Computer Algebra
Independent Integration Tests

Summer 2023 edition with Rubi V 4.17.3

4-Trig-functions/4.4-Cotangent/109-4.4.10-c+d-x-^m-a+b-cot-^n

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Contents

CHAPTER 1

Introduction

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 [61]. This is test number [109].

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 4.17.3 (Sept 25, 2023) on Mathematica 13.3.1 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
Rubi	100.00 (61)	0.00 (0)
Mathematica	100.00 (61)	0.00 (0)
Fricas	100.00 (61)	0.00 (0)
Maple	95.08 (58)	4.92 (3)
Maxima	80.33 (49)	19.67 (12)
Giac	57.38 (35)	42.62 (26)
Mupad	45.90 (28)	54.10 (33)
Sympy	45.90 (28)	54.10 (33)

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 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.

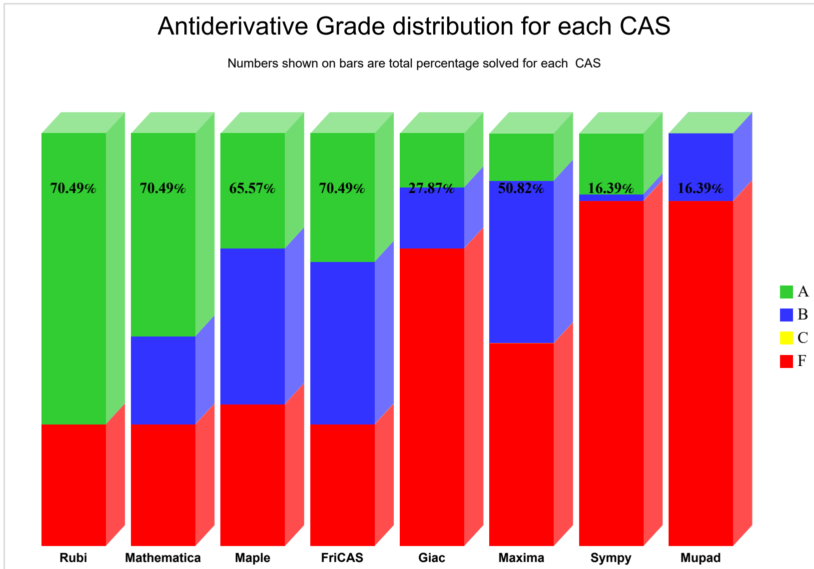
Table 1.2: Description of grading applied to integration result

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

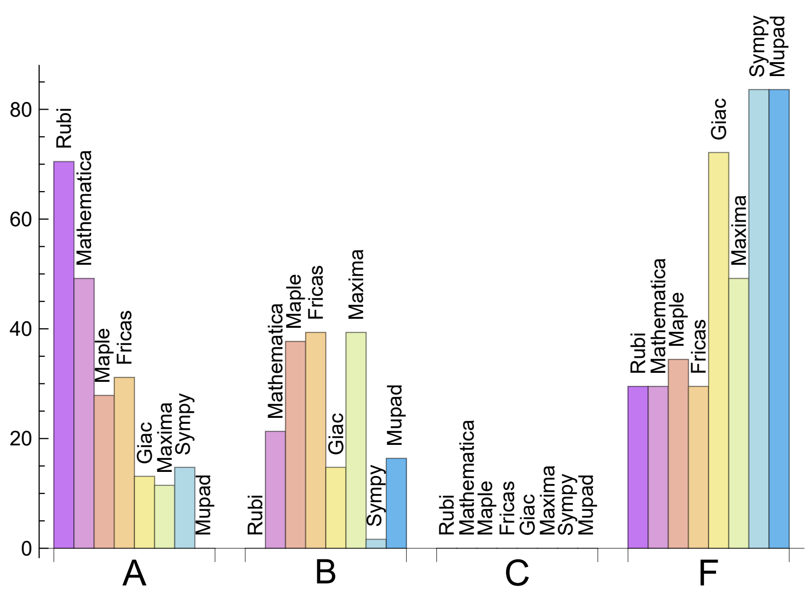
System	% A grade	% B grade	% C grade	% F grade
Rubi	70.492	0.000	0.000	29.508
Mathematica	49.180	21.311	0.000	29.508
Fricas	31.148	39.344	0.000	29.508
Maple	27.869	37.705	0.000	34.426
Sympy	14.754	1.639	0.000	83.607
Giac	13.115	14.754	0.000	72.131
Maxima	11.475	39.344	0.000	49.180
Mupad	0.000	16.393	0.000	83.607

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 timeout failure	Percentage exception failure
Rubi	0	0.00	0.00	0.00
Mathematica	0	0.00	0.00	0.00
Fricas	0	0.00	0.00	0.00
Maple	3	100.00	0.00	0.00
Maxima	12	25.00	0.00	75.00
Giac	26	100.00	0.00	0.00
Mupad	33	0.00	100.00	0.00
Sympy	33	93.94	6.06	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)
Fricas	0.27
Maple	0.48
Rubi	0.58
Giac	0.72
Sympy	0.99
Maxima	2.22
Mathematica	5.66
Mupad	10.04

Table 1.5: Time performance for each CAS

System	Mean size	Normalized mean	Median size	Normalized median
Mupad	91.86	1.16	22.00	1.10
Sympy	145.25	1.29	19.00	1.00
Rubi	179.44	1.05	147.00	1.00
Mathematica	332.89	1.67	182.00	1.26
Fricas	381.98	2.18	144.00	2.35
Giac	432.77	2.64	23.00	1.16
Maple	513.34	2.13	169.50	1.00
Maxima	1219.43	19.88	527.00	6.65

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.

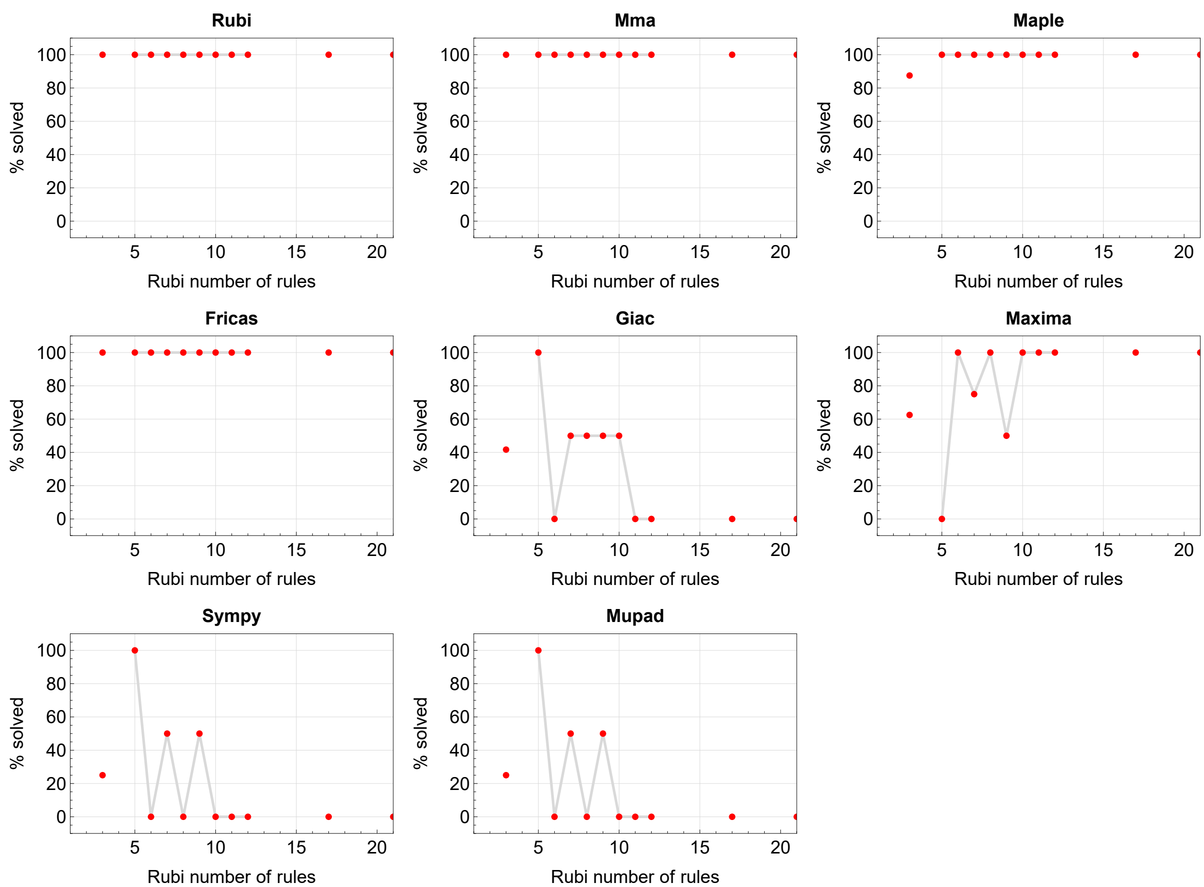


Figure 1.1: Solving statistics per number of Rubi rules used

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.

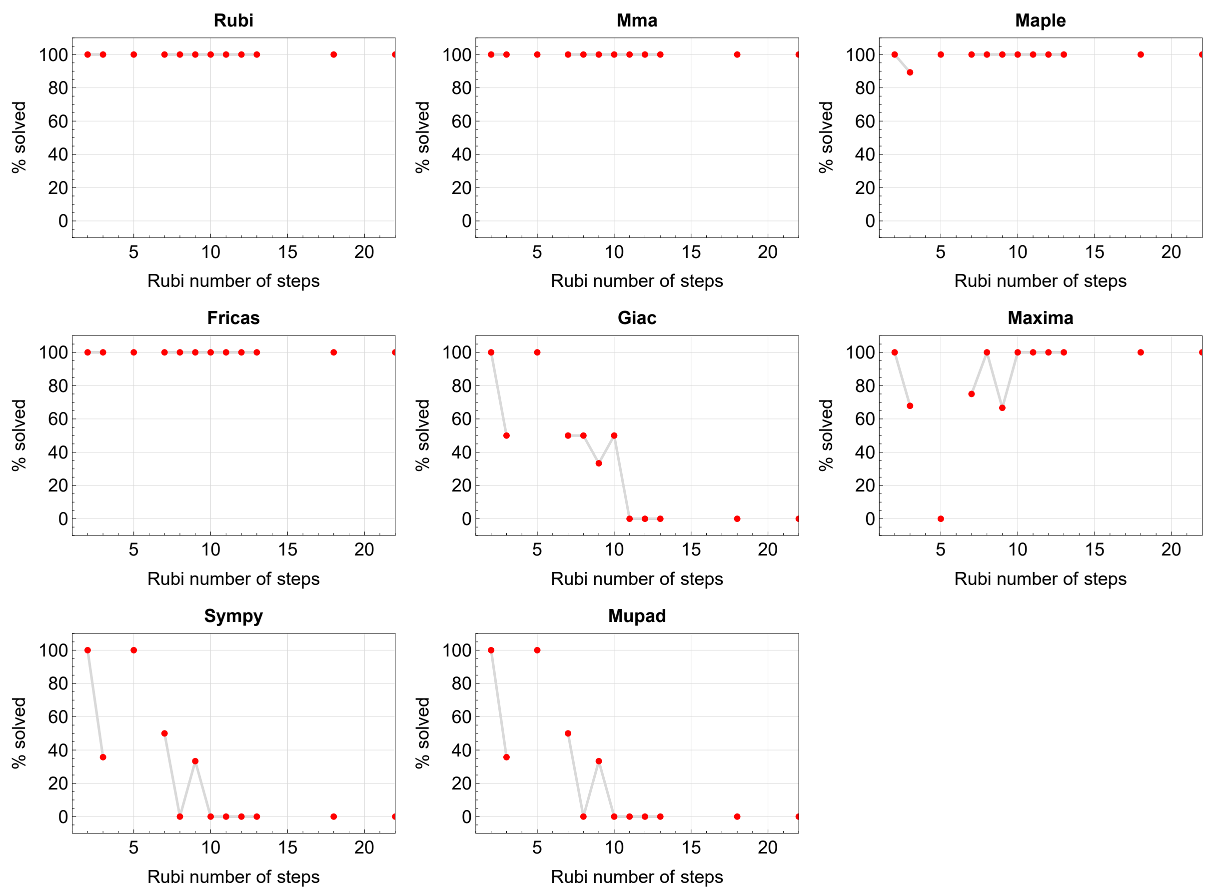


Figure 1.2: Solving statistics per number of Rubi steps used

The above diagram show that the precentage of solved intergals 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.

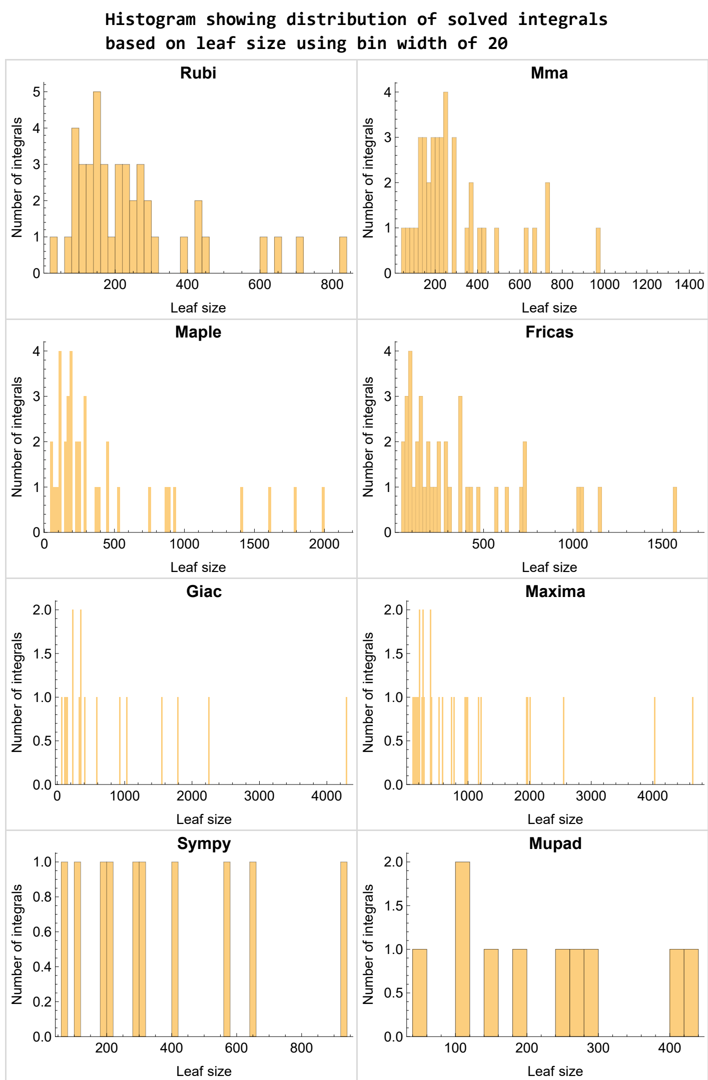


Figure 1.3: Solved integrals based on leaf size distribution

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.

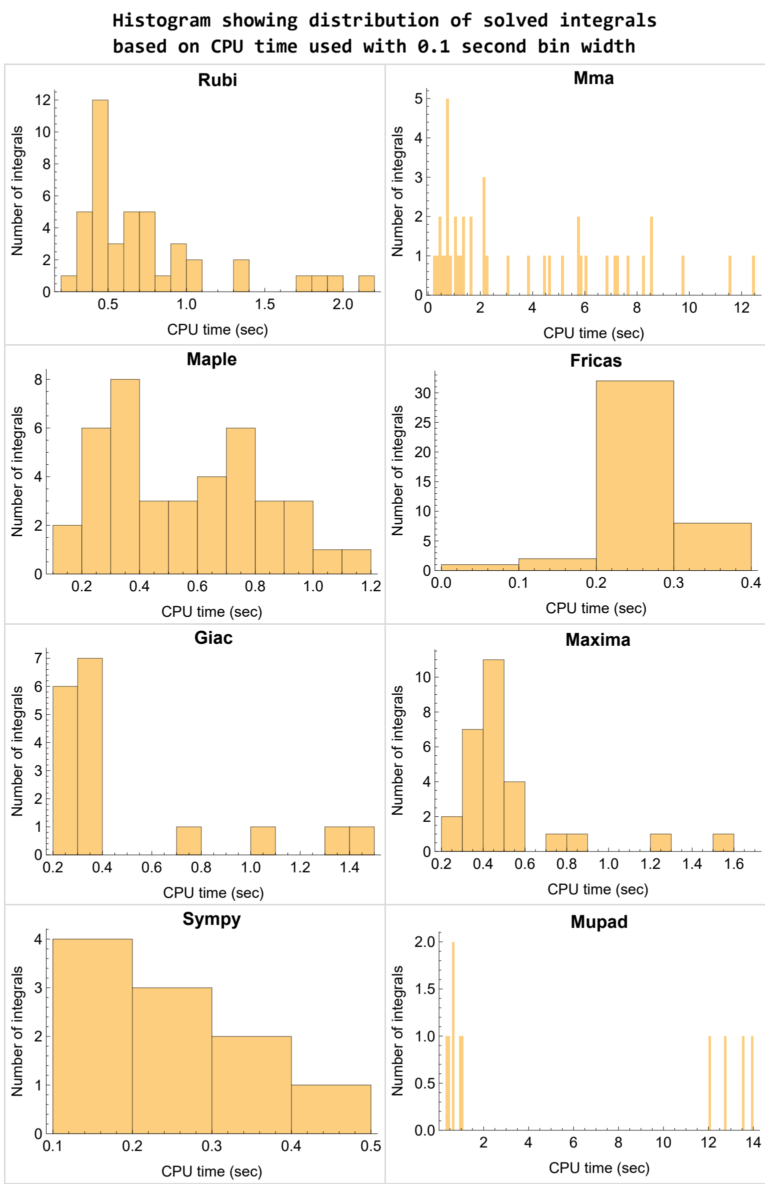


Figure 1.4: Solved integrals histogram based on CPU time used

1.8 Leaf size vs. CPU time used

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

The result for Fricas, 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.

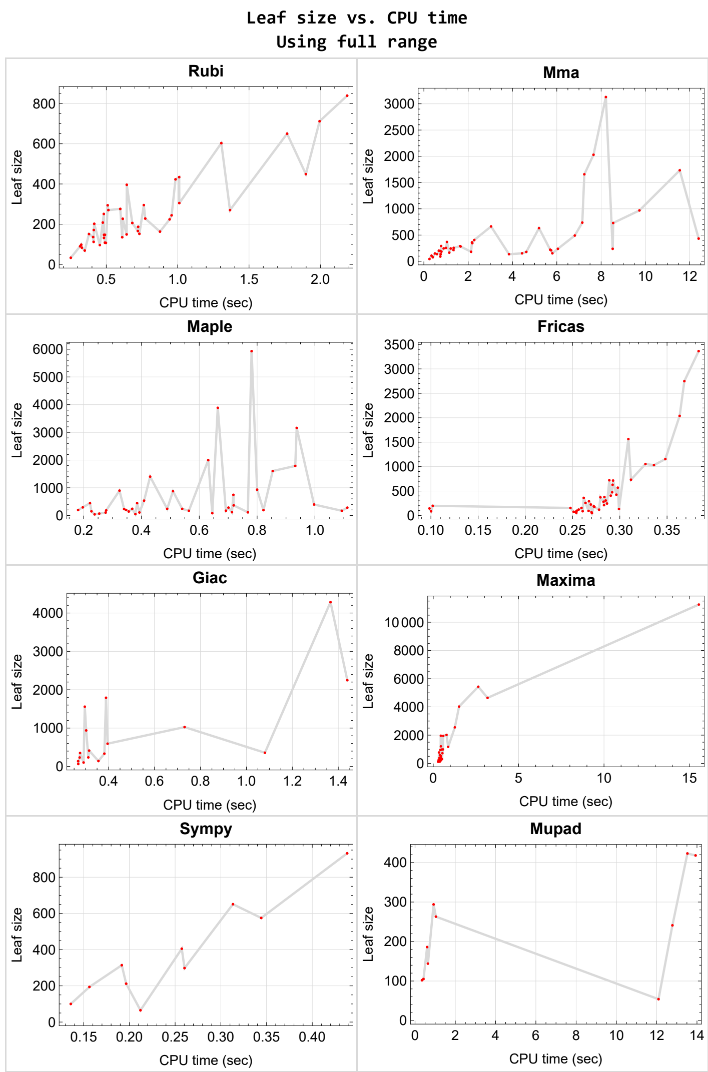


Figure 1.5: Leaf size vs. CPU time. Full range

1.9 list of integrals with no known antiderivative

$\{4, 5, 9, 10, 14, 15, 32, 33, 40, 41, 45, 46, 50, 51, 55, 56, 60, 61\}$

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 $\{42, 43, 47, 48, 57\}$

Maple {}

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

1.14.1 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.

1.14.2 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.

1.14.3 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
```

1.14.4 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.

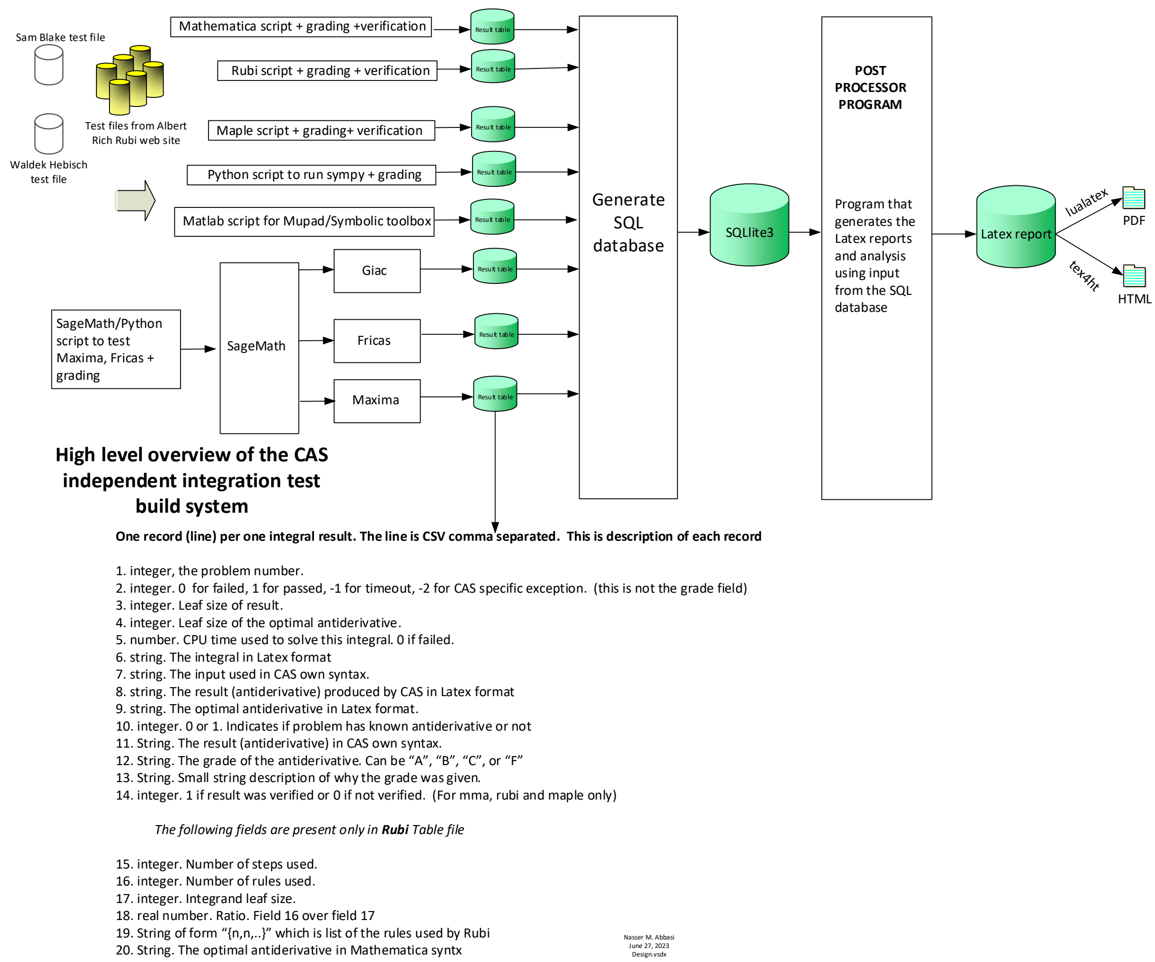
The following is an example of using Matlab's symbolic toolbox (Mupad) to solve an integral

```
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.



CHAPTER 2

DETAILED SUMMARY TABLES OF RESULTS

2.1 List of integrals sorted by grade for each CAS

2.1.1 Rubi

A grade { 1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 34, 35, 36, 37, 38, 39, 42, 43, 44, 47, 48, 49, 52, 53, 54, 57, 58, 59 }

B grade { }

C grade { }

F normal fail { }

F(-1) timedout fail { }

F(-2) exception fail { }

2.1.2 Mma

A grade { 1, 2, 8, 12, 13, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 34, 35, 36, 44, 49, 52, 53, 54, 58 }

B grade { 3, 6, 7, 11, 37, 38, 39, 42, 43, 47, 48, 57, 59 }

C grade { }

F normal fail { }

F(-1) timedout fail { }

F(-2) exception fail { }

2.1.3 Maple

A grade { 8, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31 }

B grade { 1, 2, 3, 6, 7, 11, 12, 13, 37, 38, 39, 42, 43, 44, 47, 48, 49, 52, 53, 54, 57, 58, 59 }

C grade { }

F normal fail { 34, 35, 36 }

F(-1) timedout fail { }

F(-2) exception fail { }

2.1.4 Fricas

A grade { 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 34, 35, 36 }

B grade { 1, 2, 3, 6, 7, 8, 11, 12, 13, 37, 38, 39, 42, 43, 44, 47, 48, 49, 52, 53, 54, 57, 58, 59 }

C grade { }

F normal fail { }

F(-1) timedout fail { }

F(-2) exception fail { }

2.1.5 Maxima

A grade { 19, 20, 21, 25, 26, 30, 31 }

B grade { 1, 2, 3, 6, 7, 8, 11, 12, 13, 37, 38, 39, 42, 43, 44, 47, 48, 49, 52, 53, 54, 57, 58, 59 }

C grade { }

F normal fail { 34, 35, 36 }

F(-1) timedout fail { }

F(-2) exception fail { 16, 17, 18, 22, 23, 24, 27, 28, 29 }

2.1.6 Giac

A grade { 16, 17, 18, 23, 24, 27, 28, 29 }

B grade { 8, 19, 20, 21, 22, 25, 26, 30, 31 }

C grade { }

F normal fail { 1, 2, 3, 6, 7, 11, 12, 13, 34, 35, 36, 37, 38, 39, 42, 43, 44, 47, 48, 49, 52, 53, 54, 57, 58, 59 }

F(-1) timedout fail { }

F(-2) exception fail { }

2.1.7 Mupad

A grade { }

B grade { 8, 16, 17, 18, 22, 23, 24, 27, 28, 29 }

C grade { }

F normal fail { }

F(-1) timedout fail { 1, 2, 3, 6, 7, 11, 12, 13, 19, 20, 21, 25, 26, 30, 31, 34, 35, 36, 37, 38, 39, 42, 43, 44, 47, 48, 49, 52, 53, 54, 57, 58, 59 }

F(-2) exception fail { }

2.1.8 Sympy

A grade { 16, 17, 18, 22, 23, 24, 27, 28, 29 }

B grade { 8 }

C grade { }

F normal fail { 1, 2, 3, 6, 7, 11, 12, 13, 19, 20, 21, 25, 26, 30, 34, 35, 37, 38, 39, 42, 43, 44, 47, 48, 49, 52, 53, 54, 57, 58, 59 }

F(-1) timedout fail { 31, 36 }

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	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	101	149	184	240	391	306	0	0	0
N.S.	1	1.48	1.82	2.38	3.87	3.03	0.00	0.00	0.00
time (sec)	N/A	0.640	0.791	0.489	0.364	0.285	0.000	0.000	0.000

Problem 2	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	74	108	136	198	257	244	0	0	0
N.S.	1	1.46	1.84	2.68	3.47	3.30	0.00	0.00	0.00
time (sec)	N/A	0.481	0.593	0.347	0.322	0.286	0.000	0.000	0.000

Problem 3	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	53	69	135	150	140	174	0	0	0
N.S.	1	1.30	2.55	2.83	2.64	3.28	0.00	0.00	0.00
time (sec)	N/A	0.339	3.843	0.227	0.283	0.273	0.000	0.000	0.000

Problem 4	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	10	10	12	10	12	12	8	12	12
N.S.	1	1.00	1.20	1.00	1.20	1.20	0.80	1.20	1.20
time (sec)	N/A	0.187	2.250	0.144	0.429	0.265	0.307	0.254	12.138

Problem 5	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	10	10	12	10	12	12	10	12	12
N.S.	1	1.00	1.20	1.00	1.20	1.20	1.00	1.20	1.20
time (sec)	N/A	0.184	3.735	0.171	0.385	0.243	0.273	0.266	12.187

Problem 6	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	97	135	256	231	952	372	0	0	0
N.S.	1	1.39	2.64	2.38	9.81	3.84	0.00	0.00	0.00
time (sec)	N/A	0.592	1.346	0.340	0.418	0.279	0.000	0.000	0.000

Problem 7	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	74	96	153	183	386	281	0	0	0
N.S.	1	1.30	2.07	2.47	5.22	3.80	0.00	0.00	0.00
time (sec)	N/A	0.442	5.801	0.278	0.418	0.283	0.000	0.000	0.000

Problem 8	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	31	33	44	40	269	75	65	1026	54
N.S.	1	1.06	1.42	1.29	8.68	2.42	2.10	33.10	1.74
time (sec)	N/A	0.238	0.253	0.238	0.355	0.251	0.212	0.731	12.091

Problem 9	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	12	12	14	12	348	14	10	14	14
N.S.	1	1.00	1.17	1.00	29.00	1.17	0.83	1.17	1.17
time (sec)	N/A	0.189	7.198	0.242	0.428	0.243	0.351	0.288	12.196

Problem 10	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	12	12	14	12	364	14	12	14	14
N.S.	1	1.00	1.17	1.00	30.33	1.17	1.00	1.17	1.17
time (sec)	N/A	0.189	3.866	0.271	0.509	0.244	0.300	0.284	12.176

Problem 11	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	202	270	491	444	1960	569	0	0	0
N.S.	1	1.34	2.43	2.20	9.70	2.82	0.00	0.00	0.00
time (sec)	N/A	1.356	6.813	0.222	0.444	0.298	0.000	0.000	0.000

Problem 12	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	126	163	221	293	1208	425	0	0	0
N.S.	1	1.29	1.75	2.33	9.59	3.37	0.00	0.00	0.00
time (sec)	N/A	0.854	5.701	0.197	0.448	0.296	0.000	0.000	0.000

Problem 13	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	91	107	179	197	586	291	0	0	0
N.S.	1	1.18	1.97	2.16	6.44	3.20	0.00	0.00	0.00
time (sec)	N/A	0.497	4.624	0.181	0.391	0.267	0.000	0.000	0.000

Problem 14	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	12	12	14	12	763	14	10	14	14
N.S.	1	1.00	1.17	1.00	63.58	1.17	0.83	1.17	1.17
time (sec)	N/A	0.200	9.494	0.195	0.759	0.261	0.362	0.317	12.345

Problem 15	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	12	12	14	12	761	14	12	14	14
N.S.	1	1.00	1.17	1.00	63.42	1.17	1.00	1.17	1.17
time (sec)	N/A	0.198	6.451	0.142	0.865	0.252	0.317	0.324	12.311

Problem 16	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F(-2)	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	189	206	246	170	0	154	314	233	423
N.S.	1	1.09	1.30	0.90	0.00	0.81	1.66	1.23	2.24
time (sec)	N/A	0.674	0.895	0.564	0.000	0.248	0.192	0.274	13.525

Problem 17	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F(-2)	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	137	147	149	108	0	96	194	137	241
N.S.	1	1.07	1.09	0.79	0.00	0.70	1.42	1.00	1.76
time (sec)	N/A	0.480	0.498	0.393	0.000	0.254	0.156	0.268	12.781

Problem 18	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F(-2)	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	84	90	107	50	0	48	100	64	105
N.S.	1	1.07	1.27	0.60	0.00	0.57	1.19	0.76	1.25
time (sec)	N/A	0.310	0.345	0.379	0.000	0.270	0.136	0.268	0.420

Problem 19	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	161	152	77	67	111	53	0	351	0
N.S.	1	0.94	0.48	0.42	0.69	0.33	0.00	2.18	0.00
time (sec)	N/A	0.701	0.405	0.254	0.288	0.254	0.000	0.276	0.000

Problem 20	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	166	166	215	105	121	74	0	357	0
N.S.	1	1.00	1.30	0.63	0.73	0.45	0.00	2.15	0.00
time (sec)	N/A	0.714	1.337	0.276	0.377	0.253	0.000	1.081	0.000

Problem 21	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	227	224	283	143	160	120	0	1558	0
N.S.	1	0.99	1.25	0.63	0.70	0.53	0.00	6.86	0.00
time (sec)	N/A	0.914	1.656	0.356	0.408	0.256	0.000	0.296	0.000

Problem 22	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F(-2)	A	A	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	270	270	362	283	0	257	651	413	294
N.S.	1	1.00	1.34	1.05	0.00	0.95	2.41	1.53	1.09
time (sec)	N/A	0.502	2.171	0.701	0.000	0.264	0.313	0.315	0.923

Problem 23	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F(-2)	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	202	202	255	173	0	154	405	235	186
N.S.	1	1.00	1.26	0.86	0.00	0.76	2.00	1.16	0.92
time (sec)	N/A	0.414	1.000	0.692	0.000	0.259	0.257	0.312	0.602

Problem 24	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F(-2)	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	151	151	165	82	0	68	212	102	102
N.S.	1	1.00	1.09	0.54	0.00	0.45	1.40	0.68	0.68
time (sec)	N/A	0.371	1.147	0.645	0.000	0.270	0.196	0.291	0.346

Problem 25	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	305	305	136	118	194	87	0	939	0
N.S.	1	1.00	0.45	0.39	0.64	0.29	0.00	3.08	0.00
time (sec)	N/A	0.983	0.757	0.713	0.386	0.261	0.000	0.303	0.000

Problem 26	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	434	434	203	193	211	132	0	2249	0
N.S.	1	1.00	0.47	0.44	0.49	0.30	0.00	5.18	0.00
time (sec)	N/A	1.002	0.676	0.822	0.435	0.299	0.000	1.439	0.000

Problem 27	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F(-2)	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	396	396	664	396	0	360	932	593	418
N.S.	1	1.00	1.68	1.00	0.00	0.91	2.35	1.50	1.06
time (sec)	N/A	0.630	3.033	0.997	0.000	0.262	0.438	0.396	13.931

Problem 28	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F(-2)	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	294	294	369	238	0	211	575	333	263
N.S.	1	1.00	1.26	0.81	0.00	0.72	1.96	1.13	0.89
time (sec)	N/A	0.511	1.042	0.541	0.000	0.283	0.344	0.382	1.037

Problem 29	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	F(-2)	A	A	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	209	208	244	114	0	93	298	142	144
N.S.	1	1.00	1.17	0.55	0.00	0.44	1.43	0.68	0.69
time (sec)	N/A	0.465	1.211	0.768	0.000	0.267	0.260	0.356	0.640

Problem 30	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	449	449	197	169	275	119	0	1791	0
N.S.	1	1.00	0.44	0.38	0.61	0.27	0.00	3.99	0.00
time (sec)	N/A	1.852	0.740	1.093	0.419	0.278	0.000	0.389	0.000

Problem 31	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	F(-1)	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	712	712	292	281	299	188	0	4284	0
N.S.	1	1.00	0.41	0.39	0.42	0.26	0.00	6.02	0.00
time (sec)	N/A	1.957	0.779	1.112	0.517	0.272	0.000	1.366	0.000

Problem 32	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	23	23	25	21	496	110	51	23	24
N.S.	1	1.00	1.09	0.91	21.57	4.78	2.22	1.00	1.04
time (sec)	N/A	0.214	13.565	0.182	1.157	0.260	4.045	0.413	12.372

Problem 33	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	21	21	23	19	79	25	29	21	22
N.S.	1	1.00	1.10	0.90	3.76	1.19	1.38	1.00	1.05
time (sec)	N/A	0.194	6.586	0.123	0.503	0.292	1.833	0.299	12.402

Problem 34	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	98	98	91	0	0	85	0	0	0
N.S.	1	1.00	0.93	0.00	0.00	0.87	0.00	0.00	0.00
time (sec)	N/A	0.324	0.742	0.000	0.000	0.100	0.000	0.000	0.000

Problem 35	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	171	171	152	0	0	144	0	0	0
N.S.	1	1.00	0.89	0.00	0.00	0.84	0.00	0.00	0.00
time (sec)	N/A	0.404	4.433	0.000	0.000	0.098	0.000	0.000	0.000

Problem 36	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	A	F(-1)	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	251	251	238	0	0	198	0	0	0
N.S.	1	1.00	0.95	0.00	0.00	0.79	0.00	0.00	0.00
time (sec)	N/A	0.474	6.049	0.000	0.000	0.102	0.000	0.000	0.000

Problem 37	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	147	147	632	876	978	628	0	0	0
N.S.	1	1.00	4.30	5.96	6.65	4.27	0.00	0.00	0.00
time (sec)	N/A	0.478	5.197	0.509	0.493	0.292	0.000	0.000	0.000

Problem 38	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	112	112	406	535	527	405	0	0	0
N.S.	1	1.00	3.62	4.78	4.71	3.62	0.00	0.00	0.00
time (sec)	N/A	0.409	2.276	0.409	0.439	0.290	0.000	0.000	0.000

Problem 39	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	83	83	209	240	209	224	0	0	0
N.S.	1	1.00	2.52	2.89	2.52	2.70	0.00	0.00	0.00
time (sec)	N/A	0.318	5.746	0.368	0.419	0.269	0.000	0.000	0.000

Problem 40	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	18	18	20	18	136	20	15	20	20
N.S.	1	1.00	1.11	1.00	7.56	1.11	0.83	1.11	1.11
time (sec)	N/A	0.202	3.655	0.189	0.415	0.248	0.670	0.270	12.325

Problem 41	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	18	18	20	18	242	31	17	20	20
N.S.	1	1.00	1.11	1.00	13.44	1.72	0.94	1.11	1.11
time (sec)	N/A	0.203	9.976	0.191	0.517	0.251	2.476	1.990	12.484

Problem 42	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	No	Yes	TBD	TBD	TBD	TBD	TBD
size	295	295	1657	1604	4024	1154	0	0	0
N.S.	1	1.00	5.62	5.44	13.64	3.91	0.00	0.00	0.00
time (sec)	N/A	0.770	7.243	0.854	1.512	0.348	0.000	0.000	0.000

Problem 43	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	No	Yes	TBD	TBD	TBD	TBD	TBD
size	227	227	737	932	1948	715	0	0	0
N.S.	1	1.00	3.25	4.11	8.58	3.15	0.00	0.00	0.00
time (sec)	N/A	0.611	7.151	0.800	0.586	0.293	0.000	0.000	0.000

