out] `2*x^(1/2)-2*arctan(x^(1/2))`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{\sqrt{x}}{1+x} dx = 2\sqrt{x} - 2 \arctan(\sqrt{x})$$

[In] `integrate(x^(1/2)/(1+x),x, algorithm="fricas")`

[Out] `2*sqrt(x) - 2*arctan(sqrt(x))`

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.88

$$\int \frac{\sqrt{x}}{1+x} dx = 2\sqrt{x} - 2 \operatorname{atan}(\sqrt{x})$$

[In] `integrate(x**(1/2)/(1+x),x)`

[Out] `2*sqrt(x) - 2*atan(sqrt(x))`

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{\sqrt{x}}{1+x} dx = 2\sqrt{x} - 2 \arctan(\sqrt{x})$$

[In] integrate(x^(1/2)/(1+x),x, algorithm="maxima")

[Out] 2*sqrt(x) - 2*arctan(sqrt(x))

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{\sqrt{x}}{1+x} dx = 2\sqrt{x} - 2 \arctan(\sqrt{x})$$

[In] integrate(x^(1/2)/(1+x),x, algorithm="giac")

[Out] 2*sqrt(x) - 2*arctan(sqrt(x))

Mupad [B] (verification not implemented)

Time = 15.91 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.75

$$\int \frac{\sqrt{x}}{1+x} dx = 2\sqrt{x} - 2 \operatorname{atan}(\sqrt{x})$$

[In] int(x^(1/2)/(x + 1),x)

[Out] 2*x^(1/2) - 2*atan(x^(1/2))

3.204 $\int \cos(x) \cos(2x) \cos(3x) dx$

| | |
|---|------|
| Optimal result | 1682 |
| Rubi [A] (verified) | 1682 |
| Mathematica [A] (verified) | 1683 |
| Maple [A] (verified) | 1683 |
| Fricas [A] (verification not implemented) | 1684 |
| Sympy [B] (verification not implemented) | 1684 |
| Maxima [A] (verification not implemented) | 1684 |
| Giac [A] (verification not implemented) | 1685 |
| Mupad [B] (verification not implemented) | 1685 |

Optimal result

Integrand size = 11, antiderivative size = 30

$$\int \cos(x) \cos(2x) \cos(3x) dx = \frac{x}{4} + \frac{1}{8} \sin(2x) + \frac{1}{16} \sin(4x) + \frac{1}{24} \sin(6x)$$

[Out] 1/4*x+1/8*sin(2*x)+1/16*sin(4*x)+1/24*sin(6*x)

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 30, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {4440, 2717}

$$\int \cos(x) \cos(2x) \cos(3x) dx = \frac{x}{4} + \frac{1}{8} \sin(2x) + \frac{1}{16} \sin(4x) + \frac{1}{24} \sin(6x)$$

[In] Int[Cos[x]*Cos[2*x]*Cos[3*x],x]

[Out] x/4 + Sin[2*x]/8 + Sin[4*x]/16 + Sin[6*x]/24

Rule 2717

Int[sin[Pi/2 + (c_.) + (d_.)*(x_.)], x_Symbol] := Simp[Sin[c + d*x]/d, x] /;
FreeQ[{c, d}, x]

Rule 4440

Int[(F_)[(a_.) + (b_.)*(x_.)]^(p_.)*(G_)[(c_.) + (d_.)*(x_.)]^(q_.)*(H_)[(e_.) + (f_.)*(x_.)]^(r_.), x_Symbol] := Int[ExpandTrigReduce[ActivateTrig[F[a + b*x]^p*G[c + d*x]^q*H[e + f*x]^r], x], x] /; FreeQ[{a, b, c, d, e, f}, x] && (EqQ[F, sin] || EqQ[F, cos]) && (EqQ[G, sin] || EqQ[G, cos]) && (EqQ[H,

```
sin] || EqQ[H, cos]) && IGtQ[p, 0] && IGtQ[q, 0] && IGtQ[r, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(\frac{1}{4} + \frac{1}{4} \cos(2x) + \frac{1}{4} \cos(4x) + \frac{1}{4} \cos(6x) \right) dx \\ &= \frac{x}{4} + \frac{1}{4} \int \cos(2x) dx + \frac{1}{4} \int \cos(4x) dx + \frac{1}{4} \int \cos(6x) dx \\ &= \frac{x}{4} + \frac{1}{8} \sin(2x) + \frac{1}{16} \sin(4x) + \frac{1}{24} \sin(6x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 30, normalized size of antiderivative = 1.00

$$\int \cos(x) \cos(2x) \cos(3x) dx = \frac{x}{4} + \frac{1}{8} \sin(2x) + \frac{1}{16} \sin(4x) + \frac{1}{24} \sin(6x)$$

```
[In] Integrate[Cos[x]*Cos[2*x]*Cos[3*x],x]
```

```
[Out] x/4 + Sin[2*x]/8 + Sin[4*x]/16 + Sin[6*x]/24
```

Maple [A] (verified)

Time = 0.85 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.77

| method | result | size |
|--------------|--|------|
| default | $\frac{x}{4} + \frac{\sin(2x)}{8} + \frac{\sin(4x)}{16} + \frac{\sin(6x)}{24}$ | 23 |
| risch | $\frac{x}{4} + \frac{\sin(2x)}{8} + \frac{\sin(4x)}{16} + \frac{\sin(6x)}{24}$ | 23 |
| parallelisch | $\frac{x}{4} + \frac{\sin(2x)}{8} + \frac{\sin(4x)}{16} + \frac{\sin(6x)}{24}$ | 23 |

```
[In] int(cos(x)*cos(2*x)*cos(3*x),x,method=_RETURNVERBOSE)
```

```
[Out] 1/4*x+1/8*sin(2*x)+1/16*sin(4*x)+1/24*sin(6*x)
```

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.83

$$\int \cos(x) \cos(2x) \cos(3x) dx = \frac{1}{12} (16 \cos(x)^5 - 10 \cos(x)^3 + 3 \cos(x)) \sin(x) + \frac{1}{4} x$$

[In] integrate(cos(x)*cos(2*x)*cos(3*x),x, algorithm="fricas")

[Out] 1/12*(16*cos(x)^5 - 10*cos(x)^3 + 3*cos(x))*sin(x) + 1/4*x

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 114 vs. 2(22) = 44.

Time = 0.89 (sec) , antiderivative size = 114, normalized size of antiderivative = 3.80

$$\begin{aligned} \int \cos(x) \cos(2x) \cos(3x) dx = & -\frac{x \sin(x) \sin(2x) \cos(3x)}{4} + \frac{x \sin(x) \sin(3x) \cos(2x)}{4} \\ & + \frac{x \sin(2x) \sin(3x) \cos(x)}{4} + \frac{x \cos(x) \cos(2x) \cos(3x)}{4} \\ & + \frac{\sin(x) \sin(2x) \sin(3x)}{6} + \frac{\sin(x) \cos(2x) \cos(3x)}{8} \\ & + \frac{5 \sin(3x) \cos(x) \cos(2x)}{24} \end{aligned}$$

[In] integrate(cos(x)*cos(2*x)*cos(3*x),x)

[Out] -x*sin(x)*sin(2*x)*cos(3*x)/4 + x*sin(x)*sin(3*x)*cos(2*x)/4 + x*sin(2*x)*sin(3*x)*cos(x)/4 + x*cos(x)*cos(2*x)*cos(3*x)/4 + sin(x)*sin(2*x)*sin(3*x)/6 + sin(x)*cos(2*x)*cos(3*x)/8 + 5*sin(3*x)*cos(x)*cos(2*x)/24

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.73

$$\int \cos(x) \cos(2x) \cos(3x) dx = \frac{1}{4} x + \frac{1}{24} \sin(6x) + \frac{1}{16} \sin(4x) + \frac{1}{8} \sin(2x)$$

[In] integrate(cos(x)*cos(2*x)*cos(3*x),x, algorithm="maxima")

[Out] 1/4*x + 1/24*sin(6*x) + 1/16*sin(4*x) + 1/8*sin(2*x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.73

$$\int \cos(x) \cos(2x) \cos(3x) dx = \frac{1}{4} x + \frac{1}{24} \sin(6x) + \frac{1}{16} \sin(4x) + \frac{1}{8} \sin(2x)$$

[In] integrate(cos(x)*cos(2*x)*cos(3*x),x, algorithm="giac")

[Out] 1/4*x + 1/24*sin(6*x) + 1/16*sin(4*x) + 1/8*sin(2*x)

Mupad [B] (verification not implemented)

Time = 16.18 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.73

$$\int \cos(x) \cos(2x) \cos(3x) dx = \frac{x}{4} + \frac{\sin(2x)}{8} + \frac{\sin(4x)}{16} + \frac{\sin(6x)}{24}$$

[In] int(cos(2*x)*cos(3*x)*cos(x),x)

[Out] x/4 + sin(2*x)/8 + sin(4*x)/16 + sin(6*x)/24

3.205 $\int e^{-x^{2n}} dx$

| | |
|---|------|
| Optimal result | 1686 |
| Rubi [A] (verified) | 1686 |
| Mathematica [A] (verified) | 1687 |
| Maple [C] (verified) | 1687 |
| Fricas [F] | 1687 |
| Sympy [A] (verification not implemented) | 1688 |
| Maxima [A] (verification not implemented) | 1688 |
| Giac [F] | 1688 |
| Mupad [F(-1)] | 1688 |

Optimal result

Integrand size = 9, antiderivative size = 23

$$\int e^{-x^{2n}} dx = -\frac{x \operatorname{ExpIntegralE}\left(1 - \frac{1}{2n}, x^{2n}\right)}{2n}$$

[Out] $-1/2*x*Ei(1-1/2/n,x^{(2*n)})/n$

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 34, normalized size of antiderivative = 1.48, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {2239}

$$\int e^{-x^{2n}} dx = -\frac{x(x^{2n})^{-\frac{1}{2}/n} \Gamma\left(\frac{1}{2n}, x^{2n}\right)}{2n}$$

[In] $\operatorname{Int}[E^{-x^{(2*n)}}], x]$

[Out] $-1/2*(x*\Gamma[1/(2*n), x^{(2*n)}])/(n*(x^{(2*n)})^{(1/(2*n))})$

Rule 2239

$\operatorname{Int}[(F_)^{((a_.) + (b_.)*((c_.) + (d_.)*(x_))^{(n_.))}, x_Symbol] := \operatorname{Simp}[(-F^a)*(c + d*x)*(Gamma[1/n, (-b)*(c + d*x)^n*\operatorname{Log}[F]]/(d*n*((-b)*(c + d*x)^n*\operatorname{Log}[F])^{(1/n)})), x] /;$ $\operatorname{FreeQ}\{F, a, b, c, d, n\}, x \&\& \operatorname{!IntegerQ}[2/n]$

Rubi steps

$$\text{integral} = -\frac{x(x^{2n})^{-\frac{1}{2}/n} \Gamma\left(\frac{1}{2n}, x^{2n}\right)}{2n}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.48

$$\int e^{-x^{2n}} dx = -\frac{x(x^{2n})^{-\frac{1}{2}/n} \Gamma\left(\frac{1}{2n}, x^{2n}\right)}{2n}$$

[In] Integrate[E^(-x^(2*n)), x]

[Out] -1/2*(x*Gamma[1/(2*n), x^(2*n)])/(n*(x^(2*n))^(1/(2*n)))

Maple [C] (verified)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 0.06 (sec) , antiderivative size = 185, normalized size of antiderivative = 8.04

| method | result |
|---------|---|
| meijerg | $\frac{4n^2 x^{-2n+1} (2n x^{2n} + 2n+1) (x^{2n})^{-\frac{2n+1}{4n}} e^{-\frac{x^{2n}}{2}} \text{WhittakerM}\left(\frac{1}{2n} - \frac{2n+1}{4n}, \frac{2n+1}{4n} + \frac{1}{2}, x^{2n}\right)}{(2n+1)(4n+1)} + \frac{2n x^{-2n+1} (2n+1) (x^{2n})^{-\frac{2n+1}{4n}} e^{-\frac{x^{2n}}{2}} \text{WhittakerM}\left(\frac{1}{2n} - \frac{2n+1}{4n}, \frac{2n+1}{4n} + \frac{1}{2}, x^{2n}\right)}{4n+1}$ |

[In] int(exp(-x^(2*n)), x, method=_RETURNVERBOSE)

[Out] 1/2/n*(4*n^2*x^(-2*n+1)*(2*n*x^(2*n)+2*n+1)/(2*n+1)/(4*n+1)*(x^(2*n))^(-1/4*(2*n+1)/n)*exp(-1/2*x^(2*n))*WhittakerM(1/2/n-1/4*(2*n+1)/n, 1/4*(2*n+1)/n+1/2, x^(2*n))+2*n*x^(-2*n+1)*(2*n+1)/(4*n+1)*(x^(2*n))^(-1/4*(2*n+1)/n)*exp(-1/2*x^(2*n))*WhittakerM(1/2/n-1/4*(2*n+1)/n+1, 1/4*(2*n+1)/n+1/2, x^(2*n)))

Fricas [F]

$$\int e^{-x^{2n}} dx = \int e^{(-x^{2n})} dx$$

[In] integrate(exp(-x^(2*n)), x, algorithm="fricas")

[Out] integral(e^(-x^(2*n)), x)

Sympy [A] (verification not implemented)

Time = 0.38 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.26

$$\int e^{-x^{2n}} dx = \frac{\Gamma\left(\frac{1}{2n}\right) \gamma\left(\frac{1}{2n}, x^{2n}\right)}{4n^2 \Gamma\left(1 + \frac{1}{2n}\right)}$$

[In] integrate(exp(-x**(2*n)),x)

[Out] gamma(1/(2*n))*lowergamma(1/(2*n), x**(2*n))/(4*n**2*gamma(1 + 1/(2*n)))

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 30, normalized size of antiderivative = 1.30

$$\int e^{-x^{2n}} dx = -\frac{x \Gamma\left(\frac{1}{2n}, x^{2n}\right)}{2n(x^{2n})^{\frac{1}{2n}}}$$

[In] integrate(exp(-x^(2*n)),x, algorithm="maxima")

[Out] -1/2*x*gamma(1/2/n, x^(2*n))/(n*(x^(2*n))^(1/2/n))

Giac [F]

$$\int e^{-x^{2n}} dx = \int e^{(-x^{2n})} dx$$

[In] integrate(exp(-x^(2*n)),x, algorithm="giac")

[Out] integrate(e^(-x^(2*n)), x)

Mupad [F(-1)]

Timed out.

$$\int e^{-x^{2n}} dx = \int e^{-x^{2n}} dx$$

[In] int(exp(-x^(2*n)),x)

[Out] int(exp(-x^(2*n)), x)

3.206 $\int e dx$

| | |
|---|------|
| Optimal result | 1689 |
| Rubi [A] (verified) | 1689 |
| Mathematica [A] (verified) | 1690 |
| Maple [A] (verified) | 1690 |
| Fricas [A] (verification not implemented) | 1690 |
| Sympy [A] (verification not implemented) | 1690 |
| Maxima [A] (verification not implemented) | 1691 |
| Giac [A] (verification not implemented) | 1691 |
| Mupad [B] (verification not implemented) | 1691 |

Optimal result

Integrand size = 1, antiderivative size = 3

$$\int e dx = ex$$

[Out] x*exp(1)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 1.000$, Rules used = {8}

$$\int e dx = ex$$

[In] Int[E,x]

[Out] E*x

Rule 8

Int[a_, x_Symbol] :> Simp[a*x, x] /; FreeQ[a, x]

Rubi steps

integral = ex

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int e dx = ex$$

[In] Integrate[E,x]

[Out] E*x

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 9, normalized size of antiderivative = 3.00

| method | result | size |
|---------------|--------------------------|------|
| parallelrisch | $x^{\frac{1}{\ln(x)}} x$ | 9 |

[In] int(x^(1/ln(x)),x,method=_RETURNVERBOSE)

[Out] x^(1/ln(x))*x

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

$$\int e dx = xe$$

[In] integrate(x^(1/log(x)),x, algorithm="fricas")

[Out] x*e

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int e dx = ex$$

[In] integrate(x**(1/ln(x)),x)

[Out] E*x

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

$$\int e dx = xe$$

[In] integrate(x^(1/log(x)),x, algorithm="maxima")

[Out] x*e

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

$$\int e dx = xe$$

[In] integrate(x^(1/log(x)),x, algorithm="giac")

[Out] x*e

Mupad [B] (verification not implemented)

Time = 0.01 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

$$\int e dx = xe$$

[In] int(x^(1/log(x)),x)

[Out] x*exp(1)

3.207 $\int \frac{\sin(19x)+\sin(20x)}{\cos(19x)+\cos(20x)} dx$

| | |
|---|------|
| Optimal result | 1692 |
| Rubi [B] (verified) | 1692 |
| Mathematica [B] (verified) | 1696 |
| Maple [C] (verified) | 1697 |
| Fricas [B] (verification not implemented) | 1697 |
| Sympy [F(-1)] | 1698 |
| Maxima [B] (verification not implemented) | 1698 |
| Giac [B] (verification not implemented) | 1700 |
| Mupad [B] (verification not implemented) | 1701 |

Optimal result

Integrand size = 21, antiderivative size = 11

$$\int \frac{\sin(19x) + \sin(20x)}{\cos(19x) + \cos(20x)} dx = -\frac{2}{39} \log \left(\cos \left(\frac{39x}{2} \right) \right)$$

[Out] $-2/39*\ln(\cos(39/2*x))$

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 264 vs. 2(11) = 22.

Time = 4.54 (sec) , antiderivative size = 264, normalized size of antiderivative = 24.00, number of steps used = 14, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.238$, Rules used

= {4486, 2099, 1601, 12, 2125}

$$\int \frac{\sin(19x) + \sin(20x)}{\cos(19x) + \cos(20x)} dx = -\frac{1}{780} \log(-64 \cos^6(x) + 32 \cos^5(x) + 80 \cos^4(x) - 32 \cos^3(x) - 24 \cos^2(x) + 6 \cos(x) + 1) - \frac{1}{780} \log(1 - 2 \cos(x)) + \frac{19}{780} \log(\cos(x) + 1) - \frac{1}{780} \log(4096 \cos^{12}(x) + 2048 \cos^{11}(x) - 12288 \cos^{10}(x) - 6144 \cos^9(x) + 13568 \cos^8(x) + 6784 \cos^7(x) - 6592 \cos^6(x) - 3296 \cos^5(x) + 1264 \cos^4(x) + 632 \cos^3(x) - 48 \cos^2(x) - 24 \cos(x) + 1) - \frac{1}{20} \log(524288 \cos^{20}(x) + 262144 \cos^{19}(x) - 2621440 \cos^{18}(x) - 1245184 \cos^{17}(x) + 5570560 \cos^{16}(x) + 2490368 \cos^{15}(x) - 6553600 \cos^{14}(x) - 2723840 \cos^{13}(x) + 4659200 \cos^{12}(x) + 1770496 \cos^{11}(x) - 2050048 \cos^{10}(x) - 695552 \cos^9(x) + 549120 \cos^8(x) + 160512 \cos^7(x) - 84480 \cos^6(x) - 20064 \cos^5(x) + 6600 \cos^4(x) + 1140 \cos^3(x) - 200 \cos^2(x) - 19 \cos(x) + 1)$$

[In] Int[(Sin[19*x] + Sin[20*x])/(Cos[19*x] + Cos[20*x]),x]

[Out] -1/780*Log[1 - 2*Cos[x]] + (19*Log[1 + Cos[x]])/780 - Log[1 + 6*Cos[x] - 24*Cos[x]^2 - 32*Cos[x]^3 + 80*Cos[x]^4 + 32*Cos[x]^5 - 64*Cos[x]^6]/780 - Log[1 - 24*Cos[x] - 48*Cos[x]^2 + 632*Cos[x]^3 + 1264*Cos[x]^4 - 3296*Cos[x]^5 - 6592*Cos[x]^6 + 6784*Cos[x]^7 + 13568*Cos[x]^8 - 6144*Cos[x]^9 - 12288*Cos[x]^10 + 2048*Cos[x]^11 + 4096*Cos[x]^12]/780 - Log[1 - 19*Cos[x] - 200*Cos[x]^2 + 1140*Cos[x]^3 + 6600*Cos[x]^4 - 20064*Cos[x]^5 - 84480*Cos[x]^6 + 160512*Cos[x]^7 + 549120*Cos[x]^8 - 695552*Cos[x]^9 - 2050048*Cos[x]^10 + 1770496*Cos[x]^11 + 4659200*Cos[x]^12 - 2723840*Cos[x]^13 - 6553600*Cos[x]^14 + 2490368*Cos[x]^15 + 5570560*Cos[x]^16 - 1245184*Cos[x]^17 - 2621440*Cos[x]^18 + 262144*Cos[x]^19 + 524288*Cos[x]^20]/20

Rule 12

Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]

Rule 1601

Int[(Pp_)/(Qq_), x_Symbol] := With[{p = Expon[Pp, x], q = Expon[Qq, x]}, Simp[Coeff[Pp, x, p]*(Log[RemoveContent[Qq, x]]/(q*Coeff[Qq, x, q])), x] /; EqQ[p, q - 1] && EqQ[Pp, Simplify[(Coeff[Pp, x, p]/(q*Coeff[Qq, x, q]))*D[Qq, x]]] /; PolyQ[Pp, x] && PolyQ[Qq, x]

Rule 2099

```
Int[(P_)^(p_)*(Q_)^(q_), x_Symbol] := With[{PP = Factor[P]}, Int[ExpandIntegrand[PP^p*Q^q, x], x] /; !SumQ[NonfreeFactors[PP, x]] /; FreeQ[q, x] && PolyQ[P, x] && PolyQ[Q, x] && IntegerQ[p] && NeQ[P, x]
```

Rule 2125

```
Int[(Pm_)/(Qn_), x_Symbol] := With[{m = Expon[Pm, x], n = Expon[Qn, x]}, Simp[Coeff[Pm, x, m]*(Log[Qn]/(n*Coeff[Qn, x, n])), x] + Dist[1/(n*Coeff[Qn, x, n]), Int[ExpandToSum[n*Coeff[Qn, x, n]*Pm - Coeff[Pm, x, m]*D[Qn, x], x]/Qn, x], x] /; EqQ[m, n - 1] /; PolyQ[Pm, x] && PolyQ[Qn, x]
```

Rule 4486

```
Int[u_, x_Symbol] := With[{v = ExpandTrig[u, x]}, Int[v, x] /; SumQ[v]] /; !InertTrigFreeQ[u]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \left(\frac{\sin(19x)}{\cos(19x) + \cos(20x)} + \frac{\sin(20x)}{\cos(19x) + \cos(20x)} \right) dx \\
 &= \int \frac{\sin(19x)}{\cos(19x) + \cos(20x)} dx + \int \frac{\sin(20x)}{\cos(19x) + \cos(20x)} dx \\
 &= \\
 &\quad -\text{Subst} \left(\int \frac{4x(-5 + 330x^2 - 6}{1 - 19x - 200x^2 + 1140x^3 + 6600x^4 - 20064x^5 - 84480x^6 + 160512x^7 + 549120x^8 -}{-1 + 180x^2 - 528} \right) \\
 &\quad -\text{Subst} \left(\int \frac{-1 + 180x^2 - 528}{1 - 19x - 200x^2 + 1140x^3 + 6600x^4 - 20064x^5 - 84480x^6 + 160512x^7 + 549120x^8 -} \right) \\
 &= \\
 &\quad - \left(4\text{Subst} \left(\int \frac{x(-5 + 330x^2 -}{1 - 19x - 200x^2 + 1140x^3 + 6600x^4 - 20064x^5 - 84480x^6 + 160512x^7 + 549120x^8 -} \right) \right. \\
 &\quad \left. - \text{Subst} \left(\int \left(-\frac{19}{39(1+x)} + \frac{2}{39(-1+2x)} \right. \right. \right. \\
 &\quad \quad \left. \left. + \frac{2(-3 + 24x + 48x^2 - 160x^3 - 80x^4 + 192x^5)}{39(-1 - 6x + 24x^2 + 32x^3 - 80x^4 - 32x^5 + 64x^6)} \right. \right. \\
 &\quad \left. \left. + \frac{8(-3 - 12x + 237x^2 + 632x^3 - 2060x^4 - 4944x^5 + 5936x^6 + 13568x^7 - 6912x^8 - 15360x^9)}{39(1 - 24x - 48x^2 + 632x^3 + 1264x^4 - 3296x^5 - 6592x^6 + 6784x^7 + 13568x^8 - 6144x^9 - 1228} \right) \right)
 \end{aligned}$$

$$\begin{aligned}
&= -\frac{1}{39} \log(1 - 2 \cos(x)) + \frac{19}{39} \log(1 + \cos(x)) - \frac{1}{20} \log(1 - 19 \cos(x) - 200 \cos^2(x) \\
&\quad + 1140 \cos^3(x) + 6600 \cos^4(x) - 20064 \cos^5(x) - 84480 \cos^6(x) + 160512 \cos^7(x) \\
&\quad + 549120 \cos^8(x) - 695552 \cos^9(x) - 2050048 \cos^{10}(x) + 1770496 \cos^{11}(x) \\
&\quad + 4659200 \cos^{12}(x) - 2723840 \cos^{13}(x) - 6553600 \cos^{14}(x) + 2490368 \cos^{15}(x) \\
&\quad + 5570560 \cos^{16}(x) - 1245184 \cos^{17}(x) - 2621440 \cos^{18}(x) + 262144 \cos^{19}(x) \\
&\quad + 524288 \cos^{20}(x)) \\
&\text{Subst}\left(\int \frac{2490368 - 448266240x^2 + 13149143040x^4 - 147270402048x^6 + 820506525696x^8 - 255268696800x^{10} + 52428800000x^{12} - 12451840000x^{14} + 2621440000x^{16} - 262144000x^{18} + 52428800x^{20}}{1 - 19x - 200x^2 + 1140x^3 + 6600x^4 - 20064x^5 - 84480x^6 + 160512x^7 + 549120x^8 - 695552x^9 - 2050048x^{10} + 1770496x^{11} + 4659200x^{12} - 2723840x^{13} - 6553600x^{14} + 2490368x^{15} + 5570560x^{16} - 1245184x^{17} - 2621440x^{18} + 262144x^{19} + 524288x^{20}} dx, x, \cos(x)\right) \\
&\text{---} \\
&-\frac{2}{39} \text{Subst}\left(\int \frac{-3 + 24x + 48x^2 - 160x^3 - 80x^4 + 192x^5}{-1 - 6x + 24x^2 + 32x^3 - 80x^4 - 32x^5 + 64x^6} dx, x, \cos(x)\right) \\
&-\frac{8}{39} \text{Subst}\left(\int \frac{-3 - 12x + 237x^2 + 632x^3 - 2060x^4 - 4944x^5 + 5936x^6 + 13568x^7 - 6912x^8}{1 - 24x - 48x^2 + 632x^3 + 1264x^4 - 3296x^5 - 6592x^6 + 6784x^7 + 13568x^8 - 6144x^9} dx, x, \cos(x)\right) \\
&= -\frac{1}{39} \log(1 - 2 \cos(x)) + \frac{19}{39} \log(1 + \cos(x)) \\
&\quad - \frac{1}{39} \log(1 + 6 \cos(x) - 24 \cos^2(x) - 32 \cos^3(x) + 80 \cos^4(x) + 32 \cos^5(x) - 64 \cos^6(x)) \\
&\quad - \frac{1}{39} \log(1 - 24 \cos(x) - 48 \cos^2(x) + 632 \cos^3(x) + 1264 \cos^4(x) - 3296 \cos^5(x) \\
&\quad - 6592 \cos^6(x) + 6784 \cos^7(x) + 13568 \cos^8(x) - 6144 \cos^9(x) - 12288 \cos^{10}(x) \\
&\quad + 2048 \cos^{11}(x) + 4096 \cos^{12}(x)) - \frac{1}{20} \log(1 - 19 \cos(x) - 200 \cos^2(x) + 1140 \cos^3(x) \\
&\quad + 6600 \cos^4(x) - 20064 \cos^5(x) - 84480 \cos^6(x) + 160512 \cos^7(x) + 549120 \cos^8(x) \\
&\quad - 695552 \cos^9(x) - 2050048 \cos^{10}(x) + 1770496 \cos^{11}(x) + 4659200 \cos^{12}(x) \\
&\quad - 2723840 \cos^{13}(x) - 6553600 \cos^{14}(x) + 2490368 \cos^{15}(x) + 5570560 \cos^{16}(x) \\
&\quad - 1245184 \cos^{17}(x) - 2621440 \cos^{18}(x) + 262144 \cos^{19}(x) + 524288 \cos^{20}(x)) \\
&\text{Subst}\left(\int \left(\frac{47316992}{39(1+x)} - \frac{4980736}{39(-1+2x)} - \frac{4980736(-3+24x+48x^2-160x^3-80x^4+192x^5)}{39(-1-6x+24x^2+32x^3-80x^4-32x^5+64x^6)} - \frac{19922944(-3-12x+237x^2+632x^3-2060x^4-4944x^5+5936x^6+13568x^7-6912x^8)}{39(1-24x-48x^2+632x^3+1264x^4-3296x^5-6592x^6+6784x^7+13568x^8-6144x^9)}\right) dx, x, \cos(x)\right) \\
&\text{---}
\end{aligned}$$

$$\begin{aligned}
&= -\frac{1}{780} \log(1 - 2 \cos(x)) + \frac{19}{780} \log(1 + \cos(x)) \\
&\quad - \frac{1}{39} \log(1 + 6 \cos(x) - 24 \cos^2(x) - 32 \cos^3(x) + 80 \cos^4(x) + 32 \cos^5(x) - 64 \cos^6(x)) \\
&\quad - \frac{1}{39} \log(1 - 24 \cos(x) - 48 \cos^2(x) + 632 \cos^3(x) + 1264 \cos^4(x) - 3296 \cos^5(x) \\
&\quad\quad - 6592 \cos^6(x) + 6784 \cos^7(x) + 13568 \cos^8(x) - 6144 \cos^9(x) - 12288 \cos^{10}(x) \\
&\quad\quad + 2048 \cos^{11}(x) + 4096 \cos^{12}(x)) - \frac{1}{20} \log(1 - 19 \cos(x) - 200 \cos^2(x) + 1140 \cos^3(x) \\
&\quad\quad + 6600 \cos^4(x) - 20064 \cos^5(x) - 84480 \cos^6(x) + 160512 \cos^7(x) + 549120 \cos^8(x) \\
&\quad\quad - 695552 \cos^9(x) - 2050048 \cos^{10}(x) + 1770496 \cos^{11}(x) + 4659200 \cos^{12}(x) \\
&\quad\quad - 2723840 \cos^{13}(x) - 6553600 \cos^{14}(x) + 2490368 \cos^{15}(x) + 5570560 \cos^{16}(x) \\
&\quad\quad - 1245184 \cos^{17}(x) - 2621440 \cos^{18}(x) + 262144 \cos^{19}(x) + 524288 \cos^{20}(x)) \\
&\quad + \frac{19}{390} \text{Subst} \left(\int \frac{-3 + 24x + 48x^2 - 160x^3 - 80x^4 + 192x^5}{-1 - 6x + 24x^2 + 32x^3 - 80x^4 - 32x^5 + 64x^6} dx, x, \cos(x) \right) \\
&\quad + \frac{38}{195} \text{Subst} \left(\int \frac{-3 - 12x + 237x^2 + 632x^3 - 2060x^4 - 4944x^5 + 5936x^6 + 13568x^7 - 6912x^8}{1 - 24x - 48x^2 + 632x^3 + 1264x^4 - 3296x^5 - 6592x^6 + 6784x^7 + 13568x^8 - 6144x^9} dx, x, \cos(x) \right) \\
&= -\frac{1}{780} \log(1 - 2 \cos(x)) + \frac{19}{780} \log(1 + \cos(x)) - \frac{1}{780} \log(1 + 6 \cos(x) - 24 \cos^2(x) \\
&\quad - 32 \cos^3(x) + 80 \cos^4(x) + 32 \cos^5(x) - 64 \cos^6(x)) \\
&\quad - \frac{1}{780} \log(1 - 24 \cos(x) - 48 \cos^2(x) + 632 \cos^3(x) + 1264 \cos^4(x) - 3296 \cos^5(x) \\
&\quad - 6592 \cos^6(x) + 6784 \cos^7(x) + 13568 \cos^8(x) - 6144 \cos^9(x) - 12288 \cos^{10}(x) \\
&\quad + 2048 \cos^{11}(x) + 4096 \cos^{12}(x)) - \frac{1}{20} \log(1 - 19 \cos(x) - 200 \cos^2(x) + 1140 \cos^3(x) \\
&\quad + 6600 \cos^4(x) - 20064 \cos^5(x) - 84480 \cos^6(x) + 160512 \cos^7(x) + 549120 \cos^8(x) \\
&\quad - 695552 \cos^9(x) - 2050048 \cos^{10}(x) + 1770496 \cos^{11}(x) + 4659200 \cos^{12}(x) \\
&\quad - 2723840 \cos^{13}(x) - 6553600 \cos^{14}(x) + 2490368 \cos^{15}(x) + 5570560 \cos^{16}(x) \\
&\quad - 1245184 \cos^{17}(x) - 2621440 \cos^{18}(x) + 262144 \cos^{19}(x) + 524288 \cos^{20}(x))
\end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 131 vs. $2(11) = 22$.

Time = 0.42 (sec) , antiderivative size = 131, normalized size of antiderivative = 11.91

$$\begin{aligned}
\int \frac{\sin(19x) + \sin(20x)}{\cos(19x) + \cos(20x)} dx &= -\frac{2}{39} \log\left(\cos\left(\frac{x}{2}\right)\right) - \frac{2}{39} \log(1 - 2 \cos(x) + 2 \cos(2x)) \\
&\quad - 2 \cos(3x) + 2 \cos(4x) - 2 \cos(5x) + 2 \cos(6x) - 2 \cos(7x) \\
&\quad + 2 \cos(8x) - 2 \cos(9x) + 2 \cos(10x) - 2 \cos(11x) + 2 \cos(12x) \\
&\quad - 2 \cos(13x) + 2 \cos(14x) - 2 \cos(15x) + 2 \cos(16x) \\
&\quad - 2 \cos(17x) + 2 \cos(18x) - 2 \cos(19x)
\end{aligned}$$

[In] Integrate[(Sin[19*x] + Sin[20*x])/(Cos[19*x] + Cos[20*x]),x]

[Out] $(-2*\text{Log}[\text{Cos}[x/2]])/39 - (2*\text{Log}[1 - 2*\text{Cos}[x] + 2*\text{Cos}[2*x] - 2*\text{Cos}[3*x] + 2*\text{Cos}[4*x] - 2*\text{Cos}[5*x] + 2*\text{Cos}[6*x] - 2*\text{Cos}[7*x] + 2*\text{Cos}[8*x] - 2*\text{Cos}[9*x] + 2*\text{Cos}[10*x] - 2*\text{Cos}[11*x] + 2*\text{Cos}[12*x] - 2*\text{Cos}[13*x] + 2*\text{Cos}[14*x] - 2*\text{Cos}[15*x] + 2*\text{Cos}[16*x] - 2*\text{Cos}[17*x] + 2*\text{Cos}[18*x] - 2*\text{Cos}[19*x]])/39$

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 0.64 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.45

| method | result | size |
|---------------|--|------|
| risch | $ix - \frac{2 \ln(e^{39ix} + 1)}{39}$ | 16 |
| parallelrisch | $\ln\left(\left(\sec(10x)^2\right)^{\frac{1}{39}}\right) + \ln\left(\left(\sec\left(\frac{19x}{2}\right)^2\right)^{\frac{1}{39}}\right) + \ln\left(\frac{1}{\left(\tan\left(\frac{19x}{2}\right)\tan(10x)-1\right)^{\frac{2}{39}}}\right)$ | 34 |

[In] `int((sin(20*x)+sin(19*x))/(cos(20*x)+cos(19*x)),x,method=_RETURNVERBOSE)`

[Out] $I*x - 2/39*\ln(\exp(39*I*x) + 1)$

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 123 vs. $2(7) = 14$.

Time = 0.34 (sec) , antiderivative size = 123, normalized size of antiderivative = 11.18

$$\int \frac{\sin(19x) + \sin(20x)}{\cos(19x) + \cos(20x)} dx = -\frac{1}{39} \log \left(137438953472 \cos(x)^{39} - 1340029796352 \cos(x)^{37} \right. \\ \left. + 6030134083584 \cos(x)^{35} - 16610786017280 \cos(x)^{33} \right. \\ \left. + 31323196489728 \cos(x)^{31} - 42839077552128 \cos(x)^{29} \right. \\ \left. + 43920872439808 \cos(x)^{27} - 34411219255296 \cos(x)^{25} \right. \\ \left. + 20813237452800 \cos(x)^{23} - 9751387176960 \cos(x)^{21} \right. \\ \left. + 3530674667520 \cos(x)^{19} - 980106117120 \cos(x)^{17} \right. \\ \left. + 205701283840 \cos(x)^{15} - 31950643200 \cos(x)^{13} \right. \\ \left. + 3560214528 \cos(x)^{11} - 271960832 \cos(x)^9 \right. \\ \left. + 13302432 \cos(x)^7 - 373464 \cos(x)^5 + 4940 \cos(x)^3 \right. \\ \left. - \frac{39}{2} \cos(x) + \frac{1}{2} \right)$$

[In] `integrate((sin(20*x)+sin(19*x))/(cos(20*x)+cos(19*x)),x, algorithm="fricas")`

[Out] $-1/39*\log(137438953472*\cos(x)^{39} - 1340029796352*\cos(x)^{37} + 6030134083584*\cos(x)^{35} - 16610786017280*\cos(x)^{33} + 31323196489728*\cos(x)^{31} - 428390775$

52128*cos(x)^29 + 43920872439808*cos(x)^27 - 34411219255296*cos(x)^25 + 20813237452800*cos(x)^23 - 9751387176960*cos(x)^21 + 3530674667520*cos(x)^19 - 980106117120*cos(x)^17 + 205701283840*cos(x)^15 - 31950643200*cos(x)^13 + 3560214528*cos(x)^11 - 271960832*cos(x)^9 + 13302432*cos(x)^7 - 373464*cos(x)^5 + 4940*cos(x)^3 - 39/2*cos(x) + 1/2

Sympy [F(-1)]

Timed out.

$$\int \frac{\sin(19x) + \sin(20x)}{\cos(19x) + \cos(20x)} dx = \text{Timed out}$$

[In] integrate((sin(20*x)+sin(19*x))/(cos(20*x)+cos(19*x)),x)

[Out] Timed out

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 2527 vs. 2(7) = 14.

Time = 0.37 (sec) , antiderivative size = 2527, normalized size of antiderivative = 229.73

$$\int \frac{\sin(19x) + \sin(20x)}{\cos(19x) + \cos(20x)} dx = \text{Too large to display}$$

[In] integrate((sin(20*x)+sin(19*x))/(cos(20*x)+cos(19*x)),x, algorithm="maxima")

[Out] -1/39*log(2*(cos(23*x) - cos(21*x) - cos(20*x) + cos(18*x) + cos(17*x) - cos(15*x) - cos(14*x) + cos(12*x) - cos(10*x) - cos(9*x) + cos(7*x) + cos(6*x) - cos(4*x) - cos(3*x) + cos(x) + 1)*cos(24*x) + cos(24*x)^2 - 2*(cos(21*x) + cos(20*x) - cos(18*x) - cos(17*x) + cos(15*x) + cos(14*x) - cos(12*x) + cos(10*x) + cos(9*x) - cos(7*x) - cos(6*x) + cos(4*x) + cos(3*x) - cos(x) - 1)*cos(23*x) + cos(23*x)^2 + 2*(cos(20*x) - cos(18*x) - cos(17*x) + cos(15*x) + cos(14*x) - cos(12*x) + cos(10*x) + cos(9*x) - cos(7*x) - cos(6*x) + cos(4*x) + cos(3*x) - cos(x) - 1)*cos(21*x) + cos(21*x)^2 - 2*(cos(18*x) + cos(17*x) - cos(15*x) - cos(14*x) + cos(12*x) - cos(10*x) - cos(9*x) + cos(7*x) + cos(6*x) - cos(4*x) - cos(3*x) + cos(x) + 1)*cos(20*x) + cos(20*x)^2 + 2*(cos(17*x) - cos(15*x) - cos(14*x) + cos(12*x) - cos(10*x) - cos(9*x) + cos(7*x) + cos(6*x) - cos(4*x) - cos(3*x) + cos(x) + 1)*cos(18*x) + cos(18*x)^2 - 2*(cos(15*x) + cos(14*x) - cos(12*x) + cos(10*x) + cos(9*x) - cos(7*x) - cos(6*x) + cos(4*x) + cos(3*x) - cos(x) - 1)*cos(17*x) + cos(17*x)^2 + 2*(cos(14*x) - cos(12*x) + cos(10*x) + cos(9*x) - cos(7*x) - cos(6*x) + cos(4*x) + cos(3*x) - cos(x) - 1)*cos(15*x) + cos(15*x)^2 - 2*(cos(12*x) - cos(10*x) - cos(9*x) + cos(7*x) + cos(6*x) - cos(4*x) - cos(3*x) + cos(x))

$$\begin{aligned}
& + 1) \cos(14x) + \cos(14x)^2 - 2(\cos(10x) + \cos(9x) - \cos(7x) - \cos(6x) \\
&) + \cos(4x) + \cos(3x) - \cos(x) - 1) \cos(12x) + \cos(12x)^2 + 2(\cos(9x) \\
& - \cos(7x) - \cos(6x) + \cos(4x) + \cos(3x) - \cos(x) - 1) \cos(10x) + \cos(\\
& 10x)^2 - 2(\cos(7x) + \cos(6x) - \cos(4x) - \cos(3x) + \cos(x) + 1) \cos(9x) \\
& + \cos(9x)^2 + 2(\cos(6x) - \cos(4x) - \cos(3x) + \cos(x) + 1) \cos(7x) \\
& + \cos(7x)^2 - 2(\cos(4x) + \cos(3x) - \cos(x) - 1) \cos(6x) + \cos(6x)^2 + \\
& 2(\cos(3x) - \cos(x) - 1) \cos(4x) + \cos(4x)^2 - 2(\cos(x) + 1) \cos(3x) \\
& + \cos(3x)^2 + \cos(x)^2 + 2(\sin(23x) - \sin(21x) - \sin(20x) + \sin(18x) \\
& + \sin(17x) - \sin(15x) - \sin(14x) + \sin(12x) - \sin(10x) - \sin(9x) + \sin \\
& (7x) + \sin(6x) - \sin(4x) - \sin(3x) + \sin(x)) \sin(24x) + \sin(24x)^2 - \\
& 2(\sin(21x) + \sin(20x) - \sin(18x) - \sin(17x) + \sin(15x) + \sin(14x) - \\
& \sin(12x) + \sin(10x) + \sin(9x) - \sin(7x) - \sin(6x) + \sin(4x) + \sin(3x) \\
& x) - \sin(x)) \sin(23x) + \sin(23x)^2 + 2(\sin(20x) - \sin(18x) - \sin(17x) \\
& + \sin(15x) + \sin(14x) - \sin(12x) + \sin(10x) + \sin(9x) - \sin(7x) - \sin \\
& (6x) + \sin(4x) + \sin(3x) - \sin(x)) \sin(21x) + \sin(21x)^2 - 2(\sin(18x) \\
& + \sin(17x) - \sin(15x) - \sin(14x) + \sin(12x) - \sin(10x) - \sin(9x) + \\
& \sin(7x) + \sin(6x) - \sin(4x) - \sin(3x) + \sin(x)) \sin(20x) + \sin(20x)^2 \\
& + 2(\sin(17x) - \sin(15x) - \sin(14x) + \sin(12x) - \sin(10x) - \sin(9x) \\
& + \sin(7x) + \sin(6x) - \sin(4x) - \sin(3x) + \sin(x)) \sin(18x) + \sin(18x) \\
&)^2 - 2(\sin(15x) + \sin(14x) - \sin(12x) + \sin(10x) + \sin(9x) - \sin(7x) \\
&) - \sin(6x) + \sin(4x) + \sin(3x) - \sin(x)) \sin(17x) + \sin(17x)^2 + 2(\sin \\
& (14x) - \sin(12x) + \sin(10x) + \sin(9x) - \sin(7x) - \sin(6x) + \sin(4x) \\
&) + \sin(3x) - \sin(x)) \sin(15x) + \sin(15x)^2 - 2(\sin(12x) - \sin(10x) - \\
& \sin(9x) + \sin(7x) + \sin(6x) - \sin(4x) - \sin(3x) + \sin(x)) \sin(14x) + \\
& \sin(14x)^2 - 2(\sin(10x) + \sin(9x) - \sin(7x) - \sin(6x) + \sin(4x) + \sin \\
& (3x) - \sin(x)) \sin(12x) + \sin(12x)^2 + 2(\sin(9x) - \sin(7x) - \sin(6x) \\
& x) + \sin(4x) + \sin(3x) - \sin(x)) \sin(10x) + \sin(10x)^2 - 2(\sin(7x) + \\
& \sin(6x) - \sin(4x) - \sin(3x) + \sin(x)) \sin(9x) + \sin(9x)^2 + 2(\sin(6x) \\
&) - \sin(4x) - \sin(3x) + \sin(x)) \sin(7x) + \sin(7x)^2 - 2(\sin(4x) + \sin \\
& (3x) - \sin(x)) \sin(6x) + \sin(6x)^2 + 2(\sin(3x) - \sin(x)) \sin(4x) + \sin \\
& (4x)^2 + \sin(3x)^2 - 2\sin(3x) \sin(x) + \sin(x)^2 + 2\cos(x) + 1) - 1/39 \\
& * \log(-2(\cos(11x) - \cos(10x) + \cos(9x) - \cos(8x) + \cos(7x) - \cos(6x) \\
& + \cos(5x) - \cos(4x) + \cos(3x) - \cos(2x) + \cos(x) - 1) \cos(12x) + \cos(1 \\
& 2x)^2 - 2(\cos(10x) - \cos(9x) + \cos(8x) - \cos(7x) + \cos(6x) - \cos(5x) \\
&) + \cos(4x) - \cos(3x) + \cos(2x) - \cos(x) + 1) \cos(11x) + \cos(11x)^2 - \\
& 2(\cos(9x) - \cos(8x) + \cos(7x) - \cos(6x) + \cos(5x) - \cos(4x) + \cos(3x) \\
& x) - \cos(2x) + \cos(x) - 1) \cos(10x) + \cos(10x)^2 - 2(\cos(8x) - \cos(7x) \\
&) + \cos(6x) - \cos(5x) + \cos(4x) - \cos(3x) + \cos(2x) - \cos(x) + 1) \cos(\\
& 9x) + \cos(9x)^2 - 2(\cos(7x) - \cos(6x) + \cos(5x) - \cos(4x) + \cos(3x) \\
& - \cos(2x) + \cos(x) - 1) \cos(8x) + \cos(8x)^2 - 2(\cos(6x) - \cos(5x) + \\
& \cos(4x) - \cos(3x) + \cos(2x) - \cos(x) + 1) \cos(7x) + \cos(7x)^2 - 2(\cos \\
& (5x) - \cos(4x) + \cos(3x) - \cos(2x) + \cos(x) - 1) \cos(6x) + \cos(6x)^2 \\
& - 2(\cos(4x) - \cos(3x) + \cos(2x) - \cos(x) + 1) \cos(5x) + \cos(5x)^2 - 2 \\
& * (\cos(3x) - \cos(2x) + \cos(x) - 1) \cos(4x) + \cos(4x)^2 - 2(\cos(2x) - \cos \\
& (x) + 1) \cos(3x) + \cos(3x)^2 - 2(\cos(x) - 1) \cos(2x) + \cos(2x)^2 + c
\end{aligned}$$

```

os(x)^2 - 2*(sin(11*x) - sin(10*x) + sin(9*x) - sin(8*x) + sin(7*x) - sin(6
*x) + sin(5*x) - sin(4*x) + sin(3*x) - sin(2*x) + sin(x))*sin(12*x) + sin(1
2*x)^2 - 2*(sin(10*x) - sin(9*x) + sin(8*x) - sin(7*x) + sin(6*x) - sin(5*x
) + sin(4*x) - sin(3*x) + sin(2*x) - sin(x))*sin(11*x) + sin(11*x)^2 - 2*(s
in(9*x) - sin(8*x) + sin(7*x) - sin(6*x) + sin(5*x) - sin(4*x) + sin(3*x) -
sin(2*x) + sin(x))*sin(10*x) + sin(10*x)^2 - 2*(sin(8*x) - sin(7*x) + sin(
6*x) - sin(5*x) + sin(4*x) - sin(3*x) + sin(2*x) - sin(x))*sin(9*x) + sin(9
*x)^2 - 2*(sin(7*x) - sin(6*x) + sin(5*x) - sin(4*x) + sin(3*x) - sin(2*x)
+ sin(x))*sin(8*x) + sin(8*x)^2 - 2*(sin(6*x) - sin(5*x) + sin(4*x) - sin(3
*x) + sin(2*x) - sin(x))*sin(7*x) + sin(7*x)^2 - 2*(sin(5*x) - sin(4*x) + s
in(3*x) - sin(2*x) + sin(x))*sin(6*x) + sin(6*x)^2 - 2*(sin(4*x) - sin(3*x)
+ sin(2*x) - sin(x))*sin(5*x) + sin(5*x)^2 - 2*(sin(3*x) - sin(2*x) + sin(
x))*sin(4*x) + sin(4*x)^2 - 2*(sin(2*x) - sin(x))*sin(3*x) + sin(3*x)^2 + s
in(2*x)^2 - 2*sin(2*x)*sin(x) + sin(x)^2 - 2*cos(x) + 1) - 1/39*log(-2*(cos
(x) - 1)*cos(2*x) + cos(2*x)^2 + cos(x)^2 + sin(2*x)^2 - 2*sin(2*x)*sin(x)
+ sin(x)^2 - 2*cos(x) + 1) - 1/39*log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1)

```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 134 vs. 2(7) = 14.

Time = 0.32 (sec) , antiderivative size = 134, normalized size of antiderivative = 12.18

$$\begin{aligned}
\int \frac{\sin(19x) + \sin(20x)}{\cos(19x) + \cos(20x)} dx &= -\frac{1}{39} \log(\cos(x) + 1) \\
&- \frac{2}{39} \log(|4096 \cos(x)^{12} + 2048 \cos(x)^{11} - 12288 \cos(x)^{10} - 6144 \cos(x)^9 + 13568 \cos(x)^8 + 6784 \cos(x)^7 - 6592 \cos(x)^6 - 3296 \cos(x)^5 + 1264 \cos(x)^4 + 632 \cos(x)^3 - 48 \cos(x)^2 - 24 \cos(x) + 1|) \\
&- \frac{2}{39} \log(|64 \cos(x)^6 - 32 \cos(x)^5 - 80 \cos(x)^4 + 32 \cos(x)^3 + 24 \cos(x)^2 - 6 \cos(x) - 1|) \\
&- \frac{2}{39} \log(|2 \cos(x) - 1|)
\end{aligned}$$

```
[In] integrate((sin(20*x)+sin(19*x))/(cos(20*x)+cos(19*x)),x, algorithm="giac")
```

```
[Out] -1/39*log(cos(x) + 1) - 2/39*log(abs(4096*cos(x)^12 + 2048*cos(x)^11 - 1228
8*cos(x)^10 - 6144*cos(x)^9 + 13568*cos(x)^8 + 6784*cos(x)^7 - 6592*cos(x)^
6 - 3296*cos(x)^5 + 1264*cos(x)^4 + 632*cos(x)^3 - 48*cos(x)^2 - 24*cos(x)
+ 1)) - 2/39*log(abs(64*cos(x)^6 - 32*cos(x)^5 - 80*cos(x)^4 + 32*cos(x)^3
+ 24*cos(x)^2 - 6*cos(x) - 1)) - 2/39*log(abs(2*cos(x) - 1))
```


Mupad [B] (verification not implemented)

Time = 16.88 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.36

$$\int \frac{\sin(19x) + \sin(20x)}{\cos(19x) + \cos(20x)} dx = x \operatorname{li} - \frac{2 \ln(e^{x \cdot 39i} + 1)}{39}$$

```
[In] int((sin(19*x) + sin(20*x))/(cos(19*x) + cos(20*x)),x)
```

```
[Out] x*1i - (2*log(exp(x*39i) + 1))/39
```

3.208 $\int e^x(\cos^2(x) + \cos(x)\sin(x) - \sin^2(x)) dx$

| | |
|---|------|
| Optimal result | 1702 |
| Rubi [A] (verified) | 1702 |
| Mathematica [A] (verified) | 1703 |
| Maple [A] (verified) | 1703 |
| Fricas [A] (verification not implemented) | 1703 |
| Sympy [A] (verification not implemented) | 1704 |
| Maxima [B] (verification not implemented) | 1704 |
| Giac [B] (verification not implemented) | 1704 |
| Mupad [B] (verification not implemented) | 1705 |

Optimal result

Integrand size = 20, antiderivative size = 8

$$\int e^x(\cos^2(x) + \cos(x)\sin(x) - \sin^2(x)) dx = e^x \cos(x) \sin(x)$$

[Out] exp(x)*cos(x)*sin(x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {2326}

$$\int e^x(\cos^2(x) + \cos(x)\sin(x) - \sin^2(x)) dx = e^x \sin(x) \cos(x)$$

[In] Int[E^x*(Cos[x]^2 + Cos[x]*Sin[x] - Sin[x]^2),x]

[Out] E^x*Cos[x]*Sin[x]

Rule 2326

Int[(y_)*(F_)^(u_)*((v_) + (w_)), x_Symbol] := With[{z = v*(y/(Log[F]*D[u, x]))}, Simp[F^u*z, x] /; EqQ[D[z, x], w*y]] /; FreeQ[F, x]

Rubi steps

$$\text{integral} = e^x \cos(x) \sin(x)$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.38

$$\int e^x (\cos^2(x) + \cos(x) \sin(x) - \sin^2(x)) dx = \frac{1}{2} e^x \sin(2x)$$

[In] Integrate[E^x*(Cos[x]^2 + Cos[x]*Sin[x] - Sin[x]^2),x]

[Out] (E^x*Sin[2*x])/2

Maple [A] (verified)

Time = 0.23 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.12

| method | result | size |
|---------------|--|------|
| parallelrisch | $\frac{e^x \sin(2x)}{2}$ | 9 |
| risch | $-\frac{ie^{(1+2i)x}}{4} + \frac{ie^{(1-2i)x}}{4}$ | 20 |
| norman | $\frac{2e^x \tan(\frac{x}{2}) - 2e^x \tan(\frac{x}{2})^3}{(1 + \tan(\frac{x}{2})^2)^2}$ | 31 |
| default | $\frac{(\cos(x) + 2\sin(x))e^x \cos(x)}{5} + \frac{e^x (\sin(2x) - 2\cos(2x))}{10} - \frac{(-2\cos(x) + \sin(x))e^x \sin(x)}{5}$ | 43 |
| parts | $\frac{(\cos(x) + 2\sin(x))e^x \cos(x)}{5} + \frac{e^x (\sin(2x) - 2\cos(2x))}{10} - \frac{(-2\cos(x) + \sin(x))e^x \sin(x)}{5}$ | 43 |

[In] int(exp(x)*(cos(x)^2+cos(x)*sin(x)-sin(x)^2),x,method=_RETURNVERBOSE)

[Out] 1/2*exp(x)*sin(2*x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int e^x (\cos^2(x) + \cos(x) \sin(x) - \sin^2(x)) dx = \cos(x) e^x \sin(x)$$

[In] integrate(exp(x)*(cos(x)^2+cos(x)*sin(x)-sin(x)^2),x, algorithm="fricas")

[Out] cos(x)*e^x*sin(x)

Sympy [A] (verification not implemented)

Time = 0.14 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int e^x (\cos^2(x) + \cos(x) \sin(x) - \sin^2(x)) dx = e^x \sin(x) \cos(x)$$

[In] integrate(exp(x)*(cos(x)**2+cos(x)*sin(x)-sin(x)**2),x)

[Out] exp(x)*sin(x)*cos(x)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 34 vs. 2(7) = 14.

Time = 0.19 (sec) , antiderivative size = 34, normalized size of antiderivative = 4.25

$$\int e^x (\cos^2(x) + \cos(x) \sin(x) - \sin^2(x)) dx = -\frac{1}{10} (2 \cos(2x) - \sin(2x))e^x + \frac{1}{5} \cos(2x) e^x + \frac{2}{5} e^x \sin(2x)$$

[In] integrate(exp(x)*(cos(x)^2+cos(x)*sin(x)-sin(x)^2),x, algorithm="maxima")

[Out] -1/10*(2*cos(2*x) - sin(2*x))*e^x + 1/5*cos(2*x)*e^x + 2/5*e^x*sin(2*x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 33 vs. 2(7) = 14.

Time = 0.27 (sec) , antiderivative size = 33, normalized size of antiderivative = 4.12

$$\int e^x (\cos^2(x) + \cos(x) \sin(x) - \sin^2(x)) dx = -\frac{1}{10} (2 \cos(2x) - \sin(2x))e^x + \frac{1}{5} (\cos(2x) + 2 \sin(2x))e^x$$

[In] integrate(exp(x)*(cos(x)^2+cos(x)*sin(x)-sin(x)^2),x, algorithm="giac")

[Out] -1/10*(2*cos(2*x) - sin(2*x))*e^x + 1/5*(cos(2*x) + 2*sin(2*x))*e^x

Mupad [B] (verification not implemented)

Time = 15.33 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int e^x (\cos^2(x) + \cos(x) \sin(x) - \sin^2(x)) dx = \frac{\sin(2x) e^x}{2}$$

```
[In] int(exp(x)*(cos(x)*sin(x) + cos(x)^2 - sin(x)^2),x)
```

```
[Out] (sin(2*x)*exp(x))/2
```

3.209 $\int \csc\left(\frac{\pi}{4} + x\right) \sin(x) dx$

| | |
|---|------|
| Optimal result | 1706 |
| Rubi [A] (verified) | 1706 |
| Mathematica [C] (verified) | 1707 |
| Maple [A] (verified) | 1707 |
| Fricas [A] (verification not implemented) | 1708 |
| Sympy [A] (verification not implemented) | 1708 |
| Maxima [A] (verification not implemented) | 1708 |
| Giac [B] (verification not implemented) | 1708 |
| Mupad [B] (verification not implemented) | 1709 |

Optimal result

Integrand size = 11, antiderivative size = 24

$$\int \csc\left(\frac{\pi}{4} + x\right) \sin(x) dx = \frac{x}{\sqrt{2}} - \frac{\log\left(\sin\left(\frac{\pi}{4} + x\right)\right)}{\sqrt{2}}$$

[Out] 1/2*x*2^(1/2)-1/2*ln(sin(x+1/4*Pi))*2^(1/2)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.273$, Rules used = {4678, 3556, 8}

$$\int \csc\left(\frac{\pi}{4} + x\right) \sin(x) dx = \frac{x}{\sqrt{2}} - \frac{\log\left(\sin\left(x + \frac{\pi}{4}\right)\right)}{\sqrt{2}}$$

[In] Int[Csc[Pi/4 + x]*Sin[x],x]

[Out] x/Sqrt[2] - Log[Sin[Pi/4 + x]]/Sqrt[2]

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 3556

Int[tan[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Log[RemoveContent[Cos[c + d*x], x]]/d, x] /; FreeQ[{c, d}, x]

Rule 4678

```
Int[Csc[w_]^(n_)*Sin[v_], x_Symbol] := Dist[Sin[v - w], Int[Cot[w]*Csc[w]^(n - 1), x], x] + Dist[Cos[v - w], Int[Csc[w]^(n - 1), x], x] /; GtQ[n, 0]
&& FreeQ[v - w, x] && NeQ[w, v]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{\int 1 dx}{\sqrt{2}} - \frac{\int \cot\left(\frac{\pi}{4} + x\right) dx}{\sqrt{2}} \\ &= \frac{x}{\sqrt{2}} - \frac{\log\left(\sin\left(\frac{\pi}{4} + x\right)\right)}{\sqrt{2}} \end{aligned}$$

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 0.10 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.21

$$\int \csc\left(\frac{\pi}{4} + x\right) \sin(x) dx = \left(-\frac{1}{4} - \frac{i}{4}\right) (-1)^{3/4} (2x - 2\operatorname{arctanh}(\cot(x)) - \log(\cos(2x)))$$

```
[In] Integrate[Csc[Pi/4 + x]*Sin[x],x]
```

```
[Out] (-1/4 - I/4)*(-1)^(3/4)*(2*x - 2*ArcTanh[Cot[x]] - Log[Cos[2*x]])
```

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.12

| method | result | size |
|---------|---|------|
| default | $\sqrt{2} \left(-\frac{\ln(1+\tan(x))}{2} + \frac{\ln(1+\tan(x)^2)}{4} + \frac{\arctan(\tan(x))}{2} \right)$ | 27 |
| risch | $\frac{x\sqrt{2}}{2} + \frac{i\sqrt{2}x}{2} - \frac{\sqrt{2} \ln(e^{2ix}+i)}{2}$ | 29 |

```
[In] int(sin(x)/sin(x+1/4*Pi),x,method=_RETURNVERBOSE)
```

```
[Out] 2^(1/2)*(-1/2*ln(1+tan(x))+1/4*ln(1+tan(x)^2)+1/2*arctan(tan(x)))
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.88

$$\int \csc\left(\frac{\pi}{4} + x\right) \sin(x) dx = \frac{1}{2} \sqrt{2}x - \frac{1}{2} \sqrt{2} \log\left(\frac{1}{2} \sin\left(\frac{1}{4}\pi + x\right)\right)$$

[In] integrate(sin(x)/sin(x+1/4*pi),x, algorithm="fricas")

[Out] 1/2*sqrt(2)*x - 1/2*sqrt(2)*log(1/2*sin(1/4*pi + x))

Sympy [A] (verification not implemented)

Time = 0.41 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.92

$$\int \csc\left(\frac{\pi}{4} + x\right) \sin(x) dx = \frac{\sqrt{2}x}{2} - \frac{\sqrt{2} \log(\sin(x) + \cos(x))}{2}$$

[In] integrate(sin(x)/sin(x+1/4*pi),x)

[Out] sqrt(2)*x/2 - sqrt(2)*log(sin(x) + cos(x))/2

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 33, normalized size of antiderivative = 1.38

$$\int \csc\left(\frac{\pi}{4} + x\right) \sin(x) dx = \frac{1}{2} \sqrt{2}x - \frac{1}{4} \sqrt{2} \log(\cos(2x)^2 + \sin(2x)^2 + 2 \sin(2x) + 1)$$

[In] integrate(sin(x)/sin(x+1/4*pi),x, algorithm="maxima")

[Out] 1/2*sqrt(2)*x - 1/4*sqrt(2)*log(cos(2*x)^2 + sin(2*x)^2 + 2*sin(2*x) + 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 44 vs. 2(19) = 38.

Time = 0.29 (sec) , antiderivative size = 44, normalized size of antiderivative = 1.83

$$\int \csc\left(\frac{\pi}{4} + x\right) \sin(x) dx = \frac{1}{8} \sqrt{2}(\pi + 4x) + \frac{1}{2} \sqrt{2} \log\left(\tan\left(\frac{1}{8}\pi + \frac{1}{2}x\right)^2 + 1\right) - \frac{1}{2} \sqrt{2} \log\left(\left|\tan\left(\frac{1}{8}\pi + \frac{1}{2}x\right)\right|\right)$$

[In] integrate(sin(x)/sin(x+1/4*pi),x, algorithm="giac")

[Out] 1/8*sqrt(2)*(pi + 4*x) + 1/2*sqrt(2)*log(tan(1/8*pi + 1/2*x)^2 + 1) - 1/2*sqrt(2)*log(abs(tan(1/8*pi + 1/2*x)))

Mupad [B] (verification not implemented)

Time = 0.38 (sec) , antiderivative size = 46, normalized size of antiderivative = 1.92

$$\int \csc\left(\frac{\pi}{4} + x\right) \sin(x) dx = x e^{\frac{\pi i}{4}} - \frac{e^{-\frac{\pi i}{2}} \ln\left(e^{\frac{\pi i}{2}} e^{x 2i} - 1\right) \left(e^{\frac{\pi i}{4}} 2i - e^{\frac{\pi 3i}{4}} 2i\right)}{4}$$

[In] int(sin(x)/sin(Pi/4 + x),x)

[Out] x*exp((Pi*1i)/4) - (exp(-(Pi*1i)/2)*log(exp((Pi*1i)/2)*exp(x*2i) - 1)*(exp((Pi*1i)/4)*2i - exp((Pi*3i)/4)*2i))/4

3.210 $\int \frac{1}{\sqrt[3]{x+x}} dx$

| | |
|---|------|
| Optimal result | 1710 |
| Rubi [A] (verified) | 1710 |
| Mathematica [A] (verified) | 1711 |
| Maple [A] (verified) | 1711 |
| Fricas [A] (verification not implemented) | 1712 |
| Sympy [A] (verification not implemented) | 1712 |
| Maxima [A] (verification not implemented) | 1712 |
| Giac [A] (verification not implemented) | 1712 |
| Mupad [B] (verification not implemented) | 1713 |

Optimal result

Integrand size = 9, antiderivative size = 12

$$\int \frac{1}{\sqrt[3]{x+x}} dx = \frac{3}{2} \log(1 + x^{2/3})$$

[Out] 3/2*ln(1+x^(2/3))

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {1607, 266}

$$\int \frac{1}{\sqrt[3]{x+x}} dx = \frac{3}{2} \log(x^{2/3} + 1)$$

[In] Int[(x^(1/3) + x)^(-1),x]

[Out] (3*Log[1 + x^(2/3)])/2

Rule 266

Int[(x_)^(m_)/((a_) + (b_)*(x_)^(n_)), x_Symbol] :> Simp[Log[RemoveContent[a + b*x^n, x]]/(b*n), x] /; FreeQ[{a, b, m, n}, x] && EqQ[m, n - 1]

Rule 1607

Int[(u_)*((a_)*(x_)^(p_) + (b_)*(x_)^(q_))^(n_), x_Symbol] :> Int[u*x^(n*p)*(a + b*x^(q-p))^n, x] /; FreeQ[{a, b, p, q}, x] && IntegerQ[n] && PosQ[q - p]

Rubi steps

$$\begin{aligned} \text{integral} &= \int \frac{1}{(1+x^{2/3})\sqrt[3]{x}} dx \\ &= \frac{3}{2} \log(1+x^{2/3}) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \frac{1}{\sqrt[3]{x} + x} dx = \frac{3}{2} \log(1+x^{2/3})$$

[In] Integrate[(x^(1/3) + x)^(-1),x]

[Out] (3*Log[1 + x^(2/3)])/2

Maple [A] (verified)

Time = 0.17 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.75

| method | result | size |
|-------------------|--|------|
| derivativedivides | $\frac{3 \ln(1+x^{\frac{2}{3}})}{2}$ | 9 |
| meijerg | $\frac{3 \ln(1+x^{\frac{2}{3}})}{2}$ | 9 |
| trager | $\frac{\ln(3x^{\frac{2}{3}}+3x^{\frac{4}{3}}+x^2+1)}{2}$ | 19 |
| default | $\ln\left(1+x^{\frac{2}{3}}\right) - \frac{\ln\left(x^{\frac{4}{3}}-x^{\frac{2}{3}}+1\right)}{2} + \frac{\ln(x^2+1)}{2}$ | 29 |

[In] int(1/(x+x^(1/3)),x,method=_RETURNVERBOSE)

[Out] 3/2*ln(1+x^(2/3))

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{1}{\sqrt[3]{x} + x} dx = \frac{3}{2} \log \left(x^{\frac{2}{3}} + 1 \right)$$

[In] integrate(1/(x+x^(1/3)),x, algorithm="fricas")

[Out] 3/2*log(x^(2/3) + 1)

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int \frac{1}{\sqrt[3]{x} + x} dx = \frac{3 \log \left(x^{\frac{2}{3}} + 1 \right)}{2}$$

[In] integrate(1/(x+x**(1/3)),x)

[Out] 3*log(x**(2/3) + 1)/2

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{1}{\sqrt[3]{x} + x} dx = \frac{3}{2} \log \left(x^{\frac{2}{3}} + 1 \right)$$

[In] integrate(1/(x+x^(1/3)),x, algorithm="maxima")

[Out] 3/2*log(x^(2/3) + 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{1}{\sqrt[3]{x} + x} dx = \frac{3}{2} \log \left(x^{\frac{2}{3}} + 1 \right)$$

[In] integrate(1/(x+x^(1/3)),x, algorithm="giac")

[Out] 3/2*log(x^(2/3) + 1)

Mupad [B] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{1}{\sqrt[3]{x} + x} dx = \frac{3 \ln(x^{2/3} + 1)}{2}$$

[In] int(1/(x + x^(1/3)),x)

[Out] (3*log(x^(2/3) + 1))/2

3.211 $\int x^{1+x^2} (1 + 2 \log(x)) dx$

| | |
|---|------|
| Optimal result | 1714 |
| Rubi [F] | 1714 |
| Mathematica [A] (verified) | 1715 |
| Maple [B] (verified) | 1715 |
| Fricas [B] (verification not implemented) | 1715 |
| Sympy [B] (verification not implemented) | 1716 |
| Maxima [A] (verification not implemented) | 1716 |
| Giac [F] | 1716 |
| Mupad [B] (verification not implemented) | 1716 |

Optimal result

Integrand size = 14, antiderivative size = 5

$$\int x^{1+x^2} (1 + 2 \log(x)) dx = x^{x^2}$$

[Out] $x^{(x^2)}$

Rubi [F]

$$\int x^{1+x^2} (1 + 2 \log(x)) dx = \int x^{1+x^2} (1 + 2 \log(x)) dx$$

[In] `Int[x^(1 + x^2)*(1 + 2*Log[x]),x]`

[Out] `Defer[Int][x^(1 + x^2), x] + 2*Log[x]*Defer[Int][x^(1 + x^2), x] - 2*Defer[Int][Defer[Int][x^(1 + x^2), x]/x, x]`

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(x^{1+x^2} + 2x^{1+x^2} \log(x) \right) dx \\ &= 2 \int x^{1+x^2} \log(x) dx + \int x^{1+x^2} dx \\ &= - \left(2 \int \frac{\int x^{1+x^2} dx}{x} dx \right) + (2 \log(x)) \int x^{1+x^2} dx + \int x^{1+x^2} dx \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int x^{1+x^2}(1+2\log(x)) dx = x^{x^2}$$

[In] Integrate[x^(1 + x^2)*(1 + 2*Log[x]),x]

[Out] x^x^2

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 11 vs. 2(5) = 10.

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 2.40

| method | result | size |
|--------------|-----------------------|------|
| risch | $\frac{x^{x^2+1}}{x}$ | 12 |
| parallelrisc | $\frac{x^{x^2+1}}{x}$ | 12 |

[In] int(x^(x^2+1)*(1+2*ln(x)),x,method=_RETURNVERBOSE)

[Out] x^(x^2+1)/x

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 11 vs. 2(5) = 10.

Time = 0.24 (sec) , antiderivative size = 11, normalized size of antiderivative = 2.20

$$\int x^{1+x^2}(1+2\log(x)) dx = \frac{x^{x^2+1}}{x}$$

[In] integrate(x^(x^2+1)*(1+2*log(x)),x, algorithm="fricas")

[Out] x^(x^2 + 1)/x

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 7 vs. 2(3) = 6.

Time = 0.07 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int x^{1+x^2}(1+2\log(x)) dx = \frac{x^{x^2+1}}{x}$$

[In] integrate(x**(x**2+1)*(1+2*ln(x)),x)

[Out] x**(x**2 + 1)/x

Maxima [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int x^{1+x^2}(1+2\log(x)) dx = x^{(x^2)}$$

[In] integrate(x^(x^2+1)*(1+2*log(x)),x, algorithm="maxima")

[Out] x^(x^2)

Giac [F]

$$\int x^{1+x^2}(1+2\log(x)) dx = \int x^{x^2+1}(2\log(x)+1) dx$$

[In] integrate(x^(x^2+1)*(1+2*log(x)),x, algorithm="giac")

[Out] integrate(x^(x^2 + 1)*(2*log(x) + 1), x)

Mupad [B] (verification not implemented)

Time = 15.46 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int x^{1+x^2}(1+2\log(x)) dx = x^{x^2}$$

[In] int(x^(x^2 + 1)*(2*log(x) + 1),x)

[Out] x^(x^2)

3.212 $\int \frac{-1+2x^3}{x(1+x^3)} dx$

| | |
|---|------|
| Optimal result | 1717 |
| Rubi [A] (verified) | 1717 |
| Mathematica [A] (verified) | 1718 |
| Maple [A] (verified) | 1718 |
| Fricas [A] (verification not implemented) | 1719 |
| Sympy [A] (verification not implemented) | 1719 |
| Maxima [A] (verification not implemented) | 1719 |
| Giac [A] (verification not implemented) | 1719 |
| Mupad [B] (verification not implemented) | 1720 |

Optimal result

Integrand size = 18, antiderivative size = 11

$$\int \frac{-1+2x^3}{x(1+x^3)} dx = -\log(x) + \log(1+x^3)$$

[Out] $-\ln(x)+\ln(x^3+1)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {457, 78}

$$\int \frac{-1+2x^3}{x(1+x^3)} dx = \log(x^3+1) - \log(x)$$

[In] $\text{Int}[(-1 + 2*x^3)/(x*(1 + x^3)),x]$

[Out] $-\text{Log}[x] + \text{Log}[1 + x^3]$

Rule 78

```
Int[((a_.) + (b_.)*(x_))*((c_) + (d_.)*(x_)^(n_.))*((e_.) + (f_.)*(x_)^(p_.), x_Symbol] :> Int[ExpandIntegrand[(a + b*x)*(c + d*x)^n*(e + f*x)^p, x], x] /; FreeQ[{a, b, c, d, e, f, n}, x] && NeQ[b*c - a*d, 0] && ((ILtQ[n, 0] && ILtQ[p, 0]) || EqQ[p, 1] || (IGtQ[p, 0] && (!IntegerQ[n] || LeQ[9*p + 5*(n + 2), 0] || GeQ[n + p + 1, 0] || (GeQ[n + p + 2, 0] && RationalQ[a, b, c, d, e, f])))
```

Rule 457

```
Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_.)*((c_) + (d_.)*(x_)^(n_))^(q_.
), x_Symbol] := Dist[1/n, Subst[Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p
*(c + d*x)^q, x], x, x^n], x] /; FreeQ[{a, b, c, d, m, n, p, q}, x] && NeQ[
b*c - a*d, 0] && IntegerQ[Simplify[(m + 1)/n]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{3} \text{Subst} \left(\int \frac{-1 + 2x}{x(1+x)} dx, x, x^3 \right) \\ &= \frac{1}{3} \text{Subst} \left(\int \left(-\frac{1}{x} + \frac{3}{1+x} \right) dx, x, x^3 \right) \\ &= -\log(x) + \log(1+x^3) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \frac{-1 + 2x^3}{x(1+x^3)} dx = -\log(x) + \log(1+x^3)$$

```
[In] Integrate[(-1 + 2*x^3)/(x*(1 + x^3)),x]
```

```
[Out] -Log[x] + Log[1 + x^3]
```

Maple [A] (verified)

Time = 0.17 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.09

| method | result | size |
|--------------|--|------|
| meijerg | $-\ln(x) + \ln(x^3 + 1)$ | 12 |
| risch | $-\ln(x) + \ln(x^3 + 1)$ | 12 |
| default | $\ln(1+x) + \ln(x^2 - x + 1) - \ln(x)$ | 19 |
| norman | $\ln(1+x) + \ln(x^2 - x + 1) - \ln(x)$ | 19 |
| parallelrisc | $\ln(1+x) + \ln(x^2 - x + 1) - \ln(x)$ | 19 |

```
[In] int((2*x^3-1)/x/(x^3+1),x,method=_RETURNVERBOSE)
```

```
[Out] -ln(x)+ln(x^3+1)
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \frac{-1 + 2x^3}{x(1 + x^3)} dx = \log(x^3 + 1) - \log(x)$$

[In] integrate((2*x^3-1)/x/(x^3+1),x, algorithm="fricas")

[Out] log(x^3 + 1) - log(x)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.73

$$\int \frac{-1 + 2x^3}{x(1 + x^3)} dx = -\log(x) + \log(x^3 + 1)$$

[In] integrate((2*x**3-1)/x/(x**3+1),x)

[Out] -log(x) + log(x**3 + 1)

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.18

$$\int \frac{-1 + 2x^3}{x(1 + x^3)} dx = \log(x^3 + 1) - \frac{1}{3} \log(x^3)$$

[In] integrate((2*x^3-1)/x/(x^3+1),x, algorithm="maxima")

[Out] log(x^3 + 1) - 1/3*log(x^3)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.18

$$\int \frac{-1 + 2x^3}{x(1 + x^3)} dx = \log(|x^3 + 1|) - \log(|x|)$$

[In] integrate((2*x^3-1)/x/(x^3+1),x, algorithm="giac")

[Out] log(abs(x^3 + 1)) - log(abs(x))

Mupad [B] (verification not implemented)

Time = 15.51 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \frac{-1 + 2x^3}{x(1 + x^3)} dx = \ln(x^3 + 1) - \ln(x)$$

[In] int((2*x^3 - 1)/(x*(x^3 + 1)),x)

[Out] log(x^3 + 1) - log(x)

3.213 $\int \frac{1}{\sqrt{1+x^2}} dx$

| | |
|---|------|
| Optimal result | 1721 |
| Rubi [A] (verified) | 1721 |
| Mathematica [B] (verified) | 1722 |
| Maple [A] (verified) | 1722 |
| Fricas [B] (verification not implemented) | 1722 |
| Sympy [A] (verification not implemented) | 1723 |
| Maxima [A] (verification not implemented) | 1723 |
| Giac [B] (verification not implemented) | 1723 |
| Mupad [B] (verification not implemented) | 1723 |

Optimal result

Integrand size = 9, antiderivative size = 2

$$\int \frac{1}{\sqrt{1+x^2}} dx = \operatorname{arcsinh}(x)$$

[Out] $\operatorname{arcsinh}(x)$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 2, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {221}

$$\int \frac{1}{\sqrt{1+x^2}} dx = \operatorname{arcsinh}(x)$$

[In] `Int[1/Sqrt[1 + x^2], x]`

[Out] `ArcSinh[x]`

Rule 221

`Int[1/Sqrt[(a_) + (b_.)*(x_)^2], x_Symbol] := Simp[ArcSinh[Rt[b, 2]*(x/Sqrt[a])]/Rt[b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && PosQ[b]`

Rubi steps

$$\text{integral} = \operatorname{arcsinh}(x)$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 16 vs. $2(2) = 4$.

Time = 0.00 (sec) , antiderivative size = 16, normalized size of antiderivative = 8.00

$$\int \frac{1}{\sqrt{1+x^2}} dx = -\log\left(-x + \sqrt{1+x^2}\right)$$

[In] Integrate[1/Sqrt[1 + x^2],x]

[Out] -Log[-x + Sqrt[1 + x^2]]

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.50

| method | result | size |
|----------------|---|------|
| default | $\operatorname{arcsinh}(x)$ | 3 |
| meijerg | $\operatorname{arcsinh}(x)$ | 3 |
| trager | $\ln(x + \sqrt{x^2 + 1})$ | 11 |
| pseudoelliptic | $\operatorname{arctanh}\left(\frac{\sqrt{x^2+1}}{x}\right)$ | 13 |

[In] int(1/(x^2+1)^(1/2),x,method=_RETURNVERBOSE)

[Out] arcsinh(x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 14 vs. $2(2) = 4$.

Time = 0.24 (sec) , antiderivative size = 14, normalized size of antiderivative = 7.00

$$\int \frac{1}{\sqrt{1+x^2}} dx = -\log\left(-x + \sqrt{x^2 + 1}\right)$$

[In] integrate(1/(x^2+1)^(1/2),x, algorithm="fricas")

[Out] -log(-x + sqrt(x^2 + 1))

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 2, normalized size of antiderivative = 1.00

$$\int \frac{1}{\sqrt{1+x^2}} dx = \operatorname{asinh}(x)$$

[In] integrate(1/(x**2+1)**(1/2),x)

[Out] asinh(x)

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 2, normalized size of antiderivative = 1.00

$$\int \frac{1}{\sqrt{1+x^2}} dx = \operatorname{arsinh}(x)$$

[In] integrate(1/(x^2+1)^(1/2),x, algorithm="maxima")

[Out] arcsinh(x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 25 vs. 2(2) = 4.

Time = 0.27 (sec) , antiderivative size = 25, normalized size of antiderivative = 12.50

$$\int \frac{1}{\sqrt{1+x^2}} dx = \frac{1}{2} \sqrt{x^2+1} x - \frac{1}{2} \log(-x + \sqrt{x^2+1})$$

[In] integrate(1/(x^2+1)^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(x^2 + 1)*x - 1/2*log(-x + sqrt(x^2 + 1))

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 2, normalized size of antiderivative = 1.00

$$\int \frac{1}{\sqrt{1+x^2}} dx = \operatorname{asinh}(x)$$

[In] int(1/(x^2 + 1)^(1/2),x)

[Out] asinh(x)

3.214 $\int \frac{\log(2x)}{x \log(x)} dx$

| | |
|---|------|
| Optimal result | 1724 |
| Rubi [A] (verified) | 1724 |
| Mathematica [A] (verified) | 1725 |
| Maple [A] (verified) | 1725 |
| Fricas [A] (verification not implemented) | 1726 |
| Sympy [A] (verification not implemented) | 1726 |
| Maxima [A] (verification not implemented) | 1726 |
| Giac [A] (verification not implemented) | 1726 |
| Mupad [B] (verification not implemented) | 1727 |

Optimal result

Integrand size = 12, antiderivative size = 9

$$\int \frac{\log(2x)}{x \log(x)} dx = \log(x) + \log(2) \log(\log(x))$$

[Out] $\ln(x) + \ln(2) * \ln(\ln(x))$

Rubi [A] (verified)

Time = 0.05 (sec) , antiderivative size = 18, normalized size of antiderivative = 2.00, number of steps used = 2, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {2339, 29, 2413, 2601}

$$\int \frac{\log(2x)}{x \log(x)} dx = -\log(\log(x)) \log(x) + \log(x) + \log(2x) \log(\log(x))$$

[In] `Int[Log[2*x]/(x*Log[x]),x]`

[Out] `Log[x] - Log[x]*Log[Log[x]] + Log[2*x]*Log[Log[x]]`

Rule 29

`Int[(x_)^(-1), x_Symbol] := Simp[Log[x], x]`

Rule 2339

`Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)/(x_), x_Symbol] := Dist[1/(b*n), Subst[Int[x^p, x], x, a + b*Log[c*x^n]], x] /; FreeQ[{a, b, c, n, p}, x]`

Rule 2413

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*((d_.) + Log[(f_.)*(x_)^(r_.)]*(e_.))*((g_.)*(x_)^(m_.), x_Symbol] :> With[{u = IntHide[(g*x)^m*(a + b*Log[c*x^n])^p, x]}, Dist[d + e*Log[f*x^r], u, x] - Dist[e*r, Int[Simplify Integrand[u/x, x], x], x]] /; FreeQ[{a, b, c, d, e, f, g, m, n, p, r}, x] && !(EqQ[p, 1] && EqQ[a, 0] && NeQ[d, 0])
```

Rule 2601

```
Int[((a_.) + Log[Log[(d_.)*(x_)^(n_.)]^(p_.)*(c_.)]*(b_.))/(x_), x_Symbol] :> Simp[Log[d*x^n]*((a + b*Log[c*Log[d*x^n]^p])/n), x] - Simp[b*p*Log[x], x] /; FreeQ[{a, b, c, d, n, p}, x]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \log(2x) \log(\log(x)) - \int \frac{\log(\log(x))}{x} dx \\ &= \log(x) - \log(x) \log(\log(x)) + \log(2x) \log(\log(x)) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int \frac{\log(2x)}{x \log(x)} dx = \log(x) + \log(2) \log(\log(x))$$

```
[In] Integrate[Log[2*x]/(x*Log[x]),x]
```

```
[Out] Log[x] + Log[2]*Log[Log[x]]
```

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.11

| method | result | size |
|---------|-------------------------------|------|
| default | $\ln(x) + \ln(2) \ln(\ln(x))$ | 10 |
| risch | $\ln(x) + \ln(2) \ln(\ln(x))$ | 10 |

```
[In] int(ln(2*x)/x/ln(x),x,method=_RETURNVERBOSE)
```

```
[Out] ln(x)+ln(2)*ln(ln(x))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int \frac{\log(2x)}{x \log(x)} dx = \log(2) \log(\log(x)) + \log(x)$$

[In] integrate(log(2*x)/x/log(x),x, algorithm="fricas")

[Out] log(2)*log(log(x)) + log(x)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.11

$$\int \frac{\log(2x)}{x \log(x)} dx = \log(x) + \log(2) \log(\log(x))$$

[In] integrate(ln(2*x)/x/ln(x),x)

[Out] log(x) + log(2)*log(log(x))

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 18, normalized size of antiderivative = 2.00

$$\int \frac{\log(2x)}{x \log(x)} dx = \log(2x) \log(\log(x)) - \log(x) \log(\log(x)) + \log(x)$$

[In] integrate(log(2*x)/x/log(x),x, algorithm="maxima")

[Out] log(2*x)*log(log(x)) - log(x)*log(log(x)) + log(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.11

$$\int \frac{\log(2x)}{x \log(x)} dx = \log(2) \log(|\log(x)|) + \log(x)$$

[In] integrate(log(2*x)/x/log(x),x, algorithm="giac")

[Out] log(2)*log(abs(log(x))) + log(x)

Mupad [B] (verification not implemented)

Time = 15.23 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int \frac{\log(2x)}{x \log(x)} dx = \ln(x) + \ln(\ln(x)) \ln(2)$$

[In] int(log(2*x)/(x*log(x)),x)

[Out] log(x) + log(log(x))*log(2)

3.215 $\int \frac{1}{1+e^x} dx$

| | |
|---|------|
| Optimal result | 1728 |
| Rubi [A] (verified) | 1728 |
| Mathematica [A] (verified) | 1729 |
| Maple [A] (verified) | 1729 |
| Fricas [A] (verification not implemented) | 1730 |
| Sympy [A] (verification not implemented) | 1730 |
| Maxima [A] (verification not implemented) | 1730 |
| Giac [A] (verification not implemented) | 1731 |
| Mupad [B] (verification not implemented) | 1731 |

Optimal result

Integrand size = 7, antiderivative size = 10

$$\int \frac{1}{1+e^x} dx = x - \log(1+e^x)$$

[Out] x-ln(exp(x)+1)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.571$, Rules used = {2320, 36, 29, 31}

$$\int \frac{1}{1+e^x} dx = x - \log(e^x + 1)$$

[In] Int[(1 + E^x)^(-1), x]

[Out] x - Log[1 + E^x]

Rule 29

Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]

Rule 31

Int[((a_) + (b_.)*(x_))(-1), x_Symbol] :> Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 36

Int[1/(((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))), x_Symbol] :> Dist[b/(b*c - a*d), Int[1/(a + b*x), x], x] - Dist[d/(b*c - a*d), Int[1/(c + d*x), x],

```
x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0]
```

Rule 2320

```
Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_)[v_]] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{1}{x(1+x)} dx, x, e^x\right) \\ &= \text{Subst}\left(\int \frac{1}{x} dx, x, e^x\right) - \text{Subst}\left(\int \frac{1}{1+x} dx, x, e^x\right) \\ &= x - \log(1 + e^x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{1}{1+e^x} dx = -2\text{arctanh}(1+2e^x)$$

```
[In] Integrate[(1 + E^x)^(-1), x]
```

```
[Out] -2*ArcTanh[1 + 2*E^x]
```

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

| method | result | size |
|-------------------|----------------------------|------|
| norman | $x - \ln(e^x + 1)$ | 10 |
| risch | $x - \ln(e^x + 1)$ | 10 |
| parallelrisch | $x - \ln(e^x + 1)$ | 10 |
| derivativedivides | $-\ln(e^x + 1) + \ln(e^x)$ | 12 |
| default | $-\ln(e^x + 1) + \ln(e^x)$ | 12 |

```
[In] int(1/(exp(x)+1), x, method=_RETURNVERBOSE)
```

[Out] $x - \ln(\exp(x) + 1)$

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int \frac{1}{1 + e^x} dx = x - \log(e^x + 1)$$

[In] `integrate(1/(exp(x)+1),x, algorithm="fricas")`

[Out] $x - \log(e^x + 1)$

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.70

$$\int \frac{1}{1 + e^x} dx = x - \log(e^x + 1)$$

[In] `integrate(1/(exp(x)+1),x)`

[Out] $x - \log(\exp(x) + 1)$

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int \frac{1}{1 + e^x} dx = x - \log(e^x + 1)$$

[In] `integrate(1/(exp(x)+1),x, algorithm="maxima")`

[Out] $x - \log(e^x + 1)$

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int \frac{1}{1+e^x} dx = x - \log(e^x + 1)$$

```
[In] integrate(1/(exp(x)+1),x, algorithm="giac")
```

```
[Out] x - log(e^x + 1)
```

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.90

$$\int \frac{1}{1+e^x} dx = x - \ln(e^x + 1)$$

```
[In] int(1/(exp(x) + 1),x)
```

```
[Out] x - log(exp(x) + 1)
```

3.216 $\int \frac{\log(x) \log(\log(x))}{x} dx$

| | |
|---|------|
| Optimal result | 1732 |
| Rubi [A] (verified) | 1732 |
| Mathematica [A] (verified) | 1733 |
| Maple [A] (verified) | 1733 |
| Fricas [A] (verification not implemented) | 1733 |
| Sympy [A] (verification not implemented) | 1734 |
| Maxima [A] (verification not implemented) | 1734 |
| Giac [A] (verification not implemented) | 1734 |
| Mupad [B] (verification not implemented) | 1734 |

Optimal result

Integrand size = 9, antiderivative size = 20

$$\int \frac{\log(x) \log(\log(x))}{x} dx = -\frac{1}{4} \log^2(x) + \frac{1}{2} \log^2(x) \log(\log(x))$$

[Out] $-1/4*\ln(x)^2+1/2*\ln(x)^2*\ln(\ln(x))$

Rubi [A] (verified)

Time = 0.03 (sec), antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {2601, 2341}

$$\int \frac{\log(x) \log(\log(x))}{x} dx = \frac{1}{2} \log^2(x) \log(\log(x)) - \frac{\log^2(x)}{4}$$

[In] `Int[(Log[x]*Log[Log[x]])/x,x]`

[Out] $-1/4*\text{Log}[x]^2 + (\text{Log}[x]^2*\text{Log}[\text{Log}[x]])/2$

Rule 2341

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))*((d_.)*(x_)^(m_.), x_Symbol] :>
Simp[(d*x)^(m + 1)*((a + b*Log[c*x^n])/(d*(m + 1))), x] - Simp[b*n*((d*x)^(
m + 1)/(d*(m + 1)^2)), x] /; FreeQ[{a, b, c, d, m, n}, x] && NeQ[m, -1]
```

Rule 2601

```
Int[((a_.) + Log[Log[(d_.)*(x_)^(n_.)]^(p_.)*(c_.)]*(b_.))/(x_), x_Symbol]
:> Simp[Log[d*x^n]*((a + b*Log[c*Log[d*x^n]^p])/n), x] - Simp[b*p*Log[x], x
] /; FreeQ[{a, b, c, d, n, p}, x]
```


Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int x \log(x) dx, x, \log(x)\right) \\ &= -\frac{1}{4} \log^2(x) + \frac{1}{2} \log^2(x) \log(\log(x)) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{\log(x) \log(\log(x))}{x} dx = -\frac{1}{4} \log^2(x) + \frac{1}{2} \log^2(x) \log(\log(x))$$

[In] Integrate[(Log[x]*Log[Log[x]])/x,x]

[Out] -1/4*Log[x]^2 + (Log[x]^2*Log[Log[x]])/2

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.85

| method | result | size |
|-------------------|--|------|
| derivativedivides | $-\frac{\ln(x)^2}{4} + \frac{\ln(x)^2 \ln(\ln(x))}{2}$ | 17 |
| default | $-\frac{\ln(x)^2}{4} + \frac{\ln(x)^2 \ln(\ln(x))}{2}$ | 17 |
| norman | $-\frac{\ln(x)^2}{4} + \frac{\ln(x)^2 \ln(\ln(x))}{2}$ | 17 |
| risch | $-\frac{\ln(x)^2}{4} + \frac{\ln(x)^2 \ln(\ln(x))}{2}$ | 17 |

[In] int(ln(x)*ln(ln(x))/x,x,method=_RETURNVERBOSE)

[Out] -1/4*ln(x)^2+1/2*ln(x)^2*ln(ln(x))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int \frac{\log(x) \log(\log(x))}{x} dx = \frac{1}{2} \log(x)^2 \log(\log(x)) - \frac{1}{4} \log(x)^2$$

[In] integrate(log(x)*log(log(x))/x,x, algorithm="fricas")

[Out] 1/2*log(x)^2*log(log(x)) - 1/4*log(x)^2

Sympy [A] (verification not implemented)

Time = 0.12 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.85

$$\int \frac{\log(x) \log(\log(x))}{x} dx = \frac{\log(x)^2 \log(\log(x))}{2} - \frac{\log(x)^2}{4}$$

[In] integrate(ln(x)*ln(ln(x))/x,x)

[Out] log(x)**2*log(log(x))/2 - log(x)**2/4

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int \frac{\log(x) \log(\log(x))}{x} dx = \frac{1}{2} \log(x)^2 \log(\log(x)) - \frac{1}{4} \log(x)^2$$

[In] integrate(log(x)*log(log(x))/x,x, algorithm="maxima")

[Out] 1/2*log(x)^2*log(log(x)) - 1/4*log(x)^2

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int \frac{\log(x) \log(\log(x))}{x} dx = \frac{1}{2} \log(x)^2 \log(\log(x)) - \frac{1}{4} \log(x)^2$$

[In] integrate(log(x)*log(log(x))/x,x, algorithm="giac")

[Out] 1/2*log(x)^2*log(log(x)) - 1/4*log(x)^2

Mupad [B] (verification not implemented)

Time = 14.93 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.65

$$\int \frac{\log(x) \log(\log(x))}{x} dx = \frac{\ln(x)^2 (2 \ln(\ln(x)) - 1)}{4}$$

[In] int((log(log(x))*log(x))/x,x)

[Out] (log(x)^2*(2*log(log(x)) - 1))/4

3.217 $\int \log\left(\frac{1+x}{1-x}\right) dx$

| | |
|---|------|
| Optimal result | 1735 |
| Rubi [A] (verified) | 1735 |
| Mathematica [A] (verified) | 1736 |
| Maple [A] (verified) | 1736 |
| Fricas [A] (verification not implemented) | 1737 |
| Sympy [A] (verification not implemented) | 1737 |
| Maxima [A] (verification not implemented) | 1737 |
| Giac [B] (verification not implemented) | 1737 |
| Mupad [B] (verification not implemented) | 1738 |

Optimal result

Integrand size = 12, antiderivative size = 25

$$\int \log\left(\frac{1+x}{1-x}\right) dx = 2\log(1-x) + (1+x)\log\left(\frac{1+x}{1-x}\right)$$

[Out] 2*ln(1-x)+(1+x)*ln((1+x)/(1-x))

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {2535, 31}

$$\int \log\left(\frac{1+x}{1-x}\right) dx = 2\log(1-x) + (x+1)\log\left(\frac{x+1}{1-x}\right)$$

[In] Int[Log[(1 + x)/(1 - x)],x]

[Out] 2*Log[1 - x] + (1 + x)*Log[(1 + x)/(1 - x)]

Rule 31

Int[((a_) + (b_)*(x_))⁽⁻¹⁾, x_Symbol] => Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 2535

Int[((A_) + Log[(e_)*((a_) + (b_)*(x_))]/((c_) + (d_)*(x_))^{(n_)]*(B_)^(p_), x_Symbol] => Simp[(a + b*x)*((A + B*Log[e*((a + b*x)/(c + d*x)]ⁿ))^p/b, x] - Dist[B*n*p*((b*c - a*d)/b), Int[(A + B*Log[e*((a + b*x)/(c + d*x)]ⁿ)^(p - 1)/(c + d*x), x], x] /; FreeQ[{a, b, c, d, e, A, B, n}, x]}

] && NeQ[b*c - a*d, 0] && IGtQ[p, 0]

Rubi steps

$$\begin{aligned} \text{integral} &= (1+x) \log\left(\frac{1+x}{1-x}\right) - 2 \int \frac{1}{1-x} dx \\ &= 2 \log(1-x) + (1+x) \log\left(\frac{1+x}{1-x}\right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00

$$\int \log\left(\frac{1+x}{1-x}\right) dx = 2 \log(1-x) + (1+x) \log\left(\frac{1+x}{1-x}\right)$$

[In] Integrate[Log[(1+x)/(1-x)],x]

[Out] 2*Log[1-x] + (1+x)*Log[(1+x)/(1-x)]

Maple [A] (verified)

Time = 0.08 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.88

| method | result | size |
|-------------------|--|------|
| risch | $x \ln\left(\frac{1+x}{1-x}\right) + \ln(x^2 - 1)$ | 22 |
| parts | $x \ln\left(\frac{1+x}{1-x}\right) + \ln((-1+x)(1+x))$ | 24 |
| meijerg | $\frac{(2+2x)\ln(1+x)}{2} + \frac{(-2x+2)\ln(1-x)}{2}$ | 26 |
| parallelrisch | $\ln\left(-\frac{1+x}{-1+x}\right)x + 2 \ln(-1+x) + \ln\left(-\frac{1+x}{-1+x}\right)$ | 32 |
| derivativedivides | $-2 \ln\left(-\frac{2}{-1+x}\right) - \ln\left(-1 - \frac{2}{-1+x}\right)\left(-1 - \frac{2}{-1+x}\right)(-1+x)$ | 36 |
| default | $-2 \ln\left(-\frac{2}{-1+x}\right) - \ln\left(-1 - \frac{2}{-1+x}\right)\left(-1 - \frac{2}{-1+x}\right)(-1+x)$ | 36 |

[In] int(ln((1+x)/(1-x)),x,method=_RETURNVERBOSE)

[Out] x*ln((1+x)/(1-x))+ln(x^2-1)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.80

$$\int \log\left(\frac{1+x}{1-x}\right) dx = x \log\left(-\frac{x+1}{x-1}\right) + \log(x^2 - 1)$$

[In] integrate(log((1+x)/(1-x)),x, algorithm="fricas")

[Out] x*log(-(x + 1)/(x - 1)) + log(x^2 - 1)

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.60

$$\int \log\left(\frac{1+x}{1-x}\right) dx = x \log\left(\frac{x+1}{1-x}\right) + \log(x^2 - 1)$$

[In] integrate(ln((1+x)/(1-x)),x)

[Out] x*log((x + 1)/(1 - x)) + log(x**2 - 1)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.88

$$\int \log\left(\frac{1+x}{1-x}\right) dx = x \log\left(-\frac{x+1}{x-1}\right) + \log(x+1) + \log(x-1)$$

[In] integrate(log((1+x)/(1-x)),x, algorithm="maxima")

[Out] x*log(-(x + 1)/(x - 1)) + log(x + 1) + log(x - 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 107 vs. 2(24) = 48.

Time = 0.28 (sec) , antiderivative size = 107, normalized size of antiderivative = 4.28

$$\int \log\left(\frac{1+x}{1-x}\right) dx = \frac{2 \log\left(-\frac{\frac{\frac{x+1}{x-1}+1}{\frac{x+1}{x-1}-1}+1}{\frac{\frac{x+1}{x-1}+1}{\frac{x+1}{x-1}-1}-1}\right)}{\frac{x+1}{x-1}-1} + 2 \log\left(\frac{|-x-1|}{|x-1|}\right) - 2 \log\left(\left|-\frac{x+1}{x-1}+1\right|\right)$$

```
[In] integrate(log((1+x)/(1-x)),x, algorithm="giac")
```

```
[Out] 2*log(-(((x + 1)/(x - 1) + 1)/((x + 1)/(x - 1) - 1) + 1)/(((x + 1)/(x - 1) + 1)/((x + 1)/(x - 1) - 1) - 1))/((x + 1)/(x - 1) - 1) + 2*log(abs(-x - 1)/abs(x - 1)) - 2*log(abs(-(x + 1)/(x - 1) + 1))
```

Mupad [B] (verification not implemented)

Time = 0.17 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.80

$$\int \log\left(\frac{1+x}{1-x}\right) dx = \ln(x^2 - 1) + x \ln\left(-\frac{x+1}{x-1}\right)$$

```
[In] int(log(-(x + 1)/(x - 1)),x)
```

```
[Out] log(x^2 - 1) + x*log(-(x + 1)/(x - 1))
```

$$3.218 \quad \int \frac{1}{(-1+x)^2+x^2} dx$$

| | |
|---|------|
| Optimal result | 1739 |
| Rubi [A] (verified) | 1739 |
| Mathematica [A] (verified) | 1740 |
| Maple [A] (verified) | 1740 |
| Fricas [A] (verification not implemented) | 1741 |
| Sympy [A] (verification not implemented) | 1741 |
| Maxima [A] (verification not implemented) | 1741 |
| Giac [A] (verification not implemented) | 1741 |
| Mupad [B] (verification not implemented) | 1742 |

Optimal result

Integrand size = 11, antiderivative size = 8

$$\int \frac{1}{(-1+x)^2+x^2} dx = -\arctan(1-2x)$$

[Out] `arctan(-1+2*x)`

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.273$, Rules used = {2006, 631, 210}

$$\int \frac{1}{(-1+x)^2+x^2} dx = -\arctan(1-2x)$$

[In] `Int[((-1 + x)^2 + x^2)^(-1), x]`

[Out] `-ArcTan[1 - 2*x]`

Rule 210

`Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(-(Rt[-a, 2]*Rt[-b, 2])^(-1))*ArcTan[Rt[-b, 2]*(x/Rt[-a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (LtQ[a, 0] || LtQ[b, 0])`

Rule 631

`Int[((a_) + (b_.)*(x_) + (c_.)*(x_)^2)^(-1), x_Symbol] := With[{q = 1 - 4*Simplify[a*(c/b^2)]}, Dist[-2/b, Subst[Int[1/(q - x^2), x], x, 1 + 2*c*(x/b)], x] /; RationalQ[q] && (EqQ[q^2, 1] || !RationalQ[b^2 - 4*a*c]) /; Free`

$Q[\{a, b, c\}, x] \ \&\& \ \text{NeQ}[b^2 - 4ac, 0]$

Rule 2006

$\text{Int}[(u_)^{(p_)}, x_Symbol] \ :> \ \text{Int}[\text{ExpandToSum}[u, x]^{(p)}, x] \ /; \ \text{FreeQ}[p, x] \ \&\& \ \text{QuadraticQ}[u, x] \ \&\& \ \text{!QuadraticMatchQ}[u, x]$

Rubi steps

$$\begin{aligned} \text{integral} &= \int \frac{1}{1 - 2x + 2x^2} dx \\ &= \text{Subst}\left(\int \frac{1}{-1 - x^2} dx, x, 1 - 2x\right) \\ &= -\arctan(1 - 2x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \frac{1}{(-1 + x)^2 + x^2} dx = \arctan(1 + 2(-1 + x))$$

[In] Integrate[((-1 + x)^2 + x^2)^(-1),x]

[Out] ArcTan[1 + 2*(-1 + x)]

Maple [A] (verified)

Time = 0.25 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

| method | result | size |
|---------------|--|------|
| default | $\arctan(-1 + 2x)$ | 7 |
| risch | $\arctan(-1 + 2x)$ | 7 |
| parallelrisch | $-\frac{i \ln(x - \frac{1}{2} - \frac{i}{2})}{2} + \frac{i \ln(x - \frac{1}{2} + \frac{i}{2})}{2}$ | 20 |

[In] int(1/(x^2+(-1+x)^2),x,method=_RETURNVERBOSE)

[Out] arctan(-1+2*x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{1}{(-1+x)^2+x^2} dx = \arctan(2x-1)$$

[In] integrate(1/(x^2+(-1+x)^2),x, algorithm="fricas")

[Out] arctan(2*x - 1)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.62

$$\int \frac{1}{(-1+x)^2+x^2} dx = \operatorname{atan}(2x-1)$$

[In] integrate(1/(x**2+(-1+x)**2),x)

[Out] atan(2*x - 1)

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{1}{(-1+x)^2+x^2} dx = \arctan(2x-1)$$

[In] integrate(1/(x^2+(-1+x)^2),x, algorithm="maxima")

[Out] arctan(2*x - 1)

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{1}{(-1+x)^2+x^2} dx = \arctan(2x-1)$$

[In] integrate(1/(x^2+(-1+x)^2),x, algorithm="giac")

[Out] arctan(2*x - 1)

Mupad [B] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{1}{(-1+x)^2+x^2} dx = \operatorname{atan}(2x-1)$$

[In] `int(1/((x - 1)^2 + x^2),x)`

[Out] `atan(2*x - 1)`

3.219 $\int \sqrt{x\sqrt{x^{3/2}}} dx$

| | |
|---|------|
| Optimal result | 1743 |
| Rubi [A] (verified) | 1743 |
| Mathematica [A] (verified) | 1744 |
| Maple [A] (verified) | 1744 |
| Fricas [A] (verification not implemented) | 1745 |
| Sympy [A] (verification not implemented) | 1745 |
| Maxima [A] (verification not implemented) | 1745 |
| Giac [A] (verification not implemented) | 1746 |
| Mupad [B] (verification not implemented) | 1746 |

Optimal result

Integrand size = 15, antiderivative size = 20

$$\int \sqrt{x\sqrt{x^{3/2}}} dx = \frac{8}{15}x\sqrt{x\sqrt{x^{3/2}}}$$

[Out] 8/15*x*(x*(x^(3/2))^(1/2))^(1/2)

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.200$, Rules used = {6851, 15, 30}

$$\int \sqrt{x\sqrt{x^{3/2}}} dx = \frac{8}{15}x\sqrt{x\sqrt{x^{3/2}}}$$

[In] Int[Sqrt[x*Sqrt[x^(3/2)]],x]

[Out] (8*x*Sqrt[x*Sqrt[x^(3/2)]])/15

Rule 15

Int[(u_.)*((a_.)*(x_)^(n_))^(m_), x_Symbol] := Dist[a^IntPart[m]*((a*x^n)^FracPart[m]/x^(n*FracPart[m])), Int[u*x^(m*n), x], x] /; FreeQ[{a, m, n}, x] && !IntegerQ[m]

Rule 30

Int[(x_)^(m_.), x_Symbol] := Simp[x^(m+1)/(m+1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rule 6851

```
Int[(u_.)*((a_.)*(v_)^(m_.)*(w_)^(n_.))^(p_), x_Symbol] :> Dist[a^IntPart[p]
]*((a*v^m*w^n)^FracPart[p]/(v^(m*FracPart[p])*w^(n*FracPart[p]))), Int[u*v^
(m*p)*w^(n*p), x], x] /; FreeQ[{a, m, n, p}, x] && !IntegerQ[p] && !FreeQ
[v, x] && !FreeQ[w, x]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= 2\text{Subst}\left(\int x\sqrt{x^2\sqrt{x^3}}dx, x, \sqrt{x}\right) \\
&= \frac{\left(2\sqrt{x\sqrt{x^{3/2}}}\right)\text{Subst}\left(\int x^2\sqrt[4]{x^3}dx, x, \sqrt{x}\right)}{\sqrt{x}\sqrt[4]{x^{3/2}}} \\
&= \frac{\left(2\sqrt{x\sqrt{x^{3/2}}}\right)\text{Subst}\left(\int x^{11/4}dx, x, \sqrt{x}\right)}{x^{7/8}} \\
&= \frac{8}{15}x\sqrt{x\sqrt{x^{3/2}}}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \sqrt{x\sqrt{x^{3/2}}} dx = \frac{8}{15}x\sqrt{x\sqrt{x^{3/2}}}$$

[In] Integrate[Sqrt[x*Sqrt[x^(3/2)]], x]

[Out] (8*x*Sqrt[x*Sqrt[x^(3/2)]])/15

Maple [A] (verified)

Time = 0.10 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.65

| method | result | size |
|-------------------|---------------------------------------|------|
| gospers | $\frac{8x\sqrt{x\sqrt{x^{3/2}}}}{15}$ | 13 |
| derivativedivides | $\frac{8x\sqrt{x\sqrt{x^{3/2}}}}{15}$ | 13 |
| default | $\frac{8x\sqrt{x\sqrt{x^{3/2}}}}{15}$ | 13 |

[In] `int((x*(x^(3/2))^(1/2))^(1/2),x,method=_RETURNVERBOSE)`

[Out] $8/15*x*(x*(x^{3/2})^{1/2})^{1/2}$

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.60

$$\int \sqrt{x\sqrt{x^{3/2}}} dx = \frac{8}{15} \sqrt{\sqrt{x^{3/2}}x}$$

[In] `integrate((x*(x^(3/2))^(1/2))^(1/2),x, algorithm="fricas")`

[Out] $8/15*\text{sqrt}(\text{sqrt}(x^{3/2})*x)*x$

Sympy [A] (verification not implemented)

Time = 0.51 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.85

$$\int \sqrt{x\sqrt{x^{3/2}}} dx = \frac{8x\sqrt{x\sqrt{x^{3/2}}}}{15}$$

[In] `integrate((x*(x**(3/2))**(1/2))**(1/2),x)`

[Out] $8*x*\text{sqrt}(x*\text{sqrt}(x**(3/2)))/15$

Maxima [A] (verification not implemented)

none

Time = 0.33 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.25

$$\int \sqrt{x\sqrt{x^{3/2}}} dx = \frac{8}{15} x^{15/8}$$

[In] `integrate((x*(x^(3/2))^(1/2))^(1/2),x, algorithm="maxima")`

[Out] $8/15*x^{15/8}$

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.95

$$\int \sqrt{x\sqrt{x^{3/2}}} dx = \frac{8}{15} x^{\frac{15}{8}} \operatorname{sgn}\left(x^{\frac{7}{4}} + 4x^{\frac{3}{4}}\right) \operatorname{sgn}(x + 4)$$

[In] integrate((x*(x^(3/2))^(1/2))^(1/2),x, algorithm="giac")

[Out] 8/15*x^(15/8)*sgn(x^(7/4) + 4*x^(3/4))*sgn(x + 4)

Mupad [B] (verification not implemented)

Time = 15.40 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.60

$$\int \sqrt{x\sqrt{x^{3/2}}} dx = \frac{8x\sqrt{x\sqrt{x^{3/2}}}}{15}$$

[In] int((x*(x^(3/2))^(1/2))^(1/2),x)

[Out] (8*x*(x*(x^(3/2))^(1/2))^(1/2))/15

3.220 $\int \cos^4(x)(\cos(x) - \sin(x)) \sin^4(x)(\cos(x) + \sin(x)) dx$

| | |
|---|------|
| Optimal result | 1747 |
| Rubi [A] (verified) | 1747 |
| Mathematica [B] (verified) | 1748 |
| Maple [A] (verified) | 1748 |
| Fricas [A] (verification not implemented) | 1748 |
| Sympy [A] (verification not implemented) | 1749 |
| Maxima [A] (verification not implemented) | 1749 |
| Giac [A] (verification not implemented) | 1749 |
| Mupad [B] (verification not implemented) | 1750 |

Optimal result

Integrand size = 21, antiderivative size = 12

$$\int \cos^4(x)(\cos(x) - \sin(x)) \sin^4(x)(\cos(x) + \sin(x)) dx = \frac{1}{5} \cos^5(x) \sin^5(x)$$

[Out] 1/5*cos(x)^5*sin(x)^5

Rubi [A] (verified)

Time = 0.13 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.048$, Rules used = {460}

$$\int \cos^4(x)(\cos(x) - \sin(x)) \sin^4(x)(\cos(x) + \sin(x)) dx = \frac{1}{5} \sin^5(x) \cos^5(x)$$

[In] Int[Cos[x]^4*(Cos[x] - Sin[x])*Sin[x]^4*(Cos[x] + Sin[x]),x]

[Out] (Cos[x]^5*Sin[x]^5)/5

Rule 460

Int[((e_)*(x_))^(m_)*((a_) + (b_)*(x_)^(n_))^(p_)*((c_) + (d_)*(x_)^(n_)), x_Symbol] :> Simp[c*(e*x)^(m + 1)*((a + b*x^n)^(p + 1)/(a*e*(m + 1))), x] /; FreeQ[{a, b, c, d, e, m, n, p}, x] && NeQ[b*c - a*d, 0] && EqQ[a*d*(m + 1) - b*c*(m + n*(p + 1) + 1), 0] && NeQ[m, -1]

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst}\left(\int \frac{x^4(1-x^2)}{(1+x^2)^6} dx, x, \tan(x)\right) \\ &= \frac{1}{5} \cos^5(x) \sin^5(x) \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 25 vs. $2(12) = 24$.