Problem 44	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	137	136	238	365	774	378	0	0	0
N.S.	1	0.99	1.74	2.66	5.65	2.76	0.00	0.00	0.00
time (sec)	N/A	0.401	8.522	0.719	0.336	0.284	0.000	0.000	0.000

Problem 45	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	20	20	22	20	697	36	17	22	22
N.S.	1	1.00	1.10	1.00	34.85	1.80	0.85	1.10	1.10
time (sec)	N/A	0.218	25.480	0.364	1.175	0.273	1.066	0.367	12.206

Problem 46	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	20	20	22	20	910	47	19	22	22
N.S.	1	1.00	1.10	1.00	45.50	2.35	0.95	1.10	1.10
time (sec)	N/A	0.217	20.010	0.494	1.937	0.253	2.115	2.872	12.673

Problem 47	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	No	Yes	TBD	TBD	TBD	TBD	TBD
size	603	603	3129	3161	11252	2749	0	0	0
N.S.	1	1.00	5.19	5.24	18.66	4.56	0.00	0.00	0.00
time (sec)	N/A	1.326	8.216	0.937	15.554	0.368	0.000	0.000	0.000

Problem 48	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	No	Yes	TBD	TBD	TBD	TBD	TBD
size	433	423	2029	1788	5429	1564	0	0	0
N.S.	1	0.98	4.69	4.13	12.54	3.61	0.00	0.00	0.00
time (sec)	N/A	0.952	7.657	0.932	2.637	0.309	0.000	0.000	0.000

Problem 49	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	278	276	433	745	2017	721	0	0	0
N.S.	1	0.99	1.56	2.68	7.26	2.59	0.00	0.00	0.00
time (sec)	N/A	0.594	12.402	0.718	0.777	0.289	0.000	0.000	0.000

Problem 50	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	20	20	22	20	2585	52	17	22	22
N.S.	1	1.00	1.10	1.00	129.25	2.60	0.85	1.10	1.10
time (sec)	N/A	0.222	9.417	0.478	5.493	0.290	1.375	0.531	12.632

Problem 51	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	20	20	22	20	3017	63	19	22	22
N.S.	1	1.00	1.10	1.00	150.85	3.15	0.95	1.10	1.10
time (sec)	N/A	0.224	12.325	0.638	15.251	0.261	2.552	2.783	13.003

Problem 52	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	242	244	345	1402	990	1031	0	0	0
N.S.	1	1.01	1.43	5.79	4.09	4.26	0.00	0.00	0.00
time (sec)	N/A	0.918	2.185	0.430	0.570	0.336	0.000	0.000	0.000

Problem 53	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	181	187	289	897	720	732	0	0	0
N.S.	1	1.03	1.60	4.96	3.98	4.04	0.00	0.00	0.00
time (sec)	N/A	0.697	1.637	0.324	0.536	0.312	0.000	0.000	0.000

Problem 54	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	126	132	182	445	406	475	0	0	0
N.S.	1	1.05	1.44	3.53	3.22	3.77	0.00	0.00	0.00
time (sec)	N/A	0.471	2.132	0.385	0.446	0.292	0.000	0.000	0.000

Problem 55	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	20	20	22	20	279	27	17	22	22
N.S.	1	1.00	1.10	1.00	13.95	1.35	0.85	1.10	1.10
time (sec)	N/A	0.229	3.338	0.285	0.942	0.267	0.950	0.310	12.662

Problem 56	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	20	20	22	20	424	51	19	22	22
N.S.	1	1.00	1.10	1.00	21.20	2.55	0.95	1.10	1.10
time (sec)	N/A	0.225	5.301	0.294	2.496	0.258	1.651	2.216	12.161

Problem 57	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	No	Yes	TBD	TBD	TBD	TBD	TBD
size	839	839	1733	5931	4641	3363	0	0	0
N.S.	1	1.00	2.07	7.07	5.53	4.01	0.00	0.00	0.00
time (sec)	N/A	2.210	11.550	0.781	3.180	0.383	0.000	0.000	0.000

Problem 58	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	650	650	969	3886	2552	2038	0	0	0
N.S.	1	1.00	1.49	5.98	3.93	3.14	0.00	0.00	0.00
time (sec)	N/A	1.789	9.731	0.664	1.264	0.363	0.000	0.000	0.000

Problem 59	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	B	B	B	B	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	213	228	730	1997	1171	1053	0	0	0
N.S.	1	1.07	3.43	9.38	5.50	4.94	0.00	0.00	0.00
time (sec)	N/A	0.774	8.546	0.631	0.874	0.327	0.000	0.000	0.000

Problem 60	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	20	20	22	20	1494	55	19	22	22
N.S.	1	1.00	1.10	1.00	74.70	2.75	0.95	1.10	1.10
time (sec)	N/A	0.224	22.627	0.577	10.993	0.276	1.561	0.400	13.049

Problem 61	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	20	20	22	20	1975	96	20	22	22
N.S.	1	1.00	1.10	1.00	98.75	4.80	1.00	1.10	1.10
time (sec)	N/A	0.227	21.161	0.579	28.615	0.300	3.110	2.340	13.521

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 [11] had the largest ratio of [1.7500000000000000]

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	9	8	1.48	10	0.800
2	A	8	7	1.46	10	0.700
3	A	7	6	1.30	8	0.750
4	N/A	3	0	1.00	10	0.000
5	N/A	3	0	1.00	10	0.000
6	A	12	11	1.39	12	0.917
7	A	11	10	1.30	12	0.833
8	A	7	7	1.06	10	0.700
9	N/A	2	0	1.00	12	0.000
10	N/A	2	0	1.00	12	0.000
11	A	22	21	1.34	12	1.750
12	A	18	17	1.29	12	1.417
13	A	13	12	1.18	10	1.200
14	N/A	3	0	1.00	12	0.000
15	N/A	3	0	1.00	12	0.000
16	A	9	9	1.09	23	0.391
17	A	7	7	1.07	23	0.304
18	A	5	5	1.07	21	0.238
19	A	8	8	0.94	23	0.348
20	A	8	8	1.00	23	0.348
21	A	10	10	0.99	23	0.435
22	A	3	3	1.00	23	0.130

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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
23	A	3	3	1.00	23	0.130
24	A	3	3	1.00	21	0.143
25	A	3	3	1.00	23	0.130
26	A	3	3	1.00	23	0.130
27	A	3	3	1.00	23	0.130
28	A	3	3	1.00	23	0.130
29	A	3	3	1.00	21	0.143
30	A	3	3	1.00	23	0.130
31	A	3	3	1.00	23	0.130
32	N/A	2	0	1.00	23	0.000
33	N/A	2	0	1.00	21	0.000
34	A	3	3	1.00	23	0.130
35	A	3	3	1.00	23	0.130
36	A	3	3	1.00	23	0.130
37	A	3	3	1.00	18	0.167
38	A	3	3	1.00	18	0.167
39	A	3	3	1.00	16	0.188
40	N/A	2	0	1.00	18	0.000
41	N/A	2	0	1.00	18	0.000
42	A	3	3	1.00	20	0.150
43	A	3	3	1.00	20	0.150
44	A	3	3	0.99	18	0.167
45	N/A	2	0	1.00	20	0.000
46	N/A	2	0	1.00	20	0.000
47	A	3	3	1.00	20	0.150
48	A	3	3	0.98	20	0.150
49	A	3	3	0.99	18	0.167
50	N/A	2	0	1.00	20	0.000
51	N/A	2	0	1.00	20	0.000
52	A	9	8	1.01	20	0.400
53	A	8	7	1.03	20	0.350
54	A	7	6	1.05	18	0.333
55	N/A	2	0	1.00	20	0.000

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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
56	N/A	2	0	1.00	20	0.000
57	A	3	3	1.00	20	0.150
58	A	3	3	1.00	20	0.150
59	A	10	9	1.07	18	0.500
60	N/A	2	0	1.00	20	0.000
61	N/A	2	0	1.00	20	0.000

2.3. Detailed conclusion table specific for Rubi results

CHAPTER 3

Listing of integrals

3.1 $\int x^3 \cot(a+bx)\,dx$

3.1.1 Optimal result

Integrand size = 10, antiderivative size = 101

$$\int x^3 \cot(a+bx)\,dx = -\frac{ix^4}{4} + \frac{x^3 \log\left(1-e^{2i(a+bx)}\right)}{b} - \frac{3ix^2 \operatorname{PolyLog}\left(2, e^{2i(a+bx)}\right)}{2b^2} + \frac{3x \operatorname{PolyLog}\left(3, e^{2i(a+bx)}\right)}{2b^3} + \frac{3i \operatorname{PolyLog}\left(4, e^{2i(a+bx)}\right)}{4b^4}$$

output
```
-1/4*I*x^4+x^3*ln(1-exp(2*I*(b*x+a)))/b-3/2*I*x^2*polylog(2,exp(2*I*(b*x+a
)))/b^2+3/2*x*polylog(3,exp(2*I*(b*x+a)))/b^3+3/4*I*polylog(4,exp(2*I*(b*x
+a)))/b^4
```

3.1.2 Mathematica [A] (verified)

Time = 0.79 (sec) , antiderivative size = 184, normalized size of antiderivative = 1.82

$$\int x^3 \cot(a+bx)\,dx = \frac{ib^4x^4 + 4b^3x^3 \log\left(1-e^{-i(a+bx)}\right) + 4b^3x^3 \log\left(1+e^{-i(a+bx)}\right) + 12ib^2x^2 \operatorname{PolyLog}\left(2,-e^{-i(a+bx)}\right) + 12ib^2x^2 \operatorname{P}$$

input
```
Integrate[x^3*Cot[a + b*x],x]
```

output
```
(I*b^4*x^4 + 4*b^3*x^3*Log[1 - E^((-I)*(a + b*x))] + 4*b^3*x^3*Log[1 + E^(
(-I)*(a + b*x))] + (12*I)*b^2*x^2*PolyLog[2, -E^((-I)*(a + b*x))] + (12*I)
*b^2*x^2*PolyLog[2, E^((-I)*(a + b*x))] + 24*b*x*PolyLog[3, -E^((-I)*(a +
b*x))] + 24*b*x*PolyLog[3, E^((-I)*(a + b*x))] - (24*I)*PolyLog[4, -E^((-I
)*(a + b*x))] - (24*I)*PolyLog[4, E^((-I)*(a + b*x))])/(4*b^4)
```

3.1.3 Rubi [A] (verified)

Time = 0.64 (sec) , antiderivative size = 149, normalized size of antiderivative = 1.48, number of steps used = 9, number of rules used = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.800$, Rules used = {3042, 25, 4202, 2620, 3011, 7163, 2720, 7143}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int x^3 \cot(a+bx)\,dx$$

$$\Big\downarrow \; 3042$$

$$\int -x^3 \tan\left(a+bx+\frac{\pi}{2}\right)dx$$

$$\Big\downarrow \; 25$$

$$-\int x^3 \tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx$$

$$\Big\downarrow \; 4202$$

$$2i\int \frac{e^{i(2a+2bx+\pi)}x^3}{1+e^{i(2a+2bx+\pi)}}dx-\frac{ix^4}{4}$$

$$\Big\downarrow \; 2620$$

$$2i\left(\frac{3i\int x^2\log\left(1+e^{i(2a+2bx+\pi)}\right)dx}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{ix^4}{4}$$

$$\Big\downarrow \; 3011$$

$$2i\left(\frac{3i\left(\frac{ix^2\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int x\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{ix^4}{4}$$

$$\Big\downarrow \; 7163$$

$$2i\left(\frac{3i\left(\frac{ix^2\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\left(\frac{i\int \text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)dx}{2b}-\frac{ix\,\text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)}{2b}\right)}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx}\right.}{2b}\right.$$

$$\frac{ix^4}{4}$$

$$\Big\downarrow \text{2720}$$

$$2i\left(\frac{3i\left(\frac{ix^2\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\left(\frac{\int e^{-i(2a+2bx+\pi)}\,\text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}-\frac{ix\,\text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)}{2b}\right)}{b}\right)}{2b}-\right.$$

$$\frac{ix^4}{4}$$

$$\Big\downarrow \text{7143}$$

$$2i\left(\frac{3i\left(\frac{ix^2\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\left(\frac{\text{PolyLog}\left(4,-e^{i(2a+2bx+\pi)}\right)}{4b^2}-\frac{ix\,\text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)}{2b}\right)}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right.$$

$$\frac{ix^4}{4}$$

input
```
Int[x^3*Cot[a + b*x],x]
```

output
```
(-1/4*I)*x^4 + (2*I)*(((-1/2*I)*x^3*Log[1 + E^(I*(2*a + Pi + 2*b*x))])/b +
 (((3*I)/2)*(((I/2)*x^2*PolyLog[2, -E^(I*(2*a + Pi + 2*b*x))])/b - (I*(((-
1/2*I)*x*PolyLog[3, -E^(I*(2*a + Pi + 2*b*x))])/b + PolyLog[4, -E^(I*(2*a
+ Pi + 2*b*x))]/(4*b^2)))/b))/b)
```

3.1. $\int x^3 \cot(a+bx)\,dx$

3.1.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2720
```
Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Simp[v/D[v, x]
   Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Funct
ionOfExponentialQ[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 3011
```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.)]*((f_.) + (g_.)
*(x_))^(m_.), x_Symbol] :> Simp[(-(f + g*x)^m)*(PolyLog[2, (-e)*(F^(c*(a +
b*x)))^n]/(b*c*n*Log[F])), x] + Simp[g*(m/(b*c*n*Log[F]))   Int[(f + g*x)^(
m - 1)*PolyLog[2, (-e)*(F^(c*(a + b*x)))^n], x], x] /; FreeQ[{F, a, b, c, e
, f, g, n}, x] && GtQ[m, 0]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4202
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[I
*((c + d*x)^(m + 1)/(d*(m + 1))), x] - Simp[2*I   Int[(c + d*x)^m*(E^(2*I*(
e + f*x))/(1 + E^(2*I*(e + f*x)))), x], x] /; FreeQ[{c, d, e, f}, x] && IGt
Q[m, 0]
```

rule 7143
```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] :> Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

rule 7163
```
Int[((e_.) + (f_.)*(x_))^(m_.)*PolyLog[n_, (d_.)*((F_)^((c_.)*((a_.) + (b_.
)*(x_))))^(p_.)], x_Symbol] :> Simp[(e + f*x)^m*(PolyLog[n + 1, d*(F^(c*(a
+ b*x)))^p]/(b*c*p*Log[F])), x] - Simp[f*(m/(b*c*p*Log[F]))   Int[(e + f*x)
^(m - 1)*PolyLog[n + 1, d*(F^(c*(a + b*x)))^p], x], x] /; FreeQ[{F, a, b, c
, d, e, f, n, p}, x] && GtQ[m, 0]
```

3.1.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 239 vs. 2(82) = 164.

Time = 0.49 (sec) , antiderivative size = 240, normalized size of antiderivative = 2.38

method	result
risch	$-\frac{i x^4}{4}-\frac{3 i \operatorname{polylog}\left(2,-\mathrm{e}^{i(b x+a)}\right) x^2}{b^2}-\frac{3 i \operatorname{polylog}\left(2, \mathrm{e}^{i(b x+a)}\right) x^2}{b^2}-\frac{2 i a^3 x}{b^3}+\frac{\ln\left(1+\mathrm{e}^{i(b x+a)}\right) x^3}{b}+\frac{\ln\left(1-\mathrm{e}^{i(b x+a)}\right) x^3}{b}+\frac{a^3 \ln($

input
```
int(x^3*cot(b*x+a),x,method=_RETURNVERBOSE)
```

output
```
-1/4*I*x^4-3*I/b^2*polylog(2,-exp(I*(b*x+a)))*x^2-3*I/b^2*polylog(2,exp(I*
(b*x+a)))*x^2-2*I/b^3*a^3*x+1/b*ln(1+exp(I*(b*x+a)))*x^3+1/b*ln(1-exp(I*(b
*x+a)))*x^3+1/b^4*a^3*ln(1-exp(I*(b*x+a)))+2/b^4*a^3*ln(exp(I*(b*x+a)))-1/
b^4*a^3*ln(exp(I*(b*x+a))-1)-3/2*I/b^4*a^4+6*I/b^4*polylog(4,-exp(I*(b*x+a
)))+6*I/b^4*polylog(4,exp(I*(b*x+a)))+6/b^3*polylog(3,-exp(I*(b*x+a)))*x+6
/b^3*polylog(3,exp(I*(b*x+a)))*x
```

3.1.5 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. 306 vs. 2(78) = 156.

Time = 0.29 (sec) , antiderivative size = 306, normalized size of antiderivative = 3.03

$$\int x^3 \cot(a+bx)\,dx$$
$$=\frac{-6i\,b^2x^2\mathrm{Li}_2(\cos(2\,bx+2\,a)+i\,\sin(2\,bx+2\,a))+6i\,b^2x^2\mathrm{Li}_2(\cos(2\,bx+2\,a)-i\,\sin(2\,bx+2\,a))-4\,a^3\,\mathrm{l}}{}$$

input
```
integrate(x^3*cot(b*x+a),x, algorithm="fricas")
```

output
```
1/8*(-6*I*b^2*x^2*dilog(cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a)) + 6*I*b^2*x
^2*dilog(cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a)) - 4*a^3*log(-1/2*cos(2*b*x
 + 2*a) + 1/2*I*sin(2*b*x + 2*a) + 1/2) - 4*a^3*log(-1/2*cos(2*b*x + 2*a)
- 1/2*I*sin(2*b*x + 2*a) + 1/2) + 6*b*x*polylog(3, cos(2*b*x + 2*a) + I*si
n(2*b*x + 2*a)) + 6*b*x*polylog(3, cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a))
+ 4*(b^3*x^3 + a^3)*log(-cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a) + 1) + 4*(b
^3*x^3 + a^3)*log(-cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a) + 1) + 3*I*polylo
g(4, cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a)) - 3*I*polylog(4, cos(2*b*x + 2
*a) - I*sin(2*b*x + 2*a)))/b^4
```

3.1.6 Sympy [F]

$$\int x^3 \cot(a+bx)\,dx = \int x^3 \cot\left(a+bx\right)dx$$

input
```
integrate(x**3*cot(b*x+a),x)
```

output
```
Integral(x**3*cot(a + b*x), x)
```

3.1.7 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. 391 vs. 2(78) = 156.

Time = 0.36 (sec) , antiderivative size = 391, normalized size of antiderivative = 3.87

$$\int x^3 \cot(a+bx)\,dx =$$
$$-\frac{i\,(bx+a)^4 - 4i\,(bx+a)^3 a + 6i\,(bx+a)^2 a^2 + 4\,a^3 \log\left(\sin\left(bx+a\right)\right) - 24\,bx\mathrm{Li}_3(-e^{(i\,bx+i\,a)}) - 24\,bx\mathrm{Li}_3(e^{\cdots}}{\cdots}$$

input
```
integrate(x^3*cot(b*x+a),x, algorithm="maxima")
```

output
```
-1/4*(I*(b*x + a)^4 - 4*I*(b*x + a)^3*a + 6*I*(b*x + a)^2*a^2 + 4*a^3*log(
sin(b*x + a)) - 24*b*x*polylog(3, -e^(I*b*x + I*a)) - 24*b*x*polylog(3, e^
(I*b*x + I*a)) + 4*(-I*(b*x + a)^3 + 3*I*(b*x + a)^2*a - 3*I*(b*x + a)*a^2
)*arctan2(sin(b*x + a), cos(b*x + a) + 1) + 4*(I*(b*x + a)^3 - 3*I*(b*x +
a)^2*a + 3*I*(b*x + a)*a^2)*arctan2(sin(b*x + a), -cos(b*x + a) + 1) + 12*
(I*(b*x + a)^2 - 2*I*(b*x + a)*a + I*a^2)*dilog(-e^(I*b*x + I*a)) + 12*(I*
(b*x + a)^2 - 2*I*(b*x + a)*a + I*a^2)*dilog(e^(I*b*x + I*a)) - 2*((b*x +
a)^3 - 3*(b*x + a)^2*a + 3*(b*x + a)*a^2)*log(cos(b*x + a)^2 + sin(b*x + a
)^2 + 2*cos(b*x + a) + 1) - 2*((b*x + a)^3 - 3*(b*x + a)^2*a + 3*(b*x + a)
*a^2)*log(cos(b*x + a)^2 + sin(b*x + a)^2 - 2*cos(b*x + a) + 1) - 24*I*pol
ylog(4, -e^(I*b*x + I*a)) - 24*I*polylog(4, e^(I*b*x + I*a)))/b^4
```

3.1.8 Giac [F]

$$\int x^3 \cot(a+bx)\,dx = \int x^3 \cot(bx+a)\,dx$$

input
```
integrate(x^3*cot(b*x+a),x, algorithm="giac")
```

output
```
integrate(x^3*cot(b*x + a), x)
```

3.1.9 Mupad [F(-1)]

Timed out.

$$\int x^3 \cot(a+bx)\,dx = \int x^3 \cot(a+b\,x)\,dx$$

input
```
int(x^3*cot(a + b*x),x)
```

output
```
int(x^3*cot(a + b*x), x)
```

3.2 $\int x^2 \cot(a+bx)\,dx$

3.2.1 Optimal result

Integrand size = 10, antiderivative size = 74

$$\int x^2 \cot(a+bx)\,dx = -\frac{ix^3}{3} + \frac{x^2 \log\left(1-e^{2i(a+bx)}\right)}{b} - \frac{ix\,\text{PolyLog}\left(2,e^{2i(a+bx)}\right)}{b^2} + \frac{\text{PolyLog}\left(3,e^{2i(a+bx)}\right)}{2b^3}$$

output
```
-1/3*I*x^3+x^2*ln(1-exp(2*I*(b*x+a)))/b-I*x*polylog(2,exp(2*I*(b*x+a)))/b^
2+1/2*polylog(3,exp(2*I*(b*x+a)))/b^3
```

3.2.2 Mathematica [A] (verified)

Time = 0.59 (sec) , antiderivative size = 136, normalized size of antiderivative = 1.84

$$\int x^2 \cot(a+bx)\,dx = \frac{ib^3x^3 + 3b^2x^2 \log\left(1-e^{-i(a+bx)}\right) + 3b^2x^2 \log\left(1+e^{-i(a+bx)}\right) + 6ibx\,\text{PolyLog}\left(2,-e^{-i(a+bx)}\right) + 6ibx\,\text{PolyLo}}{3b^3}$$

input
```
Integrate[x^2*Cot[a + b*x],x]
```

output
```
(I*b^3*x^3 + 3*b^2*x^2*Log[1 - E^((-I)*(a + b*x))] + 3*b^2*x^2*Log[1 + E^(
(-I)*(a + b*x))] + (6*I)*b*x*PolyLog[2, -E^((-I)*(a + b*x))] + (6*I)*b*x*P
olyLog[2, E^((-I)*(a + b*x))] + 6*PolyLog[3, -E^((-I)*(a + b*x))] + 6*Poly
Log[3, E^((-I)*(a + b*x))])/(3*b^3)
```

3.2.3 Rubi [A] (verified)

Time = 0.48 (sec) , antiderivative size = 108, normalized size of antiderivative = 1.46, number of steps used = 8, number of rules used = 7, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.700, Rules used = {3042, 25, 4202, 2620, 3011, 2720, 7143}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int x^2 \cot(a+bx)\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int -x^2 \tan\left(a+bx+\frac{\pi}{2}\right)dx$$

$$\Big\downarrow \text{25}$$

$$-\int x^2 \tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx$$

$$\Big\downarrow \text{4202}$$

$$2i\int \frac{e^{i(2a+2bx+\pi)}x^2}{1+e^{i(2a+2bx+\pi)}}dx-\frac{ix^3}{3}$$

$$\Big\downarrow \text{2620}$$

$$2i\left(\frac{i\int x\log\left(1+e^{i(2a+2bx+\pi)}\right)dx}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{ix^3}{3}$$

$$\Big\downarrow \text{3011}$$

$$2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int \text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{2b}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{ix^3}{3}$$

$$\Big\downarrow \text{2720}$$

$$2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\int e^{-i(2a+2bx+\pi)}\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{ix^3}{3}$$

$$\Big\downarrow \text{7143}$$

$$2i\left(\frac{i\left(\frac{ix\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\operatorname{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{ix^3}{3}$$

input
```
Int[x^2*Cot[a + b*x],x]
```

output
```
(-1/3*I)*x^3 + (2*I)*(((-1/2*I)*x^2*Log[1 + E^(I*(2*a + Pi + 2*b*x))])/b +
 (I*(((I/2)*x*PolyLog[2, -E^(I*(2*a + Pi + 2*b*x))])/b - PolyLog[3, -E^(I*
(2*a + Pi + 2*b*x))]/(4*b^2)))/b)
```

3.2.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2720
```
Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Simp[v/D[v, x]
   Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Funct
ionOfExponentialQ[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 3011
```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.)]*((f_.) + (g_.)
*(x_))^(m_.), x_Symbol] :> Simp[(-(f + g*x)^m)*(PolyLog[2, (-e)*(F^(c*(a +
b*x)))^n]/(b*c*n*Log[F])), x] + Simp[g*(m/(b*c*n*Log[F]))   Int[(f + g*x)^(
m - 1)*PolyLog[2, (-e)*(F^(c*(a + b*x)))^n], x], x] /; FreeQ[{F, a, b, c, e
, f, g, n}, x] && GtQ[m, 0]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4202
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[I
*((c + d*x)^(m + 1)/(d*(m + 1))), x] - Simp[2*I   Int[(c + d*x)^m*(E^(2*I*(
e + f*x))/(1 + E^(2*I*(e + f*x)))), x], x] /; FreeQ[{c, d, e, f}, x] && IGt
Q[m, 0]
```

rule 7143
```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] :> Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

3.2.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 197 vs. 2(62) = 124.

Time = 0.35 (sec) , antiderivative size = 198, normalized size of antiderivative = 2.68

method	result
risch	$-\frac{i x^3}{3}+\frac{4 i a^3}{3 b^3}+\frac{2 i a^2 x}{b^2}+\frac{\ln(1+e^{i(bx+a)}) x^2}{b}-\frac{2 i \operatorname{polylog}(2,-e^{i(bx+a)}) x}{b^2}+\frac{2 \operatorname{polylog}(3,-e^{i(bx+a)})}{b^3}+\frac{\ln(1-e^{i(bx+a)}) x^2}{b}-$

input
```
int(x^2*cot(b*x+a),x,method=_RETURNVERBOSE)
```

output
```
-1/3*I*x^3+4/3*I/b^3*a^3+2*I/b^2*a^2*x+1/b*ln(1+exp(I*(b*x+a)))*x^2-2*I/b^
2*polylog(2,-exp(I*(b*x+a)))*x+2/b^3*polylog(3,-exp(I*(b*x+a)))+1/b*ln(1-e
xp(I*(b*x+a)))*x^2-1/b^3*a^2*ln(1-exp(I*(b*x+a)))-2*I/b^2*polylog(2,exp(I*
(b*x+a)))*x+2/b^3*polylog(3,exp(I*(b*x+a)))-2/b^3*a^2*ln(exp(I*(b*x+a)))+1
/b^3*a^2*ln(exp(I*(b*x+a))-1)
```

3.2.5 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. 244 vs. 2(59) = 118.

Time = 0.29 (sec) , antiderivative size = 244, normalized size of antiderivative = 3.30

$$\int x^2 \cot(a+bx)\,dx$$
$$= \frac{-2i\,bx\operatorname{Li}_2(\cos(2\,bx+2\,a)+i\,\sin(2\,bx+2\,a))+2i\,bx\operatorname{Li}_2(\cos(2\,bx+2\,a)-i\,\sin(2\,bx+2\,a))+2\,a^2\log(\cdots}{\cdots}$$

input
```
integrate(x^2*cot(b*x+a),x, algorithm="fricas")
```

output
```
1/4*(-2*I*b*x*dilog(cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a)) + 2*I*b*x*dilog
(cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a)) + 2*a^2*log(-1/2*cos(2*b*x + 2*a)
+ 1/2*I*sin(2*b*x + 2*a) + 1/2) + 2*a^2*log(-1/2*cos(2*b*x + 2*a) - 1/2*I*
sin(2*b*x + 2*a) + 1/2) + 2*(b^2*x^2 - a^2)*log(-cos(2*b*x + 2*a) + I*sin(
2*b*x + 2*a) + 1) + 2*(b^2*x^2 - a^2)*log(-cos(2*b*x + 2*a) - I*sin(2*b*x
+ 2*a) + 1) + polylog(3, cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a)) + polylog(
3, cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a)))/b^3
```

3.2.6 Sympy [F]

$$\int x^2 \cot(a+bx)\,dx = \int x^2 \cot(a+bx)\,dx$$

input
```
integrate(x**2*cot(b*x+a),x)
```

output
```
Integral(x**2*cot(a + b*x), x)
```

3.2.7 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. 257 vs. $2(59) = 118$.

Time = 0.32 (sec), antiderivative size = 257, normalized size of antiderivative = 3.47

$$\int x^2 \cot(a+bx)\,dx = -\frac{2i(bx+a)^3 - 6i(bx+a)^2a + 12i\,bx\mathrm{Li}_2\left(-e^{(i\,bx+i\,a)}\right) + 12i\,bx\mathrm{Li}_2\left(e^{(i\,bx+i\,a)}\right) - 6\,a^2\log\left(\sin\left(bx+a\right)\right) + 6}{}$$

input
```
integrate(x^2*cot(b*x+a),x, algorithm="maxima")
```

output
```
-1/6*(2*I*(b*x + a)^3 - 6*I*(b*x + a)^2*a + 12*I*b*x*dilog(-e^(I*b*x + I*a
)) + 12*I*b*x*dilog(e^(I*b*x + I*a)) - 6*a^2*log(sin(b*x + a)) + 6*(-I*(b*
x + a)^2 + 2*I*(b*x + a)*a)*arctan2(sin(b*x + a), cos(b*x + a) + 1) + 6*(I
*(b*x + a)^2 - 2*I*(b*x + a)*a)*arctan2(sin(b*x + a), -cos(b*x + a) + 1) -
 3*((b*x + a)^2 - 2*(b*x + a)*a)*log(cos(b*x + a)^2 + sin(b*x + a)^2 + 2*c
os(b*x + a) + 1) - 3*((b*x + a)^2 - 2*(b*x + a)*a)*log(cos(b*x + a)^2 + si
n(b*x + a)^2 - 2*cos(b*x + a) + 1) - 12*polylog(3, -e^(I*b*x + I*a)) - 12*
polylog(3, e^(I*b*x + I*a)))/b^3
```

3.2.8 Giac [F]

$$\int x^2 \cot(a + bx)\, dx = \int x^2 \cot(bx + a)\, dx$$

input
```
integrate(x^2*cot(b*x+a),x, algorithm="giac")
```

output
```
integrate(x^2*cot(b*x + a), x)
```

3.2.9 Mupad [F(-1)]

Timed out.

$$\int x^2 \cot(a + bx)\, dx = \int x^2 \cot(a + b\,x)\, dx$$

input
```
int(x^2*cot(a + b*x),x)
```

output
```
int(x^2*cot(a + b*x), x)
```

3.3 $\int x \cot(a+bx)\, dx$

3.3.1 Optimal result

Integrand size = 8, antiderivative size = 53

$$\int x \cot(a+bx)\, dx = -\frac{ix^2}{2} + \frac{x \log\left(1-e^{2i(a+bx)}\right)}{b} - \frac{i \operatorname{PolyLog}\left(2, e^{2i(a+bx)}\right)}{2b^2}$$

output
```
-1/2*I*x^2+x*ln(1-exp(2*I*(b*x+a)))/b-1/2*I*polylog(2,exp(2*I*(b*x+a)))/b^
2
```

3.3.2 Mathematica [B] (verified)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 135 vs. 2(53) = 106.

Time = 3.84 (sec) , antiderivative size = 135, normalized size of antiderivative = 2.55

$$\int x \cot(a+bx)\, dx = \frac{1}{2}\left(x^2 \cot(a) - \frac{-ibx(\pi - 2\arctan(\tan(a))) - \pi \log\left(1+e^{-2ibx}\right) - 2(bx+\arctan(\tan(a)))\log\left(1-e^{2i(bx+\arctan(\tan(a)))}\right)}{b^2} - e^{i\arctan(\tan(a))} x^2 \cot(a)\sqrt{\sec^2(a)}\right)$$

input
```
Integrate[x*Cot[a + b*x],x]
```

output
```
(x^2*Cot[a] - ((-I)*b*x*(Pi - 2*ArcTan[Tan[a]]) - Pi*Log[1 + E^((-2*I)*b*x
)] - 2*(b*x + ArcTan[Tan[a]])*Log[1 - E^((2*I)*(b*x + ArcTan[Tan[a]]))] +
Pi*Log[Cos[b*x]] + 2*ArcTan[Tan[a]]*Log[Sin[b*x + ArcTan[Tan[a]]]] + I*Pol
yLog[2, E^((2*I)*(b*x + ArcTan[Tan[a]]))])/b^2 - E^(I*ArcTan[Tan[a]])*x^2*
Cot[a]*Sqrt[Sec[a]^2])/2
```

3.3.3 Rubi [A] (verified)

Time = 0.34 (sec) , antiderivative size = 69, normalized size of antiderivative = 1.30, number of steps used = 7, number of rules used = 6, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.750, Rules used = {3042, 25, 4202, 2620, 2715, 2838}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int x \cot(a+bx)\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int -x \tan\left(a+bx+\frac{\pi}{2}\right)dx$$

$$\Big\downarrow \text{25}$$

$$-\int x \tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx$$

$$\Big\downarrow \text{4202}$$

$$2i\int \frac{e^{i(2a+2bx+\pi)}x}{1+e^{i(2a+2bx+\pi)}}dx-\frac{ix^2}{2}$$

$$\Big\downarrow \text{2620}$$

$$2i\left(\frac{i\int \log\left(1+e^{i(2a+2bx+\pi)}\right)dx}{2b}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{ix^2}{2}$$

$$\Big\downarrow \text{2715}$$

$$2i\left(\frac{\int e^{-i(2a+2bx+\pi)}\log\left(1+e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{ix^2}{2}$$

$$\Big\downarrow \text{2838}$$

$$2i\left(-\frac{\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{ix^2}{2}$$

input
```
Int[x*Cot[a + b*x],x]
```

output
```
(-1/2*I)*x^2 + (2*I)*(((-1/2*I)*x*Log[1 + E^(I*(2*a + Pi + 2*b*x))])/b - P
olyLog[2, -E^(I*(2*a + Pi + 2*b*x))]/(4*b^2))
```

3.3.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2715
```
Int[Log[(a_) + (b_.)*((F_)^((e_.)*((c_.) + (d_.)*(x_))))^(n_.)], x_Symbol]
:> Simp[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 2838
```
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 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4202
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[I
*((c + d*x)^(m + 1)/(d*(m + 1))), x] - Simp[2*I   Int[(c + d*x)^m*(E^(2*I*(
e + f*x))/(1 + E^(2*I*(e + f*x)))), x], x] /; FreeQ[{c, d, e, f}, x] && IGt
Q[m, 0]
```

3.3.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 149 vs. 2(43) = 86.

Time = 0.23 (sec) , antiderivative size = 150, normalized size of antiderivative = 2.83

method	result
risch	$-\frac{ix^2}{2}-\frac{2iax}{b}-\frac{ia^2}{b^2}+\frac{\ln(1+e^{i(bx+a)})x}{b}-\frac{i\,\mathrm{polylog}(2,-e^{i(bx+a)})}{b^2}+\frac{\ln(1-e^{i(bx+a)})x}{b}+\frac{\ln(1-e^{i(bx+a)})a}{b^2}-\frac{i\,\mathrm{polylog}(2,e}{b^2}$
parts	$-\frac{\ln\left(\cot(bx+a)^2+1\right)x}{2b}+\frac{i\left(\ln(\cot(bx+a)-i)\ln\left(\cot(bx+a)^2+1\right)-\frac{\ln(\cot(bx+a)-i)^2}{2}-\mathrm{dilog}\left(-\frac{i(\cot(bx+a)+i)}{2}\right)-\ln(\cot(bx+a)-i)\ln\left(-\frac{i(\cot(\right.\right.}{2}$

input
```
int(x*cot(b*x+a),x,method=_RETURNVERBOSE)
```

output
```
-1/2*I*x^2-2*I/b*a*x-I/b^2*a^2+1/b*ln(1+exp(I*(b*x+a)))*x-I/b^2*polylog(2,
-exp(I*(b*x+a)))+1/b*ln(1-exp(I*(b*x+a)))*x+1/b^2*ln(1-exp(I*(b*x+a)))*a-I
/b^2*polylog(2,exp(I*(b*x+a)))+2/b^2*a*ln(exp(I*(b*x+a)))-1/b^2*a*ln(exp(I
*(b*x+a))-1)
```

3.3.5 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. 174 vs. 2(40) = 80.

Time = 0.27 (sec) , antiderivative size = 174, normalized size of antiderivative = 3.28

$$\int x\cot(a+bx)\,dx =$$

$$-\frac{2\,a\log\left(-\frac{1}{2}\cos\left(2\,bx+2\,a\right)+\frac{1}{2}i\sin\left(2\,bx+2\,a\right)+\frac{1}{2}\right)+2\,a\log\left(-\frac{1}{2}\cos\left(2\,bx+2\,a\right)-\frac{1}{2}i\sin\left(2\,bx+2\,a\right.\right.}{}$$

input
```
integrate(x*cot(b*x+a),x, algorithm="fricas")
```

output
```
-1/4*(2*a*log(-1/2*cos(2*b*x + 2*a) + 1/2*I*sin(2*b*x + 2*a) + 1/2) + 2*a*
log(-1/2*cos(2*b*x + 2*a) - 1/2*I*sin(2*b*x + 2*a) + 1/2) - 2*(b*x + a)*lo
g(-cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a) + 1) - 2*(b*x + a)*log(-cos(2*b*x
 + 2*a) - I*sin(2*b*x + 2*a) + 1) + I*dilog(cos(2*b*x + 2*a) + I*sin(2*b*x
 + 2*a)) - I*dilog(cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a)))/b^2
```

3.3.6 Sympy [F]

$$\int x\cot(a+bx)\,dx = \int x\cot{(a+bx)}\,dx$$

input
```
integrate(x*cot(b*x+a),x)
```

output
```
Integral(x*cot(a + b*x), x)
```

3.3.7 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. 140 vs. $2(40) = 80$.

Time = 0.28 (sec) , antiderivative size = 140, normalized size of antiderivative = 2.64

$$\int x\cot(a+bx)\,dx$$
$$= \frac{-i\,b^2x^2 + 2i\,bx\arctan\left(\sin\left(bx+a\right),\cos\left(bx+a\right)+1\right) - 2i\,bx\arctan\left(\sin\left(bx+a\right),-\cos\left(bx+a\right)+1\right) + b}{}$$

input
```
integrate(x*cot(b*x+a),x, algorithm="maxima")
```

output
```
1/2*(-I*b^2*x^2 + 2*I*b*x*arctan2(sin(b*x + a), cos(b*x + a) + 1) - 2*I*b*
x*arctan2(sin(b*x + a), -cos(b*x + a) + 1) + b*x*log(cos(b*x + a)^2 + sin(
b*x + a)^2 + 2*cos(b*x + a) + 1) + b*x*log(cos(b*x + a)^2 + sin(b*x + a)^2
 - 2*cos(b*x + a) + 1) - 2*I*dilog(-e^(I*b*x + I*a)) - 2*I*dilog(e^(I*b*x
+ I*a)))/b^2
```

3.3.8 Giac [F]

$$\int x\cot(a+bx)\,dx = \int x\cot{(bx+a)}\,dx$$

input
```
integrate(x*cot(b*x+a),x, algorithm="giac")
```

output
```
integrate(x*cot(b*x + a), x)
```

3.3.9 Mupad [F(-1)]

Timed out.

$$\int x\cot(a+bx)\,dx=\int x\cot(a+b\,x)\;dx$$

input
```
int(x*cot(a + b*x),x)
```

output
```
int(x*cot(a + b*x), x)
```

3.4 $\int \frac{\cot(a+bx)}{x} \, dx$

3.4.1 Optimal result

Integrand size = 10, antiderivative size = 10

$$\int \frac{\cot(a+bx)}{x} \, dx = \text{Int}\left(\frac{\cot(a+bx)}{x}, x\right)$$

output
```
Unintegrable(cot(b*x+a)/x,x)
```

3.4.2 Mathematica [N/A]

Not integrable

Time = 2.25 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \frac{\cot(a+bx)}{x} \, dx = \int \frac{\cot(a+bx)}{x} \, dx$$

input
```
Integrate[Cot[a + b*x]/x,x]
```

output
```
Integrate[Cot[a + b*x]/x, x]
```

3.4.3 Rubi [N/A]

Not integrable

Time = 0.19 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.000, Rules used = {3042, 25, 4222}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{\cot(a+bx)}{x}\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int -\frac{\tan\left(a+bx+\frac{\pi}{2}\right)}{x}dx$$

$$\Big\downarrow \text{25}$$

$$-\int \frac{\tan\left(\frac{1}{2}(2a+\pi)+bx\right)}{x}dx$$

$$\Big\downarrow \text{4222}$$

$$-\int \frac{\tan\left(\frac{1}{2}(2a+\pi)+bx\right)}{x}dx$$

input
```
Int[Cot[a + b*x]/x,x]
```

output
```
$Aborted
```

3.4.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4222
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] :>
Simp[If[MatchQ[f, (f1_.)*(Complex[0, j_])], If[MatchQ[e, (e1_.) + Pi/2], I^
n*Unintegrable[(c + d*x)^m*Coth[(-I)*(e - Pi/2) - I*f*x]^n, x], I^n*Uninteg
rable[(c + d*x)^m*Tanh[(-I)*e - I*f*x]^n, x]], If[MatchQ[e, (e1_.) + Pi/2],
 (-1)^n*Unintegrable[(c + d*x)^m*Cot[e - Pi/2 + f*x]^n, x], Unintegrable[(c
 + d*x)^m*Tan[e + f*x]^n, x]]], x] /; FreeQ[{c, d, e, f, m, n}, x] && Integ
erQ[n]
```

3.4.4 Maple [N/A] (verified)

Not integrable

Time = 0.14 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{\cot (bx+a)}{x}dx$$

input
```
int(cot(b*x+a)/x,x)
```

output
```
int(cot(b*x+a)/x,x)
```

3.4.5 Fricas [N/A]

Not integrable

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \frac{\cot(a+bx)}{x}\,dx=\int \frac{\cot (bx+a)}{x}\,dx$$

input
```
integrate(cot(b*x+a)/x,x, algorithm="fricas")
```

output
```
integral(cot(b*x + a)/x, x)
```

3.4.6 Sympy [N/A]

Not integrable

Time = 0.31 (sec) , antiderivative size = 8, normalized size of antiderivative = 0.80

$$\int \frac{\cot(a+bx)}{x}\,dx = \int \frac{\cot(a+bx)}{x}\,dx$$

input
```
integrate(cot(b*x+a)/x,x)
```

output
```
Integral(cot(a + b*x)/x, x)
```

3.4.7 Maxima [N/A]

Not integrable

Time = 0.43 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \frac{\cot(a+bx)}{x}\,dx = \int \frac{\cot(bx+a)}{x}\,dx$$

input
```
integrate(cot(b*x+a)/x,x, algorithm="maxima")
```

output
```
integrate(cot(b*x + a)/x, x)
```

3.4.8 Giac [N/A]

Not integrable

Time = 0.25 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \frac{\cot(a+bx)}{x}\,dx = \int \frac{\cot(bx+a)}{x}\,dx$$

input
```
integrate(cot(b*x+a)/x,x, algorithm="giac")
```

output
```
integrate(cot(b*x + a)/x, x)
```

3.4.9 Mupad [N/A]

Not integrable

Time = 12.14 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \frac{\cot(a+bx)}{x}\,dx = \int \frac{\cot(a+b\,x)}{x}\,dx$$

input
```
int(cot(a + b*x)/x,x)
```

output
```
int(cot(a + b*x)/x, x)
```

3.5 $\int \frac{\cot(a+bx)}{x^2} dx$

3.5.1 Optimal result

Integrand size = 10, antiderivative size = 10

$$\int \frac{\cot(a+bx)}{x^2} dx = \text{Int}\left(\frac{\cot(a+bx)}{x^2}, x\right)$$

output
```
Unintegrable(cot(b*x+a)/x^2,x)
```

3.5.2 Mathematica [N/A]

Not integrable

Time = 3.73 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \frac{\cot(a+bx)}{x^2} dx = \int \frac{\cot(a+bx)}{x^2} dx$$

input
```
Integrate[Cot[a + b*x]/x^2,x]
```

output
```
Integrate[Cot[a + b*x]/x^2, x]
```

3.5.3 Rubi [N/A]

Not integrable

Time = 0.18 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.000, Rules used = {3042, 25, 4222}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{\cot(a+bx)}{x^2} \, dx$$
$$\Big\downarrow \; 3042$$
$$\int -\frac{\tan\left(a+bx+\frac{\pi}{2}\right)}{x^2}dx$$
$$\Big\downarrow \; 25$$
$$-\int \frac{\tan\left(\frac{1}{2}(2a+\pi)+bx\right)}{x^2}dx$$
$$\Big\downarrow \; 4222$$
$$-\int \frac{\tan\left(\frac{1}{2}(2a+\pi)+bx\right)}{x^2}dx$$

input
```
Int[Cot[a + b*x]/x^2,x]
```

output
```
$Aborted
```

3.5.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4222
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] :>
Simp[If[MatchQ[f, (f1_.)*(Complex[0, j_])], If[MatchQ[e, (e1_.) + Pi/2], I^
n*Unintegrable[(c + d*x)^m*Coth[(-I)*(e - Pi/2) - I*f*x]^n, x], I^n*Uninteg
rable[(c + d*x)^m*Tanh[(-I)*e - I*f*x]^n, x]], If[MatchQ[e, (e1_.) + Pi/2],
 (-1)^n*Unintegrable[(c + d*x)^m*Cot[e - Pi/2 + f*x]^n, x], Unintegrable[(c
 + d*x)^m*Tan[e + f*x]^n, x]]], x] /; FreeQ[{c, d, e, f, m, n}, x] && Integ
erQ[n]
```

3.5.4 Maple [N/A] (verified)

Not integrable

Time = 0.17 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{\cot(bx+a)}{x^2}dx$$

input
```
int(cot(b*x+a)/x^2,x)
```

output
```
int(cot(b*x+a)/x^2,x)
```

3.5.5 Fricas [N/A]

Not integrable

Time = 0.24 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \frac{\cot(a+bx)}{x^2}\,dx = \int \frac{\cot(bx+a)}{x^2}\,dx$$

input
```
integrate(cot(b*x+a)/x^2,x, algorithm="fricas")
```

output
```
integral(cot(b*x + a)/x^2, x)
```

3.5.6 Sympy [N/A]

Not integrable

Time = 0.27 (sec) , antiderivative size = 10, normalized size of antiderivative = 1.00

$$\int \frac{\cot(a+bx)}{x^2}\,dx = \int \frac{\cot{(a+bx)}}{x^2}\,dx$$

input
```
integrate(cot(b*x+a)/x**2,x)
```

output
```
Integral(cot(a + b*x)/x**2, x)
```

3.5.7 Maxima [N/A]

Not integrable

Time = 0.38 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \frac{\cot(a+bx)}{x^2}\,dx = \int \frac{\cot{(bx+a)}}{x^2}\,dx$$

input
```
integrate(cot(b*x+a)/x^2,x, algorithm="maxima")
```

output
```
integrate(cot(b*x + a)/x^2, x)
```

3.5.8 Giac [N/A]

Not integrable

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \frac{\cot(a+bx)}{x^2}\,dx = \int \frac{\cot{(bx+a)}}{x^2}\,dx$$

input
```
integrate(cot(b*x+a)/x^2,x, algorithm="giac")
```

output
```
integrate(cot(b*x + a)/x^2, x)
```

3.5.9 Mupad [N/A]

Not integrable

Time = 12.19 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.20

$$\int \frac{\cot(a+bx)}{x^2} \, dx = \int \frac{\cot(a+b\,x)}{x^2} \, dx$$

input
```
int(cot(a + b*x)/x^2,x)
```

output
```
int(cot(a + b*x)/x^2, x)
```

3.6 $\int x^3 \cot^2(a+bx)\,dx$

3.6.1 Optimal result

Integrand size = 12, antiderivative size = 97

$$\int x^3 \cot^2(a+bx)\,dx = -\frac{ix^3}{b} - \frac{x^4}{4} - \frac{x^3\cot(a+bx)}{b} + \frac{3x^2\log\left(1-e^{2i(a+bx)}\right)}{b^2} - \frac{3ix\,\text{PolyLog}\left(2,e^{2i(a+bx)}\right)}{b^3} + \frac{3\,\text{PolyLog}\left(3,e^{2i(a+bx)}\right)}{2b^4}$$

output
```
-I*x^3/b-1/4*x^4-x^3*cot(b*x+a)/b+3*x^2*ln(1-exp(2*I*(b*x+a)))/b^2-3*I*x*p
olylog(2,exp(2*I*(b*x+a)))/b^3+3/2*polylog(3,exp(2*I*(b*x+a)))/b^4
```

3.6.2 Mathematica [B] (verified)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 256 vs. $2(97) = 194$.

Time = 1.35 (sec) , antiderivative size = 256, normalized size of antiderivative = 2.64

$$\int x^3 \cot^2(a+bx)\,dx = -\frac{x^4}{4} - \frac{ie^{2ia}\left(2b^3e^{-2ia}x^3 + 3ib^2(1-e^{-2ia})\,x^2\log\left(1-e^{-i(a+bx)}\right) + 3ib^2(1-e^{-2ia})\,x^2\log\left(1+e^{-i(a+bx)}\right) - 6b(1 - \cdots\right.}{\cdots} + \frac{x^3\csc(a)\csc(a+bx)\sin(bx)}{b}$$

input
```
Integrate[x^3*Cot[a + b*x]^2,x]
```

output
```
-1/4*x^4 - (I*E^((2*I)*a)*((2*b^3*x^3)/E^((2*I)*a) + (3*I)*b^2*(1 - E^((-2
*I)*a))*x^2*Log[1 - E^((-I)*(a + b*x))] + (3*I)*b^2*(1 - E^((-2*I)*a))*x^2
*Log[1 + E^((-I)*(a + b*x))] - 6*b*(1 - E^((-2*I)*a))*x*PolyLog[2, -E^((-I
)*(a + b*x))] - 6*b*(1 - E^((-2*I)*a))*x*PolyLog[2, E^((-I)*(a + b*x))] +
(6*I)*(1 - E^((-2*I)*a))*PolyLog[3, -E^((-I)*(a + b*x))] + (6*I)*(1 - E^((
-2*I)*a))*PolyLog[3, E^((-I)*(a + b*x))]))/(b^4*(-1 + E^((2*I)*a))) + (x^3
*Csc[a]*Csc[a + b*x]*Sin[b*x])/b
```

3.6.3 Rubi [A] (verified)

Time = 0.59 (sec) , antiderivative size = 135, normalized size of antiderivative = 1.39, number of steps used = 12, number of rules used = 11, $\frac{\text{number of rules}}{\text{integrand size}} = 0.917$, Rules used = {3042, 4203, 15, 25, 3042, 25, 4202, 2620, 3011, 2720, 7143}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int x^3 \cot^2(a+bx)\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int x^3 \tan\left(a+bx+\frac{\pi}{2}\right)^2 dx$$

$$\Big\downarrow \text{4203}$$

$$-\frac{3\int -x^2\cot(a+bx)dx}{b}-\int x^3dx-\frac{x^3\cot(a+bx)}{b}$$

$$\Big\downarrow \text{15}$$

$$-\frac{3\int -x^2\cot(a+bx)dx}{b}-\frac{x^3\cot(a+bx)}{b}-\frac{x^4}{4}$$

$$\Big\downarrow \text{25}$$

$$\frac{3\int x^2\cot(a+bx)dx}{b}-\frac{x^3\cot(a+bx)}{b}-\frac{x^4}{4}$$

$$\Big\downarrow \text{3042}$$

$$\frac{3\int -x^2\tan\left(a+bx+\frac{\pi}{2}\right)dx}{b}-\frac{x^3\cot(a+bx)}{b}-\frac{x^4}{4}$$

$$\Big\downarrow \text{25}$$

$$-\frac{3\int x^2\tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx}{b}-\frac{x^3\cot(a+bx)}{b}-\frac{x^4}{4}$$

$\Big\downarrow$ 4202

$$-\frac{3\left(\frac{ix^3}{3}-2i\int\frac{e^{i(2a+2bx+\pi)}x^2}{1+e^{i(2a+2bx+\pi)}}dx\right)}{b}-\frac{x^3\cot(a+bx)}{b}-\frac{x^4}{4}$$

$\Big\downarrow$ 2620

$$-\frac{3\left(\frac{ix^3}{3}-2i\left(\frac{i\int x\log\left(1+e^{i(2a+2bx+\pi)}\right)dx}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^3\cot(a+bx)}{b}-\frac{x^4}{4}$$

$\Big\downarrow$ 3011

$$-\frac{3\left(\frac{ix^3}{3}-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{2b}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^3\cot(a+bx)}{b}-\frac{x^4}{4}$$

$\Big\downarrow$ 2720

$$-\frac{3\left(\frac{ix^3}{3}-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\int e^{-i(2a+2bx+\pi)}\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^3\cot(a+bx)}{b}-\frac{x^4}{4}$$

$\Big\downarrow$ 7143

$$-\frac{3\left(\frac{ix^3}{3}-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^3\cot(a+bx)}{b}-\frac{x^4}{4}$$

input
```
Int[x^3*Cot[a + b*x]^2,x]
```

output
```
-1/4*x^4 - (x^3*Cot[a + b*x])/b - (3*((I/3)*x^3 - (2*I)*(((-1/2*I)*x^2*Log
[1 + E^(I*(2*a + Pi + 2*b*x))])/b + (I*(((I/2)*x*PolyLog[2, -E^(I*(2*a + P
i + 2*b*x))])/b - PolyLog[3, -E^(I*(2*a + Pi + 2*b*x))]/(4*b^2)))/b)))/b
```

3.6. $\int x^3\cot^2(a+bx)\,dx$

3.6.3.1 Defintions of rubi rules used

rule 15
```
Int[(a_.)*(x_)^(m_.), x_Symbol] :> Simp[a*(x^(m + 1)/(m + 1)), x] /; FreeQ[
{a, m}, x] && NeQ[m, -1]
```

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2720
```
Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Simp[v/D[v, x]
   Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Funct
ionOfExponentialQ[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 3011
```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.)]*((f_.) + (g_.)
*(x_))^(m_.), x_Symbol] :> Simp[(-(f + g*x)^m)*(PolyLog[2, (-e)*(F^(c*(a +
b*x)))^n]/(b*c*n*Log[F])), x] + Simp[g*(m/(b*c*n*Log[F]))   Int[(f + g*x)^(
m - 1)*PolyLog[2, (-e)*(F^(c*(a + b*x)))^n], x], x] /; FreeQ[{F, a, b, c, e
, f, g, n}, x] && GtQ[m, 0]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4202
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[I
*((c + d*x)^(m + 1)/(d*(m + 1))), x] - Simp[2*I   Int[(c + d*x)^m*(E^(2*I*(
e + f*x))/(1 + E^(2*I*(e + f*x)))), x], x] /; FreeQ[{c, d, e, f}, x] && IGt
Q[m, 0]
```

rule 4203
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((b_.)*tan[(e_.) + (f_.)*(x_)])^(n_), x_Symb
ol] :> Simp[b*(c + d*x)^m*((b*Tan[e + f*x])^(n - 1)/(f*(n - 1))), x] + (-Si
mp[b*d*(m/(f*(n - 1)))   Int[(c + d*x)^(m - 1)*(b*Tan[e + f*x])^(n - 1), x]
, x] - Simp[b^2   Int[(c + d*x)^m*(b*Tan[e + f*x])^(n - 2), x], x]) /; Free
Q[{b, c, d, e, f}, x] && GtQ[n, 1] && GtQ[m, 0]
```

rule 7143
```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] :> Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

3.6.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 230 vs. 2(85) = 170.

Time = 0.34 (sec) , antiderivative size = 231, normalized size of antiderivative = 2.38

method	result
risch	$-\frac{x^4}{4}-\frac{2ix^3}{b\left(e^{2i(bx+a)}-1\right)}+\frac{6ia^2x}{b^3}-\frac{2ix^3}{b}+\frac{4ia^3}{b^4}+\frac{3\ln\left(1+e^{i(bx+a)}\right)x^2}{b^2}-\frac{6i\,\mathrm{polylog}\left(2,e^{i(bx+a)}\right)x}{b^3}+\frac{6\,\mathrm{polylog}\left(3,-e^{i(bx+a}\right.}{b^4}$

input
```
int(x^3*cot(b*x+a)^2,x,method=_RETURNVERBOSE)
```

output
```
-1/4*x^4-2*I*x^3/b/(exp(2*I*(b*x+a))-1)+6*I/b^3*a^2*x-2*I/b*x^3+4*I/b^4*a^
3+3/b^2*ln(1+exp(I*(b*x+a)))*x^2-6*I/b^3*polylog(2,exp(I*(b*x+a)))*x+6/b^4
*polylog(3,-exp(I*(b*x+a)))+3/b^2*ln(1-exp(I*(b*x+a)))*x^2-3/b^4*a^2*ln(1-
exp(I*(b*x+a)))-6*I/b^3*polylog(2,-exp(I*(b*x+a)))*x+6/b^4*polylog(3,exp(I
*(b*x+a)))-6/b^4*a^2*ln(exp(I*(b*x+a)))+3/b^4*a^2*ln(exp(I*(b*x+a))-1)
```

3.6.5 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. 372 vs. 2(82) = 164.

Time = 0.28 (sec) , antiderivative size = 372, normalized size of antiderivative = 3.84

$$\int x^3\cot^2(a+bx)\,dx =$$

$$-\frac{b^4x^4\sin(2\,bx+2\,a)+4\,b^3x^3\cos(2\,bx+2\,a)+4\,b^3x^3+6i\,bx\mathrm{Li}_2(\cos(2\,bx+2\,a)+i\,\sin(2\,bx+2\,a))\sin}{}$$

input
```
integrate(x^3*cot(b*x+a)^2,x, algorithm="fricas")
```

output
```
-1/4*(b^4*x^4*sin(2*b*x + 2*a) + 4*b^3*x^3*cos(2*b*x + 2*a) + 4*b^3*x^3 +
6*I*b*x*dilog(cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a))*sin(2*b*x + 2*a) - 6*
I*b*x*dilog(cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a))*sin(2*b*x + 2*a) - 6*a^
2*log(-1/2*cos(2*b*x + 2*a) + 1/2*I*sin(2*b*x + 2*a) + 1/2)*sin(2*b*x + 2*
a) - 6*a^2*log(-1/2*cos(2*b*x + 2*a) - 1/2*I*sin(2*b*x + 2*a) + 1/2)*sin(2
*b*x + 2*a) - 6*(b^2*x^2 - a^2)*log(-cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a)
 + 1)*sin(2*b*x + 2*a) - 6*(b^2*x^2 - a^2)*log(-cos(2*b*x + 2*a) - I*sin(2
*b*x + 2*a) + 1)*sin(2*b*x + 2*a) - 3*polylog(3, cos(2*b*x + 2*a) + I*sin(
2*b*x + 2*a))*sin(2*b*x + 2*a) - 3*polylog(3, cos(2*b*x + 2*a) - I*sin(2*b
*x + 2*a))*sin(2*b*x + 2*a))/(b^4*sin(2*b*x + 2*a))
```

3.6.6 Sympy [F]

$$\int x^3 \cot^2(a+bx)\,dx = \int x^3 \cot^2{(a+bx)}\,dx$$

input
```
integrate(x**3*cot(b*x+a)**2,x)
```

output
```
Integral(x**3*cot(a + b*x)**2, x)
```

3.6.7 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. 952 vs. $2(82) = 164$.

Time = 0.42 (sec) , antiderivative size = 952, normalized size of antiderivative = 9.81

$$\int x^3 \cot^2(a+bx)\,dx = \text{Too large to display}$$

input
```
integrate(x^3*cot(b*x+a)^2,x, algorithm="maxima")
```

output
```
1/2*(2*(b*x + a + 1/tan(b*x + a))*a^3 - 3*((b*x + a)^2*cos(2*b*x + 2*a)^2
+ (b*x + a)^2*sin(2*b*x + 2*a)^2 - 2*(b*x + a)^2*cos(2*b*x + 2*a) + (b*x +
 a)^2 - (cos(2*b*x + 2*a)^2 + sin(2*b*x + 2*a)^2 - 2*cos(2*b*x + 2*a) + 1)
*log(cos(b*x + a)^2 + sin(b*x + a)^2 + 2*cos(b*x + a) + 1) - (cos(2*b*x +
2*a)^2 + sin(2*b*x + 2*a)^2 - 2*cos(2*b*x + 2*a) + 1)*log(cos(b*x + a)^2 +
 sin(b*x + a)^2 - 2*cos(b*x + a) + 1) + 4*(b*x + a)*sin(2*b*x + 2*a))*a^2/
(cos(2*b*x + 2*a)^2 + sin(2*b*x + 2*a)^2 - 2*cos(2*b*x + 2*a) + 1) + 2*(-I
*(b*x + a)^4 + 4*I*(b*x + a)^3*a - 12*((b*x + a)^2 - 2*(b*x + a)*a - ((b*x
 + a)^2 - 2*(b*x + a)*a)*cos(2*b*x + 2*a) + (-I*(b*x + a)^2 + 2*I*(b*x + a
)*a)*sin(2*b*x + 2*a))*arctan2(sin(b*x + a), cos(b*x + a) + 1) + 12*((b*x
+ a)^2 - 2*(b*x + a)*a - ((b*x + a)^2 - 2*(b*x + a)*a)*cos(2*b*x + 2*a) -
(I*(b*x + a)^2 - 2*I*(b*x + a)*a)*sin(2*b*x + 2*a))*arctan2(sin(b*x + a),
-cos(b*x + a) + 1) + (I*(b*x + a)^4 - 4*(b*x + a)^3*(I*a + 2) + 24*(b*x +
a)^2*a)*cos(2*b*x + 2*a) - 24*(b*x*cos(2*b*x + 2*a) + I*b*x*sin(2*b*x + 2*
a) - b*x)*dilog(-e^(I*b*x + I*a)) - 24*(b*x*cos(2*b*x + 2*a) + I*b*x*sin(2
*b*x + 2*a) - b*x)*dilog(e^(I*b*x + I*a)) - 6*(-I*(b*x + a)^2 + 2*I*(b*x +
 a)*a + (I*(b*x + a)^2 - 2*I*(b*x + a)*a)*cos(2*b*x + 2*a) - ((b*x + a)^2
- 2*(b*x + a)*a)*sin(2*b*x + 2*a))*log(cos(b*x + a)^2 + sin(b*x + a)^2 + 2
*cos(b*x + a) + 1) - 6*(-I*(b*x + a)^2 + 2*I*(b*x + a)*a + (I*(b*x + a)^2
- 2*I*(b*x + a)*a)*cos(2*b*x + 2*a) - ((b*x + a)^2 - 2*(b*x + a)*a)*sin...
```

3.6.8 Giac [F]

$$\int x^3 \cot^2(a+bx)\,dx = \int x^3 \cot\left(bx+a\right)^2\,dx$$

input
```
integrate(x^3*cot(b*x+a)^2,x, algorithm="giac")
```

output
```
integrate(x^3*cot(b*x + a)^2, x)
```

3.6.9 Mupad [F(-1)]

Timed out.

$$\int x^3 \cot^2(a+bx)\,dx = \int x^3 \cot(a+b\,x)^2\,dx$$

input
```
int(x^3*cot(a + b*x)^2,x)
```

output
```
int(x^3*cot(a + b*x)^2, x)
```

3.7 $\int x^2 \cot^2(a+bx)\,dx$

3.7.1 Optimal result

Integrand size = 12, antiderivative size = 74

$$\int x^2 \cot^2(a+bx)\,dx = -\frac{ix^2}{b}-\frac{x^3}{3}-\frac{x^2\cot(a+bx)}{b}+\frac{2x\log\left(1-e^{2i(a+bx)}\right)}{b^2}-\frac{i\,\text{PolyLog}\left(2,e^{2i(a+bx)}\right)}{b^3}$$

output
```
-I*x^2/b-1/3*x^3-x^2*cot(b*x+a)/b+2*x*ln(1-exp(2*I*(b*x+a)))/b^2-I*polylog
(2,exp(2*I*(b*x+a)))/b^3
```

3.7.2 Mathematica [B] (verified)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 153 vs. 2(74) = 148.

Time = 5.80 (sec) , antiderivative size = 153, normalized size of antiderivative = 2.07

$$\int x^2 \cot^2(a+bx)\,dx = -\frac{x^3}{3} + \frac{ibx(\pi-2\arctan(\tan(a)))+\pi\log\left(1+e^{-2ibx}\right)+2(bx+\arctan(\tan(a)))\log\left(1-e^{2i(bx+\arctan(\tan(a)))}\right)-}{} + \frac{x^2\csc(a)\csc(a+bx)\sin(bx)}{b}$$

input
```
Integrate[x^2*Cot[a + b*x]^2,x]
```

output
```
-1/3*x^3 + (I*b*x*(Pi - 2*ArcTan[Tan[a]]) + Pi*Log[1 + E^((-2*I)*b*x)] + 2
*(b*x + ArcTan[Tan[a]])*Log[1 - E^((2*I)*(b*x + ArcTan[Tan[a]]))] - Pi*Log
[Cos[b*x]] - 2*ArcTan[Tan[a]]*Log[Sin[b*x + ArcTan[Tan[a]]]] - I*PolyLog[2
, E^((2*I)*(b*x + ArcTan[Tan[a]]))] - b^2*E^(I*ArcTan[Tan[a]])*x^2*Cot[a]*
Sqrt[Sec[a]^2])/b^3 + (x^2*Csc[a]*Csc[a + b*x]*Sin[b*x])/b
```

3.7.3 Rubi [A] (verified)

Time = 0.44 (sec) , antiderivative size = 96, normalized size of antiderivative = 1.30, number of steps used = 11, number of rules used = 10, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.833, Rules used = {3042, 4203, 15, 25, 3042, 25, 4202, 2620, 2715, 2838}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int x^2 \cot^2(a+bx)\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int x^2 \tan\left(a+bx+\frac{\pi}{2}\right)^2dx$$

$$\Big\downarrow \text{4203}$$

$$-\frac{2\int -x\cot(a+bx)dx}{b}-\int x^2dx-\frac{x^2\cot(a+bx)}{b}$$

$$\Big\downarrow \text{15}$$

$$-\frac{2\int -x\cot(a+bx)dx}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}$$

$$\Big\downarrow \text{25}$$

$$\frac{2\int x\cot(a+bx)dx}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}$$

$$\Big\downarrow \text{3042}$$

$$\frac{2\int -x\tan\left(a+bx+\frac{\pi}{2}\right)dx}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}$$

$$\Big\downarrow \text{25}$$

$$-\frac{2\int x\tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}$$

$$\Big\downarrow \text{4202}$$

$$-\frac{2\left(\frac{ix^2}{2}-2i\int\frac{e^{i(2a+2bx+\pi)}x}{1+e^{i(2a+2bx+\pi)}}dx\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}$$

$$\Big\downarrow \text{2620}$$

$$-\frac{2\left(\frac{ix^2}{2}-2i\left(\frac{i\int\log\left(1+e^{i(2a+2bx+\pi)}\right)dx}{2b}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}$$

$$\Big\downarrow \text{2715}$$

$$-\frac{2\left(\frac{ix^2}{2}-2i\left(\frac{\int e^{-i(2a+2bx+\pi)}\log\left(1+e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}$$

$$\Big\downarrow \text{2838}$$

$$-\frac{2\left(\frac{ix^2}{2}-2i\left(-\frac{\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}$$

input
```
Int[x^2*Cot[a + b*x]^2,x]
```

output
```
-1/3*x^3 - (x^2*Cot[a + b*x])/b - (2*((I/2)*x^2 - (2*I)*(((-1/2*I)*x*Log[1
 + E^(I*(2*a + Pi + 2*b*x))])/b - PolyLog[2, -E^(I*(2*a + Pi + 2*b*x))]/(4
*b^2))))/b
```

3.7.3.1 Defintions of rubi rules used

rule 15
```
Int[(a_.)*(x_)^(m_.), x_Symbol] :> Simp[a*(x^(m + 1)/(m + 1)), x] /; FreeQ[
{a, m}, x] && NeQ[m, -1]
```

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2715
```
Int[Log[(a_) + (b_.)*((F_)^((e_.)*((c_.) + (d_.)*(x_))))^(n_.)], x_Symbol]
:> Simp[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 2838
```
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 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4202
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[I
*((c + d*x)^(m + 1)/(d*(m + 1))), x] - Simp[2*I   Int[(c + d*x)^m*(E^(2*I*(
e + f*x))/(1 + E^(2*I*(e + f*x)))), x], x] /; FreeQ[{c, d, e, f}, x] && IGt
Q[m, 0]
```

rule 4203
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((b_.)*tan[(e_.) + (f_.)*(x_)])^(n_), x_Symb
ol] :> Simp[b*(c + d*x)^m*((b*Tan[e + f*x])^(n - 1)/(f*(n - 1))), x] + (-Si
mp[b*d*(m/(f*(n - 1)))   Int[(c + d*x)^(m - 1)*(b*Tan[e + f*x])^(n - 1), x]
, x] - Simp[b^2   Int[(c + d*x)^m*(b*Tan[e + f*x])^(n - 2), x], x]) /; Free
Q[{b, c, d, e, f}, x] && GtQ[n, 1] && GtQ[m, 0]
```

3.7.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 182 vs. 2(66) = 132.

Time = 0.28 (sec) , antiderivative size = 183, normalized size of antiderivative = 2.47

method	result
risch	$-\frac{x^3}{3}-\frac{2ix^2}{b\left(e^{2i(bx+a)}-1\right)}-\frac{2ix^2}{b}-\frac{4iax}{b^2}-\frac{2ia^2}{b^3}+\frac{2\ln\left(1+e^{i(bx+a)}\right)x}{b^2}-\frac{2i\,\mathrm{polylog}\left(2,-e^{i(bx+a)}\right)}{b^3}+\frac{2\ln\left(1-e^{i(bx+a)}\right)x}{b^2}+$

input
```
int(x^2*cot(b*x+a)^2,x,method=_RETURNVERBOSE)
```

output
```
-1/3*x^3-2*I*x^2/b/(exp(2*I*(b*x+a))-1)-2*I/b*x^2-4*I/b^2*a*x-2*I/b^3*a^2+
2/b^2*ln(1+exp(I*(b*x+a)))*x-2*I/b^3*polylog(2,-exp(I*(b*x+a)))+2/b^2*ln(1
-exp(I*(b*x+a)))*x+2/b^3*ln(1-exp(I*(b*x+a)))*a-2*I/b^3*polylog(2,exp(I*(b
*x+a)))+4/b^3*a*ln(exp(I*(b*x+a)))-2/b^3*a*ln(exp(I*(b*x+a))-1)
```

3.7.5 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. 281 vs. $2(63) = 126$.

Time = 0.28 (sec) , antiderivative size = 281, normalized size of antiderivative = 3.80

$$\int x^2 \cot^2(a+bx)\,dx =$$
$$-\frac{2\,b^3x^3\sin\left(2\,bx+2\,a\right)+6\,b^2x^2\cos\left(2\,bx+2\,a\right)+6\,b^2x^2+6\,a\log\left(-\frac{1}{2}\,\cos\left(2\,bx+2\,a\right)+\frac{1}{2}i\,\sin\left(2\,bx+2\right.\right.}{}$$

input
```
integrate(x^2*cot(b*x+a)^2,x, algorithm="fricas")
```

output
```
-1/6*(2*b^3*x^3*sin(2*b*x + 2*a) + 6*b^2*x^2*cos(2*b*x + 2*a) + 6*b^2*x^2
+ 6*a*log(-1/2*cos(2*b*x + 2*a) + 1/2*I*sin(2*b*x + 2*a) + 1/2)*sin(2*b*x
+ 2*a) + 6*a*log(-1/2*cos(2*b*x + 2*a) - 1/2*I*sin(2*b*x + 2*a) + 1/2)*sin
(2*b*x + 2*a) - 6*(b*x + a)*log(-cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a) + 1
)*sin(2*b*x + 2*a) - 6*(b*x + a)*log(-cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a
) + 1)*sin(2*b*x + 2*a) + 3*I*dilog(cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a))
*sin(2*b*x + 2*a) - 3*I*dilog(cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a))*sin(2
*b*x + 2*a))/(b^3*sin(2*b*x + 2*a))
```

3.7.6 Sympy [F]

$$\int x^2 \cot^2(a+bx)\,dx = \int x^2 \cot^2\left(a+bx\right)dx$$

input
```
integrate(x**2*cot(b*x+a)**2,x)
```

output
```
Integral(x**2*cot(a + b*x)**2, x)
```

3.7.7 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. 386 vs. $2(63) = 126$.