Time = 0.02 (sec) , antiderivative size = 25, normalized size of antiderivative = 2.08

$$\int \cos^4(x)(\cos(x) - \sin(x)) \sin^4(x)(\cos(x) + \sin(x)) dx = \frac{1}{256} \sin(2x) - \frac{1}{512} \sin(6x) + \frac{\sin(10x)}{2560}$$

[In] Integrate[Cos[x]^4*(Cos[x] - Sin[x])*Sin[x]^4*(Cos[x] + Sin[x]),x]

[Out] Sin[2*x]/256 - Sin[6*x]/512 + Sin[10*x]/2560

Maple [A] (verified)

Time = 0.34 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.67

| method | result |
|---------------|--|
| risch | $\frac{\sin(10x)}{2560} - \frac{\sin(6x)}{512} + \frac{\sin(2x)}{256}$ |
| parallelrisch | $\frac{\sin(10x)}{2560} - \frac{\sin(6x)}{512} + \frac{\sin(2x)}{256}$ |
| default | $-\frac{\sin(x)^3 \cos(x)^7}{10} - \frac{3 \sin(x) \cos(x)^7}{80} + \frac{\left(\cos(x)^5 + \frac{5 \cos(x)^3}{4} + \frac{15 \cos(x)}{8}\right) \sin(x)}{160} + \frac{\cos(x)^5 \sin(x)^5}{10} + \frac{\sin(x)^3 \cos(x)^5}{16} + \cos(x) \sin(x)^5$ |
| parts | $-\frac{\sin(x)^3 \cos(x)^7}{10} - \frac{3 \sin(x) \cos(x)^7}{80} + \frac{\left(\cos(x)^5 + \frac{5 \cos(x)^3}{4} + \frac{15 \cos(x)}{8}\right) \sin(x)}{160} + \frac{\cos(x)^5 \sin(x)^5}{10} + \frac{\sin(x)^3 \cos(x)^5}{16} + \cos(x) \sin(x)^5$ |

[In] int(sin(x)^4*cos(x)^4*(cos(x)+sin(x))*(cos(x)-sin(x)),x,method=_RETURNVERBOSE)

[Out] 1/2560*sin(10*x)-1/512*sin(6*x)+1/256*sin(2*x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.58

$$\begin{aligned} \int \cos^4(x)(\cos(x) - \sin(x)) \sin^4(x)(\cos(x) + \sin(x)) dx \\ = \frac{1}{5} (\cos(x)^9 - 2 \cos(x)^7 + \cos(x)^5) \sin(x) \end{aligned}$$

[In] integrate(sin(x)^4*cos(x)^4*(cos(x)+sin(x))*(cos(x)-sin(x)),x, algorithm="fricas")

[Out] 1/5*(cos(x)^9 - 2*cos(x)^7 + cos(x)^5)*sin(x)

Sympy [A] (verification not implemented)

Time = 1.04 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int \cos^4(x)(\cos(x) - \sin(x)) \sin^4(x)(\cos(x) + \sin(x)) dx = \frac{\sin^5(x) \cos^5(x)}{5}$$

[In] integrate(sin(x)**4*cos(x)**4*(cos(x)+sin(x))*(cos(x)-sin(x)),x)

[Out] sin(x)**5*cos(x)**5/5

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \cos^4(x)(\cos(x) - \sin(x)) \sin^4(x)(\cos(x) + \sin(x)) dx = \frac{1}{160} \sin(2x)^5$$

[In] integrate(sin(x)^4*cos(x)^4*(cos(x)+sin(x))*(cos(x)-sin(x)),x, algorithm="maxima")

[Out] 1/160*sin(2*x)^5

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.58

$$\begin{aligned} \int \cos^4(x)(\cos(x) - \sin(x)) \sin^4(x)(\cos(x) + \sin(x)) dx \\ = \frac{1}{2560} \sin(10x) - \frac{1}{512} \sin(6x) + \frac{1}{256} \sin(2x) \end{aligned}$$

[In] integrate(sin(x)^4*cos(x)^4*(cos(x)+sin(x))*(cos(x)-sin(x)),x, algorithm="giac")

[Out] 1/2560*sin(10*x) - 1/512*sin(6*x) + 1/256*sin(2*x)

Mupad [B] (verification not implemented)

Time = 15.26 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.33

$$\int \cos^4(x)(\cos(x) - \sin(x)) \sin^4(x)(\cos(x) + \sin(x)) dx = \frac{\cos(x)^5 \sin(x) (\cos(x)^2 - 1)^2}{5}$$

[In] `int(cos(x)^4*sin(x)^4*(cos(x) + sin(x))*(cos(x) - sin(x)),x)`

[Out] `(cos(x)^5*sin(x)*(cos(x)^2 - 1)^2)/5`

3.221 $\int \log(1 + x^2) dx$

| | |
|---|-------|
| Optimal result | .1751 |
| Rubi [A] (verified) | .1751 |
| Mathematica [A] (verified) | .1752 |
| Maple [A] (verified) | .1752 |
| Fricas [A] (verification not implemented) | .1753 |
| Sympy [A] (verification not implemented) | .1753 |
| Maxima [A] (verification not implemented) | .1753 |
| Giac [A] (verification not implemented) | .1753 |
| Mupad [B] (verification not implemented) | .1754 |

Optimal result

Integrand size = 6, antiderivative size = 16

$$\int \log(1 + x^2) dx = -2x + 2 \arctan(x) + x \log(1 + x^2)$$

[Out] $-2*x+2*\arctan(x)+x*\ln(x^2+1)$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 16, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {2498, 327, 209}

$$\int \log(1 + x^2) dx = 2 \arctan(x) + x \log(x^2 + 1) - 2x$$

[In] $\text{Int}[\text{Log}[1 + x^2], x]$

[Out] $-2*x + 2*\text{ArcTan}[x] + x*\text{Log}[1 + x^2]$

Rule 209

$\text{Int}[(a + (b \cdot x)^n)^{-1}, x_Symbol] \rightarrow \text{Simp}[(1/(\text{Rt}[a, 2] \cdot \text{Rt}[b, 2])) \cdot \text{ArcTan}[\text{Rt}[b, 2] \cdot (x/\text{Rt}[a, 2])], x] /; \text{FreeQ}\{a, b\}, x \ \&\& \ \text{PosQ}[a/b] \ \&\& \ (\text{GtQ}[a, 0] \ || \ \text{GtQ}[b, 0])$

Rule 327

$\text{Int}[(c \cdot x)^m \cdot (a + (b \cdot x)^n)^p, x_Symbol] \rightarrow \text{Simp}[c^{(n-1)} \cdot (c \cdot x)^{(m-n+1)} \cdot ((a + b \cdot x^n)^{(p+1)} / (b \cdot (m + n \cdot p + 1))), x] - \text{Dist}[a \cdot c^n \cdot ((m - n + 1) / (b \cdot (m + n \cdot p + 1))), \text{Int}[(c \cdot x)^{(m-n)} \cdot (a + b \cdot x^n)^p, x], x] /; \text{FreeQ}\{a, b, c, p\}, x \ \&\& \ \text{IGtQ}[n, 0] \ \&\& \ \text{GtQ}[m, n - 1] \ \&\& \ \text{NeQ}[m + n \cdot p]$

+ 1, 0] && IntBinomialQ[a, b, c, n, m, p, x]

Rule 2498

Int[Log[(c_.)*((d_) + (e_.)*(x_)^(n_))^(p_.)], x_Symbol] := Simp[x*Log[c*(d + e*x^n)^p], x] - Dist[e*n*p, Int[x^n/(d + e*x^n), x], x] /; FreeQ[{c, d, e, n, p}, x]

Rubi steps

$$\begin{aligned} \text{integral} &= x \log(1 + x^2) - 2 \int \frac{x^2}{1 + x^2} dx \\ &= -2x + x \log(1 + x^2) + 2 \int \frac{1}{1 + x^2} dx \\ &= -2x + 2 \arctan(x) + x \log(1 + x^2) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \log(1 + x^2) dx = -2x + 2 \arctan(x) + x \log(1 + x^2)$$

[In] Integrate[Log[1 + x^2], x]

[Out] -2*x + 2*ArcTan[x] + x*Log[1 + x^2]

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.06

| method | result | size |
|---------------|--|------|
| default | $-2x + 2 \arctan(x) + x \ln(x^2 + 1)$ | 17 |
| risch | $-2x + 2 \arctan(x) + x \ln(x^2 + 1)$ | 17 |
| parts | $-2x + 2 \arctan(x) + x \ln(x^2 + 1)$ | 17 |
| meijerg | $-2x + \frac{2x \arctan(\sqrt{x^2})}{\sqrt{x^2}} + x \ln(x^2 + 1)$ | 27 |
| parallelrisch | $-2i \ln(x - i) + i \ln(x^2 + 1) + x \ln(x^2 + 1) - 2x$ | 30 |

[In] int(ln(x^2+1),x,method=_RETURNVERBOSE)

[Out] -2*x+2*arctan(x)+x*ln(x^2+1)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \log(1+x^2) dx = x \log(x^2+1) - 2x + 2 \arctan(x)$$

[In] integrate(log(x^2+1),x, algorithm="fricas")

[Out] x*log(x^2 + 1) - 2*x + 2*arctan(x)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.94

$$\int \log(1+x^2) dx = x \log(x^2+1) - 2x + 2 \operatorname{atan}(x)$$

[In] integrate(ln(x**2+1),x)

[Out] x*log(x**2 + 1) - 2*x + 2*atan(x)

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \log(1+x^2) dx = x \log(x^2+1) - 2x + 2 \arctan(x)$$

[In] integrate(log(x^2+1),x, algorithm="maxima")

[Out] x*log(x^2 + 1) - 2*x + 2*arctan(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \log(1+x^2) dx = x \log(x^2+1) - 2x + 2 \arctan(x)$$

[In] integrate(log(x^2+1),x, algorithm="giac")

[Out] x*log(x^2 + 1) - 2*x + 2*arctan(x)

Mupad [B] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.00

$$\int \log(1 + x^2) dx = 2 \operatorname{atan}(x) - 2x + x \ln(x^2 + 1)$$

[In] `int(log(x^2 + 1),x)`

[Out] `2*atan(x) - 2*x + x*log(x^2 + 1)`

$$3.222 \quad \int \frac{1+2x}{1+2x+2x^2} dx$$

| | |
|---|------|
| Optimal result | 1755 |
| Rubi [A] (verified) | 1755 |
| Mathematica [A] (verified) | 1756 |
| Maple [A] (verified) | 1756 |
| Fricas [A] (verification not implemented) | 1756 |
| Sympy [A] (verification not implemented) | 1757 |
| Maxima [A] (verification not implemented) | 1757 |
| Giac [A] (verification not implemented) | 1757 |
| Mupad [B] (verification not implemented) | 1757 |

Optimal result

Integrand size = 18, antiderivative size = 15

$$\int \frac{1+2x}{1+2x+2x^2} dx = \frac{1}{2} \log(1+2x+2x^2)$$

[Out] 1/2*ln(2*x^2+2*x+1)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.056$, Rules used = {642}

$$\int \frac{1+2x}{1+2x+2x^2} dx = \frac{1}{2} \log(2x^2+2x+1)$$

[In] Int[(1 + 2*x)/(1 + 2*x + 2*x^2), x]

[Out] Log[1 + 2*x + 2*x^2]/2

Rule 642

Int[((d_) + (e_)*(x_))/((a_) + (b_)*(x_) + (c_)*(x_)^2), x_Symbol] := Simp[d*(Log[RemoveContent[a + b*x + c*x^2, x]]/b), x] /; FreeQ[{a, b, c, d, e}, x] && EqQ[2*c*d - b*e, 0]

Rubi steps

$$\text{integral} = \frac{1}{2} \log(1+2x+2x^2)$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int \frac{1+2x}{1+2x+2x^2} dx = \frac{1}{2} \log(1+2x+2x^2)$$

[In] Integrate[(1 + 2*x)/(1 + 2*x + 2*x^2), x]

[Out] Log[1 + 2*x + 2*x^2]/2

Maple [A] (verified)

Time = 0.26 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.67

| method | result | size |
|--------------|------------------------------------|------|
| parallelrisc | $\frac{\ln(x^2+x+\frac{1}{2})}{2}$ | 10 |
| default | $\frac{\ln(2x^2+2x+1)}{2}$ | 14 |
| norman | $\frac{\ln(2x^2+2x+1)}{2}$ | 14 |
| risc | $\frac{\ln(2x^2+2x+1)}{2}$ | 14 |

[In] int((1+2*x)/(2*x^2+2*x+1), x, method=_RETURNVERBOSE)

[Out] 1/2*ln(x^2+x+1/2)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \frac{1+2x}{1+2x+2x^2} dx = \frac{1}{2} \log(2x^2+2x+1)$$

[In] integrate((1+2*x)/(2*x^2+2*x+1), x, algorithm="fricas")

[Out] 1/2*log(2*x^2 + 2*x + 1)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.80

$$\int \frac{1+2x}{1+2x+2x^2} dx = \frac{\log(2x^2+2x+1)}{2}$$

[In] integrate((1+2*x)/(2*x**2+2*x+1),x)

[Out] log(2*x**2 + 2*x + 1)/2

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \frac{1+2x}{1+2x+2x^2} dx = \frac{1}{2} \log(2x^2+2x+1)$$

[In] integrate((1+2*x)/(2*x^2+2*x+1),x, algorithm="maxima")

[Out] 1/2*log(2*x^2 + 2*x + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \frac{1+2x}{1+2x+2x^2} dx = \frac{1}{2} \log(2x^2+2x+1)$$

[In] integrate((1+2*x)/(2*x^2+2*x+1),x, algorithm="giac")

[Out] 1/2*log(2*x^2 + 2*x + 1)

Mupad [B] (verification not implemented)

Time = 14.94 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.60

$$\int \frac{1+2x}{1+2x+2x^2} dx = \frac{\ln(x^2+x+\frac{1}{2})}{2}$$

[In] int((2*x + 1)/(2*x + 2*x^2 + 1),x)

[Out] log(x + x^2 + 1/2)/2

3.223 $\int \frac{\arcsin(x)}{x^3} dx$

| | |
|---|------|
| Optimal result | 1758 |
| Rubi [A] (verified) | 1758 |
| Mathematica [A] (verified) | 1759 |
| Maple [A] (verified) | 1759 |
| Fricas [A] (verification not implemented) | 1759 |
| Sympy [C] (verification not implemented) | 1760 |
| Maxima [A] (verification not implemented) | 1760 |
| Giac [A] (verification not implemented) | 1760 |
| Mupad [F(-1)] | 1761 |

Optimal result

Integrand size = 6, antiderivative size = 28

$$\int \frac{\arcsin(x)}{x^3} dx = -\frac{\sqrt{1-x^2}}{2x} - \frac{\arcsin(x)}{2x^2}$$

[Out] $-1/2*(-x^2+1)^{(1/2)}/x-1/2*\arcsin(x)/x^2$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {4723, 270}

$$\int \frac{\arcsin(x)}{x^3} dx = -\frac{\arcsin(x)}{2x^2} - \frac{\sqrt{1-x^2}}{2x}$$

[In] `Int[ArcSin[x]/x^3,x]`

[Out] `-1/2*Sqrt[1 - x^2]/x - ArcSin[x]/(2*x^2)`

Rule 270

`Int[((c_.)*(x_))^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Simp[(c*x)^(m + 1)*((a + b*x^n)^(p + 1)/(a*c*(m + 1))), x] /; FreeQ[{a, b, c, m, n, p}, x] && EqQ[(m + 1)/n + p + 1, 0] && NeQ[m, -1]`

Rule 4723

`Int[((a_.) + ArcSin[(c_.)*(x_)])*(b_.))^(n_.)*((d_.)*(x_))^(m_.), x_Symbol] := Simp[(d*x)^(m + 1)*((a + b*ArcSin[c*x])^n/(d*(m + 1))), x] - Dist[b*c*(n/(d*(m + 1))), Int[(d*x)^(m + 1)*((a + b*ArcSin[c*x])^(n - 1)/Sqrt[1 - c^2*`

$x^2)), x], x] /; \text{FreeQ}\{a, b, c, d, m\}, x\} \ \&\& \ \text{IGtQ}[n, 0] \ \&\& \ \text{NeQ}[m, -1]$

Rubi steps

$$\begin{aligned} \text{integral} &= -\frac{\arcsin(x)}{2x^2} + \frac{1}{2} \int \frac{1}{x^2\sqrt{1-x^2}} dx \\ &= -\frac{\sqrt{1-x^2}}{2x} - \frac{\arcsin(x)}{2x^2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.82

$$\int \frac{\arcsin(x)}{x^3} dx = -\frac{x\sqrt{1-x^2} + \arcsin(x)}{2x^2}$$

[In] Integrate[ArcSin[x]/x^3,x]

[Out] -1/2*(x*Sqrt[1 - x^2] + ArcSin[x])/x^2

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.82

| method | result | size |
|---------|---|------|
| default | $-\frac{\sqrt{-x^2+1}}{2x} - \frac{\arcsin(x)}{2x^2}$ | 23 |
| parts | $-\frac{\sqrt{-x^2+1}}{2x} - \frac{\arcsin(x)}{2x^2}$ | 23 |

[In] int(arcsin(x)/x^3,x,method=_RETURNVERBOSE)

[Out] -1/2*(-x^2+1)^(1/2)/x-1/2*arcsin(x)/x^2

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.68

$$\int \frac{\arcsin(x)}{x^3} dx = -\frac{\sqrt{-x^2+1}x + \arcsin(x)}{2x^2}$$

[In] integrate(arcsin(x)/x^3,x, algorithm="fricas")

[Out] -1/2*(sqrt(-x^2 + 1)*x + arcsin(x))/x^2

Sympy [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.78 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.32

$$\int \frac{\arcsin(x)}{x^3} dx = \frac{\begin{cases} -\frac{i\sqrt{x^2-1}}{x} & \text{for } |x^2| > 1 \\ -\frac{\sqrt{1-x^2}}{x} & \text{otherwise} \end{cases}}{2} - \frac{\arcsin(x)}{2x^2}$$

[In] integrate(asin(x)/x**3,x)

[Out] Piecewise((-I*sqrt(x**2 - 1)/x, Abs(x**2) > 1), (-sqrt(1 - x**2)/x, True))/2 - asin(x)/(2*x**2)

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.79

$$\int \frac{\arcsin(x)}{x^3} dx = -\frac{\sqrt{-x^2+1}}{2x} - \frac{\arcsin(x)}{2x^2}$$

[In] integrate(arcsin(x)/x^3,x, algorithm="maxima")

[Out] -1/2*sqrt(-x^2 + 1)/x - 1/2*arcsin(x)/x^2

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 40, normalized size of antiderivative = 1.43

$$\int \frac{\arcsin(x)}{x^3} dx = \frac{x}{4(\sqrt{-x^2+1}-1)} - \frac{\sqrt{-x^2+1}-1}{4x} - \frac{\arcsin(x)}{2x^2}$$

[In] integrate(arcsin(x)/x^3,x, algorithm="giac")

[Out] 1/4*x/(sqrt(-x^2 + 1) - 1) - 1/4*(sqrt(-x^2 + 1) - 1)/x - 1/2*arcsin(x)/x^2

Mupad [F(-1)]

Timed out.

$$\int \frac{\arcsin(x)}{x^3} dx = \int \frac{\operatorname{asin}(x)}{x^3} dx$$

```
[In] int(asin(x)/x^3,x)
```

```
[Out] int(asin(x)/x^3, x)
```

3.224 $\int \cos(\cos(x)) \sin(2x) dx$

| | |
|---|------|
| Optimal result | 1762 |
| Rubi [A] (verified) | 1762 |
| Mathematica [A] (verified) | 1763 |
| Maple [A] (verified) | 1763 |
| Fricas [B] (verification not implemented) | 1764 |
| Sympy [A] (verification not implemented) | 1764 |
| Maxima [A] (verification not implemented) | 1764 |
| Giac [A] (verification not implemented) | 1765 |
| Mupad [B] (verification not implemented) | 1765 |

Optimal result

Integrand size = 8, antiderivative size = 13

$$\int \cos(\cos(x)) \sin(2x) dx = -2 \cos(\cos(x)) - 2 \cos(x) \sin(\cos(x))$$

[Out] $-2*\cos(\cos(x))-2*\cos(x)*\sin(\cos(x))$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.375$, Rules used = {12, 3377, 2718}

$$\int \cos(\cos(x)) \sin(2x) dx = -2 \cos(\cos(x)) - 2 \cos(x) \sin(\cos(x))$$

[In] `Int[Cos[Cos[x]]*Sin[2*x],x]`

[Out] $-2*\text{Cos}[\text{Cos}[x]] - 2*\text{Cos}[x]*\text{Sin}[\text{Cos}[x]]$

Rule 12

`Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]`

Rule 2718

`Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Cos[c + d*x]/d, x] /; FreeQ[{c, d}, x]`

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] := Simp[(-
(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= -\text{Subst}\left(\int 2x \cos(x) dx, x, \cos(x)\right) \\
 &= -(2\text{Subst}\left(\int x \cos(x) dx, x, \cos(x)\right)) \\
 &= -2 \cos(x) \sin(\cos(x)) + 2\text{Subst}\left(\int \sin(x) dx, x, \cos(x)\right) \\
 &= -2 \cos(\cos(x)) - 2 \cos(x) \sin(\cos(x))
 \end{aligned}$$

Mathematica [A] (verified)

Time = 3.44 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \cos(\cos(x)) \sin(2x) dx = -2 \cos(\cos(x)) - 2 \cos(x) \sin(\cos(x))$$

```
[In] Integrate[Cos[Cos[x]]*Sin[2*x],x]
```

```
[Out] -2*Cos[Cos[x]] - 2*Cos[x]*Sin[Cos[x]]
```

Maple [A] (verified)

Time = 12.92 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.62

| method | result | size |
|--------|---|------|
| risch | $\sin(x - \cos(x)) - \sin(x + \cos(x)) - 2 \cos(\cos(x))$ | 21 |

```
[In] int(sin(2*x)*cos(cos(x)),x,method=_RETURNVERBOSE)
```

```
[Out] sin(x-cos(x))-sin(x+cos(x))-2*cos(cos(x))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 47 vs. 2(13) = 26.

Time = 0.25 (sec) , antiderivative size = 47, normalized size of antiderivative = 3.62

$$\int \cos(\cos(x)) \sin(2x) dx = 2 \cos(x) \sin\left(\frac{\tan\left(\frac{1}{2}x\right)^2 - 1}{\tan\left(\frac{1}{2}x\right)^2 + 1}\right) - 2 \cos\left(\frac{\tan\left(\frac{1}{2}x\right)^2 - 1}{\tan\left(\frac{1}{2}x\right)^2 + 1}\right)$$

[In] integrate(sin(2*x)*cos(cos(x)),x, algorithm="fricas")

[Out] 2*cos(x)*sin((tan(1/2*x)^2 - 1)/(tan(1/2*x)^2 + 1)) - 2*cos((tan(1/2*x)^2 - 1)/(tan(1/2*x)^2 + 1))

Sympy [A] (verification not implemented)

Time = 0.84 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.31

$$\int \cos(\cos(x)) \sin(2x) dx = -2 \sin(\cos(x)) \cos(x) - 2 \cos(\cos(x))$$

[In] integrate(sin(2*x)*cos(cos(x)),x)

[Out] -2*sin(cos(x))*cos(x) - 2*cos(cos(x))

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \cos(\cos(x)) \sin(2x) dx = -2 \cos(x) \sin(\cos(x)) - 2 \cos(\cos(x))$$

[In] integrate(sin(2*x)*cos(cos(x)),x, algorithm="maxima")

[Out] -2*cos(x)*sin(cos(x)) - 2*cos(cos(x))

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \cos(\cos(x)) \sin(2x) dx = -2 \cos(x) \sin(\cos(x)) - 2 \cos(\cos(x))$$

[In] integrate(sin(2*x)*cos(cos(x)),x, algorithm="giac")

[Out] -2*cos(x)*sin(cos(x)) - 2*cos(cos(x))

Mupad [B] (verification not implemented)

Time = 15.87 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.85

$$\int \cos(\cos(x)) \sin(2x) dx = -4 \cos\left(\frac{\cos(x)}{2}\right)^2 - 4 \sin\left(\frac{\cos(x)}{2}\right) \cos(x) \cos\left(\frac{\cos(x)}{2}\right)$$

[In] int(cos(cos(x))*sin(2*x),x)

[Out] - 4*cos(cos(x)/2)^2 - 4*cos(cos(x)/2)*sin(cos(x)/2)*cos(x)

3.225 $\int -\sin(x - \sin(x)) dx$

| | |
|------------------------|------|
| Optimal result | 1766 |
| Rubi [N/A] | 1766 |
| Mathematica [N/A] | 1767 |
| Maple [N/A] (verified) | 1767 |
| Fricas [N/A] | 1767 |
| Sympy [N/A] | 1767 |
| Maxima [N/A] | 1768 |
| Giac [N/A] | 1768 |
| Mupad [N/A] | 1768 |

Optimal result

Integrand size = 9, antiderivative size = 9

$$\int -\sin(x - \sin(x)) dx = -\text{Int}(\sin(x - \sin(x)), x)$$

[Out] -CannotIntegrate(sin(x-sin(x)),x)

Rubi [N/A]

Not integrable

Time = 0.01 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00, number of steps used = 0, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int -\sin(x - \sin(x)) dx = \int -\sin(x - \sin(x)) dx$$

[In] Int[-Sin[x - Sin[x]],x]

[Out] -Defer[Int][Sin[x - Sin[x]], x]

Rubi steps

$$\text{integral} = - \int \sin(x - \sin(x)) dx$$

Mathematica [N/A]

Not integrable

Time = 1.89 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.22

$$\int -\sin(x - \sin(x)) dx = \int -\sin(x - \sin(x)) dx$$

`[In] Integrate[-Sin[x - Sin[x]],x]``[Out] -Integrate[Sin[x - Sin[x]], x]`**Maple [N/A] (verified)**

Not integrable

Time = 0.04 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int -\sin(x - \sin(x)) dx$$

`[In] int(-sin(x-sin(x)),x)``[Out] int(-sin(x-sin(x)),x)`**Fricas [N/A]**

Not integrable

Time = 0.25 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int -\sin(x - \sin(x)) dx = \int -\sin(x - \sin(x)) dx$$

`[In] integrate(-sin(x-sin(x)),x, algorithm="fricas")``[Out] integral(sin(-x + sin(x)), x)`**Sympy [N/A]**

Not integrable

Time = 0.49 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.89

$$\int -\sin(x - \sin(x)) dx = - \int \sin(x - \sin(x)) dx$$

`[In] integrate(-sin(x-sin(x)),x)``[Out] -Integral(sin(x - sin(x)), x)`

Maxima [N/A]

Not integrable

Time = 0.40 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int -\sin(x - \sin(x)) dx = \int -\sin(x - \sin(x)) dx$$

[In] integrate(-sin(x-sin(x)),x, algorithm="maxima")

[Out] integrate(sin(-x + sin(x)), x)

Giac [N/A]

Not integrable

Time = 0.27 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.22

$$\int -\sin(x - \sin(x)) dx = \int -\sin(x - \sin(x)) dx$$

[In] integrate(-sin(x-sin(x)),x, algorithm="giac")

[Out] integrate(-sin(x - sin(x)), x)

Mupad [N/A]

Not integrable

Time = 15.40 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.22

$$\int -\sin(x - \sin(x)) dx = \int -\sin(x - \sin(x)) dx$$

[In] int(-sin(x - sin(x)),x)

[Out] int(-sin(x - sin(x)), x)

$$3.226 \quad \int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx$$

| | |
|------------------------|------|
| Optimal result | 1769 |
| Rubi [N/A] | 1769 |
| Mathematica [N/A] | 1770 |
| Maple [N/A] (verified) | 1770 |
| Fricas [N/A] | 1770 |
| Sympy [N/A] | 1770 |
| Maxima [N/A] | 1771 |
| Giac [N/A] | 1772 |
| Mupad [N/A] | 1772 |

Optimal result

Integrand size = 14, antiderivative size = 14

$$\int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx = \text{Int}\left(\frac{1}{1 + \tan^{2\sqrt{505}}(x)}, x\right)$$

[Out] Unintegrable(1/(tan(x)^(2*505^(1/2))+1), x)

Rubi [N/A]

Not integrable

Time = 0.02 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00, number of steps used = 0, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx = \int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx$$

[In] Int[(1 + Tan[x]^(2*Sqrt[505]))^(-1), x]

[Out] Defer[Int] [(1 + Tan[x]^(2*Sqrt[505]))^(-1), x]

Rubi steps

$$\text{integral} = \int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx$$

Mathematica [N/A]

Not integrable

Time = 9.78 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.14

$$\int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx = \int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx$$

[In] Integrate[(1 + Tan[x]^(2*Sqrt[505]))^(-1), x]

[Out] Integrate[(1 + Tan[x]^(2*Sqrt[505]))^(-1), x]

Maple [N/A] (verified)

Not integrable

Time = 0.10 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.86

$$\int \frac{1}{\tan(x)^{2\sqrt{505}} + 1} dx$$

[In] int(1/(tan(x)^(2*505^(1/2))+1), x)

[Out] int(1/(tan(x)^(2*505^(1/2))+1), x)

Fricas [N/A]

Not integrable

Time = 0.25 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx = \int \frac{1}{\tan(x)^{2\sqrt{505}} + 1} dx$$

[In] integrate(1/(tan(x)^(2*505^(1/2))+1), x, algorithm="fricas")

[Out] integral(1/(tan(x)^(2*sqrt(505)) + 1), x)

Sympy [N/A]

Not integrable

Time = 0.80 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx = \int \frac{1}{\tan^{2\sqrt{505}}(x) + 1} dx$$

[In] integrate(1/(tan(x)**(2*505**(1/2))+1), x)

[Out] Integral(1/(tan(x)**(2*sqrt(505)) + 1), x)

Maxima [N/A]

Not integrable

Time = 0.74 (sec) , antiderivative size = 1038, normalized size of antiderivative = 74.14

$$\int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx = \int \frac{1}{\tan(x)^{2\sqrt{505}} + 1} dx$$

[In] integrate(1/(tan(x)^(2*505^(1/2))+1),x, algorithm="maxima")

```
[Out] -(-1)^(sqrt(101)*sqrt(5))*integrate(((1)^(sqrt(101)*sqrt(5))*cos(2*sqrt(101)*sqrt(5)*arctan2(sin(x), cos(x) + 1) - 2*sqrt(101)*sqrt(5)*arctan2(sin(x), -cos(x) + 1))^2*e^(2*sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) + 2*sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1)) + (-1)^(sqrt(101)*sqrt(5))*e^(2*sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) + 2*sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1))*sin(2*sqrt(101)*sqrt(5)*arctan2(sin(x), cos(x) + 1) - 2*sqrt(101)*sqrt(5)*arctan2(sin(x), -cos(x) + 1))^2 + cos(2*sqrt(101)*sqrt(5)*arctan2(sin(2*x), cos(2*x) + 1))*cos(2*sqrt(101)*sqrt(5)*arctan2(sin(x), cos(x) + 1) - 2*sqrt(101)*sqrt(5)*arctan2(sin(x), -cos(x) + 1))*e^(sqrt(101)*sqrt(5)*log(cos(2*x)^2 + sin(2*x)^2 + 2*cos(2*x) + 1) + sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) + sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1)) + e^(sqrt(101)*sqrt(5)*log(cos(2*x)^2 + sin(2*x)^2 + 2*cos(2*x) + 1) + sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) + sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1))*sin(2*sqrt(101)*sqrt(5)*arctan2(sin(2*x), cos(2*x) + 1))*sin(2*sqrt(101)*sqrt(5)*arctan2(sin(x), cos(x) + 1) - 2*sqrt(101)*sqrt(5)*arctan2(sin(x), -cos(x) + 1)))/(2*(-1)^(sqrt(101)*sqrt(5))*cos(2*sqrt(101)*sqrt(5)*arctan2(sin(2*x), cos(2*x) + 1))*cos(2*sqrt(101)*sqrt(5)*arctan2(sin(x), cos(x) + 1) - 2*sqrt(101)*sqrt(5)*arctan2(sin(x), -cos(x) + 1))*e^(sqrt(101)*sqrt(5)*log(cos(2*x)^2 + sin(2*x)^2 + 2*cos(2*x) + 1) + sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) + sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1)) + (-1)^(2*sqrt(101)*sqrt(5))*cos(2*sqrt(101)*sqrt(5)*arctan2(sin(x), cos(x) + 1) - 2*sqrt(101)*sqrt(5)*arctan2(sin(x), -cos(x) + 1))^2*e^(2*sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) + 2*sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1)) + 2*(-1)^(sqrt(101)*sqrt(5))*e^(sqrt(101)*sqrt(5)*log(cos(2*x)^2 + sin(2*x)^2 + 2*cos(2*x) + 1) + sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) + sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1))*sin(2*sqrt(101)*sqrt(5)*arctan2(sin(2*x), cos(2*x) + 1))*sin(2*sqrt(101)*sqrt(5)*arctan2(sin(x), cos(x) + 1) - 2*sqrt(101)*sqrt(5)*arctan2(sin(x), -cos(x) + 1)) + (-1)^(2*sqrt(101)*sqrt(5))*e^(2*sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) + 2*sqrt(101)*sqrt(5)*log(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1))*sin(2*sqrt(101)*sqrt(5)*arctan2(sin(x), cos(x) + 1) - 2*sqrt(101)*sqrt(5)*arctan2(sin(x), -cos(x) + 1))^2 + (cos(2*x)^2 + sin(2*x)^2 + 2*cos(2*x) + 1)^(2*sqrt(101)*sqrt(5))*cos(2*sqrt(101)*sqrt(5)*a
```

$\text{rctan2}(\sin(2*x), \cos(2*x) + 1))^2 + (\cos(2*x)^2 + \sin(2*x)^2 + 2*\cos(2*x) + 1)^{(2*\sqrt{101}*\sqrt{5})}*\sin(2*\sqrt{101}*\sqrt{5}*\arctan2(\sin(2*x), \cos(2*x) + 1))^2, x) + x$

Giac [N/A]

Not integrable

Time = 0.28 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx = \int \frac{1}{\tan(x)^{2\sqrt{505}} + 1} dx$$

[In] integrate(1/(tan(x)^(2*505^(1/2))+1),x, algorithm="giac")

[Out] integrate(1/(tan(x)^(2*sqrt(505)) + 1), x)

Mupad [N/A]

Not integrable

Time = 15.38 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{1}{1 + \tan^{2\sqrt{505}}(x)} dx = \int \frac{1}{\tan(x)^{2\sqrt{505}} + 1} dx$$

[In] int(1/(tan(x)^(2*505^(1/2)) + 1),x)

[Out] int(1/(tan(x)^(2*505^(1/2)) + 1), x)

3.227 $\int (1 - x)^{2020} x dx$

| | |
|---|------|
| Optimal result | 1773 |
| Rubi [A] (verified) | 1773 |
| Mathematica [B] (verified) | 1774 |
| Maple [B] (verified) | 1774 |
| Fricas [F(-2)] | 1774 |
| Sympy [B] (verification not implemented) | 1775 |
| Maxima [B] (verification not implemented) | 2042 |
| Giac [B] (verification not implemented) | 2308 |
| Mupad [B] (verification not implemented) | 2575 |

Optimal result

Integrand size = 9, antiderivative size = 23

$$\int (1 - x)^{2020} x dx = -\frac{(1 - x)^{2021}}{2021} + \frac{(1 - x)^{2022}}{2022}$$

[Out] $-1/2021*(1-x)^{2021}+1/2022*(1-x)^{2022}$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {45}

$$\int (1 - x)^{2020} x dx = \frac{(1 - x)^{2022}}{2022} - \frac{(1 - x)^{2021}}{2021}$$

[In] $\text{Int}[(1 - x)^{2020}*x, x]$

[Out] $-1/2021*(1 - x)^{2021} + (1 - x)^{2022}/2022$

Rule 45

$\text{Int}[(a + b*x)^m*(c + d*x)^n, x] := \text{Int}[\text{ExpandIntegrand}[(a + b*x)^m*(c + d*x)^n, x], x] /;$ FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])

Rubi steps

$$\begin{aligned} \text{integral} &= \int ((1 - x)^{2020} - (1 - x)^{2021}) dx \\ &= -\frac{(1 - x)^{2021}}{2021} + \frac{(1 - x)^{2022}}{2022} \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 11128 vs. $2(23) = 46$.

Time = 0.14 (sec) , antiderivative size = 11128, normalized size of antiderivative = 483.83

$$\int (1 - x)^{2020} x dx = \text{Result too large to show}$$

[In] Integrate[(1 - x)^2020*x,x]

[Out] Result too large to show

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 10105 vs. $2(19) = 38$.

Time = 9.33 (sec) , antiderivative size = 10106, normalized size of antiderivative = 439.39

| method | result | size |
|---------------|---------------------------------|-------|
| gospers | Expression too large to display | 10106 |
| default | Expression too large to display | 10107 |
| risch | Expression too large to display | 10107 |
| parallexrisch | Expression too large to display | 10107 |

[In] int(x*(1-x)^2020,x,method=_RETURNVERBOSE)

[Out] result too large to display

Fricas [F(-2)]

Exception generated.

$$\int (1 - x)^{2020} x dx = \text{Exception raised: RuntimeError}$$

[In] integrate(x*(1-x)^2020,x, algorithm="fricas")

[Out] Exception raised: RuntimeError >> System error: Heap exhausted (no more space for allocation).1998848 bytes available, 2179456 requested.PROCEED WITH CAUTION.

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 11171 vs. $2(12) = 24$.

Time = 2.60 (sec) , antiderivative size = 11171, normalized size of antiderivative = 485.70

$$\int (1-x)^{2020} x dx = \text{Too large to display}$$

[In] integrate(x*(1-x)**2020,x)

[Out] $x^{2022}/2022 - 2020x^{2021}/2021 + 2019x^{2020}/2 - 2038180x^{2019}/3 + 685507705x^{2018}/2 - 138266870112x^{2017} + 278745941561035x^{2016}/6 - 13373165093095968x^{2015} + 3366693482174180730x^{2014} - 2259050769046992147760x^{2013}/3 + 151506967484463186448138x^{2012} - 27698221479285170723685360x^{2011} + 13918352848288375491988868066x^{2010}/3 - 716973434466946772290161333280x^{2009} + 102834449953653272749024785712470x^{2008} - 41277737963817952963643626311862816x^{2007}/3 + 1725065037047525925910348951124302995x^{2006} - 203456149346983815836345155695893355528x^{2005} + 67954336961055157115435769332338918346705x^{2004}/3 - 2387938649240603820483180755599043532230840x^{2003} + 239032599150157038818882365583996835022772313x^{2002} - 68329158777556135034683015049498345643691036000x^{2001}/3 + 2070580051371710322595432011477108583912261365977x^{2000} - 179960368994961708008163784454456051967579363996000x^{1999} + 44945090897709842545903018770867237413834629868000750x^{1998}/3 - 1196737653552288657999009221047362441958082554435826640x^{1997} + 91872606035477133069946098385058726668676396410333163850x^{1996} - 20365089221038364860461105557164855112824957167732656091280x^{1995}/3 + 483428305875789720518480870193807402556007179708207427412550x^{1994} - 33223185208528449708566031169292044668543059434670067575119200x^{1993} + 6618056825708284424494058802194502943955470785618233551823806130x^{1992}/3 - 141683309849449923156615569074832365159751152400066575169519360800x^{1991} + 17621857212672637915910494927062643669496400090086408425321559396505x^{1990}/2 - 1593175688015870842174958343408086884084466802056598612815556642435700x^{1989}/3 + 62102597379986860750837045727224787177242246424432593713740407893495825x^{1988}/2 - 1762826139136875145854560336147570878855404166949882699385944631188781540x^{1987} + 583495304116563214661281269304428358721642399988493839669733625764655606425x^{1986}/6 - 5217287769004881602844605550783515840233337199837209592027677186658756829760x^{1985} + 544794542317071048217452589725683577666003679953979611700628832352808384574675x^{1984}/2 - 41551050103163634703691186802188386365900428229156960691552084059020136098420800x^{1983}/3 + 686284669502228720863220122823465726934296451069822398649175737920375706771597260x^{1982} - 33159258142694208431400580160346412382904367352290272569444839374856325440787301600x^{1981} + 4689665312531032901885079475470487545437442238944856864753931415596946731664397417220x^{1980}/3 - 71944537083598867559995458754564932733441509032019128051505486496979940764694848704800x^{1979} + 1390720248431077807054020318450773081599473495959097303$

24277836129527455327507705407659100*x**1978/43 - 42627181824782076664974618
4002365435930081749751131709578673349952100070121367067635629120*x**1977/3
+ 6103716645891952597625978064311726302575467010042704830898860585684816094
929504848447260500*x**1976 - 2564858996839822430289494539308145768624522319
48083118646054803912483168278678210826498756160*x**1975 + 14872651683795855
756768327580295489453802024567355606939733863140411835561790452636493259533
62750*x**1974/141 - 4247175312496622627231502713538875563376669675885201199
79077229931100423254663277085869347626000*x**1973 + 16750855125006646683765
927806149948407682165955575943587551682428429558795593704083730408309017030
*x**1972 - 1942113350160587975735256124942357285704479230932630455924561374
198235807188773849423679810642603600*x**1971/3 + 24525399448538577751018416
504076107795565624569983127045968938931942467609928105048335642175722600770
*x**1970 - 9111414916680828731909537457922602880410140559123181409214498067
36334593989735869641666120045511985600*x**1969 + 99618110701354825366267142
315649766191550146281382513073227650599463042519701580483490702384175388634
950*x**1968/3 - 11875683218477100601337825796175462481691311869345463934971
52175140038712256681143811397373961838166297920*x**1967 + 41692119941063124
704588635432001680068686948234595232029842003483354493613505235489103524351
070598365583100*x**1966 - 4311841814043431702808371481379275615951136815593
323696241989019901217925493856686652692291654967727428692640*x**1965/3 + 48
669282341048818064483160314590423417580355254067612212045974192124530040492
736873323257465234124412330158300*x**1964 - 1619284346477309911045022289431
712708011386742573680951279235099171611387560318575857463878120606538923403
623200*x**1963 + 1588517531232582899057819504815718772136971614804550999524
76875582580663979723634546495497537824209913683068641740*x**1962/3 - 170223
063862965036517691321260730218847531427986813824765787744791278453044004768
1486359322893844602835250538849600*x**1961 + 538124384391789517216364764700
378495716308332968001976963812898784093576312866748942586939472487700165182
32676054020*x**1960 - 50199304491909934476552632057058959756935320821231479
30077263631604414876259419200957697187279167206713621895919662400*x**1959/3
+ 102385638080321174949263623772645625178023720185120265033712123617268026
415416133246729145608800125063372676309620002775*x**1958/2 - 15412972415810
773603124381548619130627601265229493434880658476837048336010024316932617394
16106174841294397695134018114020*x**1957 + 27407060150439204361995575720494
577773615749528630770022370370690440846547923584775791750292620273477540813
5607574344351325*x**1956/6 - 1332855437192836961133612987461001490254939642
916052603529412956544152461305761361722216139512179614939680757449839963729
980*x**1955 + 7659996594583552131161817014298966983209011491830369357463881
8570888925805262915311156891978950353279779324390851281129461325*x**1954/2
- 3252167266750522185166015689404843636222052728715168352611767613967732005
586057722602207380409718260452821048177609511501151200*x**1953/3 + 60459322
272644979184741535320971623349081753407404333135546818768560163759175314688
741015750377101468375123918492828134764690285*x**1952/2 - 83067680820451718
067585485249798365271671727091900814189597754477894112565215713801959198371
4510431736787460685928851986948972000*x**1951 + 674924729171125721154435342

044600500314458270502619132596434341462474113536581595120162499675735513283
91080822025294310929946134210*x**1950/3 - 600652032356937093223603273963376
479331281276742141277714321473716612469028739441892329580388549313606617981
380324491354888687526000*x**1949 + 1581175473903217616451306270130588972922
922369927044878299551056715724017745688333403038969760509216653930624478232
3438577821793807750*x**1948 - 123141913423237977733632119553388756512953210
134533151330600196039166313965331223415940572180377943966419177046062228966
7145669821073840*x**1947/3 + 1051026755447885104959244960464383041394516429
916102325893690704692620719627355912087269865081895254493230102782560596201
5783488015163450*x**1946 - 265486558308114719814599052336381143176873710330
646885808543610618575555386609586483359395992493019946849885911187094239967
931853003543520*x**1945 + 1985022049168520737706839169142232018676271425471
686488604128003155726755907674144537018065396664508026350394889549777205130
5993655044049550*x**1944/3 - 1627382624433346054100138582431768078864420009
613463340810082506641313537894754728933918008680436075970532165798242097520
71482070082189962400*x**1943 + 39504702733205569481393286204014032937759755
668871395117067039086600824846906384389652470539206201343849472839864545002
78073898263847696853545*x**1942 - 94664947719005297580959018138733877034461
760380203410279573166700368828333506888431143352164818045578469804882765582
210440321905032285260504600*x**1941 + 2239633533884213093854662935051047780
192502180696336275614730265403202300397021572746810969726911186328158028582
924707327325779994075960360509505*x**1940 - 5232106345970879072697548314042
218607371427514373717306868037600701968939925989640348484275897812513879159
1139537792307752060008322059375324597800*x**1939 + 120712135699360560525318
062020598484329486242750675251431146315214097038731869187114694654701956286
8296073677086681412320780015712297584957474958075*x**1938 - 275081581800636
790399378395045887123236499036861590404665562378451337871309018658471466898
00041879533754945258413932310257659534100870024827522266080*x**1937 + 61925
325613771967549488165816567022461026442531096403984178059704831780869448892
9898383578621035751435885796345467564520560148060408661083184653492475*x**1
936 - 592240843859258573246525614728914030924940666052495279977663119847417
803050144091713881317057156823852944587467640343882357547844530155462458742
283067360*x**1935/43 + 3026938387415249071275326137373941605951276431123454
799805926628744455532476073130213639087866455904087641307515787775724292052
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- 1229445731091813520149026491635638668499305813000133029478367541316029551
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069027245784000*x**49 + 753809005767656145806808290942498198368070175740274
046616009282332074787723793848783236671750*x**48/3 - 2809131282253138852221
82735257558822277923873085995796612345737618433946209980897571879590080*x**
47/47 + 1390720248431077807054020318450773081599473495959097303242778361295
27455327507705407659100*x**46 - 9491882592562810593415400858352266791965383
091624390294261957185168220184888740372453280*x**45/3 + 7034497968796549352
8276192132057313181561633584172852971308971233954200974965961258300*x**44 -
65688490380677226902604549297646242930533551724887029960070226801590380698
199644469600*x**43/43 + 971583010681012374822073059597220764845553975728848
56723047593754156046487236126380*x**42/3 - 66988400288271128144243596283528
1058240492269743237829685754330805178291733076800*x**41 + 13510904649463361
995792824225196952726116891262858694370175595042349647937451940*x**40 - 796
639709344206921665118616792713764835628795513604695398072247347510177467200
*x**39/3 + 1016510240329381179225705790209293614404545444190481373319378053
3057947669825*x**38/2 - 946685280666208355354867942682492793590726508034977
54694050594112759700540*x**37 + 1028833029928448993105533724214357307569646
5490980999691909660907689141675*x**36/6 - 301792994615577819531999251908446
17261371471136100710865620401540996260*x**35 + 1031396936859369101548878967
789842967714642240566822140187938329383675*x**34/2 - 2564467908275043609134
7418002544658093914958584412050105683004304800*x**33/3 + 274649358266893803
616503440291071872174152037603156692400687954395*x**32/2 - 2135929294212812
911908777423238678871755042498493465957329437600*x**31 + 963956041916324702
71385085516645196069667831633816561026062470*x**30/3 - 46699256317208664248
9883972259125125863055052294559182782800*x**29 + 65492043445290127717004432
99163472086809931686965178394450*x**28 - 2655427882382133833360023793812869
77398921206800927311120*x**27/3 + 11512857899182598129065927115922146199082
25518926480750*x**26 - 1438963110483713817233277620497830591532764594512016
0*x**25 + 517645012842927580648858002869277145978065341494250*x**24/3 - 198
1545604549127916005807436435452023667040044000*x**23 + 21751966522664290532
518295268143711987072280483*x**22 - 683291587775561350346830150494983456436
910360*x**21/3 + 2269674854499242247655554695700119872779947*x**20 - 214699
77865300134250098528272119272517560*x**19 + 5767467440528895012293599993258
91967995*x**18/3 - 1624400393987894737216328588390366112*x**17 + 1290572346
9183485730002610606914985*x**16 - 288079925968819213106186823711904*x**15/3
+ 666092600596657969973752971730*x**14 - 4284701799603267563487019920*x**1
3 + 76208004644684982783413414*x**12/3 - 137802096911866521013360*x**11 + 6
78052067309879999022*x**10 - 8982309220862791840*x**9/3 + 11707329545563470

$x^{**8} - 39840611002272*x^{**7} + 691677274345*x^{**6}/6 - 274339028*x^{**5} + 1019595*x^{**4}/2 - 2020*x^{**3}/3 + x^{**2}/2$

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 10106 vs. $2(15) = 30$.

Time = 2.40 (sec) , antiderivative size = 10106, normalized size of antiderivative = 439.39

$$\int (1-x)^{2020} x dx = \text{Too large to display}$$

[In] integrate(x*(1-x)^2020,x, algorithm="maxima")

[Out] $1/2022*x^{2022} - 2020/2021*x^{2021} + 2019/2*x^{2020} - 2038180/3*x^{2019} + 685507705/2*x^{2018} - 138266870112*x^{2017} + 278745941561035/6*x^{2016} - 13373165093095968*x^{2015} + 3366693482174180730*x^{2014} - 2259050769046992147760/3*x^{2013} + 151506967484463186448138*x^{2012} - 27698221479285170723685360*x^{2011} + 13918352848288375491988868066/3*x^{2010} - 716973434466946772290161333280*x^{2009} + 102834449953653272749024785712470*x^{2008} - 41277737963817952963643626311862816/3*x^{2007} + 1725065037047525925910348951124302995*x^{2006} - 203456149346983815836345155695893355528*x^{2005} + 67954336961055157115435769332338918346705/3*x^{2004} - 2387938649240603820483180755599043532230840*x^{2003} + 239032599150157038818882365583996835022772313*x^{2002} - 6832915877556135034683015049498345643691036000/3*x^{2001} + 2070580051371710322595432011477108583912261365977*x^{2000} - 179960368994961708008163784454456051967579363996000*x^{1999} + 44945090897709842545903018770867237413834629868000750/3*x^{1998} - 1196737653552288657999009221047362441958082554435826640*x^{1997} + 91872606035477133069946098385058726668676396410333163850*x^{1996} - 20365089221038364860461105557164855112824957167732656091280/3*x^{1995} + 483428305875789720518480870193807402556007179708207427412550*x^{1994} - 33223185208528449708566031169292044668543059434670067575119200*x^{1993} + 6618056825708284424494058802194502943955470785618233551823806130/3*x^{1992} - 141683309849449923156615569074832365159751152400066575169519360800*x^{1991} + 17621857212672637915910494927062643669496400090086408425321559396505/2*x^{1990} - 1593175688015870842174958343408086884084466802056598612815556642435700/3*x^{1989} + 62102597379986860750837045727224787177242246424432593713740407893495825/2*x^{1988} - 1762826139136875145854560336147570878855404166949882699385944631188781540*x^{1987} + 583495304116563214661281269304428358721642399988493839669733625764655606425/6*x^{1986} - 5217287769004881602844605550783515840233337199837209592027677186658756829760*x^{1985} + 544794542317071048217452589725683577666003679953979611700628832352808384574675/2*x^{1984} - 41551050103163634703691186802188386365900428229156960691552084059020136098420800/3*x^{1983} + 686284669502228720863220122823465726934296451069822398649175737920375706771597260*x^{1982} - 33159258142694208431400580160346412382904367352290272569444839374856325440787301600*x^{1981} + 46896653125310329018850794754704875454374422389448568647539314155$

96946731664397417220/3*x¹⁹⁸⁰ - 7194453708359886755999545875456493273344150
9032019128051505486496979940764694848704800*x¹⁹⁷⁹ + 1390720248431077807054
02031845077308159947349595909730324277836129527455327507705407659100/43*x¹
978 - 426271818247820766649746184002365435930081749751131709578673349952100
070121367067635629120/3*x¹⁹⁷⁷ + 610371664589195259762597806431172630257546
7010042704830898860585684816094929504848447260500*x¹⁹⁷⁶ - 2564858996839822
430289494539308145768624522319480831186460548039124831682786782108264987561
60*x¹⁹⁷⁵ + 148726516837958557567683275802954894538020245673556069397338631
4041183556179045263649325953362750/141*x¹⁹⁷⁴ - 424717531249662262723150271
353887556337666967588520119979077229931100423254663277085869347626000*x¹⁹⁷
3 + 16750855125006646683765927806149948407682165955575943587551682428429558
795593704083730408309017030*x¹⁹⁷² - 19421133501605879757352561249423572857
04479230932630455924561374198235807188773849423679810642603600/3*x¹⁹⁷¹ + 2
452539944853857775101841650407610779556562456998312704596893893194246760992
8105048335642175722600770*x¹⁹⁷⁰ - 9111414916680828731909537457922602880410
14055912318140921449806736334593989735869641666120045511985600*x¹⁹⁶⁹ + 996
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169131186934546393497152175140038712256681143811397373961838166297920*x¹⁹⁶
7 + 41692119941063124704588635432001680068686948234595232029842003483354493
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92640/3*x¹⁹⁶⁵ + 4866928234104881806448316031459042341758035525406761221204
5974192124530040492736873323257465234124412330158300*x¹⁹⁶⁴ - 1619284346477
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*x¹⁹⁶² - 17022306386296503651769132126073021884753142798681382476578774479
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412972415810773603124381548619130627601265229493434880658476837048336010024
31693261739416106174841294397695134018114020*x¹⁹⁵⁷ + 274070601504392043619
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*x¹⁹⁵⁴ - 32521672667505221851660156894048436362220527287151683526117676139
67732005586057722602207380409718260452821048177609511501151200/3*x¹⁹⁵³ + 6
045932227264497918474153532097162334908175340740433313554681876856016375917
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922922369927044878299551056715724017745688333403038969760509216653930624478
2323438577821793807750*x¹⁹⁴⁸ - 1231419134232379777336321195533887565129532
101345331513306001960391663139653312234159405721803779439664191770460622289
667145669821073840/3*x¹⁹⁴⁷ + 105102675544788510495924496046438304139451642
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15783488015163450*x¹⁹⁴⁶ - 265486558308114719814599052336381143176873710330
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931853003543520*x¹⁹⁴⁵ + 19850220491685207377068391691422320186762714254716
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993655044049550/3*x¹⁹⁴⁴ - 162738262443334605410013858243176807886442000961
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43*x¹⁹³⁵ + 302693838741524907127532613737394160595127643112345479980592662
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¹⁹²⁷ + 2175309621940590341196615475354220711658122128992231210530168687740
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/2*x¹⁹²⁴ - 823138309280126426791438337753560476251164908822694033070591208
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0*x¹⁹¹⁷ + 6422555814181096179010613837835181880175429913989967790685522058
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*x¹⁹¹⁵ + 20370928700384635923933052080934574962670512865339858829129430151
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9600*x¹⁹¹³ + 6214329344843758559275848513431081889116901756794144787806553
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x⁴⁶ - 94918825925628105934154008583522667919653830916243902942619571851682
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57057902092936144045454441904813733193780533057947669825/2*x³⁸ - 946685280
66620835535486794268249279359072650803497754694050594112759700540*x³⁷ + 10

```

288330299284489931055337242143573075696465490980999691909660907689141675/6*
x^36 - 30179299461557781953199925190844617261371471136100710865620401540996
260*x^35 + 1031396936859369101548878967789842967714642240566822140187938329
383675/2*x^34 - 25644679082750436091347418002544658093914958584412050105683
004304800/3*x^33 + 27464935826689380361650344029107187217415203760315669240
0687954395/2*x^32 - 2135929294212812911908777423238678871755042498493465957
329437600*x^31 + 9639560419163247027138508551664519606966783163381656102606
2470/3*x^30 - 466992563172086642489883972259125125863055052294559182782800*
x^29 + 6549204344529012771700443299163472086809931686965178394450*x^28 - 26
5542788238213383336002379381286977398921206800927311120/3*x^27 + 1151285789
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2776204978305915327645945120160*x^25 + 517645012842927580648858002869277145
978065341494250/3*x^24 - 1981545604549127916005807436435452023667040044000*
x^23 + 21751966522664290532518295268143711987072280483*x^22 - 6832915877755
61350346830150494983456436910360/3*x^21 + 226967485449924224765555469570011
9872779947*x^20 - 21469977865300134250098528272119272517560*x^19 + 57674674
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112*x^17 + 12905723469183485730002610606914985*x^16 - 288079925968819213106
186823711904/3*x^15 + 666092600596657969973752971730*x^14 - 428470179960326
7563487019920*x^13 + 76208004644684982783413414/3*x^12 - 137802096911866521
013360*x^11 + 678052067309879999022*x^10 - 8982309220862791840/3*x^9 + 1170
7329545563470*x^8 - 39840611002272*x^7 + 691677274345/6*x^6 - 274339028*x^5
+ 1019595/2*x^4 - 2020/3*x^3 + 1/2*x^2

```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 10106 vs. $2(15) = 30$.

Time = 1.10 (sec) , antiderivative size = 10106, normalized size of antiderivative = 439.39

$$\int (1-x)^{2020} x dx = \text{Too large to display}$$

```
[In] integrate(x*(1-x)^2020,x, algorithm="giac")
```

```

[Out] 1/2022*x^2022 - 2020/2021*x^2021 + 2019/2*x^2020 - 2038180/3*x^2019 + 68550
7705/2*x^2018 - 138266870112*x^2017 + 278745941561035/6*x^2016 - 1337316509
3095968*x^2015 + 3366693482174180730*x^2014 - 2259050769046992147760/3*x^20
13 + 151506967484463186448138*x^2012 - 27698221479285170723685360*x^2011 +
13918352848288375491988868066/3*x^2010 - 716973434466946772290161333280*x^2
009 + 102834449953653272749024785712470*x^2008 - 41277737963817952963643626
311862816/3*x^2007 + 1725065037047525925910348951124302995*x^2006 - 2034561
49346983815836345155695893355528*x^2005 + 679543369610551571154357693323389
18346705/3*x^2004 - 2387938649240603820483180755599043532230840*x^2003 + 23
9032599150157038818882365583996835022772313*x^2002 - 6832915877755613503468
3015049498345643691036000/3*x^2001 + 20705800513717103225954320114771085839

```


12261365977*x²⁰⁰⁰ - 179960368994961708008163784454456051967579363996000*x¹⁹⁹⁹ + 44945090897709842545903018770867237413834629868000750/3*x¹⁹⁹⁸ - 1196737653552288657999009221047362441958082554435826640*x¹⁹⁹⁷ + 91872606035477133069946098385058726668676396410333163850*x¹⁹⁹⁶ - 20365089221038364860461105557164855112824957167732656091280/3*x¹⁹⁹⁵ + 483428305875789720518480870193807402556007179708207427412550*x¹⁹⁹⁴ - 33223185208528449708566031169292044668543059434670067575119200*x¹⁹⁹³ + 6618056825708284424494058802194502943955470785618233551823806130/3*x¹⁹⁹² - 141683309849449923156615569074832365159751152400066575169519360800*x¹⁹⁹¹ + 17621857212672637915910494927062643669496400090086408425321559396505/2*x¹⁹⁹⁰ - 1593175688015870842174958343408086884084466802056598612815556642435700/3*x¹⁹⁸⁹ + 62102597379986860750837045727224787177242246424432593713740407893495825/2*x¹⁹⁸⁸ - 1762826139136875145854560336147570878855404166949882699385944631188781540*x¹⁹⁸⁷ + 583495304116563214661281269304428358721642399988493839669733625764655606425/6*x¹⁹⁸⁶ - 5217287769004881602844605550783515840233337199837209592027677186658756829760*x¹⁹⁸⁵ + 544794542317071048217452589725683577666003679953979611700628832352808384574675/2*x¹⁹⁸⁴ - 41551050103163634703691186802188386365900428229156960691552084059020136098420800/3*x¹⁹⁸³ + 686284669502228720863220122823465726934296451069822398649175737920375706771597260*x¹⁹⁸² - 33159258142694208431400580160346412382904367352290272569444839374856325440787301600*x¹⁹⁸¹ + 4689665312531032901885079475470487545437442238944856864753931415596946731664397417220/3*x¹⁹⁸⁰ - 71944537083598867559995458754564932733441509032019128051505486496979940764694848704800*x¹⁹⁷⁹ + 139072024843107780705402031845077308159947349595909730324277836129527455327507705407659100/43*x¹⁹⁷⁸ - 426271818247820766649746184002365435930081749751131709578673349952100070121367067635629120/3*x¹⁹⁷⁷ + 6103716645891952597625978064311726302575467010042704830898860585684816094929504848447260500*x¹⁹⁷⁶ - 256485899683982243028949453930814576862452231948083118646054803912483168278678210826498756160*x¹⁹⁷⁵ + 1487265168379585575676832758029548945380202456735560693973386314041183556179045263649325953362750/141*x¹⁹⁷⁴ - 424717531249662262723150271353887556337666967588520119979077229931100423254663277085869347626000*x¹⁹⁷³ + 16750855125006646683765927806149948407682165955575943587551682428429558795593704083730408309017030*x¹⁹⁷² - 1942113350160587975735256124942357285704479230932630455924561374198235807188773849423679810642603600/3*x¹⁹⁷¹ + 24525399448538577751018416504076107795565624569983127045968938931942467609928105048335642175722600770*x¹⁹⁷⁰ - 911141491668082873190953745792260288041014055912318140921449806736334593989735869641666120045511985600*x¹⁹⁶⁹ + 99618110701354825366267142315649766191550146281382513073227650599463042519701580483490702384175388634950/3*x¹⁹⁶⁸ - 1187568321847710060133782579617546248169131186934546393497152175140038712256681143811397373961838166297920*x¹⁹⁶⁷ + 41692119941063124704588635432001680068686948234595232029842003483354493613505235489103524351070598365583100*x¹⁹⁶⁶ - 4311841814043431702808371481379275615951136815593323696241989019901217925493856686652692291654967727428692640/3*x¹⁹⁶⁵ + 48669282341048818064483160314590423417580355254067612212045974192124530040492736873323257465234124412330158300*x¹⁹⁶⁴ - 1619284346477

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8725702259872940970203384873013513554091388300*x¹¹⁶ - 51166125857898818147
839426062070662358173470805493400700844203094311960231746257435656655645055
158118023318024843981678015137931917055792611220039983896655238772471927936
3127622440457440*x¹¹⁵ + 30568603365487657776636385196063125590517500327218
118637476112546001320534570166950621493991480551865814898384128118996000529
507579450330325812112416360340341123628705705082218239056900*x¹¹⁴ - 180931
464729505052681102261844608439547985297486021472004197631613338244359689728
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7126403998361012297419657600*x¹¹³ + 10608747952983273540478055676500204082
135282284812861459184044938884169778438613802165119891398827359792597866615
7610485298544614765101237166145063893166221912894939002627978901153540*x¹¹²
2 - 61615669726596579319675867044980230289272008782201881556822489827529085
602257071220046236375480764786440194849499189669051063763319334117880214933
32408426577127515184787817802396800*x¹¹¹ + 3544541593866926650764351062082
616043504669238569135436268520846440064695234444202602412580386752439858976
40492625853844545844652149402573332407987014119214324200295838473790372760*
x¹¹⁰ - 2019459043394020085224729428178109151620034364306091540875325640389
415183384817407065930425576553421808516317159941464567975097698285944345635
6109505353214683558172784766079646400*x¹⁰⁹ + 11394089759232389147207718623
418711557792707143708128043475426169676530285526300078664976660038770152943
57647695169961166080999867211819773556839008673587130182761374224654528600*
x¹⁰⁸ - 6365854399047968129486052697635363212884551932904060410517394831285
567395071134589227039496553224211751692906866257883130863222703126284262306
2848497085114889008331725062077760*x¹⁰⁷ + 35215057988982511686481172478991
858873024550442242643238745682302700865444727713549240649123456628401854428
35341041050388744648199355172119933977541973998827047350055791706600*x¹⁰⁶
- 1928662340812992566916404329226749396210461008397460809617867211689764963
423396249928354899455925039133781544417101946965025759582169134185366627837
28153429561914633554650240*x¹⁰⁵ + 1045684768583686663351293054693756252507
426395976304376354437409482273606291811905579487759566045825891947110515308
2917114559231311241270060329309406934202999479158788669800*x¹⁰⁴ - 56120572
634087070656898145394250475958851845411579841970524049438107218138206796088
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0115535651200*x¹⁰³ + 59622377156087397471784253118503645976300627840754196
897402132996796302113129626195321670501572788318400493143416700843197048248
704445838063281150127256420611065379058205/2*x¹⁰² - 1567222741332359523485
085072772373065179198138283208540192818706653718622092253382861342429726788
442611070528609919412333226537686088999510994860688528601260257567135500*x¹⁰¹
+ 163066183044560487776559475990124435782797109101912613875005143057549
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055406841664946050091445/2*x¹⁰⁰ - 4197063179472028606949061243488497745713
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80803716906615668656992551260459006987371425810912811225272352556258111375/
2*x⁹⁸ - 107700106535902367579566050322959965913171816618596219548048217884
168381654163575707365589728772295318180217183692219099167180017062267345804
46453360188225597205280*x⁹⁷ + 10735294238148367917593686761488361953637485
831390231948070962355081901576487510277597935156527309421047839881314077091
97414291122824499817830716378008550740721775/2*x⁹⁶ - 264592617936391096300
126811066208664325853309323096859310606517609207330254891139062747567400929
83425432416652276030830026128869779499867140371956941930904007520*x⁹⁵ + 60
624371874170522194284760782415807814287188482094417842562463254080569574739
709896768017582655992884775778299496559228029265706561691215296988132671670
004384450/47*x⁹⁴ - 6217988274523752394827336011173268581876420832402644906
565602121970169401802765163857430857377047938816559478200508870247208643403
9316062223146520909420340400*x⁹³ + 296366494521820885995853484245096711018
360832983912952490790103391718538226271691719562048580659814745463746699768
5659433550729281790560005600861716920614670*x⁹² - 139648338823514374266346
472507520488002687652420985496703509657700754576659222836623851091346387925
523553805331979884362767113995784373164541376016617835600*x⁹¹ + 6504554268
067879670940534166312447851010854019769735092027402333324196666454139370925
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- 2994476176816475932145354231775408021530598873299133438089307909340876532
276009452485916771637309783526124318656608480304055017191444606270858809296
40800*x⁸⁹ + 13623571635029832860887396479644744941425817356841208876519173
135062991791278756457764438729662786531589487519600286419452323257328990543
830062376834450*x⁸⁸ - 6124517516641763942570068404642337444932168211504604
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44291784345872535970080*x⁸⁷ + 11697005949268038314903320209795993131527216
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023798008256826836077986813984435437081931100747264545846771586681788186922
340792564891356335893000157006040036897481425*x⁸⁴ - 2213791126778184127766
764508521475365348075625276805052441584536932721636088396029456015018697732
849009757726234313193620056202622501996272764200*x⁸³ + 9355869842425026333
276312415633567312820664086457103575285876817826683152767341278622572900870
5418304580092993923105360244140371077953991336395*x⁸² - 390370918428887825
076119662427768565090563960330735712493085223506675580756729436829457122329
1465797050301232278993080842899872372465371567200*x⁸¹ + 160786785982650179
754253972700520793512777985463206605576934368255613867228521605707498463297
129825150134381986053531953615578548605856801355*x⁸⁰ - 6536346277332697848
599938693598244601000245146748204973387561046242145002872856274811823103865

809161982569975914669598692881360178378381600*x⁷⁹ + 7866531023467632362502
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78939932992313408815464719794910673387450/3*x⁷⁸ - 103791041313872009804061
357909284809060917705684820798978648736661583036056493459736292767980604267
05741044922453816441480227788491908080*x⁷⁷ + 40528023988992998905883481765
978780516498062850235308196414808664239873507481590440383156751229894132129
6954800473237609863116504440750*x⁷⁶ - 468268324425468157877121112381848303
286666883348173340106085020909471080854805268899260140870913044887719378284
10097346027122079526960/3*x⁷⁵ + 592839289136799619932949962606743682708645
778144192481334705840473794829457808157875818411877335248154786520734005963
541952229557250*x⁷⁴ - 2220069113434264410272044955100775488288103281593129
979231578342279060460475833666131813644146588838792427857257872863324023896
4000*x⁷³ + 245867910575422915351282243638617934952932463856777621417890396
3254779992873129464008801307182002126380588372685375010813764071590/3*x⁷²
- 2981916747400830904990248188454300291803600459709259996549662981257737374
1359487005831507107700374472602626793853856225172527200*x⁷¹ + 213823333511
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5241812414147266982855138905761813820415/2*x⁷⁰ - 1132927121613911416963571
039341851266716698696478644713000001013062529592109897157463883718585352672
69872864383236396917048300/3*x⁶⁹ + 262785341442446488882663461320036245711
727480774518559626257083678932822783032018732591488099829680990538388847262
4595839175/2*x⁶⁸ - 4501968211603236409151405177708602781823235231958007770
3654685328512826226294907816615284139101256185270690886227961927420*x⁶⁷ +
911232178914858457048446251576546064084411109647570358800037900193685435097
2035858958893959183211130640168191556180246975/6*x⁶⁶ - 5043099358956490340
490595189732230880196732999425254766677620232981050637226770366500578866605
0710553599924585162146880*x⁶⁵ + 329601185439971079295023418378981828626238
853942901210890335400505257315491630883727334500426898716351174175140830872
5/2*x⁶⁴ - 1589559182072735412434250861868056948380995858486390049360522702
55093831628234928733083363437849012674282205080193600/3*x⁶³ + 167562978294
533744513518380024109689835093457432609089304709478437109281036676220957109
7667576403762637882691801580*x⁶² - 521091011825403173013340779369582302594
48396322494027989526860650391363176736153514888550700831977637813792005600*
x⁶¹ + 47793235258909939339322463428927795796063908859494395192229146656666
28849976386760960343883085991017290821545060/3*x⁶⁰ - 478687523423465722938
895478017529750584405866815868986616695391192423345965843411823307364582034
55279081248800*x⁵⁹ + 14132191000712086753314009872295741899144575901588659
68459816876694395421450884361578922911624220627357523700*x⁵⁸ - 12294457310
918135201490264916356386684993058130001330294783675413160295510573114788826
4138662259772268842560/3*x⁵⁷ + 1166955011073013668576272238554754403958158
856439052296000666764165138498087932799949462513643197409723700*x⁵⁶ - 3261
886540171736686023614409936291831186830320166098944498790308116077846483254
4133171647097629329084480*x⁵⁵ + 268416871742338878719479336183499624207023
7800159264460031044983107036732864353719178956393676306862050/3*x⁵⁴ - 2407
487681236804339732194856768167427750646895703279640646107212921209293062310

2246629389350796048400*x⁵³ + 635243967432944370392046339110148043460562139
 699918476050998418247367114325207393329160868949645830*x⁵² - 4929221700915
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 0168594000/3*x⁵¹ + 4164342471462839611895131722482737047064566878859569943
 12548167931531395730132673821811266941570*x⁵⁰ - 10337952079099284285350513
 704354261006190676695866615496448127300554168517354887069027245784000*x⁴⁹
 + 7538090057676561458068082909424981983680701757402740466160092823320747877
 23793848783236671750/3*x⁴⁸ - 280913128225313885222182735257558822277923873
 085995796612345737618433946209980897571879590080/47*x⁴⁷ + 1390720248431077
 80705402031845077308159947349595909730324277836129527455327507705407659100*
 x⁴⁶ - 94918825925628105934154008583522667919653830916243902942619571851682
 20184888740372453280/3*x⁴⁵ + 703449796879654935282761921320573131815616335
 84172852971308971233954200974965961258300*x⁴⁴ - 65688490380677226902604549
 297646242930533551724887029960070226801590380698199644469600/43*x⁴³ + 9715
 830106810123748220730595972207648455539757288485672304759375415604648723612
 6380/3*x⁴² - 6698840028827112814424359628352810582404922697432378296857543
 30805178291733076800*x⁴¹ + 13510904649463361995792824225196952726116891262
 858694370175595042349647937451940*x⁴⁰ - 7966397093442069216651186167927137
 64835628795513604695398072247347510177467200/3*x³⁹ + 101651024032938117922
 57057902092936144045454441904813733193780533057947669825/2*x³⁸ - 946685280
 66620835535486794268249279359072650803497754694050594112759700540*x³⁷ + 10
 288330299284489931055337242143573075696465490980999691909660907689141675/6*
 x³⁶ - 30179299461557781953199925190844617261371471136100710865620401540996
 260*x³⁵ + 1031396936859369101548878967789842967714642240566822140187938329
 383675/2*x³⁴ - 25644679082750436091347418002544658093914958584412050105683
 004304800/3*x³³ + 27464935826689380361650344029107187217415203760315669240
 0687954395/2*x³² - 2135929294212812911908777423238678871755042498493465957
 329437600*x³¹ + 9639560419163247027138508551664519606966783163381656102606
 2470/3*x³⁰ - 466992563172086642489883972259125125863055052294559182782800*
 x²⁹ + 6549204344529012771700443299163472086809931686965178394450*x²⁸ - 26
 5542788238213383336002379381286977398921206800927311120/3*x²⁷ + 1151285789
 918259812906592711592214619908225518926480750*x²⁶ - 1438963110483713817233
 2776204978305915327645945120160*x²⁵ + 517645012842927580648858002869277145
 978065341494250/3*x²⁴ - 1981545604549127916005807436435452023667040044000*
 x²³ + 21751966522664290532518295268143711987072280483*x²² - 6832915877755
 61350346830150494983456436910360/3*x²¹ + 226967485449924224765555469570011
 9872779947*x²⁰ - 21469977865300134250098528272119272517560*x¹⁹ + 57674674
 4052889501229359999325891967995/3*x¹⁸ - 1624400393987894737216328588390366
 112*x¹⁷ + 12905723469183485730002610606914985*x¹⁶ - 288079925968819213106
 186823711904/3*x¹⁵ + 666092600596657969973752971730*x¹⁴ - 428470179960326
 7563487019920*x¹³ + 76208004644684982783413414/3*x¹² - 137802096911866521
 013360*x¹¹ + 678052067309879999022*x¹⁰ - 8982309220862791840/3*x⁹ + 1170
 7329545563470*x⁸ - 39840611002272*x⁷ + 691677274345/6*x⁶ - 274339028*x⁵
 + 1019595/2*x⁴ - 2020/3*x³ + 1/2*x²

Mupad [B] (verification not implemented)

Time = 31.77 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.65

$$\int (1-x)^{2020} x dx = \frac{(x-1)^{2021}}{2021} + \frac{(x-1)^{2022}}{2022}$$

[In] int(x*(x - 1)^2020,x)

[Out] (x - 1)^2021/2021 + (x - 1)^2022/2022

$$3.228 \quad \int \frac{\sec^4(x) \tan(x)}{4 + \sec^4(x)} dx$$

| | |
|---|------|
| Optimal result | 2576 |
| Rubi [A] (verified) | 2576 |
| Mathematica [A] (verified) | 2577 |
| Maple [A] (verified) | 2578 |
| Fricas [B] (verification not implemented) | 2578 |
| Sympy [B] (verification not implemented) | 2578 |
| Maxima [A] (verification not implemented) | 2579 |
| Giac [B] (verification not implemented) | 2579 |
| Mupad [B] (verification not implemented) | 2579 |

Optimal result

Integrand size = 15, antiderivative size = 11

$$\int \frac{\sec^4(x) \tan(x)}{4 + \sec^4(x)} dx = \frac{1}{4} \log(4 + \sec^4(x))$$

[Out] 1/4*ln(sec(x)^4+4)

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.73, number of steps used = 5, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {4424, 272, 36, 29, 31}

$$\int \frac{\sec^4(x) \tan(x)}{4 + \sec^4(x)} dx = \frac{1}{4} \log(4 \cos^4(x) + 1) - \log(\cos(x))$$

[In] Int[(Sec[x]^4*Tan[x])/(4 + Sec[x]^4),x]

[Out] -Log[Cos[x]] + Log[1 + 4*Cos[x]^4]/4

Rule 29

Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]

Rule 31

Int[((a_) + (b_.)*(x_))^-1, x_Symbol] :> Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 36

```
Int[1/(((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))), x_Symbol] := Dist[b/(b*c
- a*d), Int[1/(a + b*x), x], x] - Dist[d/(b*c - a*d), Int[1/(c + d*x), x],
x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0]
```

Rule 272

```
Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[
Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b
, m, n, p}, x] && IntegerQ[Simplify[(m + 1)/n]]
```

Rule 4424

```
Int[(u_)*(F_)[(c_.)*((a_.) + (b_.)*(x_))], x_Symbol] := With[{d = FreeFacto
rs[Cos[c*(a + b*x)], x]}, Dist[-(b*c)^(-1), Subst[Int[SubstFor[1/x, Cos[c*(
a + b*x)]]/d, u, x], x], x, Cos[c*(a + b*x)]/d, x] /; FunctionOfQ[Cos[c*(a
+ b*x)]/d, u, x, True]] /; FreeQ[{a, b, c}, x] && (EqQ[F, Tan] || EqQ[F, ta
n])
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\text{Subst}\left(\int \frac{1}{x(1+4x^4)} dx, x, \cos(x)\right) \\
&= -\left(\frac{1}{4}\text{Subst}\left(\int \frac{1}{x(1+4x)} dx, x, \cos^4(x)\right)\right) \\
&= -\left(\frac{1}{4}\text{Subst}\left(\int \frac{1}{x} dx, x, \cos^4(x)\right)\right) + \text{Subst}\left(\int \frac{1}{1+4x} dx, x, \cos^4(x)\right) \\
&= -\log(\cos(x)) + \frac{1}{4}\log(1+4\cos^4(x))
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.73

$$\int \frac{\sec^4(x) \tan(x)}{4 + \sec^4(x)} dx = -\log(\cos(x)) + \frac{1}{4}\log(1 + 4\cos^4(x))$$

```
[In] Integrate[(Sec[x]^4*Tan[x])/(4 + Sec[x]^4), x]
```

```
[Out] -Log[Cos[x]] + Log[1 + 4*Cos[x]^4]/4
```

Maple [A] (verified)

Time = 3.91 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.91

| method | result | size |
|-------------------|--|------|
| derivativedivides | $\frac{\ln(\sec(x)^4+4)}{4}$ | 10 |
| default | $\frac{\ln(\sec(x)^4+4)}{4}$ | 10 |
| risch | $-\ln(e^{2ix} + 1) + \frac{\ln(e^{8ix}+4e^{6ix}+10e^{4ix}+4e^{2ix}+1)}{4}$ | 43 |

[In] `int(sec(x)^4*tan(x)/(sec(x)^4+4),x,method=_RETURNVERBOSE)`

[Out] `1/4*ln(sec(x)^4+4)`

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 19 vs. 2(9) = 18.

Time = 0.26 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.73

$$\int \frac{\sec^4(x) \tan(x)}{4 + \sec^4(x)} dx = \frac{1}{4} \log(4 \cos(x)^4 + 1) - \log(-\cos(x))$$

[In] `integrate(sec(x)^4*tan(x)/(sec(x)^4+4),x, algorithm="fricas")`

[Out] `1/4*log(4*cos(x)^4 + 1) - log(-cos(x))`

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 29 vs. 2(8) = 16.

Time = 0.25 (sec) , antiderivative size = 29, normalized size of antiderivative = 2.64

$$\int \frac{\sec^4(x) \tan(x)}{4 + \sec^4(x)} dx = \frac{\log(\sec^2(x) - 2\sec(x) + 2)}{4} + \frac{\log(\sec^2(x) + 2\sec(x) + 2)}{4}$$

[In] `integrate(sec(x)**4*tan(x)/(sec(x)**4+4),x)`

[Out] `log(sec(x)**2 - 2*sec(x) + 2)/4 + log(sec(x)**2 + 2*sec(x) + 2)/4`

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.82

$$\int \frac{\sec^4(x) \tan(x)}{4 + \sec^4(x)} dx = \frac{1}{4} \log(\sec(x)^4 + 4)$$

[In] integrate(sec(x)^4*tan(x)/(sec(x)^4+4),x, algorithm="maxima")

[Out] 1/4*log(sec(x)^4 + 4)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 19 vs. 2(9) = 18.

Time = 0.26 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.73

$$\int \frac{\sec^4(x) \tan(x)}{4 + \sec^4(x)} dx = \frac{1}{4} \log(4 \cos(x)^4 + 1) - \frac{1}{4} \log(\cos(x)^4)$$

[In] integrate(sec(x)^4*tan(x)/(sec(x)^4+4),x, algorithm="giac")

[Out] 1/4*log(4*cos(x)^4 + 1) - 1/4*log(cos(x)^4)

Mupad [B] (verification not implemented)

Time = 15.04 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.36

$$\int \frac{\sec^4(x) \tan(x)}{4 + \sec^4(x)} dx = \frac{\ln(\tan(x)^4 + 2 \tan(x)^2 + 5)}{4}$$

[In] int(tan(x)/(cos(x)^4*(1/cos(x)^4 + 4)),x)

[Out] log(2*tan(x)^2 + tan(x)^4 + 5)/4

3.229 $\int x^{2x}(2 + 2 \log(x)) dx$

| | |
|---|------|
| Optimal result | 2580 |
| Rubi [A] (verified) | 2580 |
| Mathematica [A] (verified) | 2581 |
| Maple [A] (verified) | 2581 |
| Fricas [A] (verification not implemented) | 2582 |
| Sympy [A] (verification not implemented) | 2582 |
| Maxima [A] (verification not implemented) | 2582 |
| Giac [A] (verification not implemented) | 2583 |
| Mupad [B] (verification not implemented) | 2583 |

Optimal result

Integrand size = 12, antiderivative size = 5

$$\int x^{2x}(2 + 2 \log(x)) dx = x^{2x}$$

[Out] $x^{(2*x)}$

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {6873, 12, 6874, 2633}

$$\int x^{2x}(2 + 2 \log(x)) dx = x^{2x}$$

[In] `Int[x^(2*x)*(2 + 2*Log[x]),x]`

[Out] $x^{(2*x)}$

Rule 12

```
Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]
```

Rule 2633

```
Int[Log[u_]*(u_)^((a_.)*(x_)), x_Symbol] := Simp[u^(a*x)/a, x] - Int[SimplifyIntegrand[x*u^(a*x - 1)*D[u, x], x], x] /; FreeQ[a, x] && InverseFunctionFreeQ[u, x]
```

Rule 6873


```
Int[u_, x_Symbol] :=> With[{v = NormalizeIntegrand[u, x]}, Int[v, x] /; v !=
= u]
```

Rule 6874

```
Int[u_, x_Symbol] :=> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int 2x^{2x}(1 + \log(x)) dx \\
 &= 2 \int x^{2x}(1 + \log(x)) dx \\
 &= 2 \int (x^{2x} + x^{2x} \log(x)) dx \\
 &= 2 \int x^{2x} dx + 2 \int x^{2x} \log(x) dx \\
 &= x^{2x}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int x^{2x}(2 + 2\log(x)) dx = x^{2x}$$

```
[In] Integrate[x^(2*x)*(2 + 2*Log[x]),x]
```

```
[Out] x^(2*x)
```

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.20

| method | result | size |
|-------------------|-----------------|------|
| derivativedivides | x^{2x} | 6 |
| risch | x^{2x} | 6 |
| parallelrisch | x^{2x} | 6 |
| norman | $e^{2x \ln(x)}$ | 7 |

```
[In] int(x^(2*x)*(2*ln(x)+2),x,method=_RETURNVERBOSE)
```

[Out] $x^{(2*x)}$

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int x^{2x}(2 + 2 \log(x)) dx = x^{2x}$$

[In] `integrate(x^(2*x)*(2*log(x)+2),x, algorithm="fricas")`

[Out] $x^{(2*x)}$

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 3, normalized size of antiderivative = 0.60

$$\int x^{2x}(2 + 2 \log(x)) dx = x^{2x}$$

[In] `integrate(x**(2*x)*(2*ln(x)+2),x)`

[Out] $x^{(2*x)}$

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int x^{2x}(2 + 2 \log(x)) dx = x^{2x}$$

[In] `integrate(x^(2*x)*(2*log(x)+2),x, algorithm="maxima")`

[Out] $x^{(2*x)}$

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int x^{2x}(2 + 2\log(x)) dx = x^{2x}$$

```
[In] integrate(x^(2*x)*(2*log(x)+2),x, algorithm="giac")
```

```
[Out] x^(2*x)
```

Mupad [B] (verification not implemented)

Time = 15.46 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int x^{2x}(2 + 2\log(x)) dx = x^{2x}$$

```
[In] int(x^(2*x)*(2*log(x) + 2),x)
```

```
[Out] x^(2*x)
```

3.230 $\int \sqrt{1-x^2} dx$

| | |
|---|------|
| Optimal result | 2584 |
| Rubi [A] (verified) | 2584 |
| Mathematica [A] (verified) | 2585 |
| Maple [A] (verified) | 2585 |
| Fricas [A] (verification not implemented) | 2586 |
| Sympy [A] (verification not implemented) | 2586 |
| Maxima [A] (verification not implemented) | 2586 |
| Giac [A] (verification not implemented) | 2586 |
| Mupad [B] (verification not implemented) | 2587 |

Optimal result

Integrand size = 11, antiderivative size = 23

$$\int \sqrt{1-x^2} dx = \frac{1}{2}x\sqrt{1-x^2} + \frac{\arcsin(x)}{2}$$

[Out] 1/2*x*(-x^2+1)^(1/2)+1/2*arcsin(x)

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 23, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {201, 222}

$$\int \sqrt{1-x^2} dx = \frac{\arcsin(x)}{2} + \frac{1}{2}\sqrt{1-x^2}x$$

[In] Int[Sqrt[1 - x^2], x]

[Out] (x*Sqrt[1 - x^2])/2 + ArcSin[x]/2

Rule 201

```
Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Simp[x*((a + b*x^n)^p/(n*p
+ 1)), x] + Dist[a*n*(p/(n*p + 1)), Int[(a + b*x^n)^(p - 1), x], x] /; Free
Q[{a, b}, x] && IGtQ[n, 0] && GtQ[p, 0] && (IntegerQ[2*p] || (EqQ[n, 2] &&
IntegerQ[4*p]) || (EqQ[n, 2] && IntegerQ[3*p]) || LtQ[Denominator[p + 1/n],
Denominator[p]])
```

Rule 222

```
Int[1/Sqrt[(a_) + (b_.)*(x_)^2], x_Symbol] := Simp[ArcSin[Rt[-b, 2]*(x/Sqrt
[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2}x\sqrt{1-x^2} + \frac{1}{2} \int \frac{1}{\sqrt{1-x^2}} dx \\ &= \frac{1}{2}x\sqrt{1-x^2} + \frac{\arcsin(x)}{2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.61

$$\int \sqrt{1-x^2} dx = \frac{1}{2}x\sqrt{1-x^2} - \arctan\left(\frac{\sqrt{1-x^2}}{1+x}\right)$$

[In] Integrate[Sqrt[1 - x^2],x]

[Out] (x*Sqrt[1 - x^2])/2 - ArcTan[Sqrt[1 - x^2]/(1 + x)]

Maple [A] (verified)

Time = 0.24 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.78

| method | result | size |
|----------------|--|------|
| default | $\frac{x\sqrt{-x^2+1}}{2} + \frac{\arcsin(x)}{2}$ | 18 |
| risch | $-\frac{x(x^2-1)}{2\sqrt{-x^2+1}} + \frac{\arcsin(x)}{2}$ | 23 |
| pseudoelliptic | $\frac{x\sqrt{-x^2+1}}{2} - \frac{\arctan\left(\frac{\sqrt{-x^2+1}}{x}\right)}{2}$ | 30 |
| meijerg | $\frac{i(-2i\sqrt{\pi} x\sqrt{-x^2+1} - 2i\sqrt{\pi} \arcsin(x))}{4\sqrt{\pi}}$ | 32 |
| trager | $\frac{x\sqrt{-x^2+1}}{2} + \frac{\text{RootOf}(_Z^2+1) \ln(\text{RootOf}(_Z^2+1)\sqrt{-x^2+1+x})}{2}$ | 41 |

[In] int((-x^2+1)^(1/2),x,method=_RETURNVERBOSE)

[Out] 1/2*x*(-x^2+1)^(1/2)+1/2*arcsin(x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.35

$$\int \sqrt{1-x^2} dx = \frac{1}{2} \sqrt{-x^2+1}x - \arctan\left(\frac{\sqrt{-x^2+1}-1}{x}\right)$$

[In] integrate((-x^2+1)^(1/2),x, algorithm="fricas")

[Out] 1/2*sqrt(-x^2 + 1)*x - arctan((sqrt(-x^2 + 1) - 1)/x)

Sympy [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.65

$$\int \sqrt{1-x^2} dx = \frac{x\sqrt{1-x^2}}{2} + \frac{\arcsin(x)}{2}$$

[In] integrate((-x**2+1)**(1/2),x)

[Out] x*sqrt(1 - x**2)/2 + asin(x)/2

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.74

$$\int \sqrt{1-x^2} dx = \frac{1}{2} \sqrt{-x^2+1}x + \frac{1}{2} \arcsin(x)$$

[In] integrate((-x^2+1)^(1/2),x, algorithm="maxima")

[Out] 1/2*sqrt(-x^2 + 1)*x + 1/2*arcsin(x)

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.74

$$\int \sqrt{1-x^2} dx = \frac{1}{2} \sqrt{-x^2+1}x + \frac{1}{2} \arcsin(x)$$

[In] integrate((-x^2+1)^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(-x^2 + 1)*x + 1/2*arcsin(x)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.74

$$\int \sqrt{1-x^2} dx = \frac{\operatorname{asin}(x)}{2} + \frac{x\sqrt{1-x^2}}{2}$$

[In] `int((1 - x^2)^(1/2),x)`

[Out] `asin(x)/2 + (x*(1 - x^2)^(1/2))/2`

3.231 $\int e^{-x^4} x^5 dx$

| | |
|---|------|
| Optimal result | 2588 |
| Rubi [A] (verified) | 2588 |
| Mathematica [A] (verified) | 2589 |
| Maple [A] (verified) | 2589 |
| Fricas [A] (verification not implemented) | 2590 |
| Sympy [A] (verification not implemented) | 2590 |
| Maxima [A] (verification not implemented) | 2590 |
| Giac [A] (verification not implemented) | 2590 |
| Mupad [B] (verification not implemented) | 2591 |

Optimal result

Integrand size = 11, antiderivative size = 28

$$\int e^{-x^4} x^5 dx = -\frac{1}{4}e^{-x^4} x^2 + \frac{1}{8}\sqrt{\pi}\operatorname{erf}(x^2)$$

[Out] $-1/4*x^2/\exp(x^4)+1/8*\text{Pi}^{(1/2)}*\operatorname{erf}(x^2)$

Rubi [A] (verified)

Time = 0.03 (sec), antiderivative size = 28, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.273$, Rules used = {2243, 2242, 2236}

$$\int e^{-x^4} x^5 dx = \frac{1}{8}\sqrt{\pi}\operatorname{erf}(x^2) - \frac{1}{4}e^{-x^4} x^2$$

[In] $\text{Int}[x^5/E^x^4, x]$

[Out] $-1/4*x^2/E^x^4 + (\text{Sqrt}[\text{Pi}]*\operatorname{Erf}[x^2])/8$

Rule 2236

$\text{Int}[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^{2}), x_Symbol] := \text{Simp}[F^a*\text{Sqrt}[\text{Pi}]*(\operatorname{Erf}[(c + d*x)*\text{Rt}[(-b)*\text{Log}[F], 2]]/(2*d*\text{Rt}[(-b)*\text{Log}[F], 2])), x] /; \text{FreeQ}\{F, a, b, c, d, x\} \ \&\& \ \text{NegQ}[b]$

Rule 2242

$\text{Int}[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^{(n_.)})*((c_.) + (d_.)*(x_))^{(m_.)}, x_Symbol] := \text{Dist}[1/(d*(m + 1)), \text{Subst}[\text{Int}[F^{(a + b*x^2)}, x], x, (c + d*x)^{(m + 1)}], x] /; \text{FreeQ}\{F, a, b, c, d, m, n, x\} \ \&\& \ \text{EqQ}[n, 2*(m + 1)]$

Rule 2243

```
Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^(n_))*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] := Simp[(c + d*x)^(m - n + 1)*(F^(a + b*(c + d*x)^n)/(b*d*n*Log[F])), x] - Dist[(m - n + 1)/(b*n*Log[F]), Int[(c + d*x)^(m - n)*F^(a + b*(c + d*x)^n), x], x] /; FreeQ[{F, a, b, c, d}, x] && IntegerQ[2*(m + 1)/n] && LtQ[0, (m + 1)/n, 5] && IntegerQ[n] && (LtQ[0, n, m + 1] || LtQ[m, n, 0])
```

Rubi steps

$$\begin{aligned} \text{integral} &= -\frac{1}{4}e^{-x^4}x^2 + \frac{1}{2} \int e^{-x^4} x dx \\ &= -\frac{1}{4}e^{-x^4}x^2 + \frac{1}{4} \text{Subst}\left(\int e^{-x^2} dx, x, x^2\right) \\ &= -\frac{1}{4}e^{-x^4}x^2 + \frac{1}{8}\sqrt{\pi}\text{erf}(x^2) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.00

$$\int e^{-x^4} x^5 dx = -\frac{1}{4}e^{-x^4}x^2 + \frac{1}{8}\sqrt{\pi}\text{erf}(x^2)$$

[In] Integrate[x^5/E^x^4,x]

[Out] -1/4*x^2/E^x^4 + (Sqrt[Pi]*Erf[x^2])/8

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.79

| method | result | size |
|---------|--|------|
| meijerg | $-\frac{x^2 e^{-x^4}}{4} + \frac{\sqrt{\pi} \text{erf}(x^2)}{8}$ | 22 |

[In] int(x^5*exp(-x^4),x,method=_RETURNVERBOSE)

[Out] -1/4*x^2*exp(-x^4)+1/8*Pi^(1/2)*erf(x^2)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.75

$$\int e^{-x^4} x^5 dx = -\frac{1}{4} x^2 e^{-x^4} + \frac{1}{8} \sqrt{\pi} \operatorname{erf}(x^2)$$

[In] integrate(x^5*exp(-x^4),x, algorithm="fricas")

[Out] -1/4*x^2*e^(-x^4) + 1/8*sqrt(pi)*erf(x^2)

Sympy [A] (verification not implemented)

Time = 0.52 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.71

$$\int e^{-x^4} x^5 dx = -\frac{x^2 e^{-x^4}}{4} + \frac{\sqrt{\pi} \operatorname{erf}(x^2)}{8}$$

[In] integrate(x**5*exp(-x**4),x)

[Out] -x**2*exp(-x**4)/4 + sqrt(pi)*erf(x**2)/8

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.75

$$\int e^{-x^4} x^5 dx = -\frac{1}{4} x^2 e^{-x^4} + \frac{1}{8} \sqrt{\pi} \operatorname{erf}(x^2)$$

[In] integrate(x^5*exp(-x^4),x, algorithm="maxima")

[Out] -1/4*x^2*e^(-x^4) + 1/8*sqrt(pi)*erf(x^2)

Giac [A] (verification not implemented)

none

Time = 0.31 (sec) , antiderivative size = 35, normalized size of antiderivative = 1.25

$$\int e^{-x^4} x^5 dx = -\frac{\sqrt{\pi} \left(\frac{2\sqrt{x^4} e^{-x^4}}{\sqrt{\pi}} - \operatorname{erf}(\sqrt{x^4}) \right) |x|}{8x}$$

[In] integrate(x^5*exp(-x^4),x, algorithm="giac")

[Out] -1/8*sqrt(pi)*(2*sqrt(x^4)*e^(-x^4)/sqrt(pi) - erf(sqrt(x^4)))*abs(x)/x

Mupad [B] (verification not implemented)

Time = 16.33 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.75

$$\int e^{-x^4} x^5 dx = \frac{\sqrt{\pi} \operatorname{erf}(x^2)}{8} - \frac{x^2 e^{-x^4}}{4}$$

[In] int(x^5*exp(-x^4),x)

[Out] (pi^(1/2)*erf(x^2))/8 - (x^2*exp(-x^4))/4

3.232 $\int \frac{1+\cos(x)}{x+\sin(x)} dx$

| | |
|---|------|
| Optimal result | 2592 |
| Rubi [A] (verified) | 2592 |
| Mathematica [A] (verified) | 2593 |
| Maple [A] (verified) | 2593 |
| Fricas [A] (verification not implemented) | 2593 |
| Sympy [A] (verification not implemented) | 2594 |
| Maxima [A] (verification not implemented) | 2594 |
| Giac [B] (verification not implemented) | 2594 |
| Mupad [B] (verification not implemented) | 2595 |

Optimal result

Integrand size = 11, antiderivative size = 5

$$\int \frac{1 + \cos(x)}{x + \sin(x)} dx = \log(x + \sin(x))$$

[Out] ln(x+sin(x))

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.091$, Rules used = {6816}

$$\int \frac{1 + \cos(x)}{x + \sin(x)} dx = \log(x + \sin(x))$$

[In] Int[(1 + Cos[x])/(x + Sin[x]),x]

[Out] Log[x + Sin[x]]

Rule 6816

Int[(u_)/(y_), x_Symbol] :> With[{q = DerivativeDivides[y, u, x]}, Simp[q*Log[RemoveContent[y, x]], x] /; !FalseQ[q]]

Rubi steps

$$\text{integral} = \log(x + \sin(x))$$

Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1 + \cos(x)}{x + \sin(x)} dx = \log(x + \sin(x))$$

[In] Integrate[(1 + Cos[x])/(x + Sin[x]),x]

[Out] Log[x + Sin[x]]

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.20

| method | result | size |
|-------------------|---|------|
| derivativedivides | $\ln(x + \sin(x))$ | 6 |
| default | $\ln(x + \sin(x))$ | 6 |
| risch | $-ix + \ln(e^{2ix} + 2ix e^{ix} - 1)$ | 23 |
| parallelrisc | $-\ln\left(\frac{1}{1+\cos(x)}\right) + \ln\left(\frac{x+\sin(x)}{1+\cos(x)}\right)$ | 23 |
| norman | $-\ln\left(1 + \tan\left(\frac{x}{2}\right)^2\right) + \ln\left(x \tan\left(\frac{x}{2}\right)^2 + x + 2 \tan\left(\frac{x}{2}\right)\right)$ | 30 |

[In] int((1+cos(x))/(x+sin(x)),x,method=_RETURNVERBOSE)

[Out] ln(x+sin(x))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1 + \cos(x)}{x + \sin(x)} dx = \log(x + \sin(x))$$

[In] integrate((1+cos(x))/(x+sin(x)),x, algorithm="fricas")

[Out] log(x + sin(x))

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1 + \cos(x)}{x + \sin(x)} dx = \log(x + \sin(x))$$

[In] integrate((1+cos(x))/(x+sin(x)),x)

[Out] log(x + sin(x))

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1 + \cos(x)}{x + \sin(x)} dx = \log(x + \sin(x))$$

[In] integrate((1+cos(x))/(x+sin(x)),x, algorithm="maxima")

[Out] log(x + sin(x))

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 72 vs. $2(5) = 10$.

Time = 0.28 (sec) , antiderivative size = 72, normalized size of antiderivative = 14.40

$$\int \frac{1 + \cos(x)}{x + \sin(x)} dx = \frac{1}{2} \log \left(\frac{4 \left(x^2 \tan \left(\frac{1}{2} x \right)^4 + 2 x^2 \tan \left(\frac{1}{2} x \right)^2 + 4 x \tan \left(\frac{1}{2} x \right)^3 + x^2 + 4 x \tan \left(\frac{1}{2} x \right) + 4 \tan \left(\frac{1}{2} x \right)^2 \right)}{\tan \left(\frac{1}{2} x \right)^4 + 2 \tan \left(\frac{1}{2} x \right)^2 + 1} \right)$$

[In] integrate((1+cos(x))/(x+sin(x)),x, algorithm="giac")

[Out] 1/2*log(4*(x^2*tan(1/2*x)^4 + 2*x^2*tan(1/2*x)^2 + 4*x*tan(1/2*x)^3 + x^2 + 4*x*tan(1/2*x) + 4*tan(1/2*x)^2)/(tan(1/2*x)^4 + 2*tan(1/2*x)^2 + 1))

Mupad [B] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \frac{1 + \cos(x)}{x + \sin(x)} dx = \ln(x + \sin(x))$$

[In] int((cos(x) + 1)/(x + sin(x)),x)

[Out] log(x + sin(x))

3.233 $\int \frac{\cot^{-1}(x) + \arctan(x)}{x} dx$

| | |
|---|------|
| Optimal result | 2596 |
| Rubi [A] (verified) | 2596 |
| Mathematica [A] (verified) | 2597 |
| Maple [A] (verified) | 2598 |
| Fricas [A] (verification not implemented) | 2598 |
| Sympy [F] | 2598 |
| Maxima [A] (verification not implemented) | 2598 |
| Giac [A] (verification not implemented) | 2599 |
| Mupad [F(-1)] | 2599 |

Optimal result

Integrand size = 9, antiderivative size = 57

$$\int \frac{\cot^{-1}(x) + \arctan(x)}{x} dx = -\frac{1}{2}i \operatorname{PolyLog}\left(2, -\frac{i}{x}\right) + \frac{1}{2}i \operatorname{PolyLog}\left(2, \frac{i}{x}\right) + \frac{1}{2}i \operatorname{PolyLog}(2, -ix) - \frac{1}{2}i \operatorname{PolyLog}(2, ix)$$

[Out] $-1/2*I*\operatorname{polylog}(2, -I/x) + 1/2*I*\operatorname{polylog}(2, I/x) + 1/2*I*\operatorname{polylog}(2, -I*x) - 1/2*I*\operatorname{polylog}(2, I*x)$

Rubi [A] (verified)

Time = 0.06 (sec), antiderivative size = 57, normalized size of antiderivative = 1.00, number of steps used = 8, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.444$, Rules used = {14, 4941, 2438, 4940}

$$\int \frac{\cot^{-1}(x) + \arctan(x)}{x} dx = -\frac{1}{2}i \operatorname{PolyLog}\left(2, -\frac{i}{x}\right) + \frac{1}{2}i \operatorname{PolyLog}\left(2, \frac{i}{x}\right) + \frac{1}{2}i \operatorname{PolyLog}(2, -ix) - \frac{1}{2}i \operatorname{PolyLog}(2, ix)$$

[In] `Int[(ArcCot[x] + ArcTan[x])/x, x]`

[Out] `(-1/2*I)*PolyLog[2, (-I)/x] + (I/2)*PolyLog[2, I/x] + (I/2)*PolyLog[2, (-I)*x] - (I/2)*PolyLog[2, I*x]`

Rule 14

`Int[(u_)*((c_.)*(x_))^(m_.), x_Symbol] := Int[ExpandIntegrand[(c*x)^m*u, x], x] /; FreeQ[{c, m}, x] && SumQ[u] && !LinearQ[u, x] && !MatchQ[u, (a_)`

+ (b_.)*(v_) /; FreeQ[{a, b}, x] && InverseFunctionQ[v]]

Rule 2438

Int[Log[(c_.)*((d_) + (e_.)*(x_)^(n_.))]/(x_), x_Symbol] :> Simp[-PolyLog[2, (-c)*e*x^n]/n, x] /; FreeQ[{c, d, e, n}, x] && EqQ[c*d, 1]

Rule 4940

Int[((a_.) + ArcTan[(c_.)*(x_)])*(b_.))/(x_), x_Symbol] :> Simp[a*Log[x], x] + (Dist[I*(b/2), Int[Log[1 - I*c*x]/x, x], x] - Dist[I*(b/2), Int[Log[1 + I*c*x]/x, x], x]) /; FreeQ[{a, b, c}, x]

Rule 4941

Int[((a_.) + ArcCot[(c_.)*(x_)])*(b_.))/(x_), x_Symbol] :> Simp[a*Log[x], x] + (-Dist[I*(b/2), Int[Log[1 + I/(c*x)]/x, x], x] + Dist[I*(b/2), Int[Log[1 - I/(c*x)]/x, x], x]) /; FreeQ[{a, b, c}, x]

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \left(\frac{\cot^{-1}(x)}{x} + \frac{\arctan(x)}{x} \right) dx \\
 &= \int \frac{\cot^{-1}(x)}{x} dx + \int \frac{\arctan(x)}{x} dx \\
 &= \frac{1}{2}i \int \frac{\log\left(1 - \frac{i}{x}\right)}{x} dx - \frac{1}{2}i \int \frac{\log\left(1 + \frac{i}{x}\right)}{x} dx + \frac{1}{2}i \int \frac{\log(1 - ix)}{x} dx - \frac{1}{2}i \int \frac{\log(1 + ix)}{x} dx \\
 &= -\frac{1}{2}i \text{PolyLog}\left(2, -\frac{i}{x}\right) + \frac{1}{2}i \text{PolyLog}\left(2, \frac{i}{x}\right) + \frac{1}{2}i \text{PolyLog}(2, -ix) - \frac{1}{2}i \text{PolyLog}(2, ix)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 57, normalized size of antiderivative = 1.00

$$\begin{aligned}
 \int \frac{\cot^{-1}(x) + \arctan(x)}{x} dx &= -\frac{1}{2}i \text{PolyLog}\left(2, -\frac{i}{x}\right) + \frac{1}{2}i \text{PolyLog}\left(2, \frac{i}{x}\right) \\
 &\quad + \frac{1}{2}i \text{PolyLog}(2, -ix) - \frac{1}{2}i \text{PolyLog}(2, ix)
 \end{aligned}$$

[In] Integrate[(ArcCot[x] + ArcTan[x])/x, x]

[Out] (-1/2*I)*PolyLog[2, (-I)/x] + (I/2)*PolyLog[2, I/x] + (I/2)*PolyLog[2, (-I)*x] - (I/2)*PolyLog[2, I*x]

Maple [A] (verified)

Time = 0.06 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.21

| method | result | size |
|---------|---|------|
| default | $\ln(x) \operatorname{arccot}(x) + \ln(x) \operatorname{arctan}(x)$ | 12 |
| parts | $\ln(x) \operatorname{arccot}(x) + \ln(x) \operatorname{arctan}(x)$ | 12 |

[In] `int((arctan(x)+arccot(x))/x,x,method=_RETURNVERBOSE)`

[Out] `ln(x)*arccot(x)+ln(x)*arctan(x)`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.09

$$\int \frac{\cot^{-1}(x) + \arctan(x)}{x} dx = -\frac{1}{2} \pi \log(x)$$

[In] `integrate((arctan(x)+arccot(x))/x,x, algorithm="fricas")`

[Out] `-1/2*pi*log(x)`

Sympy [F]

$$\int \frac{\cot^{-1}(x) + \arctan(x)}{x} dx = \int \frac{\operatorname{acot}(x) + \operatorname{atan}(x)}{x} dx$$

[In] `integrate((atan(x)+acot(x))/x,x)`

[Out] `Integral((acot(x) + atan(x))/x, x)`

Maxima [A] (verification not implemented)

none

Time = 0.42 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.16

$$\int \frac{\cot^{-1}(x) + \arctan(x)}{x} dx = (\arctan(x) + \arctan(1, x)) \log(x)$$

[In] `integrate((arctan(x)+arccot(x))/x,x, algorithm="maxima")`

[Out] `(arctan(x) + arctan2(1, x))*log(x)`

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.09

$$\int \frac{\cot^{-1}(x) + \arctan(x)}{x} dx = -\frac{1}{2} \pi \log(x)$$

[In] integrate((arctan(x)+arccot(x))/x,x, algorithm="giac")

[Out] -1/2*pi*log(x)

Mupad [F(-1)]

Timed out.

$$\int \frac{\cot^{-1}(x) + \arctan(x)}{x} dx = \int \frac{\operatorname{atan}(x) + \operatorname{acot}(x)}{x} dx$$

[In] int((atan(x) + acot(x))/x,x)

[Out] int((atan(x) + acot(x))/x, x)

3.234 $\int \frac{\sinh(x)}{\cosh(x) - \sinh(x)} dx$

| | |
|---|------|
| Optimal result | 2600 |
| Rubi [A] (verified) | 2600 |
| Mathematica [A] (verified) | 2601 |
| Maple [A] (verified) | 2601 |
| Fricas [B] (verification not implemented) | 2601 |
| Sympy [B] (verification not implemented) | 2602 |
| Maxima [A] (verification not implemented) | 2602 |
| Giac [A] (verification not implemented) | 2602 |
| Mupad [B] (verification not implemented) | 2603 |

Optimal result

Integrand size = 12, antiderivative size = 14

$$\int \frac{\sinh(x)}{\cosh(x) - \sinh(x)} dx = \frac{1}{2}(-x + e^x \sinh(x))$$

[Out] -1/2*x+1/2*exp(x)*sinh(x)

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.50, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {3160, 8}

$$\int \frac{\sinh(x)}{\cosh(x) - \sinh(x)} dx = \frac{\sinh(x)}{2(\cosh(x) - \sinh(x))} - \frac{x}{2}$$

[In] Int[Sinh[x]/(Cosh[x] - Sinh[x]),x]

[Out] -1/2*x + Sinh[x]/(2*(Cosh[x] - Sinh[x]))

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 3160

Int[sin[(c_.) + (d_.)*(x_)]^(m_.)*(cos[(c_.) + (d_.)*(x_)]*(a_.) + (b_.)*sin[(c_.) + (d_.)*(x_)]^(n_), x_Symbol] := Simp[a*((a*cos[c + d*x] + b*sin[c + d*x])^n/(2*b*d*n*sin[c + d*x]^n)), x] + Dist[1/(2*b), Int[(a*cos[c + d*x] + b*sin[c + d*x])^(n + 1)/sin[c + d*x]^(n + 1), x], x] /; FreeQ[{a, b, c, d}, x] && EqQ[m + n, 0] && EqQ[a^2 + b^2, 0] && LtQ[n, 0]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{\sinh(x)}{2(\cosh(x) - \sinh(x))} - \frac{\int 1 dx}{2} \\ &= -\frac{x}{2} + \frac{\sinh(x)}{2(\cosh(x) - \sinh(x))} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.57

$$\int \frac{\sinh(x)}{\cosh(x) - \sinh(x)} dx = -\frac{x}{2} + \frac{\cosh^2(x)}{2} + \frac{1}{4} \sinh(2x)$$

[In] Integrate[Sinh[x]/(Cosh[x] - Sinh[x]),x]

[Out] -1/2*x + Cosh[x]^2/2 + Sinh[2*x]/4

Maple [A] (verified)

Time = 0.08 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.79

| method | result | size |
|---------------|--|------|
| risch | $-\frac{x}{2} + \frac{e^{2x}}{4}$ | 11 |
| parallelrisch | $\frac{-\tanh(x)x+x-1}{2\tanh(x)-2}$ | 18 |
| default | $-\frac{\ln(\tanh(\frac{x}{2})+1)}{2} + \frac{1}{(\tanh(\frac{x}{2})-1)^2} + \frac{1}{\tanh(\frac{x}{2})-1} + \frac{\ln(\tanh(\frac{x}{2})-1)}{2}$ | 36 |

[In] int(sinh(x)/(cosh(x)-sinh(x)),x,method=_RETURNVERBOSE)

[Out] -1/2*x+1/4*exp(2*x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 29 vs. 2(10) = 20.

Time = 0.24 (sec) , antiderivative size = 29, normalized size of antiderivative = 2.07

$$\int \frac{\sinh(x)}{\cosh(x) - \sinh(x)} dx = -\frac{(2x - 1) \cosh(x) - (2x + 1) \sinh(x)}{4(\cosh(x) - \sinh(x))}$$

[In] integrate(sinh(x)/(cosh(x)-sinh(x)),x, algorithm="fricas")

[Out] -1/4*((2*x - 1)*cosh(x) - (2*x + 1)*sinh(x))/(cosh(x) - sinh(x))

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 42 vs. 2(10) = 20.