Time = 0.42 (sec) , antiderivative size = 386, normalized size of antiderivative = 5.22

$$\int x^2 \cot^2(a+bx)\,dx$$
$$= \frac{-i\,b^3x^3 + 6\left(bx\cos\left(2\,bx + 2\,a\right) + i\,bx\sin\left(2\,bx + 2\,a\right) - bx\right)\arctan\left(\sin\left(bx + a\right), \cos\left(bx + a\right) + 1\right) - 6\left(bx\right.}{}$$

input
```
integrate(x^2*cot(b*x+a)^2,x, algorithm="maxima")
```

output
```
(-I*b^3*x^3 + 6*(b*x*cos(2*b*x + 2*a) + I*b*x*sin(2*b*x + 2*a) - b*x)*arct
an2(sin(b*x + a), cos(b*x + a) + 1) - 6*(b*x*cos(2*b*x + 2*a) + I*b*x*sin(
2*b*x + 2*a) - b*x)*arctan2(sin(b*x + a), -cos(b*x + a) + 1) + (I*b^3*x^3
- 6*b^2*x^2)*cos(2*b*x + 2*a) - 6*(cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a) -
 1)*dilog(-e^(I*b*x + I*a)) - 6*(cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a) - 1
)*dilog(e^(I*b*x + I*a)) - 3*(I*b*x*cos(2*b*x + 2*a) - b*x*sin(2*b*x + 2*a
) - I*b*x)*log(cos(b*x + a)^2 + sin(b*x + a)^2 + 2*cos(b*x + a) + 1) - 3*(
I*b*x*cos(2*b*x + 2*a) - b*x*sin(2*b*x + 2*a) - I*b*x)*log(cos(b*x + a)^2
+ sin(b*x + a)^2 - 2*cos(b*x + a) + 1) - (b^3*x^3 + 6*I*b^2*x^2)*sin(2*b*x
 + 2*a))/(-3*I*b^3*cos(2*b*x + 2*a) + 3*b^3*sin(2*b*x + 2*a) + 3*I*b^3)
```

3.7.8 Giac [F]

$$\int x^2 \cot^2(a+bx)\,dx = \int x^2 \cot\left(bx+a\right)^2\,dx$$

input
```
integrate(x^2*cot(b*x+a)^2,x, algorithm="giac")
```

output
```
integrate(x^2*cot(b*x + a)^2, x)
```

3.7.9 Mupad [F(-1)]

Timed out.

$$\int x^2 \cot^2(a+bx)\,dx = \int x^2 \cot(a+b\,x)^2\,dx$$

input
```
int(x^2*cot(a + b*x)^2,x)
```

output
```
int(x^2*cot(a + b*x)^2, x)
```

3.8 $\int x \cot^2(a+bx)\,dx$

3.8.1 Optimal result

Integrand size = 10, antiderivative size = 31

$$\int x \cot^2(a+bx)\,dx = -\frac{x^2}{2} - \frac{x\cot(a+bx)}{b} + \frac{\log(\sin(a+bx))}{b^2}$$

output
```
-1/2*x^2-x*cot(b*x+a)/b+ln(sin(b*x+a))/b^2
```

3.8.2 Mathematica [A] (verified)

Time = 0.25 (sec) , antiderivative size = 44, normalized size of antiderivative = 1.42

$$\int x \cot^2(a+bx)\,dx = -\frac{x^2}{2} - \frac{x\cot(a)}{b} + \frac{\log(\sin(a+bx))}{b^2} + \frac{x\csc(a)\csc(a+bx)\sin(bx)}{b}$$

input
```
Integrate[x*Cot[a + b*x]^2,x]
```

output
```
-1/2*x^2 - (x*Cot[a])/b + Log[Sin[a + b*x]]/b^2 + (x*Csc[a]*Csc[a + b*x]*S
in[b*x])/b
```

3.8.3 Rubi [A] (verified)

Time = 0.24 (sec) , antiderivative size = 33, normalized size of antiderivative = 1.06, number of steps used = 7, number of rules used = 7, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.700, Rules used = {3042, 4203, 15, 25, 3042, 25, 3956}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int x\cot^2(a+bx)\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int x\tan\left(a+bx+\frac{\pi}{2}\right)^2dx$$

$$\Big\downarrow \text{4203}$$

$$-\frac{\int -\cot(a+bx)dx}{b}-\int xdx-\frac{x\cot(a+bx)}{b}$$

$$\Big\downarrow \text{15}$$

$$-\frac{\int -\cot(a+bx)dx}{b}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}$$

$$\Big\downarrow \text{25}$$

$$\frac{\int \cot(a+bx)dx}{b}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}$$

$$\Big\downarrow \text{3042}$$

$$\frac{\int -\tan\left(a+bx+\frac{\pi}{2}\right)dx}{b}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}$$

$$\Big\downarrow \text{25}$$

$$-\frac{\int \tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx}{b}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}$$

$$\Big\downarrow \text{3956}$$

$$\frac{\log(-\sin(a+bx))}{b^2}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}$$

input
```
Int[x*Cot[a + b*x]^2,x]
```

output
```
-1/2*x^2 - (x*Cot[a + b*x])/b + Log[-Sin[a + b*x]]/b^2
```

3.8.3.1 Defintions of rubi rules used

rule 15
```
Int[(a_.)*(x_)^(m_.), x_Symbol] :> Simp[a*(x^(m + 1)/(m + 1)), x] /; FreeQ[
{a, m}, x] && NeQ[m, -1]
```

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 3956
```
Int[tan[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Log[RemoveContent[Cos[c + d
*x], x]]/d, x] /; FreeQ[{c, d}, x]
```

rule 4203
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((b_.)*tan[(e_.) + (f_.)*(x_)])^(n_), x_Symb
ol] :> Simp[b*(c + d*x)^m*((b*Tan[e + f*x])^(n - 1)/(f*(n - 1))), x] + (-Si
mp[b*d*(m/(f*(n - 1)))   Int[(c + d*x)^(m - 1)*(b*Tan[e + f*x])^(n - 1), x]
, x] - Simp[b^2   Int[(c + d*x)^m*(b*Tan[e + f*x])^(n - 2), x], x]) /; Free
Q[{b, c, d, e, f}, x] && GtQ[n, 1] && GtQ[m, 0]
```

3.8.4 Maple [A] (verified)

Time = 0.24 (sec) , antiderivative size = 40, normalized size of antiderivative = 1.29

method	result	size
default	$-\frac{x^2}{2}+\frac{-(bx+a)\cot(bx+a)+\ln(\sin(bx+a))+a\cot(bx+a)}{b^2}$	40
parallelrisch	$\frac{-x^2b^2-2bx\cot(bx+a)+2\ln(\tan(bx+a))-\ln\left(\sec(bx+a)^2\right)}{2b^2}$	45
norman	$\frac{-\frac{x}{b}-\frac{\tan(bx+a)x^2}{2}}{\tan(bx+a)}+\frac{\ln(\tan(bx+a))}{b^2}-\frac{\ln\left(1+\tan(bx+a)^2\right)}{2b^2}$	56
risch	$-\frac{x^2}{2}-\frac{2ix}{b}-\frac{2ia}{b^2}-\frac{2ix}{b\left(e^{2i(bx+a)}-1\right)}+\frac{\ln\left(e^{2i(bx+a)}-1\right)}{b^2}$	57

input
```
int(x*cot(b*x+a)^2,x,method=_RETURNVERBOSE)
```

output
```
-1/2*x^2+1/b^2*(-(b*x+a)*cot(b*x+a)+ln(sin(b*x+a))+a*cot(b*x+a))
```

3.8.5 Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 75 vs. $2(29) = 58$.

Time = 0.25 (sec) , antiderivative size = 75, normalized size of antiderivative = 2.42

$$\int x\cot^2(a+bx)\,dx = -\frac{b^2x^2\sin(2bx+2a)+2bx\cos(2bx+2a)+2bx-\log\left(-\frac{1}{2}\cos(2bx+2a)+\frac{1}{2}\right)\sin(2bx+2a)}{2b^2\sin(2bx+2a)}$$

input
```
integrate(x*cot(b*x+a)^2,x, algorithm="fricas")
```

output
```
-1/2*(b^2*x^2*sin(2*b*x + 2*a) + 2*b*x*cos(2*b*x + 2*a) + 2*b*x - log(-1/2
*cos(2*b*x + 2*a) + 1/2)*sin(2*b*x + 2*a))/(b^2*sin(2*b*x + 2*a))
```

3.8.6 Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 65 vs. $2(26) = 52$.

Time = 0.21 (sec) , antiderivative size = 65, normalized size of antiderivative = 2.10

$$\int x\cot^2(a+bx)\,dx = \begin{cases} \tilde{\infty}x^2 & \text{for } a=0\wedge b=0 \\ \frac{x^2\cot^2(a)}{2} & \text{for } b=0 \\ \tilde{\infty}x^2 & \text{for } a=-bx \\ -\frac{x^2}{2}-\frac{x}{b\tan(a+bx)}-\frac{\log(\tan^2(a+bx)+1)}{2b^2}+\frac{\log(\tan(a+bx))}{b^2} & \text{otherwise} \end{cases}$$

input
```
integrate(x*cot(b*x+a)**2,x)
```

output
```
Piecewise((zoo*x**2, Eq(a, 0) & Eq(b, 0)), (x**2*cot(a)**2/2, Eq(b, 0)), (
zoo*x**2, Eq(a, -b*x)), (-x**2/2 - x/(b*tan(a + b*x)) - log(tan(a + b*x)**
2 + 1)/(2*b**2) + log(tan(a + b*x))/b**2, True))
```

3.8.7 Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 269 vs. 2(29) = 58.

Time = 0.36 (sec) , antiderivative size = 269, normalized size of antiderivative = 8.68

$$\int x\cot^2(a+bx)\,dx$$
$$= \frac{2\left(bx+a+\frac{1}{\tan(bx+a)}\right)a-\frac{(bx+a)^2\cos(2\,bx+2\,a)^2+(bx+a)^2\sin(2\,bx+2\,a)^2-2\,(bx+a)^2\cos(2\,bx+2\,a)+(bx+a)^2-\left(\cos(2\,bx+2\,a)^2+\sin(}{}}{}$$

input
```
integrate(x*cot(b*x+a)^2,x, algorithm="maxima")
```

output
```
1/2*(2*(b*x + a + 1/tan(b*x + a))*a - ((b*x + a)^2*cos(2*b*x + 2*a)^2 + (b
*x + a)^2*sin(2*b*x + 2*a)^2 - 2*(b*x + a)^2*cos(2*b*x + 2*a) + (b*x + a)^
2 - (cos(2*b*x + 2*a)^2 + sin(2*b*x + 2*a)^2 - 2*cos(2*b*x + 2*a) + 1)*log
(cos(b*x + a)^2 + sin(b*x + a)^2 + 2*cos(b*x + a) + 1) - (cos(2*b*x + 2*a)
^2 + sin(2*b*x + 2*a)^2 - 2*cos(2*b*x + 2*a) + 1)*log(cos(b*x + a)^2 + sin
(b*x + a)^2 - 2*cos(b*x + a) + 1) + 4*(b*x + a)*sin(2*b*x + 2*a))/(cos(2*b
*x + 2*a)^2 + sin(2*b*x + 2*a)^2 - 2*cos(2*b*x + 2*a) + 1))/b^2
```

3.8.8 Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1026 vs. 2(29) = 58.

Time = 0.73 (sec) , antiderivative size = 1026, normalized size of antiderivative = 33.10

$$\int x\cot^2(a+bx)\,dx = \text{Too large to display}$$

input
```
integrate(x*cot(b*x+a)^2,x, algorithm="giac")
```

output
```
-1/2*(b^2*x^2*tan(1/2*b*x)^2*tan(1/2*a) + b^2*x^2*tan(1/2*b*x)*tan(1/2*a)^
2 - b*x*tan(1/2*b*x)^2*tan(1/2*a)^2 - b^2*x^2*tan(1/2*b*x) - b^2*x^2*tan(1
/2*a) + b*x*tan(1/2*b*x)^2 + 4*b*x*tan(1/2*b*x)*tan(1/2*a) - log(16*(tan(1
/2*b*x)^4*tan(1/2*a)^2 + 2*tan(1/2*b*x)^3*tan(1/2*a)^3 + tan(1/2*b*x)^2*ta
n(1/2*a)^4 - 2*tan(1/2*b*x)^3*tan(1/2*a) - 4*tan(1/2*b*x)^2*tan(1/2*a)^2 -
 2*tan(1/2*b*x)*tan(1/2*a)^3 + tan(1/2*b*x)^2 + 2*tan(1/2*b*x)*tan(1/2*a)
+ tan(1/2*a)^2)/(tan(1/2*b*x)^4*tan(1/2*a)^4 + 2*tan(1/2*b*x)^4*tan(1/2*a)
^2 + 2*tan(1/2*b*x)^2*tan(1/2*a)^4 + tan(1/2*b*x)^4 + 4*tan(1/2*b*x)^2*tan
(1/2*a)^2 + tan(1/2*a)^4 + 2*tan(1/2*b*x)^2 + 2*tan(1/2*a)^2 + 1))*tan(1/2
*b*x)^2*tan(1/2*a) + b*x*tan(1/2*a)^2 - log(16*(tan(1/2*b*x)^4*tan(1/2*a)^
2 + 2*tan(1/2*b*x)^3*tan(1/2*a)^3 + tan(1/2*b*x)^2*tan(1/2*a)^4 - 2*tan(1/
2*b*x)^3*tan(1/2*a) - 4*tan(1/2*b*x)^2*tan(1/2*a)^2 - 2*tan(1/2*b*x)*tan(1
/2*a)^3 + tan(1/2*b*x)^2 + 2*tan(1/2*b*x)*tan(1/2*a) + tan(1/2*a)^2)/(tan(
1/2*b*x)^4*tan(1/2*a)^4 + 2*tan(1/2*b*x)^4*tan(1/2*a)^2 + 2*tan(1/2*b*x)^2
*tan(1/2*a)^4 + tan(1/2*b*x)^4 + 4*tan(1/2*b*x)^2*tan(1/2*a)^2 + tan(1/2*a
)^4 + 2*tan(1/2*b*x)^2 + 2*tan(1/2*a)^2 + 1))*tan(1/2*b*x)*tan(1/2*a)^2 -
b*x + log(16*(tan(1/2*b*x)^4*tan(1/2*a)^2 + 2*tan(1/2*b*x)^3*tan(1/2*a)^3
+ tan(1/2*b*x)^2*tan(1/2*a)^4 - 2*tan(1/2*b*x)^3*tan(1/2*a) - 4*tan(1/2*b*
x)^2*tan(1/2*a)^2 - 2*tan(1/2*b*x)*tan(1/2*a)^3 + tan(1/2*b*x)^2 + 2*tan(1
/2*b*x)*tan(1/2*a) + tan(1/2*a)^2)/(tan(1/2*b*x)^4*tan(1/2*a)^4 + 2*tan...
```

3.8.9 Mupad [B] (verification not implemented)

Time = 12.09 (sec) , antiderivative size = 54, normalized size of antiderivative = 1.74

$$\int x\cot^2(a+bx)\,dx=\frac{\ln\left(\mathrm{e}^{a\,2\mathrm{i}}\,\mathrm{e}^{b\,x\,2\mathrm{i}}-1\right)}{b^2}-\frac{x\,2\mathrm{i}}{b}-\frac{x^2}{2}-\frac{x\,2\mathrm{i}}{b\,\left(\mathrm{e}^{a\,2\mathrm{i}+b\,x\,2\mathrm{i}}-1\right)}$$

input
```
int(x*cot(a + b*x)^2,x)
```

output
```
log(exp(a*2i)*exp(b*x*2i) - 1)/b^2 - (x*2i)/b - x^2/2 - (x*2i)/(b*(exp(a*2
i + b*x*2i) - 1))
```

3.9 $\int \frac{\cot^2(a+bx)}{x}\,dx$

3.9.1 Optimal result

Integrand size = 12, antiderivative size = 12

$$\int \frac{\cot^2(a+bx)}{x}\,dx = \text{Int}\left(\frac{\cot^2(a+bx)}{x},x\right)$$

output
```
Unintegrable(cot(b*x+a)^2/x,x)
```

3.9.2 Mathematica [N/A]

Not integrable

Time = 7.20 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^2(a+bx)}{x}\,dx = \int \frac{\cot^2(a+bx)}{x}\,dx$$

input
```
Integrate[Cot[a + b*x]^2/x,x]
```

output
```
Integrate[Cot[a + b*x]^2/x, x]
```

3.9.3 Rubi [N/A]

Not integrable

Time = 0.19 (sec) , antiderivative size = 12, 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 = {3042, 4222}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{\cot^2(a+bx)}{x} \, dx$$

$$\Big\downarrow \; 3042$$

$$\int \frac{\tan\left(a+bx+\frac{\pi}{2}\right)^2}{x}dx$$

$$\Big\downarrow \; 4222$$

$$\int \frac{\cot^2(a+bx)}{x}dx$$

input
```
Int[Cot[a + b*x]^2/x,x]
```

output
```
$Aborted
```

3.9.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4222
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] :>
Simp[If[MatchQ[f, (f1_.)*(Complex[0, j_])], If[MatchQ[e, (e1_.) + Pi/2], I^
n*Unintegrable[(c + d*x)^m*Coth[(-I)*(e - Pi/2) - I*f*x]^n, x], I^n*Uninteg
rable[(c + d*x)^m*Tanh[(-I)*e - I*f*x]^n, x]], If[MatchQ[e, (e1_.) + Pi/2],
 (-1)^n*Unintegrable[(c + d*x)^m*Cot[e - Pi/2 + f*x]^n, x], Unintegrable[(c
 + d*x)^m*Tan[e + f*x]^n, x]]], x] /; FreeQ[{c, d, e, f, m, n}, x] && Integ
erQ[n]
```

3.9.4 Maple [N/A] (verified)

Not integrable

Time = 0.24 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \frac{\cot (bx+a)^2}{x}dx$$

input
```
int(cot(b*x+a)^2/x,x)
```

output
```
int(cot(b*x+a)^2/x,x)
```

3.9.5 Fricas [N/A]

Not integrable

Time = 0.24 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^2(a+bx)}{x}\,dx = \int \frac{\cot (bx+a)^2}{x}\,dx$$

input
```
integrate(cot(b*x+a)^2/x,x, algorithm="fricas")
```

output
```
integral(cot(b*x + a)^2/x, x)
```

3.9.6 Sympy [N/A]

Not integrable

Time = 0.35 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int \frac{\cot^2(a+bx)}{x}\,dx = \int \frac{\cot^2{(a+bx)}}{x}\,dx$$

input
```
integrate(cot(b*x+a)**2/x,x)
```

output
```
Integral(cot(a + b*x)**2/x, x)
```

3.9.7 Maxima [N/A]

Not integrable

Time = 0.43 (sec) , antiderivative size = 348, normalized size of antiderivative = 29.00

$$\int \frac{\cot^2(a+bx)}{x}\,dx = \int \frac{\cot(bx+a)^2}{x}\,dx$$

input
```
integrate(cot(b*x+a)^2/x,x, algorithm="maxima")
```

output
```
-(b*x*cos(2*b*x + 2*a)^2*log(x) + b*x*log(x)*sin(2*b*x + 2*a)^2 - 2*b*x*co
s(2*b*x + 2*a)*log(x) + b*x*log(x) - (b^2*x*cos(2*b*x + 2*a)^2 + b^2*x*sin
(2*b*x + 2*a)^2 - 2*b^2*x*cos(2*b*x + 2*a) + b^2*x)*integrate(sin(b*x + a)
/(b^2*x^2*cos(b*x + a)^2 + b^2*x^2*sin(b*x + a)^2 + 2*b^2*x^2*cos(b*x + a)
 + b^2*x^2), x) + (b^2*x*cos(2*b*x + 2*a)^2 + b^2*x*sin(2*b*x + 2*a)^2 - 2
*b^2*x*cos(2*b*x + 2*a) + b^2*x)*integrate(sin(b*x + a)/(b^2*x^2*cos(b*x +
 a)^2 + b^2*x^2*sin(b*x + a)^2 - 2*b^2*x^2*cos(b*x + a) + b^2*x^2), x) + 2
*sin(2*b*x + 2*a))/(b*x*cos(2*b*x + 2*a)^2 + b*x*sin(2*b*x + 2*a)^2 - 2*b*
x*cos(2*b*x + 2*a) + b*x)
```

3.9.8 Giac [N/A]

Not integrable

Time = 0.29 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^2(a+bx)}{x}\,dx = \int \frac{\cot(bx+a)^2}{x}\,dx$$

input
```
integrate(cot(b*x+a)^2/x,x, algorithm="giac")
```

output
```
integrate(cot(b*x + a)^2/x, x)
```

3.9.9 Mupad [N/A]

Not integrable

Time = 12.20 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^2(a+bx)}{x}\,dx = \int \frac{\cot(a+b\,x)^2}{x}\,dx$$

input
```
int(cot(a + b*x)^2/x,x)
```

output
```
int(cot(a + b*x)^2/x, x)
```

3.10 $\int \frac{\cot^2(a+bx)}{x^2} \, dx$

3.10.1 Optimal result

Integrand size = 12, antiderivative size = 12

$$\int \frac{\cot^2(a+bx)}{x^2} \, dx = \text{Int}\left(\frac{\cot^2(a+bx)}{x^2}, x\right)$$

output
```
Unintegrable(cot(b*x+a)^2/x^2,x)
```

3.10.2 Mathematica [N/A]

Not integrable

Time = 3.87 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^2(a+bx)}{x^2} \, dx = \int \frac{\cot^2(a+bx)}{x^2} \, dx$$

input
```
Integrate[Cot[a + b*x]^2/x^2,x]
```

output
```
Integrate[Cot[a + b*x]^2/x^2, x]
```

3.10.3 Rubi [N/A]

Not integrable

Time = 0.19 (sec) , antiderivative size = 12, 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 = {3042, 4222}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{\cot^2(a+bx)}{x^2} \, dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int \frac{\tan\left(a+bx+\frac{\pi}{2}\right)^2}{x^2}dx$$

$$\Big\downarrow \text{ 4222}$$

$$\int \frac{\cot^2(a+bx)}{x^2}dx$$

input
```
Int[Cot[a + b*x]^2/x^2,x]
```

output
```
$Aborted
```

3.10.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4222
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] :>
Simp[If[MatchQ[f, (f1_.)*(Complex[0, j_])], If[MatchQ[e, (e1_.) + Pi/2], I^
n*Unintegrable[(c + d*x)^m*Coth[(-I)*(e - Pi/2) - I*f*x]^n, x], I^n*Uninteg
rable[(c + d*x)^m*Tanh[(-I)*e - I*f*x]^n, x]], If[MatchQ[e, (e1_.) + Pi/2],
 (-1)^n*Unintegrable[(c + d*x)^m*Cot[e - Pi/2 + f*x]^n, x], Unintegrable[(c
 + d*x)^m*Tan[e + f*x]^n, x]]], x] /; FreeQ[{c, d, e, f, m, n}, x] && Integ
erQ[n]
```

3.10.4 Maple [N/A] (verified)

Not integrable

Time = 0.27 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \frac{\cot\left(bx+a\right)^{2}}{x^{2}}dx$$

input
```
int(cot(b*x+a)^2/x^2,x)
```

output
```
int(cot(b*x+a)^2/x^2,x)
```

3.10.5 Fricas [N/A]

Not integrable

Time = 0.24 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^2(a+bx)}{x^2}\,dx=\int \frac{\cot\left(bx+a\right)^{2}}{x^{2}}\,dx$$

input
```
integrate(cot(b*x+a)^2/x^2,x, algorithm="fricas")
```

output
```
integral(cot(b*x + a)^2/x^2, x)
```

3.10.6 Sympy [N/A]

Not integrable

Time = 0.30 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \frac{\cot^2(a+bx)}{x^2}\,dx=\int \frac{\cot^{2}\left(a+bx\right)}{x^{2}}\,dx$$

input
```
integrate(cot(b*x+a)**2/x**2,x)
```

output
```
Integral(cot(a + b*x)**2/x**2, x)
```

3.10.7 Maxima [N/A]

Not integrable

Time = 0.51 (sec) , antiderivative size = 364, normalized size of antiderivative = 30.33

$$\int \frac{\cot^2(a+bx)}{x^2}\,dx = \int \frac{\cot(bx+a)^2}{x^2}\,dx$$

input
```
integrate(cot(b*x+a)^2/x^2,x, algorithm="maxima")
```

output
```
(b*x*cos(2*b*x + 2*a)^2 + b*x*sin(2*b*x + 2*a)^2 - 2*b*x*cos(2*b*x + 2*a)
+ b*x + 2*(b^2*x^2*cos(2*b*x + 2*a)^2 + b^2*x^2*sin(2*b*x + 2*a)^2 - 2*b^2
*x^2*cos(2*b*x + 2*a) + b^2*x^2)*integrate(sin(b*x + a)/(b^2*x^3*cos(b*x +
 a)^2 + b^2*x^3*sin(b*x + a)^2 + 2*b^2*x^3*cos(b*x + a) + b^2*x^3), x) - 2
*(b^2*x^2*cos(2*b*x + 2*a)^2 + b^2*x^2*sin(2*b*x + 2*a)^2 - 2*b^2*x^2*cos(
2*b*x + 2*a) + b^2*x^2)*integrate(sin(b*x + a)/(b^2*x^3*cos(b*x + a)^2 + b
^2*x^3*sin(b*x + a)^2 - 2*b^2*x^3*cos(b*x + a) + b^2*x^3), x) - 2*sin(2*b*
x + 2*a))/(b*x^2*cos(2*b*x + 2*a)^2 + b*x^2*sin(2*b*x + 2*a)^2 - 2*b*x^2*c
os(2*b*x + 2*a) + b*x^2)
```

3.10.8 Giac [N/A]

Not integrable

Time = 0.28 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^2(a+bx)}{x^2}\,dx = \int \frac{\cot(bx+a)^2}{x^2}\,dx$$

input
```
integrate(cot(b*x+a)^2/x^2,x, algorithm="giac")
```

output
```
integrate(cot(b*x + a)^2/x^2, x)
```

3.10.9 Mupad [N/A]

Not integrable

Time = 12.18 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^2(a+bx)}{x^2}\,dx = \int \frac{\cot(a+b\,x)^2}{x^2}\,dx$$

input
```
int(cot(a + b*x)^2/x^2,x)
```

output
```
int(cot(a + b*x)^2/x^2, x)
```

3.11 $\int x^3 \cot^3(a+bx)\,dx$

3.11.1 Optimal result

Integrand size = 12, antiderivative size = 202

$$\int x^3 \cot^3(a+bx)\,dx = -\frac{3ix^2}{2b^2} - \frac{x^3}{2b} + \frac{ix^4}{4} - \frac{3x^2\cot(a+bx)}{2b^2} - \frac{x^3\cot^2(a+bx)}{2b} + \frac{3x\log\left(1-e^{2i(a+bx)}\right)}{b^3} - \frac{x^3\log\left(1-e^{2i(a+bx)}\right)}{b} - \frac{3i\,\text{PolyLog}\left(2,e^{2i(a+bx)}\right)}{2b^4} + \frac{3ix^2\,\text{PolyLog}\left(2,e^{2i(a+bx)}\right)}{2b^2} - \frac{3x\,\text{PolyLog}\left(3,e^{2i(a+bx)}\right)}{2b^3} - \frac{3i\,\text{PolyLog}\left(4,e^{2i(a+bx)}\right)}{4b^4}$$

output
```
-3/2*I*x^2/b^2-1/2*x^3/b+1/4*I*x^4-3/2*x^2*cot(b*x+a)/b^2-1/2*x^3*cot(b*x+
a)^2/b+3*x*ln(1-exp(2*I*(b*x+a)))/b^3-x^3*ln(1-exp(2*I*(b*x+a)))/b-3/2*I*p
olylog(2,exp(2*I*(b*x+a)))/b^4+3/2*I*x^2*polylog(2,exp(2*I*(b*x+a)))/b^2-3
/2*x*polylog(3,exp(2*I*(b*x+a)))/b^3-3/4*I*polylog(4,exp(2*I*(b*x+a)))/b^4
```

3.11.2 Mathematica [B] (verified)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 491 vs. 2(202) = 404.

Time = 6.81 (sec) , antiderivative size = 491, normalized size of antiderivative = 2.43

$$\int x^3 \cot^3(a+bx)\,dx = -\frac{1}{4}x^4\cot(a) - \frac{x^3\csc^2(a+bx)}{2b}$$
$$+\frac{e^{ia}\csc(a)\left(b^4e^{-2ia}x^4 + 2ib^3(1-e^{-2ia})\,x^3\log\left(1-e^{-i(a+bx)}\right) + 2ib^3(1-e^{-2ia})\,x^3\log\left(1+e^{-i(a+bx)}\right) - 6b\right.}{}$$
$$+\frac{3x^2\csc(a)\csc(a+bx)\sin(bx)}{2b^2}$$
$$-\frac{3\csc(a)\sec(a)\left(b^2e^{i\arctan(\tan(a))}x^2 + \frac{(ibx(-\pi+2\arctan(\tan(a)))-\pi\log(1+e^{-2ibx})-2(bx+\arctan(\tan(a)))\log(1-e^{2i(bx+\arctan(}}{}\right.}{2b^4\sqrt{\sec^2(a)\left(\cos^2(a)+s\right.}}$$

input
```
Integrate[x^3*Cot[a + b*x]^3,x]
```

output
```
-1/4*(x^4*Cot[a]) - (x^3*Csc[a + b*x]^2)/(2*b) + (E^(I*a)*Csc[a]*((b^4*x^4
)/E^((2*I)*a) + (2*I)*b^3*(1 - E^((-2*I)*a))*x^3*Log[1 - E^((-I)*(a + b*x)
)] + (2*I)*b^3*(1 - E^((-2*I)*a))*x^3*Log[1 + E^((-I)*(a + b*x))] - 6*b^2*
(1 - E^((-2*I)*a))*x^2*PolyLog[2, -E^((-I)*(a + b*x))] - 6*b^2*(1 - E^((-2
*I)*a))*x^2*PolyLog[2, E^((-I)*(a + b*x))] + (12*I)*b*(1 - E^((-2*I)*a))*x
*PolyLog[3, -E^((-I)*(a + b*x))] + (12*I)*b*(1 - E^((-2*I)*a))*x*PolyLog[3
, E^((-I)*(a + b*x))] + 12*(1 - E^((-2*I)*a))*PolyLog[4, -E^((-I)*(a + b*x
))] + 12*(1 - E^((-2*I)*a))*PolyLog[4, E^((-I)*(a + b*x))]))/(4*b^4) + (3*
x^2*Csc[a]*Csc[a + b*x]*Sin[b*x])/(2*b^2) - (3*Csc[a]*Sec[a]*(b^2*E^(I*Arc
Tan[Tan[a]])*x^2 + ((I*b*x*(-Pi + 2*ArcTan[Tan[a]]) - Pi*Log[1 + E^((-2*I)
*b*x)] - 2*(b*x + ArcTan[Tan[a]])*Log[1 - E^((2*I)*(b*x + ArcTan[Tan[a]]))
] + Pi*Log[Cos[b*x]] + 2*ArcTan[Tan[a]]*Log[Sin[b*x + ArcTan[Tan[a]]]] + I
*PolyLog[2, E^((2*I)*(b*x + ArcTan[Tan[a]]))])*Tan[a])/Sqrt[1 + Tan[a]^2])
)/(2*b^4*Sqrt[Sec[a]^2*(Cos[a]^2 + Sin[a]^2)])
```

3.11.3 Rubi [A] (verified)

Time = 1.36 (sec) , antiderivative size = 270, normalized size of antiderivative = 1.34, number of steps used = 22, number of rules used = 21, $\frac{\text{number of rules}}{\text{integrand size}}$ = 1.750, Rules used = {3042, 25, 4203, 25, 3042, 25, 4202, 2620, 3011, 4203, 15, 25, 3042, 25, 4202, 2620, 2715, 2838, 7163, 2720, 7143}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int x^3\cot^3(a+bx)\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int -x^3 \tan\left(a+bx+\frac{\pi}{2}\right)^3 dx$$

$$\Big\downarrow \text{25}$$

$$-\int x^3 \tan\left(\frac{1}{2}(2a+\pi)+bx\right)^3 dx$$

$$\Big\downarrow \text{4203}$$

$$\int -x^3 \cot(a+bx)dx + \frac{3\int x^2 \cot^2(a+bx)dx}{2b} - \frac{x^3 \cot^2(a+bx)}{2b}$$

$$\Big\downarrow \text{25}$$

$$-\int x^3 \cot(a+bx)dx + \frac{3\int x^2 \cot^2(a+bx)dx}{2b} - \frac{x^3 \cot^2(a+bx)}{2b}$$

$$\Big\downarrow \text{3042}$$

$$-\int -x^3 \tan\left(a+bx+\frac{\pi}{2}\right)dx + \frac{3\int x^2 \tan\left(a+bx+\frac{\pi}{2}\right)^2 dx}{2b} - \frac{x^3 \cot^2(a+bx)}{2b}$$

$$\Big\downarrow \text{25}$$

$$\int x^3 \tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx + \frac{3\int x^2 \tan\left(a+bx+\frac{\pi}{2}\right)^2 dx}{2b} - \frac{x^3 \cot^2(a+bx)}{2b}$$

$$\Big\downarrow \text{4202}$$

$$-2i\int \frac{e^{i(2a+2bx+\pi)}x^3}{1+e^{i(2a+2bx+\pi)}}dx + \frac{3\int x^2 \tan\left(a+bx+\frac{\pi}{2}\right)^2 dx}{2b} - \frac{x^3 \cot^2(a+bx)}{2b} + \frac{ix^4}{4}$$

$$\Big\downarrow \text{2620}$$

$$\frac{3\int x^2 \tan\left(a+bx+\frac{\pi}{2}\right)^2 dx}{2b} - 2i\left(\frac{3i\int x^2 \log\left(1+e^{i(2a+2bx+\pi)}\right)dx}{2b} - \frac{ix^3 \log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right) - \frac{x^3 \cot^2(a+bx)}{2b} + \frac{ix^4}{4}$$

$$\Big\downarrow \text{3011}$$

$$-2i\left(\frac{3i\left(\frac{ix^2 \operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b} - \frac{i\int x \operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b} - \frac{ix^3 \log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right) + \frac{3\int x^2 \tan\left(a+bx+\frac{\pi}{2}\right)^2 dx}{2b} - \frac{x^3 \cot^2(a+bx)}{2b} + \frac{ix^4}{4}$$

$$\Big\downarrow \text{4203}$$

3.11. $\int x^3 \cot^3(a+bx)\,dx$

$$-2i\left(\frac{3i\left(\frac{ix^2\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int x\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{3\left(-\frac{2\int -x\cot(a+bx)dx}{b}-\int x^2dx-\frac{x^2\cot(a+bx)}{b}\right)}{2b}-\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \text{15}$$

$$-2i\left(\frac{3i\left(\frac{ix^2\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int x\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{3\left(-\frac{2\int -x\cot(a+bx)dx}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \text{25}$$

$$-2i\left(\frac{3i\left(\frac{ix^2\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int x\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{3\left(\frac{2\int x\cot(a+bx)dx}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \text{3042}$$

$$-2i\left(\frac{3i\left(\frac{ix^2\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int x\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{3\left(\frac{2\int -x\tan\left(a+bx+\frac{\pi}{2}\right)dx}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \text{25}$$

$$-2i\left(\frac{3i\left(\frac{ix^2\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int x\operatorname{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{3\left(-\frac{2\int x\tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \text{4202}$$

3.11. $\int x^3\cot^3(a+bx)\,dx$

$$-2i\left(\frac{3i\left(\frac{ix^2\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int x\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{3\left(-\frac{2\left(\frac{ix^2}{2}-2i\int\frac{e^{i(2a+2bx+\pi)}x}{1+e^{i(2a+2bx+\pi)}}dx\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \text{ 2620}$$

$$-2i\left(\frac{3i\left(\frac{ix^2\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int x\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{3\left(-\frac{2\left(\frac{ix^2}{2}-2i\left(\frac{i\int\log\left(1+e^{i(2a+2bx+\pi)}\right)dx}{2b}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \text{ 2715}$$

$$\frac{3\left(-\frac{2\left(\frac{ix^2}{2}-2i\left(\frac{\int e^{-i(2a+2bx+\pi)}\log\left(1+e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-2i\left(\frac{3i\left(\frac{ix^2\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int x\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \text{ 2838}$$

$$-2i\left(\frac{3i\left(\frac{ix^2\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int x\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{3\left(-\frac{2\left(\frac{ix^2}{2}-2i\left(-\frac{\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \text{ 7163}$$

3.11. $\int x^3\cot^3(a+bx)\,dx$

$$-2i\left(\frac{3i\left(\frac{ix^2\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\left(\frac{i\int\text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)dx}{2b}-\frac{ix\,\text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)}{2b}\right)}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2\right.}}{2b}\right.$$

$$\frac{3\left(-\frac{2\left(\frac{ix^2}{2}-2i\left(-\frac{\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-$$

$$\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \; 2720$$

$$-2i\left(\frac{3i\left(\frac{ix^2\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\left(\frac{\int e^{-i(2a+2bx+\pi)}\,\text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}-\frac{ix\,\text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)}{2b}\right)}{b}\right)}{2b}-\right.$$

$$\frac{3\left(-\frac{2\left(\frac{ix^2}{2}-2i\left(-\frac{\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-$$

$$\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

$$\Big\downarrow \; 7143$$

3.11. $\int x^3\cot^3(a+bx)\,dx$

$$-2i\left(\frac{3i\left(\frac{ix^2\,\mathrm{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\left(\frac{\mathrm{PolyLog}\left(4,-e^{i(2a+2bx+\pi)}\right)}{4b^2}-\frac{ix\,\mathrm{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)}{2b}\right)}{b}\right)}{2b}-\frac{ix^3\log\left(1+e^{i(2a+2bx+\cdots}\right.}{2b}\right.$$

$$\frac{3\left(-\frac{2\left(\frac{ix^2}{2}-2i\left(-\frac{\mathrm{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)\right)}{b}-\frac{x^2\cot(a+bx)}{b}-\frac{x^3}{3}\right)}{2b}-\frac{x^3\cot^2(a+bx)}{2b}+\frac{ix^4}{4}$$

input
```
Int[x^3*Cot[a + b*x]^3,x]
```

output
```
(I/4)*x^4 - (x^3*Cot[a + b*x]^2)/(2*b) + (3*(-1/3*x^3 - (x^2*Cot[a + b*x])
/b - (2*((I/2)*x^2 - (2*I)*(((-1/2*I)*x*Log[1 + E^(I*(2*a + Pi + 2*b*x))])
/b - PolyLog[2, -E^(I*(2*a + Pi + 2*b*x))]/(4*b^2))))/b))/(2*b) - (2*I)*((
(-1/2*I)*x^3*Log[1 + E^(I*(2*a + Pi + 2*b*x))])/b + (((3*I)/2)*(((I/2)*x^2
*PolyLog[2, -E^(I*(2*a + Pi + 2*b*x))])/b - (I*(((-1/2*I)*x*PolyLog[3, -E^
(I*(2*a + Pi + 2*b*x))])/b + PolyLog[4, -E^(I*(2*a + Pi + 2*b*x))]/(4*b^2)
))/b))/b)
```

3.11.3.1 Defintions of rubi rules used

rule 15
```
Int[(a_.)*(x_)^(m_.), x_Symbol] :> Simp[a*(x^(m + 1)/(m + 1)), x] /; FreeQ[
{a, m}, x] && NeQ[m, -1]
```

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2715
```
Int[Log[(a_) + (b_.)*((F_)^((e_.)*((c_.) + (d_.)*(x_))))^(n_.)], x_Symbol]
:> Simp[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 2720
```
Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Simp[v/D[v, x]
   Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Funct
ionOfExponentialQ[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 2838
```
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 3011
```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.)]*((f_.) + (g_.)
*(x_))^(m_.), x_Symbol] :> Simp[(-(f + g*x)^m)*(PolyLog[2, (-e)*(F^(c*(a +
b*x)))^n]/(b*c*n*Log[F])), x] + Simp[g*(m/(b*c*n*Log[F]))   Int[(f + g*x)^(
m - 1)*PolyLog[2, (-e)*(F^(c*(a + b*x)))^n], x], x] /; FreeQ[{F, a, b, c, e
, f, g, n}, x] && GtQ[m, 0]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4202
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[I
*((c + d*x)^(m + 1)/(d*(m + 1))), x] - Simp[2*I   Int[(c + d*x)^m*(E^(2*I*(
e + f*x))/(1 + E^(2*I*(e + f*x)))), x], x] /; FreeQ[{c, d, e, f}, x] && IGt
Q[m, 0]
```

rule 4203
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((b_.)*tan[(e_.) + (f_.)*(x_)])^(n_), x_Symb
ol] :> Simp[b*(c + d*x)^m*((b*Tan[e + f*x])^(n - 1)/(f*(n - 1))), x] + (-Si
mp[b*d*(m/(f*(n - 1)))   Int[(c + d*x)^(m - 1)*(b*Tan[e + f*x])^(n - 1), x]
, x] - Simp[b^2   Int[(c + d*x)^m*(b*Tan[e + f*x])^(n - 2), x], x]) /; Free
Q[{b, c, d, e, f}, x] && GtQ[n, 1] && GtQ[m, 0]
```

3.11. $\int x^3 \cot^3(a+bx)\,dx$

rule 7143
```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] :> Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

rule 7163
```
Int[((e_.) + (f_.)*(x_))^(m_.)*PolyLog[n_, (d_.)*((F_)^((c_.)*((a_.) + (b_.
)*(x_))))^(p_.)], x_Symbol] :> Simp[(e + f*x)^m*(PolyLog[n + 1, d*(F^(c*(a
+ b*x)))^p]/(b*c*p*Log[F])), x] - Simp[f*(m/(b*c*p*Log[F]))   Int[(e + f*x)
^(m - 1)*PolyLog[n + 1, d*(F^(c*(a + b*x)))^p], x], x] /; FreeQ[{F, a, b, c
, d, e, f, n, p}, x] && GtQ[m, 0]
```

3.11.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 443 vs. $2(167) = 334$.

Time = 0.22 (sec) , antiderivative size = 444, normalized size of antiderivative = 2.20

method	result
risch	$\frac{3i\,\mathrm{polylog}(2,-\mathrm{e}^{i(bx+a)})x^2}{b^2}+\frac{3i\,\mathrm{polylog}(2,\mathrm{e}^{i(bx+a)})x^2}{b^2}+\frac{2ia^3x}{b^3}-\frac{\ln(1+\mathrm{e}^{i(bx+a)})x^3}{b}-\frac{\ln(1-\mathrm{e}^{i(bx+a)})x^3}{b}-\frac{a^3\ln(1-\mathrm{e}^{i(bx+a}}{b^4}$

input
```
int(x^3*cot(b*x+a)^3,x,method=_RETURNVERBOSE)
```

output
```
1/4*I*x^4-1/b*ln(1+exp(I*(b*x+a)))*x^3-1/b*ln(1-exp(I*(b*x+a)))*x^3-1/b^4*
a^3*ln(1-exp(I*(b*x+a)))+x^2*(2*x*exp(2*I*(b*x+a))*b-3*I*exp(2*I*(b*x+a))+
3*I)/b^2/(exp(2*I*(b*x+a))-1)^2-2/b^4*a^3*ln(exp(I*(b*x+a)))+1/b^4*a^3*ln(
exp(I*(b*x+a))-1)-6/b^3*polylog(3,-exp(I*(b*x+a)))*x-6/b^3*polylog(3,exp(I
*(b*x+a)))*x+3*I/b^2*polylog(2,-exp(I*(b*x+a)))*x^2+3*I/b^2*polylog(2,exp(
I*(b*x+a)))*x^2+2*I/b^3*a^3*x-6*I/b^3*a*x+6/b^4*a*ln(exp(I*(b*x+a)))-3/b^4
*a*ln(exp(I*(b*x+a))-1)+3/b^4*ln(1-exp(I*(b*x+a)))*a+3/b^3*ln(1+exp(I*(b*x
+a)))*x+3/b^3*ln(1-exp(I*(b*x+a)))*x-3*I/b^4*polylog(2,exp(I*(b*x+a)))+3/2
*I/b^4*a^4-6*I/b^4*polylog(4,-exp(I*(b*x+a)))-6*I/b^4*polylog(4,exp(I*(b*x
+a)))-3*I/b^2*x^2-3*I/b^4*a^2-3*I/b^4*polylog(2,-exp(I*(b*x+a)))
```

3.11.5 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. 569 vs. 2(160) = 320.

Time = 0.30 (sec) , antiderivative size = 569, normalized size of antiderivative = 2.82

$$\int x^3 \cot^3(a+bx)\,dx$$
$$= \frac{8\,b^3x^3 + 12\,b^2x^2\sin\left(2\,bx+2\,a\right) - 6\left(i\,b^2x^2 + \left(-i\,b^2x^2+i\right)\cos\left(2\,bx+2\,a\right) - i\right)\mathrm{Li}_2(\cos\left(2\,bx+2\,a\right) + i\,\sin(}{}$$

input
```
integrate(x^3*cot(b*x+a)^3,x, algorithm="fricas")
```

output
```
1/8*(8*b^3*x^3 + 12*b^2*x^2*sin(2*b*x + 2*a) - 6*(I*b^2*x^2 + (-I*b^2*x^2
+ I)*cos(2*b*x + 2*a) - I)*dilog(cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a)) -
6*(-I*b^2*x^2 + (I*b^2*x^2 - I)*cos(2*b*x + 2*a) + I)*dilog(cos(2*b*x + 2*
a) - I*sin(2*b*x + 2*a)) - 4*(a^3 - (a^3 - 3*a)*cos(2*b*x + 2*a) - 3*a)*lo
g(-1/2*cos(2*b*x + 2*a) + 1/2*I*sin(2*b*x + 2*a) + 1/2) - 4*(a^3 - (a^3 -
3*a)*cos(2*b*x + 2*a) - 3*a)*log(-1/2*cos(2*b*x + 2*a) - 1/2*I*sin(2*b*x +
 2*a) + 1/2) + 4*(b^3*x^3 + a^3 - 3*b*x - (b^3*x^3 + a^3 - 3*b*x - 3*a)*co
s(2*b*x + 2*a) - 3*a)*log(-cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a) + 1) + 4*
(b^3*x^3 + a^3 - 3*b*x - (b^3*x^3 + a^3 - 3*b*x - 3*a)*cos(2*b*x + 2*a) -
3*a)*log(-cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a) + 1) - 3*(I*cos(2*b*x + 2*
a) - I)*polylog(4, cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a)) - 3*(-I*cos(2*b*
x + 2*a) + I)*polylog(4, cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a)) - 6*(b*x*c
os(2*b*x + 2*a) - b*x)*polylog(3, cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a)) -
 6*(b*x*cos(2*b*x + 2*a) - b*x)*polylog(3, cos(2*b*x + 2*a) - I*sin(2*b*x
+ 2*a)))/(b^4*cos(2*b*x + 2*a) - b^4)
```

3.11.6 Sympy [F]

$$\int x^3 \cot^3(a+bx)\,dx = \int x^3 \cot^3\left(a+bx\right)dx$$

input
```
integrate(x**3*cot(b*x+a)**3,x)
```

output
```
Integral(x**3*cot(a + b*x)**3, x)
```

3.11.7 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. 1960 vs. 2(160) = 320.

Time = 0.44 (sec) , antiderivative size = 1960, normalized size of antiderivative = 9.70

$$\int x^3 \cot^3(a+bx)\,dx = \text{Too large to display}$$

input
```
integrate(x^3*cot(b*x+a)^3,x, algorithm="maxima")
```

output
```
1/2*(a^3*(1/sin(b*x + a)^2 + log(sin(b*x + a)^2)) + 2*((b*x + a)^4 - 4*(b*
x + a)^3*a + 6*(b*x + a)^2*a^2 + 12*a^2 - 4*((b*x + a)^3 - 3*(b*x + a)^2*a
 + 3*(a^2 - 1)*(b*x + a) + ((b*x + a)^3 - 3*(b*x + a)^2*a + 3*(a^2 - 1)*(b
*x + a) + 3*a)*cos(4*b*x + 4*a) - 2*((b*x + a)^3 - 3*(b*x + a)^2*a + 3*(a^
2 - 1)*(b*x + a) + 3*a)*cos(2*b*x + 2*a) - (-I*(b*x + a)^3 + 3*I*(b*x + a)
^2*a + 3*(-I*a^2 + I)*(b*x + a) - 3*I*a)*sin(4*b*x + 4*a) - 2*(I*(b*x + a)
^3 - 3*I*(b*x + a)^2*a + 3*(I*a^2 - I)*(b*x + a) + 3*I*a)*sin(2*b*x + 2*a)
 + 3*a)*arctan2(sin(b*x + a), cos(b*x + a) + 1) - 12*(a*cos(4*b*x + 4*a) -
 2*a*cos(2*b*x + 2*a) + I*a*sin(4*b*x + 4*a) - 2*I*a*sin(2*b*x + 2*a) + a)
*arctan2(sin(b*x + a), cos(b*x + a) - 1) + 4*((b*x + a)^3 - 3*(b*x + a)^2*
a + 3*(a^2 - 1)*(b*x + a) + ((b*x + a)^3 - 3*(b*x + a)^2*a + 3*(a^2 - 1)*(
b*x + a))*cos(4*b*x + 4*a) - 2*((b*x + a)^3 - 3*(b*x + a)^2*a + 3*(a^2 - 1
)*(b*x + a))*cos(2*b*x + 2*a) + (I*(b*x + a)^3 - 3*I*(b*x + a)^2*a + 3*(I*
a^2 - I)*(b*x + a))*sin(4*b*x + 4*a) + 2*(-I*(b*x + a)^3 + 3*I*(b*x + a)^2
*a + 3*(-I*a^2 + I)*(b*x + a))*sin(2*b*x + 2*a))*arctan2(sin(b*x + a), -co
s(b*x + a) + 1) + ((b*x + a)^4 - 4*(b*x + a)^3*a + 6*(a^2 - 2)*(b*x + a)^2
 + 24*(b*x + a)*a)*cos(4*b*x + 4*a) - 2*((b*x + a)^4 - 4*(b*x + a)^3*(a -
I) + 6*(a^2 - 2*I*a - 1)*(b*x + a)^2 - 12*(-I*a^2 - a)*(b*x + a) + 6*a^2)*
cos(2*b*x + 2*a) + 12*((b*x + a)^2 - 2*(b*x + a)*a + a^2 + ((b*x + a)^2 -
2*(b*x + a)*a + a^2 - 1)*cos(4*b*x + 4*a) - 2*((b*x + a)^2 - 2*(b*x + a...
```

3.11.8 Giac [F]

$$\int x^3 \cot^3(a+bx)\,dx = \int x^3 \cot(bx+a)^3\,dx$$

input
```
integrate(x^3*cot(b*x+a)^3,x, algorithm="giac")
```

output
```
integrate(x^3*cot(b*x + a)^3, x)
```

3.11.9 Mupad [F(-1)]

Timed out.

$$\int x^3 \cot^3(a+bx)\, dx = \int x^3 \cot(a+b\,x)^3\, dx$$

input
```
int(x^3*cot(a + b*x)^3,x)
```

output
```
int(x^3*cot(a + b*x)^3, x)
```

3.12 $\int x^2 \cot^3(a+bx)\,dx$

3.12.1 Optimal result

Integrand size = 12, antiderivative size = 126

$$\int x^2 \cot^3(a+bx)\,dx = -\frac{x^2}{2b}+\frac{ix^3}{3}-\frac{x\cot(a+bx)}{b^2}-\frac{x^2\cot^2(a+bx)}{2b}-\frac{x^2\log\left(1-e^{2i(a+bx)}\right)}{b}+\frac{\log(\sin(a+bx))}{b^3}+\frac{ix\operatorname{PolyLog}\left(2,e^{2i(a+bx)}\right)}{b^2}-\frac{\operatorname{PolyLog}\left(3,e^{2i(a+bx)}\right)}{2b^3}$$

output
```
-1/2*x^2/b+1/3*I*x^3-x*cot(b*x+a)/b^2-1/2*x^2*cot(b*x+a)^2/b-x^2*ln(1-exp(
2*I*(b*x+a)))/b+ln(sin(b*x+a))/b^3+I*x*polylog(2,exp(2*I*(b*x+a)))/b^2-1/2
*polylog(3,exp(2*I*(b*x+a)))/b^3
```

3.12.2 Mathematica [A] (verified)

Time = 5.70 (sec) , antiderivative size = 221, normalized size of antiderivative = 1.75

$$\int x^2\cot^3(a+bx)\,dx = -\frac{6bx\cot(a)+2b^3x^3\cot(a)+3b^2x^2\csc^2(a+bx)-6\log(\sin(a+bx))+2e^{-ia}(i+\cot(a))\left(ib^3x^3-b^3x^3\operatorname{co}\right.}{}$$

input
```
Integrate[x^2*Cot[a + b*x]^3,x]
```

output
```
-1/6*(6*b*x*Cot[a] + 2*b^3*x^3*Cot[a] + 3*b^2*x^2*Csc[a + b*x]^2 - 6*Log[S
in[a + b*x]] + (2*(I + Cot[a])*(I*b^3*x^3 - b^3*x^3*Cot[a] + 3*b^2*x^2*Log
[1 - E^((-I)*(a + b*x))] + 3*b^2*x^2*Log[1 + E^((-I)*(a + b*x))] + (6*I)*b
*x*PolyLog[2, -E^((-I)*(a + b*x))] + (6*I)*b*x*PolyLog[2, E^((-I)*(a + b*x
))] + 6*PolyLog[3, -E^((-I)*(a + b*x))] + 6*PolyLog[3, E^((-I)*(a + b*x))]
)*Sin[a])/E^(I*a) - 6*b*x*Csc[a]*Csc[a + b*x]*Sin[b*x])/b^3
```

3.12.3 Rubi [A] (verified)

Time = 0.85 (sec) , antiderivative size = 163, normalized size of antiderivative = 1.29, number of steps used = 18, number of rules used = 17, $\frac{\text{number of rules}}{\text{integrand size}}$ = 1.417, Rules used = {3042, 25, 4203, 25, 3042, 25, 4202, 2620, 3011, 2720, 4203, 15, 25, 3042, 25, 3956, 7143}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int x^2 \cot^3(a+bx)\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int -x^2 \tan\left(a+bx+\frac{\pi}{2}\right)^3dx$$

$$\Big\downarrow \text{25}$$

$$-\int x^2 \tan\left(\frac{1}{2}(2a+\pi)+bx\right)^3dx$$

$$\Big\downarrow \text{4203}$$

$$\int -x^2\cot(a+bx)dx+\frac{\int x\cot^2(a+bx)dx}{b}-\frac{x^2\cot^2(a+bx)}{2b}$$

$$\Big\downarrow \text{25}$$

$$-\int x^2\cot(a+bx)dx+\frac{\int x\cot^2(a+bx)dx}{b}-\frac{x^2\cot^2(a+bx)}{2b}$$

$$\Big\downarrow \text{3042}$$

$$-\int -x^2\tan\left(a+bx+\frac{\pi}{2}\right)dx+\frac{\int x\tan\left(a+bx+\frac{\pi}{2}\right)^2dx}{b}-\frac{x^2\cot^2(a+bx)}{2b}$$

$$\Big\downarrow \text{25}$$

$$\int x^2 \tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx+\frac{\int x\tan\left(a+bx+\frac{\pi}{2}\right)^2dx}{b}-\frac{x^2\cot^2(a+bx)}{2b}$$

$$\Big\downarrow \; 4202$$

$$-2i\int\frac{e^{i(2a+2bx+\pi)}x^2}{1+e^{i(2a+2bx+\pi)}}dx+\frac{\int x\tan\left(a+bx+\frac{\pi}{2}\right)^2dx}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

$$\Big\downarrow \; 2620$$

$$-2i\left(\frac{i\int x\log\left(1+e^{i(2a+2bx+\pi)}\right)dx}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{\int x\tan\left(a+bx+\frac{\pi}{2}\right)^2dx}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

$$\Big\downarrow \; 3011$$

$$-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{i\int\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)dx}{2b}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{\int x\tan\left(a+bx+\frac{\pi}{2}\right)^2dx}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

$$\Big\downarrow \; 2720$$

$$-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\int e^{-i(2a+2bx+\pi)}\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{\int x\tan\left(a+bx+\frac{\pi}{2}\right)^2dx}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

$$\Big\downarrow \; 4203$$

$$-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\int e^{-i(2a+2bx+\pi)}\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{-\frac{\int-\cot(a+bx)dx}{b}-\int xdx-\frac{x\cot(a+bx)}{b}}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

$$\Big\downarrow \; 15$$

$$-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\int e^{-i(2a+2bx+\pi)}\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+\frac{-\frac{\int-\cot(a+bx)dx}{b}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

3.12. $\int x^2\cot^3(a+bx)\,dx$

$$\Big\downarrow \; 25$$

$$-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\int e^{-i(2a+2bx+\pi)}\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+$$
$$\frac{\frac{\int\cot(a+bx)dx}{b}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

$$\Big\downarrow \; 3042$$

$$-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\int e^{-i(2a+2bx+\pi)}\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+$$
$$\frac{\frac{\int-\tan\left(a+bx+\frac{\pi}{2}\right)dx}{b}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

$$\Big\downarrow \; 25$$

$$-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\int e^{-i(2a+2bx+\pi)}\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+$$
$$\frac{-\frac{\int\tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx}{b}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

$$\Big\downarrow \; 3956$$

$$-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\int e^{-i(2a+2bx+\pi)}\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+$$
$$\frac{\frac{\log(-\sin(a+bx))}{b^2}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

$$\Big\downarrow \; 7143$$

$$-2i\left(\frac{i\left(\frac{ix\,\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{2b}-\frac{\text{PolyLog}\left(3,-e^{i(2a+2bx+\pi)}\right)}{4b^2}\right)}{b}-\frac{ix^2\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)+$$
$$\frac{\frac{\log(-\sin(a+bx))}{b^2}-\frac{x\cot(a+bx)}{b}-\frac{x^2}{2}}{b}-\frac{x^2\cot^2(a+bx)}{2b}+\frac{ix^3}{3}$$

input
```
Int[x^2*Cot[a + b*x]^3,x]
```

3.12. $\int x^2\cot^3(a+bx)\,dx$

output
```
(I/3)*x^3 - (x^2*Cot[a + b*x]^2)/(2*b) + (-1/2*x^2 - (x*Cot[a + b*x])/b +
Log[-Sin[a + b*x]]/b^2)/b - (2*I)*(((-1/2*I)*x^2*Log[1 + E^(I*(2*a + Pi +
2*b*x))])/b + (I*(((I/2)*x*PolyLog[2, -E^(I*(2*a + Pi + 2*b*x))])/b - Poly
Log[3, -E^(I*(2*a + Pi + 2*b*x))]/(4*b^2)))/b)
```

3.12.3.1 Defintions of rubi rules used

rule 15
```
Int[(a_.)*(x_)^(m_.), x_Symbol] :> Simp[a*(x^(m + 1)/(m + 1)), x] /; FreeQ[
{a, m}, x] && NeQ[m, -1]
```

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2720
```
Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Simp[v/D[v, x]
   Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Funct
ionOfExponentialQ[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 3011
```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.)]*((f_.) + (g_.)
*(x_))^(m_.), x_Symbol] :> Simp[(-(f + g*x)^m)*(PolyLog[2, (-e)*(F^(c*(a +
b*x)))^n]/(b*c*n*Log[F])), x] + Simp[g*(m/(b*c*n*Log[F]))   Int[(f + g*x)^(
m - 1)*PolyLog[2, (-e)*(F^(c*(a + b*x)))^n], x], x] /; FreeQ[{F, a, b, c, e
, f, g, n}, x] && GtQ[m, 0]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 3956
```
Int[tan[(c_.) + (d_.)*(x_)], x_Symbol] :> Simp[-Log[RemoveContent[Cos[c + d
*x], x]]/d, x] /; FreeQ[{c, d}, x]
```

rule 4202
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[I
*((c + d*x)^(m + 1)/(d*(m + 1))), x] - Simp[2*I   Int[(c + d*x)^m*(E^(2*I*(
e + f*x))/(1 + E^(2*I*(e + f*x)))), x], x] /; FreeQ[{c, d, e, f}, x] && IGt
Q[m, 0]
```

rule 4203
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((b_.)*tan[(e_.) + (f_.)*(x_)])^(n_), x_Symb
ol] :> Simp[b*(c + d*x)^m*((b*Tan[e + f*x])^(n - 1)/(f*(n - 1))), x] + (-Si
mp[b*d*(m/(f*(n - 1)))   Int[(c + d*x)^(m - 1)*(b*Tan[e + f*x])^(n - 1), x]
, x] - Simp[b^2   Int[(c + d*x)^m*(b*Tan[e + f*x])^(n - 2), x], x]) /; Free
Q[{b, c, d, e, f}, x] && GtQ[n, 1] && GtQ[m, 0]
```

rule 7143
```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] :> Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

3.12.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 292 vs. $2(110) = 220$.

Time = 0.20 (sec) , antiderivative size = 293, normalized size of antiderivative = 2.33

method	result
risch	$-\frac{4ia^3}{3b^3}+\frac{2x\left(x\,\mathrm{e}^{2i(bx+a)}b-i\mathrm{e}^{2i(bx+a)}+i\right)}{b^2\left(\mathrm{e}^{2i(bx+a)}-1\right)^2}+\frac{a^2\ln\left(1-\mathrm{e}^{i(bx+a)}\right)}{b^3}-\frac{2ia^2x}{b^2}+\frac{2a^2\ln\left(\mathrm{e}^{i(bx+a)}\right)}{b^3}-\frac{a^2\ln\left(\mathrm{e}^{i(bx+a)}-1\right)}{b^3}+\frac{ix^3}{3}-$

input
```
int(x^2*cot(b*x+a)^3,x,method=_RETURNVERBOSE)
```

output
```
-4/3*I/b^3*a^3+2*x*(x*exp(2*I*(b*x+a))*b-I*exp(2*I*(b*x+a))+I)/b^2/(exp(2*
I*(b*x+a))-1)^2+1/b^3*a^2*ln(1-exp(I*(b*x+a)))-2*I/b^2*a^2*x+2/b^3*a^2*ln(
exp(I*(b*x+a)))-1/b^3*a^2*ln(exp(I*(b*x+a))-1)+1/3*I*x^3-1/b*ln(1+exp(I*(b
*x+a)))*x^2+2*I/b^2*polylog(2,exp(I*(b*x+a)))*x-1/b*ln(1-exp(I*(b*x+a)))*x
^2+2*I/b^2*polylog(2,-exp(I*(b*x+a)))*x-2/b^3*polylog(3,-exp(I*(b*x+a)))-2
/b^3*polylog(3,exp(I*(b*x+a)))+1/b^3*ln(1+exp(I*(b*x+a)))-2/b^3*ln(exp(I*(
b*x+a)))+1/b^3*ln(exp(I*(b*x+a))-1)
```

3.12.5 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. 425 vs. 2(107) = 214.

Time = 0.30 (sec) , antiderivative size = 425, normalized size of antiderivative = 3.37

$$\int x^2 \cot^3(a+bx)\,dx$$
$$= \frac{4\,b^2x^2 + 4\,bx\sin\left(2\,bx+2\,a\right) - 2\left(-i\,bx\cos\left(2\,bx+2\,a\right)+i\,bx\right)\mathrm{Li}_2(\cos\left(2\,bx+2\,a\right)+i\,\sin\left(2\,bx+2\,a\right)) - 2}{}$$

input
```
integrate(x^2*cot(b*x+a)^3,x, algorithm="fricas")
```

output
```
1/4*(4*b^2*x^2 + 4*b*x*sin(2*b*x + 2*a) - 2*(-I*b*x*cos(2*b*x + 2*a) + I*b
*x)*dilog(cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a)) - 2*(I*b*x*cos(2*b*x + 2*
a) - I*b*x)*dilog(cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a)) + 2*(a^2 - (a^2 -
 1)*cos(2*b*x + 2*a) - 1)*log(-1/2*cos(2*b*x + 2*a) + 1/2*I*sin(2*b*x + 2*
a) + 1/2) + 2*(a^2 - (a^2 - 1)*cos(2*b*x + 2*a) - 1)*log(-1/2*cos(2*b*x +
2*a) - 1/2*I*sin(2*b*x + 2*a) + 1/2) + 2*(b^2*x^2 - a^2 - (b^2*x^2 - a^2)*
cos(2*b*x + 2*a))*log(-cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a) + 1) + 2*(b^2
*x^2 - a^2 - (b^2*x^2 - a^2)*cos(2*b*x + 2*a))*log(-cos(2*b*x + 2*a) - I*s
in(2*b*x + 2*a) + 1) - (cos(2*b*x + 2*a) - 1)*polylog(3, cos(2*b*x + 2*a)
+ I*sin(2*b*x + 2*a)) - (cos(2*b*x + 2*a) - 1)*polylog(3, cos(2*b*x + 2*a)
 - I*sin(2*b*x + 2*a)))/(b^3*cos(2*b*x + 2*a) - b^3)
```

3.12.6 Sympy [F]

$$\int x^2 \cot^3(a+bx)\,dx = \int x^2 \cot^3\left(a+bx\right)dx$$

input
```
integrate(x**2*cot(b*x+a)**3,x)
```

output
```
Integral(x**2*cot(a + b*x)**3, x)
```

3.12.7 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. 1208 vs. $2(107) = 214$.

Time = 0.45 (sec) , antiderivative size = 1208, normalized size of antiderivative = 9.59

$$\int x^2 \cot^3(a+bx)\,dx = \text{Too large to display}$$

input
```
integrate(x^2*cot(b*x+a)^3,x, algorithm="maxima")
```

output
```
-1/2*(a^2*(1/sin(b*x + a)^2 + log(sin(b*x + a)^2)) - 2*(2*(b*x + a)^3 - 6*
(b*x + a)^2*a - 6*((b*x + a)^2 - 2*(b*x + a)*a + ((b*x + a)^2 - 2*(b*x + a
)*a - 1)*cos(4*b*x + 4*a) - 2*((b*x + a)^2 - 2*(b*x + a)*a - 1)*cos(2*b*x
+ 2*a) - (-I*(b*x + a)^2 + 2*I*(b*x + a)*a + I)*sin(4*b*x + 4*a) - 2*(I*(b
*x + a)^2 - 2*I*(b*x + a)*a - I)*sin(2*b*x + 2*a) - 1)*arctan2(sin(b*x + a
), cos(b*x + a) + 1) + 6*(cos(4*b*x + 4*a) - 2*cos(2*b*x + 2*a) + I*sin(4*
b*x + 4*a) - 2*I*sin(2*b*x + 2*a) + 1)*arctan2(sin(b*x + a), cos(b*x + a)
- 1) + 6*((b*x + a)^2 - 2*(b*x + a)*a + ((b*x + a)^2 - 2*(b*x + a)*a)*cos(
4*b*x + 4*a) - 2*((b*x + a)^2 - 2*(b*x + a)*a)*cos(2*b*x + 2*a) + (I*(b*x
+ a)^2 - 2*I*(b*x + a)*a)*sin(4*b*x + 4*a) + 2*(-I*(b*x + a)^2 + 2*I*(b*x
+ a)*a)*sin(2*b*x + 2*a))*arctan2(sin(b*x + a), -cos(b*x + a) + 1) + 2*((b
*x + a)^3 - 3*(b*x + a)^2*a - 6*b*x - 6*a)*cos(4*b*x + 4*a) - 4*((b*x + a)
^3 - 3*(b*x + a)^2*(a - I) - 3*(b*x + a)*(2*I*a + 1) - 3*a)*cos(2*b*x + 2*
a) + 12*(b*x*cos(4*b*x + 4*a) - 2*b*x*cos(2*b*x + 2*a) + I*b*x*sin(4*b*x +
 4*a) - 2*I*b*x*sin(2*b*x + 2*a) + b*x)*dilog(-e^(I*b*x + I*a)) + 12*(b*x*
cos(4*b*x + 4*a) - 2*b*x*cos(2*b*x + 2*a) + I*b*x*sin(4*b*x + 4*a) - 2*I*b
*x*sin(2*b*x + 2*a) + b*x)*dilog(e^(I*b*x + I*a)) + 3*(I*(b*x + a)^2 - 2*I
*(b*x + a)*a + (I*(b*x + a)^2 - 2*I*(b*x + a)*a - I)*cos(4*b*x + 4*a) + 2*
(-I*(b*x + a)^2 + 2*I*(b*x + a)*a + I)*cos(2*b*x + 2*a) - ((b*x + a)^2 - 2
*(b*x + a)*a - 1)*sin(4*b*x + 4*a) + 2*((b*x + a)^2 - 2*(b*x + a)*a - 1...
```

3.12.8 Giac [F]

$$\int x^2 \cot^3(a+bx)\,dx = \int x^2 \cot(bx+a)^3\,dx$$

input
```
integrate(x^2*cot(b*x+a)^3,x, algorithm="giac")
```

output
```
integrate(x^2*cot(b*x + a)^3, x)
```

3.12.9 Mupad [F(-1)]

Timed out.

$$\int x^2 \cot^3(a+bx)\,dx = \int x^2 \cot(a+b\,x)^3\,dx$$

input
```
int(x^2*cot(a + b*x)^3,x)
```

output
```
int(x^2*cot(a + b*x)^3, x)
```

3.13 $\int x \cot^3(a+bx)\,dx$

3.13.1 Optimal result

Integrand size = 10, antiderivative size = 91

$$\int x\cot^3(a+bx)\,dx = -\frac{x}{2b}+\frac{ix^2}{2}-\frac{\cot(a+bx)}{2b^2}-\frac{x\cot^2(a+bx)}{2b}-\frac{x\log\left(1-e^{2i(a+bx)}\right)}{b}+\frac{i\,\text{PolyLog}\left(2,e^{2i(a+bx)}\right)}{2b^2}$$

output
```
-1/2*x/b+1/2*I*x^2-1/2*cot(b*x+a)/b^2-1/2*x*cot(b*x+a)^2/b-x*ln(1-exp(2*I*
(b*x+a)))/b+1/2*I*polylog(2,exp(2*I*(b*x+a)))/b^2
```

3.13.2 Mathematica [A] (verified)

Time = 4.62 (sec) , antiderivative size = 179, normalized size of antiderivative = 1.97

$$\int x\cot^3(a+bx)\,dx = \frac{-ib\pi x-b^2x^2\cot(a)-bx\csc^2(a+bx)-\pi\log\left(1+e^{-2ibx}\right)-2bx\log\left(1-e^{2i(bx+\arctan(\tan(a)))}\right)+\pi\log(\cos\ldots}{}$$

input
```
Integrate[x*Cot[a + b*x]^3,x]
```

output
```
((-I)*b*Pi*x - b^2*x^2*Cot[a] - b*x*Csc[a + b*x]^2 - Pi*Log[1 + E^((-2*I)*
b*x)] - 2*b*x*Log[1 - E^((2*I)*(b*x + ArcTan[Tan[a]]))] + Pi*Log[Cos[b*x]]
 + 2*ArcTan[Tan[a]]*(I*b*x - Log[1 - E^((2*I)*(b*x + ArcTan[Tan[a]]))] + L
og[Sin[b*x + ArcTan[Tan[a]]]]) + I*PolyLog[2, E^((2*I)*(b*x + ArcTan[Tan[a
]]))] + b^2*E^(I*ArcTan[Tan[a]])*x^2*Cot[a]*Sqrt[Sec[a]^2] + Csc[a]*Csc[a
+ b*x]*Sin[b*x])/(2*b^2)
```

3.13.3 Rubi [A] (verified)

Time = 0.50 (sec) , antiderivative size = 107, normalized size of antiderivative = 1.18, number of steps used = 13, number of rules used = 12, $\frac{\text{number of rules}}{\text{integrand size}}$ = 1.200, Rules used = {3042, 25, 4203, 25, 3042, 25, 3954, 24, 4202, 2620, 2715, 2838}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int x\cot^3(a+bx)\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int -x\tan\left(a+bx+\frac{\pi}{2}\right)^3dx$$

$$\Big\downarrow \text{25}$$

$$-\int x\tan\left(\frac{1}{2}(2a+\pi)+bx\right)^3dx$$

$$\Big\downarrow \text{4203}$$

$$\frac{\int \cot^2(a+bx)dx}{2b}+\int -x\cot(a+bx)dx-\frac{x\cot^2(a+bx)}{2b}$$

$$\Big\downarrow \text{25}$$

$$\frac{\int \cot^2(a+bx)dx}{2b}-\int x\cot(a+bx)dx-\frac{x\cot^2(a+bx)}{2b}$$

$$\Big\downarrow \text{3042}$$

$$-\int -x\tan\left(a+bx+\frac{\pi}{2}\right)dx+\frac{\int \tan\left(a+bx+\frac{\pi}{2}\right)^2dx}{2b}-\frac{x\cot^2(a+bx)}{2b}$$

$$\Big\downarrow \text{25}$$

$$\frac{\int \tan\left(a+bx+\frac{\pi}{2}\right)^2dx}{2b}+\int x\tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx-\frac{x\cot^2(a+bx)}{2b}$$

$$\Big\downarrow \; 3954$$

$$\int x \tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx+\frac{-\int 1dx-\frac{\cot(a+bx)}{b}}{2b}-\frac{x\cot^2(a+bx)}{2b}$$

$$\Big\downarrow \; 24$$

$$\int x \tan\left(\frac{1}{2}(2a+\pi)+bx\right)dx-\frac{x\cot^2(a+bx)}{2b}+\frac{-\frac{\cot(a+bx)}{b}-x}{2b}$$

$$\Big\downarrow \; 4202$$

$$-2i\int \frac{e^{i(2a+2bx+\pi)}x}{1+e^{i(2a+2bx+\pi)}}dx-\frac{x\cot^2(a+bx)}{2b}+\frac{-\frac{\cot(a+bx)}{b}-x}{2b}+\frac{ix^2}{2}$$

$$\Big\downarrow \; 2620$$

$$-2i\left(\frac{i\int \log\left(1+e^{i(2a+2bx+\pi)}\right)dx}{2b}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{x\cot^2(a+bx)}{2b}+\frac{-\frac{\cot(a+bx)}{b}-x}{2b}+\frac{ix^2}{2}$$

$$\Big\downarrow \; 2715$$

$$-2i\left(\frac{\int e^{-i(2a+2bx+\pi)}\log\left(1+e^{i(2a+2bx+\pi)}\right)de^{i(2a+2bx+\pi)}}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{x\cot^2(a+bx)}{2b}+\frac{-\frac{\cot(a+bx)}{b}-x}{2b}+\frac{ix^2}{2}$$

$$\Big\downarrow \; 2838$$

$$-2i\left(-\frac{\text{PolyLog}\left(2,-e^{i(2a+2bx+\pi)}\right)}{4b^2}-\frac{ix\log\left(1+e^{i(2a+2bx+\pi)}\right)}{2b}\right)-\frac{x\cot^2(a+bx)}{2b}+\frac{-\frac{\cot(a+bx)}{b}-x}{2b}+\frac{ix^2}{2}$$

input
```
Int[x*Cot[a + b*x]^3,x]
```

output
```
(I/2)*x^2 - (x*Cot[a + b*x]^2)/(2*b) + (-x - Cot[a + b*x]/b)/(2*b) - (2*I)
*(((-1/2*I)*x*Log[1 + E^(I*(2*a + Pi + 2*b*x))])/b - PolyLog[2, -E^(I*(2*a
 + Pi + 2*b*x))]/(4*b^2))
```

3.13. $\int x\cot^3(a+bx)\,dx$

3.13.3.1 Defintions of rubi rules used

rule 24
```
Int[a_, x_Symbol] :> Simp[a*x, x] /; FreeQ[a, x]
```

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2715
```
Int[Log[(a_) + (b_.)*((F_)^((e_.)*((c_.) + (d_.)*(x_))))^(n_.)], x_Symbol]
:> Simp[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 2838
```
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 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 3954
```
Int[((b_.)*tan[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[b*((b*Tan[c + d
*x])^(n - 1)/(d*(n - 1))), x] - Simp[b^2   Int[(b*Tan[c + d*x])^(n - 2), x]
, x] /; FreeQ[{b, c, d}, x] && GtQ[n, 1]
```

rule 4202
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)], x_Symbol] :> Simp[I
*((c + d*x)^(m + 1)/(d*(m + 1))), x] - Simp[2*I   Int[(c + d*x)^m*(E^(2*I*(
e + f*x))/(1 + E^(2*I*(e + f*x)))), x], x] /; FreeQ[{c, d, e, f}, x] && IGt
Q[m, 0]
```

rule 4203
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((b_.)*tan[(e_.) + (f_.)*(x_)])^(n_), x_Symb
ol] :> Simp[b*(c + d*x)^m*((b*Tan[e + f*x])^(n - 1)/(f*(n - 1))), x] + (-Si
mp[b*d*(m/(f*(n - 1)))   Int[(c + d*x)^(m - 1)*(b*Tan[e + f*x])^(n - 1), x]
, x] - Simp[b^2   Int[(c + d*x)^m*(b*Tan[e + f*x])^(n - 2), x], x]) /; Free
Q[{b, c, d, e, f}, x] && GtQ[n, 1] && GtQ[m, 0]
```

3.13.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 196 vs. 2(75) = 150.

Time = 0.18 (sec) , antiderivative size = 197, normalized size of antiderivative = 2.16

method	result
risch	$\frac{i x^2}{2}+\frac{2 x\,\mathrm{e}^{2 i (b x+a)} b-i\,\mathrm{e}^{2 i (b x+a)}+i}{b^2\left(\mathrm{e}^{2 i (b x+a)}-1\right)^2}+\frac{2 i a x}{b}+\frac{i a^2}{b^2}-\frac{\ln\left(1+\mathrm{e}^{i (b x+a)}\right) x}{b}+\frac{i\,\mathrm{polylog}\left(2,-\mathrm{e}^{i (b x+a)}\right)}{b^2}-\frac{\ln\left(1-\mathrm{e}^{i (b x+a)}\right) x}{b}-\frac{\ln(1$

input
```
int(x*cot(b*x+a)^3,x,method=_RETURNVERBOSE)
```

output
```
1/2*I*x^2+(2*x*exp(2*I*(b*x+a))*b-I*exp(2*I*(b*x+a))+I)/b^2/(exp(2*I*(b*x+
a))-1)^2+2*I/b*a*x+I/b^2*a^2-1/b*ln(1+exp(I*(b*x+a)))*x+I/b^2*polylog(2,-e
xp(I*(b*x+a)))-1/b*ln(1-exp(I*(b*x+a)))*x-1/b^2*ln(1-exp(I*(b*x+a)))*a+I/b
^2*polylog(2,exp(I*(b*x+a)))-2/b^2*a*ln(exp(I*(b*x+a)))+1/b^2*a*ln(exp(I*(
b*x+a))-1)
```

3.13.5 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. 291 vs. 2(72) = 144.

Time = 0.27 (sec) , antiderivative size = 291, normalized size of antiderivative = 3.20

$$\int x\cot^3(a+bx)\,dx$$

$$= \frac{4\,bx+(i\,\cos(2\,bx+2\,a)-i)\mathrm{Li}_2(\cos(2\,bx+2\,a)+i\,\sin(2\,bx+2\,a))+(-i\,\cos(2\,bx+2\,a)+i)\mathrm{Li}_2(\cos(2}{}$$

input
```
integrate(x*cot(b*x+a)^3,x, algorithm="fricas")
```

output
```
1/4*(4*b*x + (I*cos(2*b*x + 2*a) - I)*dilog(cos(2*b*x + 2*a) + I*sin(2*b*x
 + 2*a)) + (-I*cos(2*b*x + 2*a) + I)*dilog(cos(2*b*x + 2*a) - I*sin(2*b*x
+ 2*a)) + 2*(a*cos(2*b*x + 2*a) - a)*log(-1/2*cos(2*b*x + 2*a) + 1/2*I*sin
(2*b*x + 2*a) + 1/2) + 2*(a*cos(2*b*x + 2*a) - a)*log(-1/2*cos(2*b*x + 2*a
) - 1/2*I*sin(2*b*x + 2*a) + 1/2) + 2*(b*x - (b*x + a)*cos(2*b*x + 2*a) +
a)*log(-cos(2*b*x + 2*a) + I*sin(2*b*x + 2*a) + 1) + 2*(b*x - (b*x + a)*co
s(2*b*x + 2*a) + a)*log(-cos(2*b*x + 2*a) - I*sin(2*b*x + 2*a) + 1) + 2*si
n(2*b*x + 2*a))/(b^2*cos(2*b*x + 2*a) - b^2)
```

3.13.6 Sympy [F]

$$\int x \cot^3(a+bx)\,dx = \int x \cot^3{(a+bx)}\,dx$$

input
```
integrate(x*cot(b*x+a)**3,x)
```

output
```
Integral(x*cot(a + b*x)**3, x)
```

3.13.7 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. 586 vs. 2(72) = 144.

Time = 0.39 (sec) , antiderivative size = 586, normalized size of antiderivative = 6.44

$$\int x \cot^3(a+bx)\,dx$$
$$= \frac{b^2x^2\cos(4\,bx+4\,a)+i\,b^2x^2\sin(4\,bx+4\,a)+b^2x^2-2\,(bx\cos(4\,bx+4\,a)-2\,bx\cos(2\,bx+2\,a)+i\,bx\sin}{}$$

input
```
integrate(x*cot(b*x+a)^3,x, algorithm="maxima")
```

output
```
(b^2*x^2*cos(4*b*x + 4*a) + I*b^2*x^2*sin(4*b*x + 4*a) + b^2*x^2 - 2*(b*x*
cos(4*b*x + 4*a) - 2*b*x*cos(2*b*x + 2*a) + I*b*x*sin(4*b*x + 4*a) - 2*I*b
*x*sin(2*b*x + 2*a) + b*x)*arctan2(sin(b*x + a), cos(b*x + a) + 1) + 2*(b*
x*cos(4*b*x + 4*a) - 2*b*x*cos(2*b*x + 2*a) + I*b*x*sin(4*b*x + 4*a) - 2*I
*b*x*sin(2*b*x + 2*a) + b*x)*arctan2(sin(b*x + a), -cos(b*x + a) + 1) - 2*
(b^2*x^2 + 2*I*b*x + 1)*cos(2*b*x + 2*a) + 2*(cos(4*b*x + 4*a) - 2*cos(2*b
*x + 2*a) + I*sin(4*b*x + 4*a) - 2*I*sin(2*b*x + 2*a) + 1)*dilog(-e^(I*b*x
 + I*a)) + 2*(cos(4*b*x + 4*a) - 2*cos(2*b*x + 2*a) + I*sin(4*b*x + 4*a) -
 2*I*sin(2*b*x + 2*a) + 1)*dilog(e^(I*b*x + I*a)) - (-I*b*x*cos(4*b*x + 4*
a) + 2*I*b*x*cos(2*b*x + 2*a) + b*x*sin(4*b*x + 4*a) - 2*b*x*sin(2*b*x + 2
*a) - I*b*x)*log(cos(b*x + a)^2 + sin(b*x + a)^2 + 2*cos(b*x + a) + 1) - (
-I*b*x*cos(4*b*x + 4*a) + 2*I*b*x*cos(2*b*x + 2*a) + b*x*sin(4*b*x + 4*a)
- 2*b*x*sin(2*b*x + 2*a) - I*b*x)*log(cos(b*x + a)^2 + sin(b*x + a)^2 - 2*
cos(b*x + a) + 1) + 2*(-I*b^2*x^2 + 2*b*x - I)*sin(2*b*x + 2*a) + 2)/(-2*I
*b^2*cos(4*b*x + 4*a) + 4*I*b^2*cos(2*b*x + 2*a) + 2*b^2*sin(4*b*x + 4*a)
- 4*b^2*sin(2*b*x + 2*a) - 2*I*b^2)
```

3.13.8 Giac [F]

$$\int x\cot^3(a+bx)\,dx=\int x\cot\left(bx+a\right)^3\,dx$$

input
```
integrate(x*cot(b*x+a)^3,x, algorithm="giac")
```

output
```
integrate(x*cot(b*x + a)^3, x)
```

3.13.9 Mupad [F(-1)]

Timed out.

$$\int x\cot^3(a+bx)\,dx=\int x\cot(a+b\,x)^3\,dx$$

input
```
int(x*cot(a + b*x)^3,x)
```

output
```
int(x*cot(a + b*x)^3, x)
```

3.14 $\int \frac{\cot^3(a+bx)}{x} dx$

3.14.1 Optimal result

Integrand size = 12, antiderivative size = 12

$$\int \frac{\cot^3(a+bx)}{x} dx = \text{Int}\left(\frac{\cot^3(a+bx)}{x}, x\right)$$

output
```
Unintegrable(cot(b*x+a)^3/x,x)
```

3.14.2 Mathematica [N/A]

Not integrable

Time = 9.49 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^3(a+bx)}{x} dx = \int \frac{\cot^3(a+bx)}{x} dx$$

input
```
Integrate[Cot[a + b*x]^3/x,x]
```

output
```
Integrate[Cot[a + b*x]^3/x, x]
```

3.14.3 Rubi [N/A]

Not integrable

Time = 0.20 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.000, Rules used = {3042, 25, 4222}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{\cot^3(a+bx)}{x} \, dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int -\frac{\tan\left(a+bx+\frac{\pi}{2}\right)^3}{x}dx$$

$$\Big\downarrow \text{ 25}$$

$$-\int \frac{\tan\left(\frac{1}{2}(2a+\pi)+bx\right)^3}{x}dx$$

$$\Big\downarrow \text{ 4222}$$

$$-\int \frac{\tan^3\left(\frac{1}{2}(2a+\pi)+bx\right)}{x}dx$$

input
```
Int[Cot[a + b*x]^3/x,x]
```

output
```
$Aborted
```

3.14.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4222
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] :>
Simp[If[MatchQ[f, (f1_.)*(Complex[0, j_])], If[MatchQ[e, (e1_.) + Pi/2], I^
n*Unintegrable[(c + d*x)^m*Coth[(-I)*(e - Pi/2) - I*f*x]^n, x], I^n*Uninteg
rable[(c + d*x)^m*Tanh[(-I)*e - I*f*x]^n, x]], If[MatchQ[e, (e1_.) + Pi/2],
 (-1)^n*Unintegrable[(c + d*x)^m*Cot[e - Pi/2 + f*x]^n, x], Unintegrable[(c
 + d*x)^m*Tan[e + f*x]^n, x]]], x] /; FreeQ[{c, d, e, f, m, n}, x] && Integ
erQ[n]
```