Time = 0.27 (sec) , antiderivative size = 42, normalized size of antiderivative = 3.00

$$\int \frac{\sinh(x)}{\cosh(x) - \sinh(x)} dx = \frac{x \sinh(x)}{-2 \sinh(x) + 2 \cosh(x)} - \frac{x \cosh(x)}{-2 \sinh(x) + 2 \cosh(x)} + \frac{\cosh(x)}{-2 \sinh(x) + 2 \cosh(x)}$$

[In] integrate(sinh(x)/(cosh(x)-sinh(x)),x)

[Out] x*sinh(x)/(-2*sinh(x) + 2*cosh(x)) - x*cosh(x)/(-2*sinh(x) + 2*cosh(x)) + cosh(x)/(-2*sinh(x) + 2*cosh(x))

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \frac{\sinh(x)}{\cosh(x) - \sinh(x)} dx = -\frac{1}{2} x + \frac{1}{4} e^{(2x)}$$

[In] integrate(sinh(x)/(cosh(x)-sinh(x)),x, algorithm="maxima")

[Out] -1/2*x + 1/4*e^(2*x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \frac{\sinh(x)}{\cosh(x) - \sinh(x)} dx = -\frac{1}{2} x + \frac{1}{4} e^{(2x)}$$

[In] integrate(sinh(x)/(cosh(x)-sinh(x)),x, algorithm="giac")

[Out] -1/2*x + 1/4*e^(2*x)

Mupad [B] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \frac{\sinh(x)}{\cosh(x) - \sinh(x)} dx = \frac{e^{2x}}{4} - \frac{x}{2}$$

[In] int(sinh(x)/(cosh(x) - sinh(x)),x)

[Out] exp(2*x)/4 - x/2

3.235 $\int \frac{x}{\sqrt{-1+x}\sqrt{1+x}} dx$

| | |
|---|------|
| Optimal result | 2604 |
| Rubi [A] (verified) | 2604 |
| Mathematica [A] (verified) | 2605 |
| Maple [A] (verified) | 2605 |
| Fricas [A] (verification not implemented) | 2606 |
| Sympy [F] | 2606 |
| Maxima [F] | 2606 |
| Giac [A] (verification not implemented) | 2606 |
| Mupad [B] (verification not implemented) | 2607 |

Optimal result

Integrand size = 19, antiderivative size = 45

$$\int \frac{x}{\sqrt{-1+x}\sqrt{1+x}} dx = -\frac{1}{3}(-1+x)^{3/2} - \frac{1}{5}(-1+x)^{5/2} - \frac{1}{3}(1+x)^{3/2} + \frac{1}{5}(1+x)^{5/2}$$

[Out] $-1/3*(-1+x)^{(3/2)}-1/5*(-1+x)^{(5/2)}-1/3*(1+x)^{(3/2)}+1/5*(1+x)^{(5/2)}$

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 45, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.105$, Rules used = {2129, 45}

$$\int \frac{x}{\sqrt{-1+x}\sqrt{1+x}} dx = -\frac{1}{5}(x-1)^{5/2} - \frac{1}{3}(x-1)^{3/2} + \frac{1}{5}(x+1)^{5/2} - \frac{1}{3}(x+1)^{3/2}$$

[In] Int[x/(Sqrt[-1 + x] + Sqrt[1 + x]),x]

[Out] $-1/3*(-1 + x)^{(3/2)} - (-1 + x)^{(5/2)}/5 - (1 + x)^{(3/2)}/3 + (1 + x)^{(5/2)}/5$

Rule 45

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] :> Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])]

Rule 2129

Int[(u_)/((e_.)*Sqrt[(a_.) + (b_.)*(x_)] + (f_.)*Sqrt[(c_.) + (d_.)*(x_)]), x_Symbol] :> Dist[-d/(e*(b*c - a*d)), Int[u*Sqrt[a + b*x], x], x] + Dist[b

`/(f*(b*c - a*d)), Int[u*Sqrt[c + d*x], x], x] /; FreeQ[{a, b, c, d, e, f}, x] && NeQ[b*c - a*d, 0] && EqQ[b*e^2 - d*f^2, 0]`

Rubi steps

$$\begin{aligned} \text{integral} &= -\left(\frac{1}{2} \int \sqrt{-1+xx} dx\right) + \frac{1}{2} \int x\sqrt{1+x} dx \\ &= -\left(\frac{1}{2} \int (\sqrt{-1+x} + (-1+x)^{3/2}) dx\right) + \frac{1}{2} \int (-\sqrt{1+x} + (1+x)^{3/2}) dx \\ &= -\frac{1}{3}(-1+x)^{3/2} - \frac{1}{5}(-1+x)^{5/2} - \frac{1}{3}(1+x)^{3/2} + \frac{1}{5}(1+x)^{5/2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.31 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.76

$$\int \frac{x}{\sqrt{-1+x} + \sqrt{1+x}} dx = \frac{1}{15} \left((1+x)^{3/2}(-2+3x) + \sqrt{-1+x}(2+x-3x^2) \right)$$

[In] `Integrate[x/(Sqrt[-1 + x] + Sqrt[1 + x]), x]`

[Out] `((1 + x)^(3/2)*(-2 + 3*x) + Sqrt[-1 + x]*(2 + x - 3*x^2))/15`

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.67

| method | result | size |
|---------|--|------|
| default | $-\frac{(-1+x)^{3/2}}{3} - \frac{(-1+x)^{5/2}}{5} - \frac{(1+x)^{3/2}}{3} + \frac{(1+x)^{5/2}}{5}$ | 30 |

[In] `int(x/((-1+x)^(1/2)+(1+x)^(1/2)), x, method=_RETURNVERBOSE)`

[Out] `-1/3*(-1+x)^(3/2)-1/5*(-1+x)^(5/2)-1/3*(1+x)^(3/2)+1/5*(1+x)^(5/2)`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 33, normalized size of antiderivative = 0.73

$$\int \frac{x}{\sqrt{-1+x} + \sqrt{1+x}} dx = \frac{1}{15} (3x^2 + x - 2)\sqrt{x+1} - \frac{1}{15} (3x^2 - x - 2)\sqrt{x-1}$$

[In] integrate(x/((-1+x)^(1/2)+(1+x)^(1/2)),x, algorithm="fricas")

[Out] 1/15*(3*x^2 + x - 2)*sqrt(x + 1) - 1/15*(3*x^2 - x - 2)*sqrt(x - 1)

Sympy [F]

$$\int \frac{x}{\sqrt{-1+x} + \sqrt{1+x}} dx = \int \frac{x}{\sqrt{x-1} + \sqrt{x+1}} dx$$

[In] integrate(x/((-1+x)**(1/2)+(1+x)**(1/2)),x)

[Out] Integral(x/(sqrt(x - 1) + sqrt(x + 1)), x)

Maxima [F]

$$\int \frac{x}{\sqrt{-1+x} + \sqrt{1+x}} dx = \int \frac{x}{\sqrt{x+1} + \sqrt{x-1}} dx$$

[In] integrate(x/((-1+x)^(1/2)+(1+x)^(1/2)),x, algorithm="maxima")

[Out] integrate(x/(sqrt(x + 1) + sqrt(x - 1)), x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 33, normalized size of antiderivative = 0.73

$$\int \frac{x}{\sqrt{-1+x} + \sqrt{1+x}} dx = \frac{1}{5} (x+1)^{\frac{5}{2}} - \frac{1}{3} (x+1)^{\frac{3}{2}} - \frac{1}{15} ((3x-4)(x+1)+2)\sqrt{x-1}$$

[In] integrate(x/((-1+x)^(1/2)+(1+x)^(1/2)),x, algorithm="giac")

[Out] 1/5*(x + 1)^(5/2) - 1/3*(x + 1)^(3/2) - 1/15*((3*x - 4)*(x + 1) + 2)*sqrt(x - 1)

Mupad [B] (verification not implemented)

Time = 15.00 (sec) , antiderivative size = 51, normalized size of antiderivative = 1.13

$$\int \frac{x}{\sqrt{-1+x} + \sqrt{1+x}} dx = \frac{x\sqrt{x-1}}{15} + \frac{x\sqrt{x+1}}{15} + \frac{2\sqrt{x-1}}{15} - \frac{2\sqrt{x+1}}{15} - \frac{x^2\sqrt{x-1}}{5} + \frac{x^2\sqrt{x+1}}{5}$$

[In] int(x/((x - 1)^(1/2) + (x + 1)^(1/2)),x)

[Out] (x*(x - 1)^(1/2))/15 + (x*(x + 1)^(1/2))/15 + (2*(x - 1)^(1/2))/15 - (2*(x + 1)^(1/2))/15 - (x^2*(x - 1)^(1/2))/5 + (x^2*(x + 1)^(1/2))/5

3.236 $\int \cos(x + \cos(x)) dx$

| | |
|------------------------|------|
| Optimal result | 2608 |
| Rubi [N/A] | 2608 |
| Mathematica [N/A] | 2609 |
| Maple [N/A] (verified) | 2609 |
| Fricas [N/A] | 2609 |
| Sympy [N/A] | 2609 |
| Maxima [N/A] | 2610 |
| Giac [N/A] | 2610 |
| Mupad [N/A] | 2610 |

Optimal result

Integrand size = 5, antiderivative size = 5

$$\int \cos(x + \cos(x)) dx = \text{Int}(\cos(x + \cos(x)), x)$$

[Out] CannotIntegrate(cos(x+cos(x)),x)

Rubi [N/A]

Not integrable

Time = 0.01 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00, number of steps used = 0, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int \cos(x + \cos(x)) dx = \int \cos(x + \cos(x)) dx$$

[In] Int[Cos[x + Cos[x]],x]

[Out] Defer[Int][Cos[x + Cos[x]], x]

Rubi steps

$$\text{integral} = \int \cos(x + \cos(x)) dx$$

Mathematica [N/A]

Not integrable

Time = 1.61 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int \cos(x + \cos(x)) dx = \int \cos(x + \cos(x)) dx$$

`[In] Integrate[Cos[x + Cos[x]],x]``[Out] Integrate[Cos[x + Cos[x]], x]`**Maple [N/A] (verified)**

Not integrable

Time = 0.06 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int \cos(x + \cos(x)) dx$$

`[In] int(cos(x+cos(x)),x)``[Out] int(cos(x+cos(x)),x)`**Fricas [N/A]**

Not integrable

Time = 0.25 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int \cos(x + \cos(x)) dx = \int \cos(x + \cos(x)) dx$$

`[In] integrate(cos(x+cos(x)),x, algorithm="fricas")``[Out] integral(cos(x + cos(x)), x)`**Sympy [N/A]**

Not integrable

Time = 0.59 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int \cos(x + \cos(x)) dx = \int \cos(x + \cos(x)) dx$$

`[In] integrate(cos(x+cos(x)),x)``[Out] Integral(cos(x + cos(x)), x)`

Maxima [N/A]

Not integrable

Time = 0.41 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int \cos(x + \cos(x)) dx = \int \cos(x + \cos(x)) dx$$

[In] integrate(cos(x+cos(x)),x, algorithm="maxima")

[Out] integrate(cos(x + cos(x)), x)

Giac [N/A]

Not integrable

Time = 0.27 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int \cos(x + \cos(x)) dx = \int \cos(x + \cos(x)) dx$$

[In] integrate(cos(x+cos(x)),x, algorithm="giac")

[Out] integrate(cos(x + cos(x)), x)

Mupad [N/A]

Not integrable

Time = 15.89 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.40

$$\int \cos(x + \cos(x)) dx = \int \cos(x + \cos(x)) dx$$

[In] int(cos(x + cos(x)),x)

[Out] int(cos(x + cos(x)), x)

3.237 $\int x^3 \sin(x^2) dx$

| | |
|---|------|
| Optimal result | 2611 |
| Rubi [A] (verified) | 2611 |
| Mathematica [A] (verified) | 2612 |
| Maple [A] (verified) | 2613 |
| Fricas [A] (verification not implemented) | 2613 |
| Sympy [A] (verification not implemented) | 2613 |
| Maxima [A] (verification not implemented) | 2614 |
| Giac [A] (verification not implemented) | 2614 |
| Mupad [B] (verification not implemented) | 2614 |

Optimal result

Integrand size = 8, antiderivative size = 20

$$\int x^3 \sin(x^2) dx = -\frac{1}{2}x^2 \cos(x^2) + \frac{\sin(x^2)}{2}$$

[Out] $-1/2*x^2*\cos(x^2)+1/2*\sin(x^2)$

Rubi [A] (verified)

Time = 0.02 (sec), antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.375$, Rules used = {3460, 3377, 2717}

$$\int x^3 \sin(x^2) dx = \frac{\sin(x^2)}{2} - \frac{1}{2}x^2 \cos(x^2)$$

[In] $\text{Int}[x^3*\text{Sin}[x^2], x]$

[Out] $-1/2*(x^2*\text{Cos}[x^2]) + \text{Sin}[x^2]/2$

Rule 2717

$\text{Int}[\sin[\text{Pi}/2 + (c_.) + (d_.)*(x_.)], x_Symbol] \rightarrow \text{Simp}[\text{Sin}[c + d*x]/d, x] /;$
 $\text{FreeQ}\{c, d\}, x]$

Rule 3377

$\text{Int}[(c_. + (d_.)*(x_.))^{(m_.)*\sin[(e_.) + (f_.)*(x_.)], x_Symbol] \rightarrow \text{Simp}[($
 $-(c + d*x)^m*(\text{Cos}[e + f*x]/f), x] + \text{Dist}[d*(m/f), \text{Int}[(c + d*x)^{(m-1)}*\text{Cos}$
 $[e + f*x], x], x] /;$ $\text{FreeQ}\{c, d, e, f\}, x] \ \&\& \ \text{GtQ}[m, 0]$

Rule 3460

```
Int[(x_)^(m_.)*((a_.) + (b_.)*Sin[(c_.) + (d_.)*(x_)^(n_)])^(p_.), x_Symbol
] :> Dist[1/n, Subst[Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*Sin[c + d*x])^p
, x], x, x^n], x] /; FreeQ[{a, b, c, d, m, n, p}, x] && IntegerQ[Simplify[(
m + 1)/n]] && (EqQ[p, 1] || EqQ[m, n - 1] || (IntegerQ[p] && GtQ[Simplify[(
m + 1)/n], 0]))
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int x \sin(x) dx, x, x^2 \right) \\ &= -\frac{1}{2} x^2 \cos(x^2) + \frac{1}{2} \text{Subst} \left(\int \cos(x) dx, x, x^2 \right) \\ &= -\frac{1}{2} x^2 \cos(x^2) + \frac{\sin(x^2)}{2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int x^3 \sin(x^2) dx = -\frac{1}{2} x^2 \cos(x^2) + \frac{\sin(x^2)}{2}$$

[In] Integrate[x^3*Sin[x^2],x]

[Out] -1/2*(x^2*Cos[x^2]) + Sin[x^2]/2

Maple [A] (verified)

Time = 0.13 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.85

| method | result | size |
|-------------------|--|------|
| derivativedivides | $-\frac{x^2 \cos(x^2)}{2} + \frac{\sin(x^2)}{2}$ | 17 |
| default | $-\frac{x^2 \cos(x^2)}{2} + \frac{\sin(x^2)}{2}$ | 17 |
| risch | $-\frac{x^2 \cos(x^2)}{2} + \frac{\sin(x^2)}{2}$ | 17 |
| parallelrisc | $-\frac{x^2 \cos(x^2)}{2} + \frac{\sin(x^2)}{2}$ | 17 |
| meijerg | $\sqrt{\pi} \left(-\frac{x^2 \cos(x^2)}{2\sqrt{\pi}} + \frac{\sin(x^2)}{2\sqrt{\pi}} \right)$ | 27 |
| norman | $\frac{-\frac{x^2}{2} + \frac{x^2 \tan\left(\frac{x^2}{2}\right)^2}{2} + \tan\left(\frac{x^2}{2}\right)}{1 + \tan\left(\frac{x^2}{2}\right)^2}$ | 39 |
| parts | $\frac{\sqrt{2}\sqrt{\pi} \operatorname{FresnelS}\left(\frac{\sqrt{2}x}{\sqrt{\pi}}\right)x^3}{2} - \frac{3\pi^2 \left(\frac{2 \operatorname{FresnelS}\left(\frac{\sqrt{2}x}{\sqrt{\pi}}\right)\sqrt{2}x^3}{3\pi^{\frac{3}{2}}} + \frac{2x^2 \cos(x^2)}{3\pi^2} - \frac{2 \sin(x^2)}{3\pi^2} \right)}{4}$ | 69 |

```
[In] int(x^3*sin(x^2),x,method=_RETURNVERBOSE)
```

```
[Out] -1/2*x^2*cos(x^2)+1/2*sin(x^2)
```

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int x^3 \sin(x^2) dx = -\frac{1}{2} x^2 \cos(x^2) + \frac{1}{2} \sin(x^2)$$

```
[In] integrate(x^3*sin(x^2),x, algorithm="fricas")
```

```
[Out] -1/2*x^2*cos(x^2) + 1/2*sin(x^2)
```

Sympy [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.75

$$\int x^3 \sin(x^2) dx = -\frac{x^2 \cos(x^2)}{2} + \frac{\sin(x^2)}{2}$$

```
[In] integrate(x**3*sin(x**2),x)
```

```
[Out] -x**2*cos(x**2)/2 + sin(x**2)/2
```

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int x^3 \sin(x^2) dx = -\frac{1}{2} x^2 \cos(x^2) + \frac{1}{2} \sin(x^2)$$

[In] integrate(x^3*sin(x^2),x, algorithm="maxima")

[Out] -1/2*x^2*cos(x^2) + 1/2*sin(x^2)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int x^3 \sin(x^2) dx = -\frac{1}{2} x^2 \cos(x^2) + \frac{1}{2} \sin(x^2)$$

[In] integrate(x^3*sin(x^2),x, algorithm="giac")

[Out] -1/2*x^2*cos(x^2) + 1/2*sin(x^2)

Mupad [B] (verification not implemented)

Time = 0.12 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int x^3 \sin(x^2) dx = \frac{\sin(x^2)}{2} - \frac{x^2 \cos(x^2)}{2}$$

[In] int(x^3*sin(x^2),x)

[Out] sin(x^2)/2 - (x^2*cos(x^2))/2

3.238 $\int \frac{x}{1-x^4} dx$

| | |
|---|------|
| Optimal result | 2615 |
| Rubi [A] (verified) | 2615 |
| Mathematica [B] (verified) | 2616 |
| Maple [A] (verified) | 2616 |
| Fricas [B] (verification not implemented) | 2617 |
| Sympy [B] (verification not implemented) | 2617 |
| Maxima [B] (verification not implemented) | 2617 |
| Giac [B] (verification not implemented) | 2618 |
| Mupad [B] (verification not implemented) | 2618 |

Optimal result

Integrand size = 11, antiderivative size = 8

$$\int \frac{x}{1-x^4} dx = \frac{\operatorname{arctanh}(x^2)}{2}$$

[Out] 1/2*arctanh(x^2)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {281, 212}

$$\int \frac{x}{1-x^4} dx = \frac{\operatorname{arctanh}(x^2)}{2}$$

[In] Int[x/(1 - x^4),x]

[Out] ArcTanh[x^2]/2

Rule 212

Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])

Rule 281

Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := With[{k = GCD[m + 1, n]}, Dist[1/k, Subst[Int[x^((m + 1)/k - 1)*(a + b*x^(n/k))^p, x], x, x^k], x] /; k != 1] /; FreeQ[{a, b, p}, x] && IGtQ[n, 0] && IntegerQ[m]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \text{Subst} \left(\int \frac{1}{1-x^2} dx, x, x^2 \right) \\ &= \frac{\text{arctanh}(x^2)}{2} \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 23 vs. 2(8) = 16.

Time = 0.00 (sec) , antiderivative size = 23, normalized size of antiderivative = 2.88

$$\int \frac{x}{1-x^4} dx = -\frac{1}{4} \log(1-x^2) + \frac{1}{4} \log(1+x^2)$$

[In] Integrate[x/(1 - x^4),x]

[Out] -1/4*Log[1 - x^2] + Log[1 + x^2]/4

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

| method | result | size |
|-------------|--|------|
| meijerg | $\frac{\text{arctanh}(x^2)}{2}$ | 7 |
| risch | $\frac{\ln(x^2+1)}{4} - \frac{\ln(x^2-1)}{4}$ | 18 |
| default | $-\frac{\ln(-1+x)}{4} - \frac{\ln(1+x)}{4} + \frac{\ln(x^2+1)}{4}$ | 22 |
| norman | $-\frac{\ln(-1+x)}{4} - \frac{\ln(1+x)}{4} + \frac{\ln(x^2+1)}{4}$ | 22 |
| parallelsch | $-\frac{\ln(-1+x)}{4} - \frac{\ln(1+x)}{4} + \frac{\ln(x^2+1)}{4}$ | 22 |

[In] int(x/(-x^4+1),x,method=_RETURNVERBOSE)

[Out] 1/2*arctanh(x^2)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 17 vs. 2(6) = 12.

Time = 0.25 (sec) , antiderivative size = 17, normalized size of antiderivative = 2.12

$$\int \frac{x}{1-x^4} dx = \frac{1}{4} \log(x^2+1) - \frac{1}{4} \log(x^2-1)$$

[In] integrate(x/(-x^4+1),x, algorithm="fricas")

[Out] 1/4*log(x^2 + 1) - 1/4*log(x^2 - 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. 2(5) = 10.

Time = 0.05 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.88

$$\int \frac{x}{1-x^4} dx = -\frac{\log(x^2-1)}{4} + \frac{\log(x^2+1)}{4}$$

[In] integrate(x/(-x**4+1),x)

[Out] -log(x**2 - 1)/4 + log(x**2 + 1)/4

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 17 vs. 2(6) = 12.

Time = 0.19 (sec) , antiderivative size = 17, normalized size of antiderivative = 2.12

$$\int \frac{x}{1-x^4} dx = \frac{1}{4} \log(x^2+1) - \frac{1}{4} \log(x^2-1)$$

[In] integrate(x/(-x^4+1),x, algorithm="maxima")

[Out] 1/4*log(x^2 + 1) - 1/4*log(x^2 - 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 18 vs. 2(6) = 12.

Time = 0.28 (sec) , antiderivative size = 18, normalized size of antiderivative = 2.25

$$\int \frac{x}{1-x^4} dx = \frac{1}{4} \log(x^2+1) - \frac{1}{4} \log(|x^2-1|)$$

[In] integrate(x/(-x^4+1),x, algorithm="giac")

[Out] 1/4*log(x^2 + 1) - 1/4*log(abs(x^2 - 1))

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{x}{1-x^4} dx = \frac{\operatorname{atanh}(x^2)}{2}$$

[In] int(-x/(x^4 - 1),x)

[Out] atanh(x^2)/2

3.239 $\int \operatorname{sech}^2(x) dx$

| | |
|---|------|
| Optimal result | 2619 |
| Rubi [A] (verified) | 2619 |
| Mathematica [A] (verified) | 2620 |
| Maple [A] (verified) | 2620 |
| Fricas [B] (verification not implemented) | 2620 |
| Sympy [B] (verification not implemented) | 2621 |
| Maxima [B] (verification not implemented) | 2621 |
| Giac [B] (verification not implemented) | 2621 |
| Mupad [B] (verification not implemented) | 2622 |

Optimal result

Integrand size = 4, antiderivative size = 2

$$\int \operatorname{sech}^2(x) dx = \tanh(x)$$

[Out] $\tanh(x)$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 2, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3852, 8}

$$\int \operatorname{sech}^2(x) dx = \tanh(x)$$

[In] $\text{Int}[\text{Sech}[x]^2, x]$

[Out] $\text{Tanh}[x]$

Rule 8

$\text{Int}[a_, x_Symbol] \rightarrow \text{Simp}[a*x, x] /; \text{FreeQ}[a, x]$

Rule 3852

$\text{Int}[\text{csc}[(c_.) + (d_.)*(x_.)]^{(n_.)}, x_Symbol] \rightarrow \text{Dist}[-d^{(-1)}, \text{Subst}[\text{Int}[\text{ExpandIntegrand}[(1 + x^2)^{(n/2 - 1)}, x], x], x, \text{Cot}[c + d*x]], x] /; \text{FreeQ}[\{c, d\}, x] \ \&\& \ \text{IGtQ}[n/2, 0]$

Rubi steps

$$\begin{aligned} \text{integral} &= i\text{Subst}\left(\int 1 dx, x, -i \tanh(x)\right) \\ &= \tanh(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 2, normalized size of antiderivative = 1.00

$$\int \text{sech}^2(x) dx = \tanh(x)$$

[In] Integrate[Sech[x]^2,x]

[Out] Tanh[x]

Maple [A] (verified)

Time = 0.23 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.50

| method | result | size |
|---------------|-----------------------|------|
| default | $\tanh(x)$ | 3 |
| parallelrisch | $\tanh(x)$ | 3 |
| risch | $-\frac{2}{e^{2x}+1}$ | 11 |

[In] int(1/cosh(x)^2,x,method=_RETURNVERBOSE)

[Out] tanh(x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 20 vs. $2(2) = 4$.

Time = 0.25 (sec) , antiderivative size = 20, normalized size of antiderivative = 10.00

$$\int \text{sech}^2(x) dx = -\frac{2}{\cosh(x)^2 + 2 \cosh(x) \sinh(x) + \sinh(x)^2 + 1}$$

[In] integrate(1/cosh(x)^2,x, algorithm="fricas")

[Out] -2/(cosh(x)^2 + 2*cosh(x)*sinh(x) + sinh(x)^2 + 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 14 vs. $2(2) = 4$.

Time = 0.31 (sec) , antiderivative size = 14, normalized size of antiderivative = 7.00

$$\int \operatorname{sech}^2(x) dx = \frac{2 \tanh\left(\frac{x}{2}\right)}{\tanh^2\left(\frac{x}{2}\right) + 1}$$

[In] integrate(1/cosh(x)**2,x)

[Out] 2*tanh(x/2)/(tanh(x/2)**2 + 1)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 10 vs. $2(2) = 4$.

Time = 0.20 (sec) , antiderivative size = 10, normalized size of antiderivative = 5.00

$$\int \operatorname{sech}^2(x) dx = \frac{2}{e^{(-2x)} + 1}$$

[In] integrate(1/cosh(x)^2,x, algorithm="maxima")

[Out] 2/(e^(-2*x) + 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 10 vs. $2(2) = 4$.

Time = 0.29 (sec) , antiderivative size = 10, normalized size of antiderivative = 5.00

$$\int \operatorname{sech}^2(x) dx = -\frac{2}{e^{(2x)} + 1}$$

[In] integrate(1/cosh(x)^2,x, algorithm="giac")

[Out] -2/(e^(2*x) + 1)

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 2, normalized size of antiderivative = 1.00

$$\int \operatorname{sech}^2(x) dx = \tanh(x)$$

[In] `int(1/cosh(x)^2,x)`

[Out] `tanh(x)`

3.240 $\int (e^{e^x} - e^{e^x-x}) dx$

| | |
|---|------|
| Optimal result | 2623 |
| Rubi [A] (verified) | 2623 |
| Mathematica [A] (verified) | 2624 |
| Maple [A] (verified) | 2624 |
| Fricas [A] (verification not implemented) | 2625 |
| Sympy [A] (verification not implemented) | 2625 |
| Maxima [F] | 2625 |
| Giac [F] | 2625 |
| Mupad [B] (verification not implemented) | 2626 |

Optimal result

Integrand size = 17, antiderivative size = 9

$$\int (e^{e^x} - e^{e^x-x}) dx = e^{e^x-x}$$

[Out] exp(exp(x)-x)

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.176$, Rules used = {2320, 2209, 2208}

$$\int (e^{e^x} - e^{e^x-x}) dx = e^{e^x-x}$$

[In] Int[E^E^x - E^(E^x - x),x]

[Out] E^(E^x - x)

Rule 2208

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m_), x_Symbol]
:> Simp[(c + d*x)^(m + 1)*((b*F^(g*(e + f*x)))^n/(d*(m + 1))), x] - Dist[f*g*n*(Log[F]/(d*(m + 1))), Int[(c + d*x)^(m + 1)*(b*F^(g*(e + f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && LtQ[m, -1] && IntegerQ[2*m] && !TrueQ[$UseGamma]
```

Rule 2209

```
Int[(F_)^((g_.)*((e_.) + (f_.)*(x_)))/((c_.) + (d_.)*(x_)), x_Symbol]
:> Simp[(F^(g*(e - c*(f/d)))/d)*ExpIntegralEi[f*g*(c + d*x)*(Log[F]/d)], x] /; F
```

```
reeQ[{F, c, d, e, f, g}, x] && !TrueQ[$UseGamma]
```

Rule 2320

```
Int[u_, x_Symbol] :=> With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_) /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n]] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_) [v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int e^{e^x} dx - \int e^{e^x-x} dx \\
 &= -\text{Subst}\left(\int \frac{e^x}{x^2} dx, x, e^x\right) + \text{Subst}\left(\int \frac{e^x}{x} dx, x, e^x\right) \\
 &= e^{e^x-x} + \text{ExpIntegralEi}(e^x) - \text{Subst}\left(\int \frac{e^x}{x} dx, x, e^x\right) \\
 &= e^{e^x-x}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int (e^{e^x} - e^{e^x-x}) dx = e^{e^x-x}$$

```
[In] Integrate[E^E^x - E^(E^x - x), x]
```

```
[Out] E^(E^x - x)
```

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.89

| method | result | size |
|---------|-----------------|------|
| risch | e^{e^x-x} | 8 |
| default | $e^{e^x}e^{-x}$ | 9 |
| norman | $e^{e^x}e^{-x}$ | 9 |
| parts | $e^{e^x}e^{-x}$ | 9 |

```
[In] int(exp(exp(x))-exp(exp(x)-x), x, method=_RETURNVERBOSE)
```

[Out] $\exp(\exp(x)-x)$

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int (e^{e^x} - e^{e^x-x}) dx = e^{(-x+e^x)}$$

[In] `integrate(exp(exp(x))-exp(exp(x)-x),x, algorithm="fricas")`

[Out] $e^{(-x + e^x)}$

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int (e^{e^x} - e^{e^x-x}) dx = e^{-x} e^{e^x}$$

[In] `integrate(exp(exp(x))-exp(exp(x)-x),x)`

[Out] $\exp(-x)*\exp(\exp(x))$

Maxima [F]

$$\int (e^{e^x} - e^{e^x-x}) dx = \int -e^{(-x+e^x)} + e^{(e^x)} dx$$

[In] `integrate(exp(exp(x))-exp(exp(x)-x),x, algorithm="maxima")`

[Out] $Ei(e^x) - \int e^{(-x + e^x)}, x$

Giac [F]

$$\int (e^{e^x} - e^{e^x-x}) dx = \int -e^{(-x+e^x)} + e^{(e^x)} dx$$

[In] `integrate(exp(exp(x))-exp(exp(x)-x),x, algorithm="giac")`

[Out] `integrate(-e^{(-x + e^x)} + e^{(e^x)}, x)`

Mupad [B] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int (e^{e^x} - e^{e^x-x}) dx = e^{e^x-x}$$

[In] `int(exp(exp(x)) - exp(exp(x) - x),x)`

[Out] `exp(exp(x) - x)`

3.241 $\int \sqrt{1 - \sqrt{x}} dx$

| | |
|---|------|
| Optimal result | 2627 |
| Rubi [A] (verified) | 2627 |
| Mathematica [A] (verified) | 2628 |
| Maple [A] (verified) | 2628 |
| Fricas [A] (verification not implemented) | 2629 |
| Sympy [C] (verification not implemented) | 2629 |
| Maxima [A] (verification not implemented) | 2630 |
| Giac [A] (verification not implemented) | 2630 |
| Mupad [B] (verification not implemented) | 2630 |

Optimal result

Integrand size = 13, antiderivative size = 35

$$\int \sqrt{1 - \sqrt{x}} dx = -\frac{4}{3}(1 - \sqrt{x})^{3/2} + \frac{4}{5}(1 - \sqrt{x})^{5/2}$$

[Out] $-4/3*(1-x^{(1/2)})^{(3/2)}+4/5*(1-x^{(1/2)})^{(5/2)}$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 35, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.154$, Rules used = {196, 45}

$$\int \sqrt{1 - \sqrt{x}} dx = \frac{4}{5}(1 - \sqrt{x})^{5/2} - \frac{4}{3}(1 - \sqrt{x})^{3/2}$$

[In] `Int[Sqrt[1 - Sqrt[x]], x]`

[Out] $(-4*(1 - \text{Sqrt}[x])^{(3/2)})/3 + (4*(1 - \text{Sqrt}[x])^{(5/2)})/5$

Rule 45

`Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x], x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && LeQ[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])`

Rule 196

`Int[((a_.) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Dist[1/n, Subst[Int[x^(1/n - 1)*(a + b*x)^p, x], x, x^n], x] /; FreeQ[{a, b, p}, x] && FractionQ[n] &&`

IntegerQ[1/n]

Rubi steps

$$\begin{aligned}
\text{integral} &= 2\text{Subst}\left(\int \sqrt{1-x} dx, x, \sqrt{x}\right) \\
&= 2\text{Subst}\left(\int (\sqrt{1-x} - (1-x)^{3/2}) dx, x, \sqrt{x}\right) \\
&= -\frac{4}{3}(1-\sqrt{x})^{3/2} + \frac{4}{5}(1-\sqrt{x})^{5/2}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.74

$$\int \sqrt{1-\sqrt{x}} dx = -\frac{4}{15}(1-\sqrt{x})^{3/2}(2+3\sqrt{x})$$

`[In] Integrate[Sqrt[1 - Sqrt[x]], x]``[Out] (-4*(1 - Sqrt[x])^(3/2)*(2 + 3*Sqrt[x]))/15`**Maple [A] (verified)**

Time = 0.20 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.69

| method | result | size |
|-------------------|---|------|
| derivativedivides | $-\frac{4(1-\sqrt{x})^{3/2}}{3} + \frac{4(1-\sqrt{x})^{5/2}}{5}$ | 24 |
| default | $-\frac{4(1-\sqrt{x})^{3/2}}{3} + \frac{4(1-\sqrt{x})^{5/2}}{5}$ | 24 |
| meijerg | $-\frac{8\sqrt{\pi}}{15} + \frac{4\sqrt{\pi}(1-\sqrt{x})^{3/2}(3\sqrt{x}+2)}{15\sqrt{\pi}}$ | 33 |

`[In] int((1-x^(1/2))^(1/2), x, method=_RETURNVERBOSE)``[Out] -4/3*(1-x^(1/2))^(3/2)+4/5*(1-x^(1/2))^(5/2)`

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.60

$$\int \sqrt{1 - \sqrt{x}} dx = \frac{4}{15} (3x - \sqrt{x} - 2) \sqrt{-\sqrt{x} + 1}$$

[In] integrate((1-x^(1/2))^(1/2),x, algorithm="fricas")

[Out] 4/15*(3*x - sqrt(x) - 2)*sqrt(-sqrt(x) + 1)

Sympy [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.56 (sec) , antiderivative size = 306, normalized size of antiderivative = 8.74

$$\int \sqrt{1 - \sqrt{x}} dx = \begin{cases} -\frac{12ix^{\frac{7}{2}}\sqrt{\sqrt{x}-1}}{-15x^{\frac{5}{2}}+15x^2} + \frac{4ix^{\frac{5}{2}}\sqrt{\sqrt{x}-1}}{-15x^{\frac{5}{2}}+15x^2} - \frac{8x^{\frac{5}{2}}}{-15x^{\frac{5}{2}}+15x^2} + \frac{16ix^3\sqrt{\sqrt{x}-1}}{-15x^{\frac{5}{2}}+15x^2} - \frac{8ix^2\sqrt{\sqrt{x}-1}}{-15x^{\frac{5}{2}}+15x^2} + \frac{8x^2}{-15x^{\frac{5}{2}}+15x^2} & \text{for } |\sqrt{x}| > 1 \\ -\frac{12x^{\frac{7}{2}}\sqrt{1-\sqrt{x}}}{-15x^{\frac{5}{2}}+15x^2} + \frac{4x^{\frac{5}{2}}\sqrt{1-\sqrt{x}}}{-15x^{\frac{5}{2}}+15x^2} - \frac{8x^{\frac{5}{2}}}{-15x^{\frac{5}{2}}+15x^2} + \frac{16x^3\sqrt{1-\sqrt{x}}}{-15x^{\frac{5}{2}}+15x^2} - \frac{8x^2\sqrt{1-\sqrt{x}}}{-15x^{\frac{5}{2}}+15x^2} + \frac{8x^2}{-15x^{\frac{5}{2}}+15x^2} & \text{otherwise} \end{cases}$$

[In] integrate((1-x**(1/2))**(1/2),x)

```
[Out] Piecewise((-12*I*x**(7/2)*sqrt(sqrt(x) - 1)/(-15*x**(5/2) + 15*x**2) + 4*I*x**(5/2)*sqrt(sqrt(x) - 1)/(-15*x**(5/2) + 15*x**2) - 8*x**(5/2)/(-15*x**(5/2) + 15*x**2) + 16*I*x**3*sqrt(sqrt(x) - 1)/(-15*x**(5/2) + 15*x**2) - 8*I*x**2*sqrt(sqrt(x) - 1)/(-15*x**(5/2) + 15*x**2) + 8*x**2/(-15*x**(5/2) + 15*x**2), Abs(sqrt(x)) > 1, (-12*x**(7/2)*sqrt(1 - sqrt(x))/(-15*x**(5/2) + 15*x**2) + 4*x**(5/2)*sqrt(1 - sqrt(x))/(-15*x**(5/2) + 15*x**2) - 8*x**(5/2)/(-15*x**(5/2) + 15*x**2) + 16*x**3*sqrt(1 - sqrt(x))/(-15*x**(5/2) + 15*x**2) - 8*x**2*sqrt(1 - sqrt(x))/(-15*x**(5/2) + 15*x**2) + 8*x**2/(-15*x**(5/2) + 15*x**2), True))
```

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.66

$$\int \sqrt{1 - \sqrt{x}} dx = \frac{4}{5} (-\sqrt{x} + 1)^{\frac{5}{2}} - \frac{4}{3} (-\sqrt{x} + 1)^{\frac{3}{2}}$$

[In] integrate((1-x^(1/2))^(1/2),x, algorithm="maxima")

[Out] 4/5*(-sqrt(x) + 1)^(5/2) - 4/3*(-sqrt(x) + 1)^(3/2)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.86

$$\int \sqrt{1 - \sqrt{x}} dx = \frac{4}{5} (\sqrt{x} - 1)^2 \sqrt{-\sqrt{x} + 1} - \frac{4}{3} (-\sqrt{x} + 1)^{\frac{3}{2}}$$

[In] integrate((1-x^(1/2))^(1/2),x, algorithm="giac")

[Out] 4/5*(sqrt(x) - 1)^2*sqrt(-sqrt(x) + 1) - 4/3*(-sqrt(x) + 1)^(3/2)

Mupad [B] (verification not implemented)

Time = 16.08 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.29

$$\int \sqrt{1 - \sqrt{x}} dx = x {}_2F_1\left(-\frac{1}{2}, 2; 3; \sqrt{x}\right)$$

[In] int((1 - x^(1/2))^(1/2),x)

[Out] x*hypergeom([-1/2, 2], 3, x^(1/2))

$$3.242 \quad \int \frac{x^3}{1+x+\frac{x^2}{2}+\frac{x^3}{6}} dx$$

| | |
|---|------|
| Optimal result | 2631 |
| Rubi [B] (verified) | 2631 |
| Mathematica [A] (verified) | 2634 |
| Maple [A] (verified) | 2634 |
| Fricas [A] (verification not implemented) | 2634 |
| Sympy [A] (verification not implemented) | 2635 |
| Maxima [A] (verification not implemented) | 2635 |
| Giac [A] (verification not implemented) | 2635 |
| Mupad [B] (verification not implemented) | 2635 |

Optimal result

Integrand size = 23, antiderivative size = 24

$$\int \frac{x^3}{1+x+\frac{x^2}{2}+\frac{x^3}{6}} dx = 6x - 6 \log \left(1 + x + \frac{x^2}{2} + \frac{x^3}{6} \right)$$

[Out] 6*x-6*ln(1+x+1/2*x^2+1/6*x^3)

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 193 vs. 2(24) = 48.

Time = 0.80 (sec) , antiderivative size = 193, normalized size of antiderivative = 8.04, number of steps used = 5, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.174$, Rules used = {2106, 2104, 1642, 642}

$$\int \frac{x^3}{1+x+\frac{x^2}{2}+\frac{x^3}{6}} dx = 6x - 6 \log \left(\sqrt[3]{\sqrt{2}-1}(x+1) - (\sqrt{2}-1)^{2/3} + 1 \right) - \frac{12(1-\sqrt{2}) \left(1 - \sqrt[3]{\sqrt{2}-1} - (\sqrt{2}-1)^{2/3} \right) \log \left((\sqrt{2}-1)^{2/3} (x+1)^2 - \left(1 - \sqrt{2} + \sqrt[3]{\sqrt{2}-1} \right) (x+1) \right)}{\left(1 - \sqrt{2} + \sqrt[3]{\sqrt{2}-1} \right) \left(1 - (\sqrt{2}-1)^{2/3} + (\sqrt{2}-1)^{4/3} \right)}$$

[In] Int[x^3/(1+x+x^2/2+x^3/6),x]

[Out] 6*x - 6*Log[1 - (-1 + Sqrt[2])^(2/3) + (-1 + Sqrt[2])^(1/3)*(1 + x)] - (12*(1 - Sqrt[2])*(1 - (-1 + Sqrt[2])^(1/3) - (-1 + Sqrt[2])^(2/3))*Log[1 + (-1 + Sqrt[2])^(2/3) + (-1 + Sqrt[2])^(4/3) - (1 - Sqrt[2] + (-1 + Sqrt[2])^(1/3))*(1 + x) + (-1 + Sqrt[2])^(2/3)*(1 + x)^2])/((1 - Sqrt[2] + (-1 + Sqrt[2])^(1/3))*(1 - (-1 + Sqrt[2])^(2/3) + (-1 + Sqrt[2])^(4/3)))

Rule 642

```
Int[((d_) + (e_)*(x_))/((a_) + (b_)*(x_) + (c_)*(x_)^2), x_Symbol] := S
imp[d*(Log[RemoveContent[a + b*x + c*x^2, x]]/b), x] /; FreeQ[{a, b, c, d,
e}, x] && EqQ[2*c*d - b*e, 0]
```

Rule 1642

```
Int[(Pq_)*((d_) + (e_)*(x_))^(m_)*((a_) + (b_)*(x_) + (c_)*(x_)^2)^(p
_), x_Symbol] := Int[ExpandIntegrand[(d + e*x)^m*Pq*(a + b*x + c*x^2)^p, x
], x] /; FreeQ[{a, b, c, d, e, m}, x] && PolyQ[Pq, x] && IGtQ[p, -2]
```

Rule 2104

```
Int[((e_) + (f_)*(x_))^(m_)*((a_) + (b_)*(x_) + (d_)*(x_)^3)^(p_), x_S
ymbol] := With[{r = Rt[-9*a*d^2 + Sqrt[3]*d*Sqrt[4*b^3*d + 27*a^2*d^2], 3]}
, Dist[1/d^(2*p), Int[(e + f*x)^m*Simp[18^(1/3)*b*(d/(3*r)) - r/18^(1/3) +
d*x, x]^p*Simp[b*(d/3) + 12^(1/3)*b^2*(d^2/(3*r^2)) + r^2/(3*12^(1/3)) - d*
(2^(1/3)*b*(d/(3^(1/3)*r)) - r/18^(1/3))*x + d^2*x^2, x]^p, x], x]] /; Free
Q[{a, b, d, e, f, m}, x] && NeQ[4*b^3 + 27*a^2*d, 0] && ILtQ[p, 0]
```

Rule 2106

```
Int[(P3_)^(p_)*((e_) + (f_)*(x_))^(m_), x_Symbol] := With[{a = Coeff[P3
, x, 0], b = Coeff[P3, x, 1], c = Coeff[P3, x, 2], d = Coeff[P3, x, 3]}, Su
bst[Int[((3*d*e - c*f)/(3*d) + f*x)^m*Simp[(2*c^3 - 9*b*c*d + 27*a*d^2)/(27
*d^2) - (c^2 - 3*b*d)*(x/(3*d)) + d*x^3, x]^p, x], x, x + c/(3*d)] /; NeQ[c
, 0]] /; FreeQ[{e, f, m, p}, x] && PolyQ[P3, x, 3]
```

Rubi steps

$$\text{integral} = \text{Subst}\left(\int \frac{(-1+x)^3}{\frac{1}{3} + \frac{x}{2} + \frac{x^3}{6}} dx, x, 1+x\right)$$

$$\begin{aligned}
&= \frac{1}{36} \text{Subst} \left(\int \frac{(-1+x)^3}{\left(\frac{1-(-1+\sqrt{2})^{2/3}}{6\sqrt[3]{-1+\sqrt{2}}} + \frac{x}{6} \right) \left(\frac{1}{36} \left(1 + \frac{1}{(-1+\sqrt{2})^{2/3}} + (-1+\sqrt{2})^{2/3} \right) - \frac{(1-(-1+\sqrt{2})^{2/3})x}{36\sqrt[3]{-1+\sqrt{2}}} + x \right)} \right. \\
&= \frac{1}{36} \text{Subst} \left(\int \left(216 + \frac{216\sqrt[3]{-1+\sqrt{2}}}{-1 + (-1+\sqrt{2})^{2/3} - \sqrt[3]{-1+\sqrt{2}}x} \right. \right. \\
&\quad \left. \left. + \frac{432 \left((1-\sqrt{2}) \left(1 - \sqrt[3]{-1+\sqrt{2}} - (-1+\sqrt{2})^{2/3} \right) - (3-2\sqrt{2} + (-1+\sqrt{2})^{2/3}) \right)}{\left(1 - (-1+\sqrt{2})^{2/3} + (-1+\sqrt{2})^{4/3} \right) \left(1 + (-1+\sqrt{2})^{2/3} + (-1+\sqrt{2})^{4/3} - \left(1 - \sqrt{2} + \sqrt[3]{-1+\sqrt{2}} \right) \right)} \right. \right. \\
&= 6x - 6 \log \left(1 - (-1+\sqrt{2})^{2/3} + \sqrt[3]{-1+\sqrt{2}}(1+x) \right) \\
&\quad + \frac{12 \text{Subst} \left(\int \frac{(1-\sqrt{2}) \left(1 - \sqrt[3]{-1+\sqrt{2}} - (-1+\sqrt{2})^{2/3} \right) - (3-2\sqrt{2} + (-1+\sqrt{2})^{2/3} - (-1+\sqrt{2})^{4/3})x}{1 + (-1+\sqrt{2})^{2/3} + (-1+\sqrt{2})^{4/3} + \left(-1 + \sqrt{2} - \sqrt[3]{-1+\sqrt{2}} \right)x + (-1+\sqrt{2})^{2/3}x^2} dx, x, 1+x \right)}{1 - (-1+\sqrt{2})^{2/3} + (-1+\sqrt{2})^{4/3}} \\
&= 6x - 6 \log \left(1 - (-1+\sqrt{2})^{2/3} + \sqrt[3]{-1+\sqrt{2}}(1+x) \right) \\
&\quad - \frac{12(1-\sqrt{2}) \left(1 - \sqrt[3]{-1+\sqrt{2}} - (-1+\sqrt{2})^{2/3} \right) \log \left(1 + (-1+\sqrt{2})^{2/3} + (-1+\sqrt{2})^{4/3} - \left(1 - \sqrt{2} + \sqrt[3]{-1+\sqrt{2}} \right) \right)}{\left(1 - \sqrt{2} + \sqrt[3]{-1+\sqrt{2}} \right) \left(1 - (-1+\sqrt{2})^{2/3} + (-1+\sqrt{2})^{4/3} \right)}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.83

$$\int \frac{x^3}{1+x+\frac{x^2}{2}+\frac{x^3}{6}} dx = 6(x - \log(6+6x+3x^2+x^3))$$

[In] Integrate[x^3/(1+x+x^2/2+x^3/6),x]

[Out] 6*(x - Log[6 + 6*x + 3*x^2 + x^3])

Maple [A] (verified)

Time = 0.03 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.88

| method | result | size |
|--------------|-----------------------------------|------|
| default | $6x - 6 \ln(x^3 + 3x^2 + 6x + 6)$ | 21 |
| norman | $6x - 6 \ln(x^3 + 3x^2 + 6x + 6)$ | 21 |
| risch | $6x - 6 \ln(x^3 + 3x^2 + 6x + 6)$ | 21 |
| parallelrisk | $6x - 6 \ln(x^3 + 3x^2 + 6x + 6)$ | 21 |

[In] int(x^3/(1+x+1/2*x^2+1/6*x^3),x,method=_RETURNVERBOSE)

[Out] 6*x-6*ln(x^3+3*x^2+6*x+6)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.83

$$\int \frac{x^3}{1+x+\frac{x^2}{2}+\frac{x^3}{6}} dx = 6x - 6 \log(x^3 + 3x^2 + 6x + 6)$$

[In] integrate(x^3/(1+x+1/2*x^2+1/6*x^3),x, algorithm="fricas")

[Out] 6*x - 6*log(x^3 + 3*x^2 + 6*x + 6)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.79

$$\int \frac{x^3}{1 + x + \frac{x^2}{2} + \frac{x^3}{6}} dx = 6x - 6 \log(x^3 + 3x^2 + 6x + 6)$$

[In] integrate(x**3/(1+x+1/2*x**2+1/6*x**3),x)

[Out] 6*x - 6*log(x**3 + 3*x**2 + 6*x + 6)

Maxima [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.83

$$\int \frac{x^3}{1 + x + \frac{x^2}{2} + \frac{x^3}{6}} dx = 6x - 6 \log(x^3 + 3x^2 + 6x + 6)$$

[In] integrate(x^3/(1+x+1/2*x^2+1/6*x^3),x, algorithm="maxima")

[Out] 6*x - 6*log(x^3 + 3*x^2 + 6*x + 6)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.88

$$\int \frac{x^3}{1 + x + \frac{x^2}{2} + \frac{x^3}{6}} dx = 6x - 6 \log(|x^3 + 3x^2 + 6x + 6|)$$

[In] integrate(x^3/(1+x+1/2*x^2+1/6*x^3),x, algorithm="giac")

[Out] 6*x - 6*log(abs(x^3 + 3*x^2 + 6*x + 6))

Mupad [B] (verification not implemented)

Time = 16.01 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.83

$$\int \frac{x^3}{1 + x + \frac{x^2}{2} + \frac{x^3}{6}} dx = 6x - 6 \ln(x^3 + 3x^2 + 6x + 6)$$

[In] int(x^3/(x + x^2/2 + x^3/6 + 1),x)

[Out] 6*x - 6*log(6*x + 3*x^2 + x^3 + 6)

3.243 $\int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx$

| | |
|---|------|
| Optimal result | 2636 |
| Rubi [F] | 2636 |
| Mathematica [A] (verified) | 2636 |
| Maple [A] (verified) | 2637 |
| Fricas [B] (verification not implemented) | 2637 |
| Sympy [F] | 2637 |
| Maxima [A] (verification not implemented) | 2638 |
| Giac [A] (verification not implemented) | 2638 |
| Mupad [B] (verification not implemented) | 2638 |

Optimal result

Integrand size = 15, antiderivative size = 5

$$\int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx = -2 \cos(\sin(x))$$

[Out] -2*cos(sin(x))

Rubi [F]

$$\int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx = \int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx$$

[In] Int[-Sin[x - Sin[x]] + Sin[x + Sin[x]],x]

[Out] -Defer[Int][Sin[x - Sin[x]], x] + Defer[Int][Sin[x + Sin[x]], x]

Rubi steps

$$\text{integral} = - \int \sin(x - \sin(x)) dx + \int \sin(x + \sin(x)) dx$$

Mathematica [A] (verified)

Time = 0.13 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx = -2 \cos(\sin(x))$$

[In] Integrate[-Sin[x - Sin[x]] + Sin[x + Sin[x]],x]

[Out] -2*Cos[Sin[x]]

Maple [A] (verified)

Time = 12.75 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.20

| method | result | size |
|------------------|--------------------|------|
| derivativdivides | $-2 \cos(\sin(x))$ | 6 |
| default | $-2 \cos(\sin(x))$ | 6 |
| risch | $-2 \cos(\sin(x))$ | 6 |

[In] `int(sin(x+sin(x))-sin(x-sin(x)),x,method=_RETURNVERBOSE)`

[Out] `-2*cos(sin(x))`

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 65 vs. $2(5) = 10$.

Time = 0.24 (sec) , antiderivative size = 65, normalized size of antiderivative = 13.00

$$\begin{aligned} & \int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx \\ &= -2 \cos(x) \cos\left(\frac{x \tan\left(\frac{1}{2}x\right)^2 + x + 2 \tan\left(\frac{1}{2}x\right)}{\tan\left(\frac{1}{2}x\right)^2 + 1}\right) \\ & \quad - 2 \sin(x) \sin\left(\frac{x \tan\left(\frac{1}{2}x\right)^2 + x + 2 \tan\left(\frac{1}{2}x\right)}{\tan\left(\frac{1}{2}x\right)^2 + 1}\right) \end{aligned}$$

[In] `integrate(sin(x+sin(x))-sin(x-sin(x)),x, algorithm="fricas")`

[Out] `-2*cos(x)*cos((x*tan(1/2*x)^2 + x + 2*tan(1/2*x))/(tan(1/2*x)^2 + 1)) - 2*sin(x)*sin((x*tan(1/2*x)^2 + x + 2*tan(1/2*x))/(tan(1/2*x)^2 + 1))`

Sympy [F]

$$\int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx = \int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx$$

[In] `integrate(sin(x+sin(x))-sin(x-sin(x)),x)`

[Out] `Integral(-sin(x - sin(x)) + sin(x + sin(x)), x)`

Maxima [A] (verification not implemented)

none

Time = 0.38 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx = -2 \cos(\sin(x))$$

[In] integrate(sin(x+sin(x))-sin(x-sin(x)),x, algorithm="maxima")

[Out] -2*cos(sin(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx = -2 \cos(\sin(x))$$

[In] integrate(sin(x+sin(x))-sin(x-sin(x)),x, algorithm="giac")

[Out] -2*cos(sin(x))

Mupad [B] (verification not implemented)

Time = 16.49 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.00

$$\int (-\sin(x - \sin(x)) + \sin(x + \sin(x))) dx = -2 \cos(\sin(x))$$

[In] int(sin(x + sin(x)) - sin(x - sin(x)),x)

[Out] -2*cos(sin(x))

3.244 $\int (\sec^5(x) \tan^2(x) + \sec^3(x) \tan^4(x)) dx$

| | |
|---|------|
| Optimal result | 2639 |
| Rubi [B] (verified) | 2639 |
| Mathematica [A] (verified) | 2640 |
| Maple [C] (verified) | 2640 |
| Fricas [A] (verification not implemented) | 2641 |
| Sympy [B] (verification not implemented) | 2641 |
| Maxima [B] (verification not implemented) | 2641 |
| Giac [B] (verification not implemented) | 2642 |
| Mupad [B] (verification not implemented) | 2642 |

Optimal result

Integrand size = 19, antiderivative size = 12

$$\int (\sec^5(x) \tan^2(x) + \sec^3(x) \tan^4(x)) dx = \frac{1}{3} \sec^3(x) \tan^3(x)$$

[Out] 1/3*sec(x)^3*tan(x)^3

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 33 vs. 2(12) = 24.

Time = 0.10 (sec) , antiderivative size = 33, normalized size of antiderivative = 2.75, number of steps used = 9, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.158$, Rules used = {2691, 3853, 3855}

$$\int (\sec^5(x) \tan^2(x) + \sec^3(x) \tan^4(x)) dx = \frac{1}{6} \tan(x) \sec^5(x) + \frac{1}{6} \tan^3(x) \sec^3(x) - \frac{1}{6} \tan(x) \sec^3(x)$$

[In] Int[Sec[x]^5*Tan[x]^2 + Sec[x]^3*Tan[x]^4,x]

[Out] -1/6*(Sec[x]^3*Tan[x]) + (Sec[x]^5*Tan[x])/6 + (Sec[x]^3*Tan[x]^3)/6

Rule 2691

```
Int[((a_.)*sec[(e_.) + (f_.)*(x_.)])^(m_.)*((b_.)*tan[(e_.) + (f_.)*(x_.)])^(n_.), x_Symbol] := Simp[b*(a*Sec[e + f*x])^m*((b*Tan[e + f*x])^(n - 1)/(f*(m + n - 1))), x] - Dist[b^2*((n - 1)/(m + n - 1)), Int[(a*Sec[e + f*x])^m*(b*Tan[e + f*x])^(n - 2), x], x] /; FreeQ[{a, b, e, f, m}, x] && GtQ[n, 1] && NeQ[m + n - 1, 0] && IntegersQ[2*m, 2*n]
```

Rule 3853

```
Int[(csc[(c_.) + (d_.)*(x_)]*(b_.))^(n_), x_Symbol] := Simp[(-b)*Cos[c + d*x]*((b*Csc[c + d*x])^(n - 1)/(d*(n - 1))), x] + Dist[b^2*((n - 2)/(n - 1)), Int[(b*Csc[c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] & IntegerQ[2*n]
```

Rule 3855

```
Int[csc[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-ArcTanh[Cos[c + d*x]]/d, x] /; FreeQ[{c, d}, x]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \sec^5(x) \tan^2(x) dx + \int \sec^3(x) \tan^4(x) dx \\ &= \frac{1}{6} \sec^5(x) \tan(x) + \frac{1}{6} \sec^3(x) \tan^3(x) - \frac{1}{6} \int \sec^5(x) dx - \frac{1}{2} \int \sec^3(x) \tan^2(x) dx \\ &= -\frac{1}{6} \sec^3(x) \tan(x) + \frac{1}{6} \sec^5(x) \tan(x) + \frac{1}{6} \sec^3(x) \tan^3(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int (\sec^5(x) \tan^2(x) + \sec^3(x) \tan^4(x)) dx = \frac{1}{3} \sec^3(x) \tan^3(x)$$

```
[In] Integrate[Sec[x]^5*Tan[x]^2 + Sec[x]^3*Tan[x]^4,x]
```

```
[Out] (Sec[x]^3*Tan[x]^3)/3
```

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 6.33 (sec) , antiderivative size = 40, normalized size of antiderivative = 3.33

| method | result | size |
|---------|---|------|
| risch | $\frac{8i(e^{9ix} - 3e^{7ix} + 3e^{5ix} - e^{3ix})}{3(e^{2ix} + 1)^6}$ | 40 |
| default | $\frac{\sin(x)^3}{6 \cos(x)^6} + \frac{\sin(x)^3}{8 \cos(x)^4} + \frac{\sin(x)^3}{16 \cos(x)^2} + \frac{\sin(x)^5}{6 \cos(x)^6} + \frac{\sin(x)^5}{24 \cos(x)^4} - \frac{\sin(x)^5}{48 \cos(x)^2} - \frac{\sin(x)^3}{48}$ | 68 |
| parts | $\frac{\sin(x)^3}{6 \cos(x)^6} + \frac{\sin(x)^3}{8 \cos(x)^4} + \frac{\sin(x)^3}{16 \cos(x)^2} + \frac{\sin(x)^5}{6 \cos(x)^6} + \frac{\sin(x)^5}{24 \cos(x)^4} - \frac{\sin(x)^5}{48 \cos(x)^2} - \frac{\sin(x)^3}{48}$ | 68 |

```
[In] int(tan(x)^4*sec(x)^3+tan(x)^2*sec(x)^5,x,method=_RETURNVERBOSE)
[Out] 8/3*I/(exp(2*I*x)+1)^6*(exp(9*I*x)-3*exp(7*I*x)+3*exp(5*I*x)-exp(3*I*x))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int (\sec^5(x) \tan^2(x) + \sec^3(x) \tan^4(x)) dx = -\frac{(\cos(x)^2 - 1) \sin(x)}{3 \cos(x)^6}$$

```
[In] integrate(tan(x)^4*sec(x)^3+tan(x)^2*sec(x)^5,x, algorithm="fricas")
[Out] -1/3*(cos(x)^2 - 1)*sin(x)/cos(x)^6
```

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 80 vs. 2(10) = 20.

Time = 0.14 (sec) , antiderivative size = 80, normalized size of antiderivative = 6.67

$$\int (\sec^5(x) \tan^2(x) + \sec^3(x) \tan^4(x)) dx = \frac{-3 \sin^5(x) - 8 \sin^3(x) + 3 \sin(x)}{48 \sin^6(x) - 144 \sin^4(x) + 144 \sin^2(x) - 48} + \frac{3 \sin^5(x) - 8 \sin^3(x) - 3 \sin(x)}{48 \sin^6(x) - 144 \sin^4(x) + 144 \sin^2(x) - 48}$$

```
[In] integrate(tan(x)**4*sec(x)**3+tan(x)**2*sec(x)**5,x)
[Out] (-3*sin(x)**5 - 8*sin(x)**3 + 3*sin(x))/(48*sin(x)**6 - 144*sin(x)**4 + 144*
*sin(x)**2 - 48) + (3*sin(x)**5 - 8*sin(x)**3 - 3*sin(x))/(48*sin(x)**6 - 1
44*sin(x)**4 + 144*sin(x)**2 - 48)
```

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 79 vs. 2(10) = 20.

Time = 0.21 (sec) , antiderivative size = 79, normalized size of antiderivative = 6.58

$$\int (\sec^5(x) \tan^2(x) + \sec^3(x) \tan^4(x)) dx = -\frac{3 \sin(x)^5 + 8 \sin(x)^3 - 3 \sin(x)}{48 (\sin(x)^6 - 3 \sin(x)^4 + 3 \sin(x)^2 - 1)} + \frac{3 \sin(x)^5 - 8 \sin(x)^3 - 3 \sin(x)}{48 (\sin(x)^6 - 3 \sin(x)^4 + 3 \sin(x)^2 - 1)}$$

```
[In] integrate(tan(x)^4*sec(x)^3+tan(x)^2*sec(x)^5,x, algorithm="maxima")
[Out] -1/48*(3*sin(x)^5 + 8*sin(x)^3 - 3*sin(x))/(sin(x)^6 - 3*sin(x)^4 + 3*sin(x)
)^2 - 1) + 1/48*(3*sin(x)^5 - 8*sin(x)^3 - 3*sin(x))/(sin(x)^6 - 3*sin(x)^4
+ 3*sin(x)^2 - 1)
```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 55 vs. $2(10) = 20$.

Time = 0.27 (sec) , antiderivative size = 55, normalized size of antiderivative = 4.58

$$\int (\sec^5(x) \tan^2(x) + \sec^3(x) \tan^4(x)) dx = -\frac{3 \sin(x)^5 + 8 \sin(x)^3 - 3 \sin(x)}{48 (\sin(x)^2 - 1)^3} + \frac{3 \sin(x)^5 - 8 \sin(x)^3 - 3 \sin(x)}{48 (\sin(x)^2 - 1)^3}$$

[In] integrate(tan(x)^4*sec(x)^3+tan(x)^2*sec(x)^5,x, algorithm="giac")

[Out] -1/48*(3*sin(x)^5 + 8*sin(x)^3 - 3*sin(x))/(sin(x)^2 - 1)^3 + 1/48*(3*sin(x)^5 - 8*sin(x)^3 - 3*sin(x))/(sin(x)^2 - 1)^3

Mupad [B] (verification not implemented)

Time = 16.36 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int (\sec^5(x) \tan^2(x) + \sec^3(x) \tan^4(x)) dx = -\frac{\sin(x)^3}{3 (\sin(x)^2 - 1)^3}$$

[In] int(tan(x)^4/cos(x)^3 + tan(x)^2/cos(x)^5,x)

[Out] -sin(x)^3/(3*(sin(x)^2 - 1)^3)

3.245 $\int (1 + \log(x)) \log(\log(x)) dx$

| | |
|---|------|
| Optimal result | 2643 |
| Rubi [F] | 2643 |
| Mathematica [A] (verified) | 2644 |
| Maple [A] (verified) | 2644 |
| Fricas [A] (verification not implemented) | 2644 |
| Sympy [A] (verification not implemented) | 2645 |
| Maxima [A] (verification not implemented) | 2645 |
| Giac [A] (verification not implemented) | 2645 |
| Mupad [B] (verification not implemented) | 2645 |

Optimal result

Integrand size = 8, antiderivative size = 10

$$\int (1 + \log(x)) \log(\log(x)) dx = x(-1 + \log(x) \log(\log(x)))$$

[Out] $x*(-1+\ln(x)*\ln(\ln(x)))$

Rubi [F]

$$\int (1 + \log(x)) \log(\log(x)) dx = \int (1 + \log(x)) \log(\log(x)) dx$$

[In] $\text{Int}[(1 + \text{Log}[x]) * \text{Log}[\text{Log}[x]], x]$

[Out] $x * \text{Log}[\text{Log}[x]] - \text{LogIntegral}[x] + \text{Defer}[\text{Int}[\text{Log}[x] * \text{Log}[\text{Log}[x]], x]$

Rubi steps

$$\begin{aligned} \text{integral} &= \int (\log(\log(x)) + \log(x) \log(\log(x))) dx \\ &= \int \log(\log(x)) dx + \int \log(x) \log(\log(x)) dx \\ &= x \log(\log(x)) - \int \frac{1}{\log(x)} dx + \int \log(x) \log(\log(x)) dx \\ &= x \log(\log(x)) - \text{LogIntegral}(x) + \int \log(x) \log(\log(x)) dx \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.80

$$\int (1 + \log(x)) \log(\log(x)) dx = -x + x \log(\log(x)) + x(-1 + \log(x)) \log(\log(x))$$

[In] Integrate[(1 + Log[x])*Log[Log[x]],x]

[Out] -x + x*Log[Log[x]] + x*(-1 + Log[x])*Log[Log[x]]

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

| method | result | size |
|--------------|---|------|
| norman | $x \ln(x) \ln(\ln(x)) - x$ | 12 |
| risch | $x \ln(x) \ln(\ln(x)) - x$ | 12 |
| parallelrisc | $x \ln(x) \ln(\ln(x)) - x$ | 12 |
| default | $(-1 + \ln(x)) x \ln(\ln(x)) - x + x \ln(\ln(x))$ | 19 |
| parts | $(-1 + \ln(x)) x \ln(\ln(x)) - x + x \ln(\ln(x))$ | 19 |

[In] int((ln(x)+1)*ln(ln(x)),x,method=_RETURNVERBOSE)

[Out] x*ln(x)*ln(ln(x))-x

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

$$\int (1 + \log(x)) \log(\log(x)) dx = x \log(x) \log(\log(x)) - x$$

[In] integrate((log(x)+1)*log(log(x)),x, algorithm="fricas")

[Out] x*log(x)*log(log(x)) - x

Sympy [A] (verification not implemented)

Time = 0.19 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int (1 + \log(x)) \log(\log(x)) dx = x \log(x) \log(\log(x)) - x$$

[In] integrate((ln(x)+1)*ln(ln(x)),x)

[Out] x*log(x)*log(log(x)) - x

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.60

$$\int (1 + \log(x)) \log(\log(x)) dx = (x(\log(x) - 1) + x) \log(\log(x)) - x$$

[In] integrate((log(x)+1)*log(log(x)),x, algorithm="maxima")

[Out] (x*(log(x) - 1) + x)*log(log(x)) - x

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

$$\int (1 + \log(x)) \log(\log(x)) dx = x \log(x) \log(\log(x)) - x$$

[In] integrate((log(x)+1)*log(log(x)),x, algorithm="giac")

[Out] x*log(x)*log(log(x)) - x

Mupad [B] (verification not implemented)

Time = 16.43 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.10

$$\int (1 + \log(x)) \log(\log(x)) dx = x \ln(\ln(x)) \ln(x) - x$$

[In] int(log(log(x))*(log(x) + 1),x)

[Out] x*log(log(x))*log(x) - x

$$3.246 \quad \int \left(\frac{1}{1+\cos(x)} + \frac{1}{1+\cot(x)} + \frac{1}{1+\csc(x)} + \frac{1}{1+\sec(x)} + \frac{1}{1+\sin(x)} + \frac{1}{1+\tan(x)} \right) dx$$

| | |
|---|------|
| Optimal result | 2646 |
| Rubi [C] (verified) | 2646 |
| Mathematica [A] (verified) | 2648 |
| Maple [A] (verified) | 2648 |
| Fricas [A] (verification not implemented) | 2648 |
| Sympy [F] | 2649 |
| Maxima [C] (verification not implemented) | 2649 |
| Giac [C] (verification not implemented) | 2650 |
| Mupad [B] (verification not implemented) | 2650 |

Optimal result

Integrand size = 37, antiderivative size = 3

$$\int \left(\frac{1}{1+\cos(x)} + \frac{1}{1+\cot(x)} + \frac{1}{1+\csc(x)} + \frac{1}{1+\sec(x)} + \frac{1}{1+\sin(x)} + \frac{1}{1+\tan(x)} \right) dx = 3x$$

[Out] 3*x

Rubi [C] (verified)

Result contains higher order function than in optimal. Order 3 vs. order 1 in optimal.

Time = 0.10 (sec) , antiderivative size = 42, normalized size of antiderivative = 14.00, number of steps used = 11, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.135$, Rules used = {2727, 3565, 3611, 3862, 8}

$$\int \left(\frac{1}{1+\cos(x)} + \frac{1}{1+\cot(x)} + \frac{1}{1+\csc(x)} + \frac{1}{1+\sec(x)} + \frac{1}{1+\sin(x)} + \frac{1}{1+\tan(x)} \right) dx$$

$$= 3x + \frac{\sin(x)}{\cos(x)+1} - \frac{\cos(x)}{\sin(x)+1} + \frac{\cot(x)}{\csc(x)+1} - \frac{\tan(x)}{\sec(x)+1}$$

[In] Int[(1 + Cos[x])^(-1) + (1 + Cot[x])^(-1) + (1 + Csc[x])^(-1) + (1 + Sec[x])^(-1) + (1 + Sin[x])^(-1) + (1 + Tan[x])^(-1), x]

[Out] 3*x + Cot[x]/(1 + Csc[x]) + Sin[x]/(1 + Cos[x]) - Cos[x]/(1 + Sin[x]) - Tan[x]/(1 + Sec[x])

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 2727

Int[((a_) + (b_)*sin[(c_) + (d_)*(x_)])^(-1), x_Symbol] := Simp[-Cos[c + d*x]/(d*(b + a*Sin[c + d*x])), x] /; FreeQ[{a, b, c, d}, x] && EqQ[a^2 - b^2, 0]

Rule 3565

Int[((a_) + (b_)*tan[(c_) + (d_)*(x_)])^(-1), x_Symbol] := Simp[a*(x/(a^2 + b^2)), x] + Dist[b/(a^2 + b^2), Int[(b - a*Tan[c + d*x])/(a + b*Tan[c + d*x]), x], x] /; FreeQ[{a, b, c, d}, x] && NeQ[a^2 + b^2, 0]

Rule 3611

Int[((c_) + (d_)*tan[(e_) + (f_)*(x_)])/((a_) + (b_)*tan[(e_) + (f_)*(x_)]), x_Symbol] := Simp[(c/(b*f))*Log[RemoveContent[a*Cos[e + f*x] + b*Sin[e + f*x], x]], x] /; FreeQ[{a, b, c, d, e, f}, x] && NeQ[b*c - a*d, 0] && NeQ[a^2 + b^2, 0] && EqQ[a*c + b*d, 0]

Rule 3862

Int[(csc[(c_) + (d_)*(x_)]*(b_) + (a_))^(n_), x_Symbol] := Simp[(-Cot[c + d*x])*((a + b*Csc[c + d*x])^n/(d*(2*n + 1))), x] + Dist[1/(a^2*(2*n + 1)), Int[(a + b*Csc[c + d*x])^(n + 1)*(a*(2*n + 1) - b*(n + 1)*Csc[c + d*x]), x], x] /; FreeQ[{a, b, c, d}, x] && EqQ[a^2 - b^2, 0] && LeQ[n, -1] && IntegerQ[2*n]

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \frac{1}{1 + \cos(x)} dx + \int \frac{1}{1 + \cot(x)} dx + \int \frac{1}{1 + \csc(x)} dx \\
 &\quad + \int \frac{1}{1 + \sec(x)} dx + \int \frac{1}{1 + \sin(x)} dx + \int \frac{1}{1 + \tan(x)} dx \\
 &= x + \frac{\cot(x)}{1 + \csc(x)} + \frac{\sin(x)}{1 + \cos(x)} - \frac{\cos(x)}{1 + \sin(x)} - \frac{\tan(x)}{1 + \sec(x)} \\
 &\quad - \frac{1}{2} \int \frac{-1 + \cot(x)}{1 + \cot(x)} dx + \frac{1}{2} \int \frac{1 - \tan(x)}{1 + \tan(x)} dx - 2 \int -1 dx \\
 &= 3x + \frac{\cot(x)}{1 + \csc(x)} + \frac{\sin(x)}{1 + \cos(x)} - \frac{\cos(x)}{1 + \sin(x)} - \frac{\tan(x)}{1 + \sec(x)}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \left(\frac{1}{1 + \cos(x)} + \frac{1}{1 + \cot(x)} + \frac{1}{1 + \csc(x)} + \frac{1}{1 + \sec(x)} + \frac{1}{1 + \sin(x)} + \frac{1}{1 + \tan(x)} \right) dx = 3x$$

[In] Integrate[(1 + Cos[x])^(-1) + (1 + Cot[x])^(-1) + (1 + Csc[x])^(-1) + (1 + Sec[x])^(-1) + (1 + Sin[x])^(-1) + (1 + Tan[x])^(-1), x]

[Out] 3*x

Maple [A] (verified)

Time = 0.60 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

| method | result |
|---------|--|
| risch | 3x |
| norman | $\frac{3x + 3x \tan\left(\frac{x}{2}\right)}{1 + \tan\left(\frac{x}{2}\right)}$ |
| default | $-\frac{\ln(1 + \cot(x))}{2} + \frac{\ln(1 + \cot(x)^2)}{4} - \frac{\pi}{4} + \frac{\operatorname{arccot}(\cot(x))}{2} + 4 \arctan\left(\tan\left(\frac{x}{2}\right)\right) + \frac{\ln(1 + \tan(x))}{2} - \frac{\ln(1 + \tan(x)^2)}{4} + a$ |

[In] int(1/(1+sin(x))+1/(1+cos(x))+1/(1+tan(x))+1/(1+cot(x))+1/(1+sec(x))+1/(1+csc(x)), x, method=_RETURNVERBOSE)

[Out] 3*x

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \left(\frac{1}{1 + \cos(x)} + \frac{1}{1 + \cot(x)} + \frac{1}{1 + \csc(x)} + \frac{1}{1 + \sec(x)} + \frac{1}{1 + \sin(x)} + \frac{1}{1 + \tan(x)} \right) dx = 3x$$

[In] integrate(1/(1+sin(x))+1/(1+cos(x))+1/(1+tan(x))+1/(1+cot(x))+1/(1+sec(x))+1/(1+csc(x)), x, algorithm="fricas")

[Out] 3*x

Sympy [F]

$$\int \left(\frac{1}{1 + \cos(x)} + \frac{1}{1 + \cot(x)} + \frac{1}{1 + \csc(x)} + \frac{1}{1 + \sec(x)} + \frac{1}{1 + \sin(x)} + \frac{1}{1 + \tan(x)} \right) dx$$

= Too large to display

[In] integrate(1/(1+sin(x))+1/(1+cos(x))+1/(1+tan(x))+1/(1+cot(x))+1/(1+sec(x))+1/(1+csc(x)),x)

[Out] Integral((sin(x)*cos(x)*tan(x)*cot(x)*csc(x) + sin(x)*cos(x)*tan(x)*cot(x)*sec(x) + 2*sin(x)*cos(x)*tan(x)*cot(x) + sin(x)*cos(x)*tan(x)*csc(x)*sec(x) + 2*sin(x)*cos(x)*tan(x)*csc(x) + 2*sin(x)*cos(x)*tan(x)*sec(x) + 3*sin(x)*cos(x)*tan(x) + sin(x)*cos(x)*cot(x)*csc(x)*sec(x) + 2*sin(x)*cos(x)*cot(x)*csc(x) + 2*sin(x)*cos(x)*cot(x)*sec(x) + 3*sin(x)*cos(x)*cot(x) + 2*sin(x)*cos(x)*csc(x)*sec(x) + 3*sin(x)*cos(x)*csc(x) + 3*sin(x)*cos(x)*sec(x) + 4*sin(x)*cos(x) + sin(x)*tan(x)*cot(x)*csc(x)*sec(x) + 2*sin(x)*tan(x)*cot(x)*csc(x) + 2*sin(x)*tan(x)*cot(x)*sec(x) + 3*sin(x)*tan(x)*cot(x) + 2*sin(x)*tan(x)*csc(x)*sec(x) + 3*sin(x)*tan(x)*csc(x) + 3*sin(x)*tan(x)*sec(x) + 4*sin(x)*tan(x) + 2*sin(x)*cot(x)*csc(x)*sec(x) + 3*sin(x)*cot(x)*csc(x) + 3*sin(x)*cot(x)*sec(x) + 4*sin(x)*cot(x) + 3*sin(x)*csc(x)*sec(x) + 4*sin(x)*csc(x) + 4*sin(x)*sec(x) + 5*sin(x) + cos(x)*tan(x)*cot(x)*csc(x)*sec(x) + 2*cos(x)*tan(x)*cot(x)*csc(x) + 2*cos(x)*tan(x)*cot(x)*sec(x) + 3*cos(x)*tan(x)*cot(x) + 2*cos(x)*tan(x)*csc(x)*sec(x) + 3*cos(x)*tan(x)*csc(x) + 3*cos(x)*tan(x)*sec(x) + 4*cos(x)*tan(x) + 2*cos(x)*cot(x)*csc(x)*sec(x) + 3*cos(x)*cot(x)*csc(x) + 3*cos(x)*cot(x)*sec(x) + 4*cos(x)*cot(x) + 3*cos(x)*csc(x)*sec(x) + 4*cos(x)*csc(x) + 4*cos(x)*sec(x) + 5*cos(x) + 2*tan(x)*cot(x)*csc(x)*sec(x) + 3*tan(x)*cot(x)*csc(x) + 3*tan(x)*cot(x)*sec(x) + 4*tan(x)*cot(x) + 3*tan(x)*csc(x)*sec(x) + 4*tan(x)*csc(x) + 4*tan(x)*sec(x) + 5*tan(x) + 3*cot(x)*csc(x)*sec(x) + 4*cot(x)*csc(x) + 4*cot(x)*sec(x) + 5*cot(x) + 4*csc(x)*sec(x) + 5*csc(x) + 5*sec(x) + 6)/((sin(x) + 1)*(cos(x) + 1)*(tan(x) + 1)*(cot(x) + 1)*(csc(x) + 1)*(sec(x) + 1)), x)

Maxima [C] (verification not implemented)

Result contains higher order function than in optimal. Order 3 vs. order 1.

Time = 0.28 (sec) , antiderivative size = 14, normalized size of antiderivative = 4.67

$$\int \left(\frac{1}{1 + \cos(x)} + \frac{1}{1 + \cot(x)} + \frac{1}{1 + \csc(x)} + \frac{1}{1 + \sec(x)} + \frac{1}{1 + \sin(x)} + \frac{1}{1 + \tan(x)} \right) dx$$

$$= x + 4 \arctan \left(\frac{\sin(x)}{\cos(x) + 1} \right)$$

[In] integrate(1/(1+sin(x))+1/(1+cos(x))+1/(1+tan(x))+1/(1+cot(x))+1/(1+sec(x))+1/(1+csc(x)),x, algorithm="maxima")

[Out] x + 4*arctan(sin(x)/(cos(x) + 1))

Giac [C] (verification not implemented)

Result contains higher order function than in optimal. Order 3 vs. order 1.

Time = 0.29 (sec) , antiderivative size = 40, normalized size of antiderivative = 13.33

$$\int \left(\frac{1}{1 + \cos(x)} + \frac{1}{1 + \cot(x)} + \frac{1}{1 + \csc(x)} + \frac{1}{1 + \sec(x)} + \frac{1}{1 + \sin(x)} + \frac{1}{1 + \tan(x)} \right) dx$$

$$= 3x - \frac{2 \tan\left(\frac{1}{2}x\right)}{(x^2 + 1)\left(\frac{x^2 - 1}{x^2 + 1} - 1\right)} - \tan\left(\frac{1}{2}x\right)$$

```
[In] integrate(1/(1+sin(x))+1/(1+cos(x))+1/(1+tan(x))+1/(1+cot(x))+1/(1+sec(x))+1/(1+csc(x)),x, algorithm="giac")
```

```
[Out] 3*x - 2*tan(1/2*x)/((x^2 + 1)*((x^2 - 1)/(x^2 + 1) - 1)) - tan(1/2*x)
```

Mupad [B] (verification not implemented)

Time = 15.74 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \left(\frac{1}{1 + \cos(x)} + \frac{1}{1 + \cot(x)} + \frac{1}{1 + \csc(x)} + \frac{1}{1 + \sec(x)} + \frac{1}{1 + \sin(x)} + \frac{1}{1 + \tan(x)} \right) dx = 3x$$

```
[In] int(1/(1/sin(x) + 1) + 1/(cos(x) + 1) + 1/(cot(x) + 1) + 1/(sin(x) + 1) + 1/(tan(x) + 1) + 1/(1/cos(x) + 1),x)
```

```
[Out] 3*x
```

3.247 $\int \frac{1}{\sqrt{x-x^2}} dx$

| | |
|---|------|
| Optimal result | 2651 |
| Rubi [A] (verified) | 2651 |
| Mathematica [B] (verified) | 2652 |
| Maple [A] (verified) | 2652 |
| Fricas [B] (verification not implemented) | 2653 |
| Sympy [A] (verification not implemented) | 2653 |
| Maxima [A] (verification not implemented) | 2653 |
| Giac [B] (verification not implemented) | 2653 |
| Mupad [B] (verification not implemented) | 2654 |

Optimal result

Integrand size = 11, antiderivative size = 8

$$\int \frac{1}{\sqrt{x-x^2}} dx = -\arcsin(1-2x)$$

[Out] arcsin(-1+2*x)

Rubi [A] (verified)

Time = 0.00 (sec), antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {633, 222}

$$\int \frac{1}{\sqrt{x-x^2}} dx = -\arcsin(1-2x)$$

[In] Int[1/Sqrt[x - x^2], x]

[Out] -ArcSin[1 - 2*x]

Rule 222

Int[1/Sqrt[(a_) + (b_.)*(x_)^2], x_Symbol] := Simp[ArcSin[Rt[-b, 2]*(x/Sqrt[a])]/Rt[-b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && NegQ[b]

Rule 633

Int[((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^(p_), x_Symbol] := Dist[1/(2*c*(-4*(c/(b^2 - 4*a*c)))^p), Subst[Int[Simp[1 - x^2/(b^2 - 4*a*c)], x]^p, x], x, b + 2*c*x, x] /; FreeQ[{a, b, c, p}, x] && GtQ[4*a - b^2/c, 0]

Rubi steps

$$\begin{aligned}\text{integral} &= -\text{Subst}\left(\int \frac{1}{\sqrt{1-x^2}} dx, x, 1-2x\right) \\ &= -\arcsin(1-2x)\end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 40 vs. $2(8) = 16$.

Time = 0.01 (sec) , antiderivative size = 40, normalized size of antiderivative = 5.00

$$\int \frac{1}{\sqrt{x-x^2}} dx = -\frac{2\sqrt{-1+x}\sqrt{x} \log(\sqrt{-1+x}-\sqrt{x})}{\sqrt{-((-1+x)x)}}$$

[In] Integrate[1/Sqrt[x - x^2],x]

[Out] (-2*Sqrt[-1 + x]*Sqrt[x]*Log[Sqrt[-1 + x] - Sqrt[x]])/Sqrt[-((-1 + x)*x)]

Maple [A] (verified)

Time = 0.24 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

| method | result | size |
|----------------|---|------|
| default | $\arcsin(-1+2x)$ | 7 |
| meijerg | $2 \arcsin(\sqrt{x})$ | 7 |
| pseudoelliptic | $-2 \arctan\left(\frac{\sqrt{-(-1+x)x}}{x}\right)$ | 16 |
| trager | $\text{RootOf}(_Z^2 + 1) \ln(-2 \text{RootOf}(_Z^2 + 1) x + 2\sqrt{-x^2 + x} + \text{RootOf}(_Z^2 + 1))$ | 36 |

[In] int(1/(-x^2+x)^(1/2),x,method=_RETURNVERBOSE)

[Out] arcsin(-1+2*x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 16 vs. 2(6) = 12.

Time = 0.23 (sec) , antiderivative size = 16, normalized size of antiderivative = 2.00

$$\int \frac{1}{\sqrt{x-x^2}} dx = -2 \arctan\left(\frac{\sqrt{-x^2+x}}{x}\right)$$

[In] integrate(1/(-x^2+x)^(1/2),x, algorithm="fricas")

[Out] -2*arctan(sqrt(-x^2 + x)/x)

Sympy [A] (verification not implemented)

Time = 0.20 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.62

$$\int \frac{1}{\sqrt{x-x^2}} dx = \operatorname{asin}(2x-1)$$

[In] integrate(1/(-x**2+x)**(1/2),x)

[Out] asin(2*x - 1)

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{1}{\sqrt{x-x^2}} dx = \arcsin(2x-1)$$

[In] integrate(1/(-x^2+x)^(1/2),x, algorithm="maxima")

[Out] arcsin(2*x - 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 25 vs. 2(6) = 12.

Time = 0.26 (sec) , antiderivative size = 25, normalized size of antiderivative = 3.12

$$\int \frac{1}{\sqrt{x-x^2}} dx = \frac{1}{4} \sqrt{-x^2+x}(2x-1) + \frac{1}{8} \arcsin(2x-1)$$

[In] integrate(1/(-x^2+x)^(1/2),x, algorithm="giac")

[Out] 1/4*sqrt(-x^2 + x)*(2*x - 1) + 1/8*arcsin(2*x - 1)

Mupad [B] (verification not implemented)

Time = 14.98 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{1}{\sqrt{x - x^2}} dx = \text{asin}(2x - 1)$$

[In] int(1/(x - x^2)^(1/2),x)

[Out] asin(2*x - 1)

3.248 $\int \frac{1}{1+\cos^2(x)} dx$

| | |
|---|------|
| Optimal result | 2655 |
| Rubi [A] (verified) | 2655 |
| Mathematica [A] (verified) | 2656 |
| Maple [A] (verified) | 2656 |
| Fricas [A] (verification not implemented) | 2657 |
| Sympy [A] (verification not implemented) | 2657 |
| Maxima [A] (verification not implemented) | 2657 |
| Giac [A] (verification not implemented) | 2658 |
| Mupad [B] (verification not implemented) | 2658 |

Optimal result

Integrand size = 8, antiderivative size = 34

$$\int \frac{1}{1+\cos^2(x)} dx = \frac{x}{\sqrt{2}} - \frac{\arctan\left(\frac{\cos(x)\sin(x)}{1+\sqrt{2}+\cos^2(x)}\right)}{\sqrt{2}}$$

[Out] $1/2*x*2^{(1/2)}-1/2*\arctan(\cos(x)*\sin(x)/(1+2^{(1/2)}+\cos(x)^2))*2^{(1/2)}$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {3260, 209}

$$\int \frac{1}{1+\cos^2(x)} dx = \frac{x}{\sqrt{2}} - \frac{\arctan\left(\frac{\sin(x)\cos(x)}{\cos^2(x)+\sqrt{2}+1}\right)}{\sqrt{2}}$$

[In] $\text{Int}[(1 + \text{Cos}[x]^2)^{-1}, x]$

[Out] $x/\text{Sqrt}[2] - \text{ArcTan}[(\text{Cos}[x]*\text{Sin}[x])/ (1 + \text{Sqrt}[2] + \text{Cos}[x]^2)]/\text{Sqrt}[2]$

Rule 209

$\text{Int}[(a_ + (b_)*(x_)^2)^{-1}, x_Symbol] \rightarrow \text{Simp}[(1/(\text{Rt}[a, 2]*\text{Rt}[b, 2]))*\text{ArcTan}[\text{Rt}[b, 2]*(x/\text{Rt}[a, 2])], x] /; \text{FreeQ}\{a, b\}, x \ \&\& \ \text{PosQ}[a/b] \ \&\& \ (\text{GtQ}[a, 0] \ || \ \text{GtQ}[b, 0])$

Rule 3260

$\text{Int}[(a_ + (b_)*\sin[(e_.) + (f_.)*(x_)]^2)^{-1}, x_Symbol] \rightarrow \text{With}\{\text{ff} = \text{FreeFactors}[\text{Tan}[e + f*x], x]\}, \text{Dist}[\text{ff}/f, \text{Subst}[\text{Int}[1/(a + (a + b)*\text{ff}^2*x^2$

), x], x, Tan[e + f*x]/ff], x]] /; FreeQ[{a, b, e, f}, x]

Rubi steps

$$\begin{aligned} \text{integral} &= -\text{Subst}\left(\int \frac{1}{1+2x^2} dx, x, \cot(x)\right) \\ &= \frac{x}{\sqrt{2}} - \frac{\arctan\left(\frac{\cos(x)\sin(x)}{1+\sqrt{2}+\cos^2(x)}\right)}{\sqrt{2}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.44

$$\int \frac{1}{1+\cos^2(x)} dx = \frac{\arctan\left(\frac{\tan(x)}{\sqrt{2}}\right)}{\sqrt{2}}$$

[In] Integrate[(1 + Cos[x]^2)^(-1), x]

[Out] ArcTan[Tan[x]/Sqrt[2]]/Sqrt[2]

Maple [A] (verified)

Time = 0.11 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.41

| method | result | size |
|---------|---|------|
| default | $\frac{\sqrt{2} \arctan\left(\frac{\tan(x)\sqrt{2}}{2}\right)}{2}$ | 14 |
| risch | $\frac{i\sqrt{2} \ln\left(e^{2ix}+2\sqrt{2}+3\right)}{4} - \frac{i\sqrt{2} \ln\left(e^{2ix}-2\sqrt{2}+3\right)}{4}$ | 40 |

[In] int(1/(1+cos(x)^2), x, method=_RETURNVERBOSE)

[Out] 1/2*2^(1/2)*arctan(1/2*tan(x)*2^(1/2))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 31, normalized size of antiderivative = 0.91

$$\int \frac{1}{1 + \cos^2(x)} dx = -\frac{1}{4} \sqrt{2} \arctan \left(\frac{3 \sqrt{2} \cos(x)^2 - \sqrt{2}}{4 \cos(x) \sin(x)} \right)$$

[In] integrate(1/(1+cos(x)^2),x, algorithm="fricas")

[Out] -1/4*sqrt(2)*arctan(1/4*(3*sqrt(2)*cos(x)^2 - sqrt(2))/(cos(x)*sin(x)))

Sympy [A] (verification not implemented)

Time = 0.33 (sec) , antiderivative size = 63, normalized size of antiderivative = 1.85

$$\int \frac{1}{1 + \cos^2(x)} dx = \frac{\sqrt{2} \left(\operatorname{atan} \left(\sqrt{2} \tan \left(\frac{x}{2} \right) - 1 \right) + \pi \left\lfloor \frac{\frac{x}{2} - \frac{\pi}{2}}{\pi} \right\rfloor \right)}{2} + \frac{\sqrt{2} \left(\operatorname{atan} \left(\sqrt{2} \tan \left(\frac{x}{2} \right) + 1 \right) + \pi \left\lfloor \frac{\frac{x}{2} - \frac{\pi}{2}}{\pi} \right\rfloor \right)}{2}$$

[In] integrate(1/(1+cos(x)**2),x)

[Out] sqrt(2)*(atan(sqrt(2)*tan(x/2) - 1) + pi*floor((x/2 - pi/2)/pi))/2 + sqrt(2)*(atan(sqrt(2)*tan(x/2) + 1) + pi*floor((x/2 - pi/2)/pi))/2

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.38

$$\int \frac{1}{1 + \cos^2(x)} dx = \frac{1}{2} \sqrt{2} \arctan \left(\frac{1}{2} \sqrt{2} \tan(x) \right)$$

[In] integrate(1/(1+cos(x)^2),x, algorithm="maxima")

[Out] 1/2*sqrt(2)*arctan(1/2*sqrt(2)*tan(x))

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 46, normalized size of antiderivative = 1.35

$$\int \frac{1}{1 + \cos^2(x)} dx = \frac{1}{2} \sqrt{2} \left(x + \arctan \left(-\frac{\sqrt{2} \sin(2x) - \sin(2x)}{\sqrt{2} \cos(2x) + \sqrt{2} - \cos(2x) + 1} \right) \right)$$

[In] integrate(1/(1+cos(x)^2),x, algorithm="giac")

[Out] 1/2*sqrt(2)*(x + arctan(-(sqrt(2)*sin(2*x) - sin(2*x))/(sqrt(2)*cos(2*x) + sqrt(2) - cos(2*x) + 1)))

Mupad [B] (verification not implemented)

Time = 14.83 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.76

$$\int \frac{1}{1 + \cos^2(x)} dx = \frac{\sqrt{2}(x - \operatorname{atan}(\tan(x)))}{2} + \frac{\sqrt{2} \operatorname{atan}\left(\frac{\sqrt{2} \tan(x)}{2}\right)}{2}$$

[In] int(1/(cos(x)^2 + 1),x)

[Out] (2^(1/2)*(x - atan(tan(x))))/2 + (2^(1/2)*atan((2^(1/2)*tan(x))/2))/2

3.249 $\int \frac{\log(1+x)}{x^2} dx$

| | |
|---|------|
| Optimal result | 2659 |
| Rubi [A] (verified) | 2659 |
| Mathematica [A] (verified) | 2660 |
| Maple [A] (verified) | 2660 |
| Fricas [A] (verification not implemented) | 2661 |
| Sympy [A] (verification not implemented) | 2661 |
| Maxima [A] (verification not implemented) | 2662 |
| Giac [A] (verification not implemented) | 2662 |
| Mupad [B] (verification not implemented) | 2662 |

Optimal result

Integrand size = 8, antiderivative size = 18

$$\int \frac{\log(1+x)}{x^2} dx = \log(x) - \log(1+x) - \frac{\log(1+x)}{x}$$

[Out] ln(x)-ln(1+x)-ln(1+x)/x

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {2442, 36, 29, 31}

$$\int \frac{\log(1+x)}{x^2} dx = \log(x) - \frac{\log(x+1)}{x} - \log(x+1)$$

[In] Int[Log[1 + x]/x^2,x]

[Out] Log[x] - Log[1 + x] - Log[1 + x]/x

Rule 29

Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]

Rule 31

Int[((a_) + (b_.)*(x_))^-1, x_Symbol] :> Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 36

```
Int[1/(((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))), x_Symbol] := Dist[b/(b*c
- a*d), Int[1/(a + b*x), x], x] - Dist[d/(b*c - a*d), Int[1/(c + d*x), x],
x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0]
```

Rule 2442

```
Int[((a_.) + Log[(c_.)*((d_) + (e_.)*(x_)^(n_.))]*(b_.))*((f_.) + (g_.)*(x_
))^(q_.), x_Symbol] := Simp[(f + g*x)^(q + 1)*((a + b*Log[c*(d + e*x)^n])/(
g*(q + 1))), x] - Dist[b*e*(n/(g*(q + 1))), Int[(f + g*x)^(q + 1)/(d + e*x)
, x], x] /; FreeQ[{a, b, c, d, e, f, g, n, q}, x] && NeQ[e*f - d*g, 0] && N
eQ[q, -1]
```

Rubi steps

$$\begin{aligned} \text{integral} &= -\frac{\log(1+x)}{x} + \int \frac{1}{x(1+x)} dx \\ &= -\frac{\log(1+x)}{x} + \int \frac{1}{x} dx - \int \frac{1}{1+x} dx \\ &= \log(x) - \log(1+x) - \frac{\log(1+x)}{x} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00

$$\int \frac{\log(1+x)}{x^2} dx = \log(x) - \log(1+x) - \frac{\log(1+x)}{x}$$

```
[In] Integrate[Log[1 + x]/x^2,x]
```

```
[Out] Log[x] - Log[1 + x] - Log[1 + x]/x
```

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.89

| method | result | size |
|-------------------|---|------|
| derivativedivides | $\ln(x) - \frac{\ln(1+x)(1+x)}{x}$ | 16 |
| default | $\ln(x) - \frac{\ln(1+x)(1+x)}{x}$ | 16 |
| meijerg | $\ln(x) - \frac{(2+2x)\ln(1+x)}{2x}$ | 18 |
| risch | $\ln(x) - \ln(1+x) - \frac{\ln(1+x)}{x}$ | 19 |
| parts | $\ln(x) - \ln(1+x) - \frac{\ln(1+x)}{x}$ | 19 |
| norman | $\frac{-\ln(1+x)x - \ln(1+x)}{x} + \ln(x)$ | 22 |
| parallelrisch | $\frac{x \ln(x) - \ln(1+x)x - \ln(1+x)}{x}$ | 23 |

[In] `int(ln(1+x)/x^2,x,method=_RETURNVERBOSE)`

[Out] `ln(x)-ln(1+x)*(1+x)/x`

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.06

$$\int \frac{\log(1+x)}{x^2} dx = -\frac{(x+1)\log(x+1) - x\log(x)}{x}$$

[In] `integrate(log(1+x)/x^2,x, algorithm="fricas")`

[Out] `-((x + 1)*log(x + 1) - x*log(x))/x`

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.78

$$\int \frac{\log(1+x)}{x^2} dx = \log(x) - \log(x+1) - \frac{\log(x+1)}{x}$$

[In] `integrate(ln(1+x)/x**2,x)`

[Out] `log(x) - log(x + 1) - log(x + 1)/x`

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00

$$\int \frac{\log(1+x)}{x^2} dx = -\frac{\log(x+1)}{x} - \log(x+1) + \log(x)$$

[In] integrate(log(1+x)/x^2,x, algorithm="maxima")

[Out] -log(x + 1)/x - log(x + 1) + log(x)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.11

$$\int \frac{\log(1+x)}{x^2} dx = -\frac{\log(x+1)}{x} - \log(|x+1|) + \log(|x|)$$

[In] integrate(log(1+x)/x^2,x, algorithm="giac")

[Out] -log(x + 1)/x - log(abs(x + 1)) + log(abs(x))

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00

$$\int \frac{\log(1+x)}{x^2} dx = -\ln\left(\frac{1}{x} + 1\right) - \frac{\ln(x+1)}{x}$$

[In] int(log(x + 1)/x^2,x)

[Out] - log(1/x + 1) - log(x + 1)/x

3.250 $\int \sqrt{1 - \arccos(\sin(x))^2} dx$

| | |
|---|------|
| Optimal result | 2663 |
| Rubi [F] | 2663 |
| Mathematica [A] (verified) | 2664 |
| Maple [F] | 2664 |
| Fricas [A] (verification not implemented) | 2664 |
| Sympy [F] | 2665 |
| Maxima [A] (verification not implemented) | 2665 |
| Giac [F(-1)] | 2665 |
| Mupad [F(-1)] | 2665 |

Optimal result

Integrand size = 13, antiderivative size = 56

$$\int \sqrt{1 - \arccos(\sin(x))^2} dx = -\frac{1}{2} \left(\arccos(\sin(x)) \sqrt{1 - \arccos(\sin(x))^2} - 2 \arctan \left(\frac{\sqrt{1 - \arccos(\sin(x))^2}}{1 + \arccos(\sin(x))} \right) \right) \sqrt{\cos^2(x)} \sec(x)$$

[Out] $-1/2*((1/2*\text{Pi}-\arcsin(\sin(x)))*(1-(1/2*\text{Pi}-\arcsin(\sin(x)))^2)^{(1/2)}-2*\arctan((1-(1/2*\text{Pi}-\arcsin(\sin(x)))^2)^{(1/2)}/(1+1/2*\text{Pi}-\arcsin(\sin(x))))*(\cos(x)^2)^{(1/2)})*\sec(x)$

Rubi [F]

$$\int \sqrt{1 - \arccos(\sin(x))^2} dx = \int \sqrt{1 - \arccos(\sin(x))^2} dx$$

[In] `Int[Sqrt[1 - ArcCos[Sin[x]]^2], x]`

[Out] `Defer[Int][Sqrt[1 - ArcCos[Sin[x]]^2], x]`

Rubi steps

$$\text{integral} = \int \sqrt{1 - \arccos(\sin(x))^2} dx$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 56, normalized size of antiderivative = 1.00

$$\int \sqrt{1 - \arccos(\sin(x))^2} dx = -\frac{1}{2} \left(\arccos(\sin(x)) \sqrt{1 - \arccos(\sin(x))^2} - 2 \arctan \left(\frac{\sqrt{1 - \arccos(\sin(x))^2}}{1 + \arccos(\sin(x))} \right) \right) \sqrt{\cos^2(x)} \sec(x)$$

[In] Integrate[Sqrt[1 - ArcCos[Sin[x]]^2],x]

[Out] -1/2*((ArcCos[Sin[x]]*Sqrt[1 - ArcCos[Sin[x]]^2] - 2*ArcTan[Sqrt[1 - ArcCos[Sin[x]]^2]/(1 + ArcCos[Sin[x]])])*Sqrt[Cos[x]^2]*Sec[x])

Maple [F]

$$\int \sqrt{1 - \left(-\frac{\pi}{2} + \arcsin(\sin(x))\right)^2} dx$$

[In] int((1-(-1/2*Pi+arcsin(sin(x)))^2)^(1/2),x)

[Out] int((1-(-1/2*Pi+arcsin(sin(x)))^2)^(1/2),x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 69, normalized size of antiderivative = 1.23

$$\int \sqrt{1 - \arccos(\sin(x))^2} dx = \frac{1}{8} (\pi + 2x) \sqrt{-\pi^2 - 4\pi x - 4x^2 + 4} - \frac{1}{2} \arctan \left(\frac{(\pi + 2x) \sqrt{-\pi^2 - 4\pi x - 4x^2 + 4}}{\pi^2 + 4\pi x + 4x^2 - 4} \right)$$

[In] integrate((1-(-1/2*pi+arcsin(sin(x)))^2)^(1/2),x, algorithm="fricas")

[Out] 1/8*(pi + 2*x)*sqrt(-pi^2 - 4*pi*x - 4*x^2 + 4) - 1/2*arctan((pi + 2*x)*sqrt(-pi^2 - 4*pi*x - 4*x^2 + 4)/(pi^2 + 4*pi*x + 4*x^2 - 4))

Sympy [F]

$$\int \sqrt{1 - \arccos(\sin(x))^2} dx = \frac{\int \sqrt{-4 \operatorname{asin}^2(\sin(x)) + 4\pi \operatorname{asin}(\sin(x)) - \pi^2 + 4} dx}{2}$$

[In] integrate((1-(-1/2*pi+asin(sin(x)))**2)**(1/2),x)

[Out] Integral(sqrt(-4*asin(sin(x))**2 + 4*pi*asin(sin(x)) - pi**2 + 4), x)/2

Maxima [A] (verification not implemented)

none

Time = 0.40 (sec) , antiderivative size = 51, normalized size of antiderivative = 0.91

$$\int \sqrt{1 - \arccos(\sin(x))^2} dx = -\frac{1}{8} (\pi - 2x) \sqrt{-\pi^2 + 4\pi x - 4x^2 + 4} + \frac{1}{2} \arctan \left(-\frac{1}{2} \pi + x, \sqrt{-\frac{1}{4} \pi^2 + \pi x - x^2 + 1} \right)$$

[In] integrate((1-(-1/2*pi+arcsin(sin(x)))^2)^(1/2),x, algorithm="maxima")

[Out] -1/8*(pi - 2*x)*sqrt(-pi^2 + 4*pi*x - 4*x^2 + 4) + 1/2*arctan2(-1/2*pi + x, sqrt(-1/4*pi^2 + pi*x - x^2 + 1))

Giac [F(-1)]

Timed out.

$$\int \sqrt{1 - \arccos(\sin(x))^2} dx = \text{Timed out}$$

[In] integrate((1-(-1/2*pi+arcsin(sin(x)))^2)^(1/2),x, algorithm="giac")

[Out] Timed out

Mupad [F(-1)]

Timed out.

$$\int \sqrt{1 - \arccos(\sin(x))^2} dx = \int \sqrt{1 - \left(\frac{\Pi}{2} - \operatorname{asin}(\sin(x)) \right)^2} dx$$

[In] int((1 - (Pi/2 - asin(sin(x)))^2)^(1/2),x)

[Out] int((1 - (Pi/2 - asin(sin(x)))^2)^(1/2), x)

3.251 $\int (-2 + x)(-1 + x)x(1 + x)(2 + x) dx$

| | |
|---|------|
| Optimal result | 2666 |
| Rubi [A] (verified) | 2666 |
| Mathematica [A] (verified) | 2667 |
| Maple [A] (verified) | 2667 |
| Fricas [A] (verification not implemented) | 2667 |
| Sympy [A] (verification not implemented) | 2668 |
| Maxima [A] (verification not implemented) | 2668 |
| Giac [A] (verification not implemented) | 2668 |
| Mupad [B] (verification not implemented) | 2668 |

Optimal result

Integrand size = 14, antiderivative size = 20

$$\int (-2 + x)(-1 + x)x(1 + x)(2 + x) dx = 2x^2 - \frac{5x^4}{4} + \frac{x^6}{6}$$

[Out] $2*x^2-5/4*x^4+1/6*x^6$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.071$, Rules used = {1620}

$$\int (-2 + x)(-1 + x)x(1 + x)(2 + x) dx = \frac{x^6}{6} - \frac{5x^4}{4} + 2x^2$$

[In] `Int[(-2 + x)*(-1 + x)*x*(1 + x)*(2 + x), x]`

[Out] $2*x^2 - (5*x^4)/4 + x^6/6$

Rule 1620

`Int[(Px_)*((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.)*((g_.) + (h_.)*(x_))^(q_.), x_Symbol] :> Int[ExpandIntegrand[Px*(a + b*x)^m*(c + d*x)^n*(e + f*x)^p*(g + h*x)^q, x], x] /; FreeQ[{a, b, c, d, e, f, g, h, m, n, p, q}, x] && PolyQ[Px, x] && IntegersQ[m, n]`

Rubi steps

$$\begin{aligned} \text{integral} &= \int (4x - 5x^3 + x^5) dx \\ &= 2x^2 - \frac{5x^4}{4} + \frac{x^6}{6} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int (-2+x)(-1+x)x(1+x)(2+x) dx = 2x^2 - \frac{5x^4}{4} + \frac{x^6}{6}$$

[In] Integrate[(-2 + x)*(-1 + x)*x*(1 + x)*(2 + x), x]

[Out] 2*x^2 - (5*x^4)/4 + x^6/6

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.85

| method | result | size |
|---------------|--|------|
| gospers | $2x^2 - \frac{5}{4}x^4 + \frac{1}{6}x^6$ | 17 |
| default | $2x^2 - \frac{5}{4}x^4 + \frac{1}{6}x^6$ | 17 |
| norman | $2x^2 - \frac{5}{4}x^4 + \frac{1}{6}x^6$ | 17 |
| risch | $2x^2 - \frac{5}{4}x^4 + \frac{1}{6}x^6$ | 17 |
| parallelrisch | $2x^2 - \frac{5}{4}x^4 + \frac{1}{6}x^6$ | 17 |

[In] int((-2+x)*(-1+x)*x*(1+x)*(2+x), x, method=_RETURNVERBOSE)

[Out] 2*x^2-5/4*x^4+1/6*x^6

Fricas [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int (-2+x)(-1+x)x(1+x)(2+x) dx = \frac{1}{6}x^6 - \frac{5}{4}x^4 + 2x^2$$

[In] integrate((-2+x)*(-1+x)*x*(1+x)*(2+x), x, algorithm="fricas")

[Out] 1/6*x^6 - 5/4*x^4 + 2*x^2

Sympy [A] (verification not implemented)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.75

$$\int (-2+x)(-1+x)x(1+x)(2+x) dx = \frac{x^6}{6} - \frac{5x^4}{4} + 2x^2$$

[In] integrate((-2+x)*(-1+x)*x*(1+x)*(2+x),x)

[Out] x**6/6 - 5*x**4/4 + 2*x**2

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int (-2+x)(-1+x)x(1+x)(2+x) dx = \frac{1}{6}x^6 - \frac{5}{4}x^4 + 2x^2$$

[In] integrate((-2+x)*(-1+x)*x*(1+x)*(2+x),x, algorithm="maxima")

[Out] 1/6*x^6 - 5/4*x^4 + 2*x^2

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int (-2+x)(-1+x)x(1+x)(2+x) dx = \frac{1}{6}x^6 - \frac{5}{4}x^4 + 2x^2$$

[In] integrate((-2+x)*(-1+x)*x*(1+x)*(2+x),x, algorithm="giac")

[Out] 1/6*x^6 - 5/4*x^4 + 2*x^2

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.85

$$\int (-2+x)(-1+x)x(1+x)(2+x) dx = \frac{x^2(2x^4 - 15x^2 + 24)}{12}$$

[In] int(x*(x - 1)*(x + 1)*(x - 2)*(x + 2),x)

[Out] (x^2*(2*x^4 - 15*x^2 + 24))/12

$$3.252 \quad \int \frac{1+2x^2+3x^3}{\sqrt[3]{1+x^3}} dx$$

| | |
|---|------|
| Optimal result | 2669 |
| Rubi [A] (verified) | 2669 |
| Mathematica [A] (verified) | 2670 |
| Maple [A] (verified) | 2671 |
| Fricas [A] (verification not implemented) | 2671 |
| Sympy [C] (verification not implemented) | 2671 |
| Maxima [A] (verification not implemented) | 2672 |
| Giac [F] | 2672 |
| Mupad [B] (verification not implemented) | 2672 |

Optimal result

Integrand size = 22, antiderivative size = 21

$$\int \frac{1+2x^2+3x^3}{\sqrt[3]{1+x^3}} dx = (1+x^3)^{2/3} + x(1+x^3)^{2/3}$$

[Out] $(x^3+1)^{(2/3)}+x*(x^3+1)^{(2/3)}$

Rubi [A] (verified)

Time = 0.04 (sec), antiderivative size = 21, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.182$, Rules used = {1907, 245, 267, 327}

$$\int \frac{1+2x^2+3x^3}{\sqrt[3]{1+x^3}} dx = (x^3+1)^{2/3} x + (x^3+1)^{2/3}$$

[In] $\text{Int}[(1+2*x^2+3*x^3)/(1+x^3)^{(1/3)},x]$

[Out] $(1+x^3)^{(2/3)}+x*(1+x^3)^{(2/3)}$

Rule 245

$\text{Int}[(a_+ + (b_+)*(x_+)^3)^{-1/3}, x_Symbol] \rightarrow \text{Simp}[\text{ArcTan}[(1+2*\text{Rt}[b, 3]*(x/(a_+ + b_+*x^3)^{(1/3)}))/\text{Sqrt}[3]]/(\text{Sqrt}[3]*\text{Rt}[b, 3]), x] - \text{Simp}[\text{Log}[(a_+ + b_+*x^3)^{(1/3)} - \text{Rt}[b, 3]*x]/(2*\text{Rt}[b, 3]), x] /; \text{FreeQ}\{a, b\}, x]$

Rule 267

$\text{Int}[(x_+)^{(m_+)}*((a_+ + (b_+)*(x_+)^{(n_+)})^{(p_+)})], x_Symbol] \rightarrow \text{Simp}[(a_+ + b_+*x_+^{(n_+)})^{(p_+ + 1)}/(b_+*n_+*(p_+ + 1)), x] /; \text{FreeQ}\{a, b, m, n, p\}, x] \&\& \text{EqQ}[m, n - 1] \&\&$

NeQ[p, -1]

Rule 327

```
Int[((c_.)*(x_)^(m_))*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Simp[c^(n
- 1)*(c*x)^(m - n + 1)*((a + b*x^n)^(p + 1)/(b*(m + n*p + 1))), x] - Dist[
a*c^n*((m - n + 1)/(b*(m + n*p + 1))), Int[(c*x)^(m - n)*(a + b*x^n)^p, x],
x] /; FreeQ[{a, b, c, p}, x] && IGtQ[n, 0] && GtQ[m, n - 1] && NeQ[m + n*p
+ 1, 0] && IntBinomialQ[a, b, c, n, m, p, x]
```

Rule 1907

```
Int[(Pq_)*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Int[ExpandIntegrand[
Pq*(a + b*x^n)^p, x], x] /; FreeQ[{a, b, n, p}, x] && (PolyQ[Pq, x] || Poly
Q[Pq, x^n])
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \left(\frac{1}{\sqrt[3]{1+x^3}} + \frac{2x^2}{\sqrt[3]{1+x^3}} + \frac{3x^3}{\sqrt[3]{1+x^3}} \right) dx \\
 &= 2 \int \frac{x^2}{\sqrt[3]{1+x^3}} dx + 3 \int \frac{x^3}{\sqrt[3]{1+x^3}} dx + \int \frac{1}{\sqrt[3]{1+x^3}} dx \\
 &= (1+x^3)^{2/3} + x(1+x^3)^{2/3} + \frac{\arctan\left(\frac{1+\frac{2x}{\sqrt[3]{1+x^3}}}{\sqrt{3}}\right)}{\sqrt{3}} - \frac{1}{2} \log\left(-x+\sqrt[3]{1+x^3}\right) - \int \frac{1}{\sqrt[3]{1+x^3}} dx \\
 &= (1+x^3)^{2/3} + x(1+x^3)^{2/3}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 10.03 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.62

$$\int \frac{1+2x^2+3x^3}{\sqrt[3]{1+x^3}} dx = (1+x)(1+x^3)^{2/3}$$

[In] Integrate[(1 + 2*x^2 + 3*x^3)/(1 + x^3)^(1/3),x]

[Out] (1 + x)*(1 + x^3)^(2/3)

Maple [A] (verified)

Time = 0.26 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.57

| method | result | size |
|---------|---|------|
| trager | $(1+x)(x^3+1)^{\frac{2}{3}}$ | 12 |
| risch | $(1+x)(x^3+1)^{\frac{2}{3}}$ | 12 |
| gosper | $\frac{(1+x)^2(x^2-x+1)}{(x^3+1)^{\frac{1}{3}}}$ | 22 |
| meijerg | $x \operatorname{hypergeom}\left(\left[\frac{1}{3}, \frac{1}{3}\right], \left[\frac{4}{3}\right], -x^3\right) + \frac{3x^4 \operatorname{hypergeom}\left(\left[\frac{1}{3}, \frac{4}{3}\right], \left[\frac{7}{3}\right], -x^3\right)}{4} + \frac{2x^3 \operatorname{hypergeom}\left(\left[\frac{1}{3}, 1\right], [2], -x^3\right)}{3}$ | 47 |

[In] `int((3*x^3+2*x^2+1)/(x^3+1)^(1/3),x,method=_RETURNVERBOSE)`[Out] `(1+x)*(x^3+1)^(2/3)`**Fricas [A] (verification not implemented)**

none

Time = 0.24 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.52

$$\int \frac{1+2x^2+3x^3}{\sqrt[3]{1+x^3}} dx = (x^3+1)^{\frac{2}{3}}(x+1)$$

[In] `integrate((3*x^3+2*x^2+1)/(x^3+1)^(1/3),x, algorithm="fricas")`[Out] `(x^3 + 1)^(2/3)*(x + 1)`**Sympy [C] (verification not implemented)**

Result contains complex when optimal does not.

Time = 1.44 (sec) , antiderivative size = 65, normalized size of antiderivative = 3.10

$$\int \frac{1+2x^2+3x^3}{\sqrt[3]{1+x^3}} dx = \frac{x^4 \Gamma\left(\frac{4}{3}\right) {}_2F_1\left(\frac{1}{3}, \frac{4}{3} \middle| \frac{7}{3}, x^3 e^{i\pi}\right)}{\Gamma\left(\frac{7}{3}\right)} + \frac{x \Gamma\left(\frac{1}{3}\right) {}_2F_1\left(\frac{1}{3}, \frac{1}{3} \middle| \frac{4}{3}, x^3 e^{i\pi}\right)}{3 \Gamma\left(\frac{4}{3}\right)} + (x^3+1)^{\frac{2}{3}}$$

[In] `integrate((3*x**3+2*x**2+1)/(x**3+1)**(1/3),x)`[Out] `x**4*gamma(4/3)*hyper((1/3, 4/3), (7/3,), x**3*exp_polar(I*pi))/gamma(7/3) + x*gamma(1/3)*hyper((1/3, 1/3), (4/3,), x**3*exp_polar(I*pi))/(3*gamma(4/3)) + (x**3 + 1)**(2/3)`

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.52

$$\int \frac{1 + 2x^2 + 3x^3}{\sqrt[3]{1 + x^3}} dx = (x^3 + 1)^{\frac{2}{3}} + \frac{(x^3 + 1)^{\frac{2}{3}}}{x^2 \left(\frac{x^3 + 1}{x^3} - 1 \right)}$$

[In] integrate((3*x^3+2*x^2+1)/(x^3+1)^(1/3),x, algorithm="maxima")

[Out] (x^3 + 1)^(2/3) + (x^3 + 1)^(2/3)/(x^2*((x^3 + 1)/x^3 - 1))

Giac [F]

$$\int \frac{1 + 2x^2 + 3x^3}{\sqrt[3]{1 + x^3}} dx = \int \frac{3x^3 + 2x^2 + 1}{(x^3 + 1)^{\frac{1}{3}}} dx$$

[In] integrate((3*x^3+2*x^2+1)/(x^3+1)^(1/3),x, algorithm="giac")

[Out] integrate((3*x^3 + 2*x^2 + 1)/(x^3 + 1)^(1/3), x)

Mupad [B] (verification not implemented)

Time = 14.71 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.52

$$\int \frac{1 + 2x^2 + 3x^3}{\sqrt[3]{1 + x^3}} dx = (x^3 + 1)^{2/3} (x + 1)$$

[In] int((2*x^2 + 3*x^3 + 1)/(x^3 + 1)^(1/3),x)

[Out] (x^3 + 1)^(2/3)*(x + 1)

3.253 $\int \csc^4(x) \sec^4(x) dx$

| | |
|---|------|
| Optimal result | 2673 |
| Rubi [A] (verified) | 2673 |
| Mathematica [A] (verified) | 2674 |
| Maple [A] (verified) | 2674 |
| Fricas [B] (verification not implemented) | 2675 |
| Sympy [A] (verification not implemented) | 2675 |
| Maxima [A] (verification not implemented) | 2675 |
| Giac [A] (verification not implemented) | 2676 |
| Mupad [B] (verification not implemented) | 2676 |

Optimal result

Integrand size = 9, antiderivative size = 17

$$\int \csc^4(x) \sec^4(x) dx = -8 \cot(2x) - \frac{8}{3} \cot^3(2x)$$

[Out] $-8*\cot(2*x)-8/3*\cot(2*x)^3$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.47, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {2700, 276}

$$\int \csc^4(x) \sec^4(x) dx = \frac{\tan^3(x)}{3} + 3 \tan(x) - \frac{1}{3} \cot^3(x) - 3 \cot(x)$$

[In] $\text{Int}[\text{Csc}[x]^4*\text{Sec}[x]^4, x]$

[Out] $-3*\text{Cot}[x] - \text{Cot}[x]^3/3 + 3*\text{Tan}[x] + \text{Tan}[x]^3/3$

Rule 276

$\text{Int}[\text{((c_.)*(x_))}^{(m_.)}*\text{((a_.) + (b_.)*(x_)^{(n_)})}^{(p_.)}, x_Symbol] \text{ :> Int}[\text{ExpandIntegrand}[(c*x)^m*(a + b*x^n)^p, x], x] \text{ /; FreeQ}\{a, b, c, m, n\}, x] \ \&\amp; \text{IGtQ}[p, 0]$

Rule 2700

$\text{Int}[\text{csc}[(e_.) + (f_.)*(x_)]^{(m_.)}*\text{sec}[(e_.) + (f_.)*(x_)]^{(n_.)}, x_Symbol] \text{ :> Dist}[1/f, \text{Subst}[\text{Int}[(1 + x^2)^{(m + n)/2 - 1}/x^m, x], x, \text{Tan}[e + f*x]], x] \text{ /; FreeQ}\{e, f\}, x] \ \&\amp; \text{IntegersQ}[m, n, (m + n)/2]$

Rubi steps

$$\begin{aligned}
\text{integral} &= \text{Subst} \left(\int \frac{(1+x^2)^3}{x^4} dx, x, \tan(x) \right) \\
&= \text{Subst} \left(\int \left(3 + \frac{1}{x^4} + \frac{3}{x^2} + x^2 \right) dx, x, \tan(x) \right) \\
&= -3 \cot(x) - \frac{\cot^3(x)}{3} + 3 \tan(x) + \frac{\tan^3(x)}{3}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 33, normalized size of antiderivative = 1.94

$$\int \csc^4(x) \sec^4(x) dx = -\frac{8 \cot(x)}{3} - \frac{1}{3} \cot(x) \csc^2(x) + \frac{8 \tan(x)}{3} + \frac{1}{3} \sec^2(x) \tan(x)$$

[In] Integrate[Csc[x]^4*Sec[x]^4,x]

[Out] (-8*Cot[x])/3 - (Cot[x]*Csc[x]^2)/3 + (8*Tan[x])/3 + (Sec[x]^2*Tan[x])/3

Maple [A] (verified)

Time = 0.39 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.41

| method | result | size |
|--------------|--|------|
| paralelrisch | $-\frac{(-\cos(6x)+3\cos(2x))\sec(x)^3\csc(x)^3}{6}$ | 24 |
| risch | $\frac{32i(3e^{4ix}-1)}{3(e^{2ix}-1)^3(e^{2ix}+1)^3}$ | 31 |
| default | $\frac{1}{3\sin(x)^3\cos(x)^3} - \frac{2}{3\sin(x)^3\cos(x)} + \frac{8}{3\cos(x)\sin(x)} - \frac{16\cot(x)}{3}$ | 36 |
| norman | $\frac{\frac{1}{24} + \frac{5\tan(\frac{x}{2})^2}{4} - \frac{91\tan(\frac{x}{2})^4}{8} + \frac{35\tan(\frac{x}{2})^6}{2} - \frac{91\tan(\frac{x}{2})^8}{8} + \frac{5\tan(\frac{x}{2})^{10}}{4} + \frac{\tan(\frac{x}{2})^{12}}{24}}{\tan(\frac{x}{2})^3(\tan(\frac{x}{2})^2-1)^3}$ | 68 |

[In] int(1/sin(x)^4/cos(x)^4,x,method=_RETURNVERBOSE)

[Out] -1/6*(-cos(6*x)+3*cos(2*x))*sec(x)^3*csc(x)^3

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 39 vs. $2(15) = 30$.

Time = 0.24 (sec) , antiderivative size = 39, normalized size of antiderivative = 2.29

$$\int \csc^4(x) \sec^4(x) dx = -\frac{16 \cos(x)^6 - 24 \cos(x)^4 + 6 \cos(x)^2 + 1}{3 (\cos(x)^5 - \cos(x)^3) \sin(x)}$$

[In] integrate(1/sin(x)^4/cos(x)^4,x, algorithm="fricas")

[Out] -1/3*(16*cos(x)^6 - 24*cos(x)^4 + 6*cos(x)^2 + 1)/((cos(x)^5 - cos(x)^3)*sin(x))

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.71

$$\int \csc^4(x) \sec^4(x) dx = -\frac{16 \cos(2x)}{3 \sin(2x)} - \frac{8 \cos(2x)}{3 \sin^3(2x)}$$

[In] integrate(1/sin(x)**4/cos(x)**4,x)

[Out] -16*cos(2*x)/(3*sin(2*x)) - 8*cos(2*x)/(3*sin(2*x)**3)

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.47

$$\int \csc^4(x) \sec^4(x) dx = \frac{1}{3} \tan(x)^3 - \frac{9 \tan(x)^2 + 1}{3 \tan(x)^3} + 3 \tan(x)$$

[In] integrate(1/sin(x)^4/cos(x)^4,x, algorithm="maxima")

[Out] 1/3*tan(x)^3 - 1/3*(9*tan(x)^2 + 1)/tan(x)^3 + 3*tan(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.06

$$\int \csc^4(x) \sec^4(x) dx = -\frac{8(3 \tan(2x)^2 + 1)}{3 \tan(2x)^3}$$

[In] integrate(1/sin(x)^4/cos(x)^4,x, algorithm="giac")

[Out] -8/3*(3*tan(2*x)^2 + 1)/tan(2*x)^3

Mupad [B] (verification not implemented)

Time = 15.19 (sec) , antiderivative size = 38, normalized size of antiderivative = 2.24

$$\int \csc^4(x) \sec^4(x) dx = -\frac{24 \cos(2x) - 16 \cos(2x)^3}{3 \sin(2x) - 3 \cos(2x)^2 \sin(2x)}$$

[In] int(1/(cos(x)^4*sin(x)^4),x)

[Out] -(24*cos(2*x) - 16*cos(2*x)^3)/(3*sin(2*x) - 3*cos(2*x)^2*sin(2*x))

3.254 $\int \frac{x + \sin(x)}{1 + \cos(x)} dx$

| | |
|---|------|
| Optimal result | 2677 |
| Rubi [B] (verified) | 2677 |
| Mathematica [A] (verified) | 2679 |
| Maple [A] (verified) | 2679 |
| Fricas [A] (verification not implemented) | 2679 |
| Sympy [A] (verification not implemented) | 2680 |
| Maxima [B] (verification not implemented) | 2680 |
| Giac [A] (verification not implemented) | 2680 |
| Mupad [B] (verification not implemented) | 2681 |

Optimal result

Integrand size = 11, antiderivative size = 8

$$\int \frac{x + \sin(x)}{1 + \cos(x)} dx = x \tan\left(\frac{x}{2}\right)$$

[Out] x*tan(1/2*x)

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 25 vs. 2(8) = 16.

Time = 0.07 (sec), antiderivative size = 25, normalized size of antiderivative = 3.12, number of steps used = 6, number of rules used = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.545$, Rules used = {4462, 3399, 4269, 3556, 2746, 31}

$$\int \frac{x + \sin(x)}{1 + \cos(x)} dx = x \tan\left(\frac{x}{2}\right) + 2 \log\left(\cos\left(\frac{x}{2}\right)\right) - \log(\cos(x) + 1)$$

[In] Int[(x + Sin[x])/(1 + Cos[x]),x]

[Out] 2*Log[Cos[x/2]] - Log[1 + Cos[x]] + x*Tan[x/2]

Rule 31

Int[((a_) + (b_)*(x_))⁽⁻¹⁾, x_Symbol] :> Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 2746

Int[cos[(e_) + (f_)*(x_)]^{(p_)*((a_) + (b_)*sin[(e_) + (f_)*(x_)])^(m_), x_Symbol] :> Dist[1/(b^p*f), Subst[Int[(a + x)^{(m + (p - 1)/2)}(a - x)}

```

^((p - 1)/2), x], x, b*Sin[e + f*x]], x] /; FreeQ[{a, b, e, f, m}, x] && In
tegerQ[(p - 1)/2] && EqQ[a^2 - b^2, 0] && (GeQ[p, -1] || !IntegerQ[m + 1/2
])

```

Rule 3399

```

Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*sin[(e_.) + (f_.)*(x_)])^(n_.)
, x_Symbol] := Dist[(2*a)^n, Int[(c + d*x)^m*Sin[(1/2)*(e + Pi*(a/(2*b))) +
f*(x/2)]^(2*n), x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && EqQ[a^2 - b^2
, 0] && IntegerQ[n] && (GtQ[n, 0] || IGtQ[m, 0])

```

Rule 3556

```

Int[tan[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Log[RemoveContent[Cos[c + d
*x], x]]/d, x] /; FreeQ[{c, d}, x]

```

Rule 4269

```

Int[csc[(e_.) + (f_.)*(x_)]^2*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] := Simp
[(-(c + d*x)^m)*(Cot[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*
Cot[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]

```

Rule 4462

```

Int[(u_)*((v_) + (d_.)*(F_)[(c_.)*((a_.) + (b_.)*(x_))]^(n_.)), x_Symbol] :
> With[{e = FreeFactors[Cos[c*(a + b*x)], x]}, Int[ActivateTrig[u*v], x] +
Dist[d, Int[ActivateTrig[u]*Sin[c*(a + b*x)]^n, x], x] /; FunctionOfQ[Cos[c
*(a + b*x)]/e, u, x] /; FreeQ[{a, b, c, d}, x] && !FreeQ[v, x] && Integer
Q[(n - 1)/2] && NonsumQ[u] && (EqQ[F, Sin] || EqQ[F, sin])

```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \frac{x}{1 + \cos(x)} dx + \int \frac{\sin(x)}{1 + \cos(x)} dx \\
&= \frac{1}{2} \int x \sec^2\left(\frac{x}{2}\right) dx - \text{Subst}\left(\int \frac{1}{1+x} dx, x, \cos(x)\right) \\
&= -\log(1 + \cos(x)) + x \tan\left(\frac{x}{2}\right) - \int \tan\left(\frac{x}{2}\right) dx \\
&= 2 \log\left(\cos\left(\frac{x}{2}\right)\right) - \log(1 + \cos(x)) + x \tan\left(\frac{x}{2}\right)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int \frac{x + \sin(x)}{1 + \cos(x)} dx = x \tan\left(\frac{x}{2}\right)$$

[In] Integrate[(x + Sin[x])/(1 + Cos[x]),x]

[Out] x*Tan[x/2]

Maple [A] (verified)

Time = 0.07 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

| method | result | size |
|---------------|----------------------------------|------|
| lookup | $x \tan\left(\frac{x}{2}\right)$ | 7 |
| default | $x \tan\left(\frac{x}{2}\right)$ | 7 |
| norman | $x \tan\left(\frac{x}{2}\right)$ | 7 |
| parallelrisch | $x \tan\left(\frac{x}{2}\right)$ | 7 |
| risch | $-ix + \frac{2ix}{e^{ix}+1}$ | 19 |

[In] int((x+sin(x))/(1+cos(x)),x,method=_RETURNVERBOSE)

[Out] x*tan(1/2*x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.25

$$\int \frac{x + \sin(x)}{1 + \cos(x)} dx = \frac{x \sin(x)}{\cos(x) + 1}$$

[In] integrate((x+sin(x))/(1+cos(x)),x, algorithm="fricas")

[Out] x*sin(x)/(cos(x) + 1)

Sympy [A] (verification not implemented)

Time = 0.16 (sec) , antiderivative size = 5, normalized size of antiderivative = 0.62

$$\int \frac{x + \sin(x)}{1 + \cos(x)} dx = x \tan\left(\frac{x}{2}\right)$$

[In] integrate((x+sin(x))/(1+cos(x)),x)

[Out] x*tan(x/2)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 61 vs. 2(6) = 12.