3.14.4 Maple [N/A] (verified)

Not integrable

Time = 0.20 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \frac{\cot\left(bx+a\right)^{3}}{x}dx$$

input
```
int(cot(b*x+a)^3/x,x)
```

output
```
int(cot(b*x+a)^3/x,x)
```

3.14.5 Fricas [N/A]

Not integrable

Time = 0.26 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^3(a+bx)}{x}\,dx=\int \frac{\cot\left(bx+a\right)^{3}}{x}\,dx$$

input
```
integrate(cot(b*x+a)^3/x,x, algorithm="fricas")
```

output
```
integral(cot(b*x + a)^3/x, x)
```

3.14.6 Sympy [N/A]

Not integrable

Time = 0.36 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.83

$$\int \frac{\cot^3(a+bx)}{x}\,dx = \int \frac{\cot^3{(a+bx)}}{x}\,dx$$

input
```
integrate(cot(b*x+a)**3/x,x)
```

output
```
Integral(cot(a + b*x)**3/x, x)
```

3.14.7 Maxima [N/A]

Not integrable

Time = 0.76 (sec) , antiderivative size = 763, normalized size of antiderivative = 63.58

$$\int \frac{\cot^3(a+bx)}{x}\,dx = \int \frac{\cot{(bx+a)}^3}{x}\,dx$$

input
```
integrate(cot(b*x+a)^3/x,x, algorithm="maxima")
```

output
```
-(4*b*x*cos(2*b*x + 2*a)^2 + 4*b*x*sin(2*b*x + 2*a)^2 - 2*b*x*cos(2*b*x +
2*a) - (2*b*x*cos(2*b*x + 2*a) - sin(2*b*x + 2*a))*cos(4*b*x + 4*a) - (b^2
*x^2*cos(4*b*x + 4*a)^2 + 4*b^2*x^2*cos(2*b*x + 2*a)^2 + b^2*x^2*sin(4*b*x
 + 4*a)^2 - 4*b^2*x^2*sin(4*b*x + 4*a)*sin(2*b*x + 2*a) + 4*b^2*x^2*sin(2*
b*x + 2*a)^2 - 4*b^2*x^2*cos(2*b*x + 2*a) + b^2*x^2 - 2*(2*b^2*x^2*cos(2*b
*x + 2*a) - b^2*x^2)*cos(4*b*x + 4*a))*integrate((b^2*x^2 - 1)*sin(b*x + a
)/(b^2*x^3*cos(b*x + a)^2 + b^2*x^3*sin(b*x + a)^2 + 2*b^2*x^3*cos(b*x + a
) + b^2*x^3), x) + (b^2*x^2*cos(4*b*x + 4*a)^2 + 4*b^2*x^2*cos(2*b*x + 2*a
)^2 + b^2*x^2*sin(4*b*x + 4*a)^2 - 4*b^2*x^2*sin(4*b*x + 4*a)*sin(2*b*x +
2*a) + 4*b^2*x^2*sin(2*b*x + 2*a)^2 - 4*b^2*x^2*cos(2*b*x + 2*a) + b^2*x^2
 - 2*(2*b^2*x^2*cos(2*b*x + 2*a) - b^2*x^2)*cos(4*b*x + 4*a))*integrate((b
^2*x^2 - 1)*sin(b*x + a)/(b^2*x^3*cos(b*x + a)^2 + b^2*x^3*sin(b*x + a)^2
- 2*b^2*x^3*cos(b*x + a) + b^2*x^3), x) - (2*b*x*sin(2*b*x + 2*a) + cos(2*
b*x + 2*a) - 1)*sin(4*b*x + 4*a) - sin(2*b*x + 2*a))/(b^2*x^2*cos(4*b*x +
4*a)^2 + 4*b^2*x^2*cos(2*b*x + 2*a)^2 + b^2*x^2*sin(4*b*x + 4*a)^2 - 4*b^2
*x^2*sin(4*b*x + 4*a)*sin(2*b*x + 2*a) + 4*b^2*x^2*sin(2*b*x + 2*a)^2 - 4*
b^2*x^2*cos(2*b*x + 2*a) + b^2*x^2 - 2*(2*b^2*x^2*cos(2*b*x + 2*a) - b^2*x
^2)*cos(4*b*x + 4*a))
```

3.14.8 Giac [N/A]

Not integrable

Time = 0.32 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^3(a+bx)}{x}\,dx = \int \frac{\cot\left(bx+a\right)^3}{x}\,dx$$

input
```
integrate(cot(b*x+a)^3/x,x, algorithm="giac")
```

output
```
integrate(cot(b*x + a)^3/x, x)
```

3.14.9 Mupad [N/A]

Not integrable

Time = 12.34 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^3(a+bx)}{x}\,dx = \int \frac{\cot(a+b\,x)^3}{x}\,dx$$

input
```
int(cot(a + b*x)^3/x,x)
```

output
```
int(cot(a + b*x)^3/x, x)
```

3.15 $\int \frac{\cot^3(a+bx)}{x^2} dx$

3.15.1 Optimal result

Integrand size = 12, antiderivative size = 12

$$\int \frac{\cot^3(a+bx)}{x^2} dx = \text{Int}\left(\frac{\cot^3(a+bx)}{x^2}, x\right)$$

output
```
Unintegrable(cot(b*x+a)^3/x^2,x)
```

3.15.2 Mathematica [N/A]

Not integrable

Time = 6.45 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^3(a+bx)}{x^2} dx = \int \frac{\cot^3(a+bx)}{x^2} dx$$

input
```
Integrate[Cot[a + b*x]^3/x^2,x]
```

output
```
Integrate[Cot[a + b*x]^3/x^2, x]
```

3.15.3 Rubi [N/A]

Not integrable

Time = 0.20 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.000, Rules used = {3042, 25, 4222}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{\cot^3(a+bx)}{x^2} \, dx$$

$$\Big\downarrow \text{3042}$$

$$\int -\frac{\tan\left(a+bx+\frac{\pi}{2}\right)^3}{x^2}dx$$

$$\Big\downarrow \text{25}$$

$$-\int \frac{\tan\left(\frac{1}{2}(2a+\pi)+bx\right)^3}{x^2}dx$$

$$\Big\downarrow \text{4222}$$

$$-\int \frac{\tan^3\left(\frac{1}{2}(2a+\pi)+bx\right)}{x^2}dx$$

input
```
Int[Cot[a + b*x]^3/x^2,x]
```

output
```
$Aborted
```

3.15.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4222
```
Int[((c_.) + (d_.)*(x_))^(m_.)*tan[(e_.) + (f_.)*(x_)]^(n_.), x_Symbol] :>
Simp[If[MatchQ[f, (f1_.)*(Complex[0, j_])], If[MatchQ[e, (e1_.) + Pi/2], I^
n*Unintegrable[(c + d*x)^m*Coth[(-I)*(e - Pi/2) - I*f*x]^n, x], I^n*Uninteg
rable[(c + d*x)^m*Tanh[(-I)*e - I*f*x]^n, x]], If[MatchQ[e, (e1_.) + Pi/2],
 (-1)^n*Unintegrable[(c + d*x)^m*Cot[e - Pi/2 + f*x]^n, x], Unintegrable[(c
 + d*x)^m*Tan[e + f*x]^n, x]]], x] /; FreeQ[{c, d, e, f, m, n}, x] && Integ
erQ[n]
```

3.15.4 Maple [N/A] (verified)

Not integrable

Time = 0.14 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \frac{\cot(bx+a)^3}{x^2}dx$$

input
```
int(cot(b*x+a)^3/x^2,x)
```

output
```
int(cot(b*x+a)^3/x^2,x)
```

3.15.5 Fricas [N/A]

Not integrable

Time = 0.25 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^3(a+bx)}{x^2}\,dx = \int \frac{\cot(bx+a)^3}{x^2}\,dx$$

input
```
integrate(cot(b*x+a)^3/x^2,x, algorithm="fricas")
```

output
```
integral(cot(b*x + a)^3/x^2, x)
```

3.15.6 Sympy [N/A]

Not integrable

Time = 0.32 (sec) , antiderivative size = 12, normalized size of antiderivative = 1.00

$$\int \frac{\cot^3(a+bx)}{x^2}\,dx = \int \frac{\cot^3{(a+bx)}}{x^2}\,dx$$

input
```
integrate(cot(b*x+a)**3/x**2,x)
```

output
```
Integral(cot(a + b*x)**3/x**2, x)
```

3.15.7 Maxima [N/A]

Not integrable

Time = 0.87 (sec) , antiderivative size = 761, normalized size of antiderivative = 63.42

$$\int \frac{\cot^3(a+bx)}{x^2}\,dx = \int \frac{\cot{(bx+a)}^3}{x^2}\,dx$$

input
```
integrate(cot(b*x+a)^3/x^2,x, algorithm="maxima")
```

output
```
-(4*b*x*cos(2*b*x + 2*a)^2 + 4*b*x*sin(2*b*x + 2*a)^2 - 2*b*x*cos(2*b*x +
2*a) - 2*(b*x*cos(2*b*x + 2*a) - sin(2*b*x + 2*a))*cos(4*b*x + 4*a) - (b^2
*x^3*cos(4*b*x + 4*a)^2 + 4*b^2*x^3*cos(2*b*x + 2*a)^2 + b^2*x^3*sin(4*b*x
 + 4*a)^2 - 4*b^2*x^3*sin(4*b*x + 4*a)*sin(2*b*x + 2*a) + 4*b^2*x^3*sin(2*
b*x + 2*a)^2 - 4*b^2*x^3*cos(2*b*x + 2*a) + b^2*x^3 - 2*(2*b^2*x^3*cos(2*b
*x + 2*a) - b^2*x^3)*cos(4*b*x + 4*a))*integrate((b^2*x^2 - 3)*sin(b*x + a
)/(b^2*x^4*cos(b*x + a)^2 + b^2*x^4*sin(b*x + a)^2 + 2*b^2*x^4*cos(b*x + a
) + b^2*x^4), x) + (b^2*x^3*cos(4*b*x + 4*a)^2 + 4*b^2*x^3*cos(2*b*x + 2*a
)^2 + b^2*x^3*sin(4*b*x + 4*a)^2 - 4*b^2*x^3*sin(4*b*x + 4*a)*sin(2*b*x +
2*a) + 4*b^2*x^3*sin(2*b*x + 2*a)^2 - 4*b^2*x^3*cos(2*b*x + 2*a) + b^2*x^3
 - 2*(2*b^2*x^3*cos(2*b*x + 2*a) - b^2*x^3)*cos(4*b*x + 4*a))*integrate((b
^2*x^2 - 3)*sin(b*x + a)/(b^2*x^4*cos(b*x + a)^2 + b^2*x^4*sin(b*x + a)^2
- 2*b^2*x^4*cos(b*x + a) + b^2*x^4), x) - 2*(b*x*sin(2*b*x + 2*a) + cos(2*
b*x + 2*a) - 1)*sin(4*b*x + 4*a) - 2*sin(2*b*x + 2*a))/(b^2*x^3*cos(4*b*x
+ 4*a)^2 + 4*b^2*x^3*cos(2*b*x + 2*a)^2 + b^2*x^3*sin(4*b*x + 4*a)^2 - 4*b
^2*x^3*sin(4*b*x + 4*a)*sin(2*b*x + 2*a) + 4*b^2*x^3*sin(2*b*x + 2*a)^2 -
4*b^2*x^3*cos(2*b*x + 2*a) + b^2*x^3 - 2*(2*b^2*x^3*cos(2*b*x + 2*a) - b^2
*x^3)*cos(4*b*x + 4*a))
```

3.15.8 Giac [N/A]

Not integrable

Time = 0.32 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^3(a+bx)}{x^2}\,dx = \int \frac{\cot\left(bx+a\right)^3}{x^2}\,dx$$

input
```
integrate(cot(b*x+a)^3/x^2,x, algorithm="giac")
```

output
```
integrate(cot(b*x + a)^3/x^2, x)
```

3.15.9 Mupad [N/A]

Not integrable

Time = 12.31 (sec) , antiderivative size = 14, normalized size of antiderivative = 1.17

$$\int \frac{\cot^3(a+bx)}{x^2}\,dx = \int \frac{\cot(a+b\,x)^3}{x^2}\,dx$$

input
```
int(cot(a + b*x)^3/x^2,x)
```

output
```
int(cot(a + b*x)^3/x^2, x)
```

3.16 $\int \frac{(c+dx)^3}{a+ia\cot(e+fx)}\,dx$

3.16.1 Optimal result

Integrand size = 23, antiderivative size = 189

$$\int \frac{(c+dx)^3}{a+ia\cot(e+fx)}\,dx=-\frac{3id^3x}{8af^3}-\frac{3d(c+dx)^2}{8af^2}+\frac{i(c+dx)^3}{4af}+\frac{(c+dx)^4}{8ad}-\frac{3d^3}{8f^4(a+ia\cot(e+fx))}+\frac{3id^2(c+dx)}{4f^3(a+ia\cot(e+fx))}+\frac{3d(c+dx)^2}{4f^2(a+ia\cot(e+fx))}-\frac{i(c+dx)^3}{2f(a+ia\cot(e+fx))}$$

output
```
-3/8*I*d^3*x/a/f^3-3/8*d*(d*x+c)^2/a/f^2+1/4*I*(d*x+c)^3/a/f+1/8*(d*x+c)^4
/a/d-3/8*d^3/f^4/(a+I*a*cot(f*x+e))+3/4*I*d^2*(d*x+c)/f^3/(a+I*a*cot(f*x+e
))+3/4*d*(d*x+c)^2/f^2/(a+I*a*cot(f*x+e))-1/2*I*(d*x+c)^3/f/(a+I*a*cot(f*x
+e))
```

3.16.2 Mathematica [A] (verified)

Time = 0.89 (sec) , antiderivative size = 246, normalized size of antiderivative = 1.30

$$\int \frac{(c+dx)^3}{a+ia\cot(e+fx)}\,dx$$
$$=\frac{2f^4x(4c^3+6c^2dx+4cd^2x^2+d^3x^3)+i(4c^3f^3+6c^2df^2(i+2fx)+6cd^2f(-1+2ifx+2f^2x^2)+d^3(-3i}{}$$

input
```
Integrate[(c + d*x)^3/(a + I*a*Cot[e + f*x]),x]
```

output
```
(2*f^4*x*(4*c^3 + 6*c^2*d*x + 4*c*d^2*x^2 + d^3*x^3) + I*(4*c^3*f^3 + 6*c^
2*d*f^2*(I + 2*f*x) + 6*c*d^2*f*(-1 + (2*I)*f*x + 2*f^2*x^2) + d^3*(-3*I -
 6*f*x + (6*I)*f^2*x^2 + 4*f^3*x^3))*Cos[2*f*x]*(Cos[2*e] + I*Sin[2*e]) -
(4*c^3*f^3 + 6*c^2*d*f^2*(I + 2*f*x) + 6*c*d^2*f*(-1 + (2*I)*f*x + 2*f^2*x
^2) + d^3*(-3*I - 6*f*x + (6*I)*f^2*x^2 + 4*f^3*x^3))*(Cos[2*e] + I*Sin[2*
e])*Sin[2*f*x])/(16*a*f^4)
```

3.16.3 Rubi [A] (verified)

Time = 0.67 (sec) , antiderivative size = 206, normalized size of antiderivative = 1.09, number of steps used = 9, number of rules used = 9, $\frac{\text{number of rules}}{\text{integrand size}} = 0.391$, Rules used = {3042, 4206, 3042, 4206, 3042, 4206, 3042, 3960, 24}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^3}{a+ia\cot(e+fx)}dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{(c+dx)^3}{a-ia\tan\left(e+fx+\frac{\pi}{2}\right)}dx$$

$$\Big\downarrow \text{4206}$$

$$\frac{3id\int \frac{(c+dx)^2}{i\cot(e+fx)a+a}dx}{2f}-\frac{i(c+dx)^3}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^4}{8ad}$$

$$\Big\downarrow \text{3042}$$

$$\frac{3id\int \frac{(c+dx)^2}{a-ia\tan\left(e+fx+\frac{\pi}{2}\right)}dx}{2f}-\frac{i(c+dx)^3}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^4}{8ad}$$

$$\Big\downarrow \text{4206}$$

$$\frac{3id\left(\frac{id\int \frac{c+dx}{i\cot(e+fx)a+a}dx}{f}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^3}{6ad}\right)}{2f}-\frac{i(c+dx)^3}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^4}{8ad}$$

$$\Big\downarrow \text{3042}$$

$$\frac{3id\left(\frac{id\int \frac{c+dx}{a-ia\tan\left(e+fx+\frac{\pi}{2}\right)}dx}{f}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^3}{6ad}\right)}{2f}-\frac{i(c+dx)^3}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^4}{8ad}$$

$$\Big\downarrow \text{4206}$$

$$\frac{3id\left(\frac{id\left(\frac{id\int \frac{1}{i\cot(e+fx)a+a}dx}{2f}-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}\right)}{f}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^3}{6ad}\right)}{2f}-\frac{i(c+dx)^3}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^4}{8ad}$$

$$\Big\downarrow \text{3042}$$

$$\frac{3id\left(\frac{id\left(\frac{id\int \frac{1}{a-ia\tan\left(e+fx+\frac{\pi}{2}\right)}dx}{2f}-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}\right)}{f}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^3}{6ad}\right)}{2f}-\frac{i(c+dx)^3}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^4}{8ad}$$

$$\Big\downarrow \text{3960}$$

$$\frac{3id\left(\frac{id\left(\frac{id\left(\frac{\int 1dx}{2a}-\frac{i}{2f(a+ia\cot(e+fx))}\right)}{2f}-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}\right)}{f}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^3}{6ad}\right)}{2f}-\frac{i(c+dx)^3}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^4}{8ad}$$

$$\Big\downarrow \text{24}$$

$$-\frac{i(c+dx)^3}{2f(a+ia\cot(e+fx))}+\frac{3id\left(-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{id\left(-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}+\frac{id\left(\frac{x}{2a}-\frac{i}{2f(a+ia\cot(e+fx))}\right)}{2f}\right)}{f}+\frac{(c+dx)^3}{6ad}\right)}{2f}+\frac{(c+dx)^4}{8ad}$$

3.16. $\int \frac{(c+dx)^3}{a+ia\cot(e+fx)}\,dx$

input
```
Int[(c + d*x)^3/(a + I*a*Cot[e + f*x]),x]
```

output
```
(c + d*x)^4/(8*a*d) - ((I/2)*(c + d*x)^3)/(f*(a + I*a*Cot[e + f*x])) + (((
3*I)/2)*d*((c + d*x)^3/(6*a*d) - ((I/2)*(c + d*x)^2)/(f*(a + I*a*Cot[e + f
*x])) + (I*d*((c + d*x)^2/(4*a*d) - ((I/2)*(c + d*x))/(f*(a + I*a*Cot[e +
f*x])) + ((I/2)*d*(x/(2*a) - (I/2)/(f*(a + I*a*Cot[e + f*x]))))/f))/f))/f
```

3.16.3.1 Defintions of rubi rules used

rule 24
```
Int[a_, x_Symbol] :> Simp[a*x, x] /; FreeQ[a, x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 3960
```
Int[((a_) + (b_.)*tan[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[a*((a +
b*Tan[c + d*x])^n/(2*b*d*n)), x] + Simp[1/(2*a)   Int[(a + b*Tan[c + d*x])^
(n + 1), x], x] /; FreeQ[{a, b, c, d}, x] && EqQ[a^2 + b^2, 0] && LtQ[n, 0]
```

rule 4206
```
Int[((c_.) + (d_.)*(x_))^(m_.)/((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)]), x_Sy
mbol] :> Simp[(c + d*x)^(m + 1)/(2*a*d*(m + 1)), x] + (Simp[a*d*(m/(2*b*f))
   Int[(c + d*x)^(m - 1)/(a + b*Tan[e + f*x]), x], x] - Simp[a*((c + d*x)^m
/(2*b*f*(a + b*Tan[e + f*x]))), x]) /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[
a^2 + b^2, 0] && GtQ[m, 0]
```

3.16.4 Maple [A] (verified)

Time = 0.56 (sec) , antiderivative size = 170, normalized size of antiderivative = 0.90

method	result
risch	$\frac{d^3x^4}{8a}+\frac{d^2c\,x^3}{2a}+\frac{3d\,c^2x^2}{4a}+\frac{c^3x}{2a}+\frac{c^4}{8ad}+\frac{i(4d^3x^3f^3+12c\,d^2f^3x^2+6id^3f^2x^2+12c^2d\,f^3x+12ic\,d^2f^2x+4c^3f^3+6}{16a\,f^4}$
parallelrisch	$\frac{-6f\left(\left(-\frac{1}{6}d^3x^3-\frac{2}{3}c\,d^2x^2-c^2dx-\frac{2}{3}c^3\right)f^3+id\left(\frac{1}{3}d^2x^2+cdx+c^2\right)f^2+\left(-\frac{1}{2}d^3x-c\,d^2\right)f-\frac{id^3}{2}\right)x\tan(fx+e)+4i\left(\frac{dx}{2}+c\right)\left(\frac{1}{2}d\right.}{8f^4a(i+\tan(fx+}$
derivativedivides	Expression too large to display
default	Expression too large to display

input
```
int((d*x+c)^3/(a+I*a*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
1/8/a*d^3*x^4+1/2/a*d^2*c*x^3+3/4/a*d*c^2*x^2+1/2/a*c^3*x+1/8/a/d*c^4+1/16
*I*(4*d^3*x^3*f^3+6*I*d^3*f^2*x^2+12*c*d^2*f^3*x^2+12*I*c*d^2*f^2*x+12*c^2
*d*f^3*x+6*I*c^2*d*f^2+4*c^3*f^3-6*d^3*f*x-3*I*d^3-6*c*d^2*f)/a/f^4*exp(2*
I*(f*x+e))
```

3.16.5 Fricas [A] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 154, normalized size of antiderivative = 0.81

$$\int \frac{(c+dx)^3}{a+ia\cot(e+fx)}\,dx$$
$$= \frac{2\,d^3f^4x^4+8\,cd^2f^4x^3+12\,c^2df^4x^2+8\,c^3f^4x+(4i\,d^3f^3x^3+4i\,c^3f^3-6\,c^2df^2-6i\,cd^2f+3\,d^3-6\,(-2i\,cd}{16\,af^4}$$

input
```
integrate((d*x+c)^3/(a+I*a*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/16*(2*d^3*f^4*x^4 + 8*c*d^2*f^4*x^3 + 12*c^2*d*f^4*x^2 + 8*c^3*f^4*x + (
4*I*d^3*f^3*x^3 + 4*I*c^3*f^3 - 6*c^2*d*f^2 - 6*I*c*d^2*f + 3*d^3 - 6*(-2*
I*c*d^2*f^3 + d^3*f^2)*x^2 - 6*(-2*I*c^2*d*f^3 + 2*c*d^2*f^2 + I*d^3*f)*x)
*e^(2*I*f*x + 2*I*e))/(a*f^4)
```

3.16.6 Sympy [A] (verification not implemented)

Time = 0.19 (sec) , antiderivative size = 314, normalized size of antiderivative = 1.66

$$\int \frac{(c+dx)^3}{a+ia\cot(e+fx)}\,dx$$
$$= \begin{cases} \frac{(4ic^3f^3e^{2ie}+12ic^2df^3xe^{2ie}-6c^2df^2e^{2ie}+12icd^2f^3x^2e^{2ie}-12cd^2f^2xe^{2ie}-6icd^2fe^{2ie}+4id^3f^3x^3e^{2ie}-6d^3f^2x^2e^{2ie}-6id^3fxe^{2ie}+3d^3e^{2ie})e^{2if}}{16af^4} \\ -\frac{c^3xe^{2ie}}{2a}-\frac{3c^2dx^2e^{2ie}}{4a}-\frac{cd^2x^3e^{2ie}}{2a}-\frac{d^3x^4e^{2ie}}{8a} \end{cases}$$
$$+\frac{c^3x}{2a}+\frac{3c^2dx^2}{4a}+\frac{cd^2x^3}{2a}+\frac{d^3x^4}{8a}$$

input
```
integrate((d*x+c)**3/(a+I*a*cot(f*x+e)),x)
```

output
```
Piecewise(((4*I*c**3*f**3*exp(2*I*e) + 12*I*c**2*d*f**3*x*exp(2*I*e) - 6*c
**2*d*f**2*exp(2*I*e) + 12*I*c*d**2*f**3*x**2*exp(2*I*e) - 12*c*d**2*f**2*
x*exp(2*I*e) - 6*I*c*d**2*f*exp(2*I*e) + 4*I*d**3*f**3*x**3*exp(2*I*e) - 6
*d**3*f**2*x**2*exp(2*I*e) - 6*I*d**3*f*x*exp(2*I*e) + 3*d**3*exp(2*I*e))*
exp(2*I*f*x)/(16*a*f**4), Ne(a*f**4, 0)), (-c**3*x*exp(2*I*e)/(2*a) - 3*c*
*2*d*x**2*exp(2*I*e)/(4*a) - c*d**2*x**3*exp(2*I*e)/(2*a) - d**3*x**4*exp(
2*I*e)/(8*a), True)) + c**3*x/(2*a) + 3*c**2*d*x**2/(4*a) + c*d**2*x**3/(2
*a) + d**3*x**4/(8*a)
```

3.16.7 Maxima [F(-2)]

Exception generated.

$$\int \frac{(c+dx)^3}{a+ia\cot(e+fx)}\,dx = \text{Exception raised: RuntimeError}$$

input
```
integrate((d*x+c)^3/(a+I*a*cot(f*x+e)),x, algorithm="maxima")
```

output
```
Exception raised: RuntimeError >> ECL says: expt: undefined: 0 to a negati
ve exponent.
```

3.16.8 Giac [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 233, normalized size of antiderivative = 1.23

$$\int \frac{(c+dx)^3}{a+ia\cot(e+fx)}\,dx$$
$$= \frac{2\,d^3f^4x^4 + 8\,cd^2f^4x^3 + 4i\,d^3f^3x^3e^{(2i\,fx+2i\,e)} + 12\,c^2df^4x^2 + 12i\,cd^2f^3x^2e^{(2i\,fx+2i\,e)} + 8\,c^3f^4x + 12i\,c^2df^3xe^{\cdots}}{\cdots}$$

input
```
integrate((d*x+c)^3/(a+I*a*cot(f*x+e)),x, algorithm="giac")
```

output
```
1/16*(2*d^3*f^4*x^4 + 8*c*d^2*f^4*x^3 + 4*I*d^3*f^3*x^3*e^(2*I*f*x + 2*I*e
) + 12*c^2*d*f^4*x^2 + 12*I*c*d^2*f^3*x^2*e^(2*I*f*x + 2*I*e) + 8*c^3*f^4*
x + 12*I*c^2*d*f^3*x*e^(2*I*f*x + 2*I*e) - 6*d^3*f^2*x^2*e^(2*I*f*x + 2*I*
e) + 4*I*c^3*f^3*e^(2*I*f*x + 2*I*e) - 12*c*d^2*f^2*x*e^(2*I*f*x + 2*I*e)
- 6*c^2*d*f^2*e^(2*I*f*x + 2*I*e) - 6*I*d^3*f*x*e^(2*I*f*x + 2*I*e) - 6*I*
c*d^2*f*e^(2*I*f*x + 2*I*e) + 3*d^3*e^(2*I*f*x + 2*I*e))/(a*f^4)
```

3.16.9 Mupad [B] (verification not implemented)

Time = 13.53 (sec) , antiderivative size = 423, normalized size of antiderivative = 2.24

$$\int \frac{(c+dx)^3}{a+ia\cot(e+fx)}\,dx$$
$$= \frac{3\,d^3\,\cos\left(2\,e+2\,f\,x\right)+8\,c^3\,f^4\,x-4\,c^3\,f^3\,\sin\left(2\,e+2\,f\,x\right)+2\,d^3\,f^4\,x^4-6\,c^2\,d\,f^2\,\cos\left(2\,e+2\,f\,x\right)+12\,c^2\,d}{}$$

input
```
int((c + d*x)^3/(a + a*cot(e + f*x)*1i),x)
```

output
```
(3*d^3*cos(2*e + 2*f*x) + d^3*sin(2*e + 2*f*x)*3i + 8*c^3*f^4*x + c^3*f^3*
cos(2*e + 2*f*x)*4i - 4*c^3*f^3*sin(2*e + 2*f*x) + 2*d^3*f^4*x^4 - 6*c^2*d
*f^2*cos(2*e + 2*f*x) - c^2*d*f^2*sin(2*e + 2*f*x)*6i + 12*c^2*d*f^4*x^2 +
 8*c*d^2*f^4*x^3 - 6*d^3*f^2*x^2*cos(2*e + 2*f*x) + d^3*f^3*x^3*cos(2*e +
2*f*x)*4i - d^3*f^2*x^2*sin(2*e + 2*f*x)*6i - 4*d^3*f^3*x^3*sin(2*e + 2*f*
x) - c*d^2*f*cos(2*e + 2*f*x)*6i + 6*c*d^2*f*sin(2*e + 2*f*x) - d^3*f*x*co
s(2*e + 2*f*x)*6i + 6*d^3*f*x*sin(2*e + 2*f*x) - 12*c*d^2*f^2*x*cos(2*e +
2*f*x) + c^2*d*f^3*x*cos(2*e + 2*f*x)*12i - c*d^2*f^2*x*sin(2*e + 2*f*x)*1
2i - 12*c^2*d*f^3*x*sin(2*e + 2*f*x) + c*d^2*f^3*x^2*cos(2*e + 2*f*x)*12i
- 12*c*d^2*f^3*x^2*sin(2*e + 2*f*x))/(16*a*f^4)
```

3.17 $\int \frac{(c+dx)^2}{a+ia\cot(e+fx)}\,dx$

3.17.1 Optimal result

Integrand size = 23, antiderivative size = 137

$$\int \frac{(c+dx)^2}{a+ia\cot(e+fx)}\,dx = -\frac{d^2x}{4af^2}+\frac{i(c+dx)^2}{4af}+\frac{(c+dx)^3}{6ad}+\frac{id^2}{4f^3(a+ia\cot(e+fx))} + \frac{d(c+dx)}{2f^2(a+ia\cot(e+fx))}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}$$

output
```
-1/4*d^2*x/a/f^2+1/4*I*(d*x+c)^2/a/f+1/6*(d*x+c)^3/a/d+1/4*I*d^2/f^3/(a+I*
a*cot(f*x+e))+1/2*d*(d*x+c)/f^2/(a+I*a*cot(f*x+e))-1/2*I*(d*x+c)^2/f/(a+I*
a*cot(f*x+e))
```

3.17.2 Mathematica [A] (verified)

Time = 0.50 (sec) , antiderivative size = 149, normalized size of antiderivative = 1.09

$$\int \frac{(c+dx)^2}{a+ia\cot(e+fx)}\,dx = \frac{4f^3x(3c^2+3cdx+d^2x^2)+3((1+i)cf+d(-1+(1+i)fx))((1+i)cf+d(i+(1+i)fx))\cos(2fx)(\cos$$

input
```
Integrate[(c + d*x)^2/(a + I*a*Cot[e + f*x]),x]
```

output
```
(4*f^3*x*(3*c^2 + 3*c*d*x + d^2*x^2) + 3*((1 + I)*c*f + d*(-1 + (1 + I)*f*
x))*((1 + I)*c*f + d*(I + (1 + I)*f*x))*Cos[2*f*x]*(Cos[2*e] + I*Sin[2*e])
 + (3*I)*((1 + I)*c*f + d*(-1 + (1 + I)*f*x))*((1 + I)*c*f + d*(I + (1 + I
)*f*x))*(Cos[2*e] + I*Sin[2*e])*Sin[2*f*x])/(24*a*f^3)
```

3.17.3 Rubi [A] (verified)

Time = 0.48 (sec) , antiderivative size = 147, normalized size of antiderivative = 1.07, number of steps used = 7, number of rules used = 7, $\frac{\text{number of rules}}{\text{integrand size}} = 0.304$, Rules used = {3042, 4206, 3042, 4206, 3042, 3960, 24}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^2}{a+ia\cot(e+fx)}dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{(c+dx)^2}{a-ia\tan\left(e+fx+\frac{\pi}{2}\right)}dx$$

$$\Big\downarrow \text{4206}$$

$$\frac{id\int \frac{c+dx}{i\cot(e+fx)a+a}dx}{f}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^3}{6ad}$$

$$\Big\downarrow \text{3042}$$

$$\frac{id\int \frac{c+dx}{a-ia\tan\left(e+fx+\frac{\pi}{2}\right)}dx}{f}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^3}{6ad}$$

$$\Big\downarrow \text{4206}$$

$$\frac{id\left(\frac{id\int \frac{1}{i\cot(e+fx)a+a}dx}{2f}-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}\right)}{f}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^3}{6ad}$$

$$\Big\downarrow \text{3042}$$

$$\frac{id\left(\frac{id\int \frac{1}{a-ia\tan\left(e+fx+\frac{\pi}{2}\right)}dx}{2f}-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}\right)}{f}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^3}{6ad}$$

$$\Big\downarrow \text{3960}$$

$$\frac{id\left(\frac{id\left(\frac{\int 1dx}{2a}-\frac{i}{2f(a+ia\cot(e+fx))}\right)}{2f}-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}\right)}{f}-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^3}{6ad}$$

$$\Big\downarrow \text{ 24}$$

$$-\frac{i(c+dx)^2}{2f(a+ia\cot(e+fx))}+\frac{id\left(-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}+\frac{id\left(\frac{x}{2a}-\frac{i}{2f(a+ia\cot(e+fx))}\right)}{2f}\right)}{f}+\frac{(c+dx)^3}{6ad}$$

input
```
Int[(c + d*x)^2/(a + I*a*Cot[e + f*x]),x]
```

output
```
(c + d*x)^3/(6*a*d) - ((I/2)*(c + d*x)^2)/(f*(a + I*a*Cot[e + f*x])) + (I*
d*((c + d*x)^2/(4*a*d) - ((I/2)*(c + d*x))/(f*(a + I*a*Cot[e + f*x])) + ((
I/2)*d*(x/(2*a) - (I/2)/(f*(a + I*a*Cot[e + f*x]))))/f))/f
```

3.17.3.1 Defintions of rubi rules used

rule 24
```
Int[a_, x_Symbol] :> Simp[a*x, x] /; FreeQ[a, x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 3960
```
Int[((a_) + (b_.)*tan[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[a*((a +
b*Tan[c + d*x])^n/(2*b*d*n)), x] + Simp[1/(2*a)   Int[(a + b*Tan[c + d*x])^
(n + 1), x], x] /; FreeQ[{a, b, c, d}, x] && EqQ[a^2 + b^2, 0] && LtQ[n, 0]
```

rule 4206
```
Int[((c_.) + (d_.)*(x_))^(m_.)/((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)]), x_Sy
mbol] :> Simp[(c + d*x)^(m + 1)/(2*a*d*(m + 1)), x] + (Simp[a*d*(m/(2*b*f))
   Int[(c + d*x)^(m - 1)/(a + b*Tan[e + f*x]), x], x] - Simp[a*((c + d*x)^m
/(2*b*f*(a + b*Tan[e + f*x]))), x]) /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[
a^2 + b^2, 0] && GtQ[m, 0]
```

3.17.4 Maple [A] (verified)

Time = 0.39 (sec) , antiderivative size = 108, normalized size of antiderivative = 0.79

method	result
risch	$\frac{d^2x^3}{6a}+\frac{dc\,x^2}{2a}+\frac{c^2x}{2a}+\frac{c^3}{6ad}+\frac{i\left(2d^2x^2f^2+4cd\,f^2x+2id^2fx+2c^2f^2+2icdf-d^2\right)\mathrm{e}^{2i(fx+e)}}{8a\,f^3}$
parallelrisch	$\frac{-2\left(\left(-\frac{1}{3}d^2x^2-cdx-c^2\right)f^2+i\left(\frac{dx}{2}+c\right)df-\frac{d^2}{2}\right)fx\tan(fx+e)+2i\left(\frac{1}{3}d^2x^2+cdx+c^2\right)x\,f^3+\left(-d^2x^2-2cdx-2c^2\right)f^2-2i\left(\frac{dx}{2}+c\right)df}{4f^3a(i+\tan(fx+e))}$

input
```
int((d*x+c)^2/(a+I*a*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
1/6/a*d^2*x^3+1/2/a*d*c*x^2+1/2/a*c^2*x+1/6/a/d*c^3+1/8*I*(2*d^2*x^2*f^2+2
*I*d^2*f*x+4*c*d*f^2*x+2*I*c*d*f+2*c^2*f^2-d^2)/a/f^3*exp(2*I*(f*x+e))
```

3.17.5 Fricas [A] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 96, normalized size of antiderivative = 0.70

$$\int\frac{(c+dx)^2}{a+ia\cot(e+fx)}\,dx$$
$$=\frac{4\,d^2f^3x^3+12\,cdf^3x^2+12\,c^2f^3x-3\left(-2i\,d^2f^2x^2-2i\,c^2f^2+2\,cdf+i\,d^2+2\left(-2i\,cdf^2+d^2f\right)x\right)e^{(2i\,fx+2i\,e}}{24\,af^3}$$

input
```
integrate((d*x+c)^2/(a+I*a*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/24*(4*d^2*f^3*x^3 + 12*c*d*f^3*x^2 + 12*c^2*f^3*x - 3*(-2*I*d^2*f^2*x^2
- 2*I*c^2*f^2 + 2*c*d*f + I*d^2 + 2*(-2*I*c*d*f^2 + d^2*f)*x)*e^(2*I*f*x +
 2*I*e))/(a*f^3)
```

3.17.6 Sympy [A] (verification not implemented)

Time = 0.16 (sec) , antiderivative size = 194, normalized size of antiderivative = 1.42

$$\int\frac{(c+dx)^2}{a+ia\cot(e+fx)}\,dx$$
$$=\begin{cases}\frac{\left(2ic^2f^2e^{2ie}+4icdf^2xe^{2ie}-2cdfe^{2ie}+2id^2f^2x^2e^{2ie}-2d^2fxe^{2ie}-id^2e^{2ie}\right)e^{2ifx}}{8af^3} & \text{for } af^3\neq 0\\ -\frac{c^2xe^{2ie}}{2a}-\frac{cdx^2e^{2ie}}{2a}-\frac{d^2x^3e^{2ie}}{6a} & \text{otherwise}\end{cases}$$
$$+\frac{c^2x}{2a}+\frac{cdx^2}{2a}+\frac{d^2x^3}{6a}$$

input
```
integrate((d*x+c)**2/(a+I*a*cot(f*x+e)),x)
```

output
```
Piecewise(((2*I*c**2*f**2*exp(2*I*e) + 4*I*c*d*f**2*x*exp(2*I*e) - 2*c*d*f
*exp(2*I*e) + 2*I*d**2*f**2*x**2*exp(2*I*e) - 2*d**2*f*x*exp(2*I*e) - I*d*
*2*exp(2*I*e))*exp(2*I*f*x)/(8*a*f**3), Ne(a*f**3, 0)), (-c**2*x*exp(2*I*e
)/(2*a) - c*d*x**2*exp(2*I*e)/(2*a) - d**2*x**3*exp(2*I*e)/(6*a), True)) +
 c**2*x/(2*a) + c*d*x**2/(2*a) + d**2*x**3/(6*a)
```

3.17.7 Maxima [F(-2)]

Exception generated.

$$\int \frac{(c+dx)^2}{a+ia\cot(e+fx)}\,dx = \text{Exception raised: RuntimeError}$$

input
```
integrate((d*x+c)^2/(a+I*a*cot(f*x+e)),x, algorithm="maxima")
```

output
```
Exception raised: RuntimeError >> ECL says: expt: undefined: 0 to a negati
ve exponent.
```

3.17.8 Giac [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 137, normalized size of antiderivative = 1.00

$$\int \frac{(c+dx)^2}{a+ia\cot(e+fx)}\,dx = \frac{4\,d^2f^3x^3 + 12\,cdf^3x^2 + 6i\,d^2f^2x^2e^{(2i\,fx+2i\,e)} + 12\,c^2f^3x + 12i\,cdf^2xe^{(2i\,fx+2i\,e)} + 6i\,c^2f^2e^{(2i\,fx+2i\,e)} - 6\,d^2fx}{24\,af^3}$$

input
```
integrate((d*x+c)^2/(a+I*a*cot(f*x+e)),x, algorithm="giac")
```

output
```
1/24*(4*d^2*f^3*x^3 + 12*c*d*f^3*x^2 + 6*I*d^2*f^2*x^2*e^(2*I*f*x + 2*I*e)
 + 12*c^2*f^3*x + 12*I*c*d*f^2*x*e^(2*I*f*x + 2*I*e) + 6*I*c^2*f^2*e^(2*I*
f*x + 2*I*e) - 6*d^2*f*x*e^(2*I*f*x + 2*I*e) - 6*c*d*f*e^(2*I*f*x + 2*I*e)
 - 3*I*d^2*e^(2*I*f*x + 2*I*e))/(a*f^3)
```

3.17.9 Mupad [B] (verification not implemented)

Time = 12.78 (sec) , antiderivative size = 241, normalized size of antiderivative = 1.76

$$\int \frac{(c+dx)^2}{a+ia\cot(e+fx)}\,dx =$$
$$-\frac{6\,c^2\,f^2\,\sin\left(2\,e+2\,f\,x\right)-12\,c^2\,f^3\,x-3\,d^2\,\sin\left(2\,e+2\,f\,x\right)-4\,d^2\,f^3\,x^3+6\,c\,d\,f\,\cos\left(2\,e+2\,f\,x\right)+6\,d^2}{}$$

input
```
int((c + d*x)^2/(a + a*cot(e + f*x)*1i),x)
```

output
```
-(d^2*cos(2*e + 2*f*x)*3i - 3*d^2*sin(2*e + 2*f*x) - 12*c^2*f^3*x - c^2*f^
2*cos(2*e + 2*f*x)*6i + 6*c^2*f^2*sin(2*e + 2*f*x) - 4*d^2*f^3*x^3 + 6*c*d
*f*cos(2*e + 2*f*x) + c*d*f*sin(2*e + 2*f*x)*6i - d^2*f^2*x^2*cos(2*e + 2*
f*x)*6i + 6*d^2*f^2*x^2*sin(2*e + 2*f*x) - 12*c*d*f^3*x^2 + 6*d^2*f*x*cos(
2*e + 2*f*x) + d^2*f*x*sin(2*e + 2*f*x)*6i - c*d*f^2*x*cos(2*e + 2*f*x)*12
i + 12*c*d*f^2*x*sin(2*e + 2*f*x))/(24*a*f^3)
```

3.18 $\int \frac{c+dx}{a+ia\cot(e+fx)}\,dx$

3.18.1 Optimal result

Integrand size = 21, antiderivative size = 84

$$\int \frac{c+dx}{a+ia\cot(e+fx)}\,dx=\frac{idx}{4af}+\frac{(c+dx)^2}{4ad}+\frac{d}{4f^2(a+ia\cot(e+fx))}-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}$$

output
```
1/4*I*d*x/a/f+1/4*(d*x+c)^2/a/d+1/4*d/f^2/(a+I*a*cot(f*x+e))-1/2*I*(d*x+c)
/f/(a+I*a*cot(f*x+e))
```

3.18.2 Mathematica [A] (verified)

Time = 0.34 (sec) , antiderivative size = 107, normalized size of antiderivative = 1.27

$$\int \frac{c+dx}{a+ia\cot(e+fx)}\,dx=\frac{(\cos(e+fx)+i\sin(e+fx))\left((2cf(i+2fx)+d(-1+2ifx+2f^2x^2))\cos(e+fx)-i(2cf(-i+2fx)+\right.}{8af^2}$$

input
```
Integrate[(c + d*x)/(a + I*a*Cot[e + f*x]),x]
```

output
```
((Cos[e + f*x] + I*Sin[e + f*x])*((2*c*f*(I + 2*f*x) + d*(-1 + (2*I)*f*x +
 2*f^2*x^2))*Cos[e + f*x] - I*(2*c*f*(-I + 2*f*x) + d*(1 - (2*I)*f*x + 2*f
^2*x^2))*Sin[e + f*x]))/(8*a*f^2)
```

3.18.3 Rubi [A] (verified)

Time = 0.31 (sec) , antiderivative size = 90, normalized size of antiderivative = 1.07, number of steps used = 5, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.238, Rules used = {3042, 4206, 3042, 3960, 24}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{c+dx}{a+ia\cot(e+fx)}dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{c+dx}{a-ia\tan\left(e+fx+\frac{\pi}{2}\right)}dx$$

$$\Big\downarrow \text{4206}$$

$$\frac{id\int \frac{1}{i\cot(e+fx)a+a}dx}{2f}-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}$$

$$\Big\downarrow \text{3042}$$

$$\frac{id\int \frac{1}{a-ia\tan\left(e+fx+\frac{\pi}{2}\right)}dx}{2f}-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}$$

$$\Big\downarrow \text{3960}$$

$$\frac{id\left(\frac{\int 1dx}{2a}-\frac{i}{2f(a+ia\cot(e+fx))}\right)}{2f}-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}$$

$$\Big\downarrow \text{24}$$

$$-\frac{i(c+dx)}{2f(a+ia\cot(e+fx))}+\frac{(c+dx)^2}{4ad}+\frac{id\left(\frac{x}{2a}-\frac{i}{2f(a+ia\cot(e+fx))}\right)}{2f}$$

input
```
Int[(c + d*x)/(a + I*a*Cot[e + f*x]),x]
```

output
```
(c + d*x)^2/(4*a*d) - ((I/2)*(c + d*x))/(f*(a + I*a*Cot[e + f*x])) + ((I/2
)*d*(x/(2*a) - (I/2)/(f*(a + I*a*Cot[e + f*x]))))/f
```

3.18.3.1 Defintions of rubi rules used

rule 24
```
Int[a_, x_Symbol] :> Simp[a*x, x] /; FreeQ[a, x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 3960
```
Int[((a_) + (b_.)*tan[(c_.) + (d_.)*(x_)])^(n_), x_Symbol] :> Simp[a*((a +
b*Tan[c + d*x])^n/(2*b*d*n)), x] + Simp[1/(2*a)   Int[(a + b*Tan[c + d*x])^
(n + 1), x], x] /; FreeQ[{a, b, c, d}, x] && EqQ[a^2 + b^2, 0] && LtQ[n, 0]
```

rule 4206
```
Int[((c_.) + (d_.)*(x_))^(m_.)/((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)]), x_Sy
mbol] :> Simp[(c + d*x)^(m + 1)/(2*a*d*(m + 1)), x] + (Simp[a*d*(m/(2*b*f))
   Int[(c + d*x)^(m - 1)/(a + b*Tan[e + f*x]), x], x] - Simp[a*((c + d*x)^m
/(2*b*f*(a + b*Tan[e + f*x]))), x]) /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[
a^2 + b^2, 0] && GtQ[m, 0]
```

3.18.4 Maple [A] (verified)

Time = 0.38 (sec) , antiderivative size = 50, normalized size of antiderivative = 0.60

method	result	size
risch	$\frac{d\,x^{2}}{4a}+\frac{xc}{2a}+\frac{i\left(2dfx+2cf+id\right){\mathrm e}^{2i\left(fx+e\right)}}{8a\,f^{2}}$	50
parallelrisch	$\frac{-f\left(\left(-dx-2c\right)f+id\right)x\tan\left(fx+e\right)+2i\left(\frac{dx}{2}+c\right)x\,f^{2}+\left(-dx-2c\right)f-id}{4f^{2}a\left(i+\tan\left(fx+e\right)\right)}$	73
norman	$\frac{\frac{d\,x^{2}}{4a}-\frac{-2icf+d}{4a\,f^{2}}+\frac{d\,x^{2}\tan\left(fx+e\right)^{2}}{4a}-\frac{\left(2cf+id\right)\tan\left(fx+e\right)}{4f^{2}a}+\frac{\left(2cf+id\right)x}{4af}-\frac{dx\tan\left(fx+e\right)}{2af}+\frac{\left(2cf-id\right)x\tan\left(fx+e\right)^{2}}{4af}}{1+\tan\left(fx+e\right)^{2}}$	139

input
```
int((d*x+c)/(a+I*a*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
1/4/a*d*x^2+1/2/a*x*c+1/8*I*(2*d*f*x+I*d+2*c*f)/a/f^2*exp(2*I*(f*x+e))
```

3.18.5 Fricas [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 48, normalized size of antiderivative = 0.57

$$\int \frac{c+dx}{a+ia\cot(e+fx)}\,dx = \frac{2\,df^2x^2+4\,cf^2x+(2i\,dfx+2i\,cf-d)e^{(2i\,fx+2i\,e)}}{8\,af^2}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/8*(2*d*f^2*x^2 + 4*c*f^2*x + (2*I*d*f*x + 2*I*c*f - d)*e^(2*I*f*x + 2*I*
e))/(a*f^2)
```

3.18.6 Sympy [A] (verification not implemented)

Time = 0.14 (sec) , antiderivative size = 100, normalized size of antiderivative = 1.19

$$\int \frac{c+dx}{a+ia\cot(e+fx)}\,dx = \begin{cases} \frac{(2icfe^{2ie}+2idfxe^{2ie}-de^{2ie})e^{2ifx}}{8af^2} & \text{for } af^2\neq 0 \\ -\frac{cxe^{2ie}}{2a}-\frac{dx^2e^{2ie}}{4a} & \text{otherwise} \end{cases} + \frac{cx}{2a}+\frac{dx^2}{4a}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e)),x)
```

output
```
Piecewise((((2*I*c*f*exp(2*I*e) + 2*I*d*f*x*exp(2*I*e) - d*exp(2*I*e))*exp(
2*I*f*x)/(8*a*f**2), Ne(a*f**2, 0)), (-c*x*exp(2*I*e)/(2*a) - d*x**2*exp(2
*I*e)/(4*a), True)) + c*x/(2*a) + d*x**2/(4*a)
```

3.18.7 Maxima [F(-2)]

Exception generated.

$$\int \frac{c+dx}{a+ia\cot(e+fx)}\,dx = \text{Exception raised: RuntimeError}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e)),x, algorithm="maxima")
```

output
```
Exception raised: RuntimeError >> ECL says: expt: undefined: 0 to a negati
ve exponent.
```

3.18.8 Giac [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 64, normalized size of antiderivative = 0.76

$$\int \frac{c+dx}{a+ia\cot(e+fx)}\,dx = \frac{2\,df^2x^2+4\,cf^2x+2i\,dfxe^{(2i\,fx+2i\,e)}+2i\,cfe^{(2i\,fx+2i\,e)}-de^{(2i\,fx+2i\,e)}}{8\,af^2}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e)),x, algorithm="giac")
```

output
```
1/8*(2*d*f^2*x^2 + 4*c*f^2*x + 2*I*d*f*x*e^(2*I*f*x + 2*I*e) + 2*I*c*f*e^(
2*I*f*x + 2*I*e) - d*e^(2*I*f*x + 2*I*e))/(a*f^2)
```

3.18.9 Mupad [B] (verification not implemented)

Time = 0.42 (sec) , antiderivative size = 105, normalized size of antiderivative = 1.25

$$\int \frac{c+dx}{a+ia\cot(e+fx)}\,dx = -\frac{d\,\cos(2\,e+2\,f\,x)-2\,d\,f^2\,x^2+2\,c\,f\,\sin(2\,e+2\,f\,x)-4\,c\,f^2\,x+2\,d\,f\,x\,\sin(2\,e+2\,f\,x)+d\,\sin(2\,e+}{8\,a\,f^2}$$

input
```
int((c + d*x)/(a + a*cot(e + f*x)*1i),x)
```

output
```
-(d*cos(2*e + 2*f*x) + d*sin(2*e + 2*f*x)*1i - 2*d*f^2*x^2 - c*f*cos(2*e +
 2*f*x)*2i + 2*c*f*sin(2*e + 2*f*x) - 4*c*f^2*x - d*f*x*cos(2*e + 2*f*x)*2
i + 2*d*f*x*sin(2*e + 2*f*x))/(8*a*f^2)
```

3.19 $\int \frac{1}{(c+dx)(a+ia\cot(e+fx))}\,dx$

3.19.1 Optimal result

Integrand size = 23, antiderivative size = 161

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))}\,dx = -\frac{\cos\left(2e-\frac{2cf}{d}\right)\text{CosIntegral}\left(\frac{2cf}{d}+2fx\right)}{2ad}+\frac{\log(c+dx)}{2ad} - \frac{i\,\text{CosIntegral}\left(\frac{2cf}{d}+2fx\right)\sin\left(2e-\frac{2cf}{d}\right)}{2ad} - \frac{i\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(\frac{2cf}{d}+2fx\right)}{2ad} + \frac{\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(\frac{2cf}{d}+2fx\right)}{2ad}$$

output
```
-1/2*Ci(2*c*f/d+2*f*x)*cos(-2*e+2*c*f/d)/a/d+1/2*ln(d*x+c)/a/d-1/2*I*cos(-
2*e+2*c*f/d)*Si(2*c*f/d+2*f*x)/a/d+1/2*I*Ci(2*c*f/d+2*f*x)*sin(-2*e+2*c*f/
d)/a/d-1/2*Si(2*c*f/d+2*f*x)*sin(-2*e+2*c*f/d)/a/d
```

3.19.2 Mathematica [A] (verified)

Time = 0.41 (sec) , antiderivative size = 77, normalized size of antiderivative = 0.48

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))}\,dx = \frac{\log(c+dx)-\left(\cos\left(2e-\frac{2cf}{d}\right)+i\sin\left(2e-\frac{2cf}{d}\right)\right)\left(\text{CosIntegral}\left(\frac{2f(c+dx)}{d}\right)+i\text{Si}\left(\frac{2f(c+dx)}{d}\right)\right)}{2ad}$$

input
```
Integrate[1/((c + d*x)*(a + I*a*Cot[e + f*x])),x]
```

output
```
(Log[c + d*x] - (Cos[2*e - (2*c*f)/d] + I*Sin[2*e - (2*c*f)/d])*(CosIntegr
al[(2*f*(c + d*x))/d] + I*SinIntegral[(2*f*(c + d*x))/d]))/(2*a*d)
```

3.19.3 Rubi [A] (verified)

Time = 0.70 (sec) , antiderivative size = 152, normalized size of antiderivative = 0.94, number of steps used = 8, number of rules used = 8, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.348, Rules used = {3042, 4209, 25, 3042, 3784, 3042, 3780, 3783}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))}dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{1}{(c+dx)\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)}dx$$

$$\Big\downarrow \text{4209}$$

$$\frac{i\int -\frac{\sin(2e+2fx)}{c+dx}dx}{2a}+\frac{\int -\frac{\cos(2e+2fx)}{c+dx}dx}{2a}+\frac{\log(c+dx)}{2ad}$$

$$\Big\downarrow \text{25}$$

$$-\frac{i\int \frac{\sin(2e+2fx)}{c+dx}dx}{2a}-\frac{\int \frac{\cos(2e+2fx)}{c+dx}dx}{2a}+\frac{\log(c+dx)}{2ad}$$

$$\Big\downarrow \text{3042}$$

$$-\frac{i\int \frac{\sin(2e+2fx)}{c+dx}dx}{2a}-\frac{\int \frac{\sin\left(2e+2fx+\frac{\pi}{2}\right)}{c+dx}dx}{2a}+\frac{\log(c+dx)}{2ad}$$

$$\Big\downarrow \text{3784}$$

$$-\frac{i\left(\sin\left(2e-\frac{2cf}{d}\right)\int \frac{\cos\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx+\cos\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx\right)}{2a}-\frac{\cos\left(2e-\frac{2cf}{d}\right)\int \frac{\cos\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx-\sin\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx}{2a}+\frac{\log(c+dx)}{2ad}$$

$$\Big\downarrow \text{3042}$$

$$-\frac{\cos\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx-\sin\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx}{2a}-\frac{i\left(\sin\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx+\cos\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx\right)}{2a}+\frac{\log(c+dx)}{2ad}$$

$$\Big\downarrow \text{3780}$$

$$-\frac{\cos\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx-\frac{\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}}{2a}-\frac{i\left(\sin\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx+\frac{\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}\right)}{2a}+\frac{\log(c+dx)}{2ad}$$

$$\Big\downarrow \text{3783}$$

$$-\frac{i\left(\frac{\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\sin\left(2e-\frac{2cf}{d}\right)}{d}+\frac{\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}\right)}{2a}-\frac{\frac{\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\cos\left(2e-\frac{2cf}{d}\right)}{d}-\frac{\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}}{2a}+\frac{\log(c+dx)}{2ad}$$

input
```
Int[1/((c + d*x)*(a + I*a*Cot[e + f*x])),x]
```

output
```
Log[c + d*x]/(2*a*d) - ((I/2)*((CosIntegral[(2*c*f)/d + 2*f*x]*Sin[2*e - (
2*c*f)/d])/d + (Cos[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/d))/a
 - ((Cos[2*e - (2*c*f)/d]*CosIntegral[(2*c*f)/d + 2*f*x])/d - (Sin[2*e - (
2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/d)/(2*a)
```

3.19.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 3780
```
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 3783
```
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]
```

rule 3784
```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[Cos[(d*
e - c*f)/d]   Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Simp[Sin[(d*e - c*
f)/d]   Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x]
&& NeQ[d*e - c*f, 0]
```

rule 4209
```
Int[1/(((c_.) + (d_.)*(x_))*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])), x_Symb
ol] :> Simp[Log[c + d*x]/(2*a*d), x] + (Simp[1/(2*a)   Int[Cos[2*e + 2*f*x]
/(c + d*x), x], x] + Simp[1/(2*b)   Int[Sin[2*e + 2*f*x]/(c + d*x), x], x])
 /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[a^2 + b^2, 0]
```

3.19.4 Maple [A] (verified)

Time = 0.25 (sec) , antiderivative size = 67, normalized size of antiderivative = 0.42

method	result
risch	$\frac{\ln(dx+c)}{2ad}+\frac{\mathrm{e}^{-\frac{2i(cf-de)}{d}}\operatorname{Ei}_1\left(-2ifx-2ie-\frac{2(icf-ide)}{d}\right)}{2ad}$
derivativedivides	$\frac{-\frac{i\left(\frac{2\operatorname{Si}\left(2fx+2e+\frac{2cf-2de}{d}\right)\cos\left(\frac{2cf-2de}{d}\right)}{d}-\frac{2\operatorname{Ci}\left(2fx+2e+\frac{2cf-2de}{d}\right)\sin\left(\frac{2cf-2de}{d}\right)}{d}\right)}{4}+\frac{\ln(cf-de+d(fx+e))}{2d}-\frac{\operatorname{Si}\left(2fx+2e+\frac{2c\cdots}{}\right.}{}}{a}$
default	$\frac{-\frac{i\left(\frac{2\operatorname{Si}\left(2fx+2e+\frac{2cf-2de}{d}\right)\cos\left(\frac{2cf-2de}{d}\right)}{d}-\frac{2\operatorname{Ci}\left(2fx+2e+\frac{2cf-2de}{d}\right)\sin\left(\frac{2cf-2de}{d}\right)}{d}\right)}{4}+\frac{\ln(cf-de+d(fx+e))}{2d}-\frac{\operatorname{Si}\left(2fx+2e+\frac{2c\cdots}{}\right.}{}}{a}$

input
```
int(1/(d*x+c)/(a+I*a*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
1/2*ln(d*x+c)/a/d+1/2/a/d*exp(-2*I*(c*f-d*e)/d)*Ei(1,-2*I*f*x-2*I*e-2*(I*c
*f-I*d*e)/d)
```

3.19.5 Fricas [A] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 53, normalized size of antiderivative = 0.33

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))}\,dx = -\frac{\mathrm{Ei}\left(-\frac{2(-idfx-icf)}{d}\right)e^{\left(-\frac{2(-ide+icf)}{d}\right)} - \log\left(\frac{dx+c}{d}\right)}{2\,ad}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e)),x, algorithm="fricas")
```

output
```
-1/2*(Ei(-2*(-I*d*f*x - I*c*f)/d)*e^(-2*(-I*d*e + I*c*f)/d) - log((d*x + c
)/d))/(a*d)
```

3.19.6 Sympy [F]

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))}\,dx = -\frac{i\int \frac{1}{c\cot(e+fx)-ic+dx\cot(e+fx)-idx}\,dx}{a}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e)),x)
```

output
```
-I*Integral(1/(c*cot(e + f*x) - I*c + d*x*cot(e + f*x) - I*d*x), x)/a
```

3.19.7 Maxima [A] (verification not implemented)

Time = 0.29 (sec) , antiderivative size = 111, normalized size of antiderivative = 0.69

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))}\,dx = \frac{f\cos\left(-\frac{2(de-cf)}{d}\right)E_1\left(\frac{2(-i(fx+e)d+ide-icf)}{d}\right) - i\,fE_1\left(\frac{2(-i(fx+e)d+ide-icf)}{d}\right)\sin\left(-\frac{2(de-cf)}{d}\right) + f\log((fx+}{2\,adf}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e)),x, algorithm="maxima")
```

output
```
1/2*(f*cos(-2*(d*e - c*f)/d)*exp_integral_e(1, 2*(-I*(f*x + e)*d + I*d*e -
 I*c*f)/d) - I*f*exp_integral_e(1, 2*(-I*(f*x + e)*d + I*d*e - I*c*f)/d)*s
in(-2*(d*e - c*f)/d) + f*log((f*x + e)*d - d*e + c*f))/(a*d*f)
```

3.19.8 Giac [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 351 vs. 2(147) = 294.

Time = 0.28 (sec) , antiderivative size = 351, normalized size of antiderivative = 2.18

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))}\,dx = -\frac{\cos(e)^2\cos\left(\frac{2cf}{d}\right)\operatorname{Ci}\left(\frac{2(dfx+cf)}{d}\right)+2i\cos(e)\cos\left(\frac{2cf}{d}\right)\operatorname{Ci}\left(\frac{2(dfx+cf)}{d}\right)\sin(e)-\cos\left(\frac{2cf}{d}\right)\operatorname{Ci}\left(\frac{2(dfx+cf)}{d}\right)\mathrm{s}}{}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e)),x, algorithm="giac")
```

output
```
-1/2*(cos(e)^2*cos(2*c*f/d)*cos_integral(2*(d*f*x + c*f)/d) + 2*I*cos(e)*c
os(2*c*f/d)*cos_integral(2*(d*f*x + c*f)/d)*sin(e) - cos(2*c*f/d)*cos_inte
gral(2*(d*f*x + c*f)/d)*sin(e)^2 - I*cos(e)^2*cos_integral(2*(d*f*x + c*f)
/d)*sin(2*c*f/d) + 2*cos(e)*cos_integral(2*(d*f*x + c*f)/d)*sin(e)*sin(2*c
*f/d) + I*cos_integral(2*(d*f*x + c*f)/d)*sin(e)^2*sin(2*c*f/d) + I*cos(e)
^2*cos(2*c*f/d)*sin_integral(2*(d*f*x + c*f)/d) - 2*cos(e)*cos(2*c*f/d)*si
n(e)*sin_integral(2*(d*f*x + c*f)/d) - I*cos(2*c*f/d)*sin(e)^2*sin_integra
l(2*(d*f*x + c*f)/d) + cos(e)^2*sin(2*c*f/d)*sin_integral(2*(d*f*x + c*f)/
d) + 2*I*cos(e)*sin(e)*sin(2*c*f/d)*sin_integral(2*(d*f*x + c*f)/d) - sin(
e)^2*sin(2*c*f/d)*sin_integral(2*(d*f*x + c*f)/d) - log(d*x + c))/(a*d)
```

3.19.9 Mupad [F(-1)]

Timed out.

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))}\,dx = \int \frac{1}{(a+a\cot(e+f\,x)\;1\mathrm{i})\;(c+d\,x)}\,dx$$

input
```
int(1/((a + a*cot(e + f*x)*1i)*(c + d*x)),x)
```

output
```
int(1/((a + a*cot(e + f*x)*1i)*(c + d*x)), x)
```

3.20 $\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))}\,dx$

3.20.1 Optimal result

Integrand size = 23, antiderivative size = 166

$$\begin{aligned}\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))}\,dx = &-\frac{if\cos\left(2e-\frac{2cf}{d}\right)\text{CosIntegral}\left(\frac{2cf}{d}+2fx\right)}{ad^2}\\ &-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}\\ &+\frac{f\,\text{CosIntegral}\left(\frac{2cf}{d}+2fx\right)\sin\left(2e-\frac{2cf}{d}\right)}{ad^2}\\ &+\frac{f\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(\frac{2cf}{d}+2fx\right)}{ad^2}\\ &+\frac{if\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(\frac{2cf}{d}+2fx\right)}{ad^2}\end{aligned}$$

output
```
-I*f*Ci(2*c*f/d+2*f*x)*cos(-2*e+2*c*f/d)/a/d^2-1/d/(d*x+c)/(a+I*a*cot(f*x+
e))+f*cos(-2*e+2*c*f/d)*Si(2*c*f/d+2*f*x)/a/d^2-f*Ci(2*c*f/d+2*f*x)*sin(-2
*e+2*c*f/d)/a/d^2-I*f*Si(2*c*f/d+2*f*x)*sin(-2*e+2*c*f/d)/a/d^2
```

3.20.2 Mathematica [A] (verified)

Time = 1.34 (sec) , antiderivative size = 215, normalized size of antiderivative = 1.30

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))}\,dx$$
$$= \frac{\left(\cos\left(e+f\left(-\frac{c}{d}+x\right)\right)+i\sin\left(e+f\left(-\frac{c}{d}+x\right)\right)\right)\left(d\left(-\cos\left(e+f\left(-\frac{c}{d}+x\right)\right)+\cos\left(e+f\left(\frac{c}{d}+x\right)\right)+i(\sin\right.\right.}{}$$

input
```
Integrate[1/((c + d*x)^2*(a + I*a*Cot[e + f*x])),x]
```

output
```
((Cos[e + f*(-(c/d) + x)] + I*Sin[e + f*(-(c/d) + x)])*(d*(-Cos[e + f*(-(c
/d) + x)] + Cos[e + f*(c/d + x)] + I*(Sin[e + f*(-(c/d) + x)] + Sin[e + f*
(c/d + x)])) + 2*f*(c + d*x)*CosIntegral[(2*f*(c + d*x))/d]*((-I)*Cos[e -
(f*(c + d*x))/d] + Sin[e - (f*(c + d*x))/d]) + 2*f*(c + d*x)*(Cos[e - (f*(
c + d*x))/d] + I*Sin[e - (f*(c + d*x))/d])*SinIntegral[(2*f*(c + d*x))/d])
)/(2*a*d^2*(c + d*x))
```

3.20.3 Rubi [A] (verified)

Time = 0.71 (sec) , antiderivative size = 166, normalized size of antiderivative = 1.00, number of steps used = 8, number of rules used = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.348$, Rules used = {3042, 4207, 25, 3042, 3784, 3042, 3780, 3783}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))}\,dx$$
$$\Big\downarrow \text{3042}$$
$$\int \frac{1}{(c+dx)^2\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)}dx$$
$$\Big\downarrow \text{4207}$$
$$-\frac{f\int -\frac{\sin(2e+2fx)}{c+dx}dx}{ad}+\frac{if\int -\frac{\cos(2e+2fx)}{c+dx}dx}{ad}-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}$$
$$\Big\downarrow \text{25}$$

$$\frac{f\int\frac{\sin(2e+2fx)}{c+dx}dx}{ad}-\frac{if\int\frac{\cos(2e+2fx)}{c+dx}dx}{ad}-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}$$

$\downarrow$ 3042

$$\frac{f\int\frac{\sin(2e+2fx)}{c+dx}dx}{ad}-\frac{if\int\frac{\sin\left(2e+2fx+\frac{\pi}{2}\right)}{c+dx}dx}{ad}-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}$$

$\downarrow$ 3784

$$\frac{f\left(\sin\left(2e-\frac{2cf}{d}\right)\int\frac{\cos\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx+\cos\left(2e-\frac{2cf}{d}\right)\int\frac{\sin\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx\right)}{ad}-\frac{if\left(\cos\left(2e-\frac{2cf}{d}\right)\int\frac{\cos\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx-\sin\left(2e-\frac{2cf}{d}\right)\int\frac{\sin\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx\right)}{ad}-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}$$

$\downarrow$ 3042

$$-\frac{if\left(\cos\left(2e-\frac{2cf}{d}\right)\int\frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx-\sin\left(2e-\frac{2cf}{d}\right)\int\frac{\sin\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx\right)}{ad}+\frac{f\left(\sin\left(2e-\frac{2cf}{d}\right)\int\frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx+\cos\left(2e-\frac{2cf}{d}\right)\int\frac{\sin\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx\right)}{ad}-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}$$

$\downarrow$ 3780

$$-\frac{if\left(\cos\left(2e-\frac{2cf}{d}\right)\int\frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx-\frac{\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}\right)}{ad}+\frac{f\left(\sin\left(2e-\frac{2cf}{d}\right)\int\frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx+\frac{\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}\right)}{ad}-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}$$

$\downarrow$ 3783

$$\frac{f\left(\frac{\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\sin\left(2e-\frac{2cf}{d}\right)}{d}+\frac{\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}\right)}{ad}-\frac{if\left(\frac{\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\cos\left(2e-\frac{2cf}{d}\right)}{d}-\frac{\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}\right)}{ad}-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}$$

3.20. $\int\frac{1}{(c+dx)^2(a+ia\cot(e+fx))}dx$

input
```
Int[1/((c + d*x)^2*(a + I*a*Cot[e + f*x])),x]
```

output
```
-(1/(d*(c + d*x)*(a + I*a*Cot[e + f*x]))) + (f*((CosIntegral[(2*c*f)/d + 2
*f*x]*Sin[2*e - (2*c*f)/d])/d + (Cos[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/
d + 2*f*x])/d))/(a*d) - (I*f*((Cos[2*e - (2*c*f)/d]*CosIntegral[(2*c*f)/d
+ 2*f*x])/d - (Sin[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/d))/(a
*d)
```