Time = 0.19 (sec) , antiderivative size = 61, normalized size of antiderivative = 7.62

$$\begin{aligned} & \int \frac{x + \sin(x)}{1 + \cos(x)} dx \\ &= \frac{(\cos(x)^2 + \sin(x)^2 + 2 \cos(x) + 1) \log(\cos(x)^2 + \sin(x)^2 + 2 \cos(x) + 1) + 2x \sin(x)}{\cos(x)^2 + \sin(x)^2 + 2 \cos(x) + 1} \\ & \quad - \log(\cos(x) + 1) \end{aligned}$$

[In] integrate((x+sin(x))/(1+cos(x)),x, algorithm="maxima")

[Out] ((cos(x)^2 + sin(x)^2 + 2*cos(x) + 1)*log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) + 2*x*sin(x))/(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) - log(cos(x) + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{x + \sin(x)}{1 + \cos(x)} dx = x \tan\left(\frac{1}{2}x\right)$$

[In] integrate((x+sin(x))/(1+cos(x)),x, algorithm="giac")

[Out] x*tan(1/2*x)

Mupad [B] (verification not implemented)

Time = 14.73 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.75

$$\int \frac{x + \sin(x)}{1 + \cos(x)} dx = x \tan\left(\frac{x}{2}\right)$$

[In] int((x + sin(x))/(cos(x) + 1),x)

[Out] x*tan(x/2)

3.255 $\int \cosh^2(x) \sinh^3(x) dx$

| | |
|---|------|
| Optimal result | 2682 |
| Rubi [A] (verified) | 2682 |
| Mathematica [A] (verified) | 2683 |
| Maple [A] (verified) | 2683 |
| Fricas [B] (verification not implemented) | 2684 |
| Sympy [A] (verification not implemented) | 2684 |
| Maxima [B] (verification not implemented) | 2684 |
| Giac [B] (verification not implemented) | 2685 |
| Mupad [B] (verification not implemented) | 2685 |

Optimal result

Integrand size = 9, antiderivative size = 17

$$\int \cosh^2(x) \sinh^3(x) dx = -\frac{1}{3} \cosh^3(x) + \frac{\cosh^5(x)}{5}$$

[Out] $-1/3*\cosh(x)^3+1/5*\cosh(x)^5$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.222$, Rules used = {2645, 14}

$$\int \cosh^2(x) \sinh^3(x) dx = \frac{\cosh^5(x)}{5} - \frac{\cosh^3(x)}{3}$$

[In] `Int[Cosh[x]^2*Sinh[x]^3,x]`

[Out] $-1/3*\cosh[x]^3 + \cosh[x]^5/5$

Rule 14

```
Int[(u_)*((c_.)*(x_))^(m_.), x_Symbol] := Int[ExpandIntegrand[(c*x)^m*u, x], x] /; FreeQ[{c, m}, x] && SumQ[u] && !LinearQ[u, x] && !MatchQ[u, (a_ + (b_.)*(v_)) /; FreeQ[{a, b}, x] && InverseFunctionQ[v]]
```

Rule 2645

```
Int[(cos[(e_.) + (f_.)*(x_)]*(a_.))^(m_.)*sin[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] := Dist[-(a*f)^(-1), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*Cos[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] &&
```

!(IntegerQ[(m - 1)/2] && GtQ[m, 0] && LeQ[m, n])

Rubi steps

$$\begin{aligned} \text{integral} &= -\text{Subst}\left(\int x^2(1-x^2) dx, x, \cosh(x)\right) \\ &= -\text{Subst}\left(\int (x^2-x^4) dx, x, \cosh(x)\right) \\ &= -\frac{1}{3}\cosh^3(x) + \frac{\cosh^5(x)}{5} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.35

$$\int \cosh^2(x) \sinh^3(x) dx = -\frac{\cosh(x)}{8} - \frac{1}{48} \cosh(3x) + \frac{1}{80} \cosh(5x)$$

[In] Integrate[Cosh[x]^2*Sinh[x]^3,x]

[Out] -1/8*Cosh[x] - Cosh[3*x]/48 + Cosh[5*x]/80

Maple [A] (verified)

Time = 9.81 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.82

| method | result | size |
|-------------------|--|------|
| derivativedivides | $-\frac{\cosh(x)^3}{3} + \frac{\cosh(x)^5}{5}$ | 14 |
| default | $-\frac{\cosh(x)^3}{3} + \frac{\cosh(x)^5}{5}$ | 14 |
| risch | $\frac{e^{5x}}{160} - \frac{e^{3x}}{96} - \frac{e^x}{16} - \frac{e^{-x}}{16} - \frac{e^{-3x}}{96} + \frac{e^{-5x}}{160}$ | 36 |

[In] int(sinh(x)^3*cosh(x)^2,x,method=_RETURNVERBOSE)

[Out] -1/3*cosh(x)^3+1/5*cosh(x)^5

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 42 vs. 2(13) = 26.

Time = 0.24 (sec) , antiderivative size = 42, normalized size of antiderivative = 2.47

$$\int \cosh^2(x) \sinh^3(x) dx = \frac{1}{80} \cosh(x)^5 + \frac{1}{16} \cosh(x) \sinh(x)^4 - \frac{1}{48} \cosh(x)^3 + \frac{1}{16} (2 \cosh(x)^3 - \cosh(x)) \sinh(x)^2 - \frac{1}{8} \cosh(x)$$

[In] integrate(sinh(x)^3*cosh(x)^2,x, algorithm="fricas")

[Out] 1/80*cosh(x)^5 + 1/16*cosh(x)*sinh(x)^4 - 1/48*cosh(x)^3 + 1/16*(2*cosh(x)^3 - cosh(x))*sinh(x)^2 - 1/8*cosh(x)

Sympy [A] (verification not implemented)

Time = 0.17 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.12

$$\int \cosh^2(x) \sinh^3(x) dx = \frac{\sinh^2(x) \cosh^3(x)}{3} - \frac{2 \cosh^5(x)}{15}$$

[In] integrate(sinh(x)**3*cosh(x)**2,x)

[Out] sinh(x)**2*cosh(x)**3/3 - 2*cosh(x)**5/15

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 39 vs. 2(13) = 26.

Time = 0.20 (sec) , antiderivative size = 39, normalized size of antiderivative = 2.29

$$\int \cosh^2(x) \sinh^3(x) dx = -\frac{1}{480} (5 e^{(-2x)} + 30 e^{(-4x)} - 3) e^{(5x)} - \frac{1}{16} e^{(-x)} - \frac{1}{96} e^{(-3x)} + \frac{1}{160} e^{(-5x)}$$

[In] integrate(sinh(x)^3*cosh(x)^2,x, algorithm="maxima")

[Out] -1/480*(5*e^(-2*x) + 30*e^(-4*x) - 3)*e^(5*x) - 1/16*e^(-x) - 1/96*e^(-3*x) + 1/160*e^(-5*x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 37 vs. 2(13) = 26.

Time = 0.27 (sec) , antiderivative size = 37, normalized size of antiderivative = 2.18

$$\int \cosh^2(x) \sinh^3(x) dx = -\frac{1}{480} (30 e^{(4x)} + 5 e^{(2x)} - 3) e^{(-5x)} + \frac{1}{160} e^{(5x)} - \frac{1}{96} e^{(3x)} - \frac{1}{16} e^x$$

[In] integrate(sinh(x)^3*cosh(x)^2,x, algorithm="giac")

[Out] -1/480*(30*e^(4*x) + 5*e^(2*x) - 3)*e^(-5*x) + 1/160*e^(5*x) - 1/96*e^(3*x) - 1/16*e^x

Mupad [B] (verification not implemented)

Time = 14.88 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.82

$$\int \cosh^2(x) \sinh^3(x) dx = \frac{\cosh(x)^3 (3 \cosh(x)^2 - 5)}{15}$$

[In] int(cosh(x)^2*sinh(x)^3,x)

[Out] (cosh(x)^3*(3*cosh(x)^2 - 5))/15

3.256 $\int 3^{2^x} 4^x dx$

| | |
|---|------|
| Optimal result | 2686 |
| Rubi [A] (verified) | 2686 |
| Mathematica [A] (verified) | 2687 |
| Maple [A] (verified) | 2687 |
| Fricas [A] (verification not implemented) | 2688 |
| Sympy [A] (verification not implemented) | 2688 |
| Maxima [C] (verification not implemented) | 2688 |
| Giac [A] (verification not implemented) | 2689 |
| Mupad [B] (verification not implemented) | 2689 |

Optimal result

Integrand size = 9, antiderivative size = 33

$$\int 3^{2^x} 4^x dx = -\frac{3^{2^x}}{\log(2) \log^2(3)} + \frac{2^x 3^{2^x}}{\log(2) \log(3)}$$

[Out] $-3^{(2^x)}/\ln(2)/\ln(3)^2 + 2^x * 3^{(2^x)}/\ln(2)/\ln(3)$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 33, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {2320, 2207, 2225}

$$\int 3^{2^x} 4^x dx = \frac{2^x 3^{2^x}}{\log(2) \log(3)} - \frac{3^{2^x}}{\log(2) \log^2(3)}$$

[In] `Int[3^2^x*4^x,x]`

[Out] $-(3^{2^x}/(\text{Log}[2]*\text{Log}[3]^2)) + (2^x*3^{2^x})/(\text{Log}[2]*\text{Log}[3])$

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] := Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])), x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m] && !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] := Simp[(F^(c*(a + b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2320

```
Int[u_, x_Symbol] := With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x]
, Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Functi
onOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[
{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*
(F_)[v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{\text{Subst}\left(\int 3^x x dx, x, 2^x\right)}{\log(2)} \\ &= \frac{2^x 3^{2^x}}{\log(2) \log(3)} - \frac{\text{Subst}\left(\int 3^x dx, x, 2^x\right)}{\log(2) \log(3)} \\ &= -\frac{3^{2^x}}{\log(2) \log^2(3)} + \frac{2^x 3^{2^x}}{\log(2) \log(3)} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.67

$$\int 3^{2^x} 4^x dx = \frac{3^{2^x} (-1 + 2^x \log(3))}{\log(2) \log^2(3)}$$

[In] Integrate[3^2^x*4^x,x]

[Out] (3^2^x*(-1 + 2^x*Log[3]))/(Log[2]*Log[3]^2)

Maple [A] (verified)

Time = 0.09 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.70

| method | result | size |
|--------|--|------|
| risch | $\frac{(2^x \ln(3) - 1) 3^{2^x}}{\ln(2) \ln(3)^2}$ | 23 |
| norman | $\frac{e^{x \ln(2)} e^{e^x \ln(2) \ln(3)}}{\ln(2) \ln(3)} - \frac{e^{e^x \ln(2) \ln(3)}}{\ln(2) \ln(3)^2}$ | 44 |

[In] int(4^x*3^(2^x),x,method=_RETURNVERBOSE)

[Out] (2^x*ln(3)-1)/ln(2)/ln(3)^2*3^(2^x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.67

$$\int 3^{2x} 4^x dx = \frac{(2^x \log(3) - 1)3^{(2^x)}}{\log(3)^2 \log(2)}$$

[In] integrate(4^x*3^(2^x),x, algorithm="fricas")

[Out] (2^x*log(3) - 1)*3^(2^x)/(log(3)^2*log(2))

Sympy [A] (verification not implemented)

Time = 0.19 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.03

$$\int 3^{2x} 4^x dx = \frac{\left(e^{\frac{x \log(4)}{2}} \log(3) - 1\right) e^{e^{\frac{x \log(4)}{2}} \log(3)}}{\log(2) \log(3)^2}$$

[In] integrate(4**x*3**(2**x),x)

[Out] (exp(x*log(4)/2)*log(3) - 1)*exp(exp(x*log(4)/2)*log(3))/(log(2)*log(3)**2)

Maxima [C] (verification not implemented)

Result contains higher order function than in optimal. Order 4 vs. order 3.

Time = 0.31 (sec) , antiderivative size = 31, normalized size of antiderivative = 0.94

$$\int 3^{2x} 4^x dx = -\frac{4^x \Gamma\left(2, -4^{\frac{1}{2}x} \log(3)\right)}{4^x \log(3)^2 \log(2)}$$

[In] integrate(4^x*3^(2^x),x, algorithm="maxima")

[Out] -4^x*gamma(2, -4^(1/2*x)*log(3))/(4^x*log(3)^2*log(2))

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 51, normalized size of antiderivative = 1.55

$$\int 3^{2^x} 4^x dx = \frac{2^x e^{(2^x \log(3) + 2x \log(2))} \log(3) - e^{(2^x \log(3) + 2x \log(2))}}{2^{2x} \log(3)^2 \log(2)}$$

[In] integrate(4^x*3^(2^x),x, algorithm="giac")

[Out] (2^x*e^(2^x*log(3) + 2*x*log(2))*log(3) - e^(2^x*log(3) + 2*x*log(2)))/(2^(2*x)*log(3)^2*log(2))

Mupad [B] (verification not implemented)

Time = 15.86 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.67

$$\int 3^{2^x} 4^x dx = \frac{3^{2^x} (2^x \ln(3) - 1)}{\ln(2) \ln(3)^2}$$

[In] int(3^(2^x)*4^x,x)

[Out] (3^(2^x)*(2^x*log(3) - 1))/(log(2)*log(3)^2)

3.257

$$\int \frac{\cos(x) - \sin(x)}{2 + \sin(2x)} dx$$

| | |
|---|------|
| Optimal result | 2690 |
| Rubi [F] | 2690 |
| Mathematica [A] (verified) | 2691 |
| Maple [C] (verified) | 2691 |
| Fricas [B] (verification not implemented) | 2691 |
| Sympy [F] | 2692 |
| Maxima [F] | 2692 |
| Giac [B] (verification not implemented) | 2692 |
| Mupad [B] (verification not implemented) | 2692 |

Optimal result

Integrand size = 16, antiderivative size = 6

$$\int \frac{\cos(x) - \sin(x)}{2 + \sin(2x)} dx = \arctan(\cos(x) + \sin(x))$$

[Out] arctan(cos(x)+sin(x))

Rubi [F]

$$\int \frac{\cos(x) - \sin(x)}{2 + \sin(2x)} dx = \int \frac{\cos(x) - \sin(x)}{2 + \sin(2x)} dx$$

[In] Int[(Cos[x] - Sin[x])/(2 + Sin[2*x]),x]

[Out] Defer[Int][Cos[x]/(2 + Sin[2*x]), x] - Defer[Int][Sin[x]/(2 + Sin[2*x]), x]

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(\frac{\cos(x)}{2 + \sin(2x)} - \frac{\sin(x)}{2 + \sin(2x)} \right) dx \\ &= \int \frac{\cos(x)}{2 + \sin(2x)} dx - \int \frac{\sin(x)}{2 + \sin(2x)} dx \end{aligned}$$

Mathematica [A] (verified)

Time = 0.08 (sec) , antiderivative size = 6, normalized size of antiderivative = 1.00

$$\int \frac{\cos(x) - \sin(x)}{2 + \sin(2x)} dx = \arctan(\cos(x) + \sin(x))$$

[In] Integrate[(Cos[x] - Sin[x])/(2 + Sin[2*x]),x]

[Out] ArcTan[Cos[x] + Sin[x]]

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 0.49 (sec) , antiderivative size = 44, normalized size of antiderivative = 7.33

| method | result |
|---------|---|
| risch | $-\frac{i \ln(e^{2ix} + (1-i)e^{ix} + i)}{2} + \frac{i \ln(e^{2ix} + (-1+i)e^{ix} + i)}{2}$ |
| default | $\left(\frac{\sum_{R=\text{RootOf}(_Z^4 - 2_Z^3 + 2_Z^2 + 2_Z + 1)} \frac{(-_R^2 + 1) \ln(\tan(\frac{x}{2}) - _R)}{2_R^3 - 3_R^2 + 2_R + 1}}{2} \right) - \left(\frac{\sum_{R=\text{RootOf}(_Z^4 - 2_Z^3 + 2_Z^2 + 2_Z + 1)} \frac{(-_R^2 + 1) \ln(\tan(\frac{x}{2}) - _R)}{2_R^3 - 3_R^2 + 2_R + 1}}{2} \right)$ |
| parts | $\left(\frac{\sum_{R=\text{RootOf}(_Z^4 - 2_Z^3 + 2_Z^2 + 2_Z + 1)} \frac{(-_R^2 + 1) \ln(\tan(\frac{x}{2}) - _R)}{2_R^3 - 3_R^2 + 2_R + 1}}{2} \right) - \left(\frac{\sum_{R=\text{RootOf}(_Z^4 - 2_Z^3 + 2_Z^2 + 2_Z + 1)} \frac{(-_R^2 + 1) \ln(\tan(\frac{x}{2}) - _R)}{2_R^3 - 3_R^2 + 2_R + 1}}{2} \right)$ |

[In] int((cos(x)-sin(x))/(2+sin(2*x)),x,method=_RETURNVERBOSE)

[Out] -1/2*I*ln(exp(2*I*x)+(1-I)*exp(I*x)+I)+1/2*I*ln(exp(2*I*x)+(-1+I)*exp(I*x)+I)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. 2(6) = 12.

Time = 0.26 (sec) , antiderivative size = 15, normalized size of antiderivative = 2.50

$$\int \frac{\cos(x) - \sin(x)}{2 + \sin(2x)} dx = \frac{1}{2} \arctan \left(\frac{\cos(x) \sin(x)}{\cos(x) + \sin(x)} \right)$$

[In] integrate((cos(x)-sin(x))/(2+sin(2*x)),x, algorithm="fricas")

[Out] 1/2*arctan(cos(x)*sin(x)/(cos(x) + sin(x)))

Sympy [F]

$$\int \frac{\cos(x) - \sin(x)}{2 + \sin(2x)} dx = \int \frac{-\sin(x) + \cos(x)}{\sin(2x) + 2} dx$$

[In] integrate((cos(x)-sin(x))/(2+sin(2*x)),x)

[Out] Integral((-sin(x) + cos(x))/(sin(2*x) + 2), x)

Maxima [F]

$$\int \frac{\cos(x) - \sin(x)}{2 + \sin(2x)} dx = \int \frac{\cos(x) - \sin(x)}{\sin(2x) + 2} dx$$

[In] integrate((cos(x)-sin(x))/(2+sin(2*x)),x, algorithm="maxima")

[Out] integrate((cos(x) - sin(x))/(sin(2*x) + 2), x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 35 vs. 2(6) = 12.

Time = 0.28 (sec) , antiderivative size = 35, normalized size of antiderivative = 5.83

$$\int \frac{\cos(x) - \sin(x)}{2 + \sin(2x)} dx = \arctan\left(\frac{1}{2} \tan\left(\frac{1}{2}x\right)^3 - \frac{3}{2} \tan\left(\frac{1}{2}x\right)^2 + \frac{3}{2} \tan\left(\frac{1}{2}x\right) + \frac{1}{2}\right) - \arctan\left(\tan\left(\frac{1}{2}x\right) - 2\right)$$

[In] integrate((cos(x)-sin(x))/(2+sin(2*x)),x, algorithm="giac")

[Out] arctan(1/2*tan(1/2*x)^3 - 3/2*tan(1/2*x)^2 + 3/2*tan(1/2*x) + 1/2) - arctan(tan(1/2*x) - 2)

Mupad [B] (verification not implemented)

Time = 16.00 (sec) , antiderivative size = 35, normalized size of antiderivative = 5.83

$$\int \frac{\cos(x) - \sin(x)}{2 + \sin(2x)} dx = \operatorname{atan}\left(\frac{\tan\left(\frac{x}{2}\right)^3}{2} - \frac{3 \tan\left(\frac{x}{2}\right)^2}{2} + \frac{3 \tan\left(\frac{x}{2}\right)}{2} + \frac{1}{2}\right) - \operatorname{atan}\left(\tan\left(\frac{x}{2}\right) - 2\right)$$

[In] int((cos(x) - sin(x))/(sin(2*x) + 2),x)

[Out] atan((3*tan(x/2))/2 - (3*tan(x/2)^2)/2 + tan(x/2)^3/2 + 1/2) - atan(tan(x/2) - 2)

$$3.258 \quad \int \frac{\sec^2(1+\log(x)) - \tan(1+\log(x))}{x^2} dx$$

| | |
|---|------|
| Optimal result | 2693 |
| Rubi [C] (verified) | 2693 |
| Mathematica [B] (verified) | 2695 |
| Maple [C] (verified) | 2695 |
| Fricas [A] (verification not implemented) | 2695 |
| Sympy [F] | 2696 |
| Maxima [B] (verification not implemented) | 2696 |
| Giac [B] (verification not implemented) | 2696 |
| Mupad [F(-1)] | 2700 |

Optimal result

Integrand size = 19, antiderivative size = 9

$$\int \frac{\sec^2(1 + \log(x)) - \tan(1 + \log(x))}{x^2} dx = \frac{\tan(1 + \log(x))}{x}$$

[Out] tan(ln(x)+1)/x

Rubi [C] (verified)

Result contains higher order function than in optimal. Order 5 vs. order 3 in optimal.

Time = 0.08 (sec) , antiderivative size = 81, normalized size of antiderivative = 9.00, number of steps used = 7, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.263$, Rules used = {14, 4601, 371, 4591, 470}

$$\int \frac{\sec^2(1 + \log(x)) - \tan(1 + \log(x))}{x^2} dx = \frac{2i \operatorname{Hypergeometric2F1}\left(\frac{i}{2}, 1, 1 + \frac{i}{2}, -e^{2i}x^{2i}\right)}{x} - \left(\frac{4}{5} + \frac{8i}{5}\right) e^{2i}x^{-1+2i} \operatorname{Hypergeometric2F1}\left(1 + \frac{i}{2}, 2, 2 + \frac{i}{2}, -e^{2i}x^{2i}\right) - \frac{i}{x}$$

[In] Int[(Sec[1 + Log[x]]^2 - Tan[1 + Log[x]])/x^2,x]

[Out] (-I)/x + ((2*I)*Hypergeometric2F1[I/2, 1, 1 + I/2, -(E^(2*I)*x^(2*I))])/x - ((4/5 + (8*I)/5)*E^(2*I)*Hypergeometric2F1[1 + I/2, 2, 2 + I/2, -(E^(2*I)*x^(2*I))])/x^(1 - 2*I)

Rule 14

```
Int[(u_)*((c_)*(x_))^(m_), x_Symbol] := Int[ExpandIntegrand[(c*x)^m*u, x], x] /; FreeQ[{c, m}, x] && SumQ[u] && !LinearQ[u, x] && !MatchQ[u, (a_ + (b_)*(v_)) /; FreeQ[{a, b}, x] && InverseFunctionQ[v]]
```

Rule 371

```
Int[((c_)*(x_))^(m_)*((a_ + (b_)*(x_)^n)^(p_)), x_Symbol] := Simp[a^p*((c*x)^(m + 1)/(c*(m + 1)))*Hypergeometric2F1[-p, (m + 1)/n, (m + 1)/n + 1, (-b)*(x^n/a)], x] /; FreeQ[{a, b, c, m, n, p}, x] && !IGtQ[p, 0] && (ILtQ[p, 0] || GtQ[a, 0])
```

Rule 470

```
Int[((e_)*(x_))^(m_)*((a_ + (b_)*(x_)^n)^(p_))*((c_ + (d_)*(x_)^n), x_Symbol] := Simp[d*(e*x)^(m + 1)*((a + b*x^n)^(p + 1)/(b*e*(m + n*(p + 1) + 1))), x] - Dist[(a*d*(m + 1) - b*c*(m + n*(p + 1) + 1))/(b*(m + n*(p + 1) + 1)), Int[(e*x)^m*(a + b*x^n)^p, x], x] /; FreeQ[{a, b, c, d, e, m, n, p}, x] && NeQ[b*c - a*d, 0] && NeQ[m + n*(p + 1) + 1, 0]
```

Rule 4591

```
Int[((e_)*(x_))^(m_)*Tan[((a_ + Log[x_]*(b_))*(d_))]^(p_), x_Symbol] := Int[(e*x)^m*((1 - I*E^(2*I*a*d)*x^(2*I*b*d))/(1 + E^(2*I*a*d)*x^(2*I*b*d)))^p, x] /; FreeQ[{a, b, d, e, m, p}, x]
```

Rule 4601

```
Int[((e_)*(x_))^(m_)*Sec[((a_ + Log[x_]*(b_))*(d_))]^(p_), x_Symbol] := Dist[2^p*E^(I*a*d*p), Int[(e*x)^m*(x^(I*b*d*p))/(1 + E^(2*I*a*d)*x^(2*I*b*d))^p], x] /; FreeQ[{a, b, d, e, m}, x] && IntegerQ[p]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \left(\frac{\sec^2(1 + \log(x))}{x^2} - \frac{\tan(1 + \log(x))}{x^2} \right) dx \\
 &= \int \frac{\sec^2(1 + \log(x))}{x^2} dx - \int \frac{\tan(1 + \log(x))}{x^2} dx \\
 &= (4e^{2i}) \int \frac{x^{-2+2i}}{(1 + e^{2i}x^{2i})^2} dx - \int \frac{i - ie^{2i}x^{2i}}{(1 + e^{2i}x^{2i})x^2} dx \\
 &= -\frac{i}{x} - \left(\frac{4}{5} + \frac{8i}{5} \right) e^{2i} x^{-1+2i} \text{Hypergeometric2F1} \left(1 + \frac{i}{2}, 2, 2 + \frac{i}{2}, -e^{2i}x^{2i} \right) \\
 &\quad - 2i \int \frac{1}{(1 + e^{2i}x^{2i})x^2} dx
 \end{aligned}$$

$$= -\frac{i}{x} + \frac{2i \operatorname{Hypergeometric2F1}\left(\frac{i}{2}, 1, 1 + \frac{i}{2}, -e^{2i}x^{2i}\right)}{x} - \left(\frac{4}{5} + \frac{8i}{5}\right) e^{2i}x^{-1+2i} \operatorname{Hypergeometric2F1}\left(1 + \frac{i}{2}, 2, 2 + \frac{i}{2}, -e^{2i}x^{2i}\right)$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 21 vs. $2(9) = 18$.

Time = 0.88 (sec) , antiderivative size = 21, normalized size of antiderivative = 2.33

$$\int \frac{\sec^2(1 + \log(x)) - \tan(1 + \log(x))}{x^2} dx = \frac{\sec(1) \sec(1 + \log(x)) \sin(\log(x))}{x} + \frac{\tan(1)}{x}$$

[In] Integrate[(Sec[1 + Log[x]]^2 - Tan[1 + Log[x]])/x^2,x]

[Out] (Sec[1]*Sec[1 + Log[x]]*Sin[Log[x]])/x + Tan[1]/x

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 1.58 (sec) , antiderivative size = 28, normalized size of antiderivative = 3.11

| method | result | size |
|--------|---|------|
| risch | $-\frac{i}{x} + \frac{2i}{x(x^{2i}e^{2i}+1)}$ | 28 |

[In] int((sec(ln(x)+1)^2-tan(ln(x)+1))/x^2,x,method=_RETURNVERBOSE)

[Out] -I/x+2*I/x/((x^I)^2*exp(2*I)+1)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.78

$$\int \frac{\sec^2(1 + \log(x)) - \tan(1 + \log(x))}{x^2} dx = \frac{\sin(\log(x) + 1)}{x \cos(\log(x) + 1)}$$

[In] integrate((sec(log(x)+1)^2-tan(log(x)+1))/x^2,x, algorithm="fricas")

[Out] sin(log(x) + 1)/(x*cos(log(x) + 1))

Sympy [F]

$$\int \frac{\sec^2(1 + \log(x)) - \tan(1 + \log(x))}{x^2} dx = \int \frac{-\tan(\log(x) + 1) + \sec^2(\log(x) + 1)}{x^2} dx$$

[In] integrate((sec(ln(x)+1)**2-tan(ln(x)+1))/x**2,x)

[Out] Integral((-tan(log(x) + 1) + sec(log(x) + 1)**2)/x**2, x)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 45 vs. 2(9) = 18.

Time = 0.28 (sec) , antiderivative size = 45, normalized size of antiderivative = 5.00

$$\int \frac{\sec^2(1 + \log(x)) - \tan(1 + \log(x))}{x^2} dx$$

$$= \frac{2 \sin(2 \log(x) + 2)}{x \cos(2 \log(x) + 2)^2 + x \sin(2 \log(x) + 2)^2 + 2x \cos(2 \log(x) + 2) + x}$$

[In] integrate((sec(log(x)+1)^2-tan(log(x)+1))/x^2,x, algorithm="maxima")

[Out] 2*sin(2*log(x) + 2)/(x*cos(2*log(x) + 2)^2 + x*sin(2*log(x) + 2)^2 + 2*x*cos(2*log(x) + 2) + x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 5161 vs. 2(9) = 18.

Time = 1.84 (sec) , antiderivative size = 5161, normalized size of antiderivative = 573.44

$$\int \frac{\sec^2(1 + \log(x)) - \tan(1 + \log(x))}{x^2} dx = \text{Too large to display}$$

[In] integrate((sec(log(x)+1)^2-tan(log(x)+1))/x^2,x, algorithm="giac")

[Out] 1/4*(13*tan(1)^4*tan(log(x))^9/((tan(log(x))^2 - 1)*x) + 42*tan(1)^4*tan(log(x))^10/((tan(log(x))^2 - 1)^2*x) + 84*tan(1)^4*tan(log(x))^11/((tan(log(x))^2 - 1)^3*x) - 88*tan(1)^4*tan(log(x))^12/((tan(log(x))^2 - 1)^4*x) - 17*tan(1)^4*tan(log(x))^7/x - 4*tan(1)^3*tan(log(x))^8/x - 62*tan(1)^4*tan(log(x))^8/((tan(log(x))^2 - 1)*x) + 22*tan(1)^3*tan(log(x))^9/((tan(log(x))^2 - 1)*x) - 102*tan(1)^4*tan(log(x))^9/((tan(log(x))^2 - 1)^2*x) - 6*tan(1)^3*tan(log(x))^10/((tan(log(x))^2 - 1)^2*x) + 520*tan(1)^4*tan(log(x))^10/((tan(log(x))^2 - 1)^3*x) - 168*tan(1)^3*tan(log(x))^11/((tan(log(x))^2 - 1)^3*x) + 248*tan(1)^4*tan(log(x))^11/((tan(log(x))^2 - 1)^4*x) - 88*tan(1)^3*t

$$\begin{aligned}
& \text{an}(\log(x))^{\wedge}12/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) + 20*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}6/x - 22* \\
& \tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}7/x - 17*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}7/((\tan(\log(x))^{\wedge}2 - 1)*x \\
&) - 70*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)*x) - 740*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) + 17*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}9/((\tan(\log(x))^{\wedge}2 - 1)*x) + 488*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}9/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) - 548*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}9/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) - 56*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}10/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) + 40*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}10/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) + 560*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}10/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) + 36*\tan(1)^{\wedge}2* \\
& *\tan(\log(x))^{\wedge}11/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) - 256*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}11/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) + 32*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}12/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) - 22*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}5/x + 36*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}6/x + 326*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}6/((\tan(\log(x))^{\wedge}2 - 1)*x) - 17*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}7/x - 38 \\
& 8*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}7/((\tan(\log(x))^{\wedge}2 - 1)*x) + 150*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}7/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) - 4*\tan(1)*\tan(\log(x))^{\wedge}8/x + 64*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)*x) - 276*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) - 1256*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) + 6*\tan(1)*\tan(\log(x))^{\wedge}9/((\tan(\log(x))^{\wedge}2 - 1)*x) + 24*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}9/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) + 752*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}9/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) - 328*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}9/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) - 30*\tan(1)*\tan(\log(x))^{\wedge}10/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) - 528*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}10/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) + 24*\tan(1)*\tan(\log(x))^{\wedge}11/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) + 240* \\
& \tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}11/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) - 56*\tan(1)*\tan(\log(x))^{\wedge}12/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) - 40*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}4/x + 46*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}5/x - 137*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}5/((\tan(\log(x))^{\wedge}2 - 1)*x) - 8*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}6/x + 206*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}6/((\tan(\log(x))^{\wedge}2 - 1)*x) + 696*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}6/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) - 6*\tan(1)*\tan(\log(x))^{\wedge}7/x - 44*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}7/((\tan(\log(x))^{\wedge}2 - 1)*x) - 456*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}7/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) - 68*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}7/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) - 38*\tan(1)*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)*x) - 416*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) + 504*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) - 416*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) + 104*\tan(1)*\tan(\log(x))^{\wedge}9/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) - 432*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}9/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) - 2*\tan(\log(x))^{\wedge}10/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) - 88*\tan(1)*\tan(\log(x))^{\wedge}10/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) + 512*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}10/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) - 8*\tan(\log(x))^{\wedge}12/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) + 7*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}3/x + 8*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}4/x - 12 \\
& 2*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}4/((\tan(\log(x))^{\wedge}2 - 1)*x) - 33*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}5/x - 208*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}5/((\tan(\log(x))^{\wedge}2 - 1)*x) - 162*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}5/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) + 28*\tan(1)*\tan(\log(x))^{\wedge}6/x + 576*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}6/((\tan(\log(x))^{\wedge}2 - 1)*x) - 120*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}6/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) + 280*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}6/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) + 4*\tan(\log(x))^{\wedge}7/x - 196*\tan(1)*\tan(\log(x))^{\wedge}7/((\tan(\log(x))^{\wedge}2 - 1)*x) + 408*\tan(1)^{\wedge}2*\tan(\log(x))^{\wedge}7/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}2*x) + 448*\tan(1)^{\wedge}3*\tan(\log(x))^{\wedge}7/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}3*x) - 376*\tan(1)^{\wedge}4*\tan(\log(x))^{\wedge}7/((\tan(\log(x))^{\wedge}2 - 1)^{\wedge}4*x) - 2*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)*x) - 180*\tan(1)*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)*x) - 180*\tan(1)*\tan(\log(x))^{\wedge}8/((\tan(\log(x))^{\wedge}2 - 1)*x)
\end{aligned}$$

$$\begin{aligned}
&g(x))^8/((\tan(\log(x))^2 - 1)^2*x) - 2048*\tan(1)^2*\tan(\log(x))^8/((\tan(\log(x)))^2 - 1)^3*x) + 32*\tan(1)^3*\tan(\log(x))^8/((\tan(\log(x))^2 - 1)^4*x) + 30*\tan(\log(x))^9/((\tan(\log(x))^2 - 1)^2*x) + 496*\tan(1)*\tan(\log(x))^9/((\tan(\log(x))^2 - 1)^3*x) - 16*\tan(1)^2*\tan(\log(x))^9/((\tan(\log(x))^2 - 1)^4*x) - 8*\tan(\log(x))^10/((\tan(\log(x))^2 - 1)^3*x) - 528*\tan(1)*\tan(\log(x))^10/((\tan(\log(x))^2 - 1)^4*x) + 56*\tan(\log(x))^11/((\tan(\log(x))^2 - 1)^4*x) + 4*\tan(1)^4*\tan(\log(x))^2/x + 62*\tan(1)^3*\tan(\log(x))^3/x + 21*\tan(1)^4*\tan(\log(x))^3/((\tan(\log(x))^2 - 1)*x) - 144*\tan(1)^2*\tan(\log(x))^4/x + 238*\tan(1)^3*\tan(\log(x))^4/((\tan(\log(x))^2 - 1)*x) - 60*\tan(1)^4*\tan(\log(x))^4/((\tan(\log(x))^2 - 1)^2*x) + 62*\tan(1)*\tan(\log(x))^5/x - 378*\tan(1)^2*\tan(\log(x))^5/((\tan(\log(x))^2 - 1)*x) - 840*\tan(1)^3*\tan(\log(x))^5/((\tan(\log(x))^2 - 1)^2*x) + 52*\tan(1)^4*\tan(\log(x))^5/((\tan(\log(x))^2 - 1)^3*x) + 4*\tan(\log(x))^6/x + 238*\tan(1)*\tan(\log(x))^6/((\tan(\log(x))^2 - 1)*x) + 2352*\tan(1)^2*\tan(\log(x))^6/((\tan(\log(x))^2 - 1)^2*x) + 376*\tan(1)^3*\tan(\log(x))^6/((\tan(\log(x))^2 - 1)^3*x) - 48*\tan(1)^4*\tan(\log(x))^6/((\tan(\log(x))^2 - 1)^4*x) + 21*\tan(\log(x))^7/((\tan(\log(x))^2 - 1)*x) - 840*\tan(1)*\tan(\log(x))^7/((\tan(\log(x))^2 - 1)^2*x) + 88*\tan(1)^2*\tan(\log(x))^7/((\tan(\log(x))^2 - 1)^3*x) + 256*\tan(1)^3*\tan(\log(x))^7/((\tan(\log(x))^2 - 1)^4*x) - 60*\tan(\log(x))^8/((\tan(\log(x))^2 - 1)^2*x) + 376*\tan(1)*\tan(\log(x))^8/((\tan(\log(x))^2 - 1)^3*x) - 1088*\tan(1)^2*\tan(\log(x))^8/((\tan(\log(x))^2 - 1)^4*x) + 52*\tan(\log(x))^9/((\tan(\log(x))^2 - 1)^3*x) + 256*\tan(1)*\tan(\log(x))^9/((\tan(\log(x))^2 - 1)^4*x) - 48*\tan(\log(x))^10/((\tan(\log(x))^2 - 1)^4*x) - 4*\tan(1)^4*\tan(\log(x))/x - 28*\tan(1)^3*\tan(\log(x))^2/x + 2*\tan(1)^4*\tan(\log(x))^2/((\tan(\log(x))^2 - 1)*x) + 33*\tan(1)^2*\tan(\log(x))^3/x + 196*\tan(1)^3*\tan(\log(x))^3/((\tan(\log(x))^2 - 1)*x) - 30*\tan(1)^4*\tan(\log(x))^3/((\tan(\log(x))^2 - 1)^2*x) - 8*\tan(1)*\tan(\log(x))^4/x - 576*\tan(1)^2*\tan(\log(x))^4/((\tan(\log(x))^2 - 1)*x) + 180*\tan(1)^3*\tan(\log(x))^4/((\tan(\log(x))^2 - 1)^2*x) + 8*\tan(1)^4*\tan(\log(x))^4/((\tan(\log(x))^2 - 1)^3*x) - 7*\tan(\log(x))^5/x + 208*\tan(1)*\tan(\log(x))^5/((\tan(\log(x))^2 - 1)*x) - 408*\tan(1)^2*\tan(\log(x))^5/((\tan(\log(x))^2 - 1)^2*x) - 496*\tan(1)^3*\tan(\log(x))^5/((\tan(\log(x))^2 - 1)^3*x) - 56*\tan(1)^4*\tan(\log(x))^5/((\tan(\log(x))^2 - 1)^4*x) + 122*\tan(\log(x))^6/((\tan(\log(x))^2 - 1)*x) + 120*\tan(1)*\tan(\log(x))^6/((\tan(\log(x))^2 - 1)^2*x) + 2048*\tan(1)^2*\tan(\log(x))^6/((\tan(\log(x))^2 - 1)^3*x) + 528*\tan(1)^3*\tan(\log(x))^6/((\tan(\log(x))^2 - 1)^4*x) + 162*\tan(\log(x))^7/((\tan(\log(x))^2 - 1)^2*x) - 448*\tan(1)*\tan(\log(x))^7/((\tan(\log(x))^2 - 1)^3*x) + 16*\tan(1)^2*\tan(\log(x))^7/((\tan(\log(x))^2 - 1)^4*x) - 280*\tan(\log(x))^8/((\tan(\log(x))^2 - 1)^3*x) - 32*\tan(1)*\tan(\log(x))^8/((\tan(\log(x))^2 - 1)^4*x) + 376*\tan(\log(x))^9/((\tan(\log(x))^2 - 1)^4*x) - 6*\tan(1)^3*\tan(\log(x))/x - 8*\tan(1)^2*\tan(\log(x))^2/x - 38*\tan(1)^3*\tan(\log(x))^2/((\tan(\log(x))^2 - 1)*x) - 2*\tan(1)^4*\tan(\log(x))^2/((\tan(\log(x))^2 - 1)^2*x) + 46*\tan(1)*\tan(\log(x))^3/x - 44*\tan(1)^2*\tan(\log(x))^3/((\tan(\log(x))^2 - 1)*x) + 104*\tan(1)^3*\tan(\log(x))^3/((\tan(\log(x))^2 - 1)^2*x) - 40*\tan(\log(x))^4/x + 206*\tan(1)*\tan(\log(x))^4/((\tan(\log(x))^2 - 1)*x) - 416*\tan(1)^2*\tan(\log(x))^4/((\tan(\log(x))^2 - 1)^2*x) - 88*\tan(1)^3*\tan(\log(x))^4/((\tan(\log(x))^2 - 1)^3*x) - 8*\tan(1)^4*\tan(\log(x))^4/((\tan(\log(x))^2 - 1)^4*x) - 137*\tan(\log(x))^5/((\tan(\log(x))^2 - 1)*x) - 456*\tan
\end{aligned}$$

$$\begin{aligned}
& (1) \cdot \tan(\log(x))^5 / ((\tan(\log(x))^2 - 1)^{2x}) - 432 \cdot \tan(1)^2 \cdot \tan(\log(x))^5 / ((\tan(\log(x))^2 - 1)^{3x}) + 696 \cdot \tan(\log(x))^6 / ((\tan(\log(x))^2 - 1)^{2x}) + 504 \\
& \cdot \tan(1) \cdot \tan(\log(x))^6 / ((\tan(\log(x))^2 - 1)^{3x}) + 512 \cdot \tan(1)^2 \cdot \tan(\log(x))^6 / ((\tan(\log(x))^2 - 1)^{4x}) - 68 \cdot \tan(\log(x))^7 / ((\tan(\log(x))^2 - 1)^{3x}) - \\
& 416 \cdot \tan(\log(x))^8 / ((\tan(\log(x))^2 - 1)^{4x}) + 4 \cdot \tan(1)^3 / x + 17 \cdot \tan(1)^2 \cdot \tan(\log(x)) / x - 6 \cdot \tan(1)^3 \cdot \tan(\log(x)) / ((\tan(\log(x))^2 - 1) \cdot x) - 36 \cdot \tan(1) \cdot \tan(\log(x))^2 / x - 64 \cdot \tan(1)^2 \cdot \tan(\log(x))^2 / ((\tan(\log(x))^2 - 1) \cdot x) + 30 \cdot \tan(1)^3 \cdot \tan(\log(x))^2 / ((\tan(\log(x))^2 - 1)^{2x}) + 22 \cdot \tan(\log(x))^3 / x + 388 \cdot \tan(1) \cdot \tan(\log(x))^3 / ((\tan(\log(x))^2 - 1) \cdot x) - 24 \cdot \tan(1)^2 \cdot \tan(\log(x))^3 / ((\tan(\log(x))^2 - 1)^{2x}) - 24 \cdot \tan(1)^3 \cdot \tan(\log(x))^3 / ((\tan(\log(x))^2 - 1)^{3x}) - 326 \cdot \tan(\log(x))^4 / ((\tan(\log(x))^2 - 1) \cdot x) + 276 \cdot \tan(1) \cdot \tan(\log(x))^4 / ((\tan(\log(x))^2 - 1)^{2x}) + 56 \cdot \tan(1)^3 \cdot \tan(\log(x))^4 / ((\tan(\log(x))^2 - 1)^{4x}) - 150 \cdot \tan(\log(x))^5 / ((\tan(\log(x))^2 - 1)^{2x}) - 752 \cdot \tan(1) \cdot \tan(\log(x))^5 / ((\tan(\log(x))^2 - 1)^{3x}) - 240 \cdot \tan(1)^2 \cdot \tan(\log(x))^5 / ((\tan(\log(x))^2 - 1)^{4x}) + 1256 \cdot \tan(\log(x))^6 / ((\tan(\log(x))^2 - 1)^{3x}) + 528 \cdot \tan(1) \cdot \tan(\log(x))^6 / ((\tan(\log(x))^2 - 1)^{4x}) + 328 \cdot \tan(\log(x))^7 / ((\tan(\log(x))^2 - 1)^{4x}) - 22 \cdot \tan(1) \cdot \tan(\log(x)) / x + 17 \cdot \tan(1)^2 \cdot \tan(\log(x)) / ((\tan(\log(x))^2 - 1) \cdot x) + 20 \cdot \tan(\log(x))^2 / x - 70 \cdot \tan(1) \cdot \tan(\log(x))^2 / ((\tan(\log(x))^2 - 1) \cdot x) - 56 \cdot \tan(1)^2 \cdot \tan(\log(x))^2 / ((\tan(\log(x))^2 - 1)^{2x}) - 17 \cdot \tan(\log(x))^3 / ((\tan(\log(x))^2 - 1) \cdot x) + 488 \cdot \tan(1) \cdot \tan(\log(x))^3 / ((\tan(\log(x))^2 - 1)^{2x}) + 36 \cdot \tan(1)^2 \cdot \tan(\log(x))^3 / ((\tan(\log(x))^2 - 1)^{3x}) - 740 \cdot \tan(\log(x))^4 / ((\tan(\log(x))^2 - 1)^{2x}) + 40 \cdot \tan(1) \cdot \tan(\log(x))^4 / ((\tan(\log(x))^2 - 1)^{3x}) + 32 \cdot \tan(1)^2 \cdot \tan(\log(x))^4 / ((\tan(\log(x))^2 - 1)^{4x}) - 548 \cdot \tan(\log(x))^5 / ((\tan(\log(x))^2 - 1)^{3x}) - 256 \cdot \tan(1) \cdot \tan(\log(x))^5 / ((\tan(\log(x))^2 - 1)^{4x}) + 560 \cdot \tan(\log(x))^6 / ((\tan(\log(x))^2 - 1)^{4x}) + 4 \cdot \tan(1) / x + 17 \cdot \tan(\log(x)) / x - 22 \cdot \tan(1) \cdot \tan(\log(x)) / ((\tan(\log(x))^2 - 1) \cdot x) + 62 \cdot \tan(\log(x))^2 / ((\tan(\log(x))^2 - 1) \cdot x) + 6 \cdot \tan(1) \cdot \tan(\log(x))^2 / ((\tan(\log(x))^2 - 1)^{2x}) + 102 \cdot \tan(\log(x))^3 / ((\tan(\log(x))^2 - 1)^{2x}) + 168 \cdot \tan(1) \cdot \tan(\log(x))^3 / ((\tan(\log(x))^2 - 1)^{3x}) - 520 \cdot \tan(\log(x))^4 / ((\tan(\log(x))^2 - 1)^{3x}) + 88 \cdot \tan(1) \cdot \tan(\log(x))^4 / ((\tan(\log(x))^2 - 1)^{4x}) - 248 \cdot \tan(\log(x))^5 / ((\tan(\log(x))^2 - 1)^{4x}) + 13 \cdot \tan(\log(x)) / ((\tan(\log(x))^2 - 1) \cdot x) + 42 \cdot \tan(\log(x))^2 / ((\tan(\log(x))^2 - 1)^{2x}) + 84 \cdot \tan(\log(x))^3 / ((\tan(\log(x))^2 - 1)^{3x}) - 88 \cdot \tan(\log(x))^4 / ((\tan(\log(x))^2 - 1)^{4x}) / (\tan(1)^4 \cdot \tan(\log(x))^8 + 8 \cdot \tan(1)^4 \cdot \tan(\log(x))^{10} / (\tan(\log(x))^2 - 1)^2 + 16 \cdot \tan(1)^4 \cdot \tan(\log(x))^{12} / (\tan(\log(x))^2 - 1)^4 + 3 \cdot \tan(1)^4 \cdot \tan(\log(x))^6 - 2 \cdot \tan(1)^3 \cdot \tan(\log(x))^7 + \tan(1)^2 \cdot \tan(\log(x))^8 + 24 \cdot \tan(1)^4 \cdot \tan(\log(x))^8 / (\tan(\log(x))^2 - 1)^2 - 16 \cdot \tan(1)^3 \cdot \tan(\log(x))^9 / (\tan(\log(x))^2 - 1)^2 + 8 \cdot \tan(1)^2 \cdot \tan(\log(x))^{10} / (\tan(\log(x))^2 - 1)^2 + 48 \cdot \tan(1)^4 \cdot \tan(\log(x))^{10} / (\tan(\log(x))^2 - 1)^4 - 32 \cdot \tan(1)^3 \cdot \tan(\log(x))^{11} / (\tan(\log(x))^2 - 1)^4 + 16 \cdot \tan(1)^2 \cdot \tan(\log(x))^{12} / (\tan(\log(x))^2 - 1)^4 + 3 \cdot \tan(1)^4 \cdot \tan(\log(x))^4 - 6 \cdot \tan(1)^3 \cdot \tan(\log(x))^5 + 4 \cdot \tan(1)^2 \cdot \tan(\log(x))^6 + 24 \cdot \tan(1)^4 \cdot \tan(\log(x))^6 / (\tan(\log(x))^2 - 1)^2 - 2 \cdot \tan(1) \cdot \tan(\log(x))^7 - 48 \cdot \tan(1)^3 \cdot \tan(\log(x))^7 / (\tan(\log(x))^2 - 1)^2 + 32 \cdot \tan(1)^2 \cdot \tan(\log(x))^8 / (\tan(\log(x))^2 - 1)^2 + 48 \cdot \tan(1)^4 \cdot \tan(\log(x))^8 / (\tan(\log(x))^2 - 1)^4 - 16 \cdot \tan(1) \cdot \tan(\log(x))^9 / (\tan(\log(x))^2 - 1)^2 - 96 \cdot \tan(1)^3 \cdot \tan(\log(x))^9 / (\tan(\log(x))^2 - 1)^4 + 64 \cdot \tan(1)^2 \cdot \tan(\log(x))
\end{aligned}$$

$(x)^{10}/(\tan(\log(x))^2 - 1)^4 - 32*\tan(1)*\tan(\log(x))^{11}/(\tan(\log(x))^2 - 1)^4 + \tan(1)^4*\tan(\log(x))^2 - 6*\tan(1)^3*\tan(\log(x))^3 + 6*\tan(1)^2*\tan(\log(x))^4 + 8*\tan(1)^4*\tan(\log(x))^4/(\tan(\log(x))^2 - 1)^2 - 6*\tan(1)*\tan(\log(x))^5 - 48*\tan(1)^3*\tan(\log(x))^5/(\tan(\log(x))^2 - 1)^2 + 48*\tan(1)^2*\tan(\log(x))^6/(\tan(\log(x))^2 - 1)^2 + 16*\tan(1)^4*\tan(\log(x))^6/(\tan(\log(x))^2 - 1)^4 + \tan(\log(x))^6 - 48*\tan(1)*\tan(\log(x))^7/(\tan(\log(x))^2 - 1)^2 - 96*\tan(1)^3*\tan(\log(x))^7/(\tan(\log(x))^2 - 1)^4 + 8*\tan(\log(x))^8/(\tan(\log(x))^2 - 1)^2 + 96*\tan(1)^2*\tan(\log(x))^8/(\tan(\log(x))^2 - 1)^4 - 96*\tan(1)*\tan(\log(x))^9/(\tan(\log(x))^2 - 1)^4 + 16*\tan(\log(x))^{10}/(\tan(\log(x))^2 - 1)^4 - 2*\tan(1)^3*\tan(\log(x)) + 4*\tan(1)^2*\tan(\log(x))^2 - 6*\tan(1)*\tan(\log(x))^3 - 16*\tan(1)^3*\tan(\log(x))^3/(\tan(\log(x))^2 - 1)^2 + 32*\tan(1)^2*\tan(\log(x))^4/(\tan(\log(x))^2 - 1)^2 + 3*\tan(\log(x))^4 - 48*\tan(1)*\tan(\log(x))^5/(\tan(\log(x))^2 - 1)^2 - 32*\tan(1)^3*\tan(\log(x))^5/(\tan(\log(x))^2 - 1)^4 + 24*\tan(\log(x))^6/(\tan(\log(x))^2 - 1)^2 + 64*\tan(1)^2*\tan(\log(x))^6/(\tan(\log(x))^2 - 1)^4 - 96*\tan(1)*\tan(\log(x))^7/(\tan(\log(x))^2 - 1)^4 + 48*\tan(\log(x))^8/(\tan(\log(x))^2 - 1)^4 + \tan(1)^2 - 2*\tan(1)*\tan(\log(x)) + 8*\tan(1)^2*\tan(\log(x))^2/(\tan(\log(x))^2 - 1)^2 + 3*\tan(\log(x))^2 - 16*\tan(1)*\tan(\log(x))^3/(\tan(\log(x))^2 - 1)^2 + 24*\tan(\log(x))^4/(\tan(\log(x))^2 - 1)^2 + 16*\tan(1)^2*\tan(\log(x))^4/(\tan(\log(x))^2 - 1)^4 - 32*\tan(1)*\tan(\log(x))^5/(\tan(\log(x))^2 - 1)^4 + 48*\tan(\log(x))^6/(\tan(\log(x))^2 - 1)^4 + 8*\tan(\log(x))^2/(\tan(\log(x))^2 - 1)^2 + 16*\tan(\log(x))^4/(\tan(\log(x))^2 - 1)^4 + 1)$

Mupad [F(-1)]

Timed out.

$$\int \frac{\sec^2(1 + \log(x)) - \tan(1 + \log(x))}{x^2} dx = \int -\frac{\tan(\ln(x) + 1) - \frac{1}{\cos(\ln(x)+1)^2}}{x^2} dx$$

[In] int(-(tan(log(x) + 1) - 1/cos(log(x) + 1)^2)/x^2,x)

[Out] int(-(tan(log(x) + 1) - 1/cos(log(x) + 1)^2)/x^2, x)

$$3.259 \quad \int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx$$

| | |
|----------------------------|------|
| Optimal result | 2701 |
| Rubi [A] (verified) | 2701 |
| Mathematica [A] (verified) | 2703 |
| Maple [F] | 2703 |
| Fricas [F(-2)] | 2703 |
| Sympy [F] | 2704 |
| Maxima [F] | 2704 |
| Giac [F] | 2704 |
| Mupad [F(-1)] | 2704 |

Optimal result

Integrand size = 12, antiderivative size = 67

$$\int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx = 2x\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} - \frac{\sqrt{2\pi}\operatorname{erf}\left(\frac{\sqrt{\log\left(\frac{1}{x}\right)}}{\sqrt{2}}\right)\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}}}{\sqrt{\frac{1}{x}}\sqrt{\log\left(\frac{1}{x}\right)}}$$

[Out] $2*x*(\ln(1/x)/x)^{(1/2)}-2^{(1/2)}*\pi^{(1/2)}*\operatorname{erf}\left(\frac{1}{2}*\ln(1/x)^{(1/2)}*2^{(1/2)}\right)*(\ln(1/x)/x)^{(1/2)}/(1/x)^{(1/2)}/\ln(1/x)^{(1/2)}$

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 67, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.417$, Rules used = {6851, 2342, 2347, 2211, 2236}

$$\int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx = 2x\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} - \frac{\sqrt{2\pi}\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}}\operatorname{erf}\left(\frac{\sqrt{\log\left(\frac{1}{x}\right)}}{\sqrt{2}}\right)}{\sqrt{\frac{1}{x}}\sqrt{\log\left(\frac{1}{x}\right)}}$$

[In] $\operatorname{Int}\left[\operatorname{Sqrt}\left[\operatorname{Log}\left[x^{(-1)}\right]/x\right], x\right]$

[Out] $2*x*\operatorname{Sqrt}\left[\operatorname{Log}\left[x^{(-1)}\right]/x\right] - \left(\operatorname{Sqrt}\left[2*\pi\right]*\operatorname{Erf}\left[\operatorname{Sqrt}\left[\operatorname{Log}\left[x^{(-1)}\right]\right]/\operatorname{Sqrt}\left[2\right]\right)*\operatorname{Sqrt}\left[\operatorname{Log}\left[x^{(-1)}\right]/x\right]/\left(\operatorname{Sqrt}\left[x^{(-1)}\right]*\operatorname{Sqrt}\left[\operatorname{Log}\left[x^{(-1)}\right]\right]\right)$

Rule 2211

$\operatorname{Int}\left[\left(F_{-}\right)^{\left(\left(g_{-}\right)*\left(e_{-}\right)+\left(f_{-}\right)*\left(x_{-}\right)\right)}/\operatorname{Sqrt}\left[\left(c_{-}\right)+\left(d_{-}\right)*\left(x_{-}\right)\right], x_{\text{Symbol}}\right] :$
 $> \operatorname{Dist}\left[2/d, \operatorname{Subst}\left[\operatorname{Int}\left[F^{\left(g*(e - c*(f/d)) + f*g*(x^2/d)\right)}, x\right], x, \operatorname{Sqrt}\left[c + d*x\right]\right]$

x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !TrueQ[\$UseGamma]

Rule 2236

Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))²), x_Symbol] := Simp[F^a*Sqrt[Pi]*(Erf[(c + d*x)*Rt[(-b)*Log[F], 2]]/(2*d*Rt[(-b)*Log[F], 2])), x] /; FreeQ[{F, a, b, c, d}, x] && NegQ[b]

Rule 2342

Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*((d_.)*(x_))^(m_.), x_Symbol] := Simp[(d*x)^(m + 1)*((a + b*Log[c*x^n])^p/(d*(m + 1))), x] - Dist[b*n*(p/(m + 1)), Int[(d*x)^m*(a + b*Log[c*x^n])^(p - 1), x], x] /; FreeQ[{a, b, c, d, m, n}, x] && NeQ[m, -1] && GtQ[p, 0]

Rule 2347

Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*((d_.)*(x_))^(m_.), x_Symbol] := Dist[(d*x)^(m + 1)/(d*n*(c*x^n)^(m + 1)/n), Subst[Int[E^(((m + 1)/n)*x)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, d, m, n, p}, x]

Rule 6851

Int[(u_.)*((a_.)*(v_)^(m_.)*(w_)^(n_.))^(p_), x_Symbol] := Dist[a^IntPart[p]*((a*v^m*w^n)^FracPart[p]/(v^(m*FracPart[p])*w^(n*FracPart[p]))), Int[u*v^(m*p)*w^(n*p), x], x] /; FreeQ[{a, m, n, p}, x] && !IntegerQ[p] && !FreeQ[v, x] && !FreeQ[w, x]

Rubi steps

$$\begin{aligned}
 \text{integral} &= \frac{\left(\sqrt{x}\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}}\right) \int \frac{\sqrt{\log\left(\frac{1}{x}\right)}}{\sqrt{x}} dx}{\sqrt{\log\left(\frac{1}{x}\right)}} \\
 &= 2x\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} + \frac{\left(\sqrt{x}\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}}\right) \int \frac{1}{\sqrt{x}\sqrt{\log\left(\frac{1}{x}\right)}} dx}{\sqrt{\log\left(\frac{1}{x}\right)}} \\
 &= 2x\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} - \frac{\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} \text{Subst}\left(\int \frac{e^{-x/2}}{\sqrt{x}} dx, x, \log\left(\frac{1}{x}\right)\right)}{\sqrt{\frac{1}{x}}\sqrt{\log\left(\frac{1}{x}\right)}} \\
 &= 2x\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} - \frac{\left(2\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}}\right) \text{Subst}\left(\int e^{-\frac{x}{2}} dx, x, \sqrt{\log\left(\frac{1}{x}\right)}\right)}{\sqrt{\frac{1}{x}}\sqrt{\log\left(\frac{1}{x}\right)}}
 \end{aligned}$$

$$= 2x\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} - \frac{\sqrt{2\pi}\operatorname{erf}\left(\frac{\sqrt{\log\left(\frac{1}{x}\right)}}{\sqrt{2}}\right)\sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}}}{\sqrt{\frac{1}{x}}\sqrt{\log\left(\frac{1}{x}\right)}}$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 56, normalized size of antiderivative = 0.84

$$\int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx = \left(2x - \frac{\sqrt{2\pi}\operatorname{erf}\left(\frac{\sqrt{\log\left(\frac{1}{x}\right)}}{\sqrt{2}}\right)}{\sqrt{\frac{1}{x}}\sqrt{\log\left(\frac{1}{x}\right)}} \right) \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}}$$

[In] Integrate[Sqrt[Log[x^(-1)]/x],x]

[Out] (2*x - (Sqrt[2*Pi]*Erf[Sqrt[Log[x^(-1)]]/Sqrt[2]])/(Sqrt[x^(-1)]*Sqrt[Log[x^(-1)]]))*Sqrt[Log[x^(-1)]/x]

Maple [F]

$$\int \sqrt{\frac{\ln\left(\frac{1}{x}\right)}{x}} dx$$

[In] int((ln(1/x)/x)^(1/2),x)

[Out] int((ln(1/x)/x)^(1/2),x)

Fricas [F(-2)]

Exception generated.

$$\int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx = \text{Exception raised: TypeError}$$

[In] integrate((log(1/x)/x)^(1/2),x, algorithm="fricas")

[Out] Exception raised: TypeError >> Error detected within library code: integrate: implementation incomplete (constant residues)

Sympy [F]

$$\int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx = \int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx$$

```
[In] integrate((ln(1/x)/x)**(1/2),x)
```

```
[Out] Integral(sqrt(log(1/x)/x), x)
```

Maxima [F]

$$\int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx = \int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx$$

```
[In] integrate((log(1/x)/x)^(1/2),x, algorithm="maxima")
```

```
[Out] integrate(sqrt(-log(x)/x), x)
```

Giac [F]

$$\int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx = \int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx$$

```
[In] integrate((log(1/x)/x)^(1/2),x, algorithm="giac")
```

```
[Out] integrate(sqrt(log(1/x)/x), x)
```

Mupad [F(-1)]

Timed out.

$$\int \sqrt{\frac{\log\left(\frac{1}{x}\right)}{x}} dx = \int \sqrt{\frac{\ln\left(\frac{1}{x}\right)}{x}} dx$$

```
[In] int((log(1/x)/x)^(1/2),x)
```

```
[Out] int((log(1/x)/x)^(1/2), x)
```

3.260 $\int (1 - \cos(x))^5 \cos(5x) dx$

| | |
|---|------|
| Optimal result | 2705 |
| Rubi [A] (verified) | 2705 |
| Mathematica [A] (verified) | 2707 |
| Maple [A] (verified) | 2707 |
| Fricas [A] (verification not implemented) | 2708 |
| Sympy [B] (verification not implemented) | 2708 |
| Maxima [A] (verification not implemented) | 2710 |
| Giac [A] (verification not implemented) | 2710 |
| Mupad [B] (verification not implemented) | 2710 |

Optimal result

Integrand size = 13, antiderivative size = 84

$$\int (1 - \cos(x))^5 \cos(5x) dx = -\frac{x}{32} + \frac{5 \sin(x)}{16} - \frac{45}{64} \sin(2x) + \frac{5}{4} \sin(3x) - \frac{105}{64} \sin(4x) + \frac{63}{40} \sin(5x) - \frac{35}{32} \sin(6x) + \frac{15}{28} \sin(7x) - \frac{45}{256} \sin(8x) + \frac{5}{144} \sin(9x) - \frac{1}{320} \sin(10x)$$

[Out] $-1/32*x+5/16*\sin(x)-45/64*\sin(2*x)+5/4*\sin(3*x)-105/64*\sin(4*x)+63/40*\sin(5*x)-35/32*\sin(6*x)+15/28*\sin(7*x)-45/256*\sin(8*x)+5/144*\sin(9*x)-1/320*\sin(10*x)$

Rubi [A] (verified)

Time = 0.25 (sec) , antiderivative size = 84, normalized size of antiderivative = 1.00, number of steps used = 29, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.308$, Rules used = {4486, 2717, 4368, 4439}

$$\int (1 - \cos(x))^5 \cos(5x) dx = -\frac{x}{32} + \frac{5 \sin(x)}{16} - \frac{45}{64} \sin(2x) + \frac{5}{4} \sin(3x) - \frac{105}{64} \sin(4x) + \frac{63}{40} \sin(5x) - \frac{35}{32} \sin(6x) + \frac{15}{28} \sin(7x) - \frac{45}{256} \sin(8x) + \frac{5}{144} \sin(9x) - \frac{1}{320} \sin(10x)$$

[In] $\text{Int}[(1 - \text{Cos}[x])^5 * \text{Cos}[5*x], x]$

[Out] $-1/32*x + (5*\text{Sin}[x])/16 - (45*\text{Sin}[2*x])/64 + (5*\text{Sin}[3*x])/4 - (105*\text{Sin}[4*x])/64 + (63*\text{Sin}[5*x])/40 - (35*\text{Sin}[6*x])/32 + (15*\text{Sin}[7*x])/28 - (45*\text{Sin}[8*x])/256 + (5*\text{Sin}[9*x])/144 - \text{Sin}[10*x]/320$

Rule 2717

```
Int[sin[Pi/2 + (c_.) + (d_.)*(x_)], x_Symbol] := Simp[Sin[c + d*x]/d, x] /;
FreeQ[{c, d}, x]
```

Rule 4368

```
Int[cos[(a_.) + (b_.)*(x_)]*cos[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[Sin[
a - c + (b - d)*x]/(2*(b - d)), x] + Simp[Sin[a + c + (b + d)*x]/(2*(b + d)
), x] /; FreeQ[{a, b, c, d}, x] && NeQ[b^2 - d^2, 0]
```

Rule 4439

```
Int[(F_)[(a_.) + (b_.)*(x_)]^(p_.)*(G_)[(c_.) + (d_.)*(x_)]^(q_.), x_Symbol
] := Int[ExpandTrigReduce[ActivateTrig[F[a + b*x]^p*G[c + d*x]^q], x], x] /;
FreeQ[{a, b, c, d}, x] && (EqQ[F, sin] || EqQ[F, cos]) && (EqQ[G, sin] ||
EqQ[G, cos]) && IGtQ[p, 0] && IGtQ[q, 0]
```

Rule 4486

```
Int[u_, x_Symbol] := With[{v = ExpandTrig[u, x]}, Int[v, x] /; SumQ[v]] /;
!InertTrigFreeQ[u]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int (\cos(5x) - 5 \cos(x) \cos(5x) + 10 \cos^2(x) \cos(5x) - 10 \cos^3(x) \cos(5x) \\
&\quad + 5 \cos^4(x) \cos(5x) - \cos^5(x) \cos(5x)) dx \\
&= -(5 \int \cos(x) \cos(5x) dx) + 5 \int \cos^4(x) \cos(5x) dx + 10 \int \cos^2(x) \cos(5x) dx \\
&\quad - 10 \int \cos^3(x) \cos(5x) dx + \int \cos(5x) dx - \int \cos^5(x) \cos(5x) dx \\
&= -\frac{5}{8} \sin(4x) + \frac{1}{5} \sin(5x) - \frac{5}{12} \sin(6x) \\
&\quad + 5 \int \left(\frac{\cos(x)}{16} + \frac{1}{4} \cos(3x) + \frac{3}{8} \cos(5x) + \frac{1}{4} \cos(7x) + \frac{1}{16} \cos(9x) \right) dx \\
&\quad + 10 \int \left(\frac{1}{4} \cos(3x) + \frac{1}{2} \cos(5x) + \frac{1}{4} \cos(7x) \right) dx \\
&\quad - 10 \int \left(\frac{1}{8} \cos(2x) + \frac{3}{8} \cos(4x) + \frac{3}{8} \cos(6x) + \frac{1}{8} \cos(8x) \right) dx \\
&\quad - \int \left(\frac{1}{32} + \frac{5}{32} \cos(2x) + \frac{5}{16} \cos(4x) + \frac{5}{16} \cos(6x) + \frac{5}{32} \cos(8x) + \frac{1}{32} \cos(10x) \right) dx
\end{aligned}$$

$$\begin{aligned}
&= -\frac{x}{32} - \frac{5}{8} \sin(4x) + \frac{1}{5} \sin(5x) - \frac{5}{12} \sin(6x) - \frac{1}{32} \int \cos(10x) dx \\
&\quad - \frac{5}{32} \int \cos(2x) dx - \frac{5}{32} \int \cos(8x) dx + \frac{5}{16} \int \cos(x) dx - \frac{5}{16} \int \cos(4x) dx \\
&\quad - \frac{5}{16} \int \cos(6x) dx + \frac{5}{16} \int \cos(9x) dx - \frac{5}{4} \int \cos(2x) dx + \frac{5}{4} \int \cos(3x) dx \\
&\quad + \frac{5}{4} \int \cos(7x) dx - \frac{5}{4} \int \cos(8x) dx + \frac{15}{8} \int \cos(5x) dx + \frac{5}{2} \int \cos(3x) dx \\
&\quad + \frac{5}{2} \int \cos(7x) dx - \frac{15}{4} \int \cos(4x) dx - \frac{15}{4} \int \cos(6x) dx + 5 \int \cos(5x) dx \\
&= -\frac{x}{32} + \frac{5 \sin(x)}{16} - \frac{45}{64} \sin(2x) + \frac{5}{4} \sin(3x) - \frac{105}{64} \sin(4x) + \frac{63}{40} \sin(5x) \\
&\quad - \frac{35}{32} \sin(6x) + \frac{15}{28} \sin(7x) - \frac{45}{256} \sin(8x) + \frac{5}{144} \sin(9x) - \frac{1}{320} \sin(10x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.10 (sec) , antiderivative size = 84, normalized size of antiderivative = 1.00

$$\begin{aligned}
\int (1 - \cos(x))^5 \cos(5x) dx &= -\frac{x}{32} + \frac{5 \sin(x)}{16} - \frac{45}{64} \sin(2x) + \frac{5}{4} \sin(3x) \\
&\quad - \frac{105}{64} \sin(4x) + \frac{63}{40} \sin(5x) - \frac{35}{32} \sin(6x) + \frac{15}{28} \sin(7x) \\
&\quad - \frac{45}{256} \sin(8x) + \frac{5}{144} \sin(9x) - \frac{1}{320} \sin(10x)
\end{aligned}$$

[In] Integrate[(1 - Cos[x])^5*Cos[5*x],x]

[Out] -1/32*x + (5*Sin[x])/16 - (45*Sin[2*x])/64 + (5*Sin[3*x])/4 - (105*Sin[4*x])/64 + (63*Sin[5*x])/40 - (35*Sin[6*x])/32 + (15*Sin[7*x])/28 - (45*Sin[8*x])/256 + (5*Sin[9*x])/144 - Sin[10*x]/320

Maple [A] (verified)

Time = 1.30 (sec) , antiderivative size = 63, normalized size of antiderivative = 0.75

| method | result |
|---------------|--|
| default | $-\frac{x}{32} + \frac{5 \sin(x)}{16} - \frac{45 \sin(2x)}{64} + \frac{5 \sin(3x)}{4} - \frac{105 \sin(4x)}{64} + \frac{63 \sin(5x)}{40} - \frac{35 \sin(6x)}{32} + \frac{15 \sin(7x)}{28} - \frac{45 \sin(8x)}{256} + \frac{5 \sin(9x)}{144} - \frac{\sin(10x)}{320}$ |
| risch | $-\frac{x}{32} + \frac{5 \sin(x)}{16} - \frac{45 \sin(2x)}{64} + \frac{5 \sin(3x)}{4} - \frac{105 \sin(4x)}{64} + \frac{63 \sin(5x)}{40} - \frac{35 \sin(6x)}{32} + \frac{15 \sin(7x)}{28} - \frac{45 \sin(8x)}{256} + \frac{5 \sin(9x)}{144} - \frac{\sin(10x)}{320}$ |
| parallelrisch | $-\frac{x}{32} + \frac{5 \sin(x)}{16} - \frac{45 \sin(2x)}{64} + \frac{5 \sin(3x)}{4} - \frac{105 \sin(4x)}{64} + \frac{63 \sin(5x)}{40} - \frac{35 \sin(6x)}{32} + \frac{15 \sin(7x)}{28} - \frac{45 \sin(8x)}{256} + \frac{5 \sin(9x)}{144} - \frac{\sin(10x)}{320}$ |
| parts | $-\frac{x}{32} + \frac{5 \sin(x)}{16} - \frac{45 \sin(2x)}{64} + \frac{5 \sin(3x)}{4} - \frac{105 \sin(4x)}{64} + \frac{63 \sin(5x)}{40} - \frac{35 \sin(6x)}{32} + \frac{15 \sin(7x)}{28} - \frac{45 \sin(8x)}{256} + \frac{5 \sin(9x)}{144} - \frac{\sin(10x)}{320}$ |

```
[In] int((1-cos(x))^5*cos(5*x),x,method=_RETURNVERBOSE)
```

```
[Out] -1/32*x+5/16*sin(x)-45/64*sin(2*x)+5/4*sin(3*x)-105/64*sin(4*x)+63/40*sin(5*x)-35/32*sin(6*x)+15/28*sin(7*x)-45/256*sin(8*x)+5/144*sin(9*x)-1/320*sin(10*x)
```

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 62, normalized size of antiderivative = 0.74

$$\int (1 - \cos(x))^5 \cos(5x) dx =$$

$$-\frac{1}{10080} (16128 \cos(x)^9 - 89600 \cos(x)^8 + 194544 \cos(x)^7 - 188800 \cos(x)^6 + 33768 \cos(x)^5 + 93984 \cos(x)^4 - 83790 \cos(x)^3 + 24512 \cos(x)^2 + 315 \cos(x) - 1376) \sin(x) - \frac{1}{32} x$$

```
[In] integrate((1-cos(x))^5*cos(5*x),x, algorithm="fricas")
```

```
[Out] -1/10080*(16128*cos(x)^9 - 89600*cos(x)^8 + 194544*cos(x)^7 - 188800*cos(x)^6 + 33768*cos(x)^5 + 93984*cos(x)^4 - 83790*cos(x)^3 + 24512*cos(x)^2 + 315*cos(x) - 1376)*sin(x) - 1/32*x
```

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 394 vs. $2(83) = 166$.

Time = 4.27 (sec) , antiderivative size = 394, normalized size of antiderivative = 4.69

$$\begin{aligned}
 \int (1 - \cos(x))^5 \cos(5x) dx = & -\frac{x \sin^5(x) \sin(5x)}{32} - \frac{5x \sin^4(x) \cos(x) \cos(5x)}{32} \\
 & + \frac{5x \sin^3(x) \sin(5x) \cos^2(x)}{16} + \frac{5x \sin^2(x) \cos^3(x) \cos(5x)}{16} \\
 & - \frac{5x \sin(x) \sin(5x) \cos^4(x)}{32} - \frac{x \cos^5(x) \cos(5x)}{32} \\
 & - \frac{\sin^5(x) \cos(5x)}{64} + \frac{3 \sin^4(x) \sin(5x) \cos(x)}{64} \\
 & + \frac{8 \sin^4(x) \sin(5x)}{63} + \frac{40 \sin^3(x) \cos(x) \cos(5x)}{63} \\
 & - \frac{5 \sin^3(x) \cos(5x)}{32} + \frac{\sin^2(x) \sin(5x) \cos^3(x)}{6} \\
 & - \frac{4 \sin^2(x) \sin(5x) \cos^2(x)}{3} + \frac{25 \sin^2(x) \sin(5x) \cos(x)}{32} \\
 & - \frac{4 \sin^2(x) \sin(5x)}{21} + \frac{55 \sin(x) \cos^4(x) \cos(5x)}{192} \\
 & - \frac{100 \sin(x) \cos^3(x) \cos(5x)}{63} + \frac{55 \sin(x) \cos^2(x) \cos(5x)}{32} \\
 & - \frac{20 \sin(x) \cos(x) \cos(5x)}{21} + \frac{5 \sin(x) \cos(5x)}{24} \\
 & - \frac{241 \sin(5x) \cos^5(x)}{960} + \frac{83 \sin(5x) \cos^4(x)}{63} \\
 & - \frac{75 \sin(5x) \cos^3(x)}{32} + \frac{46 \sin(5x) \cos^2(x)}{21} \\
 & - \frac{25 \sin(5x) \cos(x)}{24} + \frac{\sin(5x)}{5}
 \end{aligned}$$

[In] integrate((1-cos(x))**5*cos(5*x),x)

[Out] -x*sin(x)**5*sin(5*x)/32 - 5*x*sin(x)**4*cos(x)*cos(5*x)/32 + 5*x*sin(x)**3*sin(5*x)*cos(x)**2/16 + 5*x*sin(x)**2*cos(x)**3*cos(5*x)/16 - 5*x*sin(x)*sin(5*x)*cos(x)**4/32 - x*cos(x)**5*cos(5*x)/32 - sin(x)**5*cos(5*x)/64 + 3*sin(x)**4*sin(5*x)*cos(x)/64 + 8*sin(x)**4*sin(5*x)/63 + 40*sin(x)**3*cos(x)*cos(5*x)/63 - 5*sin(x)**3*cos(5*x)/32 + sin(x)**2*sin(5*x)*cos(x)**3/6 - 4*sin(x)**2*sin(5*x)*cos(x)**2/3 + 25*sin(x)**2*sin(5*x)*cos(x)/32 - 4*sin(x)**2*sin(5*x)/21 + 55*sin(x)*cos(x)**4*cos(5*x)/192 - 100*sin(x)*cos(x)**3*cos(5*x)/63 + 55*sin(x)*cos(x)**2*cos(5*x)/32 - 20*sin(x)*cos(x)*cos(5*x)/21 + 5*sin(x)*cos(5*x)/24 - 241*sin(5*x)*cos(x)**5/960 + 83*sin(5*x)*cos(x)**4/63 - 75*sin(5*x)*cos(x)**3/32 + 46*sin(5*x)*cos(x)**2/21 - 25*sin(5*x)*cos(x)/24 + sin(5*x)/5

Maxima [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 66, normalized size of antiderivative = 0.79

$$\int (1 - \cos(x))^5 \cos(5x) dx = \frac{80}{9} \sin(x)^9 - \frac{380}{7} \sin(x)^7 - \frac{1}{20} \sin(2x)^5 + \frac{501}{5} \sin(x)^5 + \frac{71}{16} \sin(2x)^3 - \frac{212}{3} \sin(x)^3 - \frac{1}{32} x - \frac{45}{256} \sin(8x) - \frac{105}{64} \sin(4x) - 4 \sin(2x) + 16 \sin(x)$$

[In] integrate((1-cos(x))^5*cos(5*x),x, algorithm="maxima")

[Out] 80/9*sin(x)^9 - 380/7*sin(x)^7 - 1/20*sin(2*x)^5 + 501/5*sin(x)^5 + 71/16*sin(2*x)^3 - 212/3*sin(x)^3 - 1/32*x - 45/256*sin(8*x) - 105/64*sin(4*x) - 4*sin(2*x) + 16*sin(x)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 62, normalized size of antiderivative = 0.74

$$\int (1 - \cos(x))^5 \cos(5x) dx = -\frac{1}{32} x - \frac{1}{320} \sin(10x) + \frac{5}{144} \sin(9x) - \frac{45}{256} \sin(8x) + \frac{15}{28} \sin(7x) - \frac{35}{32} \sin(6x) + \frac{63}{40} \sin(5x) - \frac{105}{64} \sin(4x) + \frac{5}{4} \sin(3x) - \frac{45}{64} \sin(2x) + \frac{5}{16} \sin(x)$$

[In] integrate((1-cos(x))^5*cos(5*x),x, algorithm="giac")

[Out] -1/32*x - 1/320*sin(10*x) + 5/144*sin(9*x) - 45/256*sin(8*x) + 15/28*sin(7*x) - 35/32*sin(6*x) + 63/40*sin(5*x) - 105/64*sin(4*x) + 5/4*sin(3*x) - 45/64*sin(2*x) + 5/16*sin(x)

Mupad [B] (verification not implemented)

Time = 16.54 (sec) , antiderivative size = 78, normalized size of antiderivative = 0.93

$$\int (1 - \cos(x))^5 \cos(5x) dx = -\frac{8 \sin(x) \cos(x)^9}{5} + \frac{80 \sin(x) \cos(x)^8}{9} - \frac{193 \sin(x) \cos(x)^7}{10} + \frac{1180 \sin(x) \cos(x)^6}{63} - \frac{67 \sin(x) \cos(x)^5}{20} - \frac{979 \sin(x) \cos(x)^4}{105} + \frac{133 \sin(x) \cos(x)^3}{16} - \frac{766 \sin(x) \cos(x)^2}{315} - \frac{\sin(x) \cos(x)}{32} - \frac{x}{32} + \frac{43 \sin(x)}{315}$$

[In] `int(-cos(5*x)*(cos(x) - 1)^5,x)`

[Out] $(43\sin(x))/315 - x/32 - (\cos(x)\sin(x))/32 - (766\cos(x)^2\sin(x))/315 + (133\cos(x)^3\sin(x))/16 - (979\cos(x)^4\sin(x))/105 - (67\cos(x)^5\sin(x))/20 + (1180\cos(x)^6\sin(x))/63 - (193\cos(x)^7\sin(x))/10 + (80\cos(x)^8\sin(x))/9 - (8\cos(x)^9\sin(x))/5$

3.261 $\int \frac{3 \cos(x) + 4 \sin(x)}{4 \cos(x) + 3 \sin(x)} dx$

| | |
|---|------|
| Optimal result | 2712 |
| Rubi [A] (verified) | 2712 |
| Mathematica [A] (verified) | 2713 |
| Maple [C] (verified) | 2713 |
| Fricas [A] (verification not implemented) | 2713 |
| Sympy [A] (verification not implemented) | 2714 |
| Maxima [B] (verification not implemented) | 2714 |
| Giac [A] (verification not implemented) | 2714 |
| Mupad [B] (verification not implemented) | 2715 |

Optimal result

Integrand size = 21, antiderivative size = 20

$$\int \frac{3 \cos(x) + 4 \sin(x)}{4 \cos(x) + 3 \sin(x)} dx = \frac{24x}{25} - \frac{7}{25} \log(4 \cos(x) + 3 \sin(x))$$

[Out] 24/25*x-7/25*ln(3*sin(x)+4*cos(x))

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.048$, Rules used = {3212}

$$\int \frac{3 \cos(x) + 4 \sin(x)}{4 \cos(x) + 3 \sin(x)} dx = \frac{24x}{25} - \frac{7}{25} \log(3 \sin(x) + 4 \cos(x))$$

[In] Int[(3*Cos[x] + 4*Sin[x])/(4*Cos[x] + 3*Sin[x]),x]

[Out] (24*x)/25 - (7*Log[4*Cos[x] + 3*Sin[x]])/25

Rule 3212

```
Int[((A_.) + cos[(d_.) + (e_.)*(x_)])*(B_.) + (C_.)*sin[(d_.) + (e_.)*(x_)])
/((a_.) + cos[(d_.) + (e_.)*(x_)])*(b_.) + (c_.)*sin[(d_.) + (e_.)*(x_)]), x
_Symbol] :> Simp[(b*B + c*C)*(x/(b^2 + c^2)), x] + Simp[(c*B - b*C)*(Log[a
+ b*Cos[d + e*x] + c*Sin[d + e*x]]/(e*(b^2 + c^2))), x] /; FreeQ[{a, b, c,
d, e, A, B, C}, x] && NeQ[b^2 + c^2, 0] && EqQ[A*(b^2 + c^2) - a*(b*B + c*C), 0]
```

Rubi steps

$$\text{integral} = \frac{24x}{25} - \frac{7}{25} \log(4 \cos(x) + 3 \sin(x))$$

Mathematica [A] (verified)

Time = 0.11 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{3 \cos(x) + 4 \sin(x)}{4 \cos(x) + 3 \sin(x)} dx = \frac{24x}{25} - \frac{7}{25} \log(4 \cos(x) + 3 \sin(x))$$

[In] Integrate[(3*Cos[x] + 4*Sin[x])/(4*Cos[x] + 3*Sin[x]),x]

[Out] (24*x)/25 - (7*Log[4*Cos[x] + 3*Sin[x]])/25

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 0.38 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.05

| method | result | size |
|--------------|--|------|
| risch | $\frac{24x}{25} + \frac{7ix}{25} - \frac{7 \ln(e^{2ix} + \frac{7}{25} + \frac{24i}{25})}{25}$ | 21 |
| default | $\frac{7 \ln(1 + \tan(x)^2)}{50} + \frac{24 \arctan(\tan(x))}{25} - \frac{7 \ln(3 \tan(x) + 4)}{25}$ | 25 |
| parallelrisc | $\ln\left(\frac{2}{(-2048(\cot(x) - \csc(x) + 2)^7)^{\frac{1}{25}}}\right) + \ln\left(\frac{1}{(-2 \cot(x) + 2 \csc(x) + 1)^{\frac{7}{25}}}\right) + \ln\left(\left(\frac{1}{1 + \cos(x)}\right)^{\frac{7}{25}}\right) + \frac{24x}{25}$ | 44 |
| norman | $\frac{\frac{24x}{25} + \frac{24x \tan(\frac{x}{2})^2}{25}}{1 + \tan(\frac{x}{2})^2} - \frac{7 \ln(\tan(\frac{x}{2}) - 2)}{25} - \frac{7 \ln(2 \tan(\frac{x}{2}) + 1)}{25} + \frac{7 \ln(1 + \tan(\frac{x}{2})^2)}{25}$ | 57 |

[In] int((4*sin(x)+3*cos(x))/(3*sin(x)+4*cos(x)),x,method=_RETURNVERBOSE)

[Out] 24/25*x+7/25*I*x-7/25*ln(exp(2*I*x)+7/25+24/25*I)

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.80

$$\int \frac{3 \cos(x) + 4 \sin(x)}{4 \cos(x) + 3 \sin(x)} dx = \frac{24}{25} x - \frac{7}{25} \log\left(-2 \cos(x) - \frac{3}{2} \sin(x)\right)$$

[In] integrate((4*sin(x)+3*cos(x))/(3*sin(x)+4*cos(x)),x, algorithm="fricas")

[Out] 24/25*x - 7/25*log(-2*cos(x) - 3/2*sin(x))

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.95

$$\int \frac{3 \cos(x) + 4 \sin(x)}{4 \cos(x) + 3 \sin(x)} dx = \frac{24x}{25} - \frac{7 \log(3 \sin(x) + 4 \cos(x))}{25}$$

[In] integrate((4*sin(x)+3*cos(x))/(3*sin(x)+4*cos(x)),x)

[Out] 24*x/25 - 7*log(3*sin(x) + 4*cos(x))/25

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 58 vs. 2(16) = 32.

Time = 0.29 (sec) , antiderivative size = 58, normalized size of antiderivative = 2.90

$$\begin{aligned} \int \frac{3 \cos(x) + 4 \sin(x)}{4 \cos(x) + 3 \sin(x)} dx = & \frac{48}{25} \arctan\left(\frac{\sin(x)}{\cos(x) + 1}\right) - \frac{7}{25} \log\left(\frac{2 \sin(x)}{\cos(x) + 1} + 1\right) \\ & - \frac{7}{25} \log\left(\frac{\sin(x)}{\cos(x) + 1} - 2\right) + \frac{7}{25} \log\left(\frac{\sin(x)^2}{(\cos(x) + 1)^2} + 1\right) \end{aligned}$$

[In] integrate((4*sin(x)+3*cos(x))/(3*sin(x)+4*cos(x)),x, algorithm="maxima")

[Out] 48/25*arctan(sin(x)/(cos(x) + 1)) - 7/25*log(2*sin(x)/(cos(x) + 1) + 1) - 7/25*log(sin(x)/(cos(x) + 1) - 2) + 7/25*log(sin(x)^2/(cos(x) + 1)^2 + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.15

$$\int \frac{3 \cos(x) + 4 \sin(x)}{4 \cos(x) + 3 \sin(x)} dx = \frac{24}{25} x + \frac{7}{50} \log(\tan(x)^2 + 1) - \frac{7}{25} \log(|3 \tan(x) + 4|)$$

[In] integrate((4*sin(x)+3*cos(x))/(3*sin(x)+4*cos(x)),x, algorithm="giac")

[Out] 24/25*x + 7/50*log(tan(x)^2 + 1) - 7/25*log(abs(3*tan(x) + 4))

Mupad [B] (verification not implemented)

Time = 16.87 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.60

$$\int \frac{3 \cos(x) + 4 \sin(x)}{4 \cos(x) + 3 \sin(x)} dx = \frac{24x}{25} - \frac{7 \ln \left(\tan\left(\frac{x}{2}\right)^2 - \frac{3 \tan\left(\frac{x}{2}\right)}{2} - 1 \right)}{25} + \frac{7 \ln \left(\tan\left(\frac{x}{2}\right)^2 + 1 \right)}{25}$$

[In] int((3*cos(x) + 4*sin(x))/(4*cos(x) + 3*sin(x)),x)

[Out] (24*x)/25 - (7*log(tan(x/2)^2 - (3*tan(x/2))/2 - 1))/25 + (7*log(tan(x/2)^2 + 1))/25

$$3.262 \quad \int \left(-\sqrt{3} - \sqrt{4 - x^2} + \sqrt{4 - (1 + x)^2} \right) dx$$

| | |
|---|------|
| Optimal result | 2716 |
| Rubi [A] (verified) | 2716 |
| Mathematica [A] (verified) | 2717 |
| Maple [A] (verified) | 2718 |
| Fricas [A] (verification not implemented) | 2718 |
| Sympy [A] (verification not implemented) | 2718 |
| Maxima [A] (verification not implemented) | 2719 |
| Giac [A] (verification not implemented) | 2719 |
| Mupad [F(-1)] | 2720 |

Optimal result

Integrand size = 34, antiderivative size = 63

$$\int \left(-\sqrt{3} - \sqrt{4 - x^2} + \sqrt{4 - (1 + x)^2} \right) dx = -\sqrt{3}x - \frac{1}{2}x\sqrt{4 - x^2} + \frac{1}{2}(1 + x)\sqrt{4 - (1 + x)^2} - 2 \arcsin\left(\frac{x}{2}\right) + 2 \arcsin\left(\frac{1 + x}{2}\right)$$

[Out] $-x*3^{(1/2)}-1/2*x*(-x^2+4)^{(1/2)}+1/2*(1+x)*(4-(1+x)^2)^{(1/2)}-2*\arcsin(1/2*x)+2*\arcsin(1/2+1/2*x)$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 63, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.088$, Rules used = {201, 222, 253}

$$\int \left(-\sqrt{3} - \sqrt{4 - x^2} + \sqrt{4 - (1 + x)^2} \right) dx = -2 \arcsin\left(\frac{x}{2}\right) + 2 \arcsin\left(\frac{x + 1}{2}\right) - \frac{1}{2}\sqrt{4 - x^2}x - \sqrt{3}x + \frac{1}{2}(x + 1)\sqrt{4 - (x + 1)^2}$$

[In] Int[-Sqrt[3] - Sqrt[4 - x^2] + Sqrt[4 - (1 + x)^2], x]

[Out] $-(\text{Sqrt}[3]*x) - (x*\text{Sqrt}[4 - x^2])/2 + ((1 + x)*\text{Sqrt}[4 - (1 + x)^2])/2 - 2*\text{ArcSin}[x/2] + 2*\text{ArcSin}[(1 + x)/2]$

Rule 201

Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Simp[x*((a + b*x^n)^p/(n*p + 1)), x] + Dist[a*n*(p/(n*p + 1)), Int[(a + b*x^n)^(p - 1), x], x] /;

$Q[\{a, b\}, x] \&\& \text{IGtQ}[n, 0] \&\& \text{GtQ}[p, 0] \&\& (\text{IntegerQ}[2*p] \mid\mid (\text{EqQ}[n, 2] \&\& \text{IntegerQ}[4*p]) \mid\mid (\text{EqQ}[n, 2] \&\& \text{IntegerQ}[3*p]) \mid\mid \text{LtQ}[\text{Denominator}[p + 1/n], \text{Denominator}[p]])$

Rule 222

$\text{Int}[1/\text{Sqrt}[(a_) + (b_)*(x_)^2], x_Symbol] \rightarrow \text{Simp}[\text{ArcSin}[\text{Rt}[-b, 2]*(x/\text{Sqrt}[a])]/\text{Rt}[-b, 2], x] /; \text{FreeQ}[\{a, b\}, x] \&\& \text{GtQ}[a, 0] \&\& \text{NegQ}[b]$

Rule 253

$\text{Int}[(a_) + (b_)*(v_)^{(n_)}]^{(p_)}, x_Symbol] \rightarrow \text{Dist}[1/\text{Coefficient}[v, x, 1], \text{Subst}[\text{Int}[(a + b*x^n)^p, x], x, v], x] /; \text{FreeQ}[\{a, b, n, p\}, x] \&\& \text{LinearQ}[v, x] \&\& \text{NeQ}[v, x]$

Rubi steps

$$\begin{aligned}
 \text{integral} &= -\sqrt{3}x - \int \sqrt{4-x^2} dx + \int \sqrt{4-(1+x)^2} dx \\
 &= -\sqrt{3}x - \frac{1}{2}x\sqrt{4-x^2} - 2 \int \frac{1}{\sqrt{4-x^2}} dx + \text{Subst}\left(\int \sqrt{4-x^2} dx, x, 1+x\right) \\
 &= -\sqrt{3}x - \frac{1}{2}x\sqrt{4-x^2} + \frac{1}{2}(1+x)\sqrt{4-(1+x)^2} \\
 &\quad - 2 \arcsin\left(\frac{x}{2}\right) + 2 \text{Subst}\left(\int \frac{1}{\sqrt{4-x^2}} dx, x, 1+x\right) \\
 &= -\sqrt{3}x - \frac{1}{2}x\sqrt{4-x^2} + \frac{1}{2}(1+x)\sqrt{4-(1+x)^2} - 2 \arcsin\left(\frac{x}{2}\right) + 2 \arcsin\left(\frac{1+x}{2}\right)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.18 (sec) , antiderivative size = 89, normalized size of antiderivative = 1.41

$$\begin{aligned}
 \int \left(-\sqrt{3} - \sqrt{4-x^2} + \sqrt{4-(1+x)^2}\right) dx &= -\sqrt{3}x - \frac{1}{2}x\sqrt{4-x^2} + \frac{1}{2}(1+x)\sqrt{3-2x-x^2} \\
 &\quad + 4 \arctan\left(\frac{\sqrt{4-x^2}}{2+x}\right) \\
 &\quad - 4 \arctan\left(\frac{\sqrt{3-2x-x^2}}{3+x}\right)
 \end{aligned}$$

[In] Integrate[-Sqrt[3] - Sqrt[4 - x^2] + Sqrt[4 - (1 + x)^2], x]

[Out] -(Sqrt[3]*x) - (x*Sqrt[4 - x^2])/2 + ((1 + x)*Sqrt[3 - 2*x - x^2])/2 + 4*ArcTan[Sqrt[4 - x^2]/(2 + x)] - 4*ArcTan[Sqrt[3 - 2*x - x^2]/(3 + x)]

Maple [A] (verified)

Time = 0.24 (sec) , antiderivative size = 53, normalized size of antiderivative = 0.84

| method | result | size |
|---------|---|------|
| default | $-\frac{(-2-2x)\sqrt{-x^2-2x+3}}{4} + 2 \arcsin\left(\frac{x}{2} + \frac{1}{2}\right) - x\sqrt{3} - \frac{x\sqrt{-x^2+4}}{2} - 2 \arcsin\left(\frac{x}{2}\right)$ | 53 |
| parts | $-\frac{(-2-2x)\sqrt{-x^2-2x+3}}{4} + 2 \arcsin\left(\frac{x}{2} + \frac{1}{2}\right) - x\sqrt{3} - \frac{x\sqrt{-x^2+4}}{2} - 2 \arcsin\left(\frac{x}{2}\right)$ | 53 |

[In] int((4-(1+x)^2)^(1/2)-3^(1/2)-(-x^2+4)^(1/2),x,method=_RETURNVERBOSE)

[Out] -1/4*(-2-2*x)*(-x^2-2*x+3)^(1/2)+2*arcsin(1/2*x+1/2)-x*3^(1/2)-1/2*x*(-x^2+4)^(1/2)-2*arcsin(1/2*x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 83, normalized size of antiderivative = 1.32

$$\int \left(-\sqrt{3} - \sqrt{4-x^2} + \sqrt{4-(1+x)^2} \right) dx = \frac{1}{2} \sqrt{-x^2-2x+3}(x+1) - \sqrt{3}x - \frac{1}{2} \sqrt{-x^2+4}x$$

$$- 2 \arctan\left(\frac{\sqrt{-x^2-2x+3}(x+1)}{x^2+2x-3}\right)$$

$$+ 4 \arctan\left(\frac{\sqrt{-x^2+4}-2}{x}\right)$$

[In] integrate((4-(1+x)^2)^(1/2)-3^(1/2)-(-x^2+4)^(1/2),x, algorithm="fricas")

[Out] 1/2*sqrt(-x^2 - 2*x + 3)*(x + 1) - sqrt(3)*x - 1/2*sqrt(-x^2 + 4)*x - 2*arctan(sqrt(-x^2 - 2*x + 3)*(x + 1)/(x^2 + 2*x - 3)) + 4*arctan((sqrt(-x^2 + 4) - 2)/x)

Sympy [A] (verification not implemented)

Time = 1.06 (sec) , antiderivative size = 119, normalized size of antiderivative = 1.89

$$\int \left(-\sqrt{3} - \sqrt{4-x^2} + \sqrt{4-(1+x)^2} \right) dx$$

$$= -\frac{x\sqrt{4-x^2}}{2} - \sqrt{3}x$$

$$+ \begin{cases} \frac{i(x+1)^3}{2\sqrt{(x+1)^2-4}} - \frac{2i(x+1)}{\sqrt{(x+1)^2-4}} - 2i \operatorname{acosh}\left(\frac{x}{2} + \frac{1}{2}\right) & \text{for } |(x+1)^2| > 4 \\ 2 \operatorname{asin}\left(\frac{x}{2} + \frac{1}{2}\right) - \frac{(x+1)^3}{2\sqrt{4-(x+1)^2}} + \frac{2(x+1)}{\sqrt{4-(x+1)^2}} & \text{otherwise} \end{cases} - 2 \operatorname{asin}\left(\frac{x}{2}\right)$$

[In] integrate((4-(1+x)**2)**(1/2)-3**(1/2)-(-x**2+4)**(1/2),x)

[Out] $-x\sqrt{4-x^2}/2 - \sqrt{3}x + \text{Piecewise}((I*(x+1)**3/(2*\sqrt{(x+1)**2-4}) - 2*I*(x+1)/\sqrt{(x+1)**2-4} - 2*I*\text{acosh}(x/2+1/2), \text{Abs}((x+1)**2) > 4), (2*\text{asin}(x/2+1/2) - (x+1)**3/(2*\sqrt{4-(x+1)**2})) + 2*(x+1)/\sqrt{4-(x+1)**2}, \text{True})) - 2*\text{asin}(x/2)$

Maxima [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 62, normalized size of antiderivative = 0.98

$$\int \left(-\sqrt{3} - \sqrt{4-x^2} + \sqrt{4-(1+x)^2} \right) dx = -\sqrt{3}x + \frac{1}{2}\sqrt{-x^2-2x+3}x - \frac{1}{2}\sqrt{-x^2+4x} + \frac{1}{2}\sqrt{-x^2-2x+3} - 2 \arcsin\left(\frac{1}{2}x\right) - 2 \arcsin\left(-\frac{1}{2}x - \frac{1}{2}\right)$$

[In] integrate((4-(1+x)^2)^(1/2)-3^(1/2)-(-x^2+4)^(1/2),x, algorithm="maxima")

[Out] $-\sqrt{3}x + 1/2*\sqrt{-x^2-2*x+3}*x - 1/2*\sqrt{-x^2+4}*x + 1/2*\sqrt{-x^2-2*x+3} - 2*\arcsin(1/2*x) - 2*\arcsin(-1/2*x-1/2)$

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 50, normalized size of antiderivative = 0.79

$$\int \left(-\sqrt{3} - \sqrt{4-x^2} + \sqrt{4-(1+x)^2} \right) dx = \frac{1}{2}\sqrt{-x^2-2x+3}(x+1) - \sqrt{3}x - \frac{1}{2}\sqrt{-x^2+4}x - 2 \arcsin\left(\frac{1}{2}x\right) + 2 \arcsin\left(\frac{1}{2}x + \frac{1}{2}\right)$$

[In] integrate((4-(1+x)^2)^(1/2)-3^(1/2)-(-x^2+4)^(1/2),x, algorithm="giac")

[Out] $1/2*\sqrt{-x^2-2*x+3}*(x+1) - \sqrt{3}*x - 1/2*\sqrt{-x^2+4}*x - 2*\arcsin(1/2*x) + 2*\arcsin(1/2*x+1/2)$

Mupad [F(-1)]

Timed out.

$$\int \left(-\sqrt{3} - \sqrt{4-x^2} + \sqrt{4-(1+x)^2} \right) dx = \int \sqrt{4-(x+1)^2} - \sqrt{3} - \sqrt{4-x^2} dx$$

```
[In] int((4 - (x + 1)^2)^(1/2) - 3^(1/2) - (4 - x^2)^(1/2), x)
```

```
[Out] int((4 - (x + 1)^2)^(1/2) - 3^(1/2) - (4 - x^2)^(1/2), x)
```

3.263 $\int x^2 \sin(\log(x)) dx$

| | |
|---|------|
| Optimal result | 2721 |
| Rubi [A] (verified) | 2721 |
| Mathematica [A] (verified) | 2722 |
| Maple [C] (verified) | 2722 |
| Fricas [A] (verification not implemented) | 2722 |
| Sympy [A] (verification not implemented) | 2723 |
| Maxima [A] (verification not implemented) | 2723 |
| Giac [A] (verification not implemented) | 2723 |
| Mupad [B] (verification not implemented) | 2723 |

Optimal result

Integrand size = 7, antiderivative size = 21

$$\int x^2 \sin(\log(x)) dx = -\frac{1}{10}x^3 \cos(\log(x)) + \frac{3}{10}x^3 \sin(\log(x))$$

[Out] $-1/10*x^3*\cos(\ln(x))+3/10*x^3*\sin(\ln(x))$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 21, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.143$, Rules used = {4573}

$$\int x^2 \sin(\log(x)) dx = \frac{3}{10}x^3 \sin(\log(x)) - \frac{1}{10}x^3 \cos(\log(x))$$

[In] $\text{Int}[x^2*\text{Sin}[\text{Log}[x]],x]$

[Out] $-1/10*(x^3*\text{Cos}[\text{Log}[x]]) + (3*x^3*\text{Sin}[\text{Log}[x]])/10$

Rule 4573

$\text{Int}[\left((e_{.})*(x_{.})\right)^{(m_{.})}*\text{Sin}[\left((a_{.}) + \text{Log}[\left(c_{.}\right)*(x_{.})^{(n_{.})}\right)*(b_{.})\right)*(d_{.})], x_{.}$
 Symbol] $\rightarrow \text{Simp}[(m + 1)*(e*x)^{(m + 1)}*(\text{Sin}[d*(a + b*\text{Log}[c*x^n]])/(b^2*d^2*e*n^2 + e*(m + 1)^2)), x] - \text{Simp}[b*d*n*(e*x)^{(m + 1)}*(\text{Cos}[d*(a + b*\text{Log}[c*x^n]])/(b^2*d^2*e*n^2 + e*(m + 1)^2)), x] /;$ FreeQ[{a, b, c, d, e, m, n}, x] & NeQ[b^2*d^2*n^2 + (m + 1)^2, 0]

Rubi steps

$$\text{integral} = -\frac{1}{10}x^3 \cos(\log(x)) + \frac{3}{10}x^3 \sin(\log(x))$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.00

$$\int x^2 \sin(\log(x)) dx = -\frac{1}{10}x^3 \cos(\log(x)) + \frac{3}{10}x^3 \sin(\log(x))$$

[In] Integrate[x^2*Sin[Log[x]],x]

[Out] -1/10*(x^3*Cos[Log[x]]) + (3*x^3*Sin[Log[x]])/10

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 0.19 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.24

| method | result | size |
|--------|---|------|
| risch | $\left(-\frac{1}{20} - \frac{3i}{20}\right) x^3 x^i + \left(-\frac{1}{20} + \frac{3i}{20}\right) x^3 x^{-i}$ | 26 |
| norman | $\frac{-\frac{x^3}{10} + \frac{3x^3 \tan\left(\frac{\ln(x)}{2}\right)}{5} + \frac{x^3 \tan\left(\frac{\ln(x)}{2}\right)^2}{10}}{1 + \tan\left(\frac{\ln(x)}{2}\right)^2}$ | 41 |

[In] int(x^2*sin(ln(x)),x,method=_RETURNVERBOSE)

[Out] (-1/20-3/20*I)*x^3*x^I+(-1/20+3/20*I)*x^3/(x^I)

Fricas [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.81

$$\int x^2 \sin(\log(x)) dx = -\frac{1}{10}x^3 \cos(\log(x)) + \frac{3}{10}x^3 \sin(\log(x))$$

[In] integrate(x^2*sin(log(x)),x, algorithm="fricas")

[Out] -1/10*x^3*cos(log(x)) + 3/10*x^3*sin(log(x))

Sympy [A] (verification not implemented)

Time = 0.35 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.95

$$\int x^2 \sin(\log(x)) dx = \frac{3x^3 \sin(\log(x))}{10} - \frac{x^3 \cos(\log(x))}{10}$$

[In] integrate(x**2*sin(ln(x)),x)

[Out] 3*x**3*sin(log(x))/10 - x**3*cos(log(x))/10

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.67

$$\int x^2 \sin(\log(x)) dx = -\frac{1}{10} x^3 (\cos(\log(x)) - 3 \sin(\log(x)))$$

[In] integrate(x^2*sin(log(x)),x, algorithm="maxima")

[Out] -1/10*x^3*(cos(log(x)) - 3*sin(log(x)))

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.81

$$\int x^2 \sin(\log(x)) dx = -\frac{1}{10} x^3 \cos(\log(x)) + \frac{3}{10} x^3 \sin(\log(x))$$

[In] integrate(x^2*sin(log(x)),x, algorithm="giac")

[Out] -1/10*x^3*cos(log(x)) + 3/10*x^3*sin(log(x))

Mupad [B] (verification not implemented)

Time = 16.24 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.67

$$\int x^2 \sin(\log(x)) dx = -\frac{\sqrt{10} x^3 \cos(\operatorname{atan}(3) + \ln(x))}{10}$$

[In] int(x^2*sin(log(x)),x)

[Out] -(10^(1/2)*x^3*cos(atan(3) + log(x)))/10

3.264 $\int e^{-x}(36x^5 - 12x^6 + x^7) dx$

| | |
|---|------|
| Optimal result | 2724 |
| Rubi [A] (verified) | 2724 |
| Mathematica [A] (verified) | 2726 |
| Maple [A] (verified) | 2726 |
| Fricas [A] (verification not implemented) | 2727 |
| Sympy [A] (verification not implemented) | 2727 |
| Maxima [A] (verification not implemented) | 2727 |
| Giac [A] (verification not implemented) | 2728 |
| Mupad [B] (verification not implemented) | 2728 |

Optimal result

Integrand size = 20, antiderivative size = 76

$$\int e^{-x}(36x^5 - 12x^6 + x^7) dx = -720e^{-x} - 720e^{-x}x - 360e^{-x}x^2 - 120e^{-x}x^3 - 30e^{-x}x^4 - 6e^{-x}x^5 + 5e^{-x}x^6 - e^{-x}x^7$$

[Out] -720/exp(x)-720*x/exp(x)-360*x^2/exp(x)-120*x^3/exp(x)-30*x^4/exp(x)-6*x^5/exp(x)+5*x^6/exp(x)-x^7/exp(x)

Rubi [A] (verified)

Time = 0.31 (sec) , antiderivative size = 76, normalized size of antiderivative = 1.00, number of steps used = 25, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {1608, 27, 2227, 2207, 2225}

$$\int e^{-x}(36x^5 - 12x^6 + x^7) dx = -e^{-x}x^7 + 5e^{-x}x^6 - 6e^{-x}x^5 - 30e^{-x}x^4 - 120e^{-x}x^3 - 360e^{-x}x^2 - 720e^{-x}x - 720e^{-x}$$

[In] Int[(36*x^5 - 12*x^6 + x^7)/E^x,x]

[Out] -720/E^x - (720*x)/E^x - (360*x^2)/E^x - (120*x^3)/E^x - (30*x^4)/E^x - (6*x^5)/E^x + (5*x^6)/E^x - x^7/E^x

Rule 27

Int[(u_.)*((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^(p_.), x_Symbol] :> Int[u*Cancel[(b/2 + c*x)^(2*p)/c^p], x] /; FreeQ[{a, b, c}, x] && EqQ[b^2 - 4*a*c, 0] && IntegerQ[p]

Rule 1608

```
Int[(u_.)*((a_.)*(x_)^(p_.) + (b_.)*(x_)^(q_.) + (c_.)*(x_)^(r_.))^(n_.), x
_Symbol] := Int[u*x^(n*p)*(a + b*x^(q - p) + c*x^(r - p))^n, x] /; FreeQ[{a
, b, c, p, q, r}, x] && IntegerQ[n] && PosQ[q - p] && PosQ[r - p]
```

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m
_.), x_Symbol] := Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])),
x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n
, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m
] && !TrueQ[$UseGamma]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] := Simp[(F^(c*(a +
b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2227

```
Int[(F_)^((c_.)*(v_))*(u_), x_Symbol] := Int[ExpandIntegrand[F^(c*ExpandToS
um[v, x]), u, x], x] /; FreeQ[{F, c}, x] && PolynomialQ[u, x] && LinearQ[v,
x] && !TrueQ[$UseGamma]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int e^{-x} x^5 (36 - 12x + x^2) dx \\
&= \int e^{-x} (-6 + x)^2 x^5 dx \\
&= \int (36e^{-x} x^5 - 12e^{-x} x^6 + e^{-x} x^7) dx \\
&= -\left(12 \int e^{-x} x^6 dx\right) + 36 \int e^{-x} x^5 dx + \int e^{-x} x^7 dx \\
&= -36e^{-x} x^5 + 12e^{-x} x^6 - e^{-x} x^7 + 7 \int e^{-x} x^6 dx - 72 \int e^{-x} x^5 dx + 180 \int e^{-x} x^4 dx \\
&= -180e^{-x} x^4 + 36e^{-x} x^5 + 5e^{-x} x^6 - e^{-x} x^7 + 42 \int e^{-x} x^5 dx - 360 \int e^{-x} x^4 dx + 720 \int e^{-x} x^3 dx \\
&= -720e^{-x} x^3 + 180e^{-x} x^4 - 6e^{-x} x^5 + 5e^{-x} x^6 - e^{-x} x^7 \\
&\quad + 210 \int e^{-x} x^4 dx - 1440 \int e^{-x} x^3 dx + 2160 \int e^{-x} x^2 dx
\end{aligned}$$

$$\begin{aligned}
&= -2160e^{-x}x^2 + 720e^{-x}x^3 - 30e^{-x}x^4 - 6e^{-x}x^5 + 5e^{-x}x^6 - e^{-x}x^7 \\
&\quad + 840 \int e^{-x}x^3 dx + 4320 \int e^{-x}x dx - 4320 \int e^{-x}x^2 dx \\
&= -4320e^{-x}x + 2160e^{-x}x^2 - 120e^{-x}x^3 - 30e^{-x}x^4 - 6e^{-x}x^5 + 5e^{-x}x^6 \\
&\quad - e^{-x}x^7 + 2520 \int e^{-x}x^2 dx + 4320 \int e^{-x} dx - 8640 \int e^{-x}x dx \\
&= -4320e^{-x} + 4320e^{-x}x - 360e^{-x}x^2 - 120e^{-x}x^3 - 30e^{-x}x^4 \\
&\quad - 6e^{-x}x^5 + 5e^{-x}x^6 - e^{-x}x^7 + 5040 \int e^{-x}x dx - 8640 \int e^{-x} dx \\
&= 4320e^{-x} - 720e^{-x}x - 360e^{-x}x^2 - 120e^{-x}x^3 - 30e^{-x}x^4 \\
&\quad - 6e^{-x}x^5 + 5e^{-x}x^6 - e^{-x}x^7 + 5040 \int e^{-x} dx \\
&= -720e^{-x} - 720e^{-x}x - 360e^{-x}x^2 - 120e^{-x}x^3 - 30e^{-x}x^4 - 6e^{-x}x^5 + 5e^{-x}x^6 - e^{-x}x^7
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.62 (sec) , antiderivative size = 41, normalized size of antiderivative = 0.54

$$\int e^{-x}(36x^5 - 12x^6 + x^7) dx = e^{-x}(-720 - 720x - 360x^2 - 120x^3 - 30x^4 - 6x^5 + 5x^6 - x^7)$$

[In] Integrate[(36*x^5 - 12*x^6 + x^7)/E^x,x]

[Out] (-720 - 720*x - 360*x^2 - 120*x^3 - 30*x^4 - 6*x^5 + 5*x^6 - x^7)/E^x

Maple [A] (verified)

Time = 0.08 (sec) , antiderivative size = 40, normalized size of antiderivative = 0.53

| method | result |
|-------------------|--|
| gospers | $-e^{-x}(x^7 - 5x^6 + 6x^5 + 30x^4 + 120x^3 + 360x^2 + 720x + 720)$ |
| risch | $(-x^7 + 5x^6 - 6x^5 - 30x^4 - 120x^3 - 360x^2 - 720x - 720)e^{-x}$ |
| derivativedivides | $-6e^{-x}x^5 - 30x^4e^{-x} - 120x^3e^{-x} - 360x^2e^{-x} - 720xe^{-x} - 720e^{-x} + 5e^{-x}x^6 - e^{-x}x^7$ |
| default | $-6e^{-x}x^5 - 30x^4e^{-x} - 120x^3e^{-x} - 360x^2e^{-x} - 720xe^{-x} - 720e^{-x} + 5e^{-x}x^6 - e^{-x}x^7$ |
| norman | $-6e^{-x}x^5 - 30x^4e^{-x} - 120x^3e^{-x} - 360x^2e^{-x} - 720xe^{-x} - 720e^{-x} + 5e^{-x}x^6 - e^{-x}x^7$ |
| parallelrisc | $-6e^{-x}x^5 - 30x^4e^{-x} - 120x^3e^{-x} - 360x^2e^{-x} - 720xe^{-x} - 720e^{-x} + 5e^{-x}x^6 - e^{-x}x^7$ |
| parts | $-6e^{-x}x^5 - 30x^4e^{-x} - 120x^3e^{-x} - 360x^2e^{-x} - 720xe^{-x} - 720e^{-x} + 5e^{-x}x^6 - e^{-x}x^7$ |
| meijerg | $720 - \frac{(8x^7+56x^6+336x^5+1680x^4+6720x^3+20160x^2+40320x+40320)e^{-x}}{8} + \frac{12(7x^6+42x^5+210x^4+840x^3+2520x^2)}{7}$ |

[In] int(exp(-x)*(x^7-12*x^6+36*x^5),x,method=_RETURNVERBOSE)

[Out] -exp(-x)*(x^7-5*x^6+6*x^5+30*x^4+120*x^3+360*x^2+720*x+720)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 39, normalized size of antiderivative = 0.51

$$\int e^{-x}(36x^5 - 12x^6 + x^7) dx$$

$$= -(x^7 - 5x^6 + 6x^5 + 30x^4 + 120x^3 + 360x^2 + 720x + 720)e^{(-x)}$$

[In] integrate(exp(-x)*(x^7-12*x^6+36*x^5),x, algorithm="fricas")

[Out] -(x^7 - 5*x^6 + 6*x^5 + 30*x^4 + 120*x^3 + 360*x^2 + 720*x + 720)*e^(-x)

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 36, normalized size of antiderivative = 0.47

$$\int e^{-x}(36x^5 - 12x^6 + x^7) dx = (-x^7 + 5x^6 - 6x^5 - 30x^4 - 120x^3 - 360x^2 - 720x - 720)e^{-x}$$

[In] integrate(exp(-x)*(x**7-12*x**6+36*x**5),x)

[Out] (-x**7 + 5*x**6 - 6*x**5 - 30*x**4 - 120*x**3 - 360*x**2 - 720*x - 720)*exp(-x)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 103, normalized size of antiderivative = 1.36

$$\int e^{-x}(36x^5 - 12x^6 + x^7) dx$$

$$= -(x^7 + 7x^6 + 42x^5 + 210x^4 + 840x^3 + 2520x^2 + 5040x + 5040)e^{(-x)}$$

$$+ 12(x^6 + 6x^5 + 30x^4 + 120x^3 + 360x^2 + 720x + 720)e^{(-x)}$$

$$- 36(x^5 + 5x^4 + 20x^3 + 60x^2 + 120x + 120)e^{(-x)}$$

[In] integrate(exp(-x)*(x^7-12*x^6+36*x^5),x, algorithm="maxima")

[Out] -(x^7 + 7*x^6 + 42*x^5 + 210*x^4 + 840*x^3 + 2520*x^2 + 5040*x + 5040)*e^(-x) + 12*(x^6 + 6*x^5 + 30*x^4 + 120*x^3 + 360*x^2 + 720*x + 720)*e^(-x) - 36*(x^5 + 5*x^4 + 20*x^3 + 60*x^2 + 120*x + 120)*e^(-x)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 39, normalized size of antiderivative = 0.51

$$\int e^{-x}(36x^5 - 12x^6 + x^7) dx$$

$$= -(x^7 - 5x^6 + 6x^5 + 30x^4 + 120x^3 + 360x^2 + 720x + 720)e^{(-x)}$$

[In] integrate(exp(-x)*(x^7-12*x^6+36*x^5),x, algorithm="giac")

[Out] -(x^7 - 5*x^6 + 6*x^5 + 30*x^4 + 120*x^3 + 360*x^2 + 720*x + 720)*e^(-x)

Mupad [B] (verification not implemented)

Time = 16.51 (sec) , antiderivative size = 39, normalized size of antiderivative = 0.51

$$\int e^{-x}(36x^5 - 12x^6 + x^7) dx = -e^{-x} (x^7 - 5x^6 + 6x^5 + 30x^4 + 120x^3 + 360x^2 + 720x + 720)$$

[In] int(exp(-x)*(36*x^5 - 12*x^6 + x^7),x)

[Out] -exp(-x)*(720*x + 360*x^2 + 120*x^3 + 30*x^4 + 6*x^5 - 5*x^6 + x^7 + 720)

3.265 $\int \arccos(x) \arcsin(x) dx$

| | |
|---|------|
| Optimal result | 2729 |
| Rubi [F] | 2729 |
| Mathematica [A] (verified) | 2729 |
| Maple [F] | 2730 |
| Fricas [A] (verification not implemented) | 2730 |
| Sympy [A] (verification not implemented) | 2730 |
| Maxima [A] (verification not implemented) | 2730 |
| Giac [B] (verification not implemented) | 2731 |
| Mupad [F(-1)] | 2731 |

Optimal result

Integrand size = 5, antiderivative size = 38

$$\int \arccos(x) \arcsin(x) dx = 2x - \sqrt{1-x^2} \arcsin(x) + \arccos(x) \left(\sqrt{1-x^2} + x \arcsin(x) \right)$$

[Out] 2*x-(-x^2+1)^(1/2)*arcsin(x)+arccos(x)*((-x^2+1)^(1/2)+x*arcsin(x))

Rubi [F]

$$\int \arccos(x) \arcsin(x) dx = \int \arccos(x) \arcsin(x) dx$$

[In] Int[ArcCos[x]*ArcSin[x],x]

[Out] Defer[Int][ArcCos[x]*ArcSin[x], x]

Rubi steps

$$\text{integral} = \int \arccos(x) \arcsin(x) dx$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 38, normalized size of antiderivative = 1.00

$$\int \arccos(x) \arcsin(x) dx = 2x - \sqrt{1-x^2} \arcsin(x) + \arccos(x) \left(\sqrt{1-x^2} + x \arcsin(x) \right)$$

[In] Integrate[ArcCos[x]*ArcSin[x],x]

[Out] 2*x - Sqrt[1 - x^2]*ArcSin[x] + ArcCos[x]*(Sqrt[1 - x^2] + x*ArcSin[x])

Maple [F]

$$\int \arcsin(x) \arccos(x) dx$$

[In] int(arcsin(x)*arccos(x),x)

[Out] int(arcsin(x)*arccos(x),x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.89

$$\int \arccos(x) \arcsin(x) dx = \frac{1}{2} \pi x \arccos(x) - x \arccos(x)^2 - \frac{1}{2} (\pi - 4 \arccos(x)) \sqrt{-x^2 + 1} + 2x$$

[In] integrate(arcsin(x)*arccos(x),x, algorithm="fricas")

[Out] 1/2*pi*x*arccos(x) - x*arccos(x)^2 - 1/2*(pi - 4*arccos(x))*sqrt(-x^2 + 1) + 2*x

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.89

$$\int \arccos(x) \arcsin(x) dx = x \arccos(x) \arcsin(x) + 2x + \sqrt{1-x^2} \arccos(x) - \sqrt{1-x^2} \arcsin(x)$$

[In] integrate(asin(x)*acos(x),x)

[Out] x*acos(x)*asin(x) + 2*x + sqrt(1 - x**2)*acos(x) - sqrt(1 - x**2)*asin(x)

Maxima [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.89

$$\int \arccos(x) \arcsin(x) dx = \left(x \arcsin(x) + \sqrt{-x^2 + 1} \right) \arccos(x) - \sqrt{-x^2 + 1} \arcsin(x) + 2x$$

[In] integrate(arcsin(x)*arccos(x),x, algorithm="maxima")

[Out] (x*arcsin(x) + sqrt(-x^2 + 1))*arccos(x) - sqrt(-x^2 + 1)*arcsin(x) + 2*x

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 163 vs. $2(34) = 68$.

Time = 0.28 (sec) , antiderivative size = 163, normalized size of antiderivative = 4.29

$$\begin{aligned} \int \arccos(x) \arcsin(x) dx = & -\pi(-1)^{\lfloor -\frac{\arccos(x)}{\pi} + 1 \rfloor} x \arccos(x) \left[-\frac{\arccos(x)}{\pi} + 1 \right] \\ & + \frac{1}{2} \pi(-1)^{\lfloor -\frac{\arccos(x)}{\pi} + 1 \rfloor} x \arccos(x) \\ & - (-1)^{\lfloor -\frac{\arccos(x)}{\pi} + 1 \rfloor} x \arccos(x)^2 \\ & + \pi \sqrt{-x^2 + 1} (-1)^{\lfloor -\frac{\arccos(x)}{\pi} + 1 \rfloor} \left[-\frac{\arccos(x)}{\pi} + 1 \right] \\ & - \frac{1}{2} \pi \sqrt{-x^2 + 1} (-1)^{\lfloor -\frac{\arccos(x)}{\pi} + 1 \rfloor} \\ & + 2 \sqrt{-x^2 + 1} (-1)^{\lfloor -\frac{\arccos(x)}{\pi} + 1 \rfloor} \arccos(x) + 2 (-1)^{\lfloor -\frac{\arccos(x)}{\pi} + 1 \rfloor} x \end{aligned}$$

[In] integrate(arcsin(x)*arccos(x),x, algorithm="giac")

[Out] $-\pi(-1)^{\lfloor -\arccos(x)/\pi + 1 \rfloor} x \arccos(x) \lfloor -\arccos(x)/\pi + 1 \rfloor + 1/2 \pi (-1)^{\lfloor -\arccos(x)/\pi + 1 \rfloor} x \arccos(x) - (-1)^{\lfloor -\arccos(x)/\pi + 1 \rfloor} x \arccos(x)^2 + \pi \sqrt{-x^2 + 1} (-1)^{\lfloor -\arccos(x)/\pi + 1 \rfloor} \lfloor -\arccos(x)/\pi + 1 \rfloor - 1/2 \pi \sqrt{-x^2 + 1} (-1)^{\lfloor -\arccos(x)/\pi + 1 \rfloor} + 2 \sqrt{-x^2 + 1} (-1)^{\lfloor -\arccos(x)/\pi + 1 \rfloor} \arccos(x) + 2 (-1)^{\lfloor -\arccos(x)/\pi + 1 \rfloor} x$

Mupad [F(-1)]

Timed out.

$$\int \arccos(x) \arcsin(x) dx = \int \operatorname{acos}(x) \operatorname{asin}(x) dx$$

[In] int(acos(x)*asin(x),x)

[Out] int(acos(x)*asin(x), x)

3.266 $\int (1 + 6x - 7x^2 + 4x^3 - x^4)^n dx$

| | |
|---------------------|------|
| Optimal result | 2732 |
| Rubi [B] (verified) | 2732 |
| Mathematica [F] | 2734 |
| Maple [F] | 2734 |
| Fricas [F] | 2734 |
| Sympy [F] | 2734 |
| Maxima [F] | 2735 |
| Giac [F] | 2735 |
| Mupad [F(-1)] | 2735 |

Optimal result

Integrand size = 22, antiderivative size = 52

$$\int (1 + 6x - 7x^2 + 4x^3 - x^4)^n dx = 3^n(-1 + x) \operatorname{AppellF1}\left(\frac{1}{2}, -n, -n, \frac{3}{2}, -\frac{2(-1 + x)^2}{1 + \sqrt{13}}, \frac{2(-1 + x)^2}{-1 + \sqrt{13}}\right)$$

[Out] $3^n(-1+x)*\operatorname{AppellF1}(1/2, -n, -n, 3/2, 2*(-1+x)^2/(-1+\sqrt{13}), -2*(-1+x)^2/(1+\sqrt{13}))$

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 115 vs. $2(52) = 104$.

Time = 0.17 (sec) , antiderivative size = 115, normalized size of antiderivative = 2.21, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.136$, Rules used = {1120, 1119, 440}

$$\int (1 + 6x - 7x^2 + 4x^3 - x^4)^n dx = (x - 1) \left(\frac{2(x - 1)^2}{1 - \sqrt{13}} + 1\right)^{-n} \left(\frac{2(x - 1)^2}{1 + \sqrt{13}} + 1\right)^{-n} (-(x - 1)^4 - (x - 1)^2 + 3)^n \operatorname{AppellF1}\left(\frac{1}{2}, -n, -n, \frac{3}{2}, -\frac{2(x - 1)^2}{1 + \sqrt{13}}, -\frac{2(x - 1)^2}{1 - \sqrt{13}}\right)$$

[In] $\operatorname{Int}[(1 + 6*x - 7*x^2 + 4*x^3 - x^4)^n, x]$

[Out] $((3 - (-1 + x)^2 - (-1 + x)^4)^n(-1 + x)*\operatorname{AppellF1}[1/2, -n, -n, 3/2, (-2*(-1 + x)^2)/(1 + \operatorname{Sqrt}[13]), (-2*(-1 + x)^2)/(1 - \operatorname{Sqrt}[13])])/((1 + (2*(-1 + x)^2)/(1 + \operatorname{Sqrt}[13]))^n(1 + (2*(-1 + x)^2)/(1 - \operatorname{Sqrt}[13]))^n)$

Rule 440

```
Int[((a_) + (b_.)*(x_)^(n_))^(p_)*((c_) + (d_.)*(x_)^(n_))^(q_), x_Symbol]
:> Simp[a^p*c^q*x*AppellF1[1/n, -p, -q, 1 + 1/n, (-b)*(x^n/a), (-d)*(x^n/c)
], x] /; FreeQ[{a, b, c, d, n, p, q}, x] && NeQ[b*c - a*d, 0] && NeQ[n, -1]
&& (IntegerQ[p] || GtQ[a, 0]) && (IntegerQ[q] || GtQ[c, 0])
```

Rule 1119

```
Int[((a_) + (b_.)*(x_)^2 + (c_.)*(x_)^4)^(p_), x_Symbol] :> With[{q = Rt[b^
2 - 4*a*c, 2]}, Dist[a^IntPart[p]*((a + b*x^2 + c*x^4)^FracPart[p]/((1 + 2*
c*(x^2/(b + q)))^FracPart[p]*(1 + 2*c*(x^2/(b - q)))^FracPart[p])), Int[(1
+ 2*c*(x^2/(b + q)))^p*(1 + 2*c*(x^2/(b - q)))^p, x], x]] /; FreeQ[{a, b, c
, p}, x] && NeQ[b^2 - 4*a*c, 0]
```

Rule 1120

```
Int[(P4_)^(p_), x_Symbol] :> With[{a = Coeff[P4, x, 0], b = Coeff[P4, x, 1]
, c = Coeff[P4, x, 2], d = Coeff[P4, x, 3], e = Coeff[P4, x, 4]}, Subst[Int
[SimplifyIntegrand[(a + d^4/(256*e^3) - b*(d/(8*e)) + (c - 3*(d^2/(8*e)))*x
^2 + e*x^4)^p, x], x], x, d/(4*e) + x] /; EqQ[d^3 - 4*c*d*e + 8*b*e^2, 0] &
& NeQ[d, 0]] /; FreeQ[p, x] && PolyQ[P4, x, 4] && NeQ[p, 2] && NeQ[p, 3]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \text{Subst}\left(\int (3 - x^2 - x^4)^n dx, x, -1 + x\right) \\
&= \left(\left(1 - \frac{2(-1+x)^2}{-1-\sqrt{13}}\right)^{-n} \left(1 - \frac{2(-1+x)^2}{-1+\sqrt{13}}\right)^{-n} (3 - (-1+x)^2\right. \\
&\quad \left. - (-1+x)^4\right)^n \text{Subst}\left(\int \left(1 - \frac{2x^2}{-1-\sqrt{13}}\right)^n \left(1 - \frac{2x^2}{-1+\sqrt{13}}\right)^n dx, x, -1 + x\right) \\
&= -\left(1 + \frac{2(1-x)^2}{1-\sqrt{13}}\right)^{-n} \left(1 + \frac{2(1-x)^2}{1+\sqrt{13}}\right)^{-n} (3 - (1-x)^2 - (1-x)^4)^n (1 \\
&\quad - x) \text{AppellF1}\left(\frac{1}{2}, -n, -n, \frac{3}{2}, -\frac{2(1-x)^2}{1+\sqrt{13}}, -\frac{2(1-x)^2}{1-\sqrt{13}}\right)
\end{aligned}$$

Mathematica [F]

$$\int (1 + 6x - 7x^2 + 4x^3 - x^4)^n dx = \int (-x^4 + 4x^3 - 7x^2 + 6x + 1)^n dx$$

[In] Integrate[(1 + 6*x - 7*x^2 + 4*x^3 - x^4)^n,x]

[Out] Integrate[(1 + 6*x - 7*x^2 + 4*x^3 - x^4)^n, x]

Maple [F]

$$\int (-x^4 + 4x^3 - 7x^2 + 6x + 1)^n dx$$

[In] int((-x^4+4*x^3-7*x^2+6*x+1)^n,x)

[Out] int((-x^4+4*x^3-7*x^2+6*x+1)^n,x)

Fricas [F]

$$\int (1 + 6x - 7x^2 + 4x^3 - x^4)^n dx = \int (-x^4 + 4x^3 - 7x^2 + 6x + 1)^n dx$$

[In] integrate((-x^4+4*x^3-7*x^2+6*x+1)^n,x, algorithm="fricas")

[Out] integral((-x^4 + 4*x^3 - 7*x^2 + 6*x + 1)^n, x)

Sympy [F]

$$\int (1 + 6x - 7x^2 + 4x^3 - x^4)^n dx = \int (-x^4 + 4x^3 - 7x^2 + 6x + 1)^n dx$$

[In] integrate((-x**4+4*x**3-7*x**2+6*x+1)**n,x)

[Out] Integral((-x**4 + 4*x**3 - 7*x**2 + 6*x + 1)**n, x)

Maxima [F]

$$\int (1 + 6x - 7x^2 + 4x^3 - x^4)^n dx = \int (-x^4 + 4x^3 - 7x^2 + 6x + 1)^n dx$$

[In] integrate((-x^4+4*x^3-7*x^2+6*x+1)^n,x, algorithm="maxima")

[Out] integrate((-x^4 + 4*x^3 - 7*x^2 + 6*x + 1)^n, x)

Giac [F]

$$\int (1 + 6x - 7x^2 + 4x^3 - x^4)^n dx = \int (-x^4 + 4x^3 - 7x^2 + 6x + 1)^n dx$$

[In] integrate((-x^4+4*x^3-7*x^2+6*x+1)^n,x, algorithm="giac")

[Out] integrate((-x^4 + 4*x^3 - 7*x^2 + 6*x + 1)^n, x)

Mupad [F(-1)]

Timed out.

$$\int (1 + 6x - 7x^2 + 4x^3 - x^4)^n dx = \int (-x^4 + 4x^3 - 7x^2 + 6x + 1)^n dx$$

[In] int((6*x - 7*x^2 + 4*x^3 - x^4 + 1)^n,x)

[Out] int((6*x - 7*x^2 + 4*x^3 - x^4 + 1)^n, x)

3.267 $\int \frac{x^4}{\sqrt{1-x}} dx$

| | |
|---|------|
| Optimal result | 2736 |
| Rubi [A] (verified) | 2736 |
| Mathematica [A] (verified) | 2737 |
| Maple [A] (verified) | 2737 |
| Fricas [A] (verification not implemented) | 2738 |
| Sympy [C] (verification not implemented) | 2738 |
| Maxima [A] (verification not implemented) | 2738 |
| Giac [A] (verification not implemented) | 2739 |
| Mupad [B] (verification not implemented) | 2739 |

Optimal result

Integrand size = 13, antiderivative size = 64

$$\int \frac{x^4}{\sqrt{1-x}} dx = -2\sqrt{1-x} + \frac{8}{3}(1-x)^{3/2} - \frac{12}{5}(1-x)^{5/2} + \frac{8}{7}(1-x)^{7/2} - \frac{2}{9}(1-x)^{9/2}$$

[Out] $-2*(1-x)^{(1/2)}+8/3*(1-x)^{(3/2)}-12/5*(1-x)^{(5/2)}+8/7*(1-x)^{(7/2)}-2/9*(1-x)^{(9/2)}$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 64, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.077$, Rules used = {45}

$$\int \frac{x^4}{\sqrt{1-x}} dx = -\frac{2}{9}(1-x)^{9/2} + \frac{8}{7}(1-x)^{7/2} - \frac{12}{5}(1-x)^{5/2} + \frac{8}{3}(1-x)^{3/2} - 2\sqrt{1-x}$$

[In] `Int[x^4/Sqrt[1 - x],x]`

[Out] $-2*\text{Sqrt}[1 - x] + (8*(1 - x)^{(3/2)})/3 - (12*(1 - x)^{(5/2)})/5 + (8*(1 - x)^{(7/2)})/7 - (2*(1 - x)^{(9/2)})/9$

Rule 45

```
Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.), x_Symbol] := Int
[ExpandIntegrand[(a + b*x)^m*(c + d*x)^n, x], x] /; FreeQ[{a, b, c, d, n},
x] && NeQ[b*c - a*d, 0] && IGtQ[m, 0] && (!IntegerQ[n] || (EqQ[c, 0] && Le
Q[7*m + 4*n + 4, 0]) || LtQ[9*m + 5*(n + 1), 0] || GtQ[m + n + 2, 0])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(\frac{1}{\sqrt{1-x}} - 4\sqrt{1-x} + 6(1-x)^{3/2} - 4(1-x)^{5/2} + (1-x)^{7/2} \right) dx \\ &= -2\sqrt{1-x} + \frac{8}{3}(1-x)^{3/2} - \frac{12}{5}(1-x)^{5/2} + \frac{8}{7}(1-x)^{7/2} - \frac{2}{9}(1-x)^{9/2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 33, normalized size of antiderivative = 0.52

$$\int \frac{x^4}{\sqrt{1-x}} dx = -\frac{2}{315}\sqrt{1-x}(128 + 64x + 48x^2 + 40x^3 + 35x^4)$$

[In] Integrate[x^4/Sqrt[1 - x],x]

[Out] (-2*Sqrt[1 - x]*(128 + 64*x + 48*x^2 + 40*x^3 + 35*x^4))/315

Maple [A] (verified)

Time = 0.21 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.45

| method | result | size |
|-------------------|---|------|
| trager | $\left(-\frac{2}{9}x^4 - \frac{16}{63}x^3 - \frac{32}{105}x^2 - \frac{128}{315}x - \frac{256}{315}\right)\sqrt{1-x}$ | 29 |
| gospers | $-\frac{2\sqrt{1-x}(35x^4+40x^3+48x^2+64x+128)}{315}$ | 30 |
| pseudoelliptic | $-\frac{2\sqrt{1-x}(35x^4+40x^3+48x^2+64x+128)}{315}$ | 30 |
| risch | $\frac{2(-1+x)(35x^4+40x^3+48x^2+64x+128)}{315\sqrt{1-x}}$ | 33 |
| meijerg | $-\frac{256\sqrt{\pi}}{315} + \frac{\sqrt{\pi}(70x^4+80x^3+96x^2+128x+256)\sqrt{1-x}}{315\sqrt{\pi}}$ | 44 |
| derivativedivides | $-2\sqrt{1-x} + \frac{8(1-x)^{\frac{3}{2}}}{3} - \frac{12(1-x)^{\frac{5}{2}}}{5} + \frac{8(1-x)^{\frac{7}{2}}}{7} - \frac{2(1-x)^{\frac{9}{2}}}{9}$ | 47 |
| default | $-2\sqrt{1-x} + \frac{8(1-x)^{\frac{3}{2}}}{3} - \frac{12(1-x)^{\frac{5}{2}}}{5} + \frac{8(1-x)^{\frac{7}{2}}}{7} - \frac{2(1-x)^{\frac{9}{2}}}{9}$ | 47 |

[In] int(x^4/(1-x)^(1/2),x,method=_RETURNVERBOSE)

[Out] (-2/9*x^4-16/63*x^3-32/105*x^2-128/315*x-256/315)*(1-x)^(1/2)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.45

$$\int \frac{x^4}{\sqrt{1-x}} dx = -\frac{2}{315} (35x^4 + 40x^3 + 48x^2 + 64x + 128)\sqrt{-x+1}$$

[In] integrate(x^4/(1-x)^(1/2),x, algorithm="fricas")

[Out] -2/315*(35*x^4 + 40*x^3 + 48*x^2 + 64*x + 128)*sqrt(-x + 1)

Sympy [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 1.70 (sec) , antiderivative size = 138, normalized size of antiderivative = 2.16

$$\int \frac{x^4}{\sqrt{1-x}} dx = \begin{cases} -\frac{2ix^4\sqrt{x-1}}{9} - \frac{16ix^3\sqrt{x-1}}{63} - \frac{32ix^2\sqrt{x-1}}{105} - \frac{128ix\sqrt{x-1}}{315} - \frac{256i\sqrt{x-1}}{315} & \text{for } |x| > 1 \\ -\frac{2x^4\sqrt{1-x}}{9} - \frac{16x^3\sqrt{1-x}}{63} - \frac{32x^2\sqrt{1-x}}{105} - \frac{128x\sqrt{1-x}}{315} - \frac{256\sqrt{1-x}}{315} & \text{otherwise} \end{cases}$$

[In] integrate(x**4/(1-x)**(1/2),x)

[Out] Piecewise((-2*I*x**4*sqrt(x - 1)/9 - 16*I*x**3*sqrt(x - 1)/63 - 32*I*x**2*sqrt(x - 1)/105 - 128*I*x*sqrt(x - 1)/315 - 256*I*sqrt(x - 1)/315, Abs(x) > 1), (-2*x**4*sqrt(1 - x)/9 - 16*x**3*sqrt(1 - x)/63 - 32*x**2*sqrt(1 - x)/105 - 128*x*sqrt(1 - x)/315 - 256*sqrt(1 - x)/315, True))

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 46, normalized size of antiderivative = 0.72

$$\int \frac{x^4}{\sqrt{1-x}} dx = -\frac{2}{9}(-x+1)^{\frac{9}{2}} + \frac{8}{7}(-x+1)^{\frac{7}{2}} - \frac{12}{5}(-x+1)^{\frac{5}{2}} + \frac{8}{3}(-x+1)^{\frac{3}{2}} - 2\sqrt{-x+1}$$

[In] integrate(x^4/(1-x)^(1/2),x, algorithm="maxima")

[Out] -2/9*(-x + 1)^(9/2) + 8/7*(-x + 1)^(7/2) - 12/5*(-x + 1)^(5/2) + 8/3*(-x + 1)^(3/2) - 2*sqrt(-x + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 61, normalized size of antiderivative = 0.95

$$\int \frac{x^4}{\sqrt{1-x}} dx = -\frac{2}{9}(x-1)^4\sqrt{-x+1} - \frac{8}{7}(x-1)^3\sqrt{-x+1} - \frac{12}{5}(x-1)^2\sqrt{-x+1} + \frac{8}{3}(-x+1)^{\frac{3}{2}} - 2\sqrt{-x+1}$$

[In] integrate(x^4/(1-x)^(1/2),x, algorithm="giac")

[Out] -2/9*(x - 1)^4*sqrt(-x + 1) - 8/7*(x - 1)^3*sqrt(-x + 1) - 12/5*(x - 1)^2*sqrt(-x + 1) + 8/3*(-x + 1)^(3/2) - 2*sqrt(-x + 1)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 46, normalized size of antiderivative = 0.72

$$\int \frac{x^4}{\sqrt{1-x}} dx = \frac{8(1-x)^{3/2}}{3} - 2\sqrt{1-x} - \frac{12(1-x)^{5/2}}{5} + \frac{8(1-x)^{7/2}}{7} - \frac{2(1-x)^{9/2}}{9}$$

[In] int(x^4/(1 - x)^(1/2),x)

[Out] (8*(1 - x)^(3/2))/3 - 2*(1 - x)^(1/2) - (12*(1 - x)^(5/2))/5 + (8*(1 - x)^(7/2))/7 - (2*(1 - x)^(9/2))/9

3.268 $\int \sin(x^{-n}) dx$

| | |
|--|------|
| Optimal result | 2740 |
| Rubi [A] (verified) | 2740 |
| Mathematica [A] (verified) | 2741 |
| Maple [C] (verified) | 2741 |
| Fricas [F] | 2742 |
| Sympy [B] (verification not implemented) | 2742 |
| Maxima [F] | 2742 |
| Giac [F] | 2742 |
| Mupad [F(-1)] | 2743 |

Optimal result

Integrand size = 6, antiderivative size = 43

$$\int \sin(x^{-n}) dx = \frac{ix(-\text{ExpIntegralE}(1 + \frac{1}{n}, -ix^{-n}) + \text{ExpIntegralE}(1 + \frac{1}{n}, ix^{-n}))}{2n}$$

[Out] $1/2*I*x*(-\text{Ei}(1+1/n, -I/(x^n))+\text{Ei}(1+1/n, I/(x^n)))/n$

Rubi [A] (verified)

Time = 0.02 (sec), antiderivative size = 77, normalized size of antiderivative = 1.79, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {3446, 2239}

$$\int \sin(x^{-n}) dx = \frac{ix(ix^{-n})^{\frac{1}{n}} \Gamma(-\frac{1}{n}, ix^{-n})}{2n} - \frac{ix(-ix^{-n})^{\frac{1}{n}} \Gamma(-\frac{1}{n}, -ix^{-n})}{2n}$$

[In] $\text{Int}[\text{Sin}[x^{-n}], x]$

[Out] $((-1/2*I)*x*((-I)/x^n)^n \Gamma[-n(-1), (-I)/x^n])/n + ((I/2)*x*(I/x^n)^n \Gamma[-n(-1), I/x^n])/n$

Rule 2239

$\text{Int}[(F_)^{((a_.) + (b_.)*((c_.) + (d_.)*(x_))^{(n_)}), x_Symbol] := \text{Simp}[(-F^a) * (c + d*x) * (\text{Gamma}[1/n, (-b)*(c + d*x)^n * \text{Log}[F]]) / (d*n * ((-b)*(c + d*x)^n * \text{Log}[F])^{(1/n)}), x] /;$ $\text{FreeQ}\{F, a, b, c, d, n\}, x \&\& !\text{IntegerQ}[2/n]$

Rule 3446

$\text{Int}[\text{Sin}[(c_.) + (d_.)*((e_.) + (f_.)*(x_))^{(n_)}], x_Symbol] := \text{Dist}[I/2, \text{Int}[E^{((-c)*I - d*I*(e + f*x)^n)}, x], x] - \text{Dist}[I/2, \text{Int}[E^{(c*I + d*I*(e + f*x)^n)}, x], x]$

$x)^n), x], x] /; \text{FreeQ}\{c, d, e, f, n\}, x]$

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2}i \int e^{-ix^{-n}} dx - \frac{1}{2}i \int e^{ix^{-n}} dx \\ &= -\frac{ix(-ix^{-n})^{\frac{1}{n}} \Gamma(-\frac{1}{n}, -ix^{-n})}{2n} + \frac{ix(ix^{-n})^{\frac{1}{n}} \Gamma(-\frac{1}{n}, ix^{-n})}{2n} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 70, normalized size of antiderivative = 1.63

$$\int \sin(x^{-n}) dx = -\frac{ix \left((-ix^{-n})^{\frac{1}{n}} \Gamma(-\frac{1}{n}, -ix^{-n}) - (ix^{-n})^{\frac{1}{n}} \Gamma(-\frac{1}{n}, ix^{-n}) \right)}{2n}$$

[In] Integrate[Sin[x^(-n)],x]

[Out] $((-1/2*I)*x*(((I)/x^n)^n*(-1)*Gamma[-n^(-1), (I)/x^n] - (I/x^n)^n*(-1)*Gamma[-n^(-1), I/x^n]))/n$

Maple [C] (verified)

Result contains higher order function than in optimal. Order 5 vs. order 4.

Time = 0.25 (sec) , antiderivative size = 47, normalized size of antiderivative = 1.09

| method | result | size |
|---------|--|------|
| meijerg | $-\frac{x^{-n+1} \text{hypergeom}\left(\left[\frac{1}{2}-\frac{1}{2n}\right], \left[\frac{3}{2}, \frac{3}{2}-\frac{1}{2n}\right], -\frac{x^{-4n}x^{2n}}{4}\right)}{n-1}$ | 47 |

[In] int(sin(1/(x^n)),x,method=_RETURNVERBOSE)

[Out] $-1/(n-1)*x^{(-n+1)}*hypergeom([1/2-1/2/n], [3/2, 3/2-1/2/n], -1/4*(x^{(-2*n)})^{2*x}^{(2*n)})$

Fricas [F]

$$\int \sin(x^{-n}) dx = \int \sin\left(\frac{1}{x^n}\right) dx$$

[In] integrate(sin(1/(x^n)),x, algorithm="fricas")

[Out] integral(sin(1/(x^n)), x)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 56 vs. 2(27) = 54.

Time = 0.73 (sec) , antiderivative size = 56, normalized size of antiderivative = 1.30

$$\int \sin(x^{-n}) dx = -\frac{x^{1-n}\Gamma\left(\frac{1}{2} - \frac{1}{2n}\right) {}_1F_2\left(\frac{1}{2} - \frac{1}{2n} \mid -\frac{x^{-2n}}{4}\right)}{2n\Gamma\left(\frac{3}{2} - \frac{1}{2n}\right)}$$

[In] integrate(sin(1/(x**n)),x)

[Out] -x**(1 - n)*gamma(1/2 - 1/(2*n))*hyper((1/2 - 1/(2*n)), (3/2, 3/2 - 1/(2*n)), -1/(4*x**(2*n)))/(2*n*gamma(3/2 - 1/(2*n)))

Maxima [F]

$$\int \sin(x^{-n}) dx = \int \sin\left(\frac{1}{x^n}\right) dx$$

[In] integrate(sin(1/(x^n)),x, algorithm="maxima")

[Out] integrate(sin(1/(x^n)), x)

Giac [F]

$$\int \sin(x^{-n}) dx = \int \sin\left(\frac{1}{x^n}\right) dx$$

[In] integrate(sin(1/(x^n)),x, algorithm="giac")

[Out] integrate(sin(1/(x^n)), x)

Mupad [F(-1)]

Timed out.

$$\int \sin(x^{-n}) dx = \int \sin\left(\frac{1}{x^n}\right) dx$$

```
[In] int(sin(1/x^n),x)
```

```
[Out] int(sin(1/x^n), x)
```

3.269 $\int \frac{1}{2}(-x + \sqrt{4 - 3x^2}) dx$

| | |
|---|------|
| Optimal result | 2744 |
| Rubi [A] (verified) | 2744 |
| Mathematica [A] (verified) | 2745 |
| Maple [A] (verified) | 2745 |
| Fricas [A] (verification not implemented) | 2746 |
| Sympy [A] (verification not implemented) | 2746 |
| Maxima [A] (verification not implemented) | 2747 |
| Giac [A] (verification not implemented) | 2747 |
| Mupad [B] (verification not implemented) | 2747 |

Optimal result

Integrand size = 19, antiderivative size = 41

$$\int \frac{1}{2}(-x + \sqrt{4 - 3x^2}) dx = -\frac{x^2}{4} + \frac{1}{4}x\sqrt{4 - 3x^2} + \frac{\arcsin\left(\frac{\sqrt{3}x}{2}\right)}{\sqrt{3}}$$

[Out] $-1/4*x^2+1/4*x*(-3*x^2+4)^{(1/2)}+1/3*\arcsin(1/2*x*3^{(1/2)})*3^{(1/2)}$

Rubi [A] (verified)

Time = 0.02 (sec), antiderivative size = 41, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.158$, Rules used = {12, 201, 222}

$$\int \frac{1}{2}(-x + \sqrt{4 - 3x^2}) dx = \frac{\arcsin\left(\frac{\sqrt{3}x}{2}\right)}{\sqrt{3}} - \frac{x^2}{4} + \frac{1}{4}\sqrt{4 - 3x^2}x$$

[In] $\text{Int}[(-x + \text{Sqrt}[4 - 3*x^2])/2, x]$

[Out] $-1/4*x^2 + (x*\text{Sqrt}[4 - 3*x^2])/4 + \text{ArcSin}[(\text{Sqrt}[3]*x)/2]/\text{Sqrt}[3]$

Rule 12

$\text{Int}[(a_*)*(u_), x_Symbol] \rightarrow \text{Dist}[a, \text{Int}[u, x], x] /; \text{FreeQ}[a, x] \ \&\& \ !\text{Match} \text{Q}[u, (b_*)*(v_)] /; \text{FreeQ}[b, x]$

Rule 201

$\text{Int}[((a_*) + (b_*)*(x_)^{(n_)})^{(p_)}, x_Symbol] \rightarrow \text{Simp}[x*((a + b*x^n)^p/(n*p + 1)), x] + \text{Dist}[a*n*(p/(n*p + 1)), \text{Int}[(a + b*x^n)^{(p - 1)}, x], x] /; \text{Free}$

$Q[\{a, b\}, x] \&\& \text{IGtQ}[n, 0] \&\& \text{GtQ}[p, 0] \&\& (\text{IntegerQ}[2*p] \parallel (\text{EqQ}[n, 2] \&\& \text{IntegerQ}[4*p]) \parallel (\text{EqQ}[n, 2] \&\& \text{IntegerQ}[3*p]) \parallel \text{LtQ}[\text{Denominator}[p + 1/n], \text{Denominator}[p]])$

Rule 222

$\text{Int}[1/\text{Sqrt}[(a_) + (b_)*(x_)^2], x_Symbol] \text{ :> } \text{Simp}[\text{ArcSin}[\text{Rt}[-b, 2]*(x/\text{Sqrt}[a])]/\text{Rt}[-b, 2], x] \text{ /; } \text{FreeQ}[\{a, b\}, x] \&\& \text{GtQ}[a, 0] \&\& \text{NegQ}[b]$

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{2} \int (-x + \sqrt{4 - 3x^2}) dx \\ &= -\frac{x^2}{4} + \frac{1}{2} \int \sqrt{4 - 3x^2} dx \\ &= -\frac{x^2}{4} + \frac{1}{4} x \sqrt{4 - 3x^2} + \int \frac{1}{\sqrt{4 - 3x^2}} dx \\ &= -\frac{x^2}{4} + \frac{1}{4} x \sqrt{4 - 3x^2} + \frac{\arcsin\left(\frac{\sqrt{3}x}{2}\right)}{\sqrt{3}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.14 (sec) , antiderivative size = 58, normalized size of antiderivative = 1.41

$$\int \frac{1}{2} (-x + \sqrt{4 - 3x^2}) dx = \frac{1}{2} \left(-\frac{x^2}{2} + \frac{1}{2} x \sqrt{4 - 3x^2} + \frac{4 \arctan\left(\frac{\sqrt{3}x}{-2 + \sqrt{4 - 3x^2}}\right)}{\sqrt{3}} \right)$$

[In] Integrate[(-x + Sqrt[4 - 3*x^2])/2,x]

[Out] (-1/2*x^2 + (x*Sqrt[4 - 3*x^2])/2 + (4*ArcTan[(Sqrt[3]*x)/(-2 + Sqrt[4 - 3*x^2])])/Sqrt[3])/2

Maple [A] (verified)

Time = 0.19 (sec) , antiderivative size = 31, normalized size of antiderivative = 0.76

| method | result | size |
|---------|---|------|
| default | $-\frac{x^2}{4} + \frac{x\sqrt{-3x^2+4}}{4} + \frac{\arcsin\left(\frac{x\sqrt{3}}{2}\right)\sqrt{3}}{3}$ | 31 |
| parts | $-\frac{x^2}{4} + \frac{x\sqrt{-3x^2+4}}{4} + \frac{\arcsin\left(\frac{x\sqrt{3}}{2}\right)\sqrt{3}}{3}$ | 31 |
| trager | $-\frac{x^2}{4} + \frac{x\sqrt{-3x^2+4}}{4} + \frac{\text{RootOf}(-Z^2+3)\ln(\text{RootOf}(-Z^2+3)\sqrt{-3x^2+4+3x})}{3}$ | 48 |

[In] `int(-1/2*x+1/2*(-3*x^2+4)^(1/2),x,method=_RETURNVERBOSE)`

[Out] `-1/4*x^2+1/4*x*(-3*x^2+4)^(1/2)+1/3*arcsin(1/2*x*3^(1/2))*3^(1/2)`

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 48, normalized size of antiderivative = 1.17

$$\int \frac{1}{2}(-x + \sqrt{4 - 3x^2}) dx = -\frac{1}{4}x^2 + \frac{1}{4}\sqrt{-3x^2 + 4}x - \frac{2}{3}\sqrt{3}\arctan\left(\frac{\sqrt{3}\sqrt{-3x^2 + 4} - 2\sqrt{3}}{3x}\right)$$

[In] `integrate(-1/2*x+1/2*(-3*x^2+4)^(1/2),x, algorithm="fricas")`

[Out] `-1/4*x^2 + 1/4*sqrt(-3*x^2 + 4)*x - 2/3*sqrt(3)*arctan(1/3*(sqrt(3)*sqrt(-3*x^2 + 4) - 2*sqrt(3))/x)`

Sympy [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.83

$$\int \frac{1}{2}(-x + \sqrt{4 - 3x^2}) dx = -\frac{x^2}{4} + \frac{x\sqrt{4 - 3x^2}}{4} + \frac{\sqrt{3}\operatorname{asin}\left(\frac{\sqrt{3}x}{2}\right)}{3}$$

[In] `integrate(-1/2*x+1/2*(-3*x**2+4)**(1/2),x)`

[Out] `-x**2/4 + x*sqrt(4 - 3*x**2)/4 + sqrt(3)*asin(sqrt(3)*x/2)/3`

Maxima [A] (verification not implemented)

none

Time = 0.31 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.73

$$\int \frac{1}{2}(-x + \sqrt{4 - 3x^2}) dx = -\frac{1}{4}x^2 + \frac{1}{4}\sqrt{-3x^2 + 4x} + \frac{1}{3}\sqrt{3}\arcsin\left(\frac{1}{2}\sqrt{3}x\right)$$

[In] integrate(-1/2*x+1/2*(-3*x^2+4)^(1/2),x, algorithm="maxima")

[Out] -1/4*x^2 + 1/4*sqrt(-3*x^2 + 4)*x + 1/3*sqrt(3)*arcsin(1/2*sqrt(3)*x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.73

$$\int \frac{1}{2}(-x + \sqrt{4 - 3x^2}) dx = -\frac{1}{4}x^2 + \frac{1}{4}\sqrt{-3x^2 + 4x} + \frac{1}{3}\sqrt{3}\arcsin\left(\frac{1}{2}\sqrt{3}x\right)$$

[In] integrate(-1/2*x+1/2*(-3*x^2+4)^(1/2),x, algorithm="giac")

[Out] -1/4*x^2 + 1/4*sqrt(-3*x^2 + 4)*x + 1/3*sqrt(3)*arcsin(1/2*sqrt(3)*x)

Mupad [B] (verification not implemented)

Time = 15.21 (sec) , antiderivative size = 31, normalized size of antiderivative = 0.76

$$\int \frac{1}{2}(-x + \sqrt{4 - 3x^2}) dx = \frac{\sqrt{3}\left(\operatorname{asin}\left(\frac{\sqrt{3}x}{2}\right) + \frac{3x\sqrt{\frac{4}{3}-x^2}}{4}\right)}{3} - \frac{x^2}{4}$$

[In] int((4 - 3*x^2)^(1/2)/2 - x/2,x)

[Out] (3^(1/2)*(asin((3^(1/2)*x)/2) + (3*x*(4/3 - x^2)^(1/2))/4))/3 - x^2/4

3.270 $\int (1 - 3x^2 + x^4)^n dx$

| | |
|----------------------------|------|
| Optimal result | 2748 |
| Rubi [A] (verified) | 2748 |
| Mathematica [A] (verified) | 2749 |
| Maple [F] | 2750 |
| Fricas [F] | 2750 |
| Sympy [F] | 2750 |
| Maxima [F] | 2750 |
| Giac [F] | 2751 |
| Mupad [F(-1)] | 2751 |

Optimal result

Integrand size = 12, antiderivative size = 99

$$\int (1 - 3x^2 + x^4)^n dx = x \left(1 - \frac{2x^2}{3 - \sqrt{5}}\right)^{-n} \left(1 - \frac{2x^2}{3 + \sqrt{5}}\right)^{-n} (1 - 3x^2 + x^4)^n \operatorname{AppellF1}\left(\frac{1}{2}, -n, -n, \frac{3}{2}, \frac{2x^2}{3 + \sqrt{5}}, \frac{2x^2}{3 - \sqrt{5}}\right)$$

[Out] $x*(x^4-3*x^2+1)^n*\operatorname{AppellF1}(1/2,-n,-n,3/2,2*x^2/(3-5^{(1/2)}),2*x^2/(3+5^{(1/2)}))/((1-2*x^2/(3-5^{(1/2)}))^n)/((1-2*x^2/(3+5^{(1/2)}))^n)$

Rubi [A] (verified)

Time = 0.06 (sec) , antiderivative size = 99, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {1119, 440}

$$\int (1 - 3x^2 + x^4)^n dx = x \left(1 - \frac{2x^2}{3 - \sqrt{5}}\right)^{-n} \left(1 - \frac{2x^2}{3 + \sqrt{5}}\right)^{-n} (x^4 - 3x^2 + 1)^n \operatorname{AppellF1}\left(\frac{1}{2}, -n, -n, \frac{3}{2}, \frac{2x^2}{3 + \sqrt{5}}, \frac{2x^2}{3 - \sqrt{5}}\right)$$

[In] $\operatorname{Int}[(1 - 3*x^2 + x^4)^n, x]$

[Out] $(x*(1 - 3*x^2 + x^4)^n*\operatorname{AppellF1}[1/2, -n, -n, 3/2, (2*x^2)/(3 + \operatorname{Sqrt}[5]), (2*x^2)/(3 - \operatorname{Sqrt}[5])])/((1 - (2*x^2)/(3 - \operatorname{Sqrt}[5]))^n*(1 - (2*x^2)/(3 + \operatorname{Sqrt}[5]))^n)$

Rule 440

$\operatorname{Int}[(a + (b \cdot x)^n)^p * (c + (d \cdot x)^n)^q, x_Symbol]$
 $\rightarrow \operatorname{Simp}[a^p * c^q * x * \operatorname{AppellF1}[1/n, -p, -q, 1 + 1/n, (-b)*(x^n/a), (-d)*(x^n/c)]$

], x] /; FreeQ[{a, b, c, d, n, p, q}, x] && NeQ[b*c - a*d, 0] && NeQ[n, -1] && (IntegerQ[p] || GtQ[a, 0]) && (IntegerQ[q] || GtQ[c, 0])

Rule 1119

Int[((a_) + (b_.)*(x_)^2 + (c_.)*(x_)^4)^(p_), x_Symbol] := With[{q = Rt[b^2 - 4*a*c, 2]}, Dist[a^IntPart[p]*((a + b*x^2 + c*x^4)^FracPart[p]/((1 + 2*c*(x^2/(b + q)))^FracPart[p]*(1 + 2*c*(x^2/(b - q)))^FracPart[p])), Int[(1 + 2*c*(x^2/(b + q)))^p*(1 + 2*c*(x^2/(b - q)))^p, x], x]] /; FreeQ[{a, b, c, p}, x] && NeQ[b^2 - 4*a*c, 0]

Rubi steps

$$\begin{aligned} \text{integral} &= \left(\left(1 + \frac{2x^2}{-3 - \sqrt{5}} \right)^{-n} \left(1 + \frac{2x^2}{-3 + \sqrt{5}} \right)^{-n} (1 - 3x^2 + x^4)^n \right) \int \left(1 + \frac{2x^2}{-3 - \sqrt{5}} \right)^n \left(1 + \frac{2x^2}{-3 + \sqrt{5}} \right)^n dx \\ &= x \left(1 - \frac{2x^2}{3 - \sqrt{5}} \right)^{-n} \left(1 - \frac{2x^2}{3 + \sqrt{5}} \right)^{-n} (1 - 3x^2 + x^4)^n \text{AppellF1} \left(\frac{1}{2}, -n, -n, \frac{3}{2}, \frac{2x^2}{3 + \sqrt{5}}, \frac{2x^2}{3 - \sqrt{5}} \right) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.18 (sec) , antiderivative size = 142, normalized size of antiderivative = 1.43

$$\begin{aligned} \int (1 - 3x^2 + x^4)^n dx &= (3 + \sqrt{5})^n x \left(-(3 + \sqrt{5} - 2x^2)^2 \right)^{-n} (-3 - \sqrt{5} + 2x^2)^n (-3 + \sqrt{5} + 2x^2)^n \left(\frac{(-3 + \sqrt{5} + 2x^2)^2}{-3 + \sqrt{5}} \right)^{-n} (1 - 3x^2 + x^4)^n \\ &\quad \text{AppellF1} \left(\frac{1}{2}, -n, -n, \frac{3}{2}, -\frac{2x^2}{-3 + \sqrt{5}}, \frac{2x^2}{3 + \sqrt{5}} \right) \end{aligned}$$

[In] Integrate[(1 - 3*x^2 + x^4)^n,x]

[Out] ((3 + Sqrt[5])^n*x*(-3 - Sqrt[5] + 2*x^2)^n*(-3 + Sqrt[5] + 2*x^2)^n*(1 - 3*x^2 + x^4)^n*AppellF1[1/2, -n, -n, 3/2, (-2*x^2)/(-3 + Sqrt[5]), (2*x^2)/(3 + Sqrt[5])])/((-3 + Sqrt[5] - 2*x^2)^2)^n*((-3 + Sqrt[5] + 2*x^2)^2/(-3 + Sqrt[5]))^n)

Maple [F]

$$\int (x^4 - 3x^2 + 1)^n dx$$

[In] int((x^4-3*x^2+1)^n,x)

[Out] int((x^4-3*x^2+1)^n,x)

Fricas [F]

$$\int (1 - 3x^2 + x^4)^n dx = \int (x^4 - 3x^2 + 1)^n dx$$

[In] integrate((x^4-3*x^2+1)^n,x, algorithm="fricas")

[Out] integral((x^4 - 3*x^2 + 1)^n, x)

Sympy [F]

$$\int (1 - 3x^2 + x^4)^n dx = \int (x^4 - 3x^2 + 1)^n dx$$

[In] integrate((x**4-3*x**2+1)**n,x)

[Out] Integral((x**4 - 3*x**2 + 1)**n, x)

Maxima [F]

$$\int (1 - 3x^2 + x^4)^n dx = \int (x^4 - 3x^2 + 1)^n dx$$

[In] integrate((x^4-3*x^2+1)^n,x, algorithm="maxima")

[Out] integrate((x^4 - 3*x^2 + 1)^n, x)

Giac [F]

$$\int (1 - 3x^2 + x^4)^n dx = \int (x^4 - 3x^2 + 1)^n dx$$

[In] integrate((x^4-3*x^2+1)^n,x, algorithm="giac")

[Out] integrate((x^4 - 3*x^2 + 1)^n, x)

Mupad [F(-1)]

Timed out.

$$\int (1 - 3x^2 + x^4)^n dx = \int (x^4 - 3x^2 + 1)^n dx$$

[In] int((x^4 - 3*x^2 + 1)^n,x)

[Out] int((x^4 - 3*x^2 + 1)^n, x)

3.271 $\int \frac{(1+e^{-x})x}{-1+e^x} dx$

| | |
|---|------|
| Optimal result | 2752 |
| Rubi [A] (verified) | 2752 |
| Mathematica [A] (verified) | 2754 |
| Maple [A] (verified) | 2754 |
| Fricas [A] (verification not implemented) | 2754 |
| Sympy [F] | 2755 |
| Maxima [A] (verification not implemented) | 2755 |
| Giac [F] | 2755 |
| Mupad [F(-1)] | 2755 |

Optimal result

Integrand size = 16, antiderivative size = 36

$$\int \frac{(1+e^{-x})x}{-1+e^x} dx = e^{-x} + e^{-x}x - x^2 + 2x \log(1 - e^x) + 2 \text{PolyLog}(2, e^x)$$

[Out] $\exp(-x)+x/\exp(x)-x^2+2*x*\ln(1-\exp(x))+2*\text{polylog}(2,\exp(x))$

Rubi [A] (verified)

Time = 0.11 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.00, number of steps used = 8, number of rules used = 7, $\frac{\text{number of rules}}{\text{integrand size}} = 0.438$, Rules used = {2286, 2207, 2225, 2215, 2221, 2317, 2438}

$$\int \frac{(1+e^{-x})x}{-1+e^x} dx = 2 \text{PolyLog}(2, e^x) - x^2 + e^{-x}x + e^{-x} + 2x \log(1 - e^x)$$

[In] $\text{Int}[(1 + E^{-x})*x]/(-1 + E^x), x]$

[Out] $E^{-x} + x/E^x - x^2 + 2*x*\text{Log}[1 - E^x] + 2*\text{PolyLog}[2, E^x]$

Rule 2207

```
Int[((b_.)*(F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m_.), x_Symbol] :> Simp[(c + d*x)^m*((b*F^(g*(e + f*x)))^n/(f*g*n*Log[F])), x] - Dist[d*(m/(f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*(b*F^(g*(e + f*x)))^n, x], x] /; FreeQ[{F, b, c, d, e, f, g, n}, x] && GtQ[m, 0] && IntegerQ[2*m] && !TrueQ[$UseGamma]
```

Rule 2215

```
Int[((c_.) + (d_.)*(x_))^(m_.)/((a_.) + (b_.)*((F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)), x_Symbol] := Simp[(c + d*x)^(m + 1)/(a*d*(m + 1)), x] - Dist[b/a, Int[(c + d*x)^m*((F^(g*(e + f*x)))^n/(a + b*(F^(g*(e + f*x)))^n)), x], x] /; FreeQ[{F, a, b, c, d, e, f, g, n}, x] && IGtQ[m, 0]
```

Rule 2221

```
Int[(((F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)*((c_.) + (d_.)*(x_))^(m_.))/((a_.) + (b_.)*((F_)^((g_.)*((e_.) + (f_.)*(x_))))^(n_.)), x_Symbol] := Simp[((c + d*x)^m/(b*f*g*n*Log[F]))*Log[1 + b*((F^(g*(e + f*x)))^n/a)], x] - Dist[d*(m/(b*f*g*n*Log[F])), Int[(c + d*x)^(m - 1)*Log[1 + b*((F^(g*(e + f*x)))^n/a)], x], x] /; FreeQ[{F, a, b, c, d, e, f, g, n}, x] && IGtQ[m, 0]
```

Rule 2225

```
Int[((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.), x_Symbol] := Simp[(F^(c*(a + b*x)))^n/(b*c*n*Log[F]), x] /; FreeQ[{F, a, b, c, n}, x]
```

Rule 2286

```
Int[((a_.) + (b_.)*(F_)^(u_))^(p_.)*((c_.) + (d_.)*(F_)^(v_))^(q_.)*((e_.) + (f_.)*(x_))^(m_.), x_Symbol] := With[{w = ExpandIntegrand[(e + f*x)^m, (a + b*F^u)^p*(c + d*F^v)^q, x]}, Int[w, x] /; SumQ[w]] /; FreeQ[{F, a, b, c, d, e, f, m}, x] && IntegersQ[p, q] && LinearQ[{u, v}, x] && RationalQ[Simplify[u/v]]
```

Rule 2317

```
Int[Log[(a_.) + (b_.)*((F_)^((e_.)*((c_.) + (d_.)*(x_))))^(n_.)], x_Symbol] := Dist[1/(d*e*n*Log[F]), Subst[Int[Log[a + b*x]/x, x], x, (F^(e*(c + d*x)))^n], x] /; FreeQ[{F, a, b, c, d, e, n}, x] && GtQ[a, 0]
```

Rule 2438

```
Int[Log[(c_.)*((d_.) + (e_.)*(x_)^(n_.))]/(x_), x_Symbol] := Simp[-PolyLog[2, (-c)*e*x^n]/n, x] /; FreeQ[{c, d, e, n}, x] && EqQ[c*d, 1]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(-e^{-x}x + \frac{2x}{-1 + e^x} \right) dx \\ &= 2 \int \frac{x}{-1 + e^x} dx - \int e^{-x}x dx \\ &= e^{-x}x - x^2 + 2 \int \frac{e^x x}{-1 + e^x} dx - \int e^{-x} dx \end{aligned}$$

$$\begin{aligned}
&= e^{-x} + e^{-x}x - x^2 + 2x \log(1 - e^x) - 2 \int \log(1 - e^x) dx \\
&= e^{-x} + e^{-x}x - x^2 + 2x \log(1 - e^x) - 2 \text{Subst} \left(\int \frac{\log(1-x)}{x} dx, x, e^x \right) \\
&= e^{-x} + e^{-x}x - x^2 + 2x \log(1 - e^x) + 2 \text{PolyLog}(2, e^x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.18 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.00

$$\int \frac{(1 + e^{-x})x}{-1 + e^x} dx = e^{-x}(1 + x - e^x x^2) + 2x \log(1 - e^x) + 2 \text{PolyLog}(2, e^x)$$

[In] Integrate[((1 + E^(-x))*x)/(-1 + E^x),x]

[Out] (1 + x - E^x*x^2)/E^x + 2*x*Log[1 - E^x] + 2*PolyLog[2, E^x]

Maple [A] (verified)

Time = 0.04 (sec) , antiderivative size = 31, normalized size of antiderivative = 0.86

| method | result | size |
|---------|--|------|
| risch | $(1 + x)e^{-x} - x^2 + 2x \ln(1 - e^x) + 2 \text{polylog}(2, e^x)$ | 31 |
| default | $x e^{-x} + 2x \ln(1 - e^x) - x^2 + e^{-x} + 2 \text{polylog}(2, e^x)$ | 33 |

[In] int(x*(exp(-x)+1)/(exp(x)-1),x,method=_RETURNVERBOSE)

[Out] (1+x)/exp(x)-x^2+2*x*ln(1-exp(x))+2*polylog(2,exp(x))

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.00

$$\int \frac{(1 + e^{-x})x}{-1 + e^x} dx = -(x^2 e^x - 2x e^x \log(-e^x + 1) - 2 \text{Li}_2(e^x) e^x - x - 1) e^{(-x)}$$

[In] integrate(x*(exp(-x)+1)/(exp(x)-1),x, algorithm="fricas")

[Out] -(x^2*e^x - 2*x*e^x*log(-e^x + 1) - 2*dilog(e^x)*e^x - x - 1)*e^(-x)

Sympy [F]

$$\int \frac{(1 + e^{-x})x}{-1 + e^x} dx = \int \frac{x(e^x + 1)e^{-x}}{e^x - 1} dx$$

[In] integrate(x*(exp(-x)+1)/(exp(x)-1),x)

[Out] Integral(x*(exp(x) + 1)*exp(-x)/(exp(x) - 1), x)

Maxima [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.81

$$\int \frac{(1 + e^{-x})x}{-1 + e^x} dx = -x^2 + (x + 1)e^{-x} + 2x \log(-e^x + 1) + 2 \operatorname{Li}_2(e^x)$$

[In] integrate(x*(exp(-x)+1)/(exp(x)-1),x, algorithm="maxima")

[Out] -x^2 + (x + 1)*e^(-x) + 2*x*log(-e^x + 1) + 2*dilog(e^x)

Giac [F]

$$\int \frac{(1 + e^{-x})x}{-1 + e^x} dx = \int \frac{x(e^{-x} + 1)}{e^x - 1} dx$$

[In] integrate(x*(exp(-x)+1)/(exp(x)-1),x, algorithm="giac")

[Out] integrate(x*(e^(-x) + 1)/(e^x - 1), x)

Mupad [F(-1)]

Timed out.

$$\int \frac{(1 + e^{-x})x}{-1 + e^x} dx = \int \frac{x(e^{-x} + 1)}{e^x - 1} dx$$

[In] int((x*(exp(-x) + 1))/(exp(x) - 1),x)

[Out] int((x*(exp(-x) + 1))/(exp(x) - 1), x)

3.272 $\int e^{-x} x^4 \sin(x) dx$

| | |
|---|------|
| Optimal result | 2756 |
| Rubi [B] (verified) | 2756 |
| Mathematica [A] (verified) | 2759 |
| Maple [A] (verified) | 2759 |
| Fricas [A] (verification not implemented) | 2759 |
| Sympy [B] (verification not implemented) | 2760 |
| Maxima [A] (verification not implemented) | 2760 |
| Giac [A] (verification not implemented) | 2760 |
| Mupad [B] (verification not implemented) | 2761 |

Optimal result

Integrand size = 11, antiderivative size = 44

$$\int e^{-x} x^4 \sin(x) dx = \frac{1}{2} e^{-x} \left(-((-6 + x^2(6 + x(4 + x))) \cos(x)) + (6 + x(12 + 6x - x^3)) \sin(x) \right)$$

[Out] $1/2 * (-(-6 + x^2 * (6 + (4 + x) * x)) * \cos(x) + (6 + x * (-x^3 + 6 * x + 12)) * \sin(x)) / \exp(x)$

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 93 vs. $2(44) = 88$.

Time = 0.75 (sec) , antiderivative size = 93, normalized size of antiderivative = 2.11, number of steps used = 53, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.455$, Rules used = {4517, 4553, 14, 4518, 4554}

$$\int e^{-x} x^4 \sin(x) dx = -\frac{1}{2} e^{-x} x^4 \sin(x) - \frac{1}{2} e^{-x} x^4 \cos(x) - 2e^{-x} x^3 \cos(x) + 3e^{-x} x^2 \sin(x) - 3e^{-x} x^2 \cos(x) + 6e^{-x} x \sin(x) + 3e^{-x} \sin(x) + 3e^{-x} \cos(x)$$

[In] $\text{Int}[(x^4 * \text{Sin}[x]) / E^x, x]$

[Out] $(3 * \text{Cos}[x]) / E^x - (3 * x^2 * \text{Cos}[x]) / E^x - (2 * x^3 * \text{Cos}[x]) / E^x - (x^4 * \text{Cos}[x]) / (2 * E^x) + (3 * \text{Sin}[x]) / E^x + (6 * x * \text{Sin}[x]) / E^x + (3 * x^2 * \text{Sin}[x]) / E^x - (x^4 * \text{Sin}[x]) / (2 * E^x)$

Rule 14

$\text{Int}[(u_*) * ((c_*) * (x_*))^m, x_Symbol] \rightarrow \text{Int}[\text{ExpandIntegrand}[(c * x)^m * u, x], x] /;$ FreeQ[{c, m}, x] && SumQ[u] && !LinearQ[u, x] && !MatchQ[u, (a_ + (b_*) * (v_)) /; FreeQ[{a, b}, x] && InverseFunctionQ[v]]

Rule 4517

```
Int[(F_)^((c_.)*((a_.) + (b_.)*(x_)))*Sin[(d_.) + (e_.)*(x_)], x_Symbol] :=
  Simp[b*c*Log[F]*F^(c*(a + b*x))*(Sin[d + e*x]/(e^2 + b^2*c^2*Log[F]^2)), x
] - Simp[e*F^(c*(a + b*x))*(Cos[d + e*x]/(e^2 + b^2*c^2*Log[F]^2)), x] /; F
reeQ[{F, a, b, c, d, e}, x] && NeQ[e^2 + b^2*c^2*Log[F]^2, 0]
```

Rule 4518

```
Int[Cos[(d_.) + (e_.)*(x_)]*(F_)^((c_.)*((a_.) + (b_.)*(x_))), x_Symbol] :=
  Simp[b*c*Log[F]*F^(c*(a + b*x))*(Cos[d + e*x]/(e^2 + b^2*c^2*Log[F]^2)), x
] + Simp[e*F^(c*(a + b*x))*(Sin[d + e*x]/(e^2 + b^2*c^2*Log[F]^2)), x] /; F
reeQ[{F, a, b, c, d, e}, x] && NeQ[e^2 + b^2*c^2*Log[F]^2, 0]
```

Rule 4553

```
Int[(F_)^((c_.)*((a_.) + (b_.)*(x_)))*((f_.)*(x_)^(m_.)*Sin[(d_.) + (e_.)*
(x_)^(n_.)], x_Symbol] := Module[{u = IntHide[F^(c*(a + b*x))*Sin[d + e*x]^
n, x]}, Dist[(f*x)^m, u, x] - Dist[f*m, Int[(f*x)^(m - 1)*u, x], x] /; Fre
eQ[{F, a, b, c, d, e, f}, x] && IGtQ[n, 0] && GtQ[m, 0]
```

Rule 4554

```
Int[Cos[(d_.) + (e_.)*(x_)]^(n_.)*(F_)^((c_.)*((a_.) + (b_.)*(x_)))*((f_.)*
(x_)^(m_.)], x_Symbol] := Module[{u = IntHide[F^(c*(a + b*x))*Cos[d + e*x]^
n, x]}, Dist[(f*x)^m, u, x] - Dist[f*m, Int[(f*x)^(m - 1)*u, x], x] /; Fre
eQ[{F, a, b, c, d, e, f}, x] && IGtQ[n, 0] && GtQ[m, 0]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) - 4 \int x^3 \left(-\frac{1}{2}e^{-x} \cos(x) - \frac{1}{2}e^{-x} \sin(x) \right) dx \\
&= -\frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) - 4 \int \left(-\frac{1}{2}e^{-x}x^3 \cos(x) - \frac{1}{2}e^{-x}x^3 \sin(x) \right) dx \\
&= -\frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) + 2 \int e^{-x}x^3 \cos(x) dx + 2 \int e^{-x}x^3 \sin(x) dx \\
&= -2e^{-x}x^3 \cos(x) - \frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) \\
&\quad - 6 \int x^2 \left(-\frac{1}{2}e^{-x} \cos(x) - \frac{1}{2}e^{-x} \sin(x) \right) dx \\
&\quad - 6 \int x^2 \left(-\frac{1}{2}e^{-x} \cos(x) + \frac{1}{2}e^{-x} \sin(x) \right) dx
\end{aligned}$$

$$\begin{aligned}
&= -2e^{-x}x^3 \cos(x) - \frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) \\
&\quad - 6 \int \left(-\frac{1}{2}e^{-x}x^2 \cos(x) - \frac{1}{2}e^{-x}x^2 \sin(x) \right) dx \\
&\quad - 6 \int \left(-\frac{1}{2}e^{-x}x^2 \cos(x) + \frac{1}{2}e^{-x}x^2 \sin(x) \right) dx \\
&= -2e^{-x}x^3 \cos(x) - \frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) + 2 \left(3 \int e^{-x}x^2 \cos(x) dx \right) \\
&= -2e^{-x}x^3 \cos(x) - \frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) \\
&\quad + 2 \left(-\frac{3}{2}e^{-x}x^2 \cos(x) + \frac{3}{2}e^{-x}x^2 \sin(x) - 6 \int x \left(-\frac{1}{2}e^{-x} \cos(x) + \frac{1}{2}e^{-x} \sin(x) \right) dx \right) \\
&= -2e^{-x}x^3 \cos(x) - \frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) \\
&\quad + 2 \left(-\frac{3}{2}e^{-x}x^2 \cos(x) + \frac{3}{2}e^{-x}x^2 \sin(x) - 6 \int \left(-\frac{1}{2}e^{-x}x \cos(x) + \frac{1}{2}e^{-x}x \sin(x) \right) dx \right) \\
&= -2e^{-x}x^3 \cos(x) - \frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) \\
&\quad + 2 \left(-\frac{3}{2}e^{-x}x^2 \cos(x) + \frac{3}{2}e^{-x}x^2 \sin(x) + 3 \int e^{-x}x \cos(x) dx - 3 \int e^{-x}x \sin(x) dx \right) \\
&= -2e^{-x}x^3 \cos(x) - \frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) + 2 \left(-\frac{3}{2}e^{-x}x^2 \cos(x) \right. \\
&\quad \left. + 3e^{-x}x \sin(x) + \frac{3}{2}e^{-x}x^2 \sin(x) + 3 \int \left(-\frac{1}{2}e^{-x} \cos(x) - \frac{1}{2}e^{-x} \sin(x) \right) dx \right. \\
&\quad \left. - 3 \int \left(-\frac{1}{2}e^{-x} \cos(x) + \frac{1}{2}e^{-x} \sin(x) \right) dx \right) \\
&= -2e^{-x}x^3 \cos(x) - \frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) \\
&\quad + 2 \left(-\frac{3}{2}e^{-x}x^2 \cos(x) + 3e^{-x}x \sin(x) + \frac{3}{2}e^{-x}x^2 \sin(x) - 2 \left(\frac{3}{2} \int e^{-x} \sin(x) dx \right) \right) \\
&= -2e^{-x}x^3 \cos(x) - \frac{1}{2}e^{-x}x^4 \cos(x) - \frac{1}{2}e^{-x}x^4 \sin(x) + 2 \left(-\frac{3}{2}e^{-x}x^2 \cos(x) \right. \\
&\quad \left. + 3e^{-x}x \sin(x) + \frac{3}{2}e^{-x}x^2 \sin(x) - 2 \left(-\frac{3}{4}e^{-x} \cos(x) - \frac{3}{4}e^{-x} \sin(x) \right) \right)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 47, normalized size of antiderivative = 1.07

$$\int e^{-x} x^4 \sin(x) dx = \frac{1}{2} e^{-x} (-((-6 + 6x^2 + 4x^3 + x^4) \cos(x)) + (6 + 12x + 6x^2 - x^4) \sin(x))$$

`[In] Integrate[(x^4*Sin[x])/E^x,x]``[Out] (-((-6 + 6*x^2 + 4*x^3 + x^4)*Cos[x]) + (6 + 12*x + 6*x^2 - x^4)*Sin[x])/(2 *E^x)`**Maple [A] (verified)**

Time = 0.16 (sec) , antiderivative size = 42, normalized size of antiderivative = 0.95

| method | result |
|---------------|---|
| parallelrisch | $-\frac{e^{-x}((x^4+4x^3+6x^2-6)\cos(x)+\sin(x)(x^4-6x^2-12x-6))}{2}$ |
| default | $(-\frac{1}{2}x^4 - 2x^3 - 3x^2 + 3) e^{-x} \cos(x) + (-\frac{1}{2}x^4 + 3x^2 + 6x + 3) e^{-x} \sin(x)$ |
| risch | $(-\frac{1}{4} + \frac{i}{4})(x^4 + 2ix^3 + 2x^3 + 6ix^2 + 6ix - 6x - 6) e^{(-1+i)x} + (-\frac{1}{4} - \frac{i}{4})(x^4 - 2ix^3 + 2x^3 -$ |
| norman | $\frac{-3x^2e^{-x}-2x^3e^{-x}-\frac{x^4e^{-x}}{2}+6e^{-x}\tan(\frac{x}{2})-3e^{-x}\tan(\frac{x}{2})^2+12xe^{-x}\tan(\frac{x}{2})+6x^2e^{-x}\tan(\frac{x}{2})+3x^2e^{-x}\tan(\frac{x}{2})^2+2x^3e^{-x}\tan(\frac{x}{2})}{1+\tan(\frac{x}{2})^2}$ |

`[In] int(x^4*exp(-x)*sin(x),x,method=_RETURNVERBOSE)``[Out] -1/2*exp(-x)*((x^4+4*x^3+6*x^2-6)*cos(x)+sin(x)*(x^4-6*x^2-12*x-6))`**Fricas [A] (verification not implemented)**

none

Time = 0.24 (sec) , antiderivative size = 45, normalized size of antiderivative = 1.02

$$\int e^{-x} x^4 \sin(x) dx = -\frac{1}{2} (x^4 + 4x^3 + 6x^2 - 6) \cos(x) e^{-x} - \frac{1}{2} (x^4 - 6x^2 - 12x - 6) e^{-x} \sin(x)$$

`[In] integrate(x^4*exp(-x)*sin(x),x, algorithm="fricas")``[Out] -1/2*(x^4 + 4*x^3 + 6*x^2 - 6)*cos(x)*e^(-x) - 1/2*(x^4 - 6*x^2 - 12*x - 6)*e^(-x)*sin(x)`

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 85 vs. $2(36) = 72$.

Time = 1.03 (sec) , antiderivative size = 85, normalized size of antiderivative = 1.93

$$\int e^{-x} x^4 \sin(x) dx = -\frac{x^4 e^{-x} \sin(x)}{2} - \frac{x^4 e^{-x} \cos(x)}{2} - 2x^3 e^{-x} \cos(x) + 3x^2 e^{-x} \sin(x) - 3x^2 e^{-x} \cos(x) + 6x e^{-x} \sin(x) + 3e^{-x} \sin(x) + 3e^{-x} \cos(x)$$

[In] integrate(x**4*exp(-x)*sin(x),x)

[Out] -x**4*exp(-x)*sin(x)/2 - x**4*exp(-x)*cos(x)/2 - 2*x**3*exp(-x)*cos(x) + 3*x**2*exp(-x)*sin(x) - 3*x**2*exp(-x)*cos(x) + 6*x*exp(-x)*sin(x) + 3*exp(-x)*sin(x) + 3*exp(-x)*cos(x)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 41, normalized size of antiderivative = 0.93

$$\int e^{-x} x^4 \sin(x) dx = -\frac{1}{2} \left((x^4 + 4x^3 + 6x^2 - 6) \cos(x) + (x^4 - 6x^2 - 12x - 6) \sin(x) \right) e^{-x}$$

[In] integrate(x^4*exp(-x)*sin(x),x, algorithm="maxima")

[Out] -1/2*((x^4 + 4*x^3 + 6*x^2 - 6)*cos(x) + (x^4 - 6*x^2 - 12*x - 6)*sin(x))*e^(-x)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 41, normalized size of antiderivative = 0.93

$$\int e^{-x} x^4 \sin(x) dx = -\frac{1}{2} \left((x^4 + 4x^3 + 6x^2 - 6) \cos(x) + (x^4 - 6x^2 - 12x - 6) \sin(x) \right) e^{-x}$$

[In] integrate(x^4*exp(-x)*sin(x),x, algorithm="giac")

[Out] -1/2*((x^4 + 4*x^3 + 6*x^2 - 6)*cos(x) + (x^4 - 6*x^2 - 12*x - 6)*sin(x))*e^(-x)

Mupad [B] (verification not implemented)

Time = 16.53 (sec) , antiderivative size = 55, normalized size of antiderivative = 1.25

$$\int e^{-x} x^4 \sin(x) dx$$

$$= \frac{e^{-x} (6 \cos(x) + 6 \sin(x) - 6 x^2 \cos(x) - 4 x^3 \cos(x) - x^4 \cos(x) + 6 x^2 \sin(x) - x^4 \sin(x) + 12 x \sin(x))}{2}$$

[In] `int(x^4*exp(-x)*sin(x),x)`

[Out] `(exp(-x)*(6*cos(x) + 6*sin(x) - 6*x^2*cos(x) - 4*x^3*cos(x) - x^4*cos(x) + 6*x^2*sin(x) - x^4*sin(x) + 12*x*sin(x)))/2`

$$3.273 \quad \int \frac{-3(-3x+x^3) + (-3x+x^3)^3}{\sqrt{-4+x^2}} dx$$

| | |
|---|------|
| Optimal result | 2762 |
| Rubi [A] (verified) | 2762 |
| Mathematica [A] (verified) | 2763 |
| Maple [A] (verified) | 2764 |
| Fricas [A] (verification not implemented) | 2764 |
| Sympy [A] (verification not implemented) | 2764 |
| Maxima [A] (verification not implemented) | 2765 |
| Giac [A] (verification not implemented) | 2765 |
| Mupad [B] (verification not implemented) | 2765 |

Optimal result

Integrand size = 29, antiderivative size = 56

$$\int \frac{-3(-3x+x^3) + (-3x+x^3)^3}{\sqrt{-4+x^2}} dx = \sqrt{-4+x^2} + \frac{10}{3}(-4+x^2)^{3/2} + 3(-4+x^2)^{5/2} + (-4+x^2)^{7/2} + \frac{1}{9}(-4+x^2)^{9/2}$$

[Out] $(x^2-4)^{(1/2)}+10/3*(x^2-4)^{(3/2)}+3*(x^2-4)^{(5/2)}+(x^2-4)^{(7/2)}+1/9*(x^2-4)^{(9/2)}$

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 56, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.103$, Rules used = {1825, 1813, 1864}

$$\int \frac{-3(-3x+x^3) + (-3x+x^3)^3}{\sqrt{-4+x^2}} dx = \frac{1}{9}(x^2-4)^{9/2} + (x^2-4)^{7/2} + 3(x^2-4)^{5/2} + \frac{10}{3}(x^2-4)^{3/2} + \sqrt{x^2-4}$$

[In] $\text{Int}[(-3*(-3*x + x^3) + (-3*x + x^3)^3)/\text{Sqrt}[-4 + x^2], x]$

[Out] $\text{Sqrt}[-4 + x^2] + (10*(-4 + x^2)^{(3/2)})/3 + 3*(-4 + x^2)^{(5/2)} + (-4 + x^2)^{(7/2)} + (-4 + x^2)^{(9/2)}/9$

Rule 1813

$\text{Int}[(\text{Pq}_.)*(x_.)^{(m_.)}*((a_.) + (b_.)*(x_.)^2)^{(p_.)}, x_Symbol] \rightarrow \text{Dist}[1/2, \text{Subst}[\text{Int}[x^{((m-1)/2)}*\text{SubstFor}[x^2, \text{Pq}, x]*(a + b*x)^p, x], x, x^2], x] /;$

FreeQ[{a, b, p}, x] && PolyQ[Pq, x^2] && IntegerQ[(m - 1)/2]

Rule 1825

Int[(Pq_)*((a_) + (b_)*(x_)^2)^p, x_Symbol] := Int[x*PolynomialQuotient[Pq, x, x]*(a + b*x^2)^p, x] /; FreeQ[{a, b, p}, x] && PolyQ[Pq, x] && EqQ[Coeff[Pq, x, 0], 0] && !MatchQ[Pq, x^(m_.)*(u_.)] /; IntegerQ[m]

Rule 1864

Int[(Pq_)*((a_) + (b_)*(x_)^(n_.))^p, x_Symbol] := Int[ExpandIntegrand[Pq*(a + b*x^n)^p, x], x] /; FreeQ[{a, b, n}, x] && PolyQ[Pq, x] && (IGtQ[p, 0] || EqQ[n, 1])

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \frac{x(9 - 30x^2 + 27x^4 - 9x^6 + x^8)}{\sqrt{-4 + x^2}} dx \\
 &= \frac{1}{2} \text{Subst} \left(\int \frac{9 - 30x + 27x^2 - 9x^3 + x^4}{\sqrt{-4 + x}} dx, x, x^2 \right) \\
 &= \frac{1}{2} \text{Subst} \left(\int \left(\frac{1}{\sqrt{-4 + x}} + 10\sqrt{-4 + x} + 15(-4 + x)^{3/2} \right. \right. \\
 &\quad \left. \left. + 7(-4 + x)^{5/2} + (-4 + x)^{7/2} \right) dx, x, x^2 \right) \\
 &= \sqrt{-4 + x^2} + \frac{10}{3}(-4 + x^2)^{3/2} + 3(-4 + x^2)^{5/2} + (-4 + x^2)^{7/2} + \frac{1}{9}(-4 + x^2)^{9/2}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 33, normalized size of antiderivative = 0.59

$$\int \frac{-3(-3x + x^3) + (-3x + x^3)^3}{\sqrt{-4 + x^2}} dx = \frac{1}{9} \sqrt{-4 + x^2} (1 - 10x^2 + 15x^4 - 7x^6 + x^8)$$

[In] Integrate[(-3*(-3*x + x^3) + (-3*x + x^3)^3)/Sqrt[-4 + x^2], x]

[Out] (Sqrt[-4 + x^2]*(1 - 10*x^2 + 15*x^4 - 7*x^6 + x^8))/9

Maple [A] (verified)

Time = 0.24 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.54

| method | result |
|----------------|--|
| risch | $\frac{(x^8-7x^6+15x^4-10x^2+1)\sqrt{x^2-4}}{9}$ |
| pseudoelliptic | $\frac{(x^8-7x^6+15x^4-10x^2+1)\sqrt{x^2-4}}{9}$ |
| trager | $\left(\frac{1}{9}x^8 - \frac{7}{9}x^6 + \frac{5}{3}x^4 - \frac{10}{9}x^2 + \frac{1}{9}\right) \sqrt{x^2-4}$ |
| gospers | $\frac{(x^8-7x^6+15x^4-10x^2+1)(-2+x)(2+x)}{9\sqrt{x^2-4}}$ |
| default | $\frac{x^8\sqrt{x^2-4}}{9} - \frac{7x^6\sqrt{x^2-4}}{9} + \frac{5x^4\sqrt{x^2-4}}{3} - \frac{10x^2\sqrt{x^2-4}}{9} + \frac{\sqrt{x^2-4}}{9}$ |
| meijerg | $\frac{256\sqrt{-\operatorname{signum}\left(-1+\frac{x^2}{4}\right)}\left(-\frac{256\sqrt{\pi}}{315} + \frac{\sqrt{\pi}\left(\frac{35}{128}x^8 + \frac{5}{4}x^6 + 6x^4 + 32x^2 + 256\right)\sqrt{-\frac{x^2}{4}+1}}{315}\right)}{\sqrt{\pi}\sqrt{\operatorname{signum}\left(-1+\frac{x^2}{4}\right)}} - \frac{576\sqrt{-\operatorname{signum}\left(-1+\frac{x^2}{4}\right)}\left(\frac{32\sqrt{\pi}}{35}\right)}{\sqrt{\pi}\sqrt{\operatorname{signum}\left(-1+\frac{x^2}{4}\right)}}$ |

```
[In] int(((x^3-3*x)^3-3*x^3+9*x)/(x^2-4)^(1/2),x,method=_RETURNVERBOSE)
```

```
[Out] 1/9*(x^8-7*x^6+15*x^4-10*x^2+1)*(x^2-4)^(1/2)
```

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.52

$$\int \frac{-3(-3x+x^3)+(-3x+x^3)^3}{\sqrt{-4+x^2}} dx = \frac{1}{9}(x^8-7x^6+15x^4-10x^2+1)\sqrt{x^2-4}$$

```
[In] integrate(((x^3-3*x)^3-3*x^3+9*x)/(x^2-4)^(1/2),x, algorithm="fricas")
```

```
[Out] 1/9*(x^8 - 7*x^6 + 15*x^4 - 10*x^2 + 1)*sqrt(x^2 - 4)
```

Sympy [A] (verification not implemented)

Time = 0.85 (sec) , antiderivative size = 68, normalized size of antiderivative = 1.21

$$\int \frac{-3(-3x+x^3)+(-3x+x^3)^3}{\sqrt{-4+x^2}} dx = \frac{x^8\sqrt{x^2-4}}{9} - \frac{7x^6\sqrt{x^2-4}}{9} + \frac{5x^4\sqrt{x^2-4}}{3} - \frac{10x^2\sqrt{x^2-4}}{9} + \frac{\sqrt{x^2-4}}{9}$$

```
[In] integrate(((x**3-3*x)**3-3*x**3+9*x)/(x**2-4)**(1/2),x)
```

```
[Out] x**8*sqrt(x**2 - 4)/9 - 7*x**6*sqrt(x**2 - 4)/9 + 5*x**4*sqrt(x**2 - 4)/3 - 10*x**2*sqrt(x**2 - 4)/9 + sqrt(x**2 - 4)/9
```


Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 58, normalized size of antiderivative = 1.04

$$\int \frac{-3(-3x + x^3) + (-3x + x^3)^3}{\sqrt{-4 + x^2}} dx = \frac{1}{9} \sqrt{x^2 - 4} x^8 - \frac{7}{9} \sqrt{x^2 - 4} x^6 + \frac{5}{3} \sqrt{x^2 - 4} x^4 - \frac{10}{9} \sqrt{x^2 - 4} x^2 + \frac{1}{9} \sqrt{x^2 - 4}$$

[In] integrate(((x^3-3*x)^3-3*x^3+9*x)/(x^2-4)^(1/2),x, algorithm="maxima")

[Out] 1/9*sqrt(x^2 - 4)*x^8 - 7/9*sqrt(x^2 - 4)*x^6 + 5/3*sqrt(x^2 - 4)*x^4 - 10/9*sqrt(x^2 - 4)*x^2 + 1/9*sqrt(x^2 - 4)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 42, normalized size of antiderivative = 0.75

$$\int \frac{-3(-3x + x^3) + (-3x + x^3)^3}{\sqrt{-4 + x^2}} dx = \frac{1}{9} (x^2 - 4)^{\frac{9}{2}} + (x^2 - 4)^{\frac{7}{2}} + 3 (x^2 - 4)^{\frac{5}{2}} + \frac{10}{3} (x^2 - 4)^{\frac{3}{2}} + \sqrt{x^2 - 4}$$

[In] integrate(((x^3-3*x)^3-3*x^3+9*x)/(x^2-4)^(1/2),x, algorithm="giac")

[Out] 1/9*(x^2 - 4)^(9/2) + (x^2 - 4)^(7/2) + 3*(x^2 - 4)^(5/2) + 10/3*(x^2 - 4)^(3/2) + sqrt(x^2 - 4)

Mupad [B] (verification not implemented)

Time = 0.22 (sec) , antiderivative size = 30, normalized size of antiderivative = 0.54

$$\int \frac{-3(-3x + x^3) + (-3x + x^3)^3}{\sqrt{-4 + x^2}} dx = \sqrt{x^2 - 4} \left(\frac{x^8}{9} - \frac{7x^6}{9} + \frac{5x^4}{3} - \frac{10x^2}{9} + \frac{1}{9} \right)$$

[In] int(-((3*x - x^3)^3 - 9*x + 3*x^3)/(x^2 - 4)^(1/2),x)

[Out] (x^2 - 4)^(1/2)*((5*x^4)/3 - (10*x^2)/9 - (7*x^6)/9 + x^8/9 + 1/9)

3.274 $\int \frac{1}{(1+x^2)^3} dx$

| | |
|---|------|
| Optimal result | 2766 |
| Rubi [A] (verified) | 2766 |
| Mathematica [A] (verified) | 2767 |
| Maple [A] (verified) | 2767 |
| Fricas [A] (verification not implemented) | 2768 |
| Sympy [A] (verification not implemented) | 2768 |
| Maxima [A] (verification not implemented) | 2768 |
| Giac [A] (verification not implemented) | 2768 |
| Mupad [B] (verification not implemented) | 2769 |

Optimal result

Integrand size = 7, antiderivative size = 31

$$\int \frac{1}{(1+x^2)^3} dx = \frac{x}{4(1+x^2)^2} + \frac{3x}{8(1+x^2)} + \frac{3 \arctan(x)}{8}$$

[Out] 1/4*x/(x^2+1)^2+3*x/(8*x^2+8)+3/8*arctan(x)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.286$, Rules used = {205, 209}

$$\int \frac{1}{(1+x^2)^3} dx = \frac{3 \arctan(x)}{8} + \frac{3x}{8(x^2+1)} + \frac{x}{4(x^2+1)^2}$$

[In] Int[(1 + x^2)^(-3), x]

[Out] x/(4*(1 + x^2)^2) + (3*x)/(8*(1 + x^2)) + (3*ArcTan[x])/8

Rule 205

```
Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Simp[(-x)*((a + b*x^n)^(p + 1)/(a*n*(p + 1))), x] + Dist[(n*(p + 1) + 1)/(a*n*(p + 1)), Int[(a + b*x^n)^(p + 1), x], x] /; FreeQ[{a, b}, x] && IGtQ[n, 0] && LtQ[p, -1] && (IntegerQ[2*p] || (n == 2 && IntegerQ[4*p]) || (n == 2 && IntegerQ[3*p]) || Denominator[p + 1/n] < Denominator[p])
```

Rule 209

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*ArcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a
```

, 0] || GtQ[b, 0])

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{x}{4(1+x^2)^2} + \frac{3}{4} \int \frac{1}{(1+x^2)^2} dx \\ &= \frac{x}{4(1+x^2)^2} + \frac{3x}{8(1+x^2)} + \frac{3}{8} \int \frac{1}{1+x^2} dx \\ &= \frac{x}{4(1+x^2)^2} + \frac{3x}{8(1+x^2)} + \frac{3 \arctan(x)}{8} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.81

$$\int \frac{1}{(1+x^2)^3} dx = \frac{1}{8} \left(\frac{x(5+3x^2)}{(1+x^2)^2} + 3 \arctan(x) \right)$$

[In] Integrate[(1 + x^2)^(-3),x]

[Out] ((x*(5 + 3*x^2))/(1 + x^2)^2 + 3*ArcTan[x])/8

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.74

| method | result | size |
|--------------|---|------|
| meijerg | $\frac{x(3x^2+5)}{8(x^2+1)^2} + \frac{3 \arctan(x)}{8}$ | 23 |
| risch | $\frac{\frac{3}{8}x^3 + \frac{5}{8}x}{(x^2+1)^2} + \frac{3 \arctan(x)}{8}$ | 23 |
| default | $\frac{x}{4(x^2+1)^2} + \frac{3x}{8(x^2+1)} + \frac{3 \arctan(x)}{8}$ | 26 |
| paralelrisch | $-\frac{3i \ln(x-i)x^4 - 3i \ln(i+x)x^4 + 6i \ln(x-i)x^2 - 6i \ln(i+x)x^2 - 6x^3 + 3i \ln(x-i) - 3i \ln(i+x) - 10x}{16(x^2+1)^2}$ | 79 |

[In] int(1/(x^2+1)^3,x,method=_RETURNVERBOSE)

[Out] 1/8*x*(3*x^2+5)/(x^2+1)^2+3/8*arctan(x)

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 37, normalized size of antiderivative = 1.19

$$\int \frac{1}{(1+x^2)^3} dx = \frac{3x^3 + 3(x^4 + 2x^2 + 1) \arctan(x) + 5x}{8(x^4 + 2x^2 + 1)}$$

[In] integrate(1/(x^2+1)^3,x, algorithm="fricas")

[Out] 1/8*(3*x^3 + 3*(x^4 + 2*x^2 + 1)*arctan(x) + 5*x)/(x^4 + 2*x^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.84

$$\int \frac{1}{(1+x^2)^3} dx = \frac{3x^3 + 5x}{8x^4 + 16x^2 + 8} + \frac{3 \operatorname{atan}(x)}{8}$$

[In] integrate(1/(x**2+1)**3,x)

[Out] (3*x**3 + 5*x)/(8*x**4 + 16*x**2 + 8) + 3*atan(x)/8

Maxima [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 28, normalized size of antiderivative = 0.90

$$\int \frac{1}{(1+x^2)^3} dx = \frac{3x^3 + 5x}{8(x^4 + 2x^2 + 1)} + \frac{3}{8} \arctan(x)$$

[In] integrate(1/(x^2+1)^3,x, algorithm="maxima")

[Out] 1/8*(3*x^3 + 5*x)/(x^4 + 2*x^2 + 1) + 3/8*arctan(x)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.74

$$\int \frac{1}{(1+x^2)^3} dx = \frac{3x^3 + 5x}{8(x^2 + 1)^2} + \frac{3}{8} \arctan(x)$$

[In] integrate(1/(x^2+1)^3,x, algorithm="giac")

[Out] 1/8*(3*x^3 + 5*x)/(x^2 + 1)^2 + 3/8*arctan(x)

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 28, normalized size of antiderivative = 0.90

$$\int \frac{1}{(1+x^2)^3} dx = \frac{3 \operatorname{atan}(x)}{8} + x \left(\frac{1}{4(x^2+1)^2} + \frac{3}{8x^2+8} \right)$$

[In] int(1/(x^2 + 1)^3,x)

[Out] (3*atan(x))/8 + x*(1/(4*(x^2 + 1)^2) + 3/(8*x^2 + 8))

3.275 $\int \log(\sqrt{3} + \tan(x)) dx$

| | |
|---|------|
| Optimal result | 2770 |
| Rubi [F] | 2770 |
| Mathematica [A] (verified) | 2771 |
| Maple [A] (verified) | 2771 |
| Fricas [B] (verification not implemented) | 2772 |
| Sympy [F] | 2773 |
| Maxima [A] (verification not implemented) | 2773 |
| Giac [F] | 2773 |
| Mupad [F(-1)] | 2774 |

Optimal result

Integrand size = 9, antiderivative size = 108

$$\int \log(\sqrt{3} + \tan(x)) dx = -\frac{1}{2}i \left(\left(\log\left(\frac{i - \tan(x)}{i + \sqrt{3}}\right) - \log\left(\frac{i + \tan(x)}{i - \sqrt{3}}\right) \right) \log(\sqrt{3} + \tan(x)) \right. \\ \left. - \text{PolyLog}\left(2, \frac{\sqrt{3} + \tan(x)}{-i + \sqrt{3}}\right) + \text{PolyLog}\left(2, \frac{\sqrt{3} + \tan(x)}{i + \sqrt{3}}\right) \right)$$

[Out] $-1/2*I*((\ln((1-\tan(x))/(3^{1/2}+1))-\ln((1+\tan(x))/(1-3^{1/2}))))*\ln(3^{1/2}+\tan(x))-\text{polylog}(2,(3^{1/2}+\tan(x))/(-1+3^{1/2}))+\text{polylog}(2,(3^{1/2}+\tan(x))/(3^{1/2}+1)))$

Rubi [F]

$$\int \log(\sqrt{3} + \tan(x)) dx = \int \log(\sqrt{3} + \tan(x)) dx$$

[In] `Int[Log[Sqrt[3] + Tan[x]], x]`

[Out] `x*Log[Sqrt[3] + Tan[x]] - Defer[Int][(x*Sec[x]^2)/(Sqrt[3] + Tan[x]), x]`

Rubi steps

$$\text{integral} = x \log(\sqrt{3} + \tan(x)) - \int \frac{x \sec^2(x)}{\sqrt{3} + \tan(x)} dx$$

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 132, normalized size of antiderivative = 1.22

$$\int \log(\sqrt{3} + \tan(x)) dx = -\frac{1}{2}i \log\left(\frac{i - \tan(x)}{i + \sqrt{3}}\right) \log(\sqrt{3} + \tan(x)) \\ + \frac{1}{2}i \log\left(\frac{i + \tan(x)}{i - \sqrt{3}}\right) \log(\sqrt{3} + \tan(x)) \\ + \frac{1}{2}i \operatorname{PolyLog}\left(2, -\frac{\sqrt{3} + \tan(x)}{i - \sqrt{3}}\right) \\ - \frac{1}{2}i \operatorname{PolyLog}\left(2, \frac{\sqrt{3} + \tan(x)}{i + \sqrt{3}}\right)$$

`[In] Integrate[Log[Sqrt[3] + Tan[x]], x]`

```
[Out] (-1/2*I)*Log[(I - Tan[x])/(I + Sqrt[3])]*Log[Sqrt[3] + Tan[x]] + (I/2)*Log[
(I + Tan[x])/(I - Sqrt[3])]*Log[Sqrt[3] + Tan[x]] + (I/2)*PolyLog[2, -((Sqr
t[3] + Tan[x])/(I - Sqrt[3]))] - (I/2)*PolyLog[2, (Sqrt[3] + Tan[x])/(I + S
qrt[3])]
```

Maple [A] (verified)

Time = 0.64 (sec) , antiderivative size = 96, normalized size of antiderivative = 0.89

| method | result |
|-------------------|--|
| derivativedivides | $-\frac{i \ln(\sqrt{3} + \tan(x)) \ln\left(\frac{i - \tan(x)}{\sqrt{3} + i}\right)}{2} + \frac{i \ln(\sqrt{3} + \tan(x)) \ln\left(\frac{i + \tan(x)}{i - \sqrt{3}}\right)}{2} - \frac{i \operatorname{dilog}\left(\frac{i - \tan(x)}{\sqrt{3} + i}\right)}{2} + \frac{i \operatorname{dilog}\left(\frac{i + \tan(x)}{i - \sqrt{3}}\right)}{2}$ |
| default | $-\frac{i \ln(\sqrt{3} + \tan(x)) \ln\left(\frac{i - \tan(x)}{\sqrt{3} + i}\right)}{2} + \frac{i \ln(\sqrt{3} + \tan(x)) \ln\left(\frac{i + \tan(x)}{i - \sqrt{3}}\right)}{2} - \frac{i \operatorname{dilog}\left(\frac{i - \tan(x)}{\sqrt{3} + i}\right)}{2} + \frac{i \operatorname{dilog}\left(\frac{i + \tan(x)}{i - \sqrt{3}}\right)}{2}$ |
| risch | $-i \ln(e^{ix}) \ln(1 - ie^{ix}) + i \ln(e^{ix}) \ln(e^{2ix} + 1) - \frac{i\pi \operatorname{csgn}\left(\frac{i}{e^{2ix} + 1}\right) \operatorname{csgn}\left(i(\sqrt{3}e^{2ix} - ie^{2ix} + \sqrt{3} + i)\right)}{2}$ |

`[In] int(ln(3^(1/2)+tan(x)), x, method=_RETURNVERBOSE)`

```
[Out] -1/2*I*ln(3^(1/2)+tan(x))*ln((I-tan(x))/(3^(1/2)+I))+1/2*I*ln(3^(1/2)+tan(x)
)*ln((I+tan(x))/(I-3^(1/2)))-1/2*I*dilog((I-tan(x))/(3^(1/2)+I))+1/2*I*dil
og((I+tan(x))/(I-3^(1/2)))
```

Fricas [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 262 vs. $2(75) = 150$.

Time = 0.27 (sec) , antiderivative size = 262, normalized size of antiderivative = 2.43

$$\begin{aligned}
 & \int \log(\sqrt{3} + \tan(x)) \, dx \\
 &= x \log(\sqrt{3} + \tan(x)) - \frac{1}{2} x \log\left(\frac{(i\sqrt{3} + 1)\tan(x)^2 + 2(\sqrt{3} + i)\tan(x) - i\sqrt{3} + 3}{2(\tan(x)^2 + 1)}\right) \\
 & \quad - \frac{1}{2} x \log\left(\frac{(-i\sqrt{3} + 1)\tan(x)^2 + 2(\sqrt{3} - i)\tan(x) + i\sqrt{3} + 3}{2(\tan(x)^2 + 1)}\right) \\
 & \quad + \frac{1}{2} x \log\left(-\frac{2(i\tan(x) - 1)}{\tan(x)^2 + 1}\right) + \frac{1}{2} x \log\left(-\frac{2(-i\tan(x) - 1)}{\tan(x)^2 + 1}\right) \\
 & \quad + \frac{1}{4} i \operatorname{Li}_2\left(-\frac{(i\sqrt{3} + 1)\tan(x)^2 + 2(\sqrt{3} + i)\tan(x) - i\sqrt{3} + 3}{2(\tan(x)^2 + 1)} + 1\right) \\
 & \quad - \frac{1}{4} i \operatorname{Li}_2\left(-\frac{(-i\sqrt{3} + 1)\tan(x)^2 + 2(\sqrt{3} - i)\tan(x) + i\sqrt{3} + 3}{2(\tan(x)^2 + 1)} + 1\right) \\
 & \quad + \frac{1}{4} i \operatorname{Li}_2\left(\frac{2(i\tan(x) - 1)}{\tan(x)^2 + 1} + 1\right) - \frac{1}{4} i \operatorname{Li}_2\left(\frac{2(-i\tan(x) - 1)}{\tan(x)^2 + 1} + 1\right)
 \end{aligned}$$

[In] integrate(log(3^(1/2)+tan(x)),x, algorithm="fricas")

[Out] x*log(sqrt(3) + tan(x)) - 1/2*x*log(1/2*((I*sqrt(3) + 1)*tan(x)^2 + 2*(sqrt(3) + I)*tan(x) - I*sqrt(3) + 3)/(tan(x)^2 + 1)) - 1/2*x*log(1/2*((-I*sqrt(3) + 1)*tan(x)^2 + 2*(sqrt(3) - I)*tan(x) + I*sqrt(3) + 3)/(tan(x)^2 + 1)) + 1/2*x*log(-2*(I*tan(x) - 1)/(tan(x)^2 + 1)) + 1/2*x*log(-2*(-I*tan(x) - 1)/(tan(x)^2 + 1)) + 1/4*I*dilog(-1/2*((I*sqrt(3) + 1)*tan(x)^2 + 2*(sqrt(3) + I)*tan(x) - I*sqrt(3) + 3)/(tan(x)^2 + 1) + 1) - 1/4*I*dilog(-1/2*((-I*sqrt(3) + 1)*tan(x)^2 + 2*(sqrt(3) - I)*tan(x) + I*sqrt(3) + 3)/(tan(x)^2 + 1) + 1) + 1/4*I*dilog(2*(I*tan(x) - 1)/(tan(x)^2 + 1) + 1) - 1/4*I*dilog(2*(-I*tan(x) - 1)/(tan(x)^2 + 1) + 1)

Sympy [F]

$$\int \log(\sqrt{3} + \tan(x)) dx = \int \log(\tan(x) + \sqrt{3}) dx$$

```
[In] integrate(ln(3**(1/2)+tan(x)),x)
```

```
[Out] Integral(log(tan(x) + sqrt(3)), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.34 (sec) , antiderivative size = 115, normalized size of antiderivative = 1.06

$$\begin{aligned} \int \log(\sqrt{3} + \tan(x)) dx = & \frac{1}{2} \arctan\left(\frac{1}{4}\sqrt{3} + \frac{1}{4}\tan(x), \frac{1}{4}\sqrt{3}\tan(x) + \frac{3}{4}\right) \log(\tan(x)^2 + 1) \\ & - \frac{1}{2}x \log\left(\frac{1}{4}\tan(x)^2 + \frac{1}{2}\sqrt{3}\tan(x) + \frac{3}{4}\right) + x \log(\sqrt{3} + \tan(x)) \\ & + \frac{1}{2}i \operatorname{Li}_2\left(-\frac{(\sqrt{3} + i)\tan(x) - i\sqrt{3} + 1}{2i\sqrt{3} + 2}\right) \\ & - \frac{1}{2}i \operatorname{Li}_2\left(\frac{(\sqrt{3} - i)\tan(x) + i\sqrt{3} + 1}{2i\sqrt{3} - 2}\right) \end{aligned}$$

```
[In] integrate(log(3^(1/2)+tan(x)),x, algorithm="maxima")
```

```
[Out] 1/2*arctan2(1/4*sqrt(3) + 1/4*tan(x), 1/4*sqrt(3)*tan(x) + 3/4)*log(tan(x)^2 + 1) - 1/2*x*log(1/4*tan(x)^2 + 1/2*sqrt(3)*tan(x) + 3/4) + x*log(sqrt(3) + tan(x)) + 1/2*I*dilog(-((sqrt(3) + I)*tan(x) - I*sqrt(3) + 1)/(2*I*sqrt(3) + 2)) - 1/2*I*dilog(((sqrt(3) - I)*tan(x) + I*sqrt(3) + 1)/(2*I*sqrt(3) - 2))
```

Giac [F]

$$\int \log(\sqrt{3} + \tan(x)) dx = \int \log(\sqrt{3} + \tan(x)) dx$$

```
[In] integrate(log(3^(1/2)+tan(x)),x, algorithm="giac")
```

```
[Out] integrate(log(sqrt(3) + tan(x)), x)
```

Mupad [F(-1)]

Timed out.

$$\int \log(\sqrt{3} + \tan(x)) \, dx = \int \ln(\tan(x) + \sqrt{3}) \, dx$$

```
[In] int(log(tan(x) + 3^(1/2)),x)
```

```
[Out] int(log(tan(x) + 3^(1/2)), x)
```

3.276 $\int \sqrt{(\cos(20x) + 3 \cos(21x) + \cos(22x))^2 + (\sin(20x) + 3 \sin(21x) + \sin(22x))^2} dx$

| | |
|---|------|
| Optimal result | 2775 |
| Rubi [B] (verified) | 2775 |
| Mathematica [A] (verified) | 2777 |
| Maple [C] (warning: unable to verify) | 2777 |
| Fricas [A] (verification not implemented) | 2777 |
| Sympy [F] | 2778 |
| Maxima [A] (verification not implemented) | 2778 |
| Giac [A] (verification not implemented) | 2778 |
| Mupad [B] (verification not implemented) | 2779 |

Optimal result

Integrand size = 39, antiderivative size = 32

$$\int \sqrt{(\cos(20x) + 3 \cos(21x) + \cos(22x))^2 + (\sin(20x) + 3 \sin(21x) + \sin(22x))^2} dx$$

$$= \frac{2(3 + 2 \cos(x)) (3 \arctan(\tan(\frac{x}{2})) + \sin(x))}{\sqrt{(3 + 2 \cos(x))^2}}$$

[Out] $2*(3+2*\cos(x))*(3*\arctan(\tan(1/2*x))+\sin(x))/((3+2*\cos(x))^2)^{(1/2)}$

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 100 vs. $2(32) = 64$.

Time = 0.31 (sec) , antiderivative size = 100, normalized size of antiderivative = 3.12, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.077$, Rules used = {1986, 393, 209}

$$\int \sqrt{(\cos(20x) + 3 \cos(21x) + \cos(22x))^2 + (\sin(20x) + 3 \sin(21x) + \sin(22x))^2} dx$$

$$= \frac{6 \sec^2(\frac{x}{2}) \arctan(\tan(\frac{x}{2})) \sqrt{\cos^4(\frac{x}{2}) (\tan^2(\frac{x}{2}) + 5)^2}}{\tan^2(\frac{x}{2}) + 5}$$

$$+ \frac{4 \tan(\frac{x}{2}) \sqrt{\cos^4(\frac{x}{2}) (\tan^2(\frac{x}{2}) + 5)^2}}{\tan^2(\frac{x}{2}) + 5}$$

[In] $\text{Int}[\text{Sqrt}[(\text{Cos}[20*x] + 3*\text{Cos}[21*x] + \text{Cos}[22*x])^2 + (\text{Sin}[20*x] + 3*\text{Sin}[21*x] + \text{Sin}[22*x])^2], x]$

[Out] $(6*\text{ArcTan}[\text{Tan}[x/2]]*\text{Sec}[x/2]^2*\text{Sqrt}[\text{Cos}[x/2]^4*(5 + \text{Tan}[x/2]^2)^2])/(5 + \text{Tan}[x/2]^2) + (4*\text{Tan}[x/2]*\text{Sqrt}[\text{Cos}[x/2]^4*(5 + \text{Tan}[x/2]^2)^2])/(5 + \text{Tan}[x/2]^2)$

Rule 209

$\text{Int}[(a_ + (b_)*(x_)^(n_))^(p_), x_Symbol] \rightarrow \text{Simp}[(1/(\text{Rt}[a, 2]*\text{Rt}[b, 2]))*\text{ArcTan}[\text{Rt}[b, 2]*(x/\text{Rt}[a, 2])], x] /; \text{FreeQ}\{a, b, x\} \ \&\& \ \text{PosQ}[a/b] \ \&\& \ (\text{GtQ}[a, 0] \ || \ \text{GtQ}[b, 0])$

Rule 393

$\text{Int}[(a_ + (b_)*(x_)^(n_))^(p_)*((c_ + (d_)*(x_)^(n_))), x_Symbol] \rightarrow \text{Simp}[(-b*c - a*d)*x*((a + b*x^n)^(p + 1)/(a*b*n*(p + 1))), x] - \text{Dist}[(a*d - b*c*(n*(p + 1) + 1))/(a*b*n*(p + 1)), \text{Int}[(a + b*x^n)^(p + 1), x], x] /; \text{FreeQ}\{a, b, c, d, n, p\}, x] \ \&\& \ \text{NeQ}[b*c - a*d, 0] \ \&\& \ (\text{LtQ}[p, -1] \ || \ \text{ILtQ}[1/n + p, 0])$

Rule 1986

$\text{Int}[(u_)*((e_)*((a_ + (b_)*(x_)^(n_))^(q_))*((c_ + (d_)*(x_)^(n_))^(r_))^(p_)), x_Symbol] \rightarrow \text{Dist}[\text{Simp}[(e*(a + b*x^n)^q*(c + d*x^n)^r]^p/((a + b*x^n)^(p*q)*(c + d*x^n)^(p*r))], \text{Int}[u*(a + b*x^n)^(p*q)*(c + d*x^n)^(p*r), x], x] /; \text{FreeQ}\{a, b, c, d, e, n, p, q, r\}, x]$

Rubi steps

$$\begin{aligned}
 \text{integral} &= 2\text{Subst}\left(\int \frac{\sqrt{\frac{(5+x^2)^2}{(1+x^2)^2}}}{1+x^2} dx, x, \tan\left(\frac{x}{2}\right)\right) \\
 &= \frac{\left(2 \sec^2\left(\frac{x}{2}\right) \sqrt{\cos^4\left(\frac{x}{2}\right) \left(5 + \tan^2\left(\frac{x}{2}\right)\right)^2}\right) \text{Subst}\left(\int \frac{5+x^2}{(1+x^2)^2} dx, x, \tan\left(\frac{x}{2}\right)\right)}{5 + \tan^2\left(\frac{x}{2}\right)} \\
 &= \frac{4 \tan\left(\frac{x}{2}\right) \sqrt{\cos^4\left(\frac{x}{2}\right) \left(5 + \tan^2\left(\frac{x}{2}\right)\right)^2}}{5 + \tan^2\left(\frac{x}{2}\right)} \\
 &\quad + \frac{\left(6 \sec^2\left(\frac{x}{2}\right) \sqrt{\cos^4\left(\frac{x}{2}\right) \left(5 + \tan^2\left(\frac{x}{2}\right)\right)^2}\right) \text{Subst}\left(\int \frac{1}{1+x^2} dx, x, \tan\left(\frac{x}{2}\right)\right)}{5 + \tan^2\left(\frac{x}{2}\right)} \\
 &= \frac{3x \sec^2\left(\frac{x}{2}\right) \sqrt{\cos^4\left(\frac{x}{2}\right) \left(5 + \tan^2\left(\frac{x}{2}\right)\right)^2}}{5 + \tan^2\left(\frac{x}{2}\right)} + \frac{4 \tan\left(\frac{x}{2}\right) \sqrt{\cos^4\left(\frac{x}{2}\right) \left(5 + \tan^2\left(\frac{x}{2}\right)\right)^2}}{5 + \tan^2\left(\frac{x}{2}\right)}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 29, normalized size of antiderivative = 0.91

$$\int \sqrt{(\cos(20x) + 3 \cos(21x) + \cos(22x))^2 + (\sin(20x) + 3 \sin(21x) + \sin(22x))^2} dx$$

$$= \frac{\sqrt{(3 + 2 \cos(x))^2 (3x + 2 \sin(x))}}{3 + 2 \cos(x)}$$

[In] Integrate[Sqrt[(Cos[20*x] + 3*Cos[21*x] + Cos[22*x])^2 + (Sin[20*x] + 3*Sin[21*x] + Sin[22*x])^2], x]

[Out] (Sqrt[(3 + 2*Cos[x])^2]*(3*x + 2*Sin[x]))/(3 + 2*Cos[x])

Maple [C] (warning: unable to verify)

Result contains higher order function than in optimal. Order 9 vs. order 3.

Time = 2.33 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.53

| method | result | size |
|---------|---|------|
| default | $\text{csgn}(3 + 2 \cos(x))(3x + 2 \sin(x))$ | 17 |
| risch | $\frac{3\sqrt{(e^{2ix}+3e^{ix}+1)^2e^{-2ix}e^{ix}x}}{e^{2ix}+3e^{ix}+1} - \frac{i\sqrt{(e^{2ix}+3e^{ix}+1)^2e^{-2ix}e^{2ix}}}{e^{2ix}+3e^{ix}+1} + \frac{i\sqrt{(e^{2ix}+3e^{ix}+1)^2e^{-2ix}}}{e^{2ix}+3e^{ix}+1}$ | 141 |

[In] int(((sin(20*x)+3*sin(21*x)+sin(22*x))^2+(cos(20*x)+3*cos(21*x)+cos(22*x))^2)^(1/2), x, method=_RETURNVERBOSE)

[Out] csgn(3+2*cos(x))*(3*x+2*sin(x))

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.25

$$\int \sqrt{(\cos(20x) + 3 \cos(21x) + \cos(22x))^2 + (\sin(20x) + 3 \sin(21x) + \sin(22x))^2} dx$$

$$= 3x + 2 \sin(x)$$

[In] integrate(((sin(20*x)+3*sin(21*x)+sin(22*x))^2+(cos(20*x)+3*cos(21*x)+cos(22*x))^2)^(1/2), x, algorithm="fricas")

[Out] 3*x + 2*sin(x)

Sympy [F]

$$\int \sqrt{(\cos(20x) + 3 \cos(21x) + \cos(22x))^2 + (\sin(20x) + 3 \sin(21x) + \sin(22x))^2} dx$$

$$= \int \sqrt{(\sin(20x) + 3 \sin(21x) + \sin(22x))^2 + (\cos(20x) + 3 \cos(21x) + \cos(22x))^2} dx$$

```
[In] integrate(((sin(20*x)+3*sin(21*x)+sin(22*x))**2+(cos(20*x)+3*cos(21*x)+cos(22*x))**2)**(1/2),x)
```

```
[Out] Integral(sqrt((sin(20*x) + 3*sin(21*x) + sin(22*x))**2 + (cos(20*x) + 3*cos(21*x) + cos(22*x))**2), x)
```

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.25

$$\int \sqrt{(\cos(20x) + 3 \cos(21x) + \cos(22x))^2 + (\sin(20x) + 3 \sin(21x) + \sin(22x))^2} dx$$

$$= 3x + 2 \sin(x)$$

```
[In] integrate(((sin(20*x)+3*sin(21*x)+sin(22*x))^2+(cos(20*x)+3*cos(21*x)+cos(22*x))^2)^(1/2),x, algorithm="maxima")
```

```
[Out] 3*x + 2*sin(x)
```

Giac [A] (verification not implemented)

none

Time = 0.87 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.00

$$\int \sqrt{(\cos(20x) + 3 \cos(21x) + \cos(22x))^2 + (\sin(20x) + 3 \sin(21x) + \sin(22x))^2} dx$$

$$= -6\pi \left\lfloor \frac{x}{2\pi} + \frac{1}{2} \right\rfloor + 3x + \frac{4 \tan\left(\frac{1}{2}x\right)}{\tan\left(\frac{1}{2}x\right)^2 + 1}$$

```
[In] integrate(((sin(20*x)+3*sin(21*x)+sin(22*x))^2+(cos(20*x)+3*cos(21*x)+cos(22*x))^2)^(1/2),x, algorithm="giac")
```

```
[Out] -6*pi*floor(1/2*x/pi + 1/2) + 3*x + 4*tan(1/2*x)/(tan(1/2*x)^2 + 1)
```

Mupad [B] (verification not implemented)

Time = 15.60 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.25

$$\int \sqrt{(\cos(20x) + 3\cos(21x) + \cos(22x))^2 + (\sin(20x) + 3\sin(21x) + \sin(22x))^2} dx$$

$$= 3x + 2\sin(x)$$

```
[In] int(((cos(20*x) + 3*cos(21*x) + cos(22*x))^2 + (sin(20*x) + 3*sin(21*x) + s
in(22*x))^2)^(1/2),x)
```

```
[Out] 3*x + 2*sin(x)
```

3.277 $\int \frac{e^{-2x} \sin(3x)}{x} dx$

| | |
|---|------|
| Optimal result | 2780 |
| Rubi [F] | 2780 |
| Mathematica [A] (verified) | 2780 |
| Maple [A] (verified) | 2781 |
| Fricas [A] (verification not implemented) | 2781 |
| Sympy [F] | 2781 |
| Maxima [C] (verification not implemented) | 2781 |
| Giac [A] (verification not implemented) | 2782 |
| Mupad [B] (verification not implemented) | 2782 |

Optimal result

Integrand size = 13, antiderivative size = 21

$$\int \frac{e^{-2x} \sin(3x)}{x} dx = \frac{1}{2}i(\text{ExpIntegralEi}((-2 - 3i)x) - \text{ExpIntegralEi}((-2 + 3i)x))$$

[Out] 1/2*I*(Ei((-2-3*I)*x)-Ei((-2+3*I)*x))

Rubi [F]

$$\int \frac{e^{-2x} \sin(3x)}{x} dx = \int \frac{e^{-2x} \sin(3x)}{x} dx$$

[In] Int[Sin[3*x]/(E^(2*x)*x), x]

[Out] Defer[Int][Sin[3*x]/(E^(2*x)*x), x]

Rubi steps

$$\text{integral} = \int \frac{e^{-2x} \sin(3x)}{x} dx$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.00

$$\int \frac{e^{-2x} \sin(3x)}{x} dx = -\frac{1}{2}i(-\text{ExpIntegralEi}((-2 - 3i)x) + \text{ExpIntegralEi}((-2 + 3i)x))$$

[In] Integrate[Sin[3*x]/(E^(2*x)*x), x]

[Out] (-1/2*I)*(-ExpIntegralEi[(-2 - 3*I)*x] + ExpIntegralEi[(-2 + 3*I)*x])

Maple [A] (verified)

Time = 0.11 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.05

| method | result | size |
|--------|---|------|
| risch | $\frac{i \operatorname{Ei}_1((2-3i)x)}{2} - \frac{i \operatorname{Ei}_1((2+3i)x)}{2}$ | 22 |

[In] `int(exp(-2*x)*sin(3*x)/x,x,method=_RETURNVERBOSE)`

[Out] `1/2*I*Ei(1,(2-3*I)*x)-1/2*I*Ei(1,(2+3*I)*x)`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.62

$$\int \frac{e^{-2x} \sin(3x)}{x} dx = -\frac{1}{2}i \operatorname{Ei}((3i - 2)x) + \frac{1}{2}i \operatorname{Ei}(-(3i + 2)x)$$

[In] `integrate(exp(-2*x)*sin(3*x)/x,x, algorithm="fricas")`

[Out] `-1/2*I*Ei((3*I - 2)*x) + 1/2*I*Ei(-(3*I + 2)*x)`

Sympy [F]

$$\int \frac{e^{-2x} \sin(3x)}{x} dx = \int \frac{e^{-2x} \sin(3x)}{x} dx$$

[In] `integrate(exp(-2*x)*sin(3*x)/x,x)`

[Out] `Integral(exp(-2*x)*sin(3*x)/x, x)`

Maxima [C] (verification not implemented)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 0.24 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.29

$$\begin{aligned} \int \frac{e^{-2x} \sin(3x)}{x} dx &= -\frac{1}{4}i \operatorname{Ei}((3i - 2)x) + \frac{1}{4}i \operatorname{Ei}(-(3i + 2)x) \\ &\quad + \frac{1}{4}i \overline{\operatorname{Ei}((3i - 2)x)} - \frac{1}{4}i \overline{\operatorname{Ei}(-(3i + 2)x)} \end{aligned}$$

[In] `integrate(exp(-2*x)*sin(3*x)/x,x, algorithm="maxima")`

[Out] `-1/4*I*Ei((3*I - 2)*x) + 1/4*I*Ei(-(3*I + 2)*x) + 1/4*I*conjugate(Ei((3*I - 2)*x)) - 1/4*I*conjugate(Ei(-(3*I + 2)*x))`

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.62

$$\int \frac{e^{-2x} \sin(3x)}{x} dx = -\frac{1}{2}i \operatorname{Ei}((3i - 2)x) + \frac{1}{2}i \operatorname{Ei}(-(3i + 2)x)$$

[In] integrate(exp(-2*x)*sin(3*x)/x,x, algorithm="giac")

[Out] -1/2*I*Ei((3*I - 2)*x) + 1/2*I*Ei(-(3*I + 2)*x)

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.90

$$\int \frac{e^{-2x} \sin(3x)}{x} dx = \frac{\operatorname{ei}(x(-2 - 3i)) \operatorname{li}}{2} - \frac{\operatorname{ei}(x(-2 + 3i)) \operatorname{li}}{2}$$

[In] int((sin(3*x)*exp(-2*x))/x,x)

[Out] (ei(x*(- 2 - 3i))*1i)/2 - (ei(x*(- 2 + 3i))*1i)/2

3.278 $\int (1-x)^{2/3} \sqrt[3]{x} dx$

| | |
|---|------|
| Optimal result | 2783 |
| Rubi [A] (verified) | 2783 |
| Mathematica [A] (verified) | 2784 |
| Maple [C] (verified) | 2785 |
| Fricas [A] (verification not implemented) | 2785 |
| Sympy [C] (verification not implemented) | 2786 |
| Maxima [A] (verification not implemented) | 2786 |
| Giac [F] | 2787 |
| Mupad [F(-1)] | 2787 |

Optimal result

Integrand size = 15, antiderivative size = 102

$$\int (1-x)^{2/3} \sqrt[3]{x} dx = \frac{1}{6}(1-x)^{2/3} \sqrt[3]{x} - \frac{1}{2}(1-x)^{5/3} \sqrt[3]{x} + \frac{\arctan\left(\frac{1}{\sqrt{3}} - \frac{2\sqrt[3]{1-x}}{\sqrt{3}\sqrt[3]{x}}\right)}{3\sqrt{3}} + \frac{1}{6} \log\left(1 + \frac{\sqrt[3]{1-x}}{\sqrt[3]{x}}\right) + \frac{\log(x)}{18}$$

[Out] 1/6*x^(1/3)*(1-x)^(2/3)-1/2*(1-x)^(5/3)*x^(1/3)-1/9*arctan(-1/3*3^(1/2)+2/3*(1-x)^(1/3)*3^(1/2)/x^(1/3))*3^(1/2)+1/6*ln(1+(1-x)^(1/3)/x^(1/3))+1/18*ln(x)

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 102, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.133$, Rules used = {52, 62}

$$\int (1-x)^{2/3} \sqrt[3]{x} dx = \frac{\arctan\left(\frac{1}{\sqrt{3}} - \frac{2\sqrt[3]{1-x}}{\sqrt{3}\sqrt[3]{x}}\right)}{3\sqrt{3}} - \frac{1}{2}\sqrt[3]{x}(1-x)^{5/3} + \frac{1}{6}\sqrt[3]{x}(1-x)^{2/3} + \frac{1}{6} \log\left(\frac{\sqrt[3]{1-x}}{\sqrt[3]{x}} + 1\right) + \frac{\log(x)}{18}$$

[In] Int[(1-x)^(2/3)*x^(1/3),x]

[Out] ((1-x)^(2/3)*x^(1/3))/6 - ((1-x)^(5/3)*x^(1/3))/2 + ArcTan[1/Sqrt[3] - (2*(1-x)^(1/3))/(Sqrt[3]*x^(1/3))]/(3*Sqrt[3]) + Log[1 + (1-x)^(1/3)/x^(1/3)]/6 + Log[x]/18

Rule 52

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] := Simp[
(a + b*x)^(m + 1)*((c + d*x)^n/(b*(m + n + 1))), x] + Dist[n*((b*c - a*d)/(
b*(m + n + 1))], Int[(a + b*x)^m*(c + d*x)^(n - 1), x], x] /; FreeQ[{a, b,
c, d}, x] && NeQ[b*c - a*d, 0] && GtQ[n, 0] && NeQ[m + n + 1, 0] && !(IGtQ
[m, 0] && (!IntegerQ[n] || (GtQ[m, 0] && LtQ[m - n, 0]))) && !ILtQ[m + n
+ 2, 0] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 62

```
Int[1/(((a_.) + (b_.)*(x_))^(1/3)*((c_.) + (d_.)*(x_))^(2/3)), x_Symbol] :=
With[{q = Rt[-d/b, 3]}, Simp[Sqrt[3]*(q/d)*ArcTan[1/Sqrt[3] - 2*q*((a + b*
x)^(1/3)/(Sqrt[3]*(c + d*x)^(1/3))], x] + (Simp[3*(q/(2*d))*Log[q*((a + b*
x)^(1/3)/(c + d*x)^(1/3)) + 1], x] + Simp[(q/(2*d))*Log[c + d*x], x])] /; F
reeQ[{a, b, c, d}, x] && NeQ[b*c - a*d, 0] && NegQ[d/b]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\frac{1}{2}(1-x)^{5/3}\sqrt[3]{x} + \frac{1}{6} \int \frac{(1-x)^{2/3}}{x^{2/3}} dx \\
&= \frac{1}{6}(1-x)^{2/3}\sqrt[3]{x} - \frac{1}{2}(1-x)^{5/3}\sqrt[3]{x} + \frac{1}{9} \int \frac{1}{\sqrt[3]{1-xx^{2/3}}} dx \\
&= \frac{1}{6}(1-x)^{2/3}\sqrt[3]{x} - \frac{1}{2}(1-x)^{5/3}\sqrt[3]{x} + \frac{\arctan\left(\frac{1}{\sqrt{3}} - \frac{2\sqrt[3]{1-x}}{\sqrt{3}\sqrt[3]{x}}\right)}{3\sqrt{3}} + \frac{1}{6} \log\left(1 + \frac{\sqrt[3]{1-x}}{\sqrt[3]{x}}\right) \\
&\quad + \frac{\log(x)}{18}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.40 (sec) , antiderivative size = 114, normalized size of antiderivative = 1.12

$$\int (1$$

$$-x)^{2/3}\sqrt[3]{x} dx = \frac{1}{18} \left(3(1-x)^{2/3}\sqrt[3]{x}(-2+3x) + 2\sqrt{3} \arctan\left(\frac{\sqrt{3}\sqrt[3]{x}}{2\sqrt[3]{1-x}-\sqrt[3]{x}}\right) + 2 \log(\sqrt[3]{1-x} + \sqrt[3]{x}) - \log\left(\frac{1-x}{x}\right) \right)$$

[In] Integrate[(1 - x)^(2/3)*x^(1/3), x]

[Out] (3*(1 - x)^(2/3)*x^(1/3)*(-2 + 3*x) + 2*Sqrt[3]*ArcTan[(Sqrt[3]*x^(1/3))/(2*(1 - x)^(1/3) - x^(1/3))] + 2*Log[(1 - x)^(1/3) + x^(1/3)] - Log[(1 - x)^(2/3) + x^(2/3) - ((-1 + x)*x)^(1/3)])/18

Maple [C] (verified)

Result contains higher order function than in optimal. Order 5 vs. order 3.

Time = 0.25 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.13

| method | result | size |
|---------|--|------|
| meijerg | $\frac{3x^{\frac{4}{3}} \operatorname{hypergeom}\left(\left[-\frac{2}{3}, \frac{4}{3}\right], \left[\frac{7}{3}\right], x\right)}{4}$ | 13 |
| risch | $-\frac{(-2+3x)(-1+x)x^{\frac{1}{3}}(x^2(1-x))^{\frac{1}{3}}}{6(-x^2(-1+x))^{\frac{1}{3}}(1-x)^{\frac{1}{3}}} + \frac{\operatorname{hypergeom}\left(\left[\frac{1}{3}, \frac{1}{3}\right], \left[\frac{4}{3}\right], x\right)(x^2(1-x))^{\frac{1}{3}}}{3x^{\frac{1}{3}}(1-x)^{\frac{1}{3}}}$ | 73 |

[In] `int(x^(1/3)*(1-x)^(2/3),x,method=_RETURNVERBOSE)`

[Out] `3/4*x^(4/3)*hypergeom([-2/3,4/3],[7/3],x)`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 114, normalized size of antiderivative = 1.12

$$\int (1-x)^{2/3} \sqrt[3]{x} dx = \frac{1}{6} (3x-2)x^{\frac{1}{3}}(-x+1)^{\frac{2}{3}} - \frac{1}{9} \sqrt{3} \arctan\left(\frac{\sqrt{3}(x-1) + 2\sqrt{3}x^{\frac{1}{3}}(-x+1)^{\frac{2}{3}}}{3(x-1)}\right) - \frac{1}{18} \log\left(\frac{x - x^{\frac{2}{3}}(-x+1)^{\frac{1}{3}} + x^{\frac{1}{3}}(-x+1)^{\frac{2}{3}} - 1}{x-1}\right) + \frac{1}{9} \log\left(-\frac{x - x^{\frac{1}{3}}(-x+1)^{\frac{2}{3}} - 1}{x-1}\right)$$

[In] `integrate(x^(1/3)*(1-x)^(2/3),x, algorithm="fricas")`

[Out] `1/6*(3*x - 2)*x^(1/3)*(-x + 1)^(2/3) - 1/9*sqrt(3)*arctan(1/3*(sqrt(3)*(x - 1) + 2*sqrt(3)*x^(1/3)*(-x + 1)^(2/3))/(x - 1)) - 1/18*log((x - x^(2/3))*(-x + 1)^(1/3) + x^(1/3)*(-x + 1)^(2/3) - 1)/(x - 1)) + 1/9*log(-(x - x^(1/3))*(-x + 1)^(2/3) - 1)/(x - 1))`

Sympy [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 1.77 (sec) , antiderivative size = 31, normalized size of antiderivative = 0.30

$$\int (1-x)^{2/3} \sqrt[3]{x} dx = \frac{x^{4/3} \Gamma\left(\frac{4}{3}\right) {}_2F_1\left(\begin{matrix} -\frac{2}{3}, \frac{4}{3} \\ \frac{7}{3} \end{matrix} \middle| x e^{2i\pi}\right)}{\Gamma\left(\frac{7}{3}\right)}$$

[In] integrate(x**(1/3)*(1-x)**(2/3),x)

[Out] x**(4/3)*gamma(4/3)*hyper((-2/3, 4/3), (7/3,), x*exp_polar(2*I*pi))/gamma(7/3)

Maxima [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 117, normalized size of antiderivative = 1.15

$$\begin{aligned} \int (1-x)^{2/3} \sqrt[3]{x} dx = & \\ & -\frac{1}{9} \sqrt{3} \arctan\left(\frac{1}{3} \sqrt{3} \left(\frac{2(-x+1)^{1/3}}{x^{1/3}} - 1\right)\right) + \frac{\frac{(-x+1)^{2/3}}{x^{2/3}} - \frac{2(-x+1)^{5/3}}{x^{5/3}}}{6 \left(\frac{(x-1)^2}{x^2} - \frac{2(x-1)}{x} + 1\right)} \\ & + \frac{1}{9} \log\left(\frac{(-x+1)^{1/3}}{x^{1/3}} + 1\right) - \frac{1}{18} \log\left(-\frac{(-x+1)^{1/3}}{x^{1/3}} + \frac{(-x+1)^{2/3}}{x^{2/3}} + 1\right) \end{aligned}$$

[In] integrate(x^(1/3)*(1-x)^(2/3),x, algorithm="maxima")

[Out] -1/9*sqrt(3)*arctan(1/3*sqrt(3)*(2*(-x + 1)^(1/3)/x^(1/3) - 1)) + 1/6*((-x + 1)^(2/3)/x^(2/3) - 2*(-x + 1)^(5/3)/x^(5/3))/((x - 1)^2/x^2 - 2*(x - 1)/x + 1) + 1/9*log((-x + 1)^(1/3)/x^(1/3) + 1) - 1/18*log(-(-x + 1)^(1/3)/x^(1/3) + (-x + 1)^(2/3)/x^(2/3) + 1)

Giac [F]

$$\int (1-x)^{2/3} \sqrt[3]{x} dx = \int x^{1/3} (-x+1)^{2/3} dx$$

[In] integrate(x^(1/3)*(1-x)^(2/3),x, algorithm="giac")

[Out] integrate(x^(1/3)*(-x + 1)^(2/3), x)

Mupad [F(-1)]

Timed out.

$$\int (1-x)^{2/3} \sqrt[3]{x} dx = \int x^{1/3} (1-x)^{2/3} dx$$

[In] int(x^(1/3)*(1 - x)^(2/3),x)

[Out] int(x^(1/3)*(1 - x)^(2/3), x)

3.279 $\int e dx$

| | |
|---|------|
| Optimal result | 2788 |
| Rubi [A] (verified) | 2788 |
| Mathematica [A] (verified) | 2789 |
| Maple [A] (verified) | 2789 |
| Fricas [A] (verification not implemented) | 2789 |
| Sympy [A] (verification not implemented) | 2789 |
| Maxima [A] (verification not implemented) | 2790 |
| Giac [A] (verification not implemented) | 2790 |
| Mupad [B] (verification not implemented) | 2790 |

Optimal result

Integrand size = 1, antiderivative size = 3

$$\int e dx = ex$$

[Out] x*exp(1)

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 1.000$, Rules used = {8}

$$\int e dx = ex$$

[In] Int[E,x]

[Out] E*x

Rule 8

Int[a_, x_Symbol] :> Simp[a*x, x] /; FreeQ[a, x]

Rubi steps

integral = ex

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int e dx = ex$$

[In] Integrate[E,x]

[Out] E*x

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 9, normalized size of antiderivative = 3.00

| method | result | size |
|---------------|--------------------------|------|
| parallelrisch | $x^{\frac{1}{\ln(x)}} x$ | 9 |

[In] int(x^(1/ln(x)),x,method=_RETURNVERBOSE)

[Out] x^(1/ln(x))*x

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

$$\int e dx = xe$$

[In] integrate(x^(1/log(x)),x, algorithm="fricas")

[Out] x*e

Sympy [A] (verification not implemented)

Time = 0.01 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int e dx = ex$$

[In] integrate(x**(1/ln(x)),x)

[Out] E*x

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

$$\int e dx = xe$$

```
[In] integrate(x^(1/log(x)),x, algorithm="maxima")
```

```
[Out] x*e
```

Giac [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

$$\int e dx = xe$$

```
[In] integrate(x^(1/log(x)),x, algorithm="giac")
```

```
[Out] x*e
```

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

$$\int e dx = xe$$

```
[In] int(x^(1/log(x)),x)
```

```
[Out] x*exp(1)
```

3.280 $\int \operatorname{sech}(x) dx$

| | |
|---|------|
| Optimal result | 2791 |
| Rubi [A] (verified) | 2791 |
| Mathematica [A] (verified) | 2792 |
| Maple [A] (verified) | 2792 |
| Fricas [B] (verification not implemented) | 2792 |
| Sympy [B] (verification not implemented) | 2793 |
| Maxima [A] (verification not implemented) | 2793 |
| Giac [A] (verification not implemented) | 2793 |
| Mupad [B] (verification not implemented) | 2793 |

Optimal result

Integrand size = 2, antiderivative size = 3

$$\int \operatorname{sech}(x) dx = \arctan(\sinh(x))$$

[Out] $\arctan(\sinh(x))$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3855}

$$\int \operatorname{sech}(x) dx = \arctan(\sinh(x))$$

[In] $\text{Int}[\text{Sech}[x], x]$

[Out] $\text{ArcTan}[\text{Sinh}[x]]$

Rule 3855

$\text{Int}[\text{csc}[(c_.) + (d_.)*(x_.)], x_Symbol] \rightarrow \text{Simp}[-\text{ArcTanh}[\text{Cos}[c + d*x]]/d, x]$
 /; $\text{FreeQ}\{c, d\}, x]$

Rubi steps

$$\text{integral} = \arctan(\sinh(x))$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \operatorname{sech}(x) dx = \arctan(\sinh(x))$$

[In] Integrate[Sech[x],x]

[Out] ArcTan[Sinh[x]]

Maple [A] (verified)

Time = 0.07 (sec) , antiderivative size = 4, normalized size of antiderivative = 1.33

| method | result | size |
|---------------|---|------|
| lookup | $\arctan(\sinh(x))$ | 4 |
| default | $\arctan(\sinh(x))$ | 4 |
| risch | $i \ln(e^x + i) - i \ln(e^x - i)$ | 20 |
| parallelrisch | $-i(\ln(\tanh(\frac{x}{2}) - i) - \ln(\tanh(\frac{x}{2}) + i))$ | 23 |

[In] int(sech(x),x,method=_RETURNVERBOSE)

[Out] arctan(sinh(x))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 8 vs. 2(3) = 6.

Time = 0.24 (sec) , antiderivative size = 8, normalized size of antiderivative = 2.67

$$\int \operatorname{sech}(x) dx = 2 \arctan(\cosh(x) + \sinh(x))$$

[In] integrate(sech(x),x, algorithm="fricas")

[Out] 2*arctan(cosh(x) + sinh(x))

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 7 vs. $2(3) = 6$.

Time = 0.17 (sec) , antiderivative size = 7, normalized size of antiderivative = 2.33

$$\int \operatorname{sech}(x) dx = 2 \operatorname{atan} \left(\tanh \left(\frac{x}{2} \right) \right)$$

[In] integrate(sech(x),x)

[Out] 2*atan(tanh(x/2))

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 3, normalized size of antiderivative = 1.00

$$\int \operatorname{sech}(x) dx = \operatorname{arctan}(\sinh(x))$$

[In] integrate(sech(x),x, algorithm="maxima")

[Out] arctan(sinh(x))

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.67

$$\int \operatorname{sech}(x) dx = 2 \operatorname{arctan}(e^x)$$

[In] integrate(sech(x),x, algorithm="giac")

[Out] 2*arctan(e^x)

Mupad [B] (verification not implemented)

Time = 0.00 (sec) , antiderivative size = 5, normalized size of antiderivative = 1.67

$$\int \operatorname{sech}(x) dx = 2 \operatorname{atan}(e^x)$$

[In] int(1/cosh(x),x)

[Out] 2*atan(exp(x))

3.281 $\int \frac{e^x}{(1+e^x)\log(1+e^x)} dx$

| | |
|---|------|
| Optimal result | 2794 |
| Rubi [A] (verified) | 2794 |
| Mathematica [A] (verified) | 2795 |
| Maple [A] (verified) | 2795 |
| Fricas [A] (verification not implemented) | 2796 |
| Sympy [A] (verification not implemented) | 2796 |
| Maxima [A] (verification not implemented) | 2796 |
| Giac [A] (verification not implemented) | 2797 |
| Mupad [B] (verification not implemented) | 2797 |

Optimal result

Integrand size = 19, antiderivative size = 7

$$\int \frac{e^x}{(1+e^x)\log(1+e^x)} dx = \log(\log(1+e^x))$$

[Out] ln(ln(exp(x)+1))

Rubi [A] (verified)

Time = 0.08 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.211$, Rules used = {2320, 2437, 2339, 29}

$$\int \frac{e^x}{(1+e^x)\log(1+e^x)} dx = \log(\log(e^x + 1))$$

[In] Int[E^x/((1 + E^x)*Log[1 + E^x]),x]

[Out] Log[Log[1 + E^x]]

Rule 29

Int[(x_)^(-1), x_Symbol] :> Simp[Log[x], x]

Rule 2320

Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Dist[v/D[v, x], Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; FunctionOfExponentialQ[u, x] && !MatchQ[u, (w_)*((a_.)*(v_)^(n_))^(m_)] /; FreeQ[{a, m, n}, x] && IntegerQ[m*n] && !MatchQ[u, E^((c_.)*((a_.) + (b_.)*x))*(F_)[v_] /; FreeQ[{a, b, c}, x] && InverseFunctionQ[F[x]]]

Rule 2339

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)/(x_), x_Symbol] :> Dist[1/(
b*n), Subst[Int[x^p, x], x, a + b*Log[c*x^n]], x] /; FreeQ[{a, b, c, n, p},
x]
```

Rule 2437

```
Int[((a_.) + Log[(c_.)*((d_) + (e_.)*(x_))^(n_.)]*(b_.))^(p_.)*((f_) + (g_.
)*(x_))^(q_.), x_Symbol] :> Dist[1/e, Subst[Int[(f*(x/d))^q*(a + b*Log[c*x^
n])^p, x], x, d + e*x], x] /; FreeQ[{a, b, c, d, e, f, g, n, p, q}, x] && E
qQ[e*f - d*g, 0]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \text{Subst}\left(\int \frac{1}{(1+x)\log(1+x)} dx, x, e^x\right) \\
&= \text{Subst}\left(\int \frac{1}{x\log(x)} dx, x, 1+e^x\right) \\
&= \text{Subst}\left(\int \frac{1}{x} dx, x, \log(1+e^x)\right) \\
&= \log(\log(1+e^x))
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{e^x}{(1+e^x)\log(1+e^x)} dx = \log(\log(1+e^x))$$

```
[In] Integrate[E^x/((1 + E^x)*Log[1 + E^x]),x]
```

```
[Out] Log[Log[1 + E^x]]
```

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

| method | result | size |
|-------------------|---------------------|------|
| derivativedivides | $\ln(\ln(e^x + 1))$ | 7 |
| default | $\ln(\ln(e^x + 1))$ | 7 |
| norman | $\ln(\ln(e^x + 1))$ | 7 |
| risch | $\ln(\ln(e^x + 1))$ | 7 |
| parallelrisc | $\ln(\ln(e^x + 1))$ | 7 |

[In] `int(exp(x)/(exp(x)+1)/ln(exp(x)+1),x,method=_RETURNVERBOSE)`

[Out] `ln(ln(exp(x)+1))`

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.86

$$\int \frac{e^x}{(1+e^x)\log(1+e^x)} dx = \log(\log(e^x + 1))$$

[In] `integrate(exp(x)/(exp(x)+1)/log(exp(x)+1),x, algorithm="fricas")`

[Out] `log(log(e^x + 1))`

Sympy [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 7, normalized size of antiderivative = 1.00

$$\int \frac{e^x}{(1+e^x)\log(1+e^x)} dx = \log(\log(e^x + 1))$$

[In] `integrate(exp(x)/(exp(x)+1)/ln(exp(x)+1),x)`

[Out] `log(log(exp(x) + 1))`

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.86

$$\int \frac{e^x}{(1+e^x)\log(1+e^x)} dx = \log(\log(e^x + 1))$$

[In] `integrate(exp(x)/(exp(x)+1)/log(exp(x)+1),x, algorithm="maxima")`

[Out] `log(log(e^x + 1))`

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.86

$$\int \frac{e^x}{(1+e^x)\log(1+e^x)} dx = \log(\log(e^x + 1))$$

[In] integrate(exp(x)/(exp(x)+1)/log(exp(x)+1),x, algorithm="giac")

[Out] log(log(e^x + 1))

Mupad [B] (verification not implemented)

Time = 0.18 (sec) , antiderivative size = 6, normalized size of antiderivative = 0.86

$$\int \frac{e^x}{(1+e^x)\log(1+e^x)} dx = \ln(\ln(e^x + 1))$$

[In] int(exp(x)/(log(exp(x) + 1)*(exp(x) + 1)),x)

[Out] log(log(exp(x) + 1))

3.282 $\int (1 - x + x^2 - x^3 + x^4) (1 + x + x^2 + x^3 + x^4) dx$

| | |
|---|------|
| Optimal result | 2798 |
| Rubi [A] (verified) | 2798 |
| Mathematica [A] (verified) | 2799 |
| Maple [A] (verified) | 2799 |
| Fricas [A] (verification not implemented) | 2799 |
| Sympy [A] (verification not implemented) | 2800 |
| Maxima [A] (verification not implemented) | 2800 |
| Giac [A] (verification not implemented) | 2800 |
| Mupad [B] (verification not implemented) | 2800 |

Optimal result

Integrand size = 29, antiderivative size = 30

$$\int (1 - x + x^2 - x^3 + x^4) (1 + x + x^2 + x^3 + x^4) dx = x + \frac{x^3}{3} + \frac{x^5}{5} + \frac{x^7}{7} + \frac{x^9}{9}$$

[Out] $x+1/3*x^3+1/5*x^5+1/7*x^7+1/9*x^9$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 30, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.034$, Rules used = {6820}

$$\int (1 - x + x^2 - x^3 + x^4) (1 + x + x^2 + x^3 + x^4) dx = \frac{x^9}{9} + \frac{x^7}{7} + \frac{x^5}{5} + \frac{x^3}{3} + x$$

[In] $\text{Int}[(1 - x + x^2 - x^3 + x^4)*(1 + x + x^2 + x^3 + x^4), x]$

[Out] $x + x^3/3 + x^5/5 + x^7/7 + x^9/9$

Rule 6820

$\text{Int}[u_, x_Symbol] :> \text{With}[\{v = \text{SimplifyIntegrand}[u, x]\}, \text{Int}[v, x] /; \text{SimplerIntegrandQ}[v, u, x]]$

Rubi steps

$$\begin{aligned} \text{integral} &= \int (1 + x^2 + x^4 + x^6 + x^8) dx \\ &= x + \frac{x^3}{3} + \frac{x^5}{5} + \frac{x^7}{7} + \frac{x^9}{9} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 30, normalized size of antiderivative = 1.00

$$\int (1 - x + x^2 - x^3 + x^4) (1 + x + x^2 + x^3 + x^4) dx = x + \frac{x^3}{3} + \frac{x^5}{5} + \frac{x^7}{7} + \frac{x^9}{9}$$

[In] Integrate[(1 - x + x^2 - x^3 + x^4)*(1 + x + x^2 + x^3 + x^4),x]

[Out] x + x^3/3 + x^5/5 + x^7/7 + x^9/9

Maple [A] (verified)

Time = 0.08 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.77

| method | result | size |
|---------------|---|------|
| gospers | $x + \frac{1}{3}x^3 + \frac{1}{5}x^5 + \frac{1}{7}x^7 + \frac{1}{9}x^9$ | 23 |
| default | $x + \frac{1}{3}x^3 + \frac{1}{5}x^5 + \frac{1}{7}x^7 + \frac{1}{9}x^9$ | 23 |
| norman | $x + \frac{1}{3}x^3 + \frac{1}{5}x^5 + \frac{1}{7}x^7 + \frac{1}{9}x^9$ | 23 |
| risch | $x + \frac{1}{3}x^3 + \frac{1}{5}x^5 + \frac{1}{7}x^7 + \frac{1}{9}x^9$ | 23 |
| parallelrisch | $x + \frac{1}{3}x^3 + \frac{1}{5}x^5 + \frac{1}{7}x^7 + \frac{1}{9}x^9$ | 23 |

[In] int((x^4+x^3+x^2+x+1)*(x^4-x^3+x^2-x+1),x,method=_RETURNVERBOSE)

[Out] x+1/3*x^3+1/5*x^5+1/7*x^7+1/9*x^9

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.73

$$\int (1 - x + x^2 - x^3 + x^4) (1 + x + x^2 + x^3 + x^4) dx = \frac{1}{9}x^9 + \frac{1}{7}x^7 + \frac{1}{5}x^5 + \frac{1}{3}x^3 + x$$

[In] integrate((x^4+x^3+x^2+x+1)*(x^4-x^3+x^2-x+1),x, algorithm="fricas")

[Out] 1/9*x^9 + 1/7*x^7 + 1/5*x^5 + 1/3*x^3 + x

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.67

$$\int (1 - x + x^2 - x^3 + x^4) (1 + x + x^2 + x^3 + x^4) dx = \frac{x^9}{9} + \frac{x^7}{7} + \frac{x^5}{5} + \frac{x^3}{3} + x$$

[In] integrate((x**4+x**3+x**2+x+1)*(x**4-x**3+x**2-x+1),x)

[Out] x**9/9 + x**7/7 + x**5/5 + x**3/3 + x

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.73

$$\int (1 - x + x^2 - x^3 + x^4) (1 + x + x^2 + x^3 + x^4) dx = \frac{1}{9} x^9 + \frac{1}{7} x^7 + \frac{1}{5} x^5 + \frac{1}{3} x^3 + x$$

[In] integrate((x^4+x^3+x^2+x+1)*(x^4-x^3+x^2-x+1),x, algorithm="maxima")

[Out] 1/9*x^9 + 1/7*x^7 + 1/5*x^5 + 1/3*x^3 + x

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.73

$$\int (1 - x + x^2 - x^3 + x^4) (1 + x + x^2 + x^3 + x^4) dx = \frac{1}{9} x^9 + \frac{1}{7} x^7 + \frac{1}{5} x^5 + \frac{1}{3} x^3 + x$$

[In] integrate((x^4+x^3+x^2+x+1)*(x^4-x^3+x^2-x+1),x, algorithm="giac")

[Out] 1/9*x^9 + 1/7*x^7 + 1/5*x^5 + 1/3*x^3 + x

Mupad [B] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.73

$$\int (1 - x + x^2 - x^3 + x^4) (1 + x + x^2 + x^3 + x^4) dx = \frac{x^9}{9} + \frac{x^7}{7} + \frac{x^5}{5} + \frac{x^3}{3} + x$$

[In] int((x^2 - x - x^3 + x^4 + 1)*(x + x^2 + x^3 + x^4 + 1),x)

[Out] x + x^3/3 + x^5/5 + x^7/7 + x^9/9

$$3.283 \quad \int \frac{1}{120}(-4+x)(-3+x)(-2+x)(-1+x)x \, dx$$

| | |
|---|------|
| Optimal result | 2801 |
| Rubi [A] (verified) | 2801 |
| Mathematica [A] (verified) | 2802 |
| Maple [A] (verified) | 2802 |
| Fricas [A] (verification not implemented) | 2803 |
| Sympy [A] (verification not implemented) | 2803 |
| Maxima [A] (verification not implemented) | 2803 |
| Giac [A] (verification not implemented) | 2803 |
| Mupad [B] (verification not implemented) | 2804 |

Optimal result

Integrand size = 17, antiderivative size = 36

$$\int \frac{1}{120}(-4+x)(-3+x)(-2+x)(-1+x)x \, dx = \frac{x^2}{10} - \frac{5x^3}{36} + \frac{7x^4}{96} - \frac{x^5}{60} + \frac{x^6}{720}$$

[Out] 1/10*x^2-5/36*x^3+7/96*x^4-1/60*x^5+1/720*x^6

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.118$, Rules used = {12, 1620}

$$\int \frac{1}{120}(-4+x)(-3+x)(-2+x)(-1+x)x \, dx = \frac{x^6}{720} - \frac{x^5}{60} + \frac{7x^4}{96} - \frac{5x^3}{36} + \frac{x^2}{10}$$

[In] Int[(-4 + x)*(-3 + x)*(-2 + x)*(-1 + x)*x/120,x]

[Out] x^2/10 - (5*x^3)/36 + (7*x^4)/96 - x^5/60 + x^6/720

Rule 12

Int[(a_)*(u_), x_Symbol] := Dist[a, Int[u, x], x] /; FreeQ[a, x] && !MatchQ[u, (b_)*(v_)] /; FreeQ[b, x]

Rule 1620

Int[(Px_)*((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.)*((g_.) + (h_.)*(x_))^(q_.), x_Symbol] := Int[ExpandIntegrand[Px*(a + b*x)^m*(c + d*x)^n*(e + f*x)^p*(g + h*x)^q, x], x] /; FreeQ[{a, b

, c, d, e, f, g, h, m, n, p, q}, x] && PolyQ[Px, x] && IntegersQ[m, n]

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{120} \int (-4+x)(-3+x)(-2+x)(-1+x)x \, dx \\ &= \frac{1}{120} \int (24x - 50x^2 + 35x^3 - 10x^4 + x^5) \, dx \\ &= \frac{x^2}{10} - \frac{5x^3}{36} + \frac{7x^4}{96} - \frac{x^5}{60} + \frac{x^6}{720} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.00

$$\int \frac{1}{120}(-4+x)(-3+x)(-2+x)(-1+x)x \, dx = \frac{1}{120} \left(12x^2 - \frac{50x^3}{3} + \frac{35x^4}{4} - 2x^5 + \frac{x^6}{6} \right)$$

[In] Integrate[((-4 + x)*(-3 + x)*(-2 + x)*(-1 + x)*x)/120,x]

[Out] (12*x^2 - (50*x^3)/3 + (35*x^4)/4 - 2*x^5 + x^6/6)/120

Maple [A] (verified)

Time = 0.02 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.75

| method | result | size |
|--------------|--|------|
| gospers | $\frac{1}{10}x^2 - \frac{5}{36}x^3 + \frac{7}{96}x^4 - \frac{1}{60}x^5 + \frac{1}{720}x^6$ | 27 |
| default | $\frac{1}{10}x^2 - \frac{5}{36}x^3 + \frac{7}{96}x^4 - \frac{1}{60}x^5 + \frac{1}{720}x^6$ | 27 |
| norman | $\frac{1}{10}x^2 - \frac{5}{36}x^3 + \frac{7}{96}x^4 - \frac{1}{60}x^5 + \frac{1}{720}x^6$ | 27 |
| risch | $\frac{1}{10}x^2 - \frac{5}{36}x^3 + \frac{7}{96}x^4 - \frac{1}{60}x^5 + \frac{1}{720}x^6$ | 27 |
| paralelrisch | $\frac{1}{10}x^2 - \frac{5}{36}x^3 + \frac{7}{96}x^4 - \frac{1}{60}x^5 + \frac{1}{720}x^6$ | 27 |

[In] int(1/120*(x-4)*(-3+x)*(-2+x)*(-1+x)*x,x,method=_RETURNVERBOSE)

[Out] 1/10*x^2-5/36*x^3+7/96*x^4-1/60*x^5+1/720*x^6

Fricas [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.72

$$\int \frac{1}{120}(-4+x)(-3+x)(-2+x)(-1+x)x dx = \frac{1}{720}x^6 - \frac{1}{60}x^5 + \frac{7}{96}x^4 - \frac{5}{36}x^3 + \frac{1}{10}x^2$$

[In] integrate(1/120*(x-4)*(-3+x)*(-2+x)*(-1+x)*x,x, algorithm="fricas")

[Out] 1/720*x^6 - 1/60*x^5 + 7/96*x^4 - 5/36*x^3 + 1/10*x^2

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 27, normalized size of antiderivative = 0.75

$$\int \frac{1}{120}(-4+x)(-3+x)(-2+x)(-1+x)x dx = \frac{x^6}{720} - \frac{x^5}{60} + \frac{7x^4}{96} - \frac{5x^3}{36} + \frac{x^2}{10}$$

[In] integrate(1/120*(x-4)*(-3+x)*(-2+x)*(-1+x)*x,x)

[Out] x**6/720 - x**5/60 + 7*x**4/96 - 5*x**3/36 + x**2/10

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.72

$$\int \frac{1}{120}(-4+x)(-3+x)(-2+x)(-1+x)x dx = \frac{1}{720}x^6 - \frac{1}{60}x^5 + \frac{7}{96}x^4 - \frac{5}{36}x^3 + \frac{1}{10}x^2$$

[In] integrate(1/120*(x-4)*(-3+x)*(-2+x)*(-1+x)*x,x, algorithm="maxima")

[Out] 1/720*x^6 - 1/60*x^5 + 7/96*x^4 - 5/36*x^3 + 1/10*x^2

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.64

$$\int \frac{1}{120}(-4+x)(-3+x)(-2+x)(-1+x)x dx = \frac{1}{720}(x^2 - 4x)^3 + \frac{1}{160}(x^2 - 4x)^2$$

[In] integrate(1/120*(x-4)*(-3+x)*(-2+x)*(-1+x)*x,x, algorithm="giac")

[Out] 1/720*(x^2 - 4*x)^3 + 1/160*(x^2 - 4*x)^2

Mupad [B] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.72

$$\int \frac{1}{120}(-4+x)(-3+x)(-2+x)(-1+x)x dx = \frac{x^6}{720} - \frac{x^5}{60} + \frac{7x^4}{96} - \frac{5x^3}{36} + \frac{x^2}{10}$$

[In] int((x*(x - 1)*(x - 2)*(x - 3)*(x - 4))/120,x)

[Out] x^2/10 - (5*x^3)/36 + (7*x^4)/96 - x^5/60 + x^6/720

3.284 $\int (x + x \cos(x) + \sin(x) + \cos(x) \sin(x)) dx$

| | |
|---|------|
| Optimal result | 2805 |
| Rubi [A] (verified) | 2805 |
| Mathematica [A] (verified) | 2806 |
| Maple [A] (verified) | 2806 |
| Fricas [A] (verification not implemented) | 2807 |
| Sympy [B] (verification not implemented) | 2807 |
| Maxima [A] (verification not implemented) | 2807 |
| Giac [A] (verification not implemented) | 2808 |
| Mupad [B] (verification not implemented) | 2808 |

Optimal result

Integrand size = 13, antiderivative size = 10

$$\int (x + x \cos(x) + \sin(x) + \cos(x) \sin(x)) dx = \frac{1}{2}(x + \sin(x))^2$$

[Out] 1/2*(x+sin(x))^2

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 20, normalized size of antiderivative = 2.00, number of steps used = 6, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.308$, Rules used = {3377, 2718, 2644, 30}

$$\int (x + x \cos(x) + \sin(x) + \cos(x) \sin(x)) dx = \frac{x^2}{2} + \frac{\sin^2(x)}{2} + x \sin(x)$$

[In] Int[x + x*Cos[x] + Sin[x] + Cos[x]*Sin[x],x]

[Out] x^2/2 + x*Sin[x] + Sin[x]^2/2

Rule 30

Int[(x_)^(m_), x_Symbol] := Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && N eQ[m, -1]

Rule 2644

Int[cos[(e_.) + (f_.)*(x_)]^(n_.)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m_.), x_Symbol] := Dist[1/(a*f), Subst[Int[x^m*(1 - x^2/a^2)^((n - 1)/2), x], x, a*Sin[e + f*x]], x] /; FreeQ[{a, e, f, m}, x] && IntegerQ[(n - 1)/2] && !(IntegerQ[(m - 1)/2] && LtQ[0, m, n])

Rule 2718

```
Int[sin[(c_.) + (d_.)*(x_)], x_Symbol] := Simp[-Cos[c + d*x]/d, x] /; FreeQ
[{c, d}, x]
```

Rule 3377

```
Int[((c_.) + (d_.)*(x_))^(m_.)*sin[(e_.) + (f_.)*(x_)], x_Symbol] := Simp[(
-(c + d*x)^m)*(Cos[e + f*x]/f), x] + Dist[d*(m/f), Int[(c + d*x)^(m - 1)*Co
s[e + f*x], x], x] /; FreeQ[{c, d, e, f}, x] && GtQ[m, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{x^2}{2} + \int x \cos(x) dx + \int \sin(x) dx + \int \cos(x) \sin(x) dx \\ &= \frac{x^2}{2} - \cos(x) + x \sin(x) - \int \sin(x) dx + \text{Subst}\left(\int x dx, x, \sin(x)\right) \\ &= \frac{x^2}{2} + x \sin(x) + \frac{\sin^2(x)}{2} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 20, normalized size of antiderivative = 2.00

$$\int (x + x \cos(x) + \sin(x) + \cos(x) \sin(x)) dx = \frac{x^2}{2} - \frac{\cos^2(x)}{2} + x \sin(x)$$

```
[In] Integrate[x + x*Cos[x] + Sin[x] + Cos[x]*Sin[x],x]
```

```
[Out] x^2/2 - Cos[x]^2/2 + x*Sin[x]
```

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.70

| method | result | size |
|---------|---|------|
| default | $\frac{x^2}{2} + x \sin(x) + \frac{\sin(x)^2}{2}$ | 17 |
| risch | $\frac{x^2}{2} + x \sin(x) - \frac{\cos(2x)}{4}$ | 17 |
| parts | $\frac{x^2}{2} - \frac{\cos(x)^2}{2} + x \sin(x)$ | 17 |
| norman | $\frac{x^2 \tan(\frac{x}{2})^2 + 2 \tan(\frac{x}{2})^2 + \frac{x^2}{2} + 2x \tan(\frac{x}{2}) + 2x \tan(\frac{x}{2})^3 + \frac{x^2 \tan(\frac{x}{2})^4}{2}}{(1 + \tan(\frac{x}{2})^2)^2}$ | 63 |

[In] `int(x+sin(x)+x*cos(x)+cos(x)*sin(x),x,method=_RETURNVERBOSE)`

[Out] $1/2*x^2+x*\sin(x)+1/2*\sin(x)^2$

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.60

$$\int (x + x \cos(x) + \sin(x) + \cos(x) \sin(x)) dx = \frac{1}{2} x^2 - \frac{1}{2} \cos(x)^2 + x \sin(x)$$

[In] `integrate(x+sin(x)+x*cos(x)+cos(x)*sin(x),x, algorithm="fricas")`

[Out] $1/2*x^2 - 1/2*\cos(x)^2 + x*\sin(x)$

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 15 vs. $2(7) = 14$.

Time = 0.07 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.50

$$\int (x + x \cos(x) + \sin(x) + \cos(x) \sin(x)) dx = \frac{x^2}{2} + x \sin(x) + \frac{\sin^2(x)}{2}$$

[In] `integrate(x+sin(x)+x*cos(x)+cos(x)*sin(x),x)`

[Out] $x**2/2 + x*\sin(x) + \sin(x)**2/2$

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.60

$$\int (x + x \cos(x) + \sin(x) + \cos(x) \sin(x)) dx = \frac{1}{2} x^2 - \frac{1}{2} \cos(x)^2 + x \sin(x)$$

[In] `integrate(x+sin(x)+x*cos(x)+cos(x)*sin(x),x, algorithm="maxima")`

[Out] $1/2*x^2 - 1/2*\cos(x)^2 + x*\sin(x)$

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.60

$$\int (x + x \cos(x) + \sin(x) + \cos(x) \sin(x)) dx = \frac{1}{2} x^2 - \frac{1}{2} \cos(x)^2 + x \sin(x)$$

[In] integrate(x+sin(x)+x*cos(x)+cos(x)*sin(x),x, algorithm="giac")

[Out] 1/2*x^2 - 1/2*cos(x)^2 + x*sin(x)

Mupad [B] (verification not implemented)

Time = 15.37 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int (x + x \cos(x) + \sin(x) + \cos(x) \sin(x)) dx = \frac{(x + \sin(x))^2}{2}$$

[In] int(x + sin(x) + cos(x)*sin(x) + x*cos(x),x)

[Out] (x + sin(x))^2/2

3.285 $\int (\cos^2(x) + \cot^2(x) + \csc^2(x) + \sec^2(x) + \sin^2(x) + \tan^2(x)) dx$

| | |
|---|------|
| Optimal result | 2809 |
| Rubi [A] (verified) | 2809 |
| Mathematica [A] (verified) | 2810 |
| Maple [A] (verified) | 2811 |
| Fricas [A] (verification not implemented) | 2811 |
| Sympy [A] (verification not implemented) | 2811 |
| Maxima [A] (verification not implemented) | 2812 |
| Giac [B] (verification not implemented) | 2812 |
| Mupad [B] (verification not implemented) | 2812 |

Optimal result

Integrand size = 25, antiderivative size = 12

$$\int (\cos^2(x) + \cot^2(x) + \csc^2(x) + \sec^2(x) + \sin^2(x) + \tan^2(x)) dx = -x - 2 \cot(x) + 2 \tan(x)$$

[Out] $-x-2*\cot(x)+2*\tan(x)$

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 13, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.160$, Rules used = {2715, 8, 3554, 3852}

$$\int (\cos^2(x) + \cot^2(x) + \csc^2(x) + \sec^2(x) + \sin^2(x) + \tan^2(x)) dx = -x + 2 \tan(x) - 2 \cot(x)$$

[In] `Int[Cos[x]^2 + Cot[x]^2 + Csc[x]^2 + Sec[x]^2 + Sin[x]^2 + Tan[x]^2,x]`

[Out] $-x - 2*\cot[x] + 2*\tan[x]$

Rule 8

`Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]`

Rule 2715

`Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] := Simp[(-b)*Cos[c + d*x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2*n]`

Rule 3554

```
Int[((b_.)*tan[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] := Simp[b*((b*Tan[c + d
*x])^(n - 1)/(d*(n - 1))), x] - Dist[b^2, Int[(b*Tan[c + d*x])^(n - 2), x],
x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1]
```

Rule 3852

```
Int[csc[(c_.) + (d_.)*(x_)]^(n_), x_Symbol] := Dist[-d^(-1), Subst[Int[Expa
ndIntegrand[(1 + x^2)^(n/2 - 1), x], x], x, Cot[c + d*x]], x] /; FreeQ[{c,
d}, x] && IGtQ[n/2, 0]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \cos^2(x) dx + \int \cot^2(x) dx + \int \csc^2(x) dx \\
&\quad + \int \sec^2(x) dx + \int \sin^2(x) dx + \int \tan^2(x) dx \\
&= -\cot(x) + \tan(x) + 2 \int \frac{1 dx}{2} - 2 \int 1 dx \\
&\quad - \text{Subst}\left(\int 1 dx, x, \cot(x)\right) - \text{Subst}\left(\int 1 dx, x, -\tan(x)\right) \\
&= -x - 2 \cot(x) + 2 \tan(x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.26 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int (\cos^2(x) + \cot^2(x) + \csc^2(x) + \sec^2(x) + \sin^2(x) + \tan^2(x)) dx = -x - 2 \cot(x) + 2 \tan(x)$$

```
[In] Integrate[Cos[x]^2 + Cot[x]^2 + Csc[x]^2 + Sec[x]^2 + Sin[x]^2 + Tan[x]^2, x]
```

```
[Out] -x - 2*Cot[x] + 2*Tan[x]
```

Maple [A] (verified)

Time = 1.19 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.25

| method | result | size |
|--------------|---|------|
| parallelrisc | $-x - 4 \cot(x) + 2 \csc(x) \sec(x)$ | 15 |
| default | $x - 2 \cot(x) + \frac{\pi}{2} - \operatorname{arccot}(\cot(x)) + 2 \tan(x) - \arctan(\tan(x))$ | 24 |
| parts | $x - 2 \cot(x) + \frac{\pi}{2} - \operatorname{arccot}(\cot(x)) + 2 \tan(x) - \arctan(\tan(x))$ | 24 |
| risc | $\frac{4i}{e^{2ix}+1} - x - \frac{4i}{e^{2ix}-1}$ | 29 |

[In] `int(sin(x)^2+cos(x)^2+tan(x)^2+cot(x)^2+sec(x)^2+csc(x)^2,x,method=_RETURNV
ERBOSE)`

[Out] `-x-4*cot(x)+2*csc(x)*sec(x)`

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 24, normalized size of antiderivative = 2.00

$$\int (\cos^2(x) + \cot^2(x) + \csc^2(x) + \sec^2(x) + \sin^2(x) + \tan^2(x)) dx$$

$$= -\frac{x \cos(x) \sin(x) + 4 \cos(x)^2 - 2}{\cos(x) \sin(x)}$$

[In] `integrate(sin(x)^2+cos(x)^2+tan(x)^2+cot(x)^2+sec(x)^2+csc(x)^2,x, algorithm
m="fricas")`

[Out] `-(x*cos(x)*sin(x) + 4*cos(x)^2 - 2)/(cos(x)*sin(x))`

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.42

$$\int (\cos^2(x) + \cot^2(x) + \csc^2(x) + \sec^2(x) + \sin^2(x) + \tan^2(x)) dx = -x + \frac{2 \sin(x)}{\cos(x)} - \frac{2 \cos(x)}{\sin(x)}$$

[In] `integrate(sin(x)**2+cos(x)**2+tan(x)**2+cot(x)**2+sec(x)**2+csc(x)**2,x)`

[Out] `-x + 2*sin(x)/cos(x) - 2*cos(x)/sin(x)`

Maxima [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int (\cos^2(x) + \cot^2(x) + \csc^2(x) + \sec^2(x) + \sin^2(x) + \tan^2(x)) dx = -x - \frac{2}{\tan(x)} + 2 \tan(x)$$

[In] integrate(sin(x)^2+cos(x)^2+tan(x)^2+cot(x)^2+sec(x)^2+csc(x)^2,x, algorithm="maxima")

[Out] -x - 2/tan(x) + 2*tan(x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 28 vs. 2(12) = 24.

Time = 0.29 (sec) , antiderivative size = 28, normalized size of antiderivative = 2.33

$$\begin{aligned} \int (\cos^2(x) + \cot^2(x) + \csc^2(x) + \sec^2(x) + \sin^2(x) + \tan^2(x)) dx \\ = -x - \frac{1}{2 \tan\left(\frac{1}{2}x\right)} - \frac{1}{\tan(x)} + \frac{1}{2} \tan\left(\frac{1}{2}x\right) + 2 \tan(x) \end{aligned}$$

[In] integrate(sin(x)^2+cos(x)^2+tan(x)^2+cot(x)^2+sec(x)^2+csc(x)^2,x, algorithm="giac")

[Out] -x - 1/2/tan(1/2*x) - 1/tan(x) + 1/2*tan(1/2*x) + 2*tan(x)

Mupad [B] (verification not implemented)

Time = 16.00 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int (\cos^2(x) + \cot^2(x) + \csc^2(x) + \sec^2(x) + \sin^2(x) + \tan^2(x)) dx = 2 \tan(x) - x - \frac{2}{\tan(x)}$$

[In] int(1/cos(x)^2 + cos(x)^2 + cot(x)^2 + 1/sin(x)^2 + sin(x)^2 + tan(x)^2,x)

[Out] 2*tan(x) - x - 2/tan(x)

3.286 $\int e^{\log^2(x)}(1 + 2 \log(x)) dx$

| | |
|---|------|
| Optimal result | 2813 |
| Rubi [A] (verified) | 2813 |
| Mathematica [A] (verified) | 2814 |
| Maple [A] (verified) | 2814 |
| Fricas [A] (verification not implemented) | 2814 |
| Sympy [A] (verification not implemented) | 2815 |
| Maxima [A] (verification not implemented) | 2815 |
| Giac [A] (verification not implemented) | 2815 |
| Mupad [B] (verification not implemented) | 2815 |

Optimal result

Integrand size = 13, antiderivative size = 8

$$\int e^{\log^2(x)}(1 + 2 \log(x)) dx = e^{\log^2(x)}x$$

[Out] $x \cdot \exp(\ln(x)^2)$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 8, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.077$, Rules used = {2326}

$$\int e^{\log^2(x)}(1 + 2 \log(x)) dx = x e^{\log^2(x)}$$

[In] `Int[E^Log[x]^2*(1 + 2*Log[x]),x]`

[Out] `E^Log[x]^2*x`

Rule 2326

`Int[(y_.)*(F_)^(u_)*((v_) + (w_)), x_Symbol] :> With[{z = v*(y/(Log[F]*D[u, x]))}, Simp[F^u*z, x] /; EqQ[D[z, x], w*y]] /; FreeQ[F, x]`

Rubi steps

$$\text{integral} = e^{\log^2(x)}x$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

$$\int e^{\log^2(x)}(1 + 2 \log(x)) dx = e^{\log^2(x)}x$$

[In] Integrate[E^Log[x]^2*(1 + 2*Log[x]),x]

[Out] E^Log[x]^2*x

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 8, normalized size of antiderivative = 1.00

| method | result | size |
|--------------|------------------|------|
| norman | $x e^{\ln(x)^2}$ | 8 |
| risch | $x e^{\ln(x)^2}$ | 8 |
| parallelrisc | $x e^{\ln(x)^2}$ | 8 |

[In] int((1+2*ln(x))*exp(ln(x)^2),x,method=_RETURNVERBOSE)

[Out] x*exp(ln(x)^2)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int e^{\log^2(x)}(1 + 2 \log(x)) dx = x e^{(\log(x)^2)}$$

[In] integrate((1+2*log(x))*exp(log(x)^2),x, algorithm="fricas")

[Out] x*e^(log(x)^2)

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int e^{\log^2(x)}(1 + 2\log(x)) dx = xe^{\log(x)^2}$$

[In] integrate((1+2*ln(x))*exp(ln(x)**2),x)

[Out] x*exp(log(x)**2)

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int e^{\log^2(x)}(1 + 2\log(x)) dx = xe^{(\log(x)^2)}$$

[In] integrate((1+2*log(x))*exp(log(x)^2),x, algorithm="maxima")

[Out] x*e^(log(x)^2)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int e^{\log^2(x)}(1 + 2\log(x)) dx = xe^{(\log(x)^2)}$$

[In] integrate((1+2*log(x))*exp(log(x)^2),x, algorithm="giac")

[Out] x*e^(log(x)^2)

Mupad [B] (verification not implemented)

Time = 18.45 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.88

$$\int e^{\log^2(x)}(1 + 2\log(x)) dx = xe^{\ln(x)^2}$$

[In] int(exp(log(x)^2)*(2*log(x) + 1),x)

[Out] x*exp(log(x)^2)

$$3.287 \quad \int \left((1-x)^3 + (x-x^2)^3 - 3(1-x)(x-x^2)(-1+x) \right) dx$$

| | |
|---|------|
| Optimal result | 2816 |
| Rubi [B] (verified) | 2816 |
| Mathematica [A] (verified) | 2817 |
| Maple [A] (verified) | 2818 |
| Fricas [A] (verification not implemented) | 2818 |
| Sympy [A] (verification not implemented) | 2818 |
| Maxima [A] (verification not implemented) | 2819 |
| Giac [C] (verification not implemented) | 2819 |
| Mupad [B] (verification not implemented) | 2819 |

Optimal result

Integrand size = 43, antiderivative size = 1

$$\int \left((1-x)^3 + (x-x^2)^3 - 3(1-x)(x-x^2)(-1+x^2) + (-1+x^2)^3 \right) dx = 0$$

[Out] 0

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 3 vs. 2(1) = 2.

Time = 0.04 (sec) , antiderivative size = 3, normalized size of antiderivative = 3.00, number of steps used = 8, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.093$, Rules used = {625, 1607, 786, 200}

$$\int \left((1-x)^3 + (x-x^2)^3 - 3(1-x)(x-x^2)(-1+x^2) + (-1+x^2)^3 \right) dx = -\frac{1}{4}$$

[In] Int[(1 - x)^3 + (x - x^2)^3 - 3*(1 - x)*(x - x^2)*(-1 + x^2) + (-1 + x^2)^3, x]

[Out] -1/4

Rule 200

Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Int[ExpandIntegrand[(a + b*x^n)^p, x], x] /; FreeQ[{a, b}, x] && IGtQ[n, 0] && IGtQ[p, 0]

Rule 625

Int[((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^(p_), x_Symbol] := Int[ExpandIntegrand[(a + b*x + c*x^2)^p, x], x] /; FreeQ[{a, b, c}, x] && NeQ[b^2 - 4*a*c,

0] && IGtQ[p, 0] && (EqQ[a, 0] || !PerfectSquareQ[b^2 - 4*a*c])

Rule 786

Int[((d_.) + (e_.)*(x_))^(m_.)*((f_.) + (g_.)*(x_))*((a_) + (c_.)*(x_)^2)^(p_.), x_Symbol] := Int[ExpandIntegrand[(d + e*x)^m*(f + g*x)*(a + c*x^2)^p, x], x] /; FreeQ[{a, c, d, e, f, g, m}, x] && IGtQ[p, 0]

Rule 1607

Int[(u_.)*((a_.)*(x_)^(p_.) + (b_.)*(x_)^(q_.))^(n_.), x_Symbol] := Int[u*x^(n*p)*(a + b*x^(q - p))^n, x] /; FreeQ[{a, b, p, q}, x] && IntegerQ[n] && PosQ[q - p]

Rubi steps

$$\begin{aligned}
 \text{integral} &= -\frac{1}{4}(1-x)^4 - 3 \int (1-x)(x-x^2)(-1+x^2) dx + \int (x-x^2)^3 dx + \int (-1+x^2)^3 dx \\
 &= -\frac{1}{4}(1-x)^4 - 3 \int (1-x)^2 x(-1+x^2) dx \\
 &\quad + \int (x^3 - 3x^4 + 3x^5 - x^6) dx + \int (-1 + 3x^2 - 3x^4 + x^6) dx \\
 &= -\frac{1}{4}(1-x)^4 - x + x^3 + \frac{x^4}{4} - \frac{6x^5}{5} + \frac{x^6}{2} - 3 \int (-x + 2x^2 - 2x^4 + x^5) dx \\
 &= -\frac{1}{4}(1-x)^4 - x + \frac{3x^2}{2} - x^3 + \frac{x^4}{4}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 1, normalized size of antiderivative = 1.00

$$\int \left((1-x)^3 + (x-x^2)^3 - 3(1-x)(x-x^2)(-1+x^2) + (-1+x^2)^3 \right) dx = 0$$

[In] Integrate[(1 - x)^3 + (x - x^2)^3 - 3*(1 - x)*(x - x^2)*(-1 + x^2) + (-1 + x^2)^3, x]

[Out] 0

Maple [A] (verified)

Time = 0.25 (sec) , antiderivative size = 2, normalized size of antiderivative = 2.00

| method | result | size |
|---------------|----------------|------|
| default | 0 | 2 |
| norman | 0 | 2 |
| meijerg | 0 | 2 |
| risch | $-\frac{1}{4}$ | 2 |
| parallelrisch | 0 | 2 |

```
[In] int((1-x)^3+(-x^2+x)^3+(x^2-1)^3-3*(1-x)*(-x^2+x)*(x^2-1),x,method=_RETURNV
ERBOSE)
```

```
[Out] 0
```

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 1, normalized size of antiderivative = 1.00

$$\int \left((1-x)^3 + (x-x^2)^3 - 3(1-x)(x-x^2)(-1+x^2) + (-1+x^2)^3 \right) dx = 0$$

```
[In] integrate((1-x)^3+(-x^2+x)^3+(x^2-1)^3-3*(1-x)*(-x^2+x)*(x^2-1),x, algorithm
m="fricas")
```

```
[Out] 0
```

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 0, normalized size of antiderivative = 0.00

$$\int \left((1-x)^3 + (x-x^2)^3 - 3(1-x)(x-x^2)(-1+x^2) + (-1+x^2)^3 \right) dx = 0$$

```
[In] integrate((1-x)**3+(-x**2+x)**3+(x**2-1)**3-3*(1-x)*(-x**2+x)*(x**2-1),x)
```

```
[Out] 0
```

Maxima [A] (verification not implemented)

none

Time = 0.22 (sec) , antiderivative size = 1, normalized size of antiderivative = 1.00

$$\int \left((1-x)^3 + (x-x^2)^3 - 3(1-x)(x-x^2)(-1+x^2) + (-1+x^2)^3 \right) dx = 0$$

[In] integrate((1-x)^3+(-x^2+x)^3+(x^2-1)^3-3*(1-x)*(-x^2+x)*(x^2-1),x, algorithm m="maxima")

[Out] 0

Giac [C] (verification not implemented)

Result contains higher order function than in optimal. Order 3 vs. order 1.

Time = 0.27 (sec) , antiderivative size = 26, normalized size of antiderivative = 26.00

$$\begin{aligned} & \int \left((1-x)^3 + (x-x^2)^3 - 3(1-x)(x-x^2)(-1+x^2) + (-1+x^2)^3 \right) dx \\ &= -\frac{1}{4}(x-1)^4 + \frac{1}{4}x^4 - x^3 + \frac{3}{2}x^2 - x \end{aligned}$$

[In] integrate((1-x)^3+(-x^2+x)^3+(x^2-1)^3-3*(1-x)*(-x^2+x)*(x^2-1),x, algorithm m="giac")

[Out] -1/4*(x - 1)^4 + 1/4*x^4 - x^3 + 3/2*x^2 - x

Mupad [B] (verification not implemented)

Time = 0.01 (sec) , antiderivative size = 1, normalized size of antiderivative = 1.00

$$\int \left((1-x)^3 + (x-x^2)^3 - 3(1-x)(x-x^2)(-1+x^2) + (-1+x^2)^3 \right) dx = 0$$

[In] int((x - x^2)^3 - (x - 1)^3 + (x^2 - 1)^3 + 3*(x - x^2)*(x^2 - 1)*(x - 1),x)

[Out] 0

3.288 $\int (\cos^6(x) + 3 \cos^2(x) \sin^2(x) + \sin^6(x)) dx$

| | |
|---|------|
| Optimal result | 2820 |
| Rubi [C] (verified) | 2820 |
| Mathematica [A] (verified) | 2821 |
| Maple [A] (verified) | 2822 |
| Fricas [A] (verification not implemented) | 2822 |
| Sympy [B] (verification not implemented) | 2822 |
| Maxima [A] (verification not implemented) | 2823 |
| Giac [A] (verification not implemented) | 2823 |
| Mupad [B] (verification not implemented) | 2823 |

Optimal result

Integrand size = 19, antiderivative size = 1

$$\int (\cos^6(x) + 3 \cos^2(x) \sin^2(x) + \sin^6(x)) dx = x$$

[Out] x

Rubi [C] (verified)

Result contains higher order function than in optimal. Order 3 vs. order 1 in optimal.

Time = 0.08 (sec) , antiderivative size = 50, normalized size of antiderivative = 50.00, number of steps used = 12, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.158$, Rules used = {2715, 8, 2648}

$$\begin{aligned} \int (\cos^6(x) + 3 \cos^2(x) \sin^2(x) + \sin^6(x)) dx = & x + \frac{1}{6} \sin(x) \cos^5(x) \\ & - \frac{13}{24} \sin(x) \cos^3(x) - \frac{1}{6} \sin^5(x) \cos(x) \\ & - \frac{5}{24} \sin^3(x) \cos(x) + \frac{3}{8} \sin(x) \cos(x) \end{aligned}$$

[In] Int[Cos[x]^6 + 3*Cos[x]^2*Sin[x]^2 + Sin[x]^6,x]

[Out] x + (3*Cos[x]*Sin[x])/8 - (13*Cos[x]^3*Sin[x])/24 + (Cos[x]^5*Sin[x])/6 - (5*Cos[x]*Sin[x]^3)/24 - (Cos[x]*Sin[x]^5)/6

Rule 8

Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]

Rule 2648


```
Int[(cos[(e_.) + (f_.)*(x_)]*(b_.))^(n_)*((a_.)*sin[(e_.) + (f_.)*(x_)])^(m
_), x_Symbol] :> Simp[(-a)*(b*Cos[e + f*x])^(n + 1)*((a*Sin[e + f*x])^(m -
1)/(b*f*(m + n))), x] + Dist[a^2*((m - 1)/(m + n)), Int[(b*Cos[e + f*x])^n*
(a*Sin[e + f*x])^(m - 2), x], x] /; FreeQ[{a, b, e, f, n}, x] && GtQ[m, 1]
&& NeQ[m + n, 0] && IntegersQ[2*m, 2*n]
```

Rule 2715

```
Int[((b_.)*sin[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[(-b)*Cos[c + d*
x]*((b*Sin[c + d*x])^(n - 1)/(d*n)), x] + Dist[b^2*((n - 1)/n), Int[(b*Sin[
c + d*x])^(n - 2), x], x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1] && IntegerQ[2
*n]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= 3 \int \cos^2(x) \sin^2(x) dx + \int \cos^6(x) dx + \int \sin^6(x) dx \\
&= -\frac{3}{4} \cos^3(x) \sin(x) + \frac{1}{6} \cos^5(x) \sin(x) - \frac{1}{6} \cos(x) \sin^5(x) \\
&\quad + \frac{3}{4} \int \cos^2(x) dx + \frac{5}{6} \int \cos^4(x) dx + \frac{5}{6} \int \sin^4(x) dx \\
&= \frac{3}{8} \cos(x) \sin(x) - \frac{13}{24} \cos^3(x) \sin(x) + \frac{1}{6} \cos^5(x) \sin(x) - \frac{5}{24} \cos(x) \sin^3(x) \\
&\quad - \frac{1}{6} \cos(x) \sin^5(x) + \frac{3 \int 1 dx}{8} + \frac{5}{8} \int \cos^2(x) dx + \frac{5}{8} \int \sin^2(x) dx \\
&= \frac{3x}{8} + \frac{3}{8} \cos(x) \sin(x) - \frac{13}{24} \cos^3(x) \sin(x) + \frac{1}{6} \cos^5(x) \sin(x) \\
&\quad - \frac{5}{24} \cos(x) \sin^3(x) - \frac{1}{6} \cos(x) \sin^5(x) + 2 \frac{5 \int 1 dx}{16} \\
&= x + \frac{3}{8} \cos(x) \sin(x) - \frac{13}{24} \cos^3(x) \sin(x) + \frac{1}{6} \cos^5(x) \sin(x) \\
&\quad - \frac{5}{24} \cos(x) \sin^3(x) - \frac{1}{6} \cos(x) \sin^5(x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 1, normalized size of antiderivative = 1.00

$$\int (\cos^6(x) + 3 \cos^2(x) \sin^2(x) + \sin^6(x)) dx = x$$

```
[In] Integrate[Cos[x]^6 + 3*Cos[x]^2*Sin[x]^2 + Sin[x]^6,x]
```

```
[Out] x
```

Maple [A] (verified)

Time = 0.33 (sec) , antiderivative size = 2, normalized size of antiderivative = 2.00

| method | result | size |
|---------|---|------|
| risch | x | 2 |
| default | $\frac{\left(\cos(x)^5 + \frac{5\cos(x)^3}{4} + \frac{15\cos(x)}{8}\right)\sin(x)}{6} + x - \frac{\left(\sin(x)^5 + \frac{5\sin(x)^3}{4} + \frac{15\sin(x)}{8}\right)\cos(x)}{6} - \frac{3\cos(x)^3\sin(x)}{4} + \frac{3\cos(x)\sin(x)}{8}$ | 55 |
| parts | $\frac{\left(\cos(x)^5 + \frac{5\cos(x)^3}{4} + \frac{15\cos(x)}{8}\right)\sin(x)}{6} + x - \frac{\left(\sin(x)^5 + \frac{5\sin(x)^3}{4} + \frac{15\sin(x)}{8}\right)\cos(x)}{6} - \frac{3\cos(x)^3\sin(x)}{4} + \frac{3\cos(x)\sin(x)}{8}$ | 55 |
| norman | $\frac{x + x \tan\left(\frac{x}{2}\right)^{12} + 6x \tan\left(\frac{x}{2}\right)^2 + 15x \tan\left(\frac{x}{2}\right)^4 + 20x \tan\left(\frac{x}{2}\right)^6 + 15x \tan\left(\frac{x}{2}\right)^8 + 6x \tan\left(\frac{x}{2}\right)^{10}}{\left(1 + \tan\left(\frac{x}{2}\right)^2\right)^6}$ | 67 |

[In] `int(sin(x)^6+cos(x)^6+3*sin(x)^2*cos(x)^2,x,method=_RETURNVERBOSE)`[Out] `x`**Fricas [A] (verification not implemented)**

none

Time = 0.23 (sec) , antiderivative size = 1, normalized size of antiderivative = 1.00

$$\int (\cos^6(x) + 3\cos^2(x)\sin^2(x) + \sin^6(x)) dx = x$$

[In] `integrate(sin(x)^6+cos(x)^6+3*sin(x)^2*cos(x)^2,x, algorithm="fricas")`[Out] `x`**Sympy [B] (verification not implemented)**

Leaf count of result is larger than twice the leaf count of optimal. 58 vs. 2(0) = 0.

Time = 0.03 (sec) , antiderivative size = 58, normalized size of antiderivative = 58.00

$$\int (\cos^6(x) + 3\cos^2(x)\sin^2(x) + \sin^6(x)) dx = x - \frac{\sin^5(x)\cos(x)}{6} - \frac{5\sin^3(x)\cos(x)}{24} + \frac{\sin(x)\cos^5(x)}{6} + \frac{5\sin(x)\cos^3(x)}{24} - \frac{3\sin(2x)\cos(2x)}{16}$$

[In] `integrate(sin(x)**6+cos(x)**6+3*sin(x)**2*cos(x)**2,x)`[Out] `x - sin(x)**5*cos(x)/6 - 5*sin(x)**3*cos(x)/24 + sin(x)*cos(x)**5/6 + 5*sin(x)*cos(x)**3/24 - 3*sin(2*x)*cos(2*x)/16`

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 1, normalized size of antiderivative = 1.00

$$\int (\cos^6(x) + 3 \cos^2(x) \sin^2(x) + \sin^6(x)) dx = x$$

[In] integrate(sin(x)^6+cos(x)^6+3*sin(x)^2*cos(x)^2,x, algorithm="maxima")

[Out] x

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 1, normalized size of antiderivative = 1.00

$$\int (\cos^6(x) + 3 \cos^2(x) \sin^2(x) + \sin^6(x)) dx = x$$

[In] integrate(sin(x)^6+cos(x)^6+3*sin(x)^2*cos(x)^2,x, algorithm="giac")

[Out] x

Mupad [B] (verification not implemented)

Time = 18.14 (sec) , antiderivative size = 1, normalized size of antiderivative = 1.00

$$\int (\cos^6(x) + 3 \cos^2(x) \sin^2(x) + \sin^6(x)) dx = x$$

[In] int(cos(x)^6 + sin(x)^6 + 3*cos(x)^2*sin(x)^2,x)

[Out] x

3.289 $\int e^x x^e (1 + e + x) dx$

| | |
|---|------|
| Optimal result | 2824 |
| Rubi [A] (verified) | 2824 |
| Mathematica [A] (verified) | 2825 |
| Maple [A] (verified) | 2825 |
| Fricas [A] (verification not implemented) | 2825 |
| Sympy [A] (verification not implemented) | 2826 |
| Maxima [C] (verification not implemented) | 2826 |
| Giac [A] (verification not implemented) | 2826 |
| Mupad [B] (verification not implemented) | 2827 |

Optimal result

Integrand size = 11, antiderivative size = 9

$$\int e^x x^e (1 + e + x) dx = e^x x^{1+e}$$

[Out] $\exp(x) * x^{(1+\exp(1))}$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.091$, Rules used = {2228}

$$\int e^x x^e (1 + e + x) dx = e^x x^{1+e}$$

[In] $\text{Int}[E^x * x^E * (1 + E + x), x]$

[Out] $E^x * x^{(1 + E)}$

Rule 2228

```
Int[(F_)^((c_.)*(v_))*(u_)^(m_.)*(w_), x_Symbol] := With[{b = Coefficient[v, x, 1], d = Coefficient[u, x, 0], e = Coefficient[u, x, 1], f = Coefficient[w, x, 0], g = Coefficient[w, x, 1]}, Simp[g*u^(m + 1)*(F^(c*v))/(b*c*e*Log[F]), x] /; EqQ[e*g*(m + 1) - b*c*(e*f - d*g)*Log[F], 0]] /; FreeQ[{F, c, m}, x] && LinearQ[{u, v, w}, x]
```

Rubi steps

$$\text{integral} = e^x x^{1+e}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int e^x x^e (1 + e + x) dx = e^x x^{1+e}$$

`[In] Integrate[E^x*x^E*(1 + E + x),x]``[Out] E^x*x^(1 + E)`**Maple [A] (verified)**

Time = 0.38 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

| method | result |
|---------------|--|
| risch | $x x^e e^x$ |
| parallelrisch | $x x^e e^x$ |
| gospers | $e^x x^{1+e}$ |
| norman | $x e^x e^{e \ln(x)}$ |
| meijerg | $(-1)^{-e} (x^e (-1)^e (1 + e) e \Gamma(e) (-x)^{-e} - x^e (-1)^e (e - x + 1) e^x - x^e (-1)^e (1 + e) e (-x)^{-e} \Gamma(e))$ |

`[In] int((x+exp(1)+1)*x^exp(1)*exp(x),x,method=_RETURNVERBOSE)``[Out] x*x^exp(1)*exp(x)`**Fricas [A] (verification not implemented)**

none

Time = 0.24 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.89

$$\int e^x x^e (1 + e + x) dx = x x^e e^x$$

`[In] integrate((x+exp(1)+1)*x^exp(1)*exp(x),x, algorithm="fricas")``[Out] x*x^e*e^x`

Sympy [A] (verification not implemented)

Time = 0.17 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.89

$$\int e^x x^e (1 + e + x) dx = x x^e e^x$$

[In] integrate((x+exp(1)+1)*x**exp(1)*exp(x),x)

[Out] x*x**E*exp(x)

Maxima [C] (verification not implemented)

Result contains higher order function than in optimal. Order 4 vs. order 3.

Time = 0.23 (sec) , antiderivative size = 81, normalized size of antiderivative = 9.00

$$\int e^x x^e (1 + e + x) dx = -(-x)^{-e-1} x^{e+1} e \Gamma(e+1, -x) \\ - (-x)^{-e-2} x^{e+2} \Gamma(e+2, -x) - (-x)^{-e-1} x^{e+1} \Gamma(e+1, -x)$$

[In] integrate((x+exp(1)+1)*x^exp(1)*exp(x),x, algorithm="maxima")

[Out] -(-x)^(-e - 1)*x^(e + 1)*e*gamma(e + 1, -x) - (-x)^(-e - 2)*x^(e + 2)*gamma(e + 2, -x) - (-x)^(-e - 1)*x^(e + 1)*gamma(e + 1, -x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.89

$$\int e^x x^e (1 + e + x) dx = x x^e e^x$$

[In] integrate((x+exp(1)+1)*x^exp(1)*exp(x),x, algorithm="giac")

[Out] x*x^e*e^x

Mupad [B] (verification not implemented)

Time = 18.14 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00

$$\int e^x x^e (1 + e + x) dx = x^{e+1} e^x$$

[In] `int(x^exp(1)*exp(x)*(x + exp(1) + 1),x)`

[Out] `x^(exp(1) + 1)*exp(x)`

$$3.290 \quad \int \left(\sqrt{2} \sqrt{\frac{x}{1+x}} + \frac{x^2}{2-x^2} \right) dx$$

| | |
|---|------|
| Optimal result | 2828 |
| Rubi [A] (verified) | 2828 |
| Mathematica [B] (verified) | 2830 |
| Maple [A] (verified) | 2830 |
| Fricas [B] (verification not implemented) | 2830 |
| Sympy [F] | 2831 |
| Maxima [B] (verification not implemented) | 2831 |
| Giac [B] (verification not implemented) | 2832 |
| Mupad [B] (verification not implemented) | 2832 |

Optimal result

Integrand size = 31, antiderivative size = 49

$$\int \left(\sqrt{2} \sqrt{\frac{x}{1+x}} + \frac{x^2}{2-x^2} \right) dx = -x + \sqrt{2} \sqrt{x} \sqrt{1+x} - \sqrt{2} \operatorname{arcsinh}(\sqrt{x}) + \sqrt{2} \operatorname{arctanh}\left(\frac{x}{\sqrt{2}}\right)$$

[Out] $-x+2^{(1/2)}*x^{(1/2)}*(1+x)^{(1/2)}-2^{(1/2)}*\operatorname{arcsinh}(x^{(1/2)})+2^{(1/2)}*\operatorname{arctanh}(1/2*x*2^{(1/2)})$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 49, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.194$, Rules used = {1978, 52, 56, 221, 327, 212}

$$\int \left(\sqrt{2} \sqrt{\frac{x}{1+x}} + \frac{x^2}{2-x^2} \right) dx = -\sqrt{2} \operatorname{arcsinh}(\sqrt{x}) + \sqrt{2} \operatorname{arctanh}\left(\frac{x}{\sqrt{2}}\right) - x + \sqrt{2} \sqrt{x+1} \sqrt{x}$$

[In] $\operatorname{Int}[\operatorname{Sqrt}[2]*\operatorname{Sqrt}[x/(1+x)] + x^2/(2-x^2), x]$

[Out] $-x + \operatorname{Sqrt}[2]*\operatorname{Sqrt}[x]*\operatorname{Sqrt}[1+x] - \operatorname{Sqrt}[2]*\operatorname{ArcSinh}[\operatorname{Sqrt}[x]] + \operatorname{Sqrt}[2]*\operatorname{ArcTanh}[x/\operatorname{Sqrt}[2]]$

Rule 52

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] := Simp[
(a + b*x)^(m + 1)*((c + d*x)^n/(b*(m + n + 1))), x] + Dist[n*(b*c - a*d)/(
b*(m + n + 1)), Int[(a + b*x)^m*(c + d*x)^(n - 1), x], x] /; FreeQ[{a, b,
c, d}, x] && NeQ[b*c - a*d, 0] && GtQ[n, 0] && NeQ[m + n + 1, 0] && !(IGtQ[
m, 0] && (!IntegerQ[n] || (GtQ[m, 0] && LtQ[m - n, 0]))) && !ILtQ[m + n
```


+ 2, 0] && IntLinearQ[a, b, c, d, m, n, x]

Rule 56

Int[1/(Sqrt[(a_.) + (b_.)*(x_)]*Sqrt[(c_.) + (d_.)*(x_)]), x_Symbol] := Dist[2/Sqrt[b], Subst[Int[1/Sqrt[b*c - a*d + d*x^2], x], x, Sqrt[a + b*x]], x] /; FreeQ[{a, b, c, d}, x] && GtQ[b*c - a*d, 0] && GtQ[b, 0]

Rule 212

Int[((a_.) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])

Rule 221

Int[1/Sqrt[(a_.) + (b_.)*(x_)^2], x_Symbol] := Simp[ArcSinh[Rt[b, 2]*(x/Sqrt[a])]/Rt[b, 2], x] /; FreeQ[{a, b}, x] && GtQ[a, 0] && PosQ[b]

Rule 327

Int[((c_.)*(x_))^(m_)*((a_.) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Simp[c^(n - 1)*(c*x)^(m - n + 1)*((a + b*x^n)^(p + 1)/(b*(m + n*p + 1))), x] - Dist[a*c^n*((m - n + 1)/(b*(m + n*p + 1))), Int[(c*x)^(m - n)*(a + b*x^n)^p, x], x] /; FreeQ[{a, b, c, p}, x] && IGtQ[n, 0] && GtQ[m, n - 1] && NeQ[m + n*p + 1, 0] && IntBinomialQ[a, b, c, n, m, p, x]

Rule 1978

Int[(u_.)*(((e_.)*((a_.) + (b_.)*(x_)^(n_.))))/((c_.) + (d_.)*(x_)^(n_.))^(p_), x_Symbol] := Int[u*((a*e + b*e*x^n)^p/(c + d*x^n)^p), x] /; FreeQ[{a, b, c, d, e, n, p}, x] && GtQ[b*d*e, 0] && GtQ[c - a*(d/b), 0]

Rubi steps

$$\begin{aligned}
 \text{integral} &= \sqrt{2} \int \sqrt{\frac{x}{1+x}} dx + \int \frac{x^2}{2-x^2} dx \\
 &= -x + 2 \int \frac{1}{2-x^2} dx + \sqrt{2} \int \frac{\sqrt{x}}{\sqrt{1+x}} dx \\
 &= -x + \sqrt{2} \sqrt{x} \sqrt{1+x} + \sqrt{2} \operatorname{arctanh}\left(\frac{x}{\sqrt{2}}\right) - \frac{\int \frac{1}{\sqrt{x}\sqrt{1+x}} dx}{\sqrt{2}} \\
 &= -x + \sqrt{2} \sqrt{x} \sqrt{1+x} + \sqrt{2} \operatorname{arctanh}\left(\frac{x}{\sqrt{2}}\right) - \sqrt{2} \operatorname{Subst}\left(\int \frac{1}{\sqrt{1+x^2}} dx, x, \sqrt{x}\right) \\
 &= -x + \sqrt{2} \sqrt{x} \sqrt{1+x} - \sqrt{2} \operatorname{arcsinh}(\sqrt{x}) + \sqrt{2} \operatorname{arctanh}\left(\frac{x}{\sqrt{2}}\right)
 \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 100 vs. $2(49) = 98$.

Time = 0.08 (sec) , antiderivative size = 100, normalized size of antiderivative = 2.04

$$\int \left(\sqrt{2} \sqrt{\frac{x}{1+x}} + \frac{x^2}{2-x^2} \right) dx = -x + \sqrt{2} \sqrt{\frac{x}{1+x}} (1+x) - \frac{\log(\sqrt{2}-x)}{\sqrt{2}} + \frac{\log(\sqrt{2}+x)}{\sqrt{2}} + \frac{\sqrt{2} \sqrt{\frac{x}{1+x}} \sqrt{1+x} \log(-\sqrt{x} + \sqrt{1+x})}{\sqrt{x}}$$

[In] Integrate[Sqrt[2]*Sqrt[x/(1+x)] + x^2/(2-x^2), x]

[Out] -x + Sqrt[2]*Sqrt[x/(1+x)]*(1+x) - Log[Sqrt[2]-x]/Sqrt[2] + Log[Sqrt[2]+x]/Sqrt[2] + (Sqrt[2]*Sqrt[x/(1+x)]*Sqrt[1+x]*Log[-Sqrt[x]+Sqrt[1+x]])/Sqrt[x]

Maple [A] (verified)

Time = 0.35 (sec) , antiderivative size = 61, normalized size of antiderivative = 1.24

| method | result |
|---------|--|
| default | $-\frac{\sqrt{2} \sqrt{\frac{x}{1+x}} (1+x) \left(-2\sqrt{x^2+x} + \ln\left(\frac{1}{2} + x + \sqrt{x^2+x}\right) \right)}{2\sqrt{x(1+x)}} - x + \sqrt{2} \operatorname{arctanh}\left(\frac{x\sqrt{2}}{2}\right)$ |
| trager | $1 - x + \sqrt{2} (1+x) \sqrt{\frac{x}{1+x}} - \frac{\sqrt{2} \ln\left(-\frac{2\sqrt{2} \sqrt{\frac{x}{1+x}} x^2 + 2\sqrt{2} x^2 + 2\sqrt{\frac{x}{1+x}} x^2 - 2\sqrt{2} \sqrt{\frac{x}{1+x}} - x\sqrt{2} - 2x\sqrt{\frac{x}{1+x}} + 2x^2 - \sqrt{2} - 4\sqrt{\frac{x}{1+x}} - 3x - 2}{x\sqrt{2} - \sqrt{2} - x + 2}\right)}{2}$ |

[In] int(x^2/(-x^2+2)+2^(1/2)*(x/(1+x))^(1/2), x, method=_RETURNVERBOSE)

[Out] -1/2*2^(1/2)*(x/(1+x))^(1/2)*(1+x)*(-2*(x^2+x)^(1/2)+ln(1/2+x+(x^2+x)^(1/2)))/(x*(1+x))^(1/2)-x+2^(1/2)*arctanh(1/2*x*2^(1/2))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 114 vs. $2(36) = 72$.

Time = 0.25 (sec) , antiderivative size = 114, normalized size of antiderivative = 2.33

$$\int \left(\sqrt{2} \sqrt{\frac{x}{1+x}} + \frac{x^2}{2-x^2} \right) dx = \sqrt{2}(x+1) \sqrt{\frac{x}{x+1}} + \frac{1}{2} \sqrt{2} \log \left(-\frac{6x^3 + 19x^2 + 2\sqrt{2}(2x^3 + 7x^2 + 7x + 2) - 2(3x^3 + 11x^2 + 2\sqrt{2}(x^3 + 4x^2 + 5x + 2) + \dots)}{x^2 - 2} \right) - x$$

[In] integrate(x^2/(-x^2+2)+2^(1/2)*(x/(1+x))^(1/2),x, algorithm="fricas")

[Out] sqrt(2)*(x + 1)*sqrt(x/(x + 1)) + 1/2*sqrt(2)*log(-(6*x^3 + 19*x^2 + 2*sqrt(2))*(2*x^3 + 7*x^2 + 7*x + 2) - 2*(3*x^3 + 11*x^2 + 2*sqrt(2)*(x^3 + 4*x^2 + 5*x + 2) + 14*x + 6)*sqrt(x/(x + 1)) + 20*x + 6)/(x^2 - 2)) - x

Sympy [F]

$$\int \left(\sqrt{2} \sqrt{\frac{x}{1+x}} + \frac{x^2}{2-x^2} \right) dx = \int \frac{\sqrt{2}x^2 \sqrt{\frac{x}{x+1}} - x^2 - 2\sqrt{2} \sqrt{\frac{x}{x+1}}}{x^2 - 2} dx$$

[In] integrate(x**2/(-x**2+2)+2**(1/2)*(x/(1+x))**(1/2),x)

[Out] Integral((sqrt(2)*x**2*sqrt(x/(x + 1)) - x**2 - 2*sqrt(2)*sqrt(x/(x + 1)))/(x**2 - 2), x)

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 79 vs. 2(36) = 72.

Time = 0.28 (sec) , antiderivative size = 79, normalized size of antiderivative = 1.61

$$\begin{aligned} & \int \left(\sqrt{2} \sqrt{\frac{x}{1+x}} + \frac{x^2}{2-x^2} \right) dx \\ &= -\frac{1}{2} \sqrt{2} \left(\frac{2 \sqrt{\frac{x}{x+1}}}{\frac{x}{x+1} - 1} + \log \left(\sqrt{\frac{x}{x+1}} + 1 \right) - \log \left(\sqrt{\frac{x}{x+1}} - 1 \right) \right) \\ & \quad - \frac{1}{2} \sqrt{2} \log \left(\frac{x - \sqrt{2}}{x + \sqrt{2}} \right) - x \end{aligned}$$

[In] integrate(x^2/(-x^2+2)+2^(1/2)*(x/(1+x))^(1/2),x, algorithm="maxima")

[Out] -1/2*sqrt(2)*(2*sqrt(x/(x + 1)))/(x/(x + 1) - 1) + log(sqrt(x/(x + 1)) + 1) - log(sqrt(x/(x + 1)) - 1) - 1/2*sqrt(2)*log((x - sqrt(2))/(x + sqrt(2))) - x

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 73 vs. 2(36) = 72.

Time = 0.29 (sec) , antiderivative size = 73, normalized size of antiderivative = 1.49

$$\begin{aligned} & \int \left(\sqrt{2} \sqrt{\frac{x}{1+x}} + \frac{x^2}{2-x^2} \right) dx \\ &= \frac{1}{2} \sqrt{2} \left(\log \left(\left| -2x + 2\sqrt{x^2+x} - 1 \right| \right) \operatorname{sgn}(x+1) + 2\sqrt{x^2+x} \operatorname{sgn}(x+1) \right) \\ & \quad - \frac{1}{2} \sqrt{2} \log \left(\frac{|2x - 2\sqrt{2}|}{|2x + 2\sqrt{2}|} \right) - x \end{aligned}$$

[In] integrate(x^2/(-x^2+2)+2^(1/2)*(x/(1+x))^(1/2),x, algorithm="giac")

[Out] 1/2*sqrt(2)*(log(abs(-2*x + 2*sqrt(x^2 + x) - 1))*sgn(x + 1) + 2*sqrt(x^2 + x)*sgn(x + 1)) - 1/2*sqrt(2)*log(abs(2*x - 2*sqrt(2))/abs(2*x + 2*sqrt(2))) - x

Mupad [B] (verification not implemented)

Time = 17.80 (sec) , antiderivative size = 238, normalized size of antiderivative = 4.86

$$\begin{aligned} & \int \left(\sqrt{2} \sqrt{\frac{x}{1+x}} + \frac{x^2}{2-x^2} \right) dx \\ &= -\sqrt{2} \operatorname{atanh} \left(\frac{96 \sqrt{\frac{2x}{x+1}}}{64 \sqrt{2} \sqrt{\frac{2x}{x+1}} - 56 \sqrt{2} \left(\frac{2x}{x+1}\right)^{3/2} + 96 \sqrt{2} - \frac{160 \sqrt{2} x}{x+1}} \right. \\ & \quad - \frac{80 \left(\frac{2x}{x+1}\right)^{3/2}}{64 \sqrt{2} \sqrt{\frac{2x}{x+1}} - 56 \sqrt{2} \left(\frac{2x}{x+1}\right)^{3/2} + 96 \sqrt{2} - \frac{160 \sqrt{2} x}{x+1}} \\ & \quad + \frac{128}{64 \sqrt{2} \sqrt{\frac{2x}{x+1}} - 56 \sqrt{2} \left(\frac{2x}{x+1}\right)^{3/2} + 96 \sqrt{2} - \frac{160 \sqrt{2} x}{x+1}} \\ & \quad \left. - \frac{224 x}{(x+1) \left(64 \sqrt{2} \sqrt{\frac{2x}{x+1}} - 56 \sqrt{2} \left(\frac{2x}{x+1}\right)^{3/2} + 96 \sqrt{2} - \frac{160 \sqrt{2} x}{x+1}\right)} \right) - \frac{\sqrt{\frac{2x}{x+1}} - 1}{\frac{x}{x+1} - 1} \end{aligned}$$

[In] int(2^(1/2)*(x/(x + 1))^(1/2) - x^2/(x^2 - 2),x)

[Out] - 2^(1/2)*atanh((96*((2*x)/(x + 1))^(1/2))/(64*2^(1/2)*((2*x)/(x + 1))^(1/2) - 56*2^(1/2)*((2*x)/(x + 1))^(3/2) + 96*2^(1/2) - (160*2^(1/2)*x)/(x + 1))) - (80*((2*x)/(x + 1))^(3/2))/(64*2^(1/2)*((2*x)/(x + 1))^(1/2) - 56*2^(1/2)*((2*x)/(x + 1))^(3/2) + 96*2^(1/2) - (160*2^(1/2)*x)/(x + 1)) + 128/(64*

$$\begin{aligned}
& 2^{(1/2)} * ((2*x)/(x + 1))^{(1/2)} - 56 * 2^{(1/2)} * ((2*x)/(x + 1))^{(3/2)} + 96 * 2^{(1/2)} \\
& - (160 * 2^{(1/2)} * x)/(x + 1) - (224 * x)/((x + 1) * (64 * 2^{(1/2)} * ((2*x)/(x + 1))^{(1/2)} - 56 * 2^{(1/2)} * ((2*x)/(x + 1))^{(3/2)} + 96 * 2^{(1/2)} - (160 * 2^{(1/2)} * x)/(x + 1))) - (((2*x)/(x + 1))^{(1/2)} - 1)/(x/(x + 1) - 1)
\end{aligned}$$

3.291 $\int \frac{1+2x^{2022}}{x+x^{2023}} dx$

| | |
|---|------|
| Optimal result | 2834 |
| Rubi [A] (verified) | 2834 |
| Mathematica [A] (verified) | 2835 |
| Maple [F(-1)] | 2835 |
| Fricas [F(-1)] | 2836 |
| Sympy [F(-1)] | 2836 |
| Maxima [A] (verification not implemented) | 2836 |
| Giac [A] (verification not implemented) | 2836 |
| Mupad [F(-1)] | 2837 |

Optimal result

Integrand size = 15, antiderivative size = 13

$$\int \frac{1+2x^{2022}}{x+x^{2023}} dx = \log(x) + \frac{\log(1+x^{2022})}{2022}$$

[Out] $\ln(x)+1/2022*\ln(x^{2022}+1)$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.200$, Rules used = {1607, 457, 78}

$$\int \frac{1+2x^{2022}}{x+x^{2023}} dx = \frac{\log(x^{2022}+1)}{2022} + \log(x)$$

[In] $\text{Int}[(1+2*x^{2022})/(x+x^{2023}),x]$

[Out] $\text{Log}[x] + \text{Log}[1+x^{2022}]/2022$

Rule 78

```
Int[((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] := Int[ExpandIntegrand[(a + b*x)*(c + d*x)^n*(e + f*x)^p, x], x] /; FreeQ[{a, b, c, d, e, f, n}, x] && NeQ[b*c - a*d, 0] && ((ILtQ[n, 0] && ILtQ[p, 0]) || EqQ[p, 1] || (IGtQ[p, 0] && (!IntegerQ[n] || LeQ[9*p + 5*(n + 2), 0] || GeQ[n + p + 1, 0] || (GeQ[n + p + 2, 0] && RationalQ[a, b, c, d, e, f])))
```

Rule 457

```
Int[(x_)^(m_)*((a_) + (b_)*(x_)^(n_))^(p_)*((c_) + (d_)*(x_)^(n_))^(q_
), x_Symbol] := Dist[1/n, Subst[Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p
*(c + d*x)^q, x], x, x^n], x] /; FreeQ[{a, b, c, d, m, n, p, q}, x] && NeQ[
b*c - a*d, 0] && IntegerQ[Simplify[(m + 1)/n]]
```

Rule 1607

```
Int[(u_)*((a_)*(x_)^(p_) + (b_)*(x_)^(q_))^(n_), x_Symbol] := Int[u*x
^(n*p)*(a + b*x^(q - p))^n, x] /; FreeQ[{a, b, p, q}, x] && IntegerQ[n] &&
PosQ[q - p]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \frac{1 + 2x^{2022}}{x(1 + x^{2022})} dx \\
 &= \frac{\text{Subst}\left(\int \frac{1+2x}{x(1+x)} dx, x, x^{2022}\right)}{2022} \\
 &= \frac{\text{Subst}\left(\int \left(\frac{1}{x} + \frac{1}{1+x}\right) dx, x, x^{2022}\right)}{2022} \\
 &= \log(x) + \frac{\log(1 + x^{2022})}{2022}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 3.39 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \frac{1 + 2x^{2022}}{x + x^{2023}} dx = \log(x) + \frac{\log(1 + x^{2022})}{2022}$$

```
[In] Integrate[(1 + 2*x^2022)/(x + x^2023), x]
```

```
[Out] Log[x] + Log[1 + x^2022]/2022
```

Maple [F(-1)]

Timed out.

hanged

```
[In] int((2*x^2022+1)/(x^2023+x), x)
```

```
[Out] int((2*x^2022+1)/(x^2023+x), x)
```

Fricas [F(-1)]

Timed out.

$$\int \frac{1 + 2x^{2022}}{x + x^{2023}} dx = \text{Timed out}$$

```
[In] integrate((2*x^2022+1)/(x^2023+x),x, algorithm="fricas")
```

```
[Out] Timed out
```

Sympy [F(-1)]

Timed out.

$$\int \frac{1 + 2x^{2022}}{x + x^{2023}} dx = \text{Timed out}$$

```
[In] integrate((2*x**2022+1)/(x**2023+x),x)
```

```
[Out] Timed out
```

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{1 + 2x^{2022}}{x + x^{2023}} dx = \frac{1}{2022} \log(x^{2022} + 1) + \log(x)$$

```
[In] integrate((2*x^2022+1)/(x^2023+x),x, algorithm="maxima")
```

```
[Out] 1/2022*log(x^2022 + 1) + log(x)
```

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.15

$$\int \frac{1 + 2x^{2022}}{x + x^{2023}} dx = \frac{1}{2022} \log(x^{2022} + 1) + \frac{1}{2022} \log(x^{2022})$$

```
[In] integrate((2*x^2022+1)/(x^2023+x),x, algorithm="giac")
```

```
[Out] 1/2022*log(x^2022 + 1) + 1/2022*log(x^2022)
```


Mupad [F(-1)]

Timed out.

$$\int \frac{1 + 2x^{2022}}{x + x^{2023}} dx = \int \frac{2x^{2022} + 1}{x^{2023} + x} dx$$

```
[In] int((2*x^2022 + 1)/(x + x^2023), x)
```

```
[Out] int((2*x^2022 + 1)/(x + x^2023), x)
```

3.292 $\int (3 \cos(23x) \sin(20x) + 20 \sin(43x)) dx$

| | |
|---|------|
| Optimal result | 2838 |
| Rubi [A] (verified) | 2838 |
| Mathematica [A] (verified) | 2839 |
| Maple [A] (verified) | 2839 |
| Fricas [B] (verification not implemented) | 2840 |
| Sympy [B] (verification not implemented) | 2841 |
| Maxima [A] (verification not implemented) | 2841 |
| Giac [A] (verification not implemented) | 2841 |
| Mupad [B] (verification not implemented) | 2842 |

Optimal result

Integrand size = 17, antiderivative size = 9

$$\int (3 \cos(23x) \sin(20x) + 20 \sin(43x)) dx = \sin(20x) \sin(23x)$$

[Out] $\sin(20*x)*\sin(23*x)$

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.89, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.118$, Rules used = {4369, 2718}

$$\int (3 \cos(23x) \sin(20x) + 20 \sin(43x)) dx = \frac{1}{2} \cos(3x) - \frac{1}{2} \cos(43x)$$

[In] $\text{Int}[3*\text{Cos}[23*x]*\text{Sin}[20*x] + 20*\text{Sin}[43*x], x]$

[Out] $\text{Cos}[3*x]/2 - \text{Cos}[43*x]/2$

Rule 2718

$\text{Int}[\sin[(c_.) + (d_.)*(x_.)], x_Symbol] \rightarrow \text{Simp}[-\text{Cos}[c + d*x]/d, x] /;$ $\text{FreeQ}[\{c, d\}, x]$

Rule 4369

$\text{Int}[\cos[(c_.) + (d_.)*(x_.)]*\sin[(a_.) + (b_.)*(x_.)], x_Symbol] \rightarrow \text{Simp}[-\text{Cos}[a - c + (b - d)*x]/(2*(b - d)), x] - \text{Simp}[\text{Cos}[a + c + (b + d)*x]/(2*(b + d)), x] /;$ $\text{FreeQ}[\{a, b, c, d\}, x] \ \&\& \ \text{NeQ}[b^2 - d^2, 0]$

Rubi steps

$$\begin{aligned} \text{integral} &= 3 \int \cos(23x) \sin(20x) dx + 20 \int \sin(43x) dx \\ &= \frac{1}{2} \cos(3x) - \frac{1}{2} \cos(43x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.10 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.89

$$\int (3 \cos(23x) \sin(20x) + 20 \sin(43x)) dx = \frac{1}{2} \cos(3x) - \frac{1}{2} \cos(43x)$$

[In] Integrate[3*Cos[23*x]*Sin[20*x] + 20*Sin[43*x],x]

[Out] Cos[3*x]/2 - Cos[43*x]/2

Maple [A] (verified)

Time = 2.04 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.56

| method | result |
|---------------|--|
| default | $\frac{\cos(3x)}{2} - \frac{\cos(43x)}{2}$ |
| risch | $\frac{\cos(3x)}{2} - \frac{\cos(43x)}{2}$ |
| parts | $\frac{\cos(3x)}{2} - \frac{\cos(43x)}{2}$ |
| parallelrisch | $-\frac{40}{43} + \frac{40(-\tan(10x)^2 - \tan(\frac{43x}{2})^2 - 2)\tan(\frac{23x}{2})^2}{43} + \frac{92\tan(\frac{23x}{2})\tan(10x)(1+\tan(\frac{43x}{2})^2)}{(1+\tan(10x)^2)(1+\tan(\frac{23x}{2})^2)(1+\tan(\frac{43x}{2})^2)} - \frac{40\tan(\frac{43x}{2})^2\tan(10x)^2}{43} - \frac{80\tan(10x)^2}{43}$ |

[In] int(3*sin(20*x)*cos(23*x)+20*sin(43*x),x,method=_RETURNVERBOSE)

[Out] 1/2*cos(3*x)-1/2*cos(43*x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 131 vs. 2(9) = 18.

Time = 1.63 (sec) , antiderivative size = 131, normalized size of antiderivative = 14.56

$$\int (3 \cos(23x) \sin(20x) + 20 \sin(43x)) dx = -2199023255552 \cos(x)^{43} \\ + 23639499997184 \cos(x)^{41} \\ - 118197499985920 \cos(x)^{39} \\ + 364934781206528 \cos(x)^{37} \\ - 778995398344704 \cos(x)^{35} \\ + 1219742794776576 \cos(x)^{33} \\ - 1450504945139712 \cos(x)^{31} \\ + 1338263491051520 \cos(x)^{29} \\ - 970241031012352 \cos(x)^{27} \\ + 556461767786496 \cos(x)^{25} \\ - 252937167175680 \cos(x)^{23} \\ + 90899294453760 \cos(x)^{21} \\ - 25657058918400 \cos(x)^{19} \\ + 5624816762880 \cos(x)^{17} \\ - 942087536640 \cos(x)^{15} \\ + 117760942080 \cos(x)^{13} \\ - 10631196160 \cos(x)^{11} + 661443200 \cos(x)^9 \\ - 26457728 \cos(x)^7 + 609224 \cos(x)^5 \\ - 6620 \cos(x)^3 + 20 \cos(x)$$

[In] integrate(3*sin(20*x)*cos(23*x)+20*sin(43*x),x, algorithm="fricas")

[Out] -2199023255552*cos(x)^43 + 23639499997184*cos(x)^41 - 118197499985920*cos(x)^39 + 364934781206528*cos(x)^37 - 778995398344704*cos(x)^35 + 1219742794776576*cos(x)^33 - 1450504945139712*cos(x)^31 + 1338263491051520*cos(x)^29 - 970241031012352*cos(x)^27 + 556461767786496*cos(x)^25 - 252937167175680*cos(x)^23 + 90899294453760*cos(x)^21 - 25657058918400*cos(x)^19 + 5624816762880*cos(x)^17 - 942087536640*cos(x)^15 + 117760942080*cos(x)^13 - 10631196160*cos(x)^11 + 661443200*cos(x)^9 - 26457728*cos(x)^7 + 609224*cos(x)^5 - 6620*cos(x)^3 + 20*cos(x)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 34 vs. 2(8) = 16.

Time = 0.13 (sec) , antiderivative size = 34, normalized size of antiderivative = 3.78

$$\int (3 \cos(23x) \sin(20x) + 20 \sin(43x)) dx = \frac{23 \sin(20x) \sin(23x)}{43} + \frac{20 \cos(20x) \cos(23x)}{43} - \frac{20 \cos(43x)}{43}$$

[In] integrate(3*sin(20*x)*cos(23*x)+20*sin(43*x),x)

[Out] 23*sin(20*x)*sin(23*x)/43 + 20*cos(20*x)*cos(23*x)/43 - 20*cos(43*x)/43

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.44

$$\int (3 \cos(23x) \sin(20x) + 20 \sin(43x)) dx = -\frac{1}{2} \cos(43x) + \frac{1}{2} \cos(3x)$$

[In] integrate(3*sin(20*x)*cos(23*x)+20*sin(43*x),x, algorithm="maxima")

[Out] -1/2*cos(43*x) + 1/2*cos(3*x)

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.44

$$\int (3 \cos(23x) \sin(20x) + 20 \sin(43x)) dx = -\frac{1}{2} \cos(43x) + \frac{1}{2} \cos(3x)$$

[In] integrate(3*sin(20*x)*cos(23*x)+20*sin(43*x),x, algorithm="giac")

[Out] -1/2*cos(43*x) + 1/2*cos(3*x)

Mupad [B] (verification not implemented)

Time = 17.31 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.44

$$\int (3 \cos(23x) \sin(20x) + 20 \sin(43x)) dx = \frac{\cos(3x)}{2} - \frac{\cos(43x)}{2}$$

[In] int(20*sin(43*x) + 3*cos(23*x)*sin(20*x),x)

[Out] cos(3*x)/2 - cos(43*x)/2

$$3.293 \quad \int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx$$

| | |
|---|------|
| Optimal result | 2843 |
| Rubi [F] | 2843 |
| Mathematica [A] (verified) | 2844 |
| Maple [C] (verified) | 2844 |
| Fricas [A] (verification not implemented) | 2844 |
| Sympy [A] (verification not implemented) | 2845 |
| Maxima [B] (verification not implemented) | 2845 |
| Giac [B] (verification not implemented) | 2845 |
| Mupad [B] (verification not implemented) | 2846 |

Optimal result

Integrand size = 15, antiderivative size = 19

$$\int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx = \frac{1}{2}(x - \log(2e^x + \cos(x) + \sin(x)))$$

[Out] 1/2*x-1/2*ln(2*exp(x)+cos(x)+sin(x))

Rubi [F]

$$\int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx = \int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx$$

[In] Int[Sin[x]/(2*E^x + Cos[x] + Sin[x]),x]

[Out] Defer[Int][Sin[x]/(2*E^x + Cos[x] + Sin[x]), x]

Rubi steps

$$\text{integral} = \int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx$$

Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.11

$$\int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx = \frac{x}{2} - \frac{1}{2} \log(2e^x + \cos(x) + \sin(x))$$

[In] Integrate[Sin[x]/(2*E^x + Cos[x] + Sin[x]),x]

[Out] x/2 - Log[2*E^x + Cos[x] + Sin[x]]/2

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 0.33 (sec) , antiderivative size = 30, normalized size of antiderivative = 1.58

| method | result | size |
|---------------|---|------|
| risch | $\frac{x}{2} + \frac{ix}{2} - \frac{\ln(e^{2ix} + (2+2i)e^{(1+i)x} + i)}{2}$ | 30 |
| parallelrisch | $\ln\left(\frac{\sqrt{2}}{\sqrt{2e^x + \cos(x) + \sin(x)}}\right) + \ln\left(\sqrt{\frac{1}{1 + \cos(x)}}\right) + \frac{x}{2}$ | 37 |
| norman | $\frac{\frac{x}{2} + \frac{x \tan(\frac{x}{2})^2}{2}}{1 + \tan(\frac{x}{2})^2} + \frac{\ln(1 + \tan(\frac{x}{2})^2)}{2} - \frac{\ln(2e^x \tan(\frac{x}{2})^2 - \tan(\frac{x}{2})^2 + 2e^x + 2 \tan(\frac{x}{2}) + 1)}{2}$ | 70 |

[In] int(sin(x)/(2*exp(x)+cos(x)+sin(x)),x,method=_RETURNVERBOSE)

[Out] 1/2*x+1/2*I*x-1/2*ln(exp(2*I*x)+(2+2*I)*exp((1+I)*x)+I)

Fricas [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 16, normalized size of antiderivative = 0.84

$$\int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx = \frac{1}{2} x - \frac{1}{2} \log(\cos(x) + 2e^x + \sin(x))$$

[In] integrate(sin(x)/(2*exp(x)+cos(x)+sin(x)),x, algorithm="fricas")

[Out] 1/2*x - 1/2*log(cos(x) + 2*e^x + sin(x))

Sympy [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.89

$$\int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx = \frac{x}{2} - \frac{\log(2e^x + \sin(x) + \cos(x))}{2}$$

[In] integrate(sin(x)/(2*exp(x)+cos(x)+sin(x)),x)

[Out] x/2 - log(2*exp(x) + sin(x) + cos(x))/2

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 91 vs. 2(16) = 32.

Time = 0.21 (sec) , antiderivative size = 91, normalized size of antiderivative = 4.79

$$\int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx = \frac{1}{2}x - \frac{1}{4} \log(8 \cos(x)^2 e^{(2x)} + 8 e^{(2x)} \sin(x)^2 + 4(\cos(x) e^x - e^x \sin(x)) \cos(2x) + \cos(2x)^2 + 4 \cos(x) e^x + 2(2 \cos(x) e^x + 2 e^x \sin(x) + 1) \sin(2x) + \sin(2x)^2 + 4 e^x \sin(x) + 1)$$

[In] integrate(sin(x)/(2*exp(x)+cos(x)+sin(x)),x, algorithm="maxima")

[Out] 1/2*x - 1/4*log(8*cos(x)^2*e^(2*x) + 8*e^(2*x)*sin(x)^2 + 4*(cos(x)*e^x - e^x*sin(x))*cos(2*x) + cos(2*x)^2 + 4*cos(x)*e^x + 2*(2*cos(x)*e^x + 2*e^x*sin(x) + 1)*sin(2*x) + sin(2*x)^2 + 4*e^x*sin(x) + 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 119 vs. 2(16) = 32.

Time = 0.30 (sec) , antiderivative size = 119, normalized size of antiderivative = 6.26

$$\int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx = \frac{1}{2}x - \frac{1}{4} \log\left(\frac{2\left(4e^{(2x)} \tan\left(\frac{1}{2}x\right)^4 - 4e^x \tan\left(\frac{1}{2}x\right)^4 + 8e^x \tan\left(\frac{1}{2}x\right)^3 + \tan\left(\frac{1}{2}x\right)^4 + 8e^{(2x)} \tan\left(\frac{1}{2}x\right)^2 - 4 \tan\left(\frac{1}{2}x\right)\right)}{\tan\left(\frac{1}{2}x\right)^4 + 2 \tan\left(\frac{1}{2}x\right)^2 + 1}\right)$$

[In] integrate(sin(x)/(2*exp(x)+cos(x)+sin(x)),x, algorithm="giac")

[Out] 1/2*x - 1/4*log(2*(4*e^(2*x)*tan(1/2*x)^4 - 4*e^x*tan(1/2*x)^4 + 8*e^x*tan(1/2*x)^3 + tan(1/2*x)^4 + 8*e^(2*x)*tan(1/2*x)^2 - 4*tan(1/2*x)^3 + 8*e^x*tan(1/2*x) + 2*tan(1/2*x)^2 + 4*e^(2*x) + 4*e^x + 4*tan(1/2*x) + 1)/(tan(1/2*x)^4 + 2*tan(1/2*x)^2 + 1))

Mupad [B] (verification not implemented)

Time = 17.62 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.16

$$\int \frac{\sin(x)}{2e^x + \cos(x) + \sin(x)} dx = \frac{x}{2} - \frac{\ln(2e^x + \sqrt{2}\cos(x - \frac{\pi}{4}))}{2}$$

```
[In] int(sin(x)/(cos(x) + 2*exp(x) + sin(x)),x)
```

```
[Out] x/2 - log(2*exp(x) + 2^(1/2)*cos(x - pi/4))/2
```

3.294 $\int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx$

| | |
|---|------|
| Optimal result | 2847 |
| Rubi [C] (verified) | 2847 |
| Mathematica [F] | 2849 |
| Maple [F] | 2849 |
| Fricas [B] (verification not implemented) | 2849 |
| Sympy [B] (verification not implemented) | 2849 |
| Maxima [F] | 2850 |
| Giac [F] | 2850 |
| Mupad [F(-1)] | 2850 |

Optimal result

Integrand size = 16, antiderivative size = 9

$$\int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx = x \log^{-\log(\pi)}(x)$$

[Out] $x/(\ln(x)^{\ln(\pi)})$

Rubi [C] (verified)

Result contains higher order function than in optimal. Order 4 vs. order 3 in optimal.

Time = 0.06 (sec) , antiderivative size = 87, normalized size of antiderivative = 9.67, number of steps used = 4, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.312$, Rules used = {2336, 2212, 2408, 19, 6692}

$$\begin{aligned} \int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx &= (-\log(x))^{1+\log(\pi)} \log\left(\frac{x}{\pi}\right) \log^{-\log(e\pi)}(x) \Gamma(-\log(\pi), -\log(x)) \\ &\quad + (-\log(x))^{\log(\pi)} \log^{-\log(\pi)}(x) \Gamma(1 - \log(\pi), -\log(x)) \\ &\quad + (-\log(x))^{\log(\pi)} \log^{1-\log(\pi)}(x) \Gamma(-\log(\pi), -\log(x)) \end{aligned}$$

[In] `Int[Log[x/Pi]/Log[x]^Log[E*Pi],x]`

[Out] `Gamma[-Log[Pi], -Log[x]]*(-Log[x])^Log[Pi]*Log[x]^(1 - Log[Pi]) + (Gamma[1 - Log[Pi], -Log[x]]*(-Log[x])^Log[Pi])/Log[x]^Log[Pi] + (Gamma[-Log[Pi], -Log[x]]*(-Log[x])^(1 + Log[Pi])*Log[x/Pi])/Log[x]^Log[E*Pi]`

Rule 19

`Int[(u_.)*((a_.)*(v_))^(m_)*((b_.)*(v_))^(n_), x_Symbol] := Dist[a^(m + n)*((b*v)^n/(a*v)^n), Int[u*v^(m + n), x], x] /; FreeQ[{a, b, m, n}, x] && !I`

IntegerQ[m] && !IntegerQ[n] && IntegerQ[m + n]

Rule 2212

Int[(F_)^((g_)*(e_) + (f_)*(x_))*((c_) + (d_)*(x_))^(m_), x_Symbol] :> Simp[(-F^(g*(e - c*(f/d))))*((c + d*x)^FracPart[m]/(d*(-f)*g*(Log[F]/d))^(IntPart[m] + 1)*((-f)*g*Log[F]*((c + d*x)/d)^FracPart[m]))*Gamma[m + 1, ((-f)*g*(Log[F]/d))*(c + d*x)], x] /; FreeQ[{F, c, d, e, f, g, m}, x] && !IntegerQ[m]

Rule 2336

Int[((a_) + Log[(c_)*(x_)^(n_)])*(b_)^(p_), x_Symbol] :> Dist[1/(n*c^(1/n)), Subst[Int[E^(x/n)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b, c, p}, x] && IntegerQ[1/n]

Rule 2408

Int[((a_) + Log[(c_)*(x_)^(n_)])*(b_)^(p_)*((d_) + Log[(f_)*(x_)^(r_)])*(e_), x_Symbol] :> With[{u = IntHide[(a + b*Log[c*x^n])^p, x]}, Dist[d + e*Log[f*x^r], u, x] - Dist[e*r, Int[SimplifyIntegrand[u/x, x], x], x] /; FreeQ[{a, b, c, d, e, f, n, p, r}, x]

Rule 6692

Int[Gamma[n_, (a_) + (b_)*(x_)], x_Symbol] :> Simp[(a + b*x)*(Gamma[n, a + b*x]/b), x] - Simp[Gamma[n + 1, a + b*x]/b, x] /; FreeQ[{a, b, n}, x]

Rubi steps

$$\begin{aligned}
 \text{integral} &= \Gamma(-\log(\pi), -\log(x))(-\log(x))^{1+\log(\pi)} \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) \\
 &\quad + \int \frac{\Gamma(-\log(\pi), -\log(x))(-\log(x))^{\log(\pi)} \log^{-\log(\pi)}(x)}{x} dx \\
 &= \Gamma(-\log(\pi), -\log(x))(-\log(x))^{1+\log(\pi)} \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) \\
 &\quad + \left((-\log(x))^{\log(\pi)} \log^{-\log(\pi)}(x)\right) \int \frac{\Gamma(-\log(\pi), -\log(x))}{x} dx \\
 &= \Gamma(-\log(\pi), -\log(x))(-\log(x))^{1+\log(\pi)} \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) \\
 &\quad + \left((-\log(x))^{\log(\pi)} \log^{-\log(\pi)}(x)\right) \text{Subst}\left(\int \Gamma(-\log(\pi), -x) dx, x, \log(x)\right) \\
 &= \Gamma(-\log(\pi), -\log(x))(-\log(x))^{\log(\pi)} \log^{1-\log(\pi)}(x) \\
 &\quad + \Gamma(1 - \log(\pi), -\log(x))(-\log(x))^{\log(\pi)} \log^{-\log(\pi)}(x) \\
 &\quad + \Gamma(-\log(\pi), -\log(x))(-\log(x))^{1+\log(\pi)} \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right)
 \end{aligned}$$

Mathematica [F]

$$\int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx = \int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx$$

[In] Integrate[Log[x/Pi]/Log[x]^Log[E*Pi],x]

[Out] Integrate[Log[x/Pi]/Log[x]^Log[E*Pi], x]

Maple [F]

$$\int \ln\left(\frac{x}{\pi}\right) \ln(x)^{-\ln(\pi e)} dx$$

[In] int(ln(x/Pi)/(ln(x)^ln(Pi*exp(1))),x)

[Out] int(ln(x/Pi)/(ln(x)^ln(Pi*exp(1))),x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 30 vs. 2(9) = 18.

Time = 0.25 (sec) , antiderivative size = 30, normalized size of antiderivative = 3.33

$$\int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx = \frac{x \log(\pi) + x \log\left(\frac{x}{\pi}\right)}{(\log(\pi) + \log\left(\frac{x}{\pi}\right))^{\log(\pi)+1}}$$

[In] integrate(log(x/pi)/(log(x)^log(pi*exp(1))),x, algorithm="fricas")

[Out] (x*log(pi) + x*log(x/pi))/(log(pi) + log(x/pi))^(log(pi) + 1)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 56 vs. 2(7) = 14.

Time = 18.12 (sec) , antiderivative size = 56, normalized size of antiderivative = 6.22

$$\int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx = -\frac{(-\log(x))^{1+\log(\pi)} \log(\pi) \Gamma(-\log(\pi), -\log(x))}{\log(x)^{1+\log(\pi)}} + \frac{(-\log(x))^{\log(\pi)} \Gamma(1 - \log(\pi), -\log(x))}{\log(x)^{\log(\pi)}}$$

[In] integrate(ln(x/pi)/(ln(x)**ln(pi*exp(1))),x)

[Out] -(-log(x))**(1 + log(pi))*log(pi)*log(x)**(-log(pi) - 1)*uppergamma(-log(pi), -log(x)) + (-log(x))**log(pi)*uppergamma(1 - log(pi), -log(x))/log(x)**log(pi)

Maxima [F]

$$\int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx = \int \frac{\log\left(\frac{x}{\pi}\right)}{\log(x)^{\log(\pi e)}} dx$$

[In] integrate(log(x/pi)/(log(x)^log(pi*exp(1))),x, algorithm="maxima")

[Out] integrate(log(x)^(-log(pi*e))*log(x/pi), x)

Giac [F]

$$\int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx = \int \frac{\log\left(\frac{x}{\pi}\right)}{\log(x)^{\log(\pi e)}} dx$$

[In] integrate(log(x/pi)/(log(x)^log(pi*exp(1))),x, algorithm="giac")

[Out] integrate(log(x/pi)/log(x)^log(pi*e), x)

Mupad [F(-1)]

Timed out.

$$\int \log^{-\log(e\pi)}(x) \log\left(\frac{x}{\pi}\right) dx = \int \frac{\ln\left(\frac{x}{\pi}\right)}{\ln(x)^{\ln(\pi e)}} dx$$

[In] int(log(x/Pi)/log(x)^log(Pi*exp(1)),x)

[Out] int(log(x/Pi)/log(x)^log(Pi*exp(1)), x)

3.295 $\int (x + 8x^2 + 10x^3 + 5x^4 + x^5) dx$

| | |
|---|------|
| Optimal result | 2851 |
| Rubi [A] (verified) | 2851 |
| Mathematica [A] (verified) | 2852 |
| Maple [A] (verified) | 2852 |
| Fricas [A] (verification not implemented) | 2852 |
| Sympy [A] (verification not implemented) | 2853 |
| Maxima [A] (verification not implemented) | 2853 |
| Giac [A] (verification not implemented) | 2853 |
| Mupad [B] (verification not implemented) | 2853 |

Optimal result

Integrand size = 20, antiderivative size = 32

$$\int (x + 8x^2 + 10x^3 + 5x^4 + x^5) dx = \frac{x^2}{2} + \frac{8x^3}{3} + \frac{5x^4}{2} + x^5 + \frac{x^6}{6}$$

[Out] 1/2*x^2+8/3*x^3+5/2*x^4+x^5+1/6*x^6

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {}

$$\int (x + 8x^2 + 10x^3 + 5x^4 + x^5) dx = \frac{x^6}{6} + x^5 + \frac{5x^4}{2} + \frac{8x^3}{3} + \frac{x^2}{2}$$

[In] Int[x + 8*x^2 + 10*x^3 + 5*x^4 + x^5,x]

[Out] x^2/2 + (8*x^3)/3 + (5*x^4)/2 + x^5 + x^6/6

Rubi steps

$$\text{integral} = \frac{x^2}{2} + \frac{8x^3}{3} + \frac{5x^4}{2} + x^5 + \frac{x^6}{6}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.00

$$\int (x + 8x^2 + 10x^3 + 5x^4 + x^5) dx = \frac{x^2}{2} + \frac{8x^3}{3} + \frac{5x^4}{2} + x^5 + \frac{x^6}{6}$$

[In] Integrate[x + 8*x^2 + 10*x^3 + 5*x^4 + x^5,x]

[Out] x^2/2 + (8*x^3)/3 + (5*x^4)/2 + x^5 + x^6/6

Maple [A] (verified)

Time = 0.01 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.75

| method | result | size |
|---------------|---|------|
| gospers | $\frac{x^2(x^4+6x^3+15x^2+16x+3)}{6}$ | 24 |
| default | $\frac{1}{2}x^2 + \frac{8}{3}x^3 + \frac{5}{2}x^4 + x^5 + \frac{1}{6}x^6$ | 25 |
| norman | $\frac{1}{2}x^2 + \frac{8}{3}x^3 + \frac{5}{2}x^4 + x^5 + \frac{1}{6}x^6$ | 25 |
| risch | $\frac{1}{2}x^2 + \frac{8}{3}x^3 + \frac{5}{2}x^4 + x^5 + \frac{1}{6}x^6$ | 25 |
| parallelrisch | $\frac{1}{2}x^2 + \frac{8}{3}x^3 + \frac{5}{2}x^4 + x^5 + \frac{1}{6}x^6$ | 25 |
| parts | $\frac{1}{2}x^2 + \frac{8}{3}x^3 + \frac{5}{2}x^4 + x^5 + \frac{1}{6}x^6$ | 25 |

[In] int(x^5+5*x^4+10*x^3+8*x^2+x,x,method=_RETURNVERBOSE)

[Out] 1/6*x^2*(x^4+6*x^3+15*x^2+16*x+3)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.75

$$\int (x + 8x^2 + 10x^3 + 5x^4 + x^5) dx = \frac{1}{6}x^6 + x^5 + \frac{5}{2}x^4 + \frac{8}{3}x^3 + \frac{1}{2}x^2$$

[In] integrate(x^5+5*x^4+10*x^3+8*x^2+x,x, algorithm="fricas")

[Out] 1/6*x^6 + x^5 + 5/2*x^4 + 8/3*x^3 + 1/2*x^2

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 26, normalized size of antiderivative = 0.81

$$\int (x + 8x^2 + 10x^3 + 5x^4 + x^5) dx = \frac{x^6}{6} + x^5 + \frac{5x^4}{2} + \frac{8x^3}{3} + \frac{x^2}{2}$$

[In] integrate(x**5+5*x**4+10*x**3+8*x**2+x,x)

[Out] x**6/6 + x**5 + 5*x**4/2 + 8*x**3/3 + x**2/2

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.75

$$\int (x + 8x^2 + 10x^3 + 5x^4 + x^5) dx = \frac{1}{6}x^6 + x^5 + \frac{5}{2}x^4 + \frac{8}{3}x^3 + \frac{1}{2}x^2$$

[In] integrate(x^5+5*x^4+10*x^3+8*x^2+x,x, algorithm="maxima")

[Out] 1/6*x^6 + x^5 + 5/2*x^4 + 8/3*x^3 + 1/2*x^2

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.75

$$\int (x + 8x^2 + 10x^3 + 5x^4 + x^5) dx = \frac{1}{6}x^6 + x^5 + \frac{5}{2}x^4 + \frac{8}{3}x^3 + \frac{1}{2}x^2$$

[In] integrate(x^5+5*x^4+10*x^3+8*x^2+x,x, algorithm="giac")

[Out] 1/6*x^6 + x^5 + 5/2*x^4 + 8/3*x^3 + 1/2*x^2

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.75

$$\int (x + 8x^2 + 10x^3 + 5x^4 + x^5) dx = \frac{x^6}{6} + x^5 + \frac{5x^4}{2} + \frac{8x^3}{3} + \frac{x^2}{2}$$

[In] int(x + 8*x^2 + 10*x^3 + 5*x^4 + x^5,x)

[Out] x^2/2 + (8*x^3)/3 + (5*x^4)/2 + x^5 + x^6/6

3.296 $\int \frac{(1+x)(4+x)}{(2+x)(3+x)} dx$

| | |
|---|------|
| Optimal result | 2854 |
| Rubi [A] (verified) | 2854 |
| Mathematica [A] (verified) | 2855 |
| Maple [A] (verified) | 2855 |
| Fricas [A] (verification not implemented) | 2855 |
| Sympy [A] (verification not implemented) | 2856 |
| Maxima [A] (verification not implemented) | 2856 |
| Giac [A] (verification not implemented) | 2856 |
| Mupad [B] (verification not implemented) | 2856 |

Optimal result

Integrand size = 17, antiderivative size = 14

$$\int \frac{(1+x)(4+x)}{(2+x)(3+x)} dx = x - 2 \log(2+x) + 2 \log(3+x)$$

[Out] $x - 2 \ln(2+x) + 2 \ln(3+x)$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 14, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.059$, Rules used = {147}

$$\int \frac{(1+x)(4+x)}{(2+x)(3+x)} dx = x - 2 \log(x+2) + 2 \log(x+3)$$

[In] `Int[((1 + x)*(4 + x))/((2 + x)*(3 + x)),x]`

[Out] `x - 2*Log[2 + x] + 2*Log[3 + x]`

Rule 147

```
Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))
*((g_.) + (h_.)*(x_)), x_Symbol] := Int[ExpandIntegrand[(a + b*x)^m*(c +
d*x)^n*(e + f*x)*(g + h*x), x], x] /; FreeQ[{a, b, c, d, e, f, g, h}, x] &&
(IGtQ[m, 0] || IntegersQ[m, n])
```

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(1 - \frac{2}{2+x} + \frac{2}{3+x} \right) dx \\ &= x - 2 \log(2+x) + 2 \log(3+x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{(1+x)(4+x)}{(2+x)(3+x)} dx = x - 2 \log(2+x) + 2 \log(3+x)$$

[In] Integrate[((1 + x)*(4 + x))/((2 + x)*(3 + x)),x]

[Out] x - 2*Log[2 + x] + 2*Log[3 + x]

Maple [A] (verified)

Time = 0.21 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.07

| method | result | size |
|--------------|-------------------------------|------|
| default | $x - 2 \ln(2+x) + 2 \ln(3+x)$ | 15 |
| norman | $x - 2 \ln(2+x) + 2 \ln(3+x)$ | 15 |
| risch | $x - 2 \ln(2+x) + 2 \ln(3+x)$ | 15 |
| parallelrisc | $x - 2 \ln(2+x) + 2 \ln(3+x)$ | 15 |

[In] int((1+x)/(2+x)/(3+x)*(4+x),x,method=_RETURNVERBOSE)

[Out] x-2*ln(2+x)+2*ln(3+x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{(1+x)(4+x)}{(2+x)(3+x)} dx = x + 2 \log(x+3) - 2 \log(x+2)$$

[In] integrate((1+x)/(2+x)/(3+x)*(4+x),x, algorithm="fricas")

[Out] x + 2*log(x + 3) - 2*log(x + 2)

Sympy [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{(1+x)(4+x)}{(2+x)(3+x)} dx = x - 2 \log(x+2) + 2 \log(x+3)$$

[In] integrate((1+x)/(2+x)/(3+x)*(4+x),x)

[Out] x - 2*log(x + 2) + 2*log(x + 3)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.00

$$\int \frac{(1+x)(4+x)}{(2+x)(3+x)} dx = x + 2 \log(x+3) - 2 \log(x+2)$$

[In] integrate((1+x)/(2+x)/(3+x)*(4+x),x, algorithm="maxima")

[Out] x + 2*log(x + 3) - 2*log(x + 2)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.14

$$\int \frac{(1+x)(4+x)}{(2+x)(3+x)} dx = x + 2 \log(|x+3|) - 2 \log(|x+2|)$$

[In] integrate((1+x)/(2+x)/(3+x)*(4+x),x, algorithm="giac")

[Out] x + 2*log(abs(x + 3)) - 2*log(abs(x + 2))

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.71

$$\int \frac{(1+x)(4+x)}{(2+x)(3+x)} dx = x + 4 \operatorname{atanh}(2x+5)$$

[In] int(((x + 1)*(x + 4))/((x + 2)*(x + 3)),x)

[Out] x + 4*atanh(2*x + 5)

3.297 $\int x \cot(x) dx$

| | |
|---|------|
| Optimal result | 2857 |
| Rubi [A] (verified) | 2857 |
| Mathematica [A] (verified) | 2858 |
| Maple [A] (verified) | 2859 |
| Fricas [B] (verification not implemented) | 2859 |
| Sympy [F] | 2859 |
| Maxima [B] (verification not implemented) | 2860 |
| Giac [F] | 2860 |
| Mupad [F(-1)] | 2860 |

Optimal result

Integrand size = 4, antiderivative size = 39

$$\int x \cot(x) dx = -\frac{ix^2}{2} + x \log(1 - e^{2ix}) - \frac{1}{2}i \operatorname{PolyLog}(2, e^{2ix})$$

[Out] $-1/2*I*x^2+x*\ln(1-\exp(2*I*x))-1/2*I*\operatorname{polylog}(2,\exp(2*I*x))$

Rubi [A] (verified)

Time = 0.06 (sec), antiderivative size = 39, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 1.000$, Rules used = {3798, 2221, 2317, 2438}

$$\int x \cot(x) dx = -\frac{1}{2}i \operatorname{PolyLog}(2, e^{2ix}) - \frac{ix^2}{2} + x \log(1 - e^{2ix})$$

[In] $\operatorname{Int}[x*\operatorname{Cot}[x], x]$

[Out] $(-1/2*I)*x^2 + x*\operatorname{Log}[1 - E^{((2*I)*x)}] - (I/2)*\operatorname{PolyLog}[2, E^{((2*I)*x)}]$

Rule 2221

$\operatorname{Int}[(((F_)^{((g_)*(e_)+(f_)*(x_)))})^{(n_)*((c_)+(d_)*(x_))^{(m_)}))/((a_)+(b_)*((F_)^{((g_)*(e_)+(f_)*(x_)))})^{(n_)}), x_Symbol] \rightarrow \operatorname{Simp}[(c+d*x)^m/(b*f*g*n*\operatorname{Log}[F])]*\operatorname{Log}[1+b*((F^{(g*(e+f*x)))})^n/a], x] - \operatorname{Dist}[d*(m/(b*f*g*n*\operatorname{Log}[F])), \operatorname{Int}[(c+d*x)^{(m-1)}*\operatorname{Log}[1+b*((F^{(g*(e+f*x)))})^n/a)], x], x] /;$ $\operatorname{FreeQ}\{F, a, b, c, d, e, f, g, n\}, x\} \&\& \operatorname{IGtQ}[m, 0]$

Rule 2317

$\operatorname{Int}[\operatorname{Log}[(a_)+(b_)*((F_)^{((e_)*((c_)+(d_)*(x_)))})^{(n_)}], x_Symbol] \rightarrow \operatorname{Dist}[1/(d*e*n*\operatorname{Log}[F]), \operatorname{Subst}[\operatorname{Int}[\operatorname{Log}[a+b*x]/x, x], x, (F^{(e*(c+d*x))})]$

)^n], x] /; FreeQ[{F, a, b, c, d, e, n}, x] && GtQ[a, 0]

Rule 2438

Int[Log[(c_.)*((d_.) + (e_.)*(x_)^(n_.))]/(x_), x_Symbol] := Simp[-PolyLog[2, (-c)*e*x^n]/n, x] /; FreeQ[{c, d, e, n}, x] && EqQ[c*d, 1]

Rule 3798

Int[((c_.) + (d_.)*(x_)^(m_.))*tan[(e_.) + Pi*(k_.) + (f_.)*(x_)], x_Symbol] := Simp[I*((c + d*x)^(m + 1)/(d*(m + 1))), x] - Dist[2*I, Int[(c + d*x)^m * E^(2*I*k*Pi)*(E^(2*I*(e + f*x)))/(1 + E^(2*I*k*Pi)*E^(2*I*(e + f*x)))], x], x] /; FreeQ[{c, d, e, f}, x] && IntegerQ[4*k] && IGtQ[m, 0]

Rubi steps

$$\begin{aligned}
 \text{integral} &= -\frac{ix^2}{2} - 2i \int \frac{e^{2ix}x}{1 - e^{2ix}} dx \\
 &= -\frac{ix^2}{2} + x \log(1 - e^{2ix}) - \int \log(1 - e^{2ix}) dx \\
 &= -\frac{ix^2}{2} + x \log(1 - e^{2ix}) + \frac{1}{2}i \text{Subst}\left(\int \frac{\log(1 - x)}{x} dx, x, e^{2ix}\right) \\
 &= -\frac{ix^2}{2} + x \log(1 - e^{2ix}) - \frac{1}{2}i \text{PolyLog}(2, e^{2ix})
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 34, normalized size of antiderivative = 0.87

$$\int x \cot(x) dx = x \log(1 - e^{2ix}) - \frac{1}{2}i(x^2 + \text{PolyLog}(2, e^{2ix}))$$

[In] Integrate[x*Cot[x],x]

[Out] x*Log[1 - E^((2*I)*x)] - (I/2)*(x^2 + PolyLog[2, E^((2*I)*x)])

Maple [A] (verified)

Time = 0.05 (sec) , antiderivative size = 28, normalized size of antiderivative = 0.72

| method | result | size |
|--------|--|------|
| parts | $x \ln(1 - e^{2ix}) - \frac{i(x^2 + \text{polylog}(2, e^{2ix}))}{2}$ | 28 |
| risch | $-\frac{ix^2}{2} + x \ln(e^{ix} + 1) - i \text{polylog}(2, -e^{ix}) + x \ln(1 - e^{ix}) - i \text{polylog}(2, e^{ix})$ | 52 |

[In] `int(x*cot(x),x,method=_RETURNVERBOSE)`

[Out] `x*ln(1-exp(2*I*x))-1/2*I*(x^2+polylog(2,exp(2*I*x)))`

Fricas [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 65 vs. $2(24) = 48$.

Time = 0.25 (sec) , antiderivative size = 65, normalized size of antiderivative = 1.67

$$\int x \cot(x) dx = \frac{1}{2} x \log(-\cos(2x) + i \sin(2x) + 1) + \frac{1}{2} x \log(-\cos(2x) - i \sin(2x) + 1) - \frac{1}{4} i \text{Li}_2(\cos(2x) + i \sin(2x)) + \frac{1}{4} i \text{Li}_2(\cos(2x) - i \sin(2x))$$

[In] `integrate(x*cot(x),x, algorithm="fricas")`

[Out] `1/2*x*log(-cos(2*x) + I*sin(2*x) + 1) + 1/2*x*log(-cos(2*x) - I*sin(2*x) + 1) - 1/4*I*dilog(cos(2*x) + I*sin(2*x)) + 1/4*I*dilog(cos(2*x) - I*sin(2*x))`

Sympy [F]

$$\int x \cot(x) dx = \int x \cot(x) dx$$

[In] `integrate(x*cot(x),x)`

[Out] `Integral(x*cot(x), x)`

Maxima [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 80 vs. $2(24) = 48$.

Time = 0.20 (sec) , antiderivative size = 80, normalized size of antiderivative = 2.05

$$\int x \cot(x) dx = -\frac{1}{2}i x^2 + i x \arctan(\sin(x), \cos(x) + 1) - i x \arctan(\sin(x), -\cos(x) + 1) \\ + \frac{1}{2} x \log(\cos(x)^2 + \sin(x)^2 + 2 \cos(x) + 1) \\ + \frac{1}{2} x \log(\cos(x)^2 + \sin(x)^2 - 2 \cos(x) + 1) - i \operatorname{Li}_2(-e^{(ix)}) - i \operatorname{Li}_2(e^{(ix)})$$

[In] integrate(x*cot(x),x, algorithm="maxima")

[Out] $-1/2*I*x^2 + I*x*\arctan2(\sin(x), \cos(x) + 1) - I*x*\arctan2(\sin(x), -\cos(x) + 1) + 1/2*x*\log(\cos(x)^2 + \sin(x)^2 + 2*\cos(x) + 1) + 1/2*x*\log(\cos(x)^2 + \sin(x)^2 - 2*\cos(x) + 1) - I*dilog(-e^{(I*x)}) - I*dilog(e^{(I*x)})$

Giac [F]

$$\int x \cot(x) dx = \int x \cot(x) dx$$

[In] integrate(x*cot(x),x, algorithm="giac")

[Out] integrate(x*cot(x), x)

Mupad [F(-1)]

Timed out.

$$\int x \cot(x) dx = \int x \cot(x) dx$$

[In] int(x*cot(x),x)

[Out] int(x*cot(x), x)

$$3.298 \quad \int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx$$

| | |
|---|------|
| Optimal result | 2861 |
| Rubi [F] | 2861 |
| Mathematica [A] (verified) | 2862 |
| Maple [A] (verified) | 2862 |
| Fricas [A] (verification not implemented) | 2862 |
| Sympy [A] (verification not implemented) | 2863 |
| Maxima [A] (verification not implemented) | 2863 |
| Giac [B] (verification not implemented) | 2863 |
| Mupad [B] (verification not implemented) | 2864 |

Optimal result

Integrand size = 24, antiderivative size = 24

$$\int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx = e^{\frac{1}{x}+x} \left(4 + \frac{1}{x^2} - \frac{2}{x} - 2x + x^2 \right)$$

[Out] exp(x+1/x)*(4+1/x^2-2/x-2*x+x^2)

Rubi [F]

$$\int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx = \int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx$$

[In] Int[(E^(x^(-1) + x)*(-1 - x^2 + x^4 + x^6))/x^4, x]

[Out] Defer[Int][E^(x^(-1) + x), x] - Defer[Int][E^(x^(-1) + x)/x^4, x] - Defer[Int][E^(x^(-1) + x)/x^2, x] + Defer[Int][E^(x^(-1) + x)*x^2, x]

Rubi steps

$$\begin{aligned} \text{integral} &= \int \frac{e^{\frac{1}{x}+x}(-1+x^2)(1+x^2)^2}{x^4} dx \\ &= \int \left(e^{\frac{1}{x}+x} - \frac{e^{\frac{1}{x}+x}}{x^4} - \frac{e^{\frac{1}{x}+x}}{x^2} + e^{\frac{1}{x}+x}x^2 \right) dx \\ &= \int e^{\frac{1}{x}+x} dx - \int \frac{e^{\frac{1}{x}+x}}{x^4} dx - \int \frac{e^{\frac{1}{x}+x}}{x^2} dx + \int e^{\frac{1}{x}+x}x^2 dx \end{aligned}$$

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.00

$$\int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx = e^{\frac{1}{x}+x} \left(4 + \frac{1}{x^2} - \frac{2}{x} - 2x + x^2 \right)$$

[In] Integrate[(E^(x^(-1) + x)*(-1 - x^2 + x^4 + x^6))/x^4,x]

[Out] E^(x^(-1) + x)*(4 + x^(-2) - 2/x - 2*x + x^2)

Maple [A] (verified)

Time = 0.12 (sec) , antiderivative size = 33, normalized size of antiderivative = 1.38

| method | result | size |
|--------------|---|------|
| gosper | $\frac{e^{\frac{x^2+1}{x}}(x^4-2x^3+4x^2-2x+1)}{x^2}$ | 33 |
| risch | $\frac{e^{\frac{x^2+1}{x}}(x^4-2x^3+4x^2-2x+1)}{x^2}$ | 33 |
| norman | $\frac{x e^{x+\frac{1}{x}}+x^5 e^{x+\frac{1}{x}}+4x^3 e^{x+\frac{1}{x}}-2x^4 e^{x+\frac{1}{x}}-2 e^{x+\frac{1}{x}} x^2}{x^3}$ | 57 |
| parallelrisc | $\frac{e^{\frac{x^2+1}{x}} x^4 - 2 e^{\frac{x^2+1}{x}} x^3 + 4 e^{\frac{x^2+1}{x}} x^2 - 2 e^{\frac{x^2+1}{x}} x + e^{\frac{x^2+1}{x}}}{x^2}$ | 73 |

[In] int(exp(x+1/x)*(x^6+x^4-x^2-1)/x^4,x,method=_RETURNVERBOSE)

[Out] exp((x^2+1)/x)*(x^4-2*x^3+4*x^2-2*x+1)/x^2

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 32, normalized size of antiderivative = 1.33

$$\int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx = \frac{(x^4-2x^3+4x^2-2x+1)e^{\left(\frac{x^2+1}{x}\right)}}{x^2}$$

[In] integrate(exp(x+1/x)*(x^6+x^4-x^2-1)/x^4,x, algorithm="fricas")

[Out] (x^4 - 2*x^3 + 4*x^2 - 2*x + 1)*e^((x^2 + 1)/x)/x^2

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.12

$$\int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx = \frac{(x^4-2x^3+4x^2-2x+1)e^{x+\frac{1}{x}}}{x^2}$$

[In] integrate(exp(x+1/x)*(x**6+x**4-x**2-1)/x**4,x)

[Out] (x**4 - 2*x**3 + 4*x**2 - 2*x + 1)*exp(x + 1/x)/x**2

Maxima [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.17

$$\int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx = \frac{(x^4-2x^3+4x^2-2x+1)e^{(x+\frac{1}{x})}}{x^2}$$

[In] integrate(exp(x+1/x)*(x^6+x^4-x^2-1)/x^4,x, algorithm="maxima")

[Out] (x^4 - 2*x^3 + 4*x^2 - 2*x + 1)*e^(x + 1/x)/x^2

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 72 vs. 2(23) = 46.

Time = 0.28 (sec) , antiderivative size = 72, normalized size of antiderivative = 3.00

$$\begin{aligned} & \int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx \\ &= \frac{x^4 e^{\left(\frac{x^2+1}{x}\right)} - 2x^3 e^{\left(\frac{x^2+1}{x}\right)} + 4x^2 e^{\left(\frac{x^2+1}{x}\right)} - 2x e^{\left(\frac{x^2+1}{x}\right)} + e^{\left(\frac{x^2+1}{x}\right)}}{x^2} \end{aligned}$$

[In] integrate(exp(x+1/x)*(x^6+x^4-x^2-1)/x^4,x, algorithm="giac")

[Out] (x^4*e^((x^2 + 1)/x) - 2*x^3*e^((x^2 + 1)/x) + 4*x^2*e^((x^2 + 1)/x) - 2*x*e^((x^2 + 1)/x) + e^((x^2 + 1)/x))/x^2

Mupad [B] (verification not implemented)

Time = 18.19 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.17

$$\int \frac{e^{\frac{1}{x}+x}(-1-x^2+x^4+x^6)}{x^4} dx = \frac{e^{x+\frac{1}{x}}(x^4-2x^3+4x^2-2x+1)}{x^2}$$

[In] int(-(exp(x + 1/x)*(x^2 - x^4 - x^6 + 1))/x^4,x)

[Out] (exp(x + 1/x)*(4*x^2 - 2*x - 2*x^3 + x^4 + 1))/x^2

$$3.299 \quad \int \frac{1}{\sqrt{(-1+x)(1+x)^3}} dx$$

| | |
|---|------|
| Optimal result | 2865 |
| Rubi [A] (verified) | 2865 |
| Mathematica [A] (verified) | 2866 |
| Maple [A] (verified) | 2866 |
| Fricas [A] (verification not implemented) | 2867 |
| Sympy [F] | 2867 |
| Maxima [F] | 2867 |
| Giac [A] (verification not implemented) | 2867 |
| Mupad [B] (verification not implemented) | 2868 |

Optimal result

Integrand size = 13, antiderivative size = 26

$$\int \frac{1}{\sqrt{(-1+x)(1+x)^3}} dx = -\frac{(1-x)(1+x)}{\sqrt{-((1-x)(1+x)^3)}}$$

[Out] $-(1-x)*(1+x)/(-1+x)*(1+x)^3)^{(1/2)}$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.154$, Rules used = {6851, 37}

$$\int \frac{1}{\sqrt{(-1+x)(1+x)^3}} dx = -\frac{(1-x)(x+1)}{\sqrt{-((1-x)(x+1)^3)}}$$

[In] Int[1/Sqrt[(-1 + x)*(1 + x)^3], x]

[Out] -(((1 - x)*(1 + x))/Sqrt[-((1 - x)*(1 + x)^3)])

Rule 37

Int[((a_.) + (b_.)*(x_))^(m_.)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] :> Simp
 [(a + b*x)^(m + 1)*((c + d*x)^(n + 1)/((b*c - a*d)*(m + 1))), x] /; FreeQ[{
 a, b, c, d, m, n}, x] && NeQ[b*c - a*d, 0] && EqQ[m + n + 2, 0] && NeQ[m, -
 1]

Rule 6851

Int[(u_.)*((a_.)*(v_)^(m_.)*(w_)^(n_.))^(p_), x_Symbol] :> Dist[a^IntPart[p]
]*((a*v^m*w^n)^FracPart[p]/(v^(m*FracPart[p])*w^(n*FracPart[p]))), Int[u*v^

$(m*p)*w^{(n*p)}, x], x] /; \text{FreeQ}\{a, m, n, p\}, x] \&\& \text{IntegerQ}[p] \&\& \text{FreeQ}[v, x] \&\& \text{FreeQ}[w, x]$

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{(\sqrt{-1+x}(1+x)^{3/2}) \int \frac{1}{\sqrt{-1+x}(1+x)^{3/2}} dx}{\sqrt{(-1+x)(1+x)^3}} \\ &= -\frac{(1-x)(1+x)}{\sqrt{-((1-x)(1+x)^3)}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.77

$$\int \frac{1}{\sqrt{(-1+x)(1+x)^3}} dx = \frac{(-1+x)(1+x)}{\sqrt{(-1+x)(1+x)^3}}$$

[In] Integrate[1/Sqrt[(-1 + x)*(1 + x)^3],x]

[Out] ((-1 + x)*(1 + x))/Sqrt[(-1 + x)*(1 + x)^3]

Maple [A] (verified)

Time = 0.26 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.73

| method | result | size |
|---------|---|------|
| gosper | $\frac{(-1+x)(1+x)}{\sqrt{(1+x)^3(-1+x)}}$ | 19 |
| risch | $\frac{(-1+x)(1+x)}{\sqrt{(1+x)^3(-1+x)}}$ | 19 |
| trager | $\frac{\sqrt{x^4+2x^3-2x-1}}{(1+x)^2}$ | 22 |
| default | $\frac{\sqrt{(-1+x)(1+x)}\sqrt{x^2-1}}{\sqrt{(1+x)^3(-1+x)}}$ | 29 |

[In] int(1/((1+x)^3*(-1+x))^(1/2),x,method=_RETURNVERBOSE)

[Out] (-1+x)*(1+x)/((1+x)^3*(-1+x))^(1/2)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.31

$$\int \frac{1}{\sqrt{(-1+x)(1+x)^3}} dx = \frac{x^2 + 2x + \sqrt{x^4 + 2x^3 - 2x - 1} + 1}{x^2 + 2x + 1}$$

[In] integrate(1/((1+x)^3*(-1+x))^(1/2),x, algorithm="fricas")

[Out] (x^2 + 2*x + sqrt(x^4 + 2*x^3 - 2*x - 1) + 1)/(x^2 + 2*x + 1)

Sympy [F]

$$\int \frac{1}{\sqrt{(-1+x)(1+x)^3}} dx = \int \frac{1}{\sqrt{(x-1)(x+1)^3}} dx$$

[In] integrate(1/((1+x)**3*(-1+x))**(1/2),x)

[Out] Integral(1/sqrt((x - 1)*(x + 1)**3), x)

Maxima [F]

$$\int \frac{1}{\sqrt{(-1+x)(1+x)^3}} dx = \int \frac{1}{\sqrt{(x+1)^3(x-1)}} dx$$

[In] integrate(1/((1+x)^3*(-1+x))^(1/2),x, algorithm="maxima")

[Out] integrate(1/sqrt((x + 1)^3*(x - 1)), x)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.85

$$\int \frac{1}{\sqrt{(-1+x)(1+x)^3}} dx = \frac{2}{(x - \sqrt{x^2 - 1} + 1)\operatorname{sgn}(x + 1)}$$

[In] integrate(1/((1+x)^3*(-1+x))^(1/2),x, algorithm="giac")

[Out] 2/((x - sqrt(x^2 - 1) + 1)*sgn(x + 1))

Mupad [B] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.65

$$\int \frac{1}{\sqrt{(-1+x)(1+x)^3}} dx = \frac{x^2 - 1}{\sqrt{(x-1)(x+1)^3}}$$

[In] `int(1/((x - 1)*(x + 1)^3)^(1/2),x)`

[Out] `(x^2 - 1)/((x - 1)*(x + 1)^3)^(1/2)`

3.300 $\int x \sin^4(x) dx$

| | |
|---|------|
| Optimal result | 2869 |
| Rubi [A] (verified) | 2869 |
| Mathematica [A] (verified) | 2870 |
| Maple [A] (verified) | 2870 |
| Fricas [A] (verification not implemented) | 2871 |
| Sympy [A] (verification not implemented) | 2871 |
| Maxima [A] (verification not implemented) | 2871 |
| Giac [A] (verification not implemented) | 2872 |
| Mupad [B] (verification not implemented) | 2872 |

Optimal result

Integrand size = 6, antiderivative size = 44

$$\int x \sin^4(x) dx = \frac{3x^2}{16} - \frac{3}{8}x \cos(x) \sin(x) + \frac{3 \sin^2(x)}{16} - \frac{1}{4}x \cos(x) \sin^3(x) + \frac{\sin^4(x)}{16}$$

[Out] 3/16*x^2-3/8*x*cos(x)*sin(x)+3/16*sin(x)^2-1/4*x*cos(x)*sin(x)^3+1/16*sin(x)^4

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 44, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {3391, 30}

$$\int x \sin^4(x) dx = \frac{3x^2}{16} + \frac{\sin^4(x)}{16} + \frac{3 \sin^2(x)}{16} - \frac{1}{4}x \sin^3(x) \cos(x) - \frac{3}{8}x \sin(x) \cos(x)$$

[In] Int[x*Sin[x]^4,x]

[Out] (3*x^2)/16 - (3*x*Cos[x]*Sin[x])/8 + (3*Sin[x]^2)/16 - (x*Cos[x]*Sin[x]^3)/4 + Sin[x]^4/16

Rule 30

Int[(x_)^(m_), x_Symbol] := Simp[x^(m + 1)/(m + 1), x] /; FreeQ[m, x] && NeQ[m, -1]

Rule 3391

Int[((c_) + (d_)*(x_))*((b_)*sin[(e_) + (f_)*(x_)])^(n_), x_Symbol] := Simp[d*((b*Sine + f*x)^n/(f^2*n^2)), x] + (Dist[b^2*((n - 1)/n), Int[(c

```
+ d*x)*(b*Sin[e + f*x])^(n - 2), x], x] - Simp[b*(c + d*x)*Cos[e + f*x]*((b
*Sin[e + f*x])^(n - 1)/(f*n)), x] /; FreeQ[{b, c, d, e, f}, x] && GtQ[n, 1
]
```

Rubi steps

$$\begin{aligned} \text{integral} &= -\frac{1}{4}x \cos(x) \sin^3(x) + \frac{\sin^4(x)}{16} + \frac{3}{4} \int x \sin^2(x) dx \\ &= -\frac{3}{8}x \cos(x) \sin(x) + \frac{3 \sin^2(x)}{16} - \frac{1}{4}x \cos(x) \sin^3(x) + \frac{\sin^4(x)}{16} + \frac{3 \int x dx}{8} \\ &= \frac{3x^2}{16} - \frac{3}{8}x \cos(x) \sin(x) + \frac{3 \sin^2(x)}{16} - \frac{1}{4}x \cos(x) \sin^3(x) + \frac{\sin^4(x)}{16} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 42, normalized size of antiderivative = 0.95

$$\int x \sin^4(x) dx = \frac{3x^2}{16} - \frac{1}{8} \cos(2x) + \frac{1}{128} \cos(4x) - \frac{1}{4}x \sin(2x) + \frac{1}{32}x \sin(4x)$$

[In] Integrate[x*Sin[x]^4,x]

[Out] (3*x^2)/16 - Cos[2*x]/8 + Cos[4*x]/128 - (x*Sin[2*x])/4 + (x*Sin[4*x])/32

Maple [A] (verified)

Time = 0.37 (sec) , antiderivative size = 33, normalized size of antiderivative = 0.75

| method | result |
|---------|---|
| risch | $\frac{3x^2}{16} + \frac{\cos(4x)}{128} + \frac{x \sin(4x)}{32} - \frac{\cos(2x)}{8} - \frac{x \sin(2x)}{4}$ |
| default | $x \left(-\frac{(\sin(x)^3 + \frac{3 \sin(x)}{2}) \cos(x)}{4} + \frac{3x}{8} \right) - \frac{3x^2}{16} + \frac{(2 \cos(x)^2 - 5)^2}{64}$ |
| norman | $\frac{3 \tan(\frac{x}{2})^2}{4} + \frac{3 \tan(\frac{x}{2})^6}{4} + \frac{5 \tan(\frac{x}{2})^4}{2} + \frac{3x^2}{16} - \frac{3x \tan(\frac{x}{2})}{4} - \frac{11x \tan(\frac{x}{2})^3}{4} + \frac{11x \tan(\frac{x}{2})^5}{4} + \frac{3x \tan(\frac{x}{2})^7}{4} + \frac{3x^2 \tan(\frac{x}{2})^2}{4} + \frac{9x^2 \tan(\frac{x}{2})^4}{8} + \frac{3x^2 \tan(\frac{x}{2})^6}{4}$ $(1 + \tan(\frac{x}{2})^2)^4$ |

[In] int(x*sin(x)^4,x,method=_RETURNVERBOSE)

[Out] 3/16*x^2+1/128*cos(4*x)+1/32*x*sin(4*x)-1/8*cos(2*x)-1/4*x*sin(2*x)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 35, normalized size of antiderivative = 0.80

$$\int x \sin^4(x) dx = \frac{1}{16} \cos(x)^4 + \frac{3}{16} x^2 - \frac{5}{16} \cos(x)^2 + \frac{1}{8} (2x \cos(x)^3 - 5x \cos(x)) \sin(x)$$

`[In] integrate(x*sin(x)^4,x, algorithm="fricas")``[Out] 1/16*cos(x)^4 + 3/16*x^2 - 5/16*cos(x)^2 + 1/8*(2*x*cos(x)^3 - 5*x*cos(x))*sin(x)`**Sympy [A] (verification not implemented)**

Time = 0.18 (sec) , antiderivative size = 83, normalized size of antiderivative = 1.89

$$\int x \sin^4(x) dx = \frac{3x^2 \sin^4(x)}{16} + \frac{3x^2 \sin^2(x) \cos^2(x)}{8} + \frac{3x^2 \cos^4(x)}{16} - \frac{5x \sin^3(x) \cos(x)}{8} - \frac{3x \sin(x) \cos^3(x)}{8} + \frac{5 \sin^4(x)}{32} - \frac{3 \cos^4(x)}{32}$$

`[In] integrate(x*sin(x)**4,x)``[Out] 3*x**2*sin(x)**4/16 + 3*x**2*sin(x)**2*cos(x)**2/8 + 3*x**2*cos(x)**4/16 - 5*x*sin(x)**3*cos(x)/8 - 3*x*sin(x)*cos(x)**3/8 + 5*sin(x)**4/32 - 3*cos(x)**4/32`**Maxima [A] (verification not implemented)**

none

Time = 0.21 (sec) , antiderivative size = 32, normalized size of antiderivative = 0.73

$$\int x \sin^4(x) dx = \frac{3}{16} x^2 + \frac{1}{32} x \sin(4x) - \frac{1}{4} x \sin(2x) + \frac{1}{128} \cos(4x) - \frac{1}{8} \cos(2x)$$

`[In] integrate(x*sin(x)^4,x, algorithm="maxima")``[Out] 3/16*x^2 + 1/32*x*sin(4*x) - 1/4*x*sin(2*x) + 1/128*cos(4*x) - 1/8*cos(2*x)`

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 32, normalized size of antiderivative = 0.73

$$\int x \sin^4(x) dx = \frac{3}{16} x^2 + \frac{1}{32} x \sin(4x) - \frac{1}{4} x \sin(2x) + \frac{1}{128} \cos(4x) - \frac{1}{8} \cos(2x)$$

[In] integrate(x*sin(x)^4,x, algorithm="giac")

[Out] 3/16*x^2 + 1/32*x*sin(4*x) - 1/4*x*sin(2*x) + 1/128*cos(4*x) - 1/8*cos(2*x)

Mupad [B] (verification not implemented)

Time = 16.93 (sec) , antiderivative size = 38, normalized size of antiderivative = 0.86

$$\int x \sin^4(x) dx = \frac{\cos(2x)^2}{64} - \frac{x \sin(2x)}{4} - \frac{\cos(2x)}{8} + \frac{3x^2}{16} + \frac{x \cos(2x) \sin(2x)}{16}$$

[In] int(x*sin(x)^4,x)

[Out] cos(2*x)^2/64 - (x*sin(2*x))/4 - cos(2*x)/8 + (3*x^2)/16 + (x*cos(2*x)*sin(2*x))/16

3.301 $\int \cos(3x) \csc^2(x) \sec^3(x) \sin(2x) dx$

| | |
|---|------|
| Optimal result | 2873 |
| Rubi [A] (verified) | 2873 |
| Mathematica [A] (verified) | 2874 |
| Maple [A] (verified) | 2874 |
| Fricas [A] (verification not implemented) | 2875 |
| Sympy [A] (verification not implemented) | 2875 |
| Maxima [B] (verification not implemented) | 2875 |
| Giac [A] (verification not implemented) | 2876 |
| Mupad [B] (verification not implemented) | 2876 |

Optimal result

Integrand size = 17, antiderivative size = 11

$$\int \cos(3x) \csc^2(x) \sec^3(x) \sin(2x) dx = 6 \log(\cos(x)) + 2 \log(\sin(x))$$

[Out] 6*ln(cos(x))+2*ln(sin(x))

Rubi [A] (verified)

Time = 0.09 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.176$, Rules used = {4450, 457, 78}

$$\int \cos(3x) \csc^2(x) \sec^3(x) \sin(2x) dx = 2 \log(\sin(x)) + 6 \log(\cos(x))$$

[In] Int[Cos[3*x]*Csc[x]^2*Sec[x]^3*Sin[2*x],x]

[Out] 6*Log[Cos[x]] + 2*Log[Sin[x]]

Rule 78

```
Int[((a_.) + (b_.)*(x_))*((c_) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p_.), x_Symbol] :> Int[ExpandIntegrand[(a + b*x)*(c + d*x)^n*(e + f*x)^p, x], x] /; FreeQ[{a, b, c, d, e, f, n}, x] && NeQ[b*c - a*d, 0] && ((ILtQ[n, 0] && ILtQ[p, 0]) || EqQ[p, 1] || (IGtQ[p, 0] && (!IntegerQ[n] || LeQ[9*p + 5*(n + 2), 0] || GeQ[n + p + 1, 0] || (GeQ[n + p + 2, 0] && RationalQ[a, b, c, d, e, f])))
```

Rule 457

```
Int[(x_)^(m_.)*((a_) + (b_.)*(x_)^(n_))^(p_.)*((c_) + (d_.)*(x_)^(n_))^(q_.
), x_Symbol] := Dist[1/n, Subst[Int[x^(Simplify[(m + 1)/n] - 1)*(a + b*x)^p
*(c + d*x)^q, x], x, x^n], x] /; FreeQ[{a, b, c, d, m, n, p, q}, x] && NeQ[
b*c - a*d, 0] && IntegerQ[Simplify[(m + 1)/n]]
```

Rule 4450

```
Int[(u_)*(F_)[(c_.)*((a_.) + (b_.)*(x_))]^(n_), x_Symbol] := With[{d = Free
Factors[Sin[c*(a + b*x)], x]}, Dist[d/(b*c), Subst[Int[SubstFor[(1 - d^2*x^
2)^((-n - 1)/2), Sin[c*(a + b*x)]/d, u, x], x], x, Sin[c*(a + b*x)]/d], x]
/; FunctionOfQ[Sin[c*(a + b*x)]/d, u, x]] /; FreeQ[{a, b, c}, x] && Integer
Q[(n - 1)/2] && NonsumQ[u] && (EqQ[F, Sec] || EqQ[F, sec])
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \text{Subst}\left(\int \frac{2 - 8x^2}{x(1 - x^2)} dx, x, \sin(x)\right) \\
 &= \frac{1}{2} \text{Subst}\left(\int \frac{2 - 8x}{(1 - x)x} dx, x, \sin^2(x)\right) \\
 &= \frac{1}{2} \text{Subst}\left(\int \left(\frac{6}{-1 + x} + \frac{2}{x}\right) dx, x, \sin^2(x)\right) \\
 &= 6 \log(\cos(x)) + 2 \log(\sin(x))
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \cos(3x) \csc^2(x) \sec^3(x) \sin(2x) dx = 8 \log(\cos(x)) + 2 \log(\tan(x))$$

```
[In] Integrate[Cos[3*x]*Csc[x]^2*Sec[x]^3*Sin[2*x],x]
```

```
[Out] 8*Log[Cos[x]] + 2*Log[Tan[x]]
```

Maple [A] (verified)

Time = 0.18 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.09

$$-6 \ln(\tan(x)) + 8 \ln(\sin(x))$$

```
[In] int(sin(2*x)*cos(3*x)/sin(x)^2/cos(x)^3,x)
```

```
[Out] -6*ln(tan(x))+8*ln(sin(x))
```

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.55

$$\int \cos(3x) \csc^2(x) \sec^3(x) \sin(2x) dx = 3 \log(\cos(x)^2) + \log\left(-\frac{1}{4} \cos(x)^2 + \frac{1}{4}\right)$$

[In] integrate(sin(2*x)*cos(3*x)/sin(x)^2/cos(x)^3,x, algorithm="fricas")

[Out] 3*log(cos(x)^2) + log(-1/4*cos(x)^2 + 1/4)

Sympy [A] (verification not implemented)

Time = 92.25 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.36

$$\int \cos(3x) \csc^2(x) \sec^3(x) \sin(2x) dx = 3 \log(\sin^2(x) - 1) + 2 \log(\sin(x))$$

[In] integrate(sin(2*x)*cos(3*x)/sin(x)**2/cos(x)**3,x)

[Out] 3*log(sin(x)**2 - 1) + 2*log(sin(x))

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 54 vs. 2(11) = 22.

Time = 0.28 (sec) , antiderivative size = 54, normalized size of antiderivative = 4.91

$$\begin{aligned} \int \cos(3x) \csc^2(x) \sec^3(x) \sin(2x) dx = & 3 \log(\cos(2x)^2 + \sin(2x)^2 + 2 \cos(2x) + 1) \\ & + \log(\cos(x)^2 + \sin(x)^2 + 2 \cos(x) + 1) \\ & + \log(\cos(x)^2 + \sin(x)^2 - 2 \cos(x) + 1) \end{aligned}$$

[In] integrate(sin(2*x)*cos(3*x)/sin(x)^2/cos(x)^3,x, algorithm="maxima")

[Out] 3*log(cos(2*x)^2 + sin(2*x)^2 + 2*cos(2*x) + 1) + log(cos(x)^2 + sin(x)^2 + 2*cos(x) + 1) + log(cos(x)^2 + sin(x)^2 - 2*cos(x) + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 16, normalized size of antiderivative = 1.45

$$\int \cos(3x) \csc^2(x) \sec^3(x) \sin(2x) dx = \log(-\cos(x)^2 + 1) + 6 \log(|\cos(x)|)$$

[In] integrate(sin(2*x)*cos(3*x)/sin(x)^2/cos(x)^3,x, algorithm="giac")

[Out] log(-cos(x)^2 + 1) + 6*log(abs(cos(x)))

Mupad [B] (verification not implemented)

Time = 16.29 (sec) , antiderivative size = 11, normalized size of antiderivative = 1.00

$$\int \cos(3x) \csc^2(x) \sec^3(x) \sin(2x) dx = 6 \ln(\cos(x)) + \ln(\sin(x)^2)$$

[In] int((cos(3*x)*sin(2*x))/(cos(x)^3*sin(x)^2),x)

[Out] 6*log(cos(x)) + log(sin(x)^2)

$$3.302 \quad \int \left(\frac{1}{\sqrt{2}\sqrt{\log(x)}} + \sqrt{2}\sqrt{\log(x)} \right) dx$$

| | |
|---|------|
| Optimal result | 2877 |
| Rubi [A] (verified) | 2877 |
| Mathematica [A] (verified) | 2878 |
| Maple [F] | 2879 |
| Fricas [F(-2)] | 2879 |
| Sympy [B] (verification not implemented) | 2879 |
| Maxima [C] (verification not implemented) | 2880 |
| Giac [C] (verification not implemented) | 2880 |
| Mupad [B] (verification not implemented) | 2880 |

Optimal result

Integrand size = 25, antiderivative size = 13

$$\int \left(\frac{1}{\sqrt{2}\sqrt{\log(x)}} + \sqrt{2}\sqrt{\log(x)} \right) dx = \sqrt{2x}\sqrt{\log(x)}$$

[Out] $2^{(1/2)}*x*\ln(x)^{(1/2)}$

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 8, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.160$, Rules used = {2336, 2211, 2235, 2333}

$$\int \left(\frac{1}{\sqrt{2}\sqrt{\log(x)}} + \sqrt{2}\sqrt{\log(x)} \right) dx = \sqrt{2x}\sqrt{\log(x)}$$

[In] `Int[1/(Sqrt[2]*Sqrt[Log[x]]) + Sqrt[2]*Sqrt[Log[x]], x]`

[Out] `Sqrt[2]*x*Sqrt[Log[x]]`

Rule 2211

`Int[(F_)^((g_.)*(e_.) + (f_.)*(x_))/Sqrt[(c_.) + (d_.)*(x_)], x_Symbol] :`
`> Dist[2/d, Subst[Int[F^(g*(e - c*(f/d)) + f*g*(x^2/d)), x], x, Sqrt[c + d*`
`x]], x] /; FreeQ[{F, c, d, e, f, g}, x] && !TrueQ[$UseGamma]`

Rule 2235

`Int[(F_)^((a_.) + (b_.)*((c_.) + (d_.)*(x_))^2), x_Symbol] := Simp[F^a*Sqrt`
`[Pi]*(Erfi[(c + d*x)*Rt[b*Log[F], 2]]/(2*d*Rt[b*Log[F], 2])), x] /; FreeQ[{`

F, a, b, c, d}, x] && PosQ[b]

Rule 2333

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_.), x_Symbol] := Simp[x*(a + b
*Log[c*x^n])^p, x] - Dist[b*n*p, Int[(a + b*Log[c*x^n])^(p - 1), x], x] /;
FreeQ[{a, b, c, n}, x] && GtQ[p, 0] && IntegerQ[2*p]
```

Rule 2336

```
Int[((a_.) + Log[(c_.)*(x_)^(n_.)]*(b_.))^(p_), x_Symbol] := Dist[1/(n*c^(1
/n)), Subst[Int[E^(x/n)*(a + b*x)^p, x], x, Log[c*x^n]], x] /; FreeQ[{a, b,
c, p}, x] && IntegerQ[1/n]
```

Rubi steps

$$\begin{aligned}
 \text{integral} &= \frac{\int \frac{1}{\sqrt{\log(x)}} dx}{\sqrt{2}} + \sqrt{2} \int \sqrt{\log(x)} dx \\
 &= \sqrt{2}x\sqrt{\log(x)} - \frac{\int \frac{1}{\sqrt{\log(x)}} dx}{\sqrt{2}} + \frac{\text{Subst}\left(\int \frac{e^x}{\sqrt{x}} dx, x, \log(x)\right)}{\sqrt{2}} \\
 &= \sqrt{2}x\sqrt{\log(x)} - \frac{\text{Subst}\left(\int \frac{e^x}{\sqrt{x}} dx, x, \log(x)\right)}{\sqrt{2}} + \sqrt{2}\text{Subst}\left(\int e^{x^2} dx, x, \sqrt{\log(x)}\right) \\
 &= \sqrt{\frac{\pi}{2}}\text{erfi}\left(\sqrt{\log(x)}\right) + \sqrt{2}x\sqrt{\log(x)} - \sqrt{2}\text{Subst}\left(\int e^{x^2} dx, x, \sqrt{\log(x)}\right) \\
 &= \sqrt{2}x\sqrt{\log(x)}
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \left(\frac{1}{\sqrt{2}\sqrt{\log(x)}} + \sqrt{2}\sqrt{\log(x)} \right) dx = \sqrt{2}x\sqrt{\log(x)}$$

```
[In] Integrate[1/(Sqrt[2]*Sqrt[Log[x]]) + Sqrt[2]*Sqrt[Log[x]], x]
```

```
[Out] Sqrt[2]*x*Sqrt[Log[x]]
```

Maple [F]

$$\int \left(\sqrt{2} \sqrt{\ln(x)} + \frac{\sqrt{2}}{2\sqrt{\ln(x)}} \right) dx$$

[In] `int(2^(1/2)*ln(x)^(1/2)+1/2*2^(1/2)/ln(x)^(1/2),x)`

[Out] `int(2^(1/2)*ln(x)^(1/2)+1/2*2^(1/2)/ln(x)^(1/2),x)`

Fricas [F(-2)]

Exception generated.

$$\int \left(\frac{1}{\sqrt{2}\sqrt{\log(x)}} + \sqrt{2}\sqrt{\log(x)} \right) dx = \text{Exception raised: TypeError}$$

[In] `integrate(2^(1/2)*log(x)^(1/2)+1/2*2^(1/2)/log(x)^(1/2),x, algorithm="fricas")`

[Out] `Exception raised: TypeError >> Error detected within library code: integrate: implementation incomplete (constant residues)`

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 83 vs. $2(12) = 24$.

Time = 0.24 (sec) , antiderivative size = 83, normalized size of antiderivative = 6.38

$$\int \left(\frac{1}{\sqrt{2}\sqrt{\log(x)}} + \sqrt{2}\sqrt{\log(x)} \right) dx = \frac{\sqrt{2}\sqrt{\pi}\sqrt{-\log(x)} \operatorname{erfc}\left(\sqrt{-\log(x)}\right)}{2\sqrt{\log(x)}} + \frac{\sqrt{2}\left(x\sqrt{-\log(x)} + \frac{\sqrt{\pi}\operatorname{erfc}\left(\sqrt{-\log(x)}\right)}{2}\right)\sqrt{\log(x)}}{\sqrt{-\log(x)}}$$

[In] `integrate(2**(1/2)*ln(x)**(1/2)+1/2*2**(1/2)/ln(x)**(1/2),x)`

[Out] `sqrt(2)*sqrt(pi)*sqrt(-log(x))*erfc(sqrt(-log(x)))/(2*sqrt(log(x))) + sqrt(2)*(x*sqrt(-log(x)) + sqrt(pi)*erfc(sqrt(-log(x)))/2)*sqrt(log(x))/sqrt(-log(x))`

Maxima [C] (verification not implemented)

Result contains higher order function than in optimal. Order 4 vs. order 3.

Time = 0.29 (sec) , antiderivative size = 41, normalized size of antiderivative = 3.15

$$\int \left(\frac{1}{\sqrt{2}\sqrt{\log(x)}} + \sqrt{2}\sqrt{\log(x)} \right) dx = -\frac{1}{2}i\sqrt{2}\sqrt{\pi} \operatorname{erf}\left(i\sqrt{\log(x)}\right) - \frac{1}{2}\sqrt{2}\left(-i\sqrt{\pi} \operatorname{erf}\left(i\sqrt{\log(x)}\right) - 2x\sqrt{\log(x)}\right)$$

[In] integrate(2^(1/2)*log(x)^(1/2)+1/2*2^(1/2)/log(x)^(1/2),x, algorithm="maxima")

[Out] -1/2*I*sqrt(2)*sqrt(pi)*erf(I*sqrt(log(x))) - 1/2*sqrt(2)*(-I*sqrt(pi)*erf(I*sqrt(log(x))) - 2*x*sqrt(log(x)))

Giac [C] (verification not implemented)

Result contains higher order function than in optimal. Order 4 vs. order 3.

Time = 0.27 (sec) , antiderivative size = 41, normalized size of antiderivative = 3.15

$$\int \left(\frac{1}{\sqrt{2}\sqrt{\log(x)}} + \sqrt{2}\sqrt{\log(x)} \right) dx = \frac{1}{2}i\sqrt{2}\sqrt{\pi} \operatorname{erf}\left(-i\sqrt{\log(x)}\right) - \frac{1}{2}\sqrt{2}\left(i\sqrt{\pi} \operatorname{erf}\left(-i\sqrt{\log(x)}\right) - 2x\sqrt{\log(x)}\right)$$

[In] integrate(2^(1/2)*log(x)^(1/2)+1/2*2^(1/2)/log(x)^(1/2),x, algorithm="giac")

[Out] 1/2*I*sqrt(2)*sqrt(pi)*erf(-I*sqrt(log(x))) - 1/2*sqrt(2)*(I*sqrt(pi)*erf(-I*sqrt(log(x))) - 2*x*sqrt(log(x)))

Mupad [B] (verification not implemented)

Time = 16.43 (sec) , antiderivative size = 9, normalized size of antiderivative = 0.69

$$\int \left(\frac{1}{\sqrt{2}\sqrt{\log(x)}} + \sqrt{2}\sqrt{\log(x)} \right) dx = \sqrt{2}x\sqrt{\ln(x)}$$

[In] int(2^(1/2)/(2*log(x)^(1/2)) + 2^(1/2)*log(x)^(1/2),x)

[Out] 2^(1/2)*x*log(x)^(1/2)

3.303 $\int \log(\cos(x)) \sec^2(x) dx$

| | |
|---|------|
| Optimal result | 2881 |
| Rubi [A] (verified) | 2881 |
| Mathematica [A] (verified) | 2882 |
| Maple [A] (verified) | 2882 |
| Fricas [A] (verification not implemented) | 2883 |
| Sympy [B] (verification not implemented) | 2883 |
| Maxima [B] (verification not implemented) | 2883 |
| Giac [A] (verification not implemented) | 2884 |
| Mupad [B] (verification not implemented) | 2884 |

Optimal result

Integrand size = 8, antiderivative size = 12

$$\int \log(\cos(x)) \sec^2(x) dx = -x + \tan(x) + \log(\cos(x)) \tan(x)$$

[Out] $-x + \tan(x) + \ln(\cos(x)) * \tan(x)$

Rubi [A] (verified)

Time = 0.03 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3852, 8, 2634, 3554}

$$\int \log(\cos(x)) \sec^2(x) dx = -x + \tan(x) + \tan(x) \log(\cos(x))$$

[In] `Int[Log[Cos[x]]*Sec[x]^2,x]`

[Out] $-x + \tan(x) + \log(\cos(x)) * \tan(x)$

Rule 8

`Int[a_, x_Symbol] := Simp[a*x, x] /; FreeQ[a, x]`

Rule 2634

`Int[Log[u]*(v_), x_Symbol] := With[{w = IntHide[v, x]}, Dist[Log[u], w, x] - Int[SimplifyIntegrand[w*(D[u, x]/u), x], x] /; InverseFunctionFreeQ[w, x]] /; InverseFunctionFreeQ[u, x]`

Rule 3554

```
Int[((b_.)*tan[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] := Simp[b*((b*Tan[c + d
*x])^(n - 1)/(d*(n - 1))), x] - Dist[b^2, Int[(b*Tan[c + d*x])^(n - 2), x],
x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1]
```

Rule 3852

```
Int[csc[(c_.) + (d_.)*(x_)]^(n_), x_Symbol] := Dist[-d^(-1), Subst[Int[Expa
ndIntegrand[(1 + x^2)^(n/2 - 1), x], x], x, Cot[c + d*x]], x] /; FreeQ[{c,
d}, x] && IGtQ[n/2, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \log(\cos(x)) \tan(x) + \int \tan^2(x) dx \\ &= \tan(x) + \log(\cos(x)) \tan(x) - \int 1 dx \\ &= -x + \tan(x) + \log(\cos(x)) \tan(x) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \log(\cos(x)) \sec^2(x) dx = -x + \tan(x) + \log(\cos(x)) \tan(x)$$

```
[In] Integrate[Log[Cos[x]]*Sec[x]^2,x]
```

```
[Out] -x + Tan[x] + Log[Cos[x]]*Tan[x]
```

Maple [A] (verified)

Time = 0.45 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.08

| method | result |
|--------------|--|
| parallelrisc | $-x + \tan(x) + \ln(\cos(x)) \tan(x)$ |
| norman | $\frac{x - x \tan\left(\frac{x}{2}\right)^2 - 2 \tan\left(\frac{x}{2}\right) \ln\left(\frac{1 - \tan\left(\frac{x}{2}\right)^2}{1 + \tan\left(\frac{x}{2}\right)^2}\right) - 2 \tan\left(\frac{x}{2}\right)}{\tan\left(\frac{x}{2}\right)^2 - 1}$ |
| default | $-4i \left(\frac{e^{2ix} \ln\left(\frac{(e^{2ix}+1)e^{-ix}}{2}\right) - \frac{1}{2}}{e^{2ix}+1} - \frac{\ln(e^{2ix}+1)}{4} + \frac{\ln(2)}{2e^{2ix}+2} \right)$ |
| risc | $-\frac{2i \ln(e^{ix})}{e^{2ix}+1} + \frac{-i \ln(e^{2ix}+1)e^{2ix} + \pi \operatorname{csgn}(ie^{-ix}) \operatorname{csgn}(i(e^{2ix}+1)) \operatorname{csgn}(i \cos(x)) - \pi \operatorname{csgn}(ie^{-ix}) \operatorname{csgn}(i \cos(x))^2 - \pi \operatorname{csgn}(i(e^{2ix}+1))}{e^{2ix}+1}$ |

[In] `int(ln(cos(x))/cos(x)^2,x,method=_RETURNVERBOSE)`

[Out] `-x+tan(x)+ln(cos(x))*tan(x)`

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.83

$$\int \log(\cos(x)) \sec^2(x) dx = -\frac{x \cos(x) - \log(\cos(x)) \sin(x) - \sin(x)}{\cos(x)}$$

[In] `integrate(log(cos(x))/cos(x)^2,x, algorithm="fricas")`

[Out] `-(x*cos(x) - log(cos(x))*sin(x) - sin(x))/cos(x)`

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 83 vs. $2(12) = 24$.

Time = 1.47 (sec) , antiderivative size = 83, normalized size of antiderivative = 6.92

$$\int \log(\cos(x)) \sec^2(x) dx = -\frac{x \tan^2\left(\frac{x}{2}\right)}{\tan^2\left(\frac{x}{2}\right) - 1} + \frac{x}{\tan^2\left(\frac{x}{2}\right) - 1} - \frac{2 \log\left(-\frac{\tan^2\left(\frac{x}{2}\right)}{\tan^2\left(\frac{x}{2}\right)+1} + \frac{1}{\tan^2\left(\frac{x}{2}\right)+1}\right) \tan\left(\frac{x}{2}\right)}{\tan^2\left(\frac{x}{2}\right) - 1} - \frac{2 \tan\left(\frac{x}{2}\right)}{\tan^2\left(\frac{x}{2}\right) - 1}$$

[In] `integrate(ln(cos(x))/cos(x)**2,x)`

[Out] `-x*tan(x/2)**2/(tan(x/2)**2 - 1) + x/(tan(x/2)**2 - 1) - 2*log(-tan(x/2)**2/(tan(x/2)**2 + 1) + 1/(tan(x/2)**2 + 1))*tan(x/2)/(tan(x/2)**2 - 1) - 2*tan(x/2)/(tan(x/2)**2 - 1)`

Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 94 vs. $2(12) = 24$.

Time = 0.29 (sec) , antiderivative size = 94, normalized size of antiderivative = 7.83

$$\int \log(\cos(x)) \sec^2(x) dx = -\frac{2 \log\left(-\frac{\frac{\sin(x)^2}{(\cos(x)+1)^2}-1}{\frac{\sin(x)^2}{(\cos(x)+1)^2}+1}\right) \sin(x)}{\left(\frac{\sin(x)^2}{(\cos(x)+1)^2}-1\right)(\cos(x)+1)} - \frac{2 \sin(x)}{\left(\frac{\sin(x)^2}{(\cos(x)+1)^2}-1\right)(\cos(x)+1)} - 2 \arctan\left(\frac{\sin(x)}{\cos(x)+1}\right)$$

[In] integrate(log(cos(x))/cos(x)^2,x, algorithm="maxima")

[Out] $-2 \cdot \log\left(-\frac{\sin(x)^2}{(\cos(x) + 1)^2 - 1} / \left(\frac{\sin(x)^2}{(\cos(x) + 1)^2 + 1}\right) \cdot \sin(x)\right) / \left(\frac{\sin(x)^2}{(\cos(x) + 1)^2 - 1} \cdot (\cos(x) + 1)\right) - 2 \cdot \sin(x) / \left(\frac{\sin(x)^2}{(\cos(x) + 1)^2 - 1} \cdot (\cos(x) + 1)\right) - 2 \cdot \arctan(\sin(x) / (\cos(x) + 1))$

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \log(\cos(x)) \sec^2(x) dx = \log(\cos(x)) \tan(x) - x + \tan(x)$$

[In] integrate(log(cos(x))/cos(x)^2,x, algorithm="giac")

[Out] $\log(\cos(x)) \cdot \tan(x) - x + \tan(x)$

Mupad [B] (verification not implemented)

Time = 16.94 (sec) , antiderivative size = 35, normalized size of antiderivative = 2.92

$$\int \log(\cos(x)) \sec^2(x) dx = \tan(x) - 2x + \ln(\cos(x)) \tan(x) + \ln(\cos(x)) \operatorname{li} - \ln(\cos(2x) + 1 + \sin(2x) \operatorname{li}) \operatorname{li}$$

[In] int(log(cos(x))/cos(x)^2,x)

[Out] $\log(\cos(x)) \cdot \operatorname{li} - 2 \cdot x - \log(\cos(2x) + \sin(2x) \cdot \operatorname{li} + 1) \cdot \operatorname{li} + \tan(x) + \log(\cos(x)) \cdot \tan(x)$

$$3.304 \quad \int \frac{\frac{5}{(-5+x)^6} + \frac{3}{(-3+x)^4} + \frac{1}{(-1+x)^2}}{\left(1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}\right)^2} dx$$

| | |
|---|------|
| Optimal result | 2885 |
| Rubi [A] (verified) | 2885 |
| Mathematica [A] (verified) | 2886 |
| Maple [B] (verified) | 2886 |
| Fricas [B] (verification not implemented) | 2887 |
| Sympy [B] (verification not implemented) | 2887 |
| Maxima [A] (verification not implemented) | 2888 |
| Giac [B] (verification not implemented) | 2888 |
| Mupad [B] (verification not implemented) | 2888 |

Optimal result

Integrand size = 40, antiderivative size = 19

$$\int \frac{\frac{5}{(-5+x)^6} + \frac{3}{(-3+x)^4} + \frac{1}{(-1+x)^2}}{\left(1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}\right)^2} dx = \frac{1}{1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}}$$

[Out] 1/(1+1/(-1+x)+1/(-3+x)^3+1/(-5+x)^5)

Rubi [A] (verified)

Time = 0.07 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.025$, Rules used = {6818}

$$\int \frac{\frac{5}{(-5+x)^6} + \frac{3}{(-3+x)^4} + \frac{1}{(-1+x)^2}}{\left(1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}\right)^2} dx = \frac{1}{\frac{1}{(x-3)^3} + \frac{1}{(x-5)^5} + \frac{1}{x-1} + 1}$$

[In] Int[(5/(-5 + x)^6 + 3/(-3 + x)^4 + (-1 + x)^(-2))/(1 + (-5 + x)^(-5) + (-3 + x)^(-3) + (-1 + x)^(-1))^2,x]

[Out] (1 + (-5 + x)^(-5) + (-3 + x)^(-3) + (-1 + x)^(-1))^(-1)

Rule 6818

Int[(u_)*(y_)^(m_.), x_Symbol] :-> With[{q = DerivativeDivides[y, u, x]}, Simp[q*(y^(m + 1)/(m + 1)), x] /; !FalseQ[q]] /; FreeQ[m, x] && NeQ[m, -1]

Rubi steps

$$\text{integral} = \frac{1}{1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}}$$

Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int \frac{\frac{5}{(-5+x)^6} + \frac{3}{(-3+x)^4} + \frac{1}{(-1+x)^2}}{\left(1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}\right)^2} dx = \frac{1}{1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}}$$

[In] Integrate[(5/(-5 + x)^6 + 3/(-3 + x)^4 + (-1 + x)^(-2))/(1 + (-5 + x)^(-5) + (-3 + x)^(-3) + (-1 + x)^(-1))^2,x]

[Out] (1 + (-5 + x)^(-5) + (-3 + x)^(-3) + (-1 + x)^(-1))^(-1)

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 85 vs. 2(19) = 38.

Time = 0.26 (sec) , antiderivative size = 86, normalized size of antiderivative = 4.53

| method | result |
|---------------|--|
| gospers | $-\frac{x^8-34x^7+503x^6-4228x^5+22076x^4-73260x^3+150661x^2-175054x+87527}{x^9-34x^8+502x^7-4201x^6+21774x^5-71474x^4+144740x^3-164339x^2+78071x+3152}$ |
| default | $\frac{-x^8+34x^7-503x^6+4228x^5-22076x^4+73260x^3-150661x^2+175054x-87527}{x^9-34x^8+502x^7-4201x^6+21774x^5-71474x^4+144740x^3-164339x^2+78071x+3152}$ |
| risch | $\frac{-x^8+34x^7-503x^6+4228x^5-22076x^4+73260x^3-150661x^2+175054x-87527}{x^9-34x^8+502x^7-4201x^6+21774x^5-71474x^4+144740x^3-164339x^2+78071x+3152}$ |
| parallelrisch | $\frac{-x^8+34x^7-503x^6+4228x^5-22076x^4+73260x^3-150661x^2+175054x-87527}{x^9-34x^8+502x^7-4201x^6+21774x^5-71474x^4+144740x^3-164339x^2+78071x+3152}$ |
| norman | $\frac{-x^{17}+69x^{16}-2229x^{15}+44761x^{14}-625602x^{13}+6455858x^{12}-50913715x^{11}+313280159x^{10}-1521750430x^9+5864557678x^8-175054x+87527}{(-1+x)(-3+x)^3(-5+x)^5(x^9-34x^8+502x^7-4201x^6+21774x^5-71474x^4+144740x^3-164339x^2+78071x+3152)}$ |

[In] int((1/(-1+x)^2+3/(-3+x)^4+5/(-5+x)^6)/(1+1/(-1+x)+1/(-3+x)^3+1/(-5+x)^5)^2 ,x,method=_RETURNVERBOSE)

[Out] -(x^8-34*x^7+503*x^6-4228*x^5+22076*x^4-73260*x^3+150661*x^2-175054*x+87527)/(x^9-34*x^8+502*x^7-4201*x^6+21774*x^5-71474*x^4+144740*x^3-164339*x^2+78071*x+3152)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 85 vs. $2(19) = 38$.

Time = 0.23 (sec) , antiderivative size = 85, normalized size of antiderivative = 4.47

$$\int \frac{\frac{5}{(-5+x)^6} + \frac{3}{(-3+x)^4} + \frac{1}{(-1+x)^2}}{\left(1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}\right)^2} dx =$$

$$\frac{x^8 - 34x^7 + 503x^6 - 4228x^5 + 22076x^4 - 73260x^3 + 150661x^2 - 175054x + 87527}{x^9 - 34x^8 + 502x^7 - 4201x^6 + 21774x^5 - 71474x^4 + 144740x^3 - 164339x^2 + 78071x + 3152}$$

[In] integrate((1/(-1+x)^2+3/(-3+x)^4+5/(-5+x)^6)/(1+1/(-1+x)+1/(-3+x)^3+1/(-5+x)^5)^2,x, algorithm="fricas")

[Out] -(x^8 - 34*x^7 + 503*x^6 - 4228*x^5 + 22076*x^4 - 73260*x^3 + 150661*x^2 - 175054*x + 87527)/(x^9 - 34*x^8 + 502*x^7 - 4201*x^6 + 21774*x^5 - 71474*x^4 + 144740*x^3 - 164339*x^2 + 78071*x + 3152)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 82 vs. $2(20) = 40$.

Time = 0.47 (sec) , antiderivative size = 82, normalized size of antiderivative = 4.32

$$\int \frac{\frac{5}{(-5+x)^6} + \frac{3}{(-3+x)^4} + \frac{1}{(-1+x)^2}}{\left(1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}\right)^2} dx$$

$$= \frac{-x^8 + 34x^7 - 503x^6 + 4228x^5 - 22076x^4 + 73260x^3 - 150661x^2 + 175054x - 87527}{x^9 - 34x^8 + 502x^7 - 4201x^6 + 21774x^5 - 71474x^4 + 144740x^3 - 164339x^2 + 78071x + 3152}$$

[In] integrate((1/(-1+x)**2+3/(-3+x)**4+5/(-5+x)**6)/(1+1/(-1+x)+1/(-3+x)**3+1/(-5+x)**5)**2,x)

[Out] (-x**8 + 34*x**7 - 503*x**6 + 4228*x**5 - 22076*x**4 + 73260*x**3 - 150661*x**2 + 175054*x - 87527)/(x**9 - 34*x**8 + 502*x**7 - 4201*x**6 + 21774*x**5 - 71474*x**4 + 144740*x**3 - 164339*x**2 + 78071*x + 3152)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 19, normalized size of antiderivative = 1.00

$$\int \frac{\frac{5}{(-5+x)^6} + \frac{3}{(-3+x)^4} + \frac{1}{(-1+x)^2}}{\left(1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}\right)^2} dx = \frac{1}{\frac{1}{x-1} + \frac{1}{(x-3)^3} + \frac{1}{(x-5)^5} + 1}$$

[In] integrate((1/(-1+x)^2+3/(-3+x)^4+5/(-5+x)^6)/(1+1/(-1+x)+1/(-3+x)^3+1/(-5+x)^5)^2,x, algorithm="maxima")

[Out] 1/(1/(x - 1) + 1/(x - 3)^3 + 1/(x - 5)^5 + 1)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 85 vs. 2(19) = 38.

Time = 0.29 (sec) , antiderivative size = 85, normalized size of antiderivative = 4.47

$$\int \frac{\frac{5}{(-5+x)^6} + \frac{3}{(-3+x)^4} + \frac{1}{(-1+x)^2}}{\left(1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}\right)^2} dx = \frac{x^8 - 34x^7 + 503x^6 - 4228x^5 + 22076x^4 - 73260x^3 + 150661x^2 - 175054x + 87527}{x^9 - 34x^8 + 502x^7 - 4201x^6 + 21774x^5 - 71474x^4 + 144740x^3 - 164339x^2 + 78071x + 3152}$$

[In] integrate((1/(-1+x)^2+3/(-3+x)^4+5/(-5+x)^6)/(1+1/(-1+x)+1/(-3+x)^3+1/(-5+x)^5)^2,x, algorithm="giac")

[Out] -(x^8 - 34*x^7 + 503*x^6 - 4228*x^5 + 22076*x^4 - 73260*x^3 + 150661*x^2 - 175054*x + 87527)/(x^9 - 34*x^8 + 502*x^7 - 4201*x^6 + 21774*x^5 - 71474*x^4 + 144740*x^3 - 164339*x^2 + 78071*x + 3152)

Mupad [B] (verification not implemented)

Time = 17.04 (sec) , antiderivative size = 85, normalized size of antiderivative = 4.47

$$\int \frac{\frac{5}{(-5+x)^6} + \frac{3}{(-3+x)^4} + \frac{1}{(-1+x)^2}}{\left(1 + \frac{1}{(-5+x)^5} + \frac{1}{(-3+x)^3} + \frac{1}{-1+x}\right)^2} dx = \frac{x^8 - 34x^7 + 503x^6 - 4228x^5 + 22076x^4 - 73260x^3 + 150661x^2 - 175054x + 87527}{x^9 - 34x^8 + 502x^7 - 4201x^6 + 21774x^5 - 71474x^4 + 144740x^3 - 164339x^2 + 78071x + 3152}$$

[In] int((1/(x - 1)^2 + 3/(x - 3)^4 + 5/(x - 5)^6)/(1/(x - 1) + 1/(x - 3)^3 + 1/(x - 5)^5 + 1)^2,x)

[Out] -(150661*x^2 - 175054*x - 73260*x^3 + 22076*x^4 - 4228*x^5 + 503*x^6 - 34*x^7 + x^8 + 87527)/(78071*x - 164339*x^2 + 144740*x^3 - 71474*x^4 + 21774*x^5 - 4201*x^6 + 502*x^7 - 34*x^8 + x^9 + 3152)

3.305 $\int \csc(x) \sin(23x) dx$

| | |
|---|------|
| Optimal result | 2889 |
| Rubi [A] (verified) | 2889 |
| Mathematica [A] (verified) | 2893 |
| Maple [A] (verified) | 2893 |
| Fricas [A] (verification not implemented) | 2893 |
| Sympy [A] (verification not implemented) | 2894 |
| Maxima [F(-1)] | 2894 |
| Giac [A] (verification not implemented) | 2894 |
| Mupad [B] (verification not implemented) | 2895 |

Optimal result

Integrand size = 7, antiderivative size = 86

$$\int \csc(x) \sin(23x) dx = x + \sin(2x) + \frac{1}{2} \sin(4x) + \frac{1}{3} \sin(6x) + \frac{1}{4} \sin(8x) + \frac{1}{5} \sin(10x) + \frac{1}{6} \sin(12x) \\ + \frac{1}{7} \sin(14x) + \frac{1}{8} \sin(16x) + \frac{1}{9} \sin(18x) + \frac{1}{10} \sin(20x) + \frac{1}{11} \sin(22x)$$

[Out] x+sin(2*x)+1/2*sin(4*x)+1/3*sin(6*x)+1/4*sin(8*x)+1/5*sin(10*x)+1/6*sin(12*x)+1/7*sin(14*x)+1/8*sin(16*x)+1/9*sin(18*x)+1/10*sin(20*x)+1/11*sin(22*x)

Rubi [A] (verified)

Time = 0.40 (sec) , antiderivative size = 108, normalized size of antiderivative = 1.26, number of steps used = 13, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.571$, Rules used = {1828, 1171, 393, 209}

$$\int \csc(x) \sin(23x) dx = x + \frac{2097152}{11} \sin(x) \cos^{21}(x) - \frac{49545216}{55} \sin(x) \cos^{19}(x) \\ + \frac{899022848}{495} \sin(x) \cos^{17}(x) - \frac{1009455104}{495} \sin(x) \cos^{15}(x) \\ + \frac{322500608}{231} \sin(x) \cos^{13}(x) - \frac{415607296}{693} \sin(x) \cos^{11}(x) \\ + \frac{10100480}{63} \sin(x) \cos^9(x) - \frac{178880}{7} \sin(x) \cos^7(x) \\ + \frac{6656}{3} \sin(x) \cos^5(x) - \frac{260}{3} \sin(x) \cos^3(x) + 2 \sin(x) \cos(x)$$

[In] Int[Csc[x]*Sin[23*x],x]

[Out] x + 2*Cos[x]*Sin[x] - (260*Cos[x]^3*Sin[x])/3 + (6656*Cos[x]^5*Sin[x])/3 - (178880*Cos[x]^7*Sin[x])/7 + (10100480*Cos[x]^9*Sin[x])/63 - (415607296*Cos

$[x]^{11} \sin[x] / 693 + (322500608 \cos[x]^{13} \sin[x]) / 231 - (1009455104 \cos[x]^{15} \sin[x]) / 495 + (899022848 \cos[x]^{17} \sin[x]) / 495 - (49545216 \cos[x]^{19} \sin[x]) / 55 + (2097152 \cos[x]^{21} \sin[x]) / 11$

Rule 209

$\text{Int}[(a + (b \cdot x)^2)^{-1}, x_Symbol] \rightarrow \text{Simp}[(1/(\text{Rt}[a, 2] \cdot \text{Rt}[b, 2])) \cdot \text{ArcTan}[\text{Rt}[b, 2] \cdot (x/\text{Rt}[a, 2])], x] /; \text{FreeQ}\{a, b, x\} \ \&\& \ \text{PosQ}[a/b] \ \&\& \ (\text{GtQ}[a, 0] \ || \ \text{GtQ}[b, 0])$

Rule 393

$\text{Int}[(a + (b \cdot x)^n)^p \cdot ((c + (d \cdot x)^n)), x_Symbol] \rightarrow \text{Simp}[(-b \cdot c - a \cdot d) \cdot x \cdot ((a + b \cdot x^n)^{p+1} / (a \cdot b \cdot n \cdot (p+1))), x] - \text{Dist}[(a \cdot d - b \cdot c \cdot (n \cdot (p+1) + 1)) / (a \cdot b \cdot n \cdot (p+1)), \text{Int}[(a + b \cdot x^n)^{p+1}, x], x] /; \text{FreeQ}\{a, b, c, d, n, p\}, x] \ \&\& \ \text{NeQ}[b \cdot c - a \cdot d, 0] \ \&\& \ (\text{LtQ}[p, -1] \ || \ \text{ILtQ}[1/n + p, 0])$

Rule 1171

$\text{Int}[(d + (e \cdot x)^2)^q \cdot ((a + (b \cdot x)^2 + (c \cdot x)^4)^p), x_Symbol] \rightarrow \text{With}\{Qx = \text{PolynomialQuotient}[(a + b \cdot x^2 + c \cdot x^4)^p, d + e \cdot x^2, x], R = \text{Coeff}[\text{PolynomialRemainder}[(a + b \cdot x^2 + c \cdot x^4)^p, d + e \cdot x^2, x], x, 0]\}, \text{Simp}[(-R) \cdot x \cdot ((d + e \cdot x^2)^{q+1} / (2 \cdot d \cdot (q+1))), x] + \text{Dist}[1 / (2 \cdot d \cdot (q+1)), \text{Int}[(d + e \cdot x^2)^{q+1} \cdot \text{ExpandToSum}[2 \cdot d \cdot (q+1) \cdot Qx + R \cdot (2 \cdot q + 3), x], x], x] /; \text{FreeQ}\{a, b, c, d, e\}, x] \ \&\& \ \text{NeQ}[b^2 - 4 \cdot a \cdot c, 0] \ \&\& \ \text{NeQ}[c \cdot d^2 - b \cdot d \cdot e + a \cdot e^2, 0] \ \&\& \ \text{IGtQ}[p, 0] \ \&\& \ \text{LtQ}[q, -1]$

Rule 1828

$\text{Int}[(Pq) \cdot ((a + (b \cdot x)^2)^p), x_Symbol] \rightarrow \text{With}\{Q = \text{PolynomialQuotient}[Pq, a + b \cdot x^2, x], f = \text{Coeff}[\text{PolynomialRemainder}[Pq, a + b \cdot x^2, x], x, 0], g = \text{Coeff}[\text{PolynomialRemainder}[Pq, a + b \cdot x^2, x], x, 1]\}, \text{Simp}[(a \cdot g - b \cdot f \cdot x) \cdot ((a + b \cdot x^2)^{p+1} / (2 \cdot a \cdot b \cdot (p+1))), x] + \text{Dist}[1 / (2 \cdot a \cdot (p+1)), \text{Int}[(a + b \cdot x^2)^{p+1} \cdot \text{ExpandToSum}[2 \cdot a \cdot (p+1) \cdot Q + f \cdot (2 \cdot p + 3), x], x], x] /; \text{FreeQ}\{a, b\}, x] \ \&\& \ \text{PolyQ}[Pq, x] \ \&\& \ \text{LtQ}[p, -1]$

Rubi steps

integral

$$= \text{Subst} \left(\int \frac{23 - 1771x^2 + 33649x^4 - 245157x^6 + 817190x^8 - 1352078x^{10} + 1144066x^{12} - 490314x^{14} + 100000x^{16}}{(1+x^2)^{12}} dx \right)$$

$$= \frac{2097152}{11} \cos^{21}(x) \sin(x) - \frac{1}{22} \text{Subst} \left(\int \frac{4193798 - 92235220x^2 + 91494942x^4 - 86101488x^6 + 68123308x^8 - 38377592x^{10}}{(1+x^2)^{11}} dx \right)$$

$$\begin{aligned}
&= -\frac{49545216}{55} \cos^{19}(x) \sin(x) + \frac{2097152}{11} \cos^{21}(x) \sin(x) \\
&+ \frac{1}{440} \text{Subst} \left(\int \frac{312485768 - 5998654200x^2 + 4168755360x^4 - 2446725600x^6 + 1084259440x^8 - 2446725600x^{10} + 312485768x^{12}}{(1+x^2)^{10}} dx, x, \tan(x) \right) \\
&= \frac{899022848}{495} \cos^{17}(x) \sin(x) - \frac{49545216}{55} \cos^{19}(x) \sin(x) + \frac{2097152}{11} \cos^{21}(x) \sin(x) \\
&\text{Subst} \left(\int \frac{8759621744 - 145318060800x^2 + 70280464320x^4 - 26239403520x^6 + 6722733600x^8 - 1021996800x^{10} + 76190400x^{12} - 2097152x^{14}}{(1+x^2)^9} dx, x, \tan(x) \right) \\
&\frac{7920}{7920} \\
&= -\frac{1009455104}{495} \cos^{15}(x) \sin(x) + \frac{899022848}{495} \cos^{17}(x) \sin(x) \\
&- \frac{49545216}{55} \cos^{19}(x) \sin(x) + \frac{2097152}{11} \cos^{21}(x) \sin(x) \\
&\text{Subst} \left(\int \frac{118266558720 - 1669485185280x^2 + 544997756160x^4 - 125167299840x^6 + 17603562240x^8 - 1251613440x^{10} + 32567040x^{12}}{(1+x^2)^8} dx, x, \tan(x) \right) \\
&\frac{126720}{126720} \\
&= \frac{322500608}{231} \cos^{13}(x) \sin(x) - \frac{1009455104}{495} \cos^{15}(x) \sin(x) \\
&+ \frac{899022848}{495} \cos^{17}(x) \sin(x) - \frac{49545216}{55} \cos^{19}(x) \sin(x) + \frac{2097152}{11} \cos^{21}(x) \sin(x) \\
&\text{Subst} \left(\int \frac{821072847360 - 9646740956160x^2 + 2016772369920x^4 - 264430172160x^6 + 17980300800x^8 - 457712640x^{10} + 1774080x^{12}}{(1+x^2)^7} dx, x, \tan(x) \right) \\
&\frac{1774080}{1774080} \\
&= -\frac{415607296}{693} \cos^{11}(x) \sin(x) + \frac{322500608}{231} \cos^{13}(x) \sin(x) - \frac{1009455104}{495} \cos^{15}(x) \sin(x) \\
&+ \frac{899022848}{495} \cos^{17}(x) \sin(x) - \frac{49545216}{55} \cos^{19}(x) \sin(x) + \frac{2097152}{11} \cos^{21}(x) \sin(x) \\
&\text{Subst} \left(\int \frac{2914581964800 - 27595707955200x^2 + 3394439516160x^4 - 221277450240x^6 + 5513840640x^8 - 21288960x^{10}}{(1+x^2)^6} dx, x, \tan(x) \right) \\
&\frac{21288960}{21288960} \\
&= \frac{10100480}{63} \cos^9(x) \sin(x) - \frac{415607296}{693} \cos^{11}(x) \sin(x) + \frac{322500608}{231} \cos^{13}(x) \sin(x) \\
&- \frac{1009455104}{495} \cos^{15}(x) \sin(x) + \frac{899022848}{495} \cos^{17}(x) \sin(x) \\
&- \frac{49545216}{55} \cos^{19}(x) \sin(x) + \frac{2097152}{11} \cos^{21}(x) \sin(x) \\
&\text{Subst} \left(\int \frac{4985722368000 - 36212520960000x^2 + 2268125798400x^4 - 55351296000x^6 + 212889600x^8}{(1+x^2)^5} dx, x, \tan(x) \right) \\
&\frac{212889600}{212889600} \\
&= -\frac{178880}{7} \cos^7(x) \sin(x) + \frac{10100480}{63} \cos^9(x) \sin(x) - \frac{415607296}{693} \cos^{11}(x) \sin(x) \\
&+ \frac{322500608}{231} \cos^{13}(x) \sin(x) - \frac{1009455104}{495} \cos^{15}(x) \sin(x) \\
&+ \frac{899022848}{495} \cos^{17}(x) \sin(x) - \frac{49545216}{55} \cos^{19}(x) \sin(x) + \frac{2097152}{11} \cos^{21}(x) \sin(x) \\
&\text{Subst} \left(\int \frac{3636154368000 - 18589519872000x^2 + 444513484800x^4 - 1703116800x^6}{(1+x^2)^4} dx, x, \tan(x) \right) \\
&\frac{1703116800}{1703116800}
\end{aligned}$$

$$\begin{aligned}
&= \frac{6656}{3} \cos^5(x) \sin(x) - \frac{178880}{7} \cos^7(x) \sin(x) + \frac{10100480}{63} \cos^9(x) \sin(x) \\
&\quad - \frac{415607296}{693} \cos^{11}(x) \sin(x) + \frac{322500608}{231} \cos^{13}(x) \sin(x) \\
&\quad - \frac{1009455104}{495} \cos^{15}(x) \sin(x) + \frac{899022848}{495} \cos^{17}(x) \sin(x) \\
&\quad - \frac{49545216}{55} \cos^{19}(x) \sin(x) + \frac{2097152}{11} \cos^{21}(x) \sin(x) \\
&\quad - \frac{\text{Subst}\left(\int \frac{854964633600 - 2677299609600x^2 + 10218700800x^4}{(1+x^2)^3} dx, x, \tan(x)\right)}{10218700800} \\
&= -\frac{260}{3} \cos^3(x) \sin(x) + \frac{6656}{3} \cos^5(x) \sin(x) - \frac{178880}{7} \cos^7(x) \sin(x) \\
&\quad + \frac{10100480}{63} \cos^9(x) \sin(x) - \frac{415607296}{693} \cos^{11}(x) \sin(x) \\
&\quad + \frac{322500608}{231} \cos^{13}(x) \sin(x) - \frac{1009455104}{495} \cos^{15}(x) \sin(x) \\
&\quad + \frac{899022848}{495} \cos^{17}(x) \sin(x) - \frac{49545216}{55} \cos^{19}(x) \sin(x) \\
&\quad + \frac{2097152}{11} \cos^{21}(x) \sin(x) + \frac{\text{Subst}\left(\int \frac{122624409600 - 40874803200x^2}{(1+x^2)^2} dx, x, \tan(x)\right)}{40874803200} \\
&= 2 \cos(x) \sin(x) - \frac{260}{3} \cos^3(x) \sin(x) + \frac{6656}{3} \cos^5(x) \sin(x) \\
&\quad - \frac{178880}{7} \cos^7(x) \sin(x) + \frac{10100480}{63} \cos^9(x) \sin(x) - \frac{415607296}{693} \cos^{11}(x) \sin(x) \\
&\quad + \frac{322500608}{231} \cos^{13}(x) \sin(x) - \frac{1009455104}{495} \cos^{15}(x) \sin(x) \\
&\quad + \frac{899022848}{495} \cos^{17}(x) \sin(x) - \frac{49545216}{55} \cos^{19}(x) \sin(x) \\
&\quad + \frac{2097152}{11} \cos^{21}(x) \sin(x) + \text{Subst}\left(\int \frac{1}{1+x^2} dx, x, \tan(x)\right) \\
&= x + 2 \cos(x) \sin(x) - \frac{260}{3} \cos^3(x) \sin(x) + \frac{6656}{3} \cos^5(x) \sin(x) \\
&\quad - \frac{178880}{7} \cos^7(x) \sin(x) + \frac{10100480}{63} \cos^9(x) \sin(x) - \frac{415607296}{693} \cos^{11}(x) \sin(x) \\
&\quad + \frac{322500608}{231} \cos^{13}(x) \sin(x) - \frac{1009455104}{495} \cos^{15}(x) \sin(x) \\
&\quad + \frac{899022848}{495} \cos^{17}(x) \sin(x) - \frac{49545216}{55} \cos^{19}(x) \sin(x) + \frac{2097152}{11} \cos^{21}(x) \sin(x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 86, normalized size of antiderivative = 1.00

$$\int \csc(x) \sin(23x) dx = x + \sin(2x) + \frac{1}{2} \sin(4x) + \frac{1}{3} \sin(6x) + \frac{1}{4} \sin(8x) + \frac{1}{5} \sin(10x) + \frac{1}{6} \sin(12x) \\ + \frac{1}{7} \sin(14x) + \frac{1}{8} \sin(16x) + \frac{1}{9} \sin(18x) + \frac{1}{10} \sin(20x) + \frac{1}{11} \sin(22x)$$

[In] Integrate[Csc[x]*Sin[23*x],x]

[Out] x + Sin[2*x] + Sin[4*x]/2 + Sin[6*x]/3 + Sin[8*x]/4 + Sin[10*x]/5 + Sin[12*x]/6 + Sin[14*x]/7 + Sin[16*x]/8 + Sin[18*x]/9 + Sin[20*x]/10 + Sin[22*x]/11

Maple [A] (verified)

Time = 0.31 (sec) , antiderivative size = 67, normalized size of antiderivative = 0.78

| method | result |
|--------|--|
| risch | $x + \sin(2x) + \frac{\sin(4x)}{2} + \frac{\sin(6x)}{3} + \frac{\sin(8x)}{4} + \frac{\sin(10x)}{5} + \frac{\sin(12x)}{6} + \frac{\sin(14x)}{7} + \frac{\sin(16x)}{8} + \frac{\sin(18x)}{9} + \frac{\sin(20x)}{10}$ |

[In] int(sin(23*x)/sin(x),x,method=_RETURNVERBOSE)

[Out] x+sin(2*x)+1/2*sin(4*x)+1/3*sin(6*x)+1/4*sin(8*x)+1/5*sin(10*x)+1/6*sin(12*x)+1/7*sin(14*x)+1/8*sin(16*x)+1/9*sin(18*x)+1/10*sin(20*x)+1/11*sin(22*x)

Fricas [A] (verification not implemented)

none

Time = 0.36 (sec) , antiderivative size = 71, normalized size of antiderivative = 0.83

$$\int \csc(x) \sin(23x) dx \\ = \frac{2}{3465} (330301440 \cos(x)^{21} - 1560674304 \cos(x)^{19} + 3146579968 \cos(x)^{17} - 3533092864 \cos(x)^{15} + 2418754560 \cos(x)^{13} - 1039018240 \cos(x)^{11} + 277763200 \cos(x)^9 - 44272800 \cos(x)^7 + 3843840 \cos(x)^5 - 150150 \cos(x)^3 + 3465 \cos(x)) \sin(x) + x$$

[In] integrate(sin(23*x)/sin(x),x, algorithm="fricas")

[Out] 2/3465*(330301440*cos(x)^21 - 1560674304*cos(x)^19 + 3146579968*cos(x)^17 - 3533092864*cos(x)^15 + 2418754560*cos(x)^13 - 1039018240*cos(x)^11 + 277763200*cos(x)^9 - 44272800*cos(x)^7 + 3843840*cos(x)^5 - 150150*cos(x)^3 + 3465*cos(x))*sin(x) + x

Sympy [A] (verification not implemented)

Time = 69.50 (sec) , antiderivative size = 100, normalized size of antiderivative = 1.16

$$\int \csc(x) \sin(23x) dx = x - \frac{1024 \sin^{11}(2x)}{11} + \frac{2560 \sin^9(2x)}{9} - \frac{2304 \sin^7(2x)}{7} + \frac{896 \sin^5(2x)}{5} - \frac{140 \sin^3(2x)}{3} + 6 \sin(2x) + \frac{8 \sin^5(4x)}{5} - \frac{8 \sin^3(4x)}{3} + \frac{3 \sin(4x)}{2} + \frac{\sin(8x)}{4} + \frac{\sin(16x)}{8}$$

[In] integrate(sin(23*x)/sin(x),x)

[Out] x - 1024*sin(2*x)**11/11 + 2560*sin(2*x)**9/9 - 2304*sin(2*x)**7/7 + 896*sin(2*x)**5/5 - 140*sin(2*x)**3/3 + 6*sin(2*x) + 8*sin(4*x)**5/5 - 8*sin(4*x)**3/3 + 3*sin(4*x)/2 + sin(8*x)/4 + sin(16*x)/8

Maxima [F(-1)]

Timed out.

$$\int \csc(x) \sin(23x) dx = \text{Timed out}$$

[In] integrate(sin(23*x)/sin(x),x, algorithm="maxima")

[Out] Timed out

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 66, normalized size of antiderivative = 0.77

$$\int \csc(x) \sin(23x) dx = x + \frac{1}{11} \sin(22x) + \frac{1}{10} \sin(20x) + \frac{1}{9} \sin(18x) + \frac{1}{8} \sin(16x) + \frac{1}{7} \sin(14x) + \frac{1}{6} \sin(12x) + \frac{1}{5} \sin(10x) + \frac{1}{4} \sin(8x) + \frac{1}{3} \sin(6x) + \frac{1}{2} \sin(4x) + \sin(2x)$$

[In] integrate(sin(23*x)/sin(x),x, algorithm="giac")

[Out] x + 1/11*sin(22*x) + 1/10*sin(20*x) + 1/9*sin(18*x) + 1/8*sin(16*x) + 1/7*sin(14*x) + 1/6*sin(12*x) + 1/5*sin(10*x) + 1/4*sin(8*x) + 1/3*sin(6*x) + 1/2*sin(4*x) + sin(2*x)

Mupad [B] (verification not implemented)

Time = 0.20 (sec) , antiderivative size = 66, normalized size of antiderivative = 0.77

$$\int \csc(x) \sin(23x) dx = x + \sin(2x) + \frac{\sin(4x)}{2} + \frac{\sin(6x)}{3} + \frac{\sin(8x)}{4} + \frac{\sin(10x)}{5} + \frac{\sin(12x)}{6} \\ + \frac{\sin(14x)}{7} + \frac{\sin(16x)}{8} + \frac{\sin(18x)}{9} + \frac{\sin(20x)}{10} + \frac{\sin(22x)}{11}$$

[In] `int(sin(23*x)/sin(x),x)`

[Out] `x + sin(2*x) + sin(4*x)/2 + sin(6*x)/3 + sin(8*x)/4 + sin(10*x)/5 + sin(12*x)/6 + sin(14*x)/7 + sin(16*x)/8 + sin(18*x)/9 + sin(20*x)/10 + sin(22*x)/11`
1

3.306 $\int \frac{(1-x)^2 x^4}{1+x^2} dx$

| | |
|---|------|
| Optimal result | 2896 |
| Rubi [A] (verified) | 2896 |
| Mathematica [A] (verified) | 2897 |
| Maple [A] (verified) | 2897 |
| Fricas [A] (verification not implemented) | 2898 |
| Sympy [A] (verification not implemented) | 2898 |
| Maxima [A] (verification not implemented) | 2898 |
| Giac [A] (verification not implemented) | 2898 |
| Mupad [B] (verification not implemented) | 2899 |

Optimal result

Integrand size = 18, antiderivative size = 26

$$\int \frac{(1-x)^2 x^4}{1+x^2} dx = x^2 - \frac{x^4}{2} + \frac{x^5}{5} - \log(1+x^2)$$

[Out] $x^2 - 1/2*x^4 + 1/5*x^5 - \ln(x^2+1)$

Rubi [A] (verified)

Time = 0.04 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {1643, 266}

$$\int \frac{(1-x)^2 x^4}{1+x^2} dx = \frac{x^5}{5} - \frac{x^4}{2} + x^2 - \log(x^2+1)$$

[In] `Int[((1 - x)^2*x^4)/(1 + x^2),x]`

[Out] $x^2 - x^4/2 + x^5/5 - \text{Log}[1 + x^2]$

Rule 266

`Int[(x_)^(m_.)/((a_) + (b_.)*(x_)^(n_.)), x_Symbol] := Simp[Log[RemoveContent[a + b*x^n, x]]/(b*n), x] /; FreeQ[{a, b, m, n}, x] && EqQ[m, n - 1]`

Rule 1643

`Int[(Pq_)*((d_) + (e_.)*(x_))^(m_.)*((a_) + (c_.)*(x_)^2)^(p_.), x_Symbol] := Int[ExpandIntegrand[(d + e*x)^m*Pq*(a + c*x^2)^p, x], x] /; FreeQ[{a, c, d, e, m}, x] && PolyQ[Pq, x] && IGtQ[p, -2]`

Rubi steps

$$\begin{aligned}
 \text{integral} &= \int \left(2x - 2x^3 + x^4 - \frac{2x}{1+x^2} \right) dx \\
 &= x^2 - \frac{x^4}{2} + \frac{x^5}{5} - 2 \int \frac{x}{1+x^2} dx \\
 &= x^2 - \frac{x^4}{2} + \frac{x^5}{5} - \log(1+x^2)
 \end{aligned}$$

Mathematica [A] (verified)

Time = 0.03 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.00

$$\int \frac{(1-x)^2 x^4}{1+x^2} dx = x^2 - \frac{x^4}{2} + \frac{x^5}{5} - \log(1+x^2)$$

[In] Integrate[((1 - x)^2*x^4)/(1 + x^2),x]

[Out] x^2 - x^4/2 + x^5/5 - Log[1 + x^2]

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.88

| method | result | size |
|--------------|--|------|
| default | $x^2 - \frac{x^4}{2} + \frac{x^5}{5} - \ln(x^2 + 1)$ | 23 |
| norman | $x^2 - \frac{x^4}{2} + \frac{x^5}{5} - \ln(x^2 + 1)$ | 23 |
| risch | $x^2 - \frac{x^4}{2} + \frac{x^5}{5} - \ln(x^2 + 1)$ | 23 |
| parallelrisc | $x^2 - \frac{x^4}{2} + \frac{x^5}{5} - \ln(x^2 + 1)$ | 23 |
| meijerg | $-\frac{x(-5x^2+15)}{15} + \frac{x^2(-3x^2+6)}{6} - \ln(x^2 + 1) + \frac{x(21x^4-35x^2+105)}{105}$ | 47 |

[In] int(x^4*(1-x)^2/(x^2+1),x,method=_RETURNVERBOSE)

[Out] x^2-1/2*x^4+1/5*x^5-ln(x^2+1)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.85

$$\int \frac{(1-x)^2 x^4}{1+x^2} dx = \frac{1}{5} x^5 - \frac{1}{2} x^4 + x^2 - \log(x^2 + 1)$$

[In] integrate(x^4*(1-x)^2/(x^2+1),x, algorithm="fricas")

[Out] 1/5*x^5 - 1/2*x^4 + x^2 - log(x^2 + 1)

Sympy [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.73

$$\int \frac{(1-x)^2 x^4}{1+x^2} dx = \frac{x^5}{5} - \frac{x^4}{2} + x^2 - \log(x^2 + 1)$$

[In] integrate(x**4*(1-x)**2/(x**2+1),x)

[Out] x**5/5 - x**4/2 + x**2 - log(x**2 + 1)

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.85

$$\int \frac{(1-x)^2 x^4}{1+x^2} dx = \frac{1}{5} x^5 - \frac{1}{2} x^4 + x^2 - \log(x^2 + 1)$$

[In] integrate(x^4*(1-x)^2/(x^2+1),x, algorithm="maxima")

[Out] 1/5*x^5 - 1/2*x^4 + x^2 - log(x^2 + 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.85

$$\int \frac{(1-x)^2 x^4}{1+x^2} dx = \frac{1}{5} x^5 - \frac{1}{2} x^4 + x^2 - \log(x^2 + 1)$$

[In] integrate(x^4*(1-x)^2/(x^2+1),x, algorithm="giac")

[Out] 1/5*x^5 - 1/2*x^4 + x^2 - log(x^2 + 1)

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.85

$$\int \frac{(1-x)^2 x^4}{1+x^2} dx = x^2 - \ln(x^2 + 1) - \frac{x^4}{2} + \frac{x^5}{5}$$

[In] int((x^4*(x - 1)^2)/(x^2 + 1),x)

[Out] x^2 - log(x^2 + 1) - x^4/2 + x^5/5

3.307 $\int x^{-\log(x)} dx$

| | |
|---|------|
| Optimal result | 2900 |
| Rubi [F] | 2900 |
| Mathematica [A] (verified) | 2900 |
| Maple [F] | 2901 |
| Fricas [A] (verification not implemented) | 2901 |
| Sympy [F] | 2901 |
| Maxima [F] | 2901 |
| Giac [A] (verification not implemented) | 2902 |
| Mupad [F(-1)] | 2902 |

Optimal result

Integrand size = 6, antiderivative size = 23

$$\int x^{-\log(x)} dx = -\frac{1}{2} \sqrt[4]{e} \sqrt{\pi} \operatorname{erf}\left(\frac{1}{2} - \log(x)\right)$$

[Out] $1/2*\exp(1/4)*\text{Pi}^{(1/2)}*\operatorname{erf}(-1/2+\ln(x))$

Rubi [F]

$$\int x^{-\log(x)} dx = \int x^{-\log(x)} dx$$

[In] $\text{Int}[x^{(-\text{Log}[x])}, x]$

[Out] $\text{Defer}[\text{Int}[x^{(-\text{Log}[x])}, x]$

Rubi steps

$$\text{integral} = \int x^{-\log(x)} dx$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.09

$$\int x^{-\log(x)} dx = \frac{1}{2} \sqrt[4]{e} \sqrt{\pi} \operatorname{erf}\left(\frac{1}{2}(-1 + 2 \log(x))\right)$$

[In] $\text{Integrate}[x^{(-\text{Log}[x])}, x]$

[Out] $(E^{(1/4)}*\text{Sqrt}[\text{Pi}]*\text{Erf}[(-1 + 2*\text{Log}[x])/2])/2$

Maple [F]

$$\int x^{-\ln(x)} dx$$

[In] int(x[^](-ln(x)),x)

[Out] int(x[^](-ln(x)),x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.52

$$\int x^{-\log(x)} dx = \frac{1}{2} \sqrt{\pi} \operatorname{erf} \left(\log(x) - \frac{1}{2} \right) e^{\frac{1}{4}}$$

[In] integrate(x[^](-log(x)),x, algorithm="fricas")

[Out] 1/2*sqrt(pi)*erf(log(x) - 1/2)*e^{^(1/4)}

Sympy [F]

$$\int x^{-\log(x)} dx = \int x^{-\log(x)} dx$$

[In] integrate(x^{**}(-ln(x)),x)

[Out] Integral(x^{**}(-log(x)), x)

Maxima [F]

$$\int x^{-\log(x)} dx = \int \frac{1}{x^{\log(x)}} dx$$

[In] integrate(x[^](-log(x)),x, algorithm="maxima")

[Out] integrate(1/(x[^]log(x)), x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.52

$$\int x^{-\log(x)} dx = \frac{1}{2} \sqrt{\pi} \operatorname{erf} \left(\log(x) - \frac{1}{2} \right) e^{\frac{1}{4}}$$

[In] integrate(x^(-log(x)),x, algorithm="giac")

[Out] 1/2*sqrt(pi)*erf(log(x) - 1/2)*e^(1/4)

Mupad [F(-1)]

Timed out.

$$\int x^{-\log(x)} dx = \int e^{-\ln(x)^2} dx$$

[In] int(1/x^log(x),x)

[Out] int(exp(-log(x)^2), x)

$$3.308 \quad \int \frac{1-2x}{x^{2/3}(1+x)^2} dx$$

| | |
|---|------|
| Optimal result | 2903 |
| Rubi [A] (verified) | 2903 |
| Mathematica [A] (verified) | 2904 |
| Maple [A] (verified) | 2904 |
| Fricas [A] (verification not implemented) | 2904 |
| Sympy [A] (verification not implemented) | 2905 |
| Maxima [A] (verification not implemented) | 2905 |
| Giac [A] (verification not implemented) | 2905 |
| Mupad [B] (verification not implemented) | 2905 |

Optimal result

Integrand size = 16, antiderivative size = 12

$$\int \frac{1-2x}{x^{2/3}(1+x)^2} dx = \frac{3\sqrt[3]{x}}{1+x}$$

[Out] $3*x^{(1/3)}/(1+x)$

Rubi [A] (verified)

Time = 0.00 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.062$, Rules used = {75}

$$\int \frac{1-2x}{x^{2/3}(1+x)^2} dx = \frac{3\sqrt[3]{x}}{x+1}$$

[In] $\text{Int}[(1 - 2*x)/(x^{(2/3)}*(1 + x)^2), x]$

[Out] $(3*x^{(1/3)})/(1 + x)$

Rule 75

```
Int[((a_.) + (b_.)*(x_))*((c_.) + (d_.)*(x_))^(n_.)*((e_.) + (f_.)*(x_))^(p
_.), x_Symbol] :> Simp[b*(c + d*x)^(n + 1)*((e + f*x)^(p + 1)/(d*f*(n + p +
2))), x] /; FreeQ[{a, b, c, d, e, f, n, p}, x] && NeQ[n + p + 2, 0] && EqQ
[a*d*f*(n + p + 2) - b*(d*e*(n + 1) + c*f*(p + 1)), 0]
```

Rubi steps

$$\text{integral} = \frac{3\sqrt[3]{x}}{1+x}$$

Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \frac{1-2x}{x^{2/3}(1+x)^2} dx = \frac{3\sqrt[3]{x}}{1+x}$$

[In] Integrate[(1 - 2*x)/(x^(2/3)*(1 + x)^2),x]

[Out] (3*x^(1/3))/(1 + x)

Maple [A] (verified)

Time = 0.22 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.92

| method | result |
|------------------|--|
| gospers | $\frac{3x^{\frac{1}{3}}}{1+x}$ |
| trager | $\frac{3x^{\frac{1}{3}}}{1+x}$ |
| risch | $\frac{3x^{\frac{1}{3}}}{1+x}$ |
| derivativdivides | $-\frac{-x^{\frac{1}{3}}-1}{x^{\frac{2}{3}}-x^{\frac{1}{3}}+1} - \frac{1}{1+x^{\frac{1}{3}}}$ |
| default | $-\frac{-x^{\frac{1}{3}}-1}{x^{\frac{2}{3}}-x^{\frac{1}{3}}+1} - \frac{1}{1+x^{\frac{1}{3}}}$ |
| meijerg | $\frac{3x^{\frac{1}{3}}}{3+3x} + \frac{2\ln(1+x^{\frac{1}{3}})}{3} - \frac{\ln(x^{\frac{2}{3}}-x^{\frac{1}{3}}+1)}{3} + \frac{2\sqrt{3}\arctan\left(\frac{\sqrt{3}x^{\frac{1}{3}}}{2-x^{\frac{1}{3}}}\right)}{3} + \frac{2x^{\frac{1}{3}}}{1+x} - \frac{2x^{\frac{1}{3}}\left(\frac{\ln(1+x^{\frac{1}{3}})}{x^{\frac{1}{3}}} - \frac{\ln(x^{\frac{2}{3}}-x^{\frac{1}{3}}+1)}{2x^{\frac{1}{3}}}\right)}{3}$ |

[In] int((1-2*x)/(1+x)^2/x^(2/3),x,method=_RETURNVERBOSE)

[Out] 3*x^(1/3)/(1+x)

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int \frac{1-2x}{x^{2/3}(1+x)^2} dx = \frac{3x^{\frac{1}{3}}}{x+1}$$

[In] integrate((1-2*x)/(1+x)^2/x^(2/3),x, algorithm="fricas")

[Out] 3*x^(1/3)/(x + 1)

Sympy [A] (verification not implemented)

Time = 0.23 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.67

$$\int \frac{1-2x}{x^{2/3}(1+x)^2} dx = \frac{3\sqrt[3]{x}}{x+1}$$

[In] integrate((1-2*x)/(1+x)**2/x**(2/3),x)

[Out] 3*x**(1/3)/(x + 1)

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int \frac{1-2x}{x^{2/3}(1+x)^2} dx = \frac{3x^{1/3}}{x+1}$$

[In] integrate((1-2*x)/(1+x)^2/x^(2/3),x, algorithm="maxima")

[Out] 3*x^(1/3)/(x + 1)

Giac [A] (verification not implemented)

none

Time = 0.26 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int \frac{1-2x}{x^{2/3}(1+x)^2} dx = \frac{3x^{1/3}}{x+1}$$

[In] integrate((1-2*x)/(1+x)^2/x^(2/3),x, algorithm="giac")

[Out] 3*x^(1/3)/(x + 1)

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int \frac{1-2x}{x^{2/3}(1+x)^2} dx = \frac{3x^{1/3}}{x+1}$$

[In] int(-(2*x - 1)/(x^(2/3)*(x + 1)^2),x)

[Out] (3*x^(1/3))/(x + 1)

3.309 $\int \cos^2 \left(\frac{\pi x^2}{\sqrt{2}} \right) dx$

| | |
|---|------|
| Optimal result | 2906 |
| Rubi [A] (verified) | 2906 |
| Mathematica [A] (verified) | 2907 |
| Maple [B] (verified) | 2907 |
| Fricas [A] (verification not implemented) | 2908 |
| Sympy [A] (verification not implemented) | 2908 |
| Maxima [C] (verification not implemented) | 2908 |
| Giac [C] (verification not implemented) | 2909 |
| Mupad [F(-1)] | 2909 |

Optimal result

Integrand size = 13, antiderivative size = 23

$$\int \cos^2 \left(\frac{\pi x^2}{\sqrt{2}} \right) dx = \frac{x}{2} + \frac{\text{FresnelC} \left(2^{3/4} x \right)}{2 \cdot 2^{3/4}}$$

[Out] 1/2*x+1/4*FresnelC(2^(3/4)*x)*2^(1/4)

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.154$, Rules used = {3439, 3433}

$$\int \cos^2 \left(\frac{\pi x^2}{\sqrt{2}} \right) dx = \frac{\text{FresnelC} \left(2^{3/4} x \right)}{2 \cdot 2^{3/4}} + \frac{x}{2}$$

[In] Int[Cos[(Pi*x^2)/Sqrt[2]]^2,x]

[Out] x/2 + FresnelC[2^(3/4)*x]/(2*2^(3/4))

Rule 3433

Int[Cos[(d_.)*((e_.) + (f_.)*(x_))^(2)], x_Symbol] := Simp[(Sqrt[Pi/2]/(f*Rt[d, 2]))*FresnelC[Sqrt[2/Pi]*Rt[d, 2]*(e + f*x)], x] /; FreeQ[{d, e, f}, x]

Rule 3439

Int[((a_.) + Cos[(c_.) + (d_.)*((e_.) + (f_.)*(x_))^(n_)])*(b_.))^(p_), x_Symbol] := Int[ExpandTrigReduce[(a + b*Cos[c + d*(e + f*x)^n])^p, x], x] /; FreeQ[{a, b, c, d, e, f}, x] && IGtQ[p, 1] && IGtQ[n, 1]

Rubi steps

$$\begin{aligned} \text{integral} &= \int \left(\frac{1}{2} + \frac{1}{2} \cos(\sqrt{2}\pi x^2) \right) dx \\ &= \frac{x}{2} + \frac{1}{2} \int \cos(\sqrt{2}\pi x^2) dx \\ &= \frac{x}{2} + \frac{\text{FresnelC}(2^{3/4}x)}{2 \cdot 2^{3/4}} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 22, normalized size of antiderivative = 0.96

$$\int \cos^2\left(\frac{\pi x^2}{\sqrt{2}}\right) dx = \frac{1}{4} \left(2x + \sqrt[4]{2} \text{FresnelC}(2^{3/4}x) \right)$$

[In] Integrate[Cos[(Pi*x^2)/Sqrt[2]]^2,x]

[Out] (2*x + 2^(1/4)*FresnelC[2^(3/4)*x])/4

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 33 vs. 2(15) = 30.

Time = 0.18 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.48

| method | result | size |
|---------|---|------|
| default | $\frac{x}{2} + \frac{\sqrt{2}\sqrt{\pi} \text{FresnelC}\left(\frac{2\sqrt{\pi}x}{\sqrt{\pi\sqrt{2}}}\right)}{4\sqrt{\pi\sqrt{2}}}$ | 34 |
| risch | $\frac{x}{2} + \frac{\sqrt{\pi} \operatorname{erf}\left(\sqrt{i\pi\sqrt{2}x}\right)}{8\sqrt{i\pi\sqrt{2}}} + \frac{\sqrt{\pi} \operatorname{erf}\left(\sqrt{-i\pi\sqrt{2}x}\right)}{8\sqrt{-i\pi\sqrt{2}}}$ | 57 |

[In] int(cos(1/2*Pi*x^2*2^(1/2))^2,x,method=_RETURNVERBOSE)

[Out] 1/2*x+1/4*2^(1/2)*Pi^(1/2)/(Pi*2^(1/2))^(1/2)*FresnelC(2*Pi^(1/2)/(Pi*2^(1/2))^(1/2)*x)

Fricas [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.65

$$\int \cos^2 \left(\frac{\pi x^2}{\sqrt{2}} \right) dx = \frac{1}{4} \cdot 2^{\frac{1}{4}} C \left(2^{\frac{3}{4}} x \right) + \frac{1}{2} x$$

[In] integrate(cos(1/2*pi*x^2*2^(1/2))^2,x, algorithm="fricas")

[Out] 1/4*2^(1/4)*fresnel_cos(2^(3/4)*x) + 1/2*x

Sympy [A] (verification not implemented)

Time = 1.34 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.17

$$\int \cos^2 \left(\frac{\pi x^2}{\sqrt{2}} \right) dx = \frac{x}{2} + \frac{\sqrt[4]{2} C \left(2^{\frac{3}{4}} x \right) \Gamma \left(\frac{1}{4} \right)}{16 \Gamma \left(\frac{5}{4} \right)}$$

[In] integrate(cos(1/2*pi*x**2*2**(1/2))**2,x)

[Out] x/2 + 2**(1/4)*fresnelc(2**(3/4)*x)*gamma(1/4)/(16*gamma(5/4))

Maxima [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.30 (sec) , antiderivative size = 46, normalized size of antiderivative = 2.00

$$\int \cos^2 \left(\frac{\pi x^2}{\sqrt{2}} \right) dx = -\frac{2^{\frac{1}{4}} \pi^2 \left((i-1) \operatorname{erf} \left(\sqrt{i} \sqrt{2} \pi x \right) - (i+1) \operatorname{erf} \left(\sqrt{-i} \sqrt{2} \pi x \right) \right) - 8 \pi^2 x}{16 \pi^2}$$

[In] integrate(cos(1/2*pi*x^2*2^(1/2))^2,x, algorithm="maxima")

[Out] -1/16*(2^(1/4)*pi^2*((I - 1)*erf(sqrt(I*sqrt(2)*pi)*x) - (I + 1)*erf(sqrt(-I*sqrt(2)*pi)*x)) - 8*pi^2*x/pi^2

Giac [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.30 (sec) , antiderivative size = 42, normalized size of antiderivative = 1.83

$$\int \cos^2\left(\frac{\pi x^2}{\sqrt{2}}\right) dx = -\left(\frac{1}{16}i + \frac{1}{16}\right) \cdot 2^{\frac{1}{4}} \operatorname{erf}\left(\left(\frac{1}{2}i - \frac{1}{2}\right) \sqrt{2}\sqrt{\sqrt{2}\pi x}\right) \\ + \left(\frac{1}{16}i - \frac{1}{16}\right) \cdot 2^{\frac{1}{4}} \operatorname{erf}\left(-\left(\frac{1}{2}i + \frac{1}{2}\right) \sqrt{2}\sqrt{\sqrt{2}\pi x}\right) + \frac{1}{2}x$$

[In] integrate(cos(1/2*pi*x^2*2^(1/2))^2,x, algorithm="giac")

[Out] -(1/16*I + 1/16)*2^(1/4)*erf((1/2*I - 1/2)*sqrt(2)*sqrt(sqrt(2)*pi)*x) + (1/16*I - 1/16)*2^(1/4)*erf(-(1/2*I + 1/2)*sqrt(2)*sqrt(sqrt(2)*pi)*x) + 1/2*x

Mupad [F(-1)]

Timed out.

$$\int \cos^2\left(\frac{\pi x^2}{\sqrt{2}}\right) dx = \int \cos\left(\frac{\sqrt{2}\Pi x^2}{2}\right)^2 dx$$

[In] int(cos((2^(1/2)*Pi*x^2)/2)^2,x)

[Out] int(cos((2^(1/2)*Pi*x^2)/2)^2, x)

3.310 $\int \frac{1}{1+\cos(x)+\sin(x)} dx$

| | |
|---|------|
| Optimal result | 2910 |
| Rubi [A] (verified) | 2910 |
| Mathematica [B] (verified) | 2911 |
| Maple [A] (verified) | 2911 |
| Fricas [B] (verification not implemented) | 2912 |
| Sympy [A] (verification not implemented) | 2912 |
| Maxima [A] (verification not implemented) | 2912 |
| Giac [A] (verification not implemented) | 2912 |
| Mupad [B] (verification not implemented) | 2913 |

Optimal result

Integrand size = 8, antiderivative size = 9

$$\int \frac{1}{1 + \cos(x) + \sin(x)} dx = \log \left(1 + \tan \left(\frac{x}{2} \right) \right)$$

[Out] $\ln(1+\tan(1/2*x))$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 9, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {3203, 31}

$$\int \frac{1}{1 + \cos(x) + \sin(x)} dx = \log \left(\tan \left(\frac{x}{2} \right) + 1 \right)$$

[In] $\text{Int}[(1 + \text{Cos}[x] + \text{Sin}[x])^{-1}, x]$

[Out] $\text{Log}[1 + \text{Tan}[x/2]]$

Rule 31

$\text{Int}[(a + (b \cdot x))^{-1}, x_Symbol] \rightarrow \text{Simp}[\text{Log}[\text{RemoveContent}[a + b \cdot x, x]]/b, x] \text{ ; FreeQ}\{a, b\}, x]$

Rule 3203

$\text{Int}[(\cos[(d + e \cdot x)] \cdot (b + a + c \cdot \sin[(d + e \cdot x)])^{-1}, x_Symbol] \rightarrow \text{Module}\{f = \text{FreeFactors}[\text{Tan}[(d + e \cdot x)/2], x]\}, \text{Dist}[2 \cdot (f/e), \text{Subst}[\text{Int}[1/(a + b + 2 \cdot c \cdot f \cdot x + (a - b) \cdot f^2 \cdot x^2), x], x, \text{Tan}[(d + e \cdot x)/2]/f], x] \text{ ; FreeQ}\{a, b, c, d, e\}, x \ \&\& \ \text{NeQ}[a^2 - b^2 - c^2, 0]$

Rubi steps

$$\begin{aligned} \text{integral} &= 2\text{Subst}\left(\int \frac{1}{2+2x} dx, x, \tan\left(\frac{x}{2}\right)\right) \\ &= \log\left(1 + \tan\left(\frac{x}{2}\right)\right) \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 24 vs. 2(9) = 18.

Time = 0.03 (sec) , antiderivative size = 24, normalized size of antiderivative = 2.67

$$\int \frac{1}{1 + \cos(x) + \sin(x)} dx = -\log\left(\cos\left(\frac{x}{2}\right)\right) + \log\left(\cos\left(\frac{x}{2}\right) + \sin\left(\frac{x}{2}\right)\right)$$

[In] Integrate[(1 + Cos[x] + Sin[x])^(-1),x]

[Out] -Log[Cos[x/2]] + Log[Cos[x/2] + Sin[x/2]]

Maple [A] (verified)

Time = 0.17 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.89

| method | result | size |
|---------------|--|------|
| default | $\ln\left(1 + \tan\left(\frac{x}{2}\right)\right)$ | 8 |
| parallelrisch | $\ln\left(1 + \tan\left(\frac{x}{2}\right)\right)$ | 8 |
| norman | $\ln\left(2 + 2 \tan\left(\frac{x}{2}\right)\right)$ | 10 |
| risch | $\ln(i + e^{ix}) - \ln(e^{ix} + 1)$ | 21 |

[In] int(1/(1+cos(x)+sin(x)),x,method=_RETURNVERBOSE)

[Out] ln(1+tan(1/2*x))

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 17 vs. $2(7) = 14$.

Time = 0.26 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.89

$$\int \frac{1}{1 + \cos(x) + \sin(x)} dx = -\frac{1}{2} \log\left(\frac{1}{2} \cos(x) + \frac{1}{2}\right) + \frac{1}{2} \log(\sin(x) + 1)$$

[In] integrate(1/(1+cos(x)+sin(x)),x, algorithm="fricas")

[Out] -1/2*log(1/2*cos(x) + 1/2) + 1/2*log(sin(x) + 1)

Sympy [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \frac{1}{1 + \cos(x) + \sin(x)} dx = \log\left(\tan\left(\frac{x}{2}\right) + 1\right)$$

[In] integrate(1/(1+cos(x)+sin(x)),x)

[Out] log(tan(x/2) + 1)

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.33

$$\int \frac{1}{1 + \cos(x) + \sin(x)} dx = \log\left(\frac{\sin(x)}{\cos(x) + 1} + 1\right)$$

[In] integrate(1/(1+cos(x)+sin(x)),x, algorithm="maxima")

[Out] log(sin(x)/(cos(x) + 1) + 1)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.89

$$\int \frac{1}{1 + \cos(x) + \sin(x)} dx = \log\left(\left|\tan\left(\frac{1}{2}x\right) + 1\right|\right)$$

[In] integrate(1/(1+cos(x)+sin(x)),x, algorithm="giac")

[Out] log(abs(tan(1/2*x) + 1))

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 7, normalized size of antiderivative = 0.78

$$\int \frac{1}{1 + \cos(x) + \sin(x)} dx = \ln \left(\tan\left(\frac{x}{2}\right) + 1 \right)$$

[In] int(1/(cos(x) + sin(x) + 1),x)

[Out] log(tan(x/2) + 1)

3.311 $\int \tan^5(x) dx$

| | |
|---|------|
| Optimal result | 2914 |
| Rubi [A] (verified) | 2914 |
| Mathematica [A] (verified) | 2915 |
| Maple [A] (verified) | 2915 |
| Fricas [A] (verification not implemented) | 2916 |
| Sympy [A] (verification not implemented) | 2916 |
| Maxima [A] (verification not implemented) | 2916 |
| Giac [A] (verification not implemented) | 2916 |
| Mupad [B] (verification not implemented) | 2917 |

Optimal result

Integrand size = 4, antiderivative size = 22

$$\int \tan^5(x) dx = -\log(\cos(x)) - \frac{\tan^2(x)}{2} + \frac{\tan^4(x)}{4}$$

[Out] $-\ln(\cos(x)) - 1/2 * \tan(x)^2 + 1/4 * \tan(x)^4$

Rubi [A] (verified)

Time = 0.01 (sec), antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {3554, 3556}

$$\int \tan^5(x) dx = \frac{\tan^4(x)}{4} - \frac{\tan^2(x)}{2} - \log(\cos(x))$$

[In] $\text{Int}[\text{Tan}[x]^5, x]$

[Out] $-\text{Log}[\text{Cos}[x]] - \text{Tan}[x]^2/2 + \text{Tan}[x]^4/4$

Rule 3554

$\text{Int}[(b \cdot \tan[(c \cdot x) + (d \cdot x)])^n, x_Symbol] \rightarrow \text{Simp}[b \cdot ((b \cdot \tan[c + d \cdot x])^{n-1}) / (d \cdot (n-1)), x] - \text{Dist}[b^2, \text{Int}[(b \cdot \tan[c + d \cdot x])^{n-2}, x], x] /;$ $\text{FreeQ}\{b, c, d, x\} \ \&\& \ \text{GtQ}[n, 1]$

Rule 3556

$\text{Int}[\tan[(c \cdot x) + (d \cdot x)], x_Symbol] \rightarrow \text{Simp}[-\text{Log}[\text{RemoveContent}[\text{Cos}[c + d \cdot x], x]] / d, x] /;$ $\text{FreeQ}\{c, d, x\}$

Rubi steps

$$\begin{aligned}
\text{integral} &= \frac{\tan^4(x)}{4} - \int \tan^3(x) dx \\
&= -\frac{1}{2} \tan^2(x) + \frac{\tan^4(x)}{4} + \int \tan(x) dx \\
&= -\log(\cos(x)) - \frac{\tan^2(x)}{2} + \frac{\tan^4(x)}{4}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \tan^5(x) dx = -\log(\cos(x)) - \frac{\tan^2(x)}{2} + \frac{\tan^4(x)}{4}$$

[In] Integrate[Tan[x]^5,x]

[Out] -Log[Cos[x]] - Tan[x]^2/2 + Tan[x]^4/4

Maple [A] (verified)

Time = 0.06 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.05

| method | result | size |
|------------------|---|------|
| derivativdivides | $\frac{\tan(x)^4}{4} - \frac{\tan(x)^2}{2} + \frac{\ln(1+\tan(x)^2)}{2}$ | 23 |
| default | $\frac{\tan(x)^4}{4} - \frac{\tan(x)^2}{2} + \frac{\ln(1+\tan(x)^2)}{2}$ | 23 |
| norman | $\frac{\tan(x)^4}{4} - \frac{\tan(x)^2}{2} + \frac{\ln(1+\tan(x)^2)}{2}$ | 23 |
| parallelrisc | $\frac{\tan(x)^4}{4} - \frac{\tan(x)^2}{2} + \frac{\ln(1+\tan(x)^2)}{2}$ | 23 |
| risc | $i x - \frac{4(e^{6ix} + e^{4ix} + e^{2ix})}{(e^{2ix} + 1)^4} - \ln(e^{2ix} + 1)$ | 43 |

[In] int(tan(x)^5,x,method=_RETURNVERBOSE)

[Out] 1/4*tan(x)^4-1/2*tan(x)^2+1/2*ln(1+tan(x)^2)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.09

$$\int \tan^5(x) dx = \frac{1}{4} \tan(x)^4 - \frac{1}{2} \tan(x)^2 - \frac{1}{2} \log\left(\frac{1}{\tan(x)^2 + 1}\right)$$

[In] integrate(tan(x)^5,x, algorithm="fricas")

[Out] 1/4*tan(x)^4 - 1/2*tan(x)^2 - 1/2*log(1/(tan(x)^2 + 1))

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.91

$$\int \tan^5(x) dx = -\frac{4 \cos^2(x) - 1}{4 \cos^4(x)} - \log(\cos(x))$$

[In] integrate(tan(x)**5,x)

[Out] -(4*cos(x)**2 - 1)/(4*cos(x)**4) - log(cos(x))

Maxima [A] (verification not implemented)

none

Time = 0.19 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.55

$$\int \tan^5(x) dx = \frac{4 \sin(x)^2 - 3}{4 (\sin(x)^4 - 2 \sin(x)^2 + 1)} - \frac{1}{2} \log(\sin(x)^2 - 1)$$

[In] integrate(tan(x)^5,x, algorithm="maxima")

[Out] 1/4*(4*sin(x)^2 - 3)/(sin(x)^4 - 2*sin(x)^2 + 1) - 1/2*log(sin(x)^2 - 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \tan^5(x) dx = \frac{1}{4} \tan(x)^4 - \frac{1}{2} \tan(x)^2 + \frac{1}{2} \log(\tan(x)^2 + 1)$$

[In] integrate(tan(x)^5,x, algorithm="giac")

[Out] 1/4*tan(x)^4 - 1/2*tan(x)^2 + 1/2*log(tan(x)^2 + 1)

Mupad [B] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.82

$$\int \tan^5(x) dx = \frac{\tan(x)^4}{4} - \frac{\tan(x)^2}{2} - \ln(\cos(x))$$

[In] int(tan(x)^5,x)

[Out] tan(x)^4/4 - tan(x)^2/2 - log(cos(x))

3.312 $\int \sqrt{1 + \frac{1}{x}} dx$

| | |
|---|------|
| Optimal result | 2918 |
| Rubi [A] (verified) | 2918 |
| Mathematica [A] (verified) | 2919 |
| Maple [B] (verified) | 2920 |
| Fricas [B] (verification not implemented) | 2920 |
| Sympy [A] (verification not implemented) | 2920 |
| Maxima [A] (verification not implemented) | 2921 |
| Giac [A] (verification not implemented) | 2921 |
| Mupad [B] (verification not implemented) | 2921 |

Optimal result

Integrand size = 9, antiderivative size = 22

$$\int \sqrt{1 + \frac{1}{x}} dx = \sqrt{1 + \frac{1}{x}} + \operatorname{arctanh}\left(\sqrt{1 + \frac{1}{x}}\right)$$

[Out] $(1+1/x)^{(1/2)}*x+\operatorname{arctanh}((1+1/x)^{(1/2)})$

Rubi [A] (verified)

Time = 0.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.444$, Rules used = {248, 43, 65, 213}

$$\int \sqrt{1 + \frac{1}{x}} dx = \operatorname{arctanh}\left(\sqrt{\frac{1}{x} + 1}\right) + \sqrt{\frac{1}{x} + 1}x$$

[In] `Int[Sqrt[1 + x^(-1)],x]`

[Out] `Sqrt[1 + x^(-1)]*x + ArcTanh[Sqrt[1 + x^(-1)]]`

Rule 43

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] :> Simp[
(a + b*x)^(m + 1)*((c + d*x)^n/(b*(m + 1))), x] - Dist[d*(n/(b*(m + 1))), I
nt[(a + b*x)^(m + 1)*(c + d*x)^(n - 1), x], x] /; FreeQ[{a, b, c, d, n}, x]
&& NeQ[b*c - a*d, 0] && ILtQ[m, -1] && !IntegerQ[n] && GtQ[n, 0]
```

Rule 65

```
Int[((a_.) + (b_.)*(x_))^(m_)*((c_.) + (d_.)*(x_))^(n_), x_Symbol] := With[
{p = Denominator[m]}, Dist[p/b, Subst[Int[x^(p*(m + 1) - 1)*(c - a*(d/b) +
d*(x^p/b))^n, x], x, (a + b*x)^(1/p)], x] /; FreeQ[{a, b, c, d}, x] && NeQ
[b*c - a*d, 0] && LtQ[-1, m, 0] && LeQ[-1, n, 0] && LeQ[Denominator[n], Den
ominator[m]] && IntLinearQ[a, b, c, d, m, n, x]
```

Rule 213

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(-Rt[-a, 2]*Rt[b, 2])^(-
1))*ArcTanh[Rt[b, 2]*(x/Rt[-a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] &&
(LtQ[a, 0] || GtQ[b, 0])
```

Rule 248

```
Int[((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := -Subst[Int[(a + b/x^n)^p/x^
2, x], x, 1/x] /; FreeQ[{a, b, p}, x] && ILtQ[n, 0]
```

Rubi steps

$$\begin{aligned}
\text{integral} &= -\text{Subst}\left(\int \frac{\sqrt{1+x}}{x^2} dx, x, \frac{1}{x}\right) \\
&= \sqrt{1+\frac{1}{x}}x - \frac{1}{2}\text{Subst}\left(\int \frac{1}{x\sqrt{1+x}} dx, x, \frac{1}{x}\right) \\
&= \sqrt{1+\frac{1}{x}}x - \text{Subst}\left(\int \frac{1}{-1+x^2} dx, x, \sqrt{1+\frac{1}{x}}\right) \\
&= \sqrt{1+\frac{1}{x}}x + \text{arctanh}\left(\sqrt{1+\frac{1}{x}}\right)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.04 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.00

$$\int \sqrt{1+\frac{1}{x}} dx = \sqrt{1+\frac{1}{x}}x + \text{arctanh}\left(\sqrt{1+\frac{1}{x}}\right)$$

```
[In] Integrate[Sqrt[1 + x^(-1)], x]
```

```
[Out] Sqrt[1 + x^(-1)]*x + ArcTanh[Sqrt[1 + x^(-1)]]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 38 vs. $2(18) = 36$.

Time = 0.11 (sec) , antiderivative size = 39, normalized size of antiderivative = 1.77

| method | result | size |
|---------|---|------|
| trager | $\sqrt{-\frac{-1-x}{x}} x - \frac{\ln\left(2\sqrt{-\frac{-1-x}{x}} x - 2x - 1\right)}{2}$ | 39 |
| default | $\frac{\sqrt{\frac{1+x}{x}} x \left(2\sqrt{x^2+x} + \ln\left(\frac{1}{2} + x + \sqrt{x^2+x}\right)\right)}{2\sqrt{x(1+x)}}$ | 41 |
| risch | $x\sqrt{\frac{1+x}{x}} + \frac{\ln\left(\frac{1}{2} + x + \sqrt{x^2+x}\right)\sqrt{\frac{1+x}{x}}\sqrt{x(1+x)}}{2+2x}$ | 47 |

[In] `int((1+1/x)^(1/2),x,method=_RETURNVERBOSE)`

[Out] `(-(-1-x)/x)^(1/2)*x-1/2*ln(2*(-(-1-x)/x)^(1/2)*x-2*x-1)`

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 40 vs. $2(18) = 36$.

Time = 0.24 (sec) , antiderivative size = 40, normalized size of antiderivative = 1.82

$$\int \sqrt{1 + \frac{1}{x}} dx = x\sqrt{\frac{x+1}{x}} + \frac{1}{2} \log\left(\sqrt{\frac{x+1}{x}} + 1\right) - \frac{1}{2} \log\left(\sqrt{\frac{x+1}{x}} - 1\right)$$

[In] `integrate((1+1/x)^(1/2),x, algorithm="fricas")`

[Out] `x*sqrt((x + 1)/x) + 1/2*log(sqrt((x + 1)/x) + 1) - 1/2*log(sqrt((x + 1)/x) - 1)`

Sympy [A] (verification not implemented)

Time = 0.76 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.77

$$\int \sqrt{1 + \frac{1}{x}} dx = \sqrt{x}\sqrt{x+1} + \operatorname{asinh}(\sqrt{x})$$

[In] `integrate((1+1/x)**(1/2),x)`

[Out] `sqrt(x)*sqrt(x + 1) + asinh(sqrt(x))`

Maxima [A] (verification not implemented)

none

Time = 0.18 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.55

$$\int \sqrt{1 + \frac{1}{x}} dx = x\sqrt{\frac{1}{x} + 1} + \frac{1}{2} \log \left(\sqrt{\frac{1}{x} + 1} + 1 \right) - \frac{1}{2} \log \left(\sqrt{\frac{1}{x} + 1} - 1 \right)$$

[In] integrate((1+1/x)^(1/2),x, algorithm="maxima")

[Out] x*sqrt(1/x + 1) + 1/2*log(sqrt(1/x + 1) + 1) - 1/2*log(sqrt(1/x + 1) - 1)

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.41

$$\int \sqrt{1 + \frac{1}{x}} dx = -\frac{1}{2} \log \left(\left| -2x + 2\sqrt{x^2 + x} - 1 \right| \right) \operatorname{sgn}(x) + \sqrt{x^2 + x} \operatorname{sgn}(x)$$

[In] integrate((1+1/x)^(1/2),x, algorithm="giac")

[Out] -1/2*log(abs(-2*x + 2*sqrt(x^2 + x) - 1))*sgn(x) + sqrt(x^2 + x)*sgn(x)

Mupad [B] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 38, normalized size of antiderivative = 1.73

$$\int \sqrt{1 + \frac{1}{x}} dx = x\sqrt{\frac{1}{x} + 1} + \frac{x \ln \left(x + \sqrt{x^2 + x} + \frac{1}{2} \right) \sqrt{\frac{1}{x} + 1}}{2\sqrt{x^2 + x}}$$

[In] int((1/x + 1)^(1/2),x)

[Out] x*(1/x + 1)^(1/2) + (x*log(x + (x + x^2)^(1/2) + 1/2)*(1/x + 1)^(1/2))/(2*(x + x^2)^(1/2))

3.313 $\int e^{\cos(x)} \cos(2x + \sin(x)) dx$

| | |
|---|------|
| Optimal result | 2922 |
| Rubi [F] | 2922 |
| Mathematica [A] (verified) | 2922 |
| Maple [C] (verified) | 2923 |
| Fricas [B] (verification not implemented) | 2923 |
| Sympy [F] | 2923 |
| Maxima [F] | 2924 |
| Giac [B] (verification not implemented) | 2924 |
| Mupad [B] (verification not implemented) | 2924 |

Optimal result

Integrand size = 12, antiderivative size = 21

$$\int e^{\cos(x)} \cos(2x + \sin(x)) dx = 2e^{\cos(x)} \cos\left(\frac{x}{2} + \sin(x)\right) \sin\left(\frac{x}{2}\right)$$

[Out] 2*exp(cos(x))*cos(1/2*x+sin(x))*sin(1/2*x)

Rubi [F]

$$\int e^{\cos(x)} \cos(2x + \sin(x)) dx = \int e^{\cos(x)} \cos(2x + \sin(x)) dx$$

[In] Int[E^Cos[x]*Cos[2*x + Sin[x]],x]

[Out] Defer[Int][E^Cos[x]*Cos[2*x + Sin[x]], x]

Rubi steps

$$\text{integral} = \int e^{\cos(x)} \cos(2x + \sin(x)) dx$$

Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.00

$$\int e^{\cos(x)} \cos(2x + \sin(x)) dx = 2e^{\cos(x)} \cos\left(\frac{x}{2} + \sin(x)\right) \sin\left(\frac{x}{2}\right)$$

[In] Integrate[E^Cos[x]*Cos[2*x + Sin[x]],x]

[Out] 2*E^Cos[x]*Cos[x/2 + Sin[x]]*Sin[x/2]

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 2.17 (sec) , antiderivative size = 52, normalized size of antiderivative = 2.48

| method | result | size |
|--------|---|------|
| risch | $-\frac{ie^{ix}e^{e^{ix}}}{2} + \frac{ie^{e^{ix}}}{2} + \frac{ie^{-ix}e^{-ix}}{2} - \frac{ie^{e^{-ix}}}{2}$ | 52 |

[In] `int(exp(cos(x))*cos(2*x+sin(x)),x,method=_RETURNVERBOSE)`

[Out] $-1/2*I*\exp(I*x)*\exp(\exp(I*x))+1/2*I*\exp(\exp(I*x))+1/2*I*\exp(1/\exp(I*x))*\exp(-I*x)-1/2*I*\exp(1/\exp(I*x))$

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 84 vs. $2(16) = 32$.

Time = 0.26 (sec) , antiderivative size = 84, normalized size of antiderivative = 4.00

$$\begin{aligned} & \int e^{\cos(x)} \cos(2x + \sin(x)) dx \\ &= (2 \cos(x) - 1) \cos\left(\frac{2\left(x \tan\left(\frac{1}{2}x\right)^2 + x + \tan\left(\frac{1}{2}x\right)\right)}{\tan\left(\frac{1}{2}x\right)^2 + 1}\right) e^{\cos(x)} \sin(x) \\ & \quad - (2 \cos(x)^2 - \cos(x) - 1) e^{\cos(x)} \sin\left(\frac{2\left(x \tan\left(\frac{1}{2}x\right)^2 + x + \tan\left(\frac{1}{2}x\right)\right)}{\tan\left(\frac{1}{2}x\right)^2 + 1}\right) \end{aligned}$$

[In] `integrate(exp(cos(x))*cos(2*x+sin(x)),x, algorithm="fricas")`

[Out] $(2*\cos(x) - 1)*\cos(2*(x*\tan(1/2*x)^2 + x + \tan(1/2*x))/(\tan(1/2*x)^2 + 1))*e^{\cos(x)}*\sin(x) - (2*\cos(x)^2 - \cos(x) - 1)*e^{\cos(x)}*\sin(2*(x*\tan(1/2*x)^2 + x + \tan(1/2*x))/(\tan(1/2*x)^2 + 1))$

Sympy [F]

$$\int e^{\cos(x)} \cos(2x + \sin(x)) dx = \int e^{\cos(x)} \cos(2x + \sin(x)) dx$$

[In] `integrate(exp(cos(x))*cos(2*x+sin(x)),x)`

[Out] `Integral(exp(cos(x))*cos(2*x + sin(x)), x)`

Maxima [F]

$$\int e^{\cos(x)} \cos(2x + \sin(x)) dx = \int \cos(2x + \sin(x)) e^{\cos(x)} dx$$

[In] integrate(exp(cos(x))*cos(2*x+sin(x)),x, algorithm="maxima")

[Out] 1/4*e^cos(x)*sin(2*x + sin(x)) + 1/2*e^cos(x)*sin(x + sin(x)) - 1/2*e^cos(x)*sin(sin(x)) - 1/4*integrate(cos(3*x + sin(x))*e^cos(x), x)

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 136 vs. 2(16) = 32.

Time = 0.28 (sec) , antiderivative size = 136, normalized size of antiderivative = 6.48

$$\int e^{\cos(x)} \cos(2x + \sin(x)) dx$$

$$= \frac{\cos(x)^3 e^{\cos(x)} \sin(2x + \sin(x)) - \cos(2x + \sin(x)) \cos(x)^2 e^{\cos(x)} \sin(x) + \cos(x) e^{\cos(x)} \sin(2x + \sin(x))}{\cos(x)^4 + 2 \cos(x)^2 \sin(x)^2 + \sin(x)^4}$$

[In] integrate(exp(cos(x))*cos(2*x+sin(x)),x, algorithm="giac")

[Out] (cos(x)^3*e^cos(x)*sin(2*x + sin(x)) - cos(2*x + sin(x))*cos(x)^2*e^cos(x)*sin(x) + cos(x)*e^cos(x)*sin(2*x + sin(x))*sin(x)^2 - cos(2*x + sin(x))*e^cos(x)*sin(x)^3 - cos(x)^2*e^cos(x)*sin(2*x + sin(x)) + 2*cos(2*x + sin(x))*cos(x)*e^cos(x)*sin(x) + e^cos(x)*sin(2*x + sin(x))*sin(x)^2)/(cos(x)^4 + 2*cos(x)^2*sin(x)^2 + sin(x)^4)

Mupad [B] (verification not implemented)

Time = 17.19 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.71

$$\int e^{\cos(x)} \cos(2x + \sin(x)) dx = e^{\cos(x)} (\sin(x + \sin(x)) - \sin(\sin(x)))$$

[In] int(exp(cos(x))*cos(2*x + sin(x)),x)

[Out] exp(cos(x))*(sin(x + sin(x)) - sin(sin(x)))

$$3.314 \quad \int \frac{-1+2x+3 \log(x)}{x^2+2x^4+x \log(x)} dx$$

| | |
|---|------|
| Optimal result | 2925 |
| Rubi [A] (verified) | 2925 |
| Mathematica [A] (verified) | 2926 |
| Maple [A] (verified) | 2926 |
| Fricas [A] (verification not implemented) | 2927 |
| Sympy [A] (verification not implemented) | 2927 |
| Maxima [A] (verification not implemented) | 2927 |
| Giac [A] (verification not implemented) | 2927 |
| Mupad [B] (verification not implemented) | 2928 |

Optimal result

Integrand size = 25, antiderivative size = 17

$$\int \frac{-1 + 2x + 3 \log(x)}{x^2 + 2x^4 + x \log(x)} dx = 3 \log(x) - \log(x + 2x^3 + \log(x))$$

[Out] 3*ln(x)-ln(x+2*x^3+ln(x))

Rubi [A] (verified)

Time = 0.13 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.080$, Rules used = {6874, 6816}

$$\int \frac{-1 + 2x + 3 \log(x)}{x^2 + 2x^4 + x \log(x)} dx = 3 \log(x) - \log(2x^3 + x + \log(x))$$

[In] Int[(-1 + 2*x + 3*Log[x])/(x^2 + 2*x^4 + x*Log[x]),x]

[Out] 3*Log[x] - Log[x + 2*x^3 + Log[x]]

Rule 6816

Int[(u_)/(y_), x_Symbol] :> With[{q = DerivativeDivides[y, u, x]}, Simp[q*Log[RemoveContent[y, x]], x] /; !FalseQ[q]]

Rule 6874

Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]]

Rubi steps

$$\begin{aligned}
\text{integral} &= \int \left(\frac{3}{x} + \frac{-1 - x - 6x^3}{x(x + 2x^3 + \log(x))} \right) dx \\
&= 3 \log(x) + \int \frac{-1 - x - 6x^3}{x(x + 2x^3 + \log(x))} dx \\
&= 3 \log(x) - \log(x + 2x^3 + \log(x))
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00

$$\int \frac{-1 + 2x + 3 \log(x)}{x^2 + 2x^4 + x \log(x)} dx = 3 \log(x) - \log(x + 2x^3 + \log(x))$$

[In] Integrate[(-1 + 2*x + 3*Log[x])/(x^2 + 2*x^4 + x*Log[x]),x]

[Out] 3*Log[x] - Log[x + 2*x^3 + Log[x]]

Maple [A] (verified)

Time = 0.32 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.06

| method | result | size |
|---------------|--|------|
| default | $3 \ln(x) - \ln(x + 2x^3 + \ln(x))$ | 18 |
| norman | $3 \ln(x) - \ln(x + 2x^3 + \ln(x))$ | 18 |
| risch | $3 \ln(x) - \ln(x + 2x^3 + \ln(x))$ | 18 |
| parallelrisch | $-\ln\left(x^3 + \frac{x}{2} + \frac{\ln(x)}{2}\right) + 3 \ln(x)$ | 20 |

[In] int((3*ln(x)+2*x-1)/(x*ln(x)+x^2+2*x^4),x,method=_RETURNVERBOSE)

[Out] 3*ln(x)-ln(x+2*x^3+ln(x))

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00

$$\int \frac{-1 + 2x + 3 \log(x)}{x^2 + 2x^4 + x \log(x)} dx = -\log(2x^3 + x + \log(x)) + 3 \log(x)$$

[In] integrate((3*log(x)+2*x-1)/(x*log(x)+x^2+2*x^4),x, algorithm="fricas")

[Out] -log(2*x^3 + x + log(x)) + 3*log(x)

Sympy [A] (verification not implemented)

Time = 0.06 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.88

$$\int \frac{-1 + 2x + 3 \log(x)}{x^2 + 2x^4 + x \log(x)} dx = 3 \log(x) - \log(2x^3 + x + \log(x))$$

[In] integrate((3*ln(x)+2*x-1)/(x*ln(x)+x**2+2*x**4),x)

[Out] 3*log(x) - log(2*x**3 + x + log(x))

Maxima [A] (verification not implemented)

none

Time = 0.25 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00

$$\int \frac{-1 + 2x + 3 \log(x)}{x^2 + 2x^4 + x \log(x)} dx = -\log(2x^3 + x + \log(x)) + 3 \log(x)$$

[In] integrate((3*log(x)+2*x-1)/(x*log(x)+x^2+2*x^4),x, algorithm="maxima")

[Out] -log(2*x^3 + x + log(x)) + 3*log(x)

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.24

$$\int \frac{-1 + 2x + 3 \log(x)}{x^2 + 2x^4 + x \log(x)} dx = -\log(-2x^3 - x - \log(x)) + 3 \log(x)$$

[In] integrate((3*log(x)+2*x-1)/(x*log(x)+x^2+2*x^4),x, algorithm="giac")

[Out] -log(-2*x^3 - x - log(x)) + 3*log(x)

Mupad [B] (verification not implemented)

Time = 17.01 (sec) , antiderivative size = 17, normalized size of antiderivative = 1.00

$$\int \frac{-1 + 2x + 3 \log(x)}{x^2 + 2x^4 + x \log(x)} dx = 3 \ln(x) - \ln(x + \ln(x) + 2x^3)$$

[In] int((2*x + 3*log(x) - 1)/(x*log(x) + x^2 + 2*x^4),x)

[Out] 3*log(x) - log(x + log(x) + 2*x^3)

3.315 $\int (-\sqrt{x} + \sqrt{1+x})^\pi dx$

| | |
|---|------|
| Optimal result | 2929 |
| Rubi [A] (verified) | 2929 |
| Mathematica [B] (verified) | 2930 |
| Maple [F] | 2930 |
| Fricas [A] (verification not implemented) | 2931 |
| Sympy [B] (verification not implemented) | 2931 |
| Maxima [F] | 2934 |
| Giac [F] | 2934 |
| Mupad [F(-1)] | 2934 |

Optimal result

Integrand size = 17, antiderivative size = 45

$$\int (-\sqrt{x} + \sqrt{1+x})^\pi dx = -\frac{2(-\sqrt{x} + \sqrt{1+x})^\pi (1 + 2x + \pi\sqrt{x}\sqrt{1+x})}{-4 + \pi^2}$$

[Out] $-2*(-x^{(1/2)}+(1+x)^{(1/2)})^\pi*(1+2*x+\pi*x^{(1/2)}*(1+x)^{(1/2)})/(\pi^2-4)$

Rubi [A] (verified)

Time = 0.08 (sec), antiderivative size = 59, normalized size of antiderivative = 1.31, number of steps used = 4, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.118$, Rules used = {2144, 459}

$$\int (-\sqrt{x} + \sqrt{1+x})^\pi dx = \frac{(\sqrt{x+1} - \sqrt{x})^{2+\pi}}{2(2+\pi)} + \frac{(\sqrt{x+1} - \sqrt{x})^{\pi-2}}{2(2-\pi)}$$

[In] $\text{Int}[(-\text{Sqrt}[x] + \text{Sqrt}[1 + x])^\pi, x]$

[Out] $(-\text{Sqrt}[x] + \text{Sqrt}[1 + x])^{(-2 + \pi)/(2*(2 - \pi))} + (-\text{Sqrt}[x] + \text{Sqrt}[1 + x])^{(2 + \pi)/(2*(2 + \pi))}$

Rule 459

$\text{Int}[(e_.*(x_))^{(m_.)}*((a_.) + (b_.*(x_))^{(n_.)})^{(p_.)}*((c_.) + (d_.*(x_))^{(n_.)})^{(q_.)}, x_Symbol] \rightarrow \text{Int}[\text{ExpandIntegrand}[(e*x)^m*(a + b*x^n)^p*(c + d*x^n)^q, x], x] /;$ $\text{FreeQ}\{a, b, c, d, e, m, n\}, x$ && $\text{NeQ}[b*c - a*d, 0]$ && $\text{IGtQ}[p, 0]$ && $\text{IGtQ}[q, 0]$

Rule 2144

$\text{Int}[(g_.) + (h_.*(x_))^{(m_.)}*((e_.*(x_)) + (f_.*\text{Sqrt}[(a_.) + (c_.*(x_))^{(n_.)})])^{(n_.)}, x_Symbol] \rightarrow \text{Dist}[1/(2^{(m+1)}*e^{(m+1)})], \text{Subst}[\text{Int}[x^{(n-m-1)}$

2)*(a*f^2 + x^2)*((-a)*f^2*h + 2*e*g*x + h*x^2)^m, x], x, e*x + f*Sqrt[a + c*x^2]], x] /; FreeQ[{a, c, e, f, g, h, n}, x] && EqQ[e^2 - c*f^2, 0] && IntegerQ[m]

Rubi steps

$$\begin{aligned}
 \text{integral} &= 2\text{Subst}\left(\int x\left(-x + \sqrt{1+x^2}\right)^\pi dx, x, \sqrt{x}\right) \\
 &= \frac{1}{2}\text{Subst}\left(\int x^{-3+\pi}(-1+x^2)(1+x^2) dx, x, -\sqrt{x} + \sqrt{1+x}\right) \\
 &= \frac{1}{2}\text{Subst}\left(\int (-x^{-3+\pi} + x^{1+\pi}) dx, x, -\sqrt{x} + \sqrt{1+x}\right) \\
 &= \frac{(-\sqrt{x} + \sqrt{1+x})^{-2+\pi}}{2(2-\pi)} + \frac{(-\sqrt{x} + \sqrt{1+x})^{2+\pi}}{2(2+\pi)}
 \end{aligned}$$

Mathematica [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 107 vs. 2(45) = 90.

Time = 0.54 (sec) , antiderivative size = 107, normalized size of antiderivative = 2.38

$$\begin{aligned}
 &\int \left(-\sqrt{x} + \sqrt{1+x}\right)^\pi dx \\
 &= \frac{2\sqrt{1+x}(-\sqrt{x} + \sqrt{1+x})^{-1+\pi} (1 - 2(-2+\pi)x - 2(-2+\pi)x^2 + (-2+\pi)\sqrt{x}\sqrt{1+x} + 2(-2+\pi)x^{3/2}\sqrt{1+x})}{(-2+\pi)(2+\pi)(-1-x+\sqrt{x}\sqrt{1+x})}
 \end{aligned}$$

[In] Integrate[(-Sqrt[x] + Sqrt[1 + x])^Pi, x]

[Out] (2*Sqrt[1 + x]*(-Sqrt[x] + Sqrt[1 + x])^(-1 + Pi)*(1 - 2*(-2 + Pi)*x - 2*(-2 + Pi)*x^2 + (-2 + Pi)*Sqrt[x]*Sqrt[1 + x] + 2*(-2 + Pi)*x^(3/2)*Sqrt[1 + x]))/((-2 + Pi)*(2 + Pi)*(-1 - x + Sqrt[x]*Sqrt[1 + x]))

Maple [F]

$$\int \left(\sqrt{1+x} - \sqrt{x}\right)^\pi dx$$

[In] int(((1+x)^(1/2)-x^(1/2))^Pi, x)

[Out] int(((1+x)^(1/2)-x^(1/2))^Pi, x)

Fricas [A] (verification not implemented)

none

Time = 0.30 (sec) , antiderivative size = 37, normalized size of antiderivative = 0.82

$$\int \left(-\sqrt{x} + \sqrt{1+x} \right)^\pi dx = -\frac{2(\pi\sqrt{x+1}\sqrt{x} + 2x + 1)(\sqrt{x+1} - \sqrt{x})^\pi}{\pi^2 - 4}$$

[In] integrate(((1+x)^(1/2)-x^(1/2))^pi,x, algorithm="fricas")

[Out] -2*(pi*sqrt(x + 1)*sqrt(x) + 2*x + 1)*(sqrt(x + 1) - sqrt(x))^pi/(pi^2 - 4)

Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 4362 vs. 2(39) = 78.

Time = 3.88 (sec) , antiderivative size = 4362, normalized size of antiderivative = 96.93

$$\int \left(-\sqrt{x} + \sqrt{1+x} \right)^\pi dx = \text{Too large to display}$$

[In] integrate(((1+x)**(1/2)-x**(1/2))**pi,x)

```
[Out] Piecewise((4*x**(13/2)*sqrt(1 + 1/x)*sinh(asinh(sqrt(x)) + pi*asinh(sqrt(x)))
)*gamma(1 + pi/2)/(-4*x**5*gamma(1 + pi/2) + pi**2*x**5*gamma(1 + pi/2) -
4*x**4*gamma(1 + pi/2) + pi**2*x**4*gamma(1 + pi/2)) + 2*pi*x**(13/2)*sqrt(
1 + 1/x)*sinh(asinh(sqrt(x)) + pi*asinh(sqrt(x)))*gamma(1 + pi/2)/(-4*x**5*
gamma(1 + pi/2) + pi**2*x**5*gamma(1 + pi/2) - 4*x**4*gamma(1 + pi/2) + pi*
**2*x**4*gamma(1 + pi/2)) - 2*pi*x**(13/2)*cosh(asinh(sqrt(x)) + pi*asinh(sq
rt(x)))*gamma(1 + pi/2)/(-4*x**5*gamma(1 + pi/2) + pi**2*x**5*gamma(1 + pi/
2) - 4*x**4*gamma(1 + pi/2) + pi**2*x**4*gamma(1 + pi/2)) - 4*x**(13/2)*cos
h(asinh(sqrt(x)) + pi*asinh(sqrt(x)))*gamma(1 + pi/2)/(-4*x**5*gamma(1 + pi
/2) + pi**2*x**5*gamma(1 + pi/2) - 4*x**4*gamma(1 + pi/2) + pi**2*x**4*gamma
(1 + pi/2)) + 6*x**(11/2)*sqrt(1 + 1/x)*sinh(asinh(sqrt(x)) + pi*asinh(sqrt
(x)))*gamma(1 + pi/2)/(-4*x**5*gamma(1 + pi/2) + pi**2*x**5*gamma(1 + pi/2
) - 4*x**4*gamma(1 + pi/2) + pi**2*x**4*gamma(1 + pi/2)) + 2*pi*x**(11/2)*s
qrt(1 + 1/x)*sinh(asinh(sqrt(x)) + pi*asinh(sqrt(x)))*gamma(1 + pi/2)/(-4*x
**5*gamma(1 + pi/2) + pi**2*x**5*gamma(1 + pi/2) - 4*x**4*gamma(1 + pi/2) +
pi**2*x**4*gamma(1 + pi/2)) - 4*pi*x**(11/2)*cosh(asinh(sqrt(x)) + pi*asin
h(sqrt(x)))*gamma(1 + pi/2)/(-4*x**5*gamma(1 + pi/2) + pi**2*x**5*gamma(1 +
pi/2) - 4*x**4*gamma(1 + pi/2) + pi**2*x**4*gamma(1 + pi/2)) - 6*x**(11/2)
*cosh(asinh(sqrt(x)) + pi*asinh(sqrt(x)))*gamma(1 + pi/2)/(-4*x**5*gamma(1
+ pi/2) + pi**2*x**5*gamma(1 + pi/2) - 4*x**4*gamma(1 + pi/2) + pi**2*x**4*
gamma(1 + pi/2)) + 2*x**(9/2)*sqrt(1 + 1/x)*sinh(asinh(sqrt(x)) + pi*asinh(
sqrt(x)))*gamma(1 + pi/2)/(-4*x**5*gamma(1 + pi/2) + pi**2*x**5*gamma(1 + p
```



```

**6*gamma(1 + pi/2) + pi**2*x**6*gamma(1 + pi/2)) - 2*pi**2*x**7*cosh(2*asinh(sqrt(x)) + pi*asinh(sqrt(x)))*gamma(pi/2)/(-4*x**7*gamma(1 + pi/2) + pi**2*x**7*gamma(1 + pi/2) - 4*x**6*gamma(1 + pi/2) + pi**2*x**6*gamma(1 + pi/2)) - 5*pi*x**7*cosh(2*asinh(sqrt(x)) + pi*asinh(sqrt(x)))*gamma(pi/2)/(-4*x**7*gamma(1 + pi/2) + pi**2*x**7*gamma(1 + pi/2) - 4*x**6*gamma(1 + pi/2) + pi**2*x**6*gamma(1 + pi/2)) + pi*x**7*gamma(pi/2)/(-4*x**7*gamma(1 + pi/2) + pi**2*x**7*gamma(1 + pi/2) - 4*x**6*gamma(1 + pi/2) + pi**2*x**6*gamma(1 + pi/2)) + 2*x**6*sqrt(x + 1)*sinh(asinh(sqrt(x)) + pi*asinh(sqrt(x)))*gamma(pi/2)/(-4*x**7*gamma(1 + pi/2) + pi**2*x**7*gamma(1 + pi/2) - 4*x**6*gamma(1 + pi/2) + pi**2*x**6*gamma(1 + pi/2)) - pi*x**6*cosh(2*asinh(sqrt(x)) + pi*asinh(sqrt(x)))*gamma(pi/2)/(-4*x**7*gamma(1 + pi/2) + pi**2*x**7*gamma(1 + pi/2) - 4*x**6*gamma(1 + pi/2) + pi**2*x**6*gamma(1 + pi/2)) + pi*x**6*gamma(pi/2)/(-4*x**7*gamma(1 + pi/2) + pi**2*x**7*gamma(1 + pi/2) - 4*x**6*gamma(1 + pi/2) + pi**2*x**6*gamma(1 + pi/2)), True))

```

Maxima [F]

$$\int \left(-\sqrt{x} + \sqrt{1+x}\right)^\pi dx = \int \left(\sqrt{x+1} - \sqrt{x}\right)^\pi dx$$

```
[In] integrate(((1+x)^(1/2)-x^(1/2))^pi,x, algorithm="maxima")
```

```
[Out] integrate((sqrt(x + 1) - sqrt(x))^pi, x)
```

Giac [F]

$$\int \left(-\sqrt{x} + \sqrt{1+x}\right)^\pi dx = \int \left(\sqrt{x+1} - \sqrt{x}\right)^\pi dx$$

```
[In] integrate(((1+x)^(1/2)-x^(1/2))^pi,x, algorithm="giac")
```

```
[Out] integrate((sqrt(x + 1) - sqrt(x))^pi, x)
```

Mupad [F(-1)]

Timed out.

$$\int \left(-\sqrt{x} + \sqrt{1+x}\right)^\pi dx = \int \left(\sqrt{x+1} - \sqrt{x}\right)^\pi dx$$

```
[In] int(((x + 1)^(1/2) - x^(1/2))^Pi,x)
```

```
[Out] int(((x + 1)^(1/2) - x^(1/2))^Pi, x)
```

$$3.316 \quad \int \left(-2 + \left(-2 + \left(-2 + (-2 + x^2)^2 \right)^2 \right)^2 \right) dx$$

| | |
|---|------|
| Optimal result | 2935 |
| Rubi [A] (verified) | 2935 |
| Mathematica [A] (verified) | 2936 |
| Maple [A] (verified) | 2936 |
| Fricas [A] (verification not implemented) | 2937 |
| Sympy [A] (verification not implemented) | 2937 |
| Maxima [A] (verification not implemented) | 2937 |
| Giac [A] (verification not implemented) | 2938 |
| Mupad [B] (verification not implemented) | 2938 |

Optimal result

Integrand size = 17, antiderivative size = 54

$$\int \left(-2 + \left(-2 + \left(-2 + (-2 + x^2)^2 \right)^2 \right)^2 \right) dx$$

$$= 2x - \frac{64x^3}{3} + \frac{336x^5}{5} - 96x^7 + \frac{220x^9}{3} - 32x^{11} + 8x^{13} - \frac{16x^{15}}{15} + \frac{x^{17}}{17}$$

[Out] 2*x-64/3*x^3+336/5*x^5-96*x^7+220/3*x^9-32*x^11+8*x^13-16/15*x^15+1/17*x^17

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 54, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.059$, Rules used = {2086}

$$\int \left(-2 + \left(-2 + \left(-2 + (-2 + x^2)^2 \right)^2 \right)^2 \right) dx$$

$$= \frac{x^{17}}{17} - \frac{16x^{15}}{15} + 8x^{13} - 32x^{11} + \frac{220x^9}{3} - 96x^7 + \frac{336x^5}{5} - \frac{64x^3}{3} + 2x$$

[In] Int[-2 + (-2 + (-2 + (-2 + x^2)^2)^2)^2, x]

[Out] 2*x - (64*x^3)/3 + (336*x^5)/5 - 96*x^7 + (220*x^9)/3 - 32*x^11 + 8*x^13 - (16*x^15)/15 + x^17/17

Rule 2086

```
Int[(P_)^(p_), x_Symbol] := Int[ExpandToSum[P^p, x], x] /; PolyQ[P, x] && I
GtQ[p, 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= -2x + \int \left(-2 + \left(-2 + \left(-2 + x^2 \right)^2 \right)^2 \right)^2 dx \\ &= -2x + \int \left(4 - 64x^2 + 336x^4 - 672x^6 + 660x^8 - 352x^{10} + 104x^{12} - 16x^{14} + x^{16} \right) dx \\ &= 2x - \frac{64x^3}{3} + \frac{336x^5}{5} - 96x^7 + \frac{220x^9}{3} - 32x^{11} + 8x^{13} - \frac{16x^{15}}{15} + \frac{x^{17}}{17} \end{aligned}$$

Mathematica [A] (verified)

Time = 0.00 (sec) , antiderivative size = 54, normalized size of antiderivative = 1.00

$$\begin{aligned} &\int \left(-2 + \left(-2 + \left(-2 + \left(-2 + x^2 \right)^2 \right)^2 \right)^2 \right) dx \\ &= 2x - \frac{64x^3}{3} + \frac{336x^5}{5} - 96x^7 + \frac{220x^9}{3} - 32x^{11} + 8x^{13} - \frac{16x^{15}}{15} + \frac{x^{17}}{17} \end{aligned}$$

```
[In] Integrate[-2 + (-2 + (-2 + (-2 + x^2)^2)^2)^2, x]
```

```
[Out] 2*x - (64*x^3)/3 + (336*x^5)/5 - 96*x^7 + (220*x^9)/3 - 32*x^11 + 8*x^13 - (16*x^15)/15 + x^17/17
```

Maple [A] (verified)

Time = 0.20 (sec) , antiderivative size = 45, normalized size of antiderivative = 0.83

| method | result | size |
|---------------|--|------|
| default | $2x - \frac{64}{3}x^3 + \frac{336}{5}x^5 - 96x^7 + \frac{220}{3}x^9 - 32x^{11} + 8x^{13} - \frac{16}{15}x^{15} + \frac{1}{17}x^{17}$ | 45 |
| norman | $2x - \frac{64}{3}x^3 + \frac{336}{5}x^5 - 96x^7 + \frac{220}{3}x^9 - 32x^{11} + 8x^{13} - \frac{16}{15}x^{15} + \frac{1}{17}x^{17}$ | 45 |
| risch | $2x - \frac{64}{3}x^3 + \frac{336}{5}x^5 - 96x^7 + \frac{220}{3}x^9 - 32x^{11} + 8x^{13} - \frac{16}{15}x^{15} + \frac{1}{17}x^{17}$ | 45 |
| parallelrisch | $2x - \frac{64}{3}x^3 + \frac{336}{5}x^5 - 96x^7 + \frac{220}{3}x^9 - 32x^{11} + 8x^{13} - \frac{16}{15}x^{15} + \frac{1}{17}x^{17}$ | 45 |
| parts | $2x - \frac{64}{3}x^3 + \frac{336}{5}x^5 - 96x^7 + \frac{220}{3}x^9 - 32x^{11} + 8x^{13} - \frac{16}{15}x^{15} + \frac{1}{17}x^{17}$ | 45 |
| gospers | $\frac{x(15x^{16} - 272x^{14} + 2040x^{12} - 8160x^{10} + 18700x^8 - 24480x^6 + 17136x^4 - 5440x^2 + 510)}{255}$ | 46 |

```
[In] int((((x^2-2)^2-2)^2-2)^2-2,x,method=_RETURNVERBOSE)
```

[Out] $2*x-64/3*x^3+336/5*x^5-96*x^7+220/3*x^9-32*x^{11}+8*x^{13}-16/15*x^{15}+1/17*x^{17}$

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 44, normalized size of antiderivative = 0.81

$$\int \left(-2 + \left(-2 + \left(-2 + (-2 + x^2)^2 \right)^2 \right)^2 \right) dx$$

$$= \frac{1}{17}x^{17} - \frac{16}{15}x^{15} + 8x^{13} - 32x^{11} + \frac{220}{3}x^9 - 96x^7 + \frac{336}{5}x^5 - \frac{64}{3}x^3 + 2x$$

[In] `integrate((((x^2-2)^2-2)^2-2,x, algorithm="fricas")`

[Out] $1/17*x^{17} - 16/15*x^{15} + 8*x^{13} - 32*x^{11} + 220/3*x^9 - 96*x^7 + 336/5*x^5 - 64/3*x^3 + 2*x$

Sympy [A] (verification not implemented)

Time = 0.02 (sec) , antiderivative size = 49, normalized size of antiderivative = 0.91

$$\int \left(-2 + \left(-2 + \left(-2 + (-2 + x^2)^2 \right)^2 \right)^2 \right) dx$$

$$= \frac{x^{17}}{17} - \frac{16x^{15}}{15} + 8x^{13} - 32x^{11} + \frac{220x^9}{3} - 96x^7 + \frac{336x^5}{5} - \frac{64x^3}{3} + 2x$$

[In] `integrate((((x**2-2)**2-2)**2-2,x)`

[Out] $x^{17}/17 - 16*x^{15}/15 + 8*x^{13} - 32*x^{11} + 220*x^9/3 - 96*x^7 + 336*x^5/5 - 64*x^3/3 + 2*x$

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 44, normalized size of antiderivative = 0.81

$$\int \left(-2 + \left(-2 + \left(-2 + (-2 + x^2)^2 \right)^2 \right)^2 \right) dx$$

$$= \frac{1}{17}x^{17} - \frac{16}{15}x^{15} + 8x^{13} - 32x^{11} + \frac{220}{3}x^9 - 96x^7 + \frac{336}{5}x^5 - \frac{64}{3}x^3 + 2x$$

[In] `integrate((((x^2-2)^2-2)^2-2,x, algorithm="maxima")`

[Out] $1/17*x^{17} - 16/15*x^{15} + 8*x^{13} - 32*x^{11} + 220/3*x^9 - 96*x^7 + 336/5*x^5 - 64/3*x^3 + 2*x$

Giac [A] (verification not implemented)

none

Time = 0.27 (sec) , antiderivative size = 44, normalized size of antiderivative = 0.81

$$\int \left(-2 + \left(-2 + \left(-2 + (-2 + x^2)^2 \right)^2 \right) \right) dx$$

$$= \frac{1}{17} x^{17} - \frac{16}{15} x^{15} + 8x^{13} - 32x^{11} + \frac{220}{3} x^9 - 96x^7 + \frac{336}{5} x^5 - \frac{64}{3} x^3 + 2x$$

[In] integrate((((x^2-2)^2-2)^2-2,x, algorithm="giac")

[Out] 1/17*x^17 - 16/15*x^15 + 8*x^13 - 32*x^11 + 220/3*x^9 - 96*x^7 + 336/5*x^5 - 64/3*x^3 + 2*x

Mupad [B] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 44, normalized size of antiderivative = 0.81

$$\int \left(-2 + \left(-2 + \left(-2 + (-2 + x^2)^2 \right)^2 \right) \right) dx$$

$$= \frac{x^{17}}{17} - \frac{16x^{15}}{15} + 8x^{13} - 32x^{11} + \frac{220x^9}{3} - 96x^7 + \frac{336x^5}{5} - \frac{64x^3}{3} + 2x$$

[In] int((((x^2 - 2)^2 - 2)^2 - 2,x)

[Out] 2*x - (64*x^3)/3 + (336*x^5)/5 - 96*x^7 + (220*x^9)/3 - 32*x^11 + 8*x^13 - (16*x^15)/15 + x^17/17

3.317 $\int \sin(4 \arctan(x)) dx$

| | |
|---|------|
| Optimal result | 2939 |
| Rubi [F] | 2939 |
| Mathematica [A] (verified) | 2939 |
| Maple [C] (verified) | 2940 |
| Fricas [A] (verification not implemented) | 2940 |
| Sympy [F] | 2940 |
| Maxima [A] (verification not implemented) | 2940 |
| Giac [A] (verification not implemented) | 2941 |
| Mupad [B] (verification not implemented) | 2941 |

Optimal result

Integrand size = 5, antiderivative size = 18

$$\int \sin(4 \arctan(x)) dx = -\frac{4}{1+x^2} - 2 \log(1+x^2)$$

[Out] $-4/(x^2+1)-2*\ln(x^2+1)$

Rubi [F]

$$\int \sin(4 \arctan(x)) dx = \int \sin(4 \arctan(x)) dx$$

[In] `Int[Sin[4*ArcTan[x]],x]`

[Out] `Defer[Int][Sin[4*ArcTan[x]], x]`

Rubi steps

$$\text{integral} = \int \sin(4 \arctan(x)) dx$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00

$$\int \sin(4 \arctan(x)) dx = -\frac{4}{1+x^2} - 2 \log(1+x^2)$$

[In] `Integrate[Sin[4*ArcTan[x]],x]`

[Out] $-4/(1+x^2) - 2*\text{Log}[1+x^2]$

Maple [C] (verified)

Result contains complex when optimal does not.

Time = 0.34 (sec) , antiderivative size = 34, normalized size of antiderivative = 1.89

| method | result | size |
|---------|---|------|
| default | $\frac{2i}{x-i} - 2 \ln(x-i) - \frac{2i}{i+x} - 2 \ln(i+x)$ | 34 |

[In] `int(sin(4*arctan(x)),x,method=_RETURNVERBOSE)`

[Out] `2*I/(x-I)-2*ln(x-I)-2*I/(I+x)-2*ln(I+x)`

Fricas [A] (verification not implemented)

none

Time = 0.23 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.28

$$\int \sin(4 \arctan(x)) dx = -\frac{2((x^2 + 1) \log(x^2 + 1) + 2)}{x^2 + 1}$$

[In] `integrate(sin(4*arctan(x)),x, algorithm="fricas")`

[Out] `-2*((x^2 + 1)*log(x^2 + 1) + 2)/(x^2 + 1)`

Sympy [F]

$$\int \sin(4 \arctan(x)) dx = \int \sin(4 \operatorname{atan}(x)) dx$$

[In] `integrate(sin(4*atan(x)),x)`

[Out] `Integral(sin(4*atan(x)), x)`

Maxima [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.28

$$\int \sin(4 \arctan(x)) dx = -\frac{2((x^2 + 1) \log(x^2 + 1) + 2)}{x^2 + 1}$$

[In] `integrate(sin(4*arctan(x)),x, algorithm="maxima")`

[Out] `-2*((x^2 + 1)*log(x^2 + 1) + 2)/(x^2 + 1)`

Giac [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.28

$$\int \sin(4 \arctan(x)) dx = \frac{2(x^2 - 1)}{x^2 + 1} - 2 \log(x^2 + 1)$$

[In] integrate(sin(4*arctan(x)),x, algorithm="giac")

[Out] 2*(x^2 - 1)/(x^2 + 1) - 2*log(x^2 + 1)

Mupad [B] (verification not implemented)

Time = 16.64 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00

$$\int \sin(4 \arctan(x)) dx = -2 \ln(x^2 + 1) - \frac{4}{x^2 + 1}$$

[In] int(sin(4*atan(x)),x)

[Out] - 2*log(x^2 + 1) - 4/(x^2 + 1)

$$3.318 \quad \int \frac{\sqrt[3]{\tan(x)}}{(\cos(x)+\sin(x))^2} dx$$

| | |
|---|------|
| Optimal result | 2942 |
| Rubi [A] (verified) | 2942 |
| Mathematica [A] (verified) | 2944 |
| Maple [F] | 2944 |
| Fricas [B] (verification not implemented) | 2945 |
| Sympy [F] | 2945 |
| Maxima [A] (verification not implemented) | 2945 |
| Giac [A] (verification not implemented) | 2946 |
| Mupad [F(-1)] | 2946 |

Optimal result

Integrand size = 14, antiderivative size = 61

$$\int \frac{\sqrt[3]{\tan(x)}}{(\cos(x) + \sin(x))^2} dx = -\frac{\arctan\left(\frac{1-2\sqrt[3]{\tan(x)}}{\sqrt{3}}\right)}{\sqrt{3}} + \frac{1}{2} \log\left(1 + \sqrt[3]{\tan(x)}\right) - \frac{1}{6} \log(1 + \tan(x)) - \frac{\sqrt[3]{\tan(x)}}{1 + \tan(x)}$$

[Out] -1/3*arctan(1/3*(1-2*tan(x)^(1/3))*3^(1/2))*3^(1/2)+1/2*ln(1+tan(x)^(1/3))-1/6*ln(1+tan(x))-tan(x)^(1/3)/(1+tan(x))

Rubi [A] (verified)

Time = 0.11 (sec) , antiderivative size = 61, normalized size of antiderivative = 1.00, number of steps used = 6, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.357$, Rules used = {43, 60, 632, 210, 31}

$$\int \frac{\sqrt[3]{\tan(x)}}{(\cos(x) + \sin(x))^2} dx = -\frac{\arctan\left(\frac{1-2\sqrt[3]{\tan(x)}}{\sqrt{3}}\right)}{\sqrt{3}} - \frac{\sqrt[3]{\tan(x)}}{\tan(x) + 1} + \frac{1}{2} \log\left(\sqrt[3]{\tan(x)} + 1\right) - \frac{1}{6} \log(\tan(x) + 1)$$

[In] Int[Tan[x]^(1/3)/(Cos[x] + Sin[x])^2,x]

[Out] -(ArcTan[(1 - 2*Tan[x]^(1/3))/Sqrt[3]]/Sqrt[3]) + Log[1 + Tan[x]^(1/3)]/2 - Log[1 + Tan[x]]/6 - Tan[x]^(1/3)/(1 + Tan[x])

Rule 31

Int[((a_) + (b_)*(x_))⁽⁻¹⁾, x_Symbol] := Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 43

Int[((a_) + (b_)*(x_))^{(m_)*((c_) + (d_)*(x_))^(n_), x_Symbol] := Simp[(a + b*x)^{(m + 1)*((c + d*x)^{n/(b*(m + 1))}), x] - Dist[d*(n/(b*(m + 1))), Int[(a + b*x)^{(m + 1)*(c + d*x)^(n - 1), x], x] /; FreeQ[{a, b, c, d, n}, x] && NeQ[b*c - a*d, 0] && ILtQ[m, -1] && !IntegerQ[n] && GtQ[n, 0]}}}

Rule 60

Int[1/(((a_) + (b_)*(x_))*((c_) + (d_)*(x_))^(2/3)), x_Symbol] := With[{q = Rt[-(b*c - a*d)/b, 3]}, Simp[-Log[RemoveContent[a + b*x, x]]/(2*b*q²), x] + (Dist[3/(2*b*q), Subst[Int[1/(q² - q*x + x²), x], x, (c + d*x)^(1/3)]), x] + Dist[3/(2*b*q²), Subst[Int[1/(q + x), x], x, (c + d*x)^(1/3)], x]) /; FreeQ[{a, b, c, d}, x] && NegQ[(b*c - a*d)/b]

Rule 210

Int[((a_) + (b_)*(x_)²)⁽⁻¹⁾, x_Symbol] := Simp[(-(Rt[-a, 2]*Rt[-b, 2])⁽⁻¹⁾)*ArcTan[Rt[-b, 2]*(x/Rt[-a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (LtQ[a, 0] || LtQ[b, 0])

Rule 632

Int[((a_) + (b_)*(x_) + (c_)*(x_)²)⁽⁻¹⁾, x_Symbol] := Dist[-2, Subst[Int[1/Simp[b² - 4*a*c - x², x], x], x, b + 2*c*x], x] /; FreeQ[{a, b, c}, x] && NeQ[b² - 4*a*c, 0]

Rubi steps

$$\begin{aligned}
 \text{integral} &= \text{Subst}\left(\int \frac{\sqrt[3]{x}}{(1+x)^2} dx, x, \tan(x)\right) \\
 &= -\frac{\sqrt[3]{\tan(x)}}{1+\tan(x)} + \frac{1}{3}\text{Subst}\left(\int \frac{1}{x^{2/3}(1+x)} dx, x, \tan(x)\right) \\
 &= -\frac{1}{6}\log(1+\tan(x)) - \frac{\sqrt[3]{\tan(x)}}{1+\tan(x)} + \frac{1}{2}\text{Subst}\left(\int \frac{1}{1+x} dx, x, \sqrt[3]{\tan(x)}\right) \\
 &\quad + \frac{1}{2}\text{Subst}\left(\int \frac{1}{1-x+x^2} dx, x, \sqrt[3]{\tan(x)}\right)
 \end{aligned}$$

$$\begin{aligned}
&= \frac{1}{2} \log\left(1 + \sqrt[3]{\tan(x)}\right) - \frac{1}{6} \log(1 + \tan(x)) - \frac{\sqrt[3]{\tan(x)}}{1 + \tan(x)} \\
&\quad - \text{Subst}\left(\int \frac{1}{-3 - x^2} dx, x, -1 + 2\sqrt[3]{\tan(x)}\right) \\
&= \frac{\arctan\left(\frac{-1 + 2\sqrt[3]{\tan(x)}}{\sqrt{3}}\right)}{\sqrt{3}} + \frac{1}{2} \log\left(1 + \sqrt[3]{\tan(x)}\right) - \frac{1}{6} \log(1 + \tan(x)) - \frac{\sqrt[3]{\tan(x)}}{1 + \tan(x)}
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.28 (sec) , antiderivative size = 77, normalized size of antiderivative = 1.26

$$\begin{aligned}
\int \frac{\sqrt[3]{\tan(x)}}{(\cos(x) + \sin(x))^2} dx &= \frac{\arctan\left(\frac{-1 + 2\sqrt[3]{\tan(x)}}{\sqrt{3}}\right)}{\sqrt{3}} + \frac{1}{3} \log\left(1 + \sqrt[3]{\tan(x)}\right) \\
&\quad - \frac{1}{6} \log\left(1 - \sqrt[3]{\tan(x)} + \tan^{\frac{2}{3}}(x)\right) \\
&\quad + \left(-1 + \frac{\sin(x)}{\cos(x) + \sin(x)}\right) \sqrt[3]{\tan(x)}
\end{aligned}$$

[In] Integrate[Tan[x]^(1/3)/(Cos[x] + Sin[x])^2,x]

[Out] ArcTan[(-1 + 2*Tan[x]^(1/3))/Sqrt[3]]/Sqrt[3] + Log[1 + Tan[x]^(1/3)]/3 - Log[1 - Tan[x]^(1/3) + Tan[x]^(2/3)]/6 + (-1 + Sin[x]/(Cos[x] + Sin[x]))*Tan[x]^(1/3)

Maple [F]

$$\int \frac{\tan(x)^{\frac{1}{3}}}{(\cos(x) + \sin(x))^2} dx$$

[In] int(tan(x)^(1/3)/(cos(x)+sin(x))^2,x)

[Out] int(tan(x)^(1/3)/(cos(x)+sin(x))^2,x)

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 108 vs. 2(48) = 96.

Time = 0.25 (sec) , antiderivative size = 108, normalized size of antiderivative = 1.77

$$\int \frac{\sqrt[3]{\tan(x)}}{(\cos(x) + \sin(x))^2} dx$$

$$= \frac{2(\sqrt{3}\cos(x) + \sqrt{3}\sin(x)) \arctan\left(\frac{2}{3}\sqrt{3}\left(\frac{\sin(x)}{\cos(x)}\right)^{\frac{1}{3}} - \frac{1}{3}\sqrt{3}\right) - (\cos(x) + \sin(x)) \log\left(\left(\frac{\sin(x)}{\cos(x)}\right)^{\frac{2}{3}} - \left(\frac{\sin(x)}{\cos(x)}\right)^{\frac{1}{3}} + 1\right)}{6(\cos(x) + \sin(x))}$$

[In] integrate(tan(x)^(1/3)/(cos(x)+sin(x))^2,x, algorithm="fricas")

[Out] 1/6*(2*(sqrt(3)*cos(x) + sqrt(3)*sin(x))*arctan(2/3*sqrt(3)*(sin(x)/cos(x))^(1/3) - 1/3*sqrt(3)) - (cos(x) + sin(x))*log((sin(x)/cos(x))^(2/3) - (sin(x)/cos(x))^(1/3) + 1) + 2*(cos(x) + sin(x))*log((sin(x)/cos(x))^(1/3) + 1) - 6*(sin(x)/cos(x))^(1/3)*cos(x))/(cos(x) + sin(x))

Sympy [F]

$$\int \frac{\sqrt[3]{\tan(x)}}{(\cos(x) + \sin(x))^2} dx = \int \frac{\sqrt[3]{\tan(x)}}{(\sin(x) + \cos(x))^2} dx$$

[In] integrate(tan(x)**(1/3)/(cos(x)+sin(x))**2,x)

[Out] Integral(tan(x)**(1/3)/(sin(x) + cos(x))**2, x)

Maxima [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 56, normalized size of antiderivative = 0.92

$$\int \frac{\sqrt[3]{\tan(x)}}{(\cos(x) + \sin(x))^2} dx = \frac{1}{3}\sqrt{3}\arctan\left(\frac{1}{3}\sqrt{3}\left(2\tan(x)^{\frac{1}{3}} - 1\right)\right) - \frac{\tan(x)^{\frac{1}{3}}}{\tan(x) + 1} - \frac{1}{6}\log\left(\tan(x)^{\frac{2}{3}} - \tan(x)^{\frac{1}{3}} + 1\right) + \frac{1}{3}\log\left(\tan(x)^{\frac{1}{3}} + 1\right)$$

[In] integrate(tan(x)^(1/3)/(cos(x)+sin(x))^2,x, algorithm="maxima")

[Out] 1/3*sqrt(3)*arctan(1/3*sqrt(3)*(2*tan(x)^(1/3) - 1)) - tan(x)^(1/3)/(tan(x) + 1) - 1/6*log(tan(x)^(2/3) - tan(x)^(1/3) + 1) + 1/3*log(tan(x)^(1/3) + 1)

Giac [A] (verification not implemented)

none

Time = 0.29 (sec) , antiderivative size = 57, normalized size of antiderivative = 0.93

$$\int \frac{\sqrt[3]{\tan(x)}}{(\cos(x) + \sin(x))^2} dx = \frac{1}{3} \sqrt{3} \arctan \left(\frac{1}{3} \sqrt{3} (2 \tan(x)^{\frac{1}{3}} - 1) \right) - \frac{\tan(x)^{\frac{1}{3}}}{\tan(x) + 1} - \frac{1}{6} \log \left(\tan(x)^{\frac{2}{3}} - \tan(x)^{\frac{1}{3}} + 1 \right) + \frac{1}{3} \log \left(\left| \tan(x)^{\frac{1}{3}} + 1 \right| \right)$$

```
[In] integrate(tan(x)^(1/3)/(cos(x)+sin(x))^2,x, algorithm="giac")
```

```
[Out] 1/3*sqrt(3)*arctan(1/3*sqrt(3)*(2*tan(x)^(1/3) - 1)) - tan(x)^(1/3)/(tan(x) + 1) - 1/6*log(tan(x)^(2/3) - tan(x)^(1/3) + 1) + 1/3*log(abs(tan(x)^(1/3) + 1))
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt[3]{\tan(x)}}{(\cos(x) + \sin(x))^2} dx = \int \frac{\tan(x)^{1/3}}{(\cos(x) + \sin(x))^2} dx$$

```
[In] int(tan(x)^(1/3)/(cos(x) + sin(x))^2,x)
```

```
[Out] int(tan(x)^(1/3)/(cos(x) + sin(x))^2, x)
```

3.319 $\int \csc^2(x) \csc^2(6x) \csc^2(10x) \csc^2(15x) \sin^2(2x) \sin^2(3x) \sin^2(5x) \sin^2(30x) dx$

| | |
|---|------|
| Optimal result | 2947 |
| Rubi [A] (verified) | 2947 |
| Mathematica [A] (verified) | 2950 |
| Maple [B] (verified) | 2950 |
| Fricas [A] (verification not implemented) | 2951 |
| Sympy [F(-1)] | 2951 |
| Maxima [A] (verification not implemented) | 2951 |
| Giac [A] (verification not implemented) | 2952 |
| Mupad [B] (verification not implemented) | 2952 |

Optimal result

Integrand size = 47, antiderivative size = 64

$$\begin{aligned} & \int \csc^2(x) \csc^2(6x) \csc^2(10x) \csc^2(15x) \sin^2(2x) \sin^2(3x) \sin^2(5x) \sin^2(30x) dx \\ &= 7x + 4 \sin(2x) - \frac{1}{2} \sin(4x) - \frac{4}{3} \sin(6x) - \sin(8x) \\ &\quad - \frac{2}{5} \sin(10x) + \frac{1}{6} \sin(12x) + \frac{2}{7} \sin(14x) + \frac{1}{8} \sin(16x) \end{aligned}$$

[Out] 7*x+4*sin(2*x)-1/2*sin(4*x)-4/3*sin(6*x)-sin(8*x)-2/5*sin(10*x)+1/6*sin(12*x)+2/7*sin(14*x)+1/8*sin(16*x)

Rubi [A] (verified)

Time = 2.20 (sec) , antiderivative size = 78, normalized size of antiderivative = 1.22, number of steps used = 10, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.085$, Rules used = {1828, 1171, 393, 209}

$$\begin{aligned} & \int \csc^2(x) \csc^2(6x) \csc^2(10x) \csc^2(15x) \sin^2(2x) \sin^2(3x) \sin^2(5x) \sin^2(30x) dx \\ &= 7x + 4096 \sin(x) \cos^{15}(x) - \frac{83968}{7} \sin(x) \cos^{13}(x) \\ &\quad + \frac{279040}{21} \sin(x) \cos^{11}(x) - \frac{744704}{105} \sin(x) \cos^9(x) + \frac{67936}{35} \sin(x) \cos^7(x) \\ &\quad - \frac{4112}{15} \sin(x) \cos^5(x) + \frac{76}{3} \sin(x) \cos^3(x) + 6 \sin(x) \cos(x) \end{aligned}$$

[In] Int[Csc[x]^2*Csc[6*x]^2*Csc[10*x]^2*Csc[15*x]^2*Sin[2*x]^2*Sin[3*x]^2*Sin[5*x]^2*Sin[30*x]^2,x]

```
[Out] 7*x + 6*Cos[x]*Sin[x] + (76*Cos[x]^3*Ssin[x])/3 - (4112*Cos[x]^5*Ssin[x])/15
+ (67936*Cos[x]^7*Ssin[x])/35 - (744704*Cos[x]^9*Ssin[x])/105 + (279040*Cos[x]
]^11*Ssin[x])/21 - (83968*Cos[x]^13*Ssin[x])/7 + 4096*Cos[x]^15*Ssin[x]
```

Rule 209

```
Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[b, 2]))*A
rcTan[Rt[b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && PosQ[a/b] && (GtQ[a
, 0] || GtQ[b, 0])
```

Rule 393

```
Int[((a_) + (b_.)*(x_)^(n_))^(p_)*((c_) + (d_.)*(x_)^(n_)), x_Symbol] := Si
mp[(-(b*c - a*d))*x*((a + b*x^n)^(p + 1)/(a*b*n*(p + 1))), x] - Dist[(a*d -
b*c*(n*(p + 1) + 1))/(a*b*n*(p + 1)), Int[(a + b*x^n)^(p + 1), x], x] /; F
reeQ[{a, b, c, d, n, p}, x] && NeQ[b*c - a*d, 0] && (LtQ[p, -1] || ILtQ[1/n
+ p, 0])
```

Rule 1171

```
Int[((d_) + (e_.)*(x_)^2)^(q_)*((a_) + (b_.)*(x_)^2 + (c_.)*(x_)^4)^(p_.),
x_Symbol] := With[{Qx = PolynomialQuotient[(a + b*x^2 + c*x^4)^p, d + e*x^2
, x], R = Coeff[PolynomialRemainder[(a + b*x^2 + c*x^4)^p, d + e*x^2, x], x
, 0]}, Simp[(-R)*x*((d + e*x^2)^(q + 1)/(2*d*(q + 1))), x] + Dist[1/(2*d*(q
+ 1)), Int[(d + e*x^2)^(q + 1)*ExpandToSum[2*d*(q + 1)*Qx + R*(2*q + 3), x
], x], x] /; FreeQ[{a, b, c, d, e}, x] && NeQ[b^2 - 4*a*c, 0] && NeQ[c*d^2
- b*d*e + a*e^2, 0] && IGtQ[p, 0] && LtQ[q, -1]
```

Rule 1828

```
Int[(Pq_)*((a_) + (b_.)*(x_)^2)^(p_), x_Symbol] := With[{Q = PolynomialQuot
ient[Pq, a + b*x^2, x], f = Coeff[PolynomialRemainder[Pq, a + b*x^2, x], x,
0], g = Coeff[PolynomialRemainder[Pq, a + b*x^2, x], x, 1]}, Simp[(a*g - b
*f*x)*((a + b*x^2)^(p + 1)/(2*a*b*(p + 1))), x] + Dist[1/(2*a*(p + 1)), Int
[(a + b*x^2)^(p + 1)*ExpandToSum[2*a*(p + 1)*Q + f*(2*p + 3), x], x], x] /
; FreeQ[{a, b}, x] && PolyQ[Pq, x] && LtQ[p, -1]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \text{Subst} \left(\int \frac{(1 - 92x^2 + 134x^4 - 28x^6 + x^8)^2}{(1 + x^2)^9} dx, x, \tan(x) \right) \\ &= 4096 \cos^{15}(x) \sin(x) \\ &\quad - \frac{1}{16} \text{Subst} \left(\int \frac{65520 - 1045616x^2 + 905904x^4 - 510512x^6 + 140752x^8 - 17744x^{10} + 912x^{12} - 16}{(1 + x^2)^8} dx, x, \tan(x) \right) \end{aligned}$$

$$\begin{aligned}
&= -\frac{83968}{7} \cos^{13}(x) \sin(x) + 4096 \cos^{15}(x) \sin(x) \\
&\quad + \frac{1}{224} \text{Subst} \left(\int \frac{1769696 - 22061760x^2 + 9379104x^4 - 2231936x^6 + 261408x^8 - 12992x^{10} + 224}{(1+x^2)^7} dx, x, \tan(x) \right) \\
&= \frac{279040}{21} \cos^{11}(x) \sin(x) - \frac{83968}{7} \cos^{13}(x) \sin(x) + 4096 \cos^{15}(x) \sin(x) \\
&\quad - \frac{\text{Subst} \left(\int \frac{14480768 - 142627968x^2 + 30078720x^4 - 3295488x^6 + 158592x^8 - 2688x^{10}}{(1+x^2)^6} dx, x, \tan(x) \right)}{2688} \\
&= -\frac{744704}{105} \cos^9(x) \sin(x) + \frac{279040}{21} \cos^{11}(x) \sin(x) \\
&\quad - \frac{83968}{7} \cos^{13}(x) \sin(x) + 4096 \cos^{15}(x) \sin(x) \\
&\quad + \frac{\text{Subst} \left(\int \frac{45836544 - 335354880x^2 + 34567680x^4 - 1612800x^6 + 26880x^8}{(1+x^2)^5} dx, x, \tan(x) \right)}{26880} \\
&= \frac{67936}{35} \cos^7(x) \sin(x) - \frac{744704}{105} \cos^9(x) \sin(x) + \frac{279040}{21} \cos^{11}(x) \sin(x) \\
&\quad - \frac{83968}{7} \cos^{13}(x) \sin(x) + 4096 \cos^{15}(x) \sin(x) \\
&\quad - \frac{\text{Subst} \left(\int \frac{50706432 - 289658880x^2 + 13117440x^4 - 215040x^6}{(1+x^2)^4} dx, x, \tan(x) \right)}{215040} \\
&= -\frac{4112}{15} \cos^5(x) \sin(x) + \frac{67936}{35} \cos^7(x) \sin(x) - \frac{744704}{105} \cos^9(x) \sin(x) \\
&\quad + \frac{279040}{21} \cos^{11}(x) \sin(x) - \frac{83968}{7} \cos^{13}(x) \sin(x) + 4096 \cos^{15}(x) \sin(x) \\
&\quad + \frac{\text{Subst} \left(\int \frac{49459200 - 79994880x^2 + 1290240x^4}{(1+x^2)^3} dx, x, \tan(x) \right)}{1290240} \\
&= \frac{76}{3} \cos^3(x) \sin(x) - \frac{4112}{15} \cos^5(x) \sin(x) + \frac{67936}{35} \cos^7(x) \sin(x) \\
&\quad - \frac{744704}{105} \cos^9(x) \sin(x) + \frac{279040}{21} \cos^{11}(x) \sin(x) - \frac{83968}{7} \cos^{13}(x) \sin(x) \\
&\quad + 4096 \cos^{15}(x) \sin(x) - \frac{\text{Subst} \left(\int \frac{-67092480 - 5160960x^2}{(1+x^2)^2} dx, x, \tan(x) \right)}{5160960} \\
&= 6 \cos(x) \sin(x) + \frac{76}{3} \cos^3(x) \sin(x) - \frac{4112}{15} \cos^5(x) \sin(x) + \frac{67936}{35} \cos^7(x) \sin(x) \\
&\quad - \frac{744704}{105} \cos^9(x) \sin(x) + \frac{279040}{21} \cos^{11}(x) \sin(x) - \frac{83968}{7} \cos^{13}(x) \sin(x) \\
&\quad + 4096 \cos^{15}(x) \sin(x) + 7 \text{Subst} \left(\int \frac{1}{1+x^2} dx, x, \tan(x) \right)
\end{aligned}$$

$$\begin{aligned}
&= 7x + 6 \cos(x) \sin(x) + \frac{76}{3} \cos^3(x) \sin(x) - \frac{4112}{15} \cos^5(x) \sin(x) \\
&\quad + \frac{67936}{35} \cos^7(x) \sin(x) - \frac{744704}{105} \cos^9(x) \sin(x) \\
&\quad + \frac{279040}{21} \cos^{11}(x) \sin(x) - \frac{83968}{7} \cos^{13}(x) \sin(x) + 4096 \cos^{15}(x) \sin(x)
\end{aligned}$$

Mathematica [A] (verified)

Time = 0.48 (sec) , antiderivative size = 64, normalized size of antiderivative = 1.00

$$\begin{aligned}
&\int \csc^2(x) \csc^2(6x) \csc^2(10x) \csc^2(15x) \sin^2(2x) \sin^2(3x) \sin^2(5x) \sin^2(30x) dx \\
&= 7x + 4 \sin(2x) - \frac{1}{2} \sin(4x) - \frac{4}{3} \sin(6x) - \sin(8x) \\
&\quad - \frac{2}{5} \sin(10x) + \frac{1}{6} \sin(12x) + \frac{2}{7} \sin(14x) + \frac{1}{8} \sin(16x)
\end{aligned}$$

[In] Integrate[Csc[x]^2*Csc[6*x]^2*Csc[10*x]^2*Csc[15*x]^2*Sin[2*x]^2*Sin[3*x]^2*Sin[5*x]^2*Sin[30*x]^2,x]

[Out] 7*x + 4*Sin[2*x] - Sin[4*x]/2 - (4*Sin[6*x])/3 - Sin[8*x] - (2*Sin[10*x])/5 + Sin[12*x]/6 + (2*Sin[14*x])/7 + Sin[16*x]/8

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 227 vs. 2(52) = 104.

Time = 0.74 (sec) , antiderivative size = 228, normalized size of antiderivative = 3.56

$$4096 \left(\cos(x)^{15} + \frac{15 \cos(x)^{13}}{14} + \frac{65 \cos(x)^{11}}{56} + \frac{143 \cos(x)^9}{112} + \frac{1287 \cos(x)^7}{896} + \frac{429 \cos(x)^5}{256} + \frac{2145 \cos(x)^3}{1024} + \dots \right)$$

[In] int(sin(2*x)^2*sin(3*x)^2*sin(5*x)^2*sin(30*x)^2/sin(x)^2/sin(6*x)^2/sin(10*x)^2/sin(15*x)^2,x)

[Out] 4096*(cos(x)^15+15/14*cos(x)^13+65/56*cos(x)^11+143/112*cos(x)^9+1287/896*cos(x)^7+429/256*cos(x)^5+2145/1024*cos(x)^3+6435/2048*cos(x))*sin(x)+7*x-16384*(cos(x)^13+13/12*cos(x)^11+143/120*cos(x)^9+429/320*cos(x)^7+1001/640*cos(x)^5+1001/512*cos(x)^3+3003/1024*cos(x))*sin(x)+78848/3*(cos(x)^11+11/10*cos(x)^9+99/80*cos(x)^7+231/160*cos(x)^5+231/128*cos(x)^3+693/256*cos(x))*sin(x)-108544/5*(cos(x)^9+9/8*cos(x)^7+21/16*cos(x)^5+105/64*cos(x)^3+315/128*cos(x))*sin(x)+9920*(cos(x)^7+7/6*cos(x)^5+35/24*cos(x)^3+35/16*cos(x))*sin(x)-7616/3*(cos(x)^5+5/4*cos(x)^3+15/8*cos(x))*sin(x)+368*(cos(x)^3+3/2*cos(x))*sin(x)-32*cos(x)*sin(x)

Fricas [A] (verification not implemented)

none

Time = 0.28 (sec) , antiderivative size = 55, normalized size of antiderivative = 0.86

$$\int \csc^2(x) \csc^2(6x) \csc^2(10x) \csc^2(15x) \sin^2(2x) \sin^2(3x) \sin^2(5x) \sin^2(30x) dx$$

$$= \frac{2}{105} (215040 \cos(x)^{15} - 629760 \cos(x)^{13} + 697600 \cos(x)^{11} - 372352 \cos(x)^9 + 101904 \cos(x)^7 - 14392 \cos(x)^5 + 1330 \cos(x)^3 + 315 \cos(x)) \sin(x) + 7x$$

```
[In] integrate(sin(2*x)^2*sin(3*x)^2*sin(5*x)^2*sin(30*x)^2/sin(x)^2/sin(6*x)^2/sin(10*x)^2/sin(15*x)^2,x, algorithm="fricas")
```

```
[Out] 2/105*(215040*cos(x)^15 - 629760*cos(x)^13 + 697600*cos(x)^11 - 372352*cos(x)^9 + 101904*cos(x)^7 - 14392*cos(x)^5 + 1330*cos(x)^3 + 315*cos(x))*sin(x) + 7*x
```

Sympy [F(-1)]

Timed out.

$$\int \csc^2(x) \csc^2(6x) \csc^2(10x) \csc^2(15x) \sin^2(2x) \sin^2(3x) \sin^2(5x) \sin^2(30x) dx = \text{Timed out}$$

```
[In] integrate(sin(2*x)**2*sin(3*x)**2*sin(5*x)**2*sin(30*x)**2/sin(x)**2/sin(6*x)**2/sin(10*x)**2/sin(15*x)**2,x)
```

```
[Out] Timed out
```

Maxima [A] (verification not implemented)

none

Time = 0.21 (sec) , antiderivative size = 52, normalized size of antiderivative = 0.81

$$\int \csc^2(x) \csc^2(6x) \csc^2(10x) \csc^2(15x) \sin^2(2x) \sin^2(3x) \sin^2(5x) \sin^2(30x) dx$$

$$= 7x + \frac{1}{8} \sin(16x) + \frac{2}{7} \sin(14x) + \frac{1}{6} \sin(12x) - \frac{2}{5} \sin(10x) - \sin(8x) - \frac{4}{3} \sin(6x) - \frac{1}{2} \sin(4x) + 4 \sin(2x)$$

```
[In] integrate(sin(2*x)^2*sin(3*x)^2*sin(5*x)^2*sin(30*x)^2/sin(x)^2/sin(6*x)^2/sin(10*x)^2/sin(15*x)^2,x, algorithm="maxima")
```

```
[Out] 7*x + 1/8*sin(16*x) + 2/7*sin(14*x) + 1/6*sin(12*x) - 2/5*sin(10*x) - sin(8*x) - 4/3*sin(6*x) - 1/2*sin(4*x) + 4*sin(2*x)
```

Giac [A] (verification not implemented)

none

Time = 37.52 (sec) , antiderivative size = 61, normalized size of antiderivative = 0.95

$$\int \csc^2(x) \csc^2(6x) \csc^2(10x) \csc^2(15x) \sin^2(2x) \sin^2(3x) \sin^2(5x) \sin^2(30x) dx = 7x + \frac{2(315 \tan(x)^{15} + 3535 \tan(x)^{13} + 203 \tan(x)^{11} + 60919 \tan(x)^9 - 71031 \tan(x)^7 + 74613 \tan(x)^5 - 5775 \tan(x)^3 - 315 \tan(x))}{105 (\tan(x)^2 + 1)^8}$$

```
[In] integrate(sin(2*x)^2*sin(3*x)^2*sin(5*x)^2*sin(30*x)^2/sin(x)^2/sin(6*x)^2/sin(10*x)^2/sin(15*x)^2,x, algorithm="giac")
```

```
[Out] 7*x + 2/105*(315*tan(x)^15 + 3535*tan(x)^13 + 203*tan(x)^11 + 60919*tan(x)^9 - 71031*tan(x)^7 + 74613*tan(x)^5 - 5775*tan(x)^3 - 315*tan(x))/(tan(x)^2 + 1)^8
```

Mupad [B] (verification not implemented)

Time = 19.38 (sec) , antiderivative size = 66, normalized size of antiderivative = 1.03

$$\begin{aligned} & \int \csc^2(x) \csc^2(6x) \csc^2(10x) \csc^2(15x) \sin^2(2x) \sin^2(3x) \sin^2(5x) \sin^2(30x) dx \\ &= 4096 \sin(x) \cos(x)^{15} - \frac{83968 \sin(x) \cos(x)^{13}}{7} + \frac{279040 \sin(x) \cos(x)^{11}}{21} \\ & \quad - \frac{744704 \sin(x) \cos(x)^9}{105} + \frac{67936 \sin(x) \cos(x)^7}{35} \\ & \quad - \frac{4112 \sin(x) \cos(x)^5}{15} + \frac{76 \sin(x) \cos(x)^3}{3} + 6 \sin(x) \cos(x) + 7x \end{aligned}$$

```
[In] int((sin(2*x)^2*sin(3*x)^2*sin(5*x)^2*sin(30*x)^2)/(sin(6*x)^2*sin(10*x)^2*sin(15*x)^2*sin(x)^2),x)
```

```
[Out] 7*x + 6*cos(x)*sin(x) + (76*cos(x)^3*sin(x))/3 - (4112*cos(x)^5*sin(x))/15 + (67936*cos(x)^7*sin(x))/35 - (744704*cos(x)^9*sin(x))/105 + (279040*cos(x)^11*sin(x))/21 - (83968*cos(x)^13*sin(x))/7 + 4096*cos(x)^15*sin(x)
```

3.320 $\int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx$

| | |
|---|------|
| Optimal result | 2953 |
| Rubi [F] | 2953 |
| Mathematica [A] (verified) | 2954 |
| Maple [F] | 2954 |
| Fricas [A] (verification not implemented) | 2954 |
| Sympy [F] | 2955 |
| Maxima [F] | 2955 |
| Giac [F] | 2955 |
| Mupad [F(-1)] | 2955 |

Optimal result

Integrand size = 21, antiderivative size = 105

$$\int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx = \frac{1}{8} \left(\frac{2x(5+x^2+5\sqrt{1+x^2+x^4})}{(1-x^2+\sqrt{1+x^2+x^4})\sqrt{1+x^2} + \sqrt{1+x^2+x^4}} + 3\sqrt{2}\operatorname{arctanh}\left(\frac{\sqrt{2}x}{\sqrt{1+x^2} + \sqrt{1+x^2+x^4}}\right) \right)$$

[Out] 1/4*x*(5+x^2+5*(x^4+x^2+1)^(1/2))/(1-x^2+(x^4+x^2+1)^(1/2))/(1+x^2+(x^4+x^2+1)^(1/2))^(1/2)+3/8*2^(1/2)*arctanh(2^(1/2)*x/(1+x^2+(x^4+x^2+1)^(1/2))^(1/2))

Rubi [F]

$$\int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx = \int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx$$

[In] Int[Sqrt[1 + x^2 + Sqrt[1 + x^2 + x^4]], x]

[Out] Defer[Int][Sqrt[1 + x^2 + Sqrt[1 + x^2 + x^4]], x]

Rubi steps

$$\text{integral} = \int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx$$

Mathematica [A] (verified)

Time = 0.55 (sec) , antiderivative size = 105, normalized size of antiderivative = 1.00

$$\int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx = \frac{1}{8} \left(\frac{2x(5+x^2+5\sqrt{1+x^2+x^4})}{(1-x^2+\sqrt{1+x^2+x^4})\sqrt{1+x^2} + \sqrt{1+x^2+x^4}} + 3\sqrt{2}\operatorname{arctanh}\left(\frac{\sqrt{2}x}{\sqrt{1+x^2} + \sqrt{1+x^2+x^4}}\right) \right)$$

[In] Integrate[Sqrt[1 + x^2 + Sqrt[1 + x^2 + x^4]], x]

[Out] ((2*x*(5 + x^2 + 5*Sqrt[1 + x^2 + x^4]))/((1 - x^2 + Sqrt[1 + x^2 + x^4])*Sqrt[1 + x^2 + Sqrt[1 + x^2 + x^4]]) + 3*Sqrt[2]*ArcTanh[(Sqrt[2]*x)/Sqrt[1 + x^2 + Sqrt[1 + x^2 + x^4]]])/8

Maple [F]

$$\int \sqrt{1+x^2} + \sqrt{x^4+x^2+1} dx$$

[In] int((1+x^2+(x^4+x^2+1)^(1/2))^(1/2), x)

[Out] int((1+x^2+(x^4+x^2+1)^(1/2))^(1/2), x)

Fricas [A] (verification not implemented)

none

Time = 0.65 (sec) , antiderivative size = 148, normalized size of antiderivative = 1.41

$$\int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx = \frac{3\sqrt{2}x \log\left(-\frac{64x^5+16x^3+16\sqrt{x^4+x^2+1}(4x^3-x)+4(\sqrt{2\sqrt{x^4+x^2+1}(8x^2-5)+\sqrt{2}(8x^4-x^2+5)})\sqrt{x^2+\sqrt{x^4+x^2+1}+1+25x}}{x}\right) + 8(3\sqrt{2}x^2 - \sqrt{x^4+x^2+1} + 1)\sqrt{x^2+\sqrt{x^4+x^2+1}+1}}{32x}$$

[In] integrate((1+x^2+(x^4+x^2+1)^(1/2))^(1/2), x, algorithm="fricas")

[Out] 1/32*(3*sqrt(2)*x*log(-(64*x^5 + 16*x^3 + 16*sqrt(x^4 + x^2 + 1)*(4*x^3 - x) + 4*(sqrt(2)*sqrt(x^4 + x^2 + 1)*(8*x^2 - 5) + sqrt(2)*(8*x^4 - x^2 + 5)))*sqrt(x^2 + sqrt(x^4 + x^2 + 1) + 1) + 25*x)/x) + 8*(3*x^2 - sqrt(x^4 + x^2 + 1) + 1)*sqrt(x^2 + sqrt(x^4 + x^2 + 1) + 1))/x

Sympy [F]

$$\int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx = \int \sqrt{x^2 + \sqrt{x^4+x^2+1} + 1} dx$$

[In] integrate((1+x**2+(x**4+x**2+1)**(1/2))**(1/2),x)

[Out] Integral(sqrt(x**2 + sqrt(x**4 + x**2 + 1) + 1), x)

Maxima [F]

$$\int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx = \int \sqrt{x^2 + \sqrt{x^4+x^2+1} + 1} dx$$

[In] integrate((1+x^2+(x^4+x^2+1)^(1/2))^(1/2),x, algorithm="maxima")

[Out] integrate(sqrt(x^2 + sqrt(x^4 + x^2 + 1) + 1), x)

Giac [F]

$$\int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx = \int \sqrt{x^2 + \sqrt{x^4+x^2+1} + 1} dx$$

[In] integrate((1+x^2+(x^4+x^2+1)^(1/2))^(1/2),x, algorithm="giac")

[Out] integrate(sqrt(x^2 + sqrt(x^4 + x^2 + 1) + 1), x)

Mupad [F(-1)]

Timed out.

$$\int \sqrt{1+x^2} + \sqrt{1+x^2+x^4} dx = \int \sqrt{\sqrt{x^4+x^2+1} + x^2 + 1} dx$$

[In] int(((x^2 + x^4 + 1)^(1/2) + x^2 + 1)^(1/2),x)

[Out] int(((x^2 + x^4 + 1)^(1/2) + x^2 + 1)^(1/2), x)

$$3.321 \quad \int \frac{x^9}{575 - 48x^{10} + x^{20}} dx$$

| | |
|---|------|
| Optimal result | 2956 |
| Rubi [A] (verified) | 2956 |
| Mathematica [A] (verified) | 2957 |
| Maple [A] (verified) | 2957 |
| Fricas [A] (verification not implemented) | 2958 |
| Sympy [A] (verification not implemented) | 2958 |
| Maxima [A] (verification not implemented) | 2958 |
| Giac [A] (verification not implemented) | 2958 |
| Mupad [B] (verification not implemented) | 2959 |

Optimal result

Integrand size = 16, antiderivative size = 25

$$\int \frac{x^9}{575 - 48x^{10} + x^{20}} dx = -\frac{1}{20} \log(23 - x^{10}) + \frac{1}{20} \log(25 - x^{10})$$

[Out] -1/20*ln(-x^10+23)+1/20*ln(-x^10+25)

Rubi [A] (verified)

Time = 0.02 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.188$, Rules used = {1366, 630, 31}

$$\int \frac{x^9}{575 - 48x^{10} + x^{20}} dx = \frac{1}{20} \log(25 - x^{10}) - \frac{1}{20} \log(23 - x^{10})$$

[In] Int[x^9/(575 - 48*x^10 + x^20),x]

[Out] -1/20*Log[23 - x^10] + Log[25 - x^10]/20

Rule 31

Int[((a_) + (b_.)*(x_))^(n_), x_Symbol] := Simp[Log[RemoveContent[a + b*x, x]]/b, x] /; FreeQ[{a, b}, x]

Rule 630

Int[((a_.) + (b_.)*(x_) + (c_.)*(x_)^2)^(n_), x_Symbol] := With[{q = Rt[b^2 - 4*a*c, 2]}, Dist[c/q, Int[1/Simp[b/2 - q/2 + c*x, x], x], x] - Dist[c/q, Int[1/Simp[b/2 + q/2 + c*x, x], x], x] /; FreeQ[{a, b, c}, x] && NeQ[b^2 - 4*a*c, 0] && PosQ[b^2 - 4*a*c] && PerfectSquareQ[b^2 - 4*a*c]

Rule 1366

```
Int[(x_)^(m_.)*((a_) + (c_.)*(x_)^(n2_.) + (b_.)*(x_)^(n_.))^(p_.), x_Symbol
] := Dist[1/n, Subst[Int[(a + b*x + c*x^2)^p, x], x, x^n], x] /; FreeQ[{a,
b, c, m, n, p}, x] && EqQ[n2, 2*n] && EqQ[Simplify[m - n + 1], 0]
```

Rubi steps

$$\begin{aligned} \text{integral} &= \frac{1}{10} \text{Subst} \left(\int \frac{1}{575 - 48x + x^2} dx, x, x^{10} \right) \\ &= \frac{1}{20} \text{Subst} \left(\int \frac{1}{-25 + x} dx, x, x^{10} \right) - \frac{1}{20} \text{Subst} \left(\int \frac{1}{-23 + x} dx, x, x^{10} \right) \\ &= -\frac{1}{20} \log(23 - x^{10}) + \frac{1}{20} \log(25 - x^{10}) \end{aligned}$$

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00

$$\int \frac{x^9}{575 - 48x^{10} + x^{20}} dx = -\frac{1}{20} \log(23 - x^{10}) + \frac{1}{20} \log(25 - x^{10})$$

[In] Integrate[x^9/(575 - 48*x^10 + x^20),x]

[Out] -1/20*Log[23 - x^10] + Log[25 - x^10]/20

Maple [A] (verified)

Time = 0.06 (sec) , antiderivative size = 18, normalized size of antiderivative = 0.72

| method | result | size |
|--------------|---|------|
| default | $\frac{\ln(x^{10}-25)}{20} - \frac{\ln(x^{10}-23)}{20}$ | 18 |
| risch | $\frac{\ln(x^{10}-25)}{20} - \frac{\ln(x^{10}-23)}{20}$ | 18 |
| norman | $\frac{\ln(x^5-5)}{20} + \frac{\ln(x^5+5)}{20} - \frac{\ln(x^{10}-23)}{20}$ | 26 |
| parallelrisc | $\frac{\ln(x^5-5)}{20} + \frac{\ln(x^5+5)}{20} - \frac{\ln(x^{10}-23)}{20}$ | 26 |

[In] int(x^9/(x^20-48*x^10+575),x,method=_RETURNVERBOSE)

[Out] 1/20*ln(x^10-25)-1/20*ln(x^10-23)

Fricas [A] (verification not implemented)

none

Time = 0.24 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.68

$$\int \frac{x^9}{575 - 48x^{10} + x^{20}} dx = -\frac{1}{20} \log(x^{10} - 23) + \frac{1}{20} \log(x^{10} - 25)$$

[In] integrate(x^9/(x^20-48*x^10+575),x, algorithm="fricas")

[Out] -1/20*log(x^10 - 23) + 1/20*log(x^10 - 25)

Sympy [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.60

$$\int \frac{x^9}{575 - 48x^{10} + x^{20}} dx = \frac{\log(x^{10} - 25)}{20} - \frac{\log(x^{10} - 23)}{20}$$

[In] integrate(x**9/(x**20-48*x**10+575),x)

[Out] log(x**10 - 25)/20 - log(x**10 - 23)/20

Maxima [A] (verification not implemented)

none

Time = 0.20 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.68

$$\int \frac{x^9}{575 - 48x^{10} + x^{20}} dx = -\frac{1}{20} \log(x^{10} - 23) + \frac{1}{20} \log(x^{10} - 25)$$

[In] integrate(x^9/(x^20-48*x^10+575),x, algorithm="maxima")

[Out] -1/20*log(x^10 - 23) + 1/20*log(x^10 - 25)

Giac [A] (verification not implemented)

none

Time = 0.34 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.76

$$\int \frac{x^9}{575 - 48x^{10} + x^{20}} dx = -\frac{1}{20} \log(|x^{10} - 23|) + \frac{1}{20} \log(|x^{10} - 25|)$$

[In] integrate(x^9/(x^20-48*x^10+575),x, algorithm="giac")

[Out] -1/20*log(abs(x^10 - 23)) + 1/20*log(abs(x^10 - 25))

Mupad [B] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.92

$$\int \frac{x^9}{575 - 48x^{10} + x^{20}} dx = \frac{\operatorname{atan}\left(\frac{x^{10} 1006772302081i - 21354610286400i}{2807924963544 x^{10} - 66383426822975}\right) 1i}{10}$$

[In] int(x^9/(x^20 - 48*x^10 + 575),x)

[Out] (atan((x^10*1006772302081i - 21354610286400i)/(2807924963544*x^10 - 66383426822975))*1i)/10

CHAPTER 4

APPENDIX

4.1 Listing of Grading functions 2961

4.1 Listing of Grading functions

The following are the current version of the grading functions used for grading the quality of the antiderivative with reference to the optimal antiderivative included in the test suite.

There is a version for Maple and for Mathematica/Rubi. There is a version for grading Sympy and version for use with Sagemath.

The following are links to the current source code.

The following are the listings of source code of the grading functions.

Mathematica and Rubi grading function

```
(* Original version thanks to Albert Rich emailed on 03/21/2017 *)
(* ::Package:: *)

(* Nasser: April 7, 2022. add second output which gives reason for the grade *)
(*      Small rewrite of logic in main function to make it*)
(*      match Maple's logic. No change in functionality otherwise*)

(* ::Subsection:: *)
(*GradeAntiderivative[result,optimal]*)

(* ::Text:: *)
(*If result and optimal are mathematical expressions, *)
```

```

(*      GradeAntiderivative[result,optimal] returns*)
(* "F" if the result fails to integrate an expression that*)
(*   is integrable*)
(* "C" if result involves higher level functions than necessary*)
(* "B" if result is more than twice the size of the optimal*)
(*   antiderivative*)
(* "A" if result can be considered optimal*)

GradeAntiderivative[result_,optimal_] := Module[{expnResult,expnOptimal,leafCountResult,leafCo
  expnResult = ExpnType[result];
  expnOptimal = ExpnType[optimal];
  leafCountResult = LeafCount[result];
  leafCountOptimal = LeafCount[optimal];

  (*Print["expnResult=",expnResult," expnOptimal=",expnOptimal];*)
  If[expnResult<=expnOptimal,
    If[Not[FreeQ[result,Complex]], (*result contains complex*)
      If[Not[FreeQ[optimal,Complex]], (*optimal contains complex*)
        If[leafCountResult<=2*leafCountOptimal,
          finalresult={"A",""}
          ,(*ELSE*)
          finalresult={"B","Both result and optimal contain complex but leaf count is
        ]
      ,(*ELSE*)
      finalresult={"C","Result contains complex when optimal does not."}
    ]
    ,(*ELSE*)(*result does not contains complex*)
    If[leafCountResult<=2*leafCountOptimal,
      finalresult={"A",""}
      ,(*ELSE*)
      finalresult={"B","Leaf count is larger than twice the leaf count of optimal. $"
    ]
  ]
  ,(*ELSE*) (*expnResult>expnOptimal*)
  If[FreeQ[result,Integrate] && FreeQ[result,Int],
    finalresult={"C","Result contains higher order function than in optimal. Order "<>
    ,
    finalresult={"F","Contains unresolved integral."}
  ]
];

  finalresult
]

(* ::Text:: *)
(*The following summarizes the type number assigned an *)

```

```

(*expression based on the functions it involves*)
(*1 = rational function*)
(*2 = algebraic function*)
(*3 = elementary function*)
(*4 = special function*)
(*5 = hyperpergeometric function*)
(*6 = appell function*)
(*7 = rootsum function*)
(*8 = integrate function*)
(*9 = unknown function*)

```

```

ExpnType[expn_] :=
  If[AtomQ[expn],
    1,
    If[ListQ[expn],
      Max[Map[ExpnType, expn]],
      If[Head[expn]===Power,
        If[IntegerQ[expn[[2]]],
          ExpnType[expn[[1]]],
          If[Head[expn[[2]]]===Rational,
            If[IntegerQ[expn[[1]]] || Head[expn[[1]]]===Rational,
              1,
              Max[ExpnType[expn[[1]], 2]],
            Max[ExpnType[expn[[1]], ExpnType[expn[[2]], 3]]],
          If[Head[expn]===Plus || Head[expn]===Times,
            Max[ExpnType[First[expn]], ExpnType[Rest[expn]]],
            If[ElementaryFunctionQ[Head[expn]],
              Max[3, ExpnType[expn[[1]]],
            If[SpecialFunctionQ[Head[expn]],
              Apply[Max, Append[Map[ExpnType, Apply[List, expn]], 4]],
            If[HypergeometricFunctionQ[Head[expn]],
              Apply[Max, Append[Map[ExpnType, Apply[List, expn]], 5]],
            If[AppellFunctionQ[Head[expn]],
              Apply[Max, Append[Map[ExpnType, Apply[List, expn]], 6]],
            If[Head[expn]===RootSum,
              Apply[Max, Append[Map[ExpnType, Apply[List, expn]], 7]],
            If[Head[expn]===Integrate || Head[expn]===Int,
              Apply[Max, Append[Map[ExpnType, Apply[List, expn]], 8]],
            9]]]]]]]]]]

```

```

ElementaryFunctionQ[func_] :=
  MemberQ[{
    Exp, Log,
    Sin, Cos, Tan, Cot, Sec, Csc,
    ArcSin, ArcCos, ArcTan, ArcCot, ArcSec, ArcCsc,

```

```

    Sinh, Cosh, Tanh, Coth, Sech, Csch,
    ArcSinh, ArcCosh, ArcTanh, ArcCoth, ArcSech, ArcCsch
  }, func]

SpecialFunctionQ[func_] :=
  MemberQ[{
    Erf, Erfc, Erfi,
    FresnelS, FresnelC,
    ExpIntegralE, ExpIntegralEi, LogIntegral,
    SinIntegral, CosIntegral, SinhIntegral, CoshIntegral,
    Gamma, LogGamma, PolyGamma,
    Zeta, PolyLog, ProductLog,
    EllipticF, EllipticE, EllipticPi
  }, func]

HypergeometricFunctionQ[func_] :=
  MemberQ[{Hypergeometric1F1, Hypergeometric2F1, HypergeometricPFQ}, func]

AppellFunctionQ[func_] :=
  MemberQ[{AppellF1}, func]

```

Maple grading function

```

# File: GradeAntiderivative.mpl
# Original version thanks to Albert Rich emailed on 03/21/2017

#Nasser 03/22/2017 Use Maple leaf count instead since buildin
#Nasser 03/23/2017 missing 'ln' for ElementaryFunctionQ added
#Nasser 03/24/2017 corrected the check for complex result
#Nasser 10/27/2017 check for leafsize and do not call ExpnType()
#
# if leaf size is "too large". Set at 500,000
#Nasser 12/22/2019 Added debug flag, added 'dilog' to special functions
#
# see problem 156, file Apostol_Problems
#Nasser 4/07/2022 add second output which gives reason for the grade

GradeAntiderivative := proc(result, optimal)
local leaf_count_result,
      leaf_count_optimal,
      ExpnType_result,
      ExpnType_optimal,
      debug:=false;

      leaf_count_result:=leafcount(result);

```



```

#do NOT call ExpnType() if leaf size is too large. Recursion problem
if leaf_count_result > 500000 then
    return "B","result has leaf size over 500,000. Avoiding possible recursion issues
fi;

leaf_count_optimal := leafcount(optimal);
ExpnType_result := ExpnType(result);
ExpnType_optimal := ExpnType(optimal);

if debug then
    print("ExpnType_result",ExpnType_result," ExpnType_optimal=",ExpnType_optimal);
fi;

# If result and optimal are mathematical expressions,
# GradeAntiderivative[result,optimal] returns
# "F" if the result fails to integrate an expression that
# is integrable
# "C" if result involves higher level functions than necessary
# "B" if result is more than twice the size of the optimal
# antiderivative
# "A" if result can be considered optimal

#This check below actually is not needed, since I only
#call this grading only for passed integrals. i.e. I check
#for "F" before calling this. But no harm of keeping it here.
#just in case.

if not type(result,freeof('int')) then
    return "F","Result contains unresolved integral";
fi;

if ExpnType_result<=ExpnType_optimal then
    if debug then
        print("ExpnType_result<=ExpnType_optimal");
    fi;
    if is_contains_complex(result) then
        if is_contains_complex(optimal) then
            if debug then
                print("both result and optimal complex");
            fi;
            if leaf_count_result<=2*leaf_count_optimal then
                return "A"," ";
            else
                return "B",cat("Both result and optimal contain complex but leaf count of
                                convert(leaf_count_result,string)," vs. $2 ("
```

```

                                convert(leaf_count_optimal,string)," ) = ",convert(2*leaf_c
    end if
else #result contains complex but optimal is not
    if debug then
        print("result contains complex but optimal is not");
    fi;
    return "C","Result contains complex when optimal does not.";
fi;
else # result do not contain complex
    # this assumes optimal do not as well. No check is needed here.
    if debug then
        print("result do not contain complex, this assumes optimal do not as well")
    fi;
    if leaf_count_result<=2*leaf_count_optimal then
        if debug then
            print("leaf_count_result<=2*leaf_count_optimal");
        fi;
        return "A"," ";
    else
        if debug then
            print("leaf_count_result>2*leaf_count_optimal");
        fi;
        return "B",cat("Leaf count of result is larger than twice the leaf count of opt
                                convert(leaf_count_result,string)," $ vs. $2(",
                                convert(leaf_count_optimal,string)," )=",convert(2*leaf_count
    fi;
fi;
else #ExpnType(result) > ExpnType(optimal)
    if debug then
        print("ExpnType(result) > ExpnType(optimal)");
    fi;
    return "C",cat("Result contains higher order function than in optimal. Order ",
        convert(ExpnType_result,string)," vs. order ",
        convert(ExpnType_optimal,string),".");
fi;

end proc:

#
# is_contains_complex(result)
# takes expressions and returns true if it contains "I" else false
#
#Nasser 032417
is_contains_complex:= proc(expression)
    return (has(expression,I));
end proc:

```

```

# The following summarizes the type number assigned an expression
# based on the functions it involves
# 1 = rational function
# 2 = algebraic function
# 3 = elementary function
# 4 = special function
# 5 = hyperpergeometric function
# 6 = appell function
# 7 = rootsum function
# 8 = integrate function
# 9 = unknown function

ExpnType := proc(expn)
  if type(expn,'atomic') then
    1
  elif type(expn,'list') then
    apply(max,map(ExpnType,expn))
  elif type(expn,'sqrt') then
    if type(op(1,expn),'rational') then
      1
    else
      max(2,ExpnType(op(1,expn)))
    end if
  elif type(expn,'^^') then
    if type(op(2,expn),'integer') then
      ExpnType(op(1,expn))
    elif type(op(2,expn),'rational') then
      if type(op(1,expn),'rational') then
        1
      else
        max(2,ExpnType(op(1,expn)))
      end if
    else
      max(3,ExpnType(op(1,expn)),ExpnType(op(2,expn)))
    end if
  elif type(expn,'+`') or type(expn,'*`') then
    max(ExpnType(op(1,expn)),max(ExpnType(rest(expn))))
  elif ElementaryFunctionQ(op(0,expn)) then
    max(3,ExpnType(op(1,expn)))
  elif SpecialFunctionQ(op(0,expn)) then
    max(4,apply(max,map(ExpnType,[op(expn)])))
  elif HypergeometricFunctionQ(op(0,expn)) then
    max(5,apply(max,map(ExpnType,[op(expn)])))
  elif AppellFunctionQ(op(0,expn)) then
    max(6,apply(max,map(ExpnType,[op(expn)])))
  elif op(0,expn)='int' then
    max(8,apply(max,map(ExpnType,[op(expn)]))) else

```

```

9
end if
end proc:

ElementaryFunctionQ := proc(func)
  member(func, [
    exp, log, ln,
    sin, cos, tan, cot, sec, csc,
    arcsin, arccos, arctan, arccot, arcsec, arccsc,
    sinh, cosh, tanh, coth, sech, csch,
    arcsinh, arccosh, arctanh, arccoth, arcsech, arccsch])
end proc:

SpecialFunctionQ := proc(func)
  member(func, [
    erf, erfc, erfi,
    FresnelS, FresnelC,
    Ei, Ei, Li, Si, Ci, Shi, Chi,
    GAMMA, lnGAMMA, Psi, Zeta, polylog, dilog, LambertW,
    EllipticF, EllipticE, EllipticPi])
end proc:

HypergeometricFunctionQ := proc(func)
  member(func, [Hypergeometric1F1, hypergeom, HypergeometricPFQ])
end proc:

AppellFunctionQ := proc(func)
  member(func, [AppellF1])
end proc:

# u is a sum or product. rest(u) returns all but the
# first term or factor of u.
rest := proc(u) local v;
  if nops(u)=2 then
    op(2,u)
  else
    apply(op(0,u), op(2..nops(u), u))
  end if
end proc:

#leafcount(u) returns the number of nodes in u.
#Nasser 3/23/17 Replaced by build-in leafCount from package in Maple
leafcount := proc(u)
  MmaTranslator[Mma][LeafCount](u);
end proc:

```

Sympy grading function

```

#Dec 24, 2019. Nasser M. Abbasi:
#      Port of original Maple grading function by
#      Albert Rich to use with Sympy/Python
#Dec 27, 2019 Nasser. Added `RootSum`. See problem 177, Timofeev file
#      added 'exp_polar'
from sympy import *

def leaf_count(expr):
    #sympy do not have leaf count function. This is approximation
    return round(1.7*count_ops(expr))

def is_sqrt(expr):
    if isinstance(expr,Pow):
        if expr.args[1] == Rational(1,2):
            return True
        else:
            return False
    else:
        return False

def is_elementary_function(func):
    return func in [exp,log,ln,sin,cos,tan,cot,sec,csc,
        asin,acos,atan,acot,asec,acsc,sinh,cosh,tanh,coth,sech,csch,
        asinh,acosh,atanh,acoth,asech,acsch
    ]

def is_special_function(func):
    return func in [ erf,erfc,erfi,
        fresnels,fresnelc,Ei,Ei,Li,Si,Ci,Shi,Chi,
        gamma,loggamma,digamma,zeta,polylog,LambertW,
        elliptic_f,elliptic_e,elliptic_pi,exp_polar
    ]

def is_hypergeometric_function(func):
    return func in [hyper]

def is_appell_function(func):
    return func in [appellf1]

def is_atom(expn):
    try:
        if expn.isAtom or isinstance(expn,int) or isinstance(expn,float):
            return True
        else:
            return False

```

```

except AttributeError as error:
    return False

def expnType(expn):
    debug=False
    if debug:
        print("expn=",expn,"type(expn)=",type(expn))

    if is_atom(expn):
        return 1
    elif isinstance(expn,list):
        return max(map(expnType, expn)) #apply(max,map(ExpnType,expn))
    elif is_sqrt(expn):
        if isinstance(expn.args[0],Rational): #type(op(1,expn),'rational')
            return 1
        else:
            return max(2,expnType(expn.args[0])) #max(2,ExpnType(op(1,expn)))
    elif isinstance(expn,Pow): #type(expn,'^')
        if isinstance(expn.args[1],Integer): #type(op(2,expn),'integer')
            return expnType(expn.args[0]) #ExpnType(op(1,expn))
        elif isinstance(expn.args[1],Rational): #type(op(2,expn),'rational')
            if isinstance(expn.args[0],Rational): #type(op(1,expn),'rational')
                return 1
            else:
                return max(2,expnType(expn.args[0])) #max(2,ExpnType(op(1,expn)))
        else:
            return max(3,expnType(expn.args[0]),expnType(expn.args[1])) #max(3,ExpnType(op(1,expn)),ExpnTy
    elif isinstance(expn,Add) or isinstance(expn,Mul): #type(expn,'+' or type(expn,'*')
        m1 = expnType(expn.args[0])
        m2 = expnType(list(expn.args[1:]))
        return max(m1,m2) #max(ExpnType(op(1,expn)),max(ExpnType(rest(expn))))
    elif is_elementary_function(expn.func): #ElementaryFunctionQ(op(0,expn))
        return max(3,expnType(expn.args[0])) #max(3,ExpnType(op(1,expn)))
    elif is_special_function(expn.func): #SpecialFunctionQ(op(0,expn))
        m1 = max(map(expnType, list(expn.args)))
        return max(4,m1) #max(4,apply(max,map(ExpnType,[op(expn)])))
    elif is_hypergeometric_function(expn.func): #HypergeometricFunctionQ(op(0,expn))
        m1 = max(map(expnType, list(expn.args)))
        return max(5,m1) #max(5,apply(max,map(ExpnType,[op(expn)])))
    elif is_appell_function(expn.func):
        m1 = max(map(expnType, list(expn.args)))
        return max(6,m1) #max(5,apply(max,map(ExpnType,[op(expn)])))
    elif isinstance(expn,RootSum):
        m1 = max(map(expnType, list(expn.args))) #Apply[Max,Append[Map[ExpnType,Apply[List,expn]],7]],
        return max(7,m1)
    elif str(expn).find("Integral") != -1:

```

```

    m1 = max(map(expnType, list(expn.args)))
    return max(8,m1)  #max(5,apply(max,map(ExpnType,[op(expn)])))
else:
    return 9

#main function
def grade_antiderivative(result,optimal):

    #print ("Enter grade_antiderivative for sagemath")
    #print("Enter grade_antiderivative, result=",result," optimal=",optimal)

    leaf_count_result = leaf_count(result)
    leaf_count_optimal = leaf_count(optimal)

    #print("leaf_count_result=",leaf_count_result)
    #print("leaf_count_optimal=",leaf_count_optimal)

    expnType_result = expnType(result)
    expnType_optimal = expnType(optimal)

    if str(result).find("Integral") != -1:
        grade = "F"
        grade_annotation = ""
    else:
        if expnType_result <= expnType_optimal:
            if result.has(I):
                if optimal.has(I): #both result and optimal complex
                    if leaf_count_result <= 2*leaf_count_optimal:
                        grade = "A"
                        grade_annotation = ""
                    else:
                        grade = "B"
                        grade_annotation = "Both result and optimal contain complex but leaf count of result is large"
                else: #result contains complex but optimal is not
                    grade = "C"
                    grade_annotation = "Result contains complex when optimal does not."
            else: # result do not contain complex, this assumes optimal do not as well
                if leaf_count_result <= 2*leaf_count_optimal:
                    grade = "A"
                    grade_annotation = ""
                else:
                    grade = "B"
                    grade_annotation = "Leaf count of result is larger than twice the leaf count of optimal. "+str(leaf_count_result)
            else:
                grade = "C"
                grade_annotation = "Result contains higher order function than in optimal. Order "+str(ExpnType_result)

```

```

#print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)

return grade, grade_annotation

```

SageMath grading function

```

#Dec 24, 2019. Nasser: Ported original Maple grading function by
#    Albert Rich to use with Sagemath. This is used to
#    grade Fricas, Giac and Maxima results.
#Dec 24, 2019. Nasser: Added 'exp_integral_e' and 'sng', 'sin_integral'
#    'arctan2', 'floor', 'abs', 'log_integral'
#June 4, 2022 Made default grade_annotation "none" instead of "" due
#    issue later when reading the file.
#July 14, 2022. Added ellipticF. This is until they fix sagemath, then remove it.

from sage.all import *
from sage.symbolic.operators import add_vararg, mul_vararg

debug=False;

def tree_size(expr):
    r"""
    Return the tree size of this expression.
    """
    #print("Enter tree_size, expr is ",expr)

    if expr not in SR:
        # deal with lists, tuples, vectors
        return 1 + sum(tree_size(a) for a in expr)
    expr = SR(expr)
    x, aa = expr.operator(), expr.operands()
    if x is None:
        return 1
    else:
        return 1 + sum(tree_size(a) for a in aa)

def is_sqrt(expr):
    if expr.operator() == operator.pow: #isinstance(expr, Pow):
        if expr.operands()[1]==1/2: #expr.args[1] == Rational(1,2):
            if debug: print ("expr is sqrt")
            return True
        else:
            return False
    else:
        return False

```



```

def is_elementary_function(func):
    #debug=False
    m = func.name() in ['exp','log','ln',
        'sin','cos','tan','cot','sec','csc',
        'arcsin','arccos','arctan','arccot','arcsec','arccsc',
        'sinh','cosh','tanh','coth','sech','csch',
        'arcsinh','arccosh','arctanh','arcoth','arcsech','arccsch','sgn',
        'arctan2','floor','abs'
    ]
    if debug:
        if m:
            print ("func ", func , " is elementary_function")
        else:
            print ("func ", func , " is NOT elementary_function")

    return m

def is_special_function(func):
    #debug=False
    if debug:
        print ("type(func)=", type(func))

    m= func.name() in ['erf','erfc','erfi','fresnel_sin','fresnel_cos','Ei',
        'Ei','Li','Si','sin_integral','Ci','cos_integral','Shi','sinh_integral',
        'Chi','cosh_integral','gamma','log_gamma','psi,zeta',
        'polylog','lambert_w','elliptic_f','elliptic_e','ellipticF',
        'elliptic_pi','exp_integral_e','log_integral']

    if debug:
        print ("m=",m)
        if m:
            print ("func ", func , " is special_function")
        else:
            print ("func ", func , " is NOT special_function")

    return m

def is_hypergeometric_function(func):
    return func.name() in ['hypergeometric','hypergeometric_M','hypergeometric_U']

def is_appell_function(func):
    return func.name() in ['hypergeometric']  #[appellf1] can't find this in sagemath

```

```

def is_atom(expn):

    #debug=False
    if debug:
        print ("Enter is_atom, expn=",expn)

    if not hasattr(expn, 'parent'):
        return False

    #thanks to answer at https://ask.sagemath.org/question/49179/what-is-sagemath-equivalent-to-atomic-t
    try:
        if expn.parent() is SR:
            return expn.operator() is None
        if expn.parent() in (ZZ, QQ, AA, QQbar):
            return expn in expn.parent() # Should always return True
        if hasattr(expn.parent(), "base_ring") and hasattr(expn.parent(), "gens"):
            return expn in expn.parent().base_ring() or expn in expn.parent().gens()

        return False

    except AttributeError as error:
        print("Exception,AttributeError in is_atom")
        print ("caught exception" , type(error).__name__ )
        return False

def expnType(expn):

    if debug:
        print (">>>>>Enter expnType, expn=", expn)
        print (">>>>>is_atom(expn)=", is_atom(expn))

    if is_atom(expn):
        return 1
    elif type(expn)==list: #isinstance(expn,list):
        return max(map(expnType, expn)) #apply(max,map(ExpnType,expn))
    elif is_sqrt(expn):
        if type(expn.operands()[0])==Rational: #type(isinstance(expn.args[0],Rational):
            return 1
        else:
            return max(2,expnType(expn.operands()[0])) #max(2,expnType(expn.args[0]))
    elif expn.operator() == operator.pow: #isinstance(expn,Pow)
        if type(expn.operands()[1])==Integer: #isinstance(expn.args[1],Integer)
            return expnType(expn.operands()[0]) #expnType(expn.args[0])
        elif type(expn.operands()[1])==Rational: #isinstance(expn.args[1],Rational)
            if type(expn.operands()[0])==Rational: #isinstance(expn.args[0],Rational)

```

```

    return 1
  else:
    return max(2,expnType(expn.operands()[0])) #max(2,expnType(expn.args[0]))
  else:
    return max(3,expnType(expn.operands()[0]),expnType(expn.operands()[1])) #max(3,expnType(expn.
elif expn.operator() == add_vararg or expn.operator() == mul_vararg: #isinstance(expn,Add) or isinst
    m1 = expnType(expn.operands()[0]) #expnType(expn.args[0])
    m2 = expnType(expn.operands()[1:]) #expnType(list(expn.args[1:]))
    return max(m1,m2) #max(ExpnType(op(1,expn)),max(ExpnType(rest(expn))))
elif is_elementary_function(expn.operator()): #is_elementary_function(expn.func)
    return max(3,expnType(expn.operands()[0]))
elif is_special_function(expn.operator()): #is_special_function(expn.func)
    m1 = max(map(expnType, expn.operands())) #max(map(expnType, list(expn.args)))
    return max(4,m1) #max(4,m1)
elif is_hypergeometric_function(expn.operator()): #is_hypergeometric_function(expn.func)
    m1 = max(map(expnType, expn.operands())) #max(map(expnType, list(expn.args)))
    return max(5,m1) #max(5,m1)
elif is_appell_function(expn.operator()):
    m1 = max(map(expnType, expn.operands())) #max(map(expnType, list(expn.args)))
    return max(6,m1) #max(6,m1)
elif str(expn).find("Integral") != -1: #this will never happen, since it
    #is checked before calling the grading function that is passed.
    #but kept it here.
    m1 = max(map(expnType, expn.operands())) #max(map(expnType, list(expn.args)))
    return max(8,m1) #max(5,apply(max,map(ExpnType,[op(expn)])))
else:
    return 9

#main function
def grade_antiderivative(result,optimal):

    if debug:
        print ("Enter grade_antiderivative for sagemath")
        print("Enter grade_antiderivative, result=",result)
        print("Enter grade_antiderivative, optimal=",optimal)
        print("type(anti)=",type(result))
        print("type(optimal)=",type(optimal))

    leaf_count_result = tree_size(result) #leaf_count(result)
    leaf_count_optimal = tree_size(optimal) #leaf_count(optimal)

    #if debug: print ("leaf_count_result=", leaf_count_result, "leaf_count_optimal=",leaf_count_optimal)

    expnType_result = expnType(result)
    expnType_optimal = expnType(optimal)

```

```

if debug: print ("expnType_result=", expnType_result, "expnType_optimal=",expnType_optimal)

if expnType_result <= expnType_optimal:
    if result.has(I):
        if optimal.has(I): #both result and optimal complex
            if leaf_count_result <= 2*leaf_count_optimal:
                grade = "A"
                grade_annotation = "none"
            else:
                grade = "B"
                grade_annotation = "Both result and optimal contain complex but leaf count of result is larger than"
        else: #result contains complex but optimal is not
            grade = "C"
            grade_annotation = "Result contains complex when optimal does not."
    else: # result do not contain complex, this assumes optimal do not as well
        if leaf_count_result <= 2*leaf_count_optimal:
            grade = "A"
            grade_annotation = "none"
        else:
            grade = "B"
            grade_annotation = "Leaf count of result is larger than twice the leaf count of optimal. " + str(leaf_c

else:
    grade = "C"
    grade_annotation = "Result contains higher order function than in optimal. Order " + str(expnType_result

print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)

return grade, grade_annotation

```