3.20.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 3780
```
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 3783
```
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]
```

rule 3784
```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[Cos[(d*
e - c*f)/d]   Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Simp[Sin[(d*e - c*
f)/d]   Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x]
&& NeQ[d*e - c*f, 0]
```

rule 4207
```
Int[1/(((c_.) + (d_.)*(x_))^2*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])), x_Sy
mbol] :> -Simp[(d*(c + d*x)*(a + b*Tan[e + f*x]))^(-1), x] + (-Simp[f/(a*d)
   Int[Sin[2*e + 2*f*x]/(c + d*x), x], x] + Simp[f/(b*d)   Int[Cos[2*e + 2*
f*x]/(c + d*x), x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[a^2 + b^2, 0
]
```

3.20.4 Maple [A] (verified)

Time = 0.28 (sec) , antiderivative size = 105, normalized size of antiderivative = 0.63

method	result
risch	$-\frac{1}{2d(dx+c)a}+\frac{if\,\mathrm{e}^{2i(fx+e)}}{2a\,d^2\left(ifx+\frac{icf}{d}\right)}+\frac{if\,\mathrm{e}^{-\frac{2i(cf-de)}{d}}\,\mathrm{Ei}_1\left(-2ifx-2ie-\frac{2(icf-ide)}{d}\right)}{a\,d^2}$
derivativedivides	$\frac{f\left(-\frac{i\left(-\frac{2\sin(2fx+2e)}{(cf-de+d(fx+e))d}+\frac{\frac{4\,\mathrm{Si}\left(2fx+2e+\frac{2cf-2de}{d}\right)\sin\left(\frac{2cf-2de}{d}\right)}{d}+\frac{4\,\mathrm{Ci}\left(2fx+2e+\frac{2cf-2de}{d}\right)\cos\left(\frac{2cf-2de}{d}\right)}{d}}{d}\right)}{4}-\frac{}{2(cf-de+}\right.}{a}$
default	$\frac{f\left(-\frac{i\left(-\frac{2\sin(2fx+2e)}{(cf-de+d(fx+e))d}+\frac{\frac{4\,\mathrm{Si}\left(2fx+2e+\frac{2cf-2de}{d}\right)\sin\left(\frac{2cf-2de}{d}\right)}{d}+\frac{4\,\mathrm{Ci}\left(2fx+2e+\frac{2cf-2de}{d}\right)\cos\left(\frac{2cf-2de}{d}\right)}{d}}{d}\right)}{4}-\frac{}{2(cf-de+}\right.}{a}$

input
```
int(1/(d*x+c)^2/(a+I*a*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
-1/2/d/(d*x+c)/a+1/2*I/a*f/d^2*exp(2*I*(f*x+e))/(I*f*x+I/d*c*f)+I/a*f/d^2*
exp(-2*I*(c*f-d*e)/d)*Ei(1,-2*I*f*x-2*I*e-2*(I*c*f-I*d*e)/d)
```

3.20.5 Fricas [A] (verification not implemented)

Time = 0.25 (sec) , antiderivative size = 74, normalized size of antiderivative = 0.45

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))}\,dx$$
$$=-\frac{2\,(i\,dfx+i\,cf)\mathrm{Ei}\left(-\frac{2\,(-i\,dfx-i\,cf)}{d}\right)e^{\left(-\frac{2\,(-i\,de+i\,cf)}{d}\right)}-de^{(2i\,fx+2i\,e)}+d}{2\,(ad^3x+acd^2)}$$

input
```
integrate(1/(d*x+c)^2/(a+I*a*cot(f*x+e)),x, algorithm="fricas")
```

output
```
-1/2*(2*(I*d*f*x + I*c*f)*Ei(-2*(-I*d*f*x - I*c*f)/d)*e^(-2*(-I*d*e + I*c*
f)/d) - d*e^(2*I*f*x + 2*I*e) + d)/(a*d^3*x + a*c*d^2)
```

3.20.6 Sympy [F]

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))}\,dx = -\frac{i\int \frac{1}{c^2\cot(e+fx)-ic^2+2cdx\cot(e+fx)-2icdx+d^2x^2\cot(e+fx)-id^2x^2}\,dx}{a}$$

input
```
integrate(1/(d*x+c)**2/(a+I*a*cot(f*x+e)),x)
```

output
```
-I*Integral(1/(c**2*cot(e + f*x) - I*c**2 + 2*c*d*x*cot(e + f*x) - 2*I*c*d
*x + d**2*x**2*cot(e + f*x) - I*d**2*x**2), x)/a
```

3.20.7 Maxima [A] (verification not implemented)

Time = 0.38 (sec) , antiderivative size = 121, normalized size of antiderivative = 0.73

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))}\,dx = \frac{f^2\cos\left(-\frac{2(de-cf)}{d}\right)E_2\left(\frac{2(-i(fx+e)d+ide-icf)}{d}\right)-if^2E_2\left(\frac{2(-i(fx+e)d+ide-icf)}{d}\right)\sin\left(-\frac{2(de-cf)}{d}\right)-f^2}{2\left((fx+e)ad^2-ad^2e+acdf\right)f}$$

input
```
integrate(1/(d*x+c)^2/(a+I*a*cot(f*x+e)),x, algorithm="maxima")
```

output
```
1/2*(f^2*cos(-2*(d*e - c*f)/d)*exp_integral_e(2, 2*(-I*(f*x + e)*d + I*d*e
 - I*c*f)/d) - I*f^2*exp_integral_e(2, 2*(-I*(f*x + e)*d + I*d*e - I*c*f)/
d)*sin(-2*(d*e - c*f)/d) - f^2)/(((f*x + e)*a*d^2 - a*d^2*e + a*c*d*f)*f)
```

3.20.8 Giac [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 357 vs. 2(161) = 322.

Time = 1.08 (sec) , antiderivative size = 357, normalized size of antiderivative = 2.15

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))}\,dx =$$

$$-\frac{i\left(-2i\,(dx+c)\left(\frac{i\,de}{dx+c}-\frac{i\,cf}{dx+c}+i\,f\right)f^2\text{Ei}\left(\frac{2\left((dx+c)\left(\frac{i\,de}{dx+c}-\frac{i\,cf}{dx+c}+i\,f\right)-i\,de+i\,cf\right)}{d}\right)e^{\left(-\frac{2\,(-i\,de+i\,cf)}{d}\right)}-2\,def^2\text{Ei}\left(\right.\right.}{2\,(-i}$$

$$-\frac{1}{2\,(dx+c)ad}$$

input
```
integrate(1/(d*x+c)^2/(a+I*a*cot(f*x+e)),x, algorithm="giac")
```

output
```
-1/2*I*(-2*I*(d*x + c)*(I*d*e/(d*x + c) - I*c*f/(d*x + c) + I*f)*f^2*Ei(2*
((d*x + c)*(I*d*e/(d*x + c) - I*c*f/(d*x + c) + I*f) - I*d*e + I*c*f)/d)*e
^(-2*(-I*d*e + I*c*f)/d) - 2*d*e*f^2*Ei(2*((d*x + c)*(I*d*e/(d*x + c) - I*
c*f/(d*x + c) + I*f) - I*d*e + I*c*f)/d)*e^(-2*(-I*d*e + I*c*f)/d) + 2*c*f
^3*Ei(2*((d*x + c)*(I*d*e/(d*x + c) - I*c*f/(d*x + c) + I*f) - I*d*e + I*c
*f)/d)*e^(-2*(-I*d*e + I*c*f)/d) + I*d*f^2*e^(-2*(d*x + c)*(-I*d*e/(d*x +
c) + I*c*f/(d*x + c) - I*f)/d))*d^2/((-I*(d*x + c)*d^4*(I*d*e/(d*x + c) -
I*c*f/(d*x + c) + I*f) - d^5*e + c*d^4*f)*a*f) - 1/2/((d*x + c)*a*d)
```

3.20.9 Mupad [F(-1)]

Timed out.

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))}\,dx = \int \frac{1}{(a+a\cot(e+f\,x)\ 1\text{i})\ (c+d\,x)^2}\,dx$$

input
```
int(1/((a + a*cot(e + f*x)*1i)*(c + d*x)^2),x)
```

output
```
int(1/((a + a*cot(e + f*x)*1i)*(c + d*x)^2), x)
```

3.21 $\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx$

3.21.1 Optimal result

Integrand size = 23, antiderivative size = 227

$$
\begin{aligned}
\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx = & \frac{if}{2ad^2(c+dx)} \\
& + \frac{f^2\cos\left(2e-\frac{2cf}{d}\right)\operatorname{CosIntegral}\left(\frac{2cf}{d}+2fx\right)}{ad^3} \\
& - \frac{1}{2d(c+dx)^2(a+ia\cot(e+fx))} \\
& - \frac{if}{d^2(c+dx)(a+ia\cot(e+fx))} \\
& + \frac{if^2\operatorname{CosIntegral}\left(\frac{2cf}{d}+2fx\right)\sin\left(2e-\frac{2cf}{d}\right)}{ad^3} \\
& + \frac{if^2\cos\left(2e-\frac{2cf}{d}\right)\operatorname{Si}\left(\frac{2cf}{d}+2fx\right)}{ad^3} \\
& - \frac{f^2\sin\left(2e-\frac{2cf}{d}\right)\operatorname{Si}\left(\frac{2cf}{d}+2fx\right)}{ad^3}
\end{aligned}
$$

output
```
1/2*I*f/a/d^2/(d*x+c)+f^2*Ci(2*c*f/d+2*f*x)*cos(-2*e+2*c*f/d)/a/d^3-1/2/d/
(d*x+c)^2/(a+I*a*cot(f*x+e))-I*f/d^2/(d*x+c)/(a+I*a*cot(f*x+e))+I*f^2*cos(
-2*e+2*c*f/d)*Si(2*c*f/d+2*f*x)/a/d^3-I*f^2*Ci(2*c*f/d+2*f*x)*sin(-2*e+2*c
*f/d)/a/d^3+f^2*Si(2*c*f/d+2*f*x)*sin(-2*e+2*c*f/d)/a/d^3
```

3.21.2 Mathematica [A] (verified)

Time = 1.66 (sec) , antiderivative size = 283, normalized size of antiderivative = 1.25

$$\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx$$
$$= \frac{\left(\cos\left(e+f\left(-\frac{c}{d}+x\right)\right)+i\sin\left(e+f\left(-\frac{c}{d}+x\right)\right)\right)\left(4f^2(c+dx)^2\,\text{CosIntegral}\left(\frac{2f(c+dx)}{d}\right)\left(\cos\left(e-\frac{f(c+dx)}{d}\right)\right.\right.}{}$$

input
```
Integrate[1/((c + d*x)^3*(a + I*a*Cot[e + f*x])),x]
```

output
```
((Cos[e + f*(-(c/d) + x)] + I*Sin[e + f*(-(c/d) + x)])*(4*f^2*(c + d*x)^2*
CosIntegral[(2*f*(c + d*x))/d]*(Cos[e - (f*(c + d*x))/d] + I*Sin[e - (f*(c
 + d*x))/d]) + I*(d*(I*d*Cos[e + f*(-(c/d) + x)] + ((-I)*d + 2*c*f + 2*d*f
*x)*Cos[e + f*(c/d + x)] + d*Sin[e + f*(-(c/d) + x)] + d*Sin[e + f*(c/d +
x)] + (2*I)*c*f*Sin[e + f*(c/d + x)] + (2*I)*d*f*x*Sin[e + f*(c/d + x)]) +
 4*f^2*(c + d*x)^2*(Cos[e - (f*(c + d*x))/d] + I*Sin[e - (f*(c + d*x))/d])
*SinIntegral[(2*f*(c + d*x))/d]))/(4*a*d^3*(c + d*x)^2)
```

3.21.3 Rubi [A] (verified)

Time = 0.91 (sec) , antiderivative size = 224, normalized size of antiderivative = 0.99, number of steps used = 10, number of rules used = 10, $\frac{\text{number of rules}}{\text{integrand size}} = 0.435$, Rules used = {3042, 4208, 3042, 4207, 25, 3042, 3784, 3042, 3780, 3783}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx$$
$$\Big\downarrow \; 3042$$
$$\int \frac{1}{(c+dx)^3\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)}dx$$
$$\Big\downarrow \; 4208$$
$$\frac{if\int \frac{1}{(c+dx)^2(i\cot(e+fx)a+a)}dx}{d}+\frac{if}{2ad^2(c+dx)}-\frac{1}{2d(c+dx)^2(a+ia\cot(e+fx))}$$
$$\Big\downarrow \; 3042$$

$$\frac{if\int \frac{1}{(c+dx)^2\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)}dx}{d}+\frac{if}{2ad^2(c+dx)}-\frac{1}{2d(c+dx)^2(a+ia\cot(e+fx))}$$

$\Big\downarrow$ 4207

$$\frac{if\left(-\frac{f\int -\frac{\sin(2e+2fx)}{c+dx}dx}{ad}+\frac{if\int -\frac{\cos(2e+2fx)}{c+dx}dx}{ad}-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}\right)}{d}+\frac{if}{2ad^2(c+dx)}-\frac{1}{2d(c+dx)^2(a+ia\cot(e+fx))}$$

$\Big\downarrow$ 25

$$\frac{if\left(\frac{f\int \frac{\sin(2e+2fx)}{c+dx}dx}{ad}-\frac{if\int \frac{\cos(2e+2fx)}{c+dx}dx}{ad}-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}\right)}{d}+\frac{if}{2ad^2(c+dx)}-\frac{1}{2d(c+dx)^2(a+ia\cot(e+fx))}$$

$\Big\downarrow$ 3042

$$\frac{if\left(\frac{f\int \frac{\sin(2e+2fx)}{c+dx}dx}{ad}-\frac{if\int \frac{\sin\left(2e+2fx+\frac{\pi}{2}\right)}{c+dx}dx}{ad}-\frac{1}{d(c+dx)(a+ia\cot(e+fx))}\right)}{d}+\frac{if}{2ad^2(c+dx)}-\frac{1}{2d(c+dx)^2(a+ia\cot(e+fx))}$$

$\Big\downarrow$ 3784

$$\frac{if\left(\frac{f\left(\sin\left(2e-\frac{2cf}{d}\right)\int \frac{\cos\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx+\cos\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx\right)}{ad}-\frac{if\left(\cos\left(2e-\frac{2cf}{d}\right)\int \frac{\cos\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx-\sin\left(2e-\frac{2cf}{d}\right)\int \frac{\sin(2xf+}{c+d}\right.}{ad}}{d}$$

$$\frac{if}{2ad^2(c+dx)}-\frac{1}{2d(c+dx)^2(a+ia\cot(e+fx))}$$

$\Big\downarrow$ 3042

$$\frac{if\left(-\frac{if\left(\cos\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx-\sin\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}\right)}{c+dx}dx\right)}{ad}+\frac{f\left(\sin\left(2e-\frac{2cf}{d}\right)\int \frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx+\cos\left(2e-\frac{2cf}{d}\right)\int\right.}{ad}}{d}$$

$$\frac{if}{2ad^2(c+dx)}-\frac{1}{2d(c+dx)^2(a+ia\cot(e+fx))}$$

$\Big\downarrow$ 3780

3.21. $\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx$

$$\frac{if\left(-\frac{if\left(\cos\left(2e-\frac{2cf}{d}\right)\int\frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx-\frac{\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}\right)}{ad}+\frac{f\left(\sin\left(2e-\frac{2cf}{d}\right)\int\frac{\sin\left(2xf+\frac{2cf}{d}+\frac{\pi}{2}\right)}{c+dx}dx+\frac{\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\right.}{d}\right.}{ad}\right.}{d}$$

$$\frac{if}{2ad^2(c+dx)}-\frac{1}{2d(c+dx)^2(a+ia\cot(e+fx))}$$

$$\Big\downarrow \ 3783$$

$$\frac{if\left(\frac{f\left(\frac{\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\sin\left(2e-\frac{2cf}{d}\right)}{d}+\frac{\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}\right)}{ad}-\frac{if\left(\frac{\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\cos\left(2e-\frac{2cf}{d}\right)}{d}-\frac{\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{d}\right)}{ad}\right.}{d}$$

$$\frac{if}{2ad^2(c+dx)}-\frac{1}{2d(c+dx)^2(a+ia\cot(e+fx))}$$

input
```
Int[1/((c + d*x)^3*(a + I*a*Cot[e + f*x])),x]
```

output
```
((I/2)*f)/(a*d^2*(c + d*x)) - 1/(2*d*(c + d*x)^2*(a + I*a*Cot[e + f*x])) +
 (I*f*(-(1/(d*(c + d*x)*(a + I*a*Cot[e + f*x]))) + (f*((CosIntegral[(2*c*f
)/d + 2*f*x]*Sin[2*e - (2*c*f)/d])/d + (Cos[2*e - (2*c*f)/d]*SinIntegral[(
2*c*f)/d + 2*f*x])/d))/(a*d) - (I*f*((Cos[2*e - (2*c*f)/d]*CosIntegral[(2*
c*f)/d + 2*f*x])/d - (Sin[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])
/d))/(a*d)))/d
```

3.21.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 3780
```
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 3783
```
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]
```

rule 3784
```
Int[sin[(e_.) + (f_.)*(x_)]/((c_.) + (d_.)*(x_)), x_Symbol] :> Simp[Cos[(d*
e - c*f)/d]   Int[Sin[c*(f/d) + f*x]/(c + d*x), x], x] + Simp[Sin[(d*e - c*
f)/d]   Int[Cos[c*(f/d) + f*x]/(c + d*x), x], x] /; FreeQ[{c, d, e, f}, x]
&& NeQ[d*e - c*f, 0]
```

rule 4207
```
Int[1/(((c_.) + (d_.)*(x_))^2*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])), x_Sy
mbol] :> -Simp[(d*(c + d*x)*(a + b*Tan[e + f*x]))^(-1), x] + (-Simp[f/(a*d)
   Int[Sin[2*e + 2*f*x]/(c + d*x), x], x] + Simp[f/(b*d)   Int[Cos[2*e + 2*
f*x]/(c + d*x), x], x]) /; FreeQ[{a, b, c, d, e, f}, x] && EqQ[a^2 + b^2, 0
]
```

rule 4208
```
Int[((c_.) + (d_.)*(x_))^(m_)/((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)]), x_Sym
bol] :> Simp[f*((c + d*x)^(m + 2)/(b*d^2*(m + 1)*(m + 2))), x] + (Simp[2*b*
(f/(a*d*(m + 1)))   Int[(c + d*x)^(m + 1)/(a + b*Tan[e + f*x]), x], x] + Si
mp[(c + d*x)^(m + 1)/(d*(m + 1)*(a + b*Tan[e + f*x])), x]) /; FreeQ[{a, b,
c, d, e, f}, x] && EqQ[a^2 + b^2, 0] && LtQ[m, -1] && NeQ[m, -2]
```

3.21.4 Maple [A] (verified)

Time = 0.36 (sec) , antiderivative size = 143, normalized size of antiderivative = 0.63

method	result
risch	$-\frac{1}{4d(dx+c)^2a}-\frac{f^2\mathrm{e}^{2i(fx+e)}}{4a\,d^3\left(ifx+\frac{icf}{d}\right)^2}-\frac{f^2\mathrm{e}^{2i(fx+e)}}{2a\,d^3\left(ifx+\frac{icf}{d}\right)}-\frac{f^2\mathrm{e}^{-\frac{2i(cf-de)}{d}}\,\mathrm{Ei}_1\left(-2ifx-2ie-\frac{2(icf-ide)}{d}\right)}{a\,d^3}$
derivativedivides	$f^2\left(-\frac{i\left(-\frac{\sin(2fx+2e)}{(cf-de+d(fx+e))^2d}+\frac{-\frac{2\cos(2fx+2e)}{(cf-de+d(fx+e))d}-\frac{2\left(\frac{2\,\mathrm{Si}\left(2fx+2e+\frac{2cf-2de}{d}\right)\cos\left(\frac{2cf-2de}{d}\right)}{d}-\frac{2\,\mathrm{Ci}\left(2fx+2e+\frac{2cf-2de}{d}\right)}{d}\right.}{d}}{d}\right.}{4}\right.$
default	$f^2\left(-\frac{i\left(-\frac{\sin(2fx+2e)}{(cf-de+d(fx+e))^2d}+\frac{-\frac{2\cos(2fx+2e)}{(cf-de+d(fx+e))d}-\frac{2\left(\frac{2\,\mathrm{Si}\left(2fx+2e+\frac{2cf-2de}{d}\right)\cos\left(\frac{2cf-2de}{d}\right)}{d}-\frac{2\,\mathrm{Ci}\left(2fx+2e+\frac{2cf-2de}{d}\right)}{d}\right.}{d}}{d}\right.}{4}\right.$

input
```
int(1/(d*x+c)^3/(a+I*a*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
-1/4/d/(d*x+c)^2/a-1/4*f^2/a/d^3*exp(2*I*(f*x+e))/(I*f*x+I/d*c*f)^2-1/2*f^
2/a/d^3*exp(2*I*(f*x+e))/(I*f*x+I/d*c*f)-f^2/a/d^3*exp(-2*I*(c*f-d*e)/d)*E
i(1,-2*I*f*x-2*I*e-2*(I*c*f-I*d*e)/d)
```

3.21.5 Fricas [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 120, normalized size of antiderivative = 0.53

$$\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx$$
$$=\frac{4\left(d^2f^2x^2+2\,cdf^2x+c^2f^2\right)\mathrm{Ei}\left(-\frac{2\left(-i\,dfx-i\,cf\right)}{d}\right)e^{\left(-\frac{2\left(-i\,de+i\,cf\right)}{d}\right)}-d^2+\left(2i\,d^2fx+2i\,cdf+d^2\right)e^{\left(2i\,fx+2i\,e\right)}}{4\left(ad^5x^2+2\,acd^4x+ac^2d^3\right)}$$

input
```
integrate(1/(d*x+c)^3/(a+I*a*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/4*(4*(d^2*f^2*x^2 + 2*c*d*f^2*x + c^2*f^2)*Ei(-2*(-I*d*f*x - I*c*f)/d)*e
^(-2*(-I*d*e + I*c*f)/d) - d^2 + (2*I*d^2*f*x + 2*I*c*d*f + d^2)*e^(2*I*f*
x + 2*I*e))/(a*d^5*x^2 + 2*a*c*d^4*x + a*c^2*d^3)
```

3.21.6 Sympy [F]

$$\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx$$
$$= -\frac{i\int \frac{1}{c^3\cot{(e+fx)}-ic^3+3c^2dx\cot{(e+fx)}-3ic^2dx+3cd^2x^2\cot{(e+fx)}-3icd^2x^2+d^3x^3\cot{(e+fx)}-id^3x^3}\,dx}{a}$$

input
```
integrate(1/(d*x+c)**3/(a+I*a*cot(f*x+e)),x)
```

output
```
-I*Integral(1/(c**3*cot(e + f*x) - I*c**3 + 3*c**2*d*x*cot(e + f*x) - 3*I*
c**2*d*x + 3*c*d**2*x**2*cot(e + f*x) - 3*I*c*d**2*x**2 + d**3*x**3*cot(e
+ f*x) - I*d**3*x**3), x)/a
```

3.21.7 Maxima [A] (verification not implemented)

Time = 0.41 (sec) , antiderivative size = 160, normalized size of antiderivative = 0.70

$$\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx$$
$$= \frac{2\,f^3\cos\left(-\frac{2\,(de-cf)}{d}\right)E_3\left(\frac{2\,(-i\,(fx+e)d+i\,de-i\,cf)}{d}\right)-2i\,f^3E_3\left(\frac{2\,(-i\,(fx+e)d+i\,de-i\,cf)}{d}\right)\sin\left(-\frac{2\,(de-cf)}{d}\right)-f^3}{4\left((fx+e)^2ad^3+ad^3e^2-2\,acd^2ef+ac^2df^2-2\,(ad^3e-acd^2f)(fx+e)\right)f}$$

input
```
integrate(1/(d*x+c)^3/(a+I*a*cot(f*x+e)),x, algorithm="maxima")
```

output
```
1/4*(2*f^3*cos(-2*(d*e - c*f)/d)*exp_integral_e(3, 2*(-I*(f*x + e)*d + I*d
*e - I*c*f)/d) - 2*I*f^3*exp_integral_e(3, 2*(-I*(f*x + e)*d + I*d*e - I*c
*f)/d)*sin(-2*(d*e - c*f)/d) - f^3)/(((f*x + e)^2*a*d^3 + a*d^3*e^2 - 2*a*
c*d^2*e*f + a*c^2*d*f^2 - 2*(a*d^3*e - a*c*d^2*f)*(f*x + e))*f)
```

3.21.8 Giac [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 1558 vs. 2(210) = 420.

Time = 0.30 (sec) , antiderivative size = 1558, normalized size of antiderivative = 6.86

$$\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx = \text{Too large to display}$$

input
```
integrate(1/(d*x+c)^3/(a+I*a*cot(f*x+e)),x, algorithm="giac")
```

output
```
1/4*(4*d^2*f^2*x^2*cos(e)^2*cos(2*c*f/d)*cos_integral(2*(d*f*x + c*f)/d) +
 8*I*d^2*f^2*x^2*cos(e)*cos(2*c*f/d)*cos_integral(2*(d*f*x + c*f)/d)*sin(e
) - 4*d^2*f^2*x^2*cos(2*c*f/d)*cos_integral(2*(d*f*x + c*f)/d)*sin(e)^2 -
4*I*d^2*f^2*x^2*cos(e)^2*cos_integral(2*(d*f*x + c*f)/d)*sin(2*c*f/d) + 8*
d^2*f^2*x^2*cos(e)*cos_integral(2*(d*f*x + c*f)/d)*sin(e)*sin(2*c*f/d) + 4
*I*d^2*f^2*x^2*cos_integral(2*(d*f*x + c*f)/d)*sin(e)^2*sin(2*c*f/d) + 4*I
*d^2*f^2*x^2*cos(e)^2*cos(2*c*f/d)*sin_integral(2*(d*f*x + c*f)/d) - 8*d^2
*f^2*x^2*cos(e)*cos(2*c*f/d)*sin(e)*sin_integral(2*(d*f*x + c*f)/d) - 4*I*
d^2*f^2*x^2*cos(2*c*f/d)*sin(e)^2*sin_integral(2*(d*f*x + c*f)/d) + 4*d^2*
f^2*x^2*cos(e)^2*sin(2*c*f/d)*sin_integral(2*(d*f*x + c*f)/d) + 8*I*d^2*f^
2*x^2*cos(e)*sin(e)*sin(2*c*f/d)*sin_integral(2*(d*f*x + c*f)/d) - 4*d^2*f
^2*x^2*sin(e)^2*sin(2*c*f/d)*sin_integral(2*(d*f*x + c*f)/d) + 8*c*d*f^2*x
*cos(e)^2*cos(2*c*f/d)*cos_integral(2*(d*f*x + c*f)/d) + 16*I*c*d*f^2*x*co
s(e)*cos(2*c*f/d)*cos_integral(2*(d*f*x + c*f)/d)*sin(e) - 8*c*d*f^2*x*cos
(2*c*f/d)*cos_integral(2*(d*f*x + c*f)/d)*sin(e)^2 - 8*I*c*d*f^2*x*cos(e)^
2*cos_integral(2*(d*f*x + c*f)/d)*sin(2*c*f/d) + 16*c*d*f^2*x*cos(e)*cos_i
ntegral(2*(d*f*x + c*f)/d)*sin(e)*sin(2*c*f/d) + 8*I*c*d*f^2*x*cos_integra
l(2*(d*f*x + c*f)/d)*sin(e)^2*sin(2*c*f/d) + 8*I*c*d*f^2*x*cos(e)^2*cos(2*
c*f/d)*sin_integral(2*(d*f*x + c*f)/d) - 16*c*d*f^2*x*cos(e)*cos(2*c*f/d)*
sin(e)*sin_integral(2*(d*f*x + c*f)/d) - 8*I*c*d*f^2*x*cos(2*c*f/d)*sin...
```

3.21.9 Mupad [F(-1)]

Timed out.

$$\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx = \int \frac{1}{(a+a\cot(e+f\,x)\ 1\mathrm{i})\ (c+d\,x)^3}\,dx$$

input
```
int(1/((a + a*cot(e + f*x)*1i)*(c + d*x)^3),x)
```

output
```
int(1/((a + a*cot(e + f*x)*1i)*(c + d*x)^3), x)
```

3.21. $\int \frac{1}{(c+dx)^3(a+ia\cot(e+fx))}\,dx$

3.22 $\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^2}\,dx$

3.22.1 Optimal result

Integrand size = 23, antiderivative size = 270

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^2}\,dx = \frac{3d^3e^{2ie+2ifx}}{16a^2f^4} - \frac{3d^3e^{4ie+4ifx}}{512a^2f^4} - \frac{3id^2e^{2ie+2ifx}(c+dx)}{8a^2f^3} + \frac{3id^2e^{4ie+4ifx}(c+dx)}{128a^2f^3} - \frac{3de^{2ie+2ifx}(c+dx)^2}{8a^2f^2} + \frac{3de^{4ie+4ifx}(c+dx)^2}{64a^2f^2} + \frac{ie^{2ie+2ifx}(c+dx)^3}{4a^2f} - \frac{ie^{4ie+4ifx}(c+dx)^3}{16a^2f} + \frac{(c+dx)^4}{16a^2d}$$

output
```
3/16*d^3*exp(2*I*e+2*I*f*x)/a^2/f^4-3/512*d^3*exp(4*I*e+4*I*f*x)/a^2/f^4-3
/8*I*d^2*exp(2*I*e+2*I*f*x)*(d*x+c)/a^2/f^3+3/128*I*d^2*exp(4*I*e+4*I*f*x)
*(d*x+c)/a^2/f^3-3/8*d*exp(2*I*e+2*I*f*x)*(d*x+c)^2/a^2/f^2+3/64*d*exp(4*I
*e+4*I*f*x)*(d*x+c)^2/a^2/f^2+1/4*I*exp(2*I*e+2*I*f*x)*(d*x+c)^3/a^2/f-1/1
6*I*exp(4*I*e+4*I*f*x)*(d*x+c)^3/a^2/f+1/16*(d*x+c)^4/a^2/d
```

3.22.2 Mathematica [A] (verified)

Time = 2.17 (sec) , antiderivative size = 362, normalized size of antiderivative = 1.34

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^2}\,dx = \frac{(\cos(2(e+fx))+i\sin(2(e+fx)))\left((32c^3f^3(-i+4fx)+24c^2df^2(1-4ifx+8f^2x^2)+4cd^2f(3i+12fx\right.}{}$$

input
```
Integrate[(c + d*x)^3/(a + I*a*Cot[e + f*x])^2,x]
```

output
```
((Cos[2*(e + f*x)] + I*Sin[2*(e + f*x)])*((32*c^3*f^3*(-I + 4*f*x) + 24*c^
2*d*f^2*(1 - (4*I)*f*x + 8*f^2*x^2) + 4*c*d^2*f*(3*I + 12*f*x - (24*I)*f^2
*x^2 + 32*f^3*x^3) + d^3*(-3 + (12*I)*f*x + 24*f^2*x^2 - (32*I)*f^3*x^3 +
32*f^4*x^4))*Cos[2*(e + f*x)] - I*(-32*(4*c^3*f^3 + 6*c^2*d*f^2*(I + 2*f*x
) + 6*c*d^2*f*(-1 + (2*I)*f*x + 2*f^2*x^2) + d^3*(-3*I - 6*f*x + (6*I)*f^2
*x^2 + 4*f^3*x^3)) + (32*c^3*f^3*(I + 4*f*x) + 24*c^2*d*f^2*(-1 + (4*I)*f*
x + 8*f^2*x^2) + 4*c*d^2*f*(-3*I - 12*f*x + (24*I)*f^2*x^2 + 32*f^3*x^3) +
 d^3*(3 - (12*I)*f*x - 24*f^2*x^2 + (32*I)*f^3*x^3 + 32*f^4*x^4))*Sin[2*(e
 + f*x)])))/(512*a^2*f^4)
```

3.22.3 Rubi [A] (verified)

Time = 0.50 (sec) , antiderivative size = 270, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.130$, Rules used = {3042, 4212, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^2}\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{(c+dx)^3}{\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$

$$\Big\downarrow \text{4212}$$

$$\int \left(-\frac{(c+dx)^3e^{2ie+2ifx}}{2a^2}+\frac{(c+dx)^3e^{4ie+4ifx}}{4a^2}+\frac{(c+dx)^3}{4a^2}\right)dx$$

$$\downarrow 2009$$

$$-\frac{3id^2(c+dx)e^{2ie+2ifx}}{8a^2f^3}+\frac{3id^2(c+dx)e^{4ie+4ifx}}{128a^2f^3}-\frac{3d(c+dx)^2e^{2ie+2ifx}}{8a^2f^2}+\frac{3d(c+dx)^2e^{4ie+4ifx}}{64a^2f^2}+\frac{i(c+dx)^3e^{2ie+2ifx}}{4a^2f}-\frac{i(c+dx)^3e^{4ie+4ifx}}{16a^2f}+\frac{(c+dx)^4}{16a^2d}+\frac{3d^3e^{2ie+2ifx}}{16a^2f^4}-\frac{3d^3e^{4ie+4ifx}}{512a^2f^4}$$

input
```
Int[(c + d*x)^3/(a + I*a*Cot[e + f*x])^2,x]
```

output
```
(3*d^3*E^((2*I)*e + (2*I)*f*x))/(16*a^2*f^4) - (3*d^3*E^((4*I)*e + (4*I)*f
*x))/(512*a^2*f^4) - (((3*I)/8)*d^2*E^((2*I)*e + (2*I)*f*x)*(c + d*x))/(a^
2*f^3) + (((3*I)/128)*d^2*E^((4*I)*e + (4*I)*f*x)*(c + d*x))/(a^2*f^3) - (
3*d*E^((2*I)*e + (2*I)*f*x)*(c + d*x)^2)/(8*a^2*f^2) + (3*d*E^((4*I)*e + (
4*I)*f*x)*(c + d*x)^2)/(64*a^2*f^2) + ((I/4)*E^((2*I)*e + (2*I)*f*x)*(c +
d*x)^3)/(a^2*f) - ((I/16)*E^((4*I)*e + (4*I)*f*x)*(c + d*x)^3)/(a^2*f) + (
c + d*x)^4/(16*a^2*d)
```

3.22.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4212
```
Int[((c_.) + (d_.)*(x_))^(m_)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(2*a) + E^(2*(a/b)*(e + f*
x))/(2*a))^(-n), x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && EqQ[a^2 + b^2
, 0] && ILtQ[n, 0]
```

3.22.4 Maple [A] (verified)

Time = 0.70 (sec) , antiderivative size = 283, normalized size of antiderivative = 1.05

method	result
risch	$\frac{d^3x^4}{16a^2}+\frac{d^2c\,x^3}{4a^2}+\frac{3d\,c^2x^2}{8a^2}+\frac{c^3x}{4a^2}+\frac{c^4}{16a^2d}-\frac{i(32d^3x^3f^3+96c\,d^2f^3x^2+24id^3f^2x^2+96c^2d\,f^3x+48ic\,d^2f^2x+32c^3f^3+24}{512a^2f^4}$
parallelrisch	$\frac{-120f\left(-\frac{4\left(\frac{dx}{2}+c\right)\left(\frac{1}{2}d^2x^2+cdx+c^2\right)f^3}{15}+id\left(\frac{1}{3}d^2x^2+cdx+c^2\right)f^2-\frac{9\left(\frac{dx}{2}+c\right)d^2f}{10}-\frac{17id^3}{40}\right)x\tan(fx+e)^2+\left(64i\left(\frac{dx}{2}+c\right)\left(\frac{1}{2}d^2x^2+\right.\right.}{}$

input
```
int((d*x+c)^3/(a+I*a*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
1/16/a^2*d^3*x^4+1/4/a^2*d^2*c*x^3+3/8/a^2*d*c^2*x^2+1/4/a^2*c^3*x+1/16/a^
2/d*c^4-1/512*I*(32*d^3*x^3*f^3+24*I*d^3*f^2*x^2+96*c*d^2*f^3*x^2+48*I*c*d
^2*f^2*x+96*c^2*d*f^3*x+24*I*c^2*d*f^2+32*c^3*f^3-12*d^3*f*x-3*I*d^3-12*c*
d^2*f)/a^2/f^4*exp(4*I*(f*x+e))+1/16*I*(4*d^3*x^3*f^3+6*I*d^3*f^2*x^2+12*c
*d^2*f^3*x^2+12*I*c*d^2*f^2*x+12*c^2*d*f^3*x+6*I*c^2*d*f^2+4*c^3*f^3-6*d^3
*f*x-3*I*d^3-6*c*d^2*f)/a^2/f^4*exp(2*I*(f*x+e))
```

3.22.5 Fricas [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 257, normalized size of antiderivative = 0.95

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^2}\,dx$$
$$=\frac{32\,d^3f^4x^4+128\,cd^2f^4x^3+192\,c^2df^4x^2+128\,c^3f^4x+(-32i\,d^3f^3x^3-32i\,c^3f^3+24\,c^2df^2+12i\,cd^2f-3\,}{}$$

input
```
integrate((d*x+c)^3/(a+I*a*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
1/512*(32*d^3*f^4*x^4 + 128*c*d^2*f^4*x^3 + 192*c^2*d*f^4*x^2 + 128*c^3*f^
4*x + (-32*I*d^3*f^3*x^3 - 32*I*c^3*f^3 + 24*c^2*d*f^2 + 12*I*c*d^2*f - 3*
d^3 - 24*(4*I*c*d^2*f^3 - d^3*f^2)*x^2 - 12*(8*I*c^2*d*f^3 - 4*c*d^2*f^2 -
 I*d^3*f)*x)*e^(4*I*f*x + 4*I*e) - 32*(-4*I*d^3*f^3*x^3 - 4*I*c^3*f^3 + 6*
c^2*d*f^2 + 6*I*c*d^2*f - 3*d^3 + 6*(-2*I*c*d^2*f^3 + d^3*f^2)*x^2 + 6*(-2
*I*c^2*d*f^3 + 2*c*d^2*f^2 + I*d^3*f)*x)*e^(2*I*f*x + 2*I*e))/(a^2*f^4)
```

3.22.6 Sympy [A] (verification not implemented)

Time = 0.31 (sec) , antiderivative size = 651, normalized size of antiderivative = 2.41

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^2}\,dx$$
$$=\begin{cases} \frac{(2048ia^2c^3f^7e^{2ie}+6144ia^2c^2df^7xe^{2ie}-3072a^2c^2df^6e^{2ie}+6144ia^2cd^2f^7x^2e^{2ie}-6144a^2cd^2f^6xe^{2ie}-3072ia^2cd^2f^5e^{2ie}+2048ia^2d^3f^7x^3e^{2ie}-\cdots}{\cdots} \\ \frac{x^4(d^3e^{4ie}-2d^3e^{2ie})}{16a^2}+\frac{x^3(cd^2e^{4ie}-2cd^2e^{2ie})}{4a^2}+\frac{x^2\cdot(3c^2de^{4ie}-6c^2de^{2ie})}{8a^2}+\frac{x(c^3e^{4ie}-2c^3e^{2ie})}{4a^2} \end{cases}$$
$$+\frac{c^3x}{4a^2}+\frac{3c^2dx^2}{8a^2}+\frac{cd^2x^3}{4a^2}+\frac{d^3x^4}{16a^2}$$

input
```
integrate((d*x+c)**3/(a+I*a*cot(f*x+e))**2,x)
```

output
```
Piecewise((((2048*I*a**2*c**3*f**7*exp(2*I*e) + 6144*I*a**2*c**2*d*f**7*x*
exp(2*I*e) - 3072*a**2*c**2*d*f**6*exp(2*I*e) + 6144*I*a**2*c*d**2*f**7*x*
*2*exp(2*I*e) - 6144*a**2*c*d**2*f**6*x*exp(2*I*e) - 3072*I*a**2*c*d**2*f*
*5*exp(2*I*e) + 2048*I*a**2*d**3*f**7*x**3*exp(2*I*e) - 3072*a**2*d**3*f**
6*x**2*exp(2*I*e) - 3072*I*a**2*d**3*f**5*x*exp(2*I*e) + 1536*a**2*d**3*f*
*4*exp(2*I*e))*exp(2*I*f*x) + (-512*I*a**2*c**3*f**7*exp(4*I*e) - 1536*I*a
**2*c**2*d*f**7*x*exp(4*I*e) + 384*a**2*c**2*d*f**6*exp(4*I*e) - 1536*I*a*
*2*c*d**2*f**7*x**2*exp(4*I*e) + 768*a**2*c*d**2*f**6*x*exp(4*I*e) + 192*I
*a**2*c*d**2*f**5*exp(4*I*e) - 512*I*a**2*d**3*f**7*x**3*exp(4*I*e) + 384*
a**2*d**3*f**6*x**2*exp(4*I*e) + 192*I*a**2*d**3*f**5*x*exp(4*I*e) - 48*a*
*2*d**3*f**4*exp(4*I*e))*exp(4*I*f*x))/(8192*a**4*f**8), Ne(a**4*f**8, 0))
, (x**4*(d**3*exp(4*I*e) - 2*d**3*exp(2*I*e))/(16*a**2) + x**3*(c*d**2*exp
(4*I*e) - 2*c*d**2*exp(2*I*e))/(4*a**2) + x**2*(3*c**2*d*exp(4*I*e) - 6*c*
*2*d*exp(2*I*e))/(8*a**2) + x*(c**3*exp(4*I*e) - 2*c**3*exp(2*I*e))/(4*a**
2), True)) + c**3*x/(4*a**2) + 3*c**2*d*x**2/(8*a**2) + c*d**2*x**3/(4*a**
2) + d**3*x**4/(16*a**2)
```

3.22.7 Maxima [F(-2)]

Exception generated.

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^2}\,dx = \text{Exception raised: RuntimeError}$$

input
```
integrate((d*x+c)^3/(a+I*a*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
Exception raised: RuntimeError >> ECL says: expt: undefined: 0 to a negati
ve exponent.
```

3.22.8 Giac [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 413 vs. $2(204) = 408$.

Time = 0.32 (sec) , antiderivative size = 413, normalized size of antiderivative = 1.53

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^2}\,dx$$
$$= \frac{32\,d^3f^4x^4 + 128\,cd^2f^4x^3 - 32i\,d^3f^3x^3e^{(4i\,fx+4i\,e)} + 128i\,d^3f^3x^3e^{(2i\,fx+2i\,e)} + 192\,c^2df^4x^2 - 96i\,cd^2f^3x^2e^{(4i\,f}}{}$$

input
```
integrate((d*x+c)^3/(a+I*a*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
1/512*(32*d^3*f^4*x^4 + 128*c*d^2*f^4*x^3 - 32*I*d^3*f^3*x^3*e^(4*I*f*x +
4*I*e) + 128*I*d^3*f^3*x^3*e^(2*I*f*x + 2*I*e) + 192*c^2*d*f^4*x^2 - 96*I*
c*d^2*f^3*x^2*e^(4*I*f*x + 4*I*e) + 384*I*c*d^2*f^3*x^2*e^(2*I*f*x + 2*I*e
) + 128*c^3*f^4*x - 96*I*c^2*d*f^3*x*e^(4*I*f*x + 4*I*e) + 24*d^3*f^2*x^2*
e^(4*I*f*x + 4*I*e) + 384*I*c^2*d*f^3*x*e^(2*I*f*x + 2*I*e) - 192*d^3*f^2*
x^2*e^(2*I*f*x + 2*I*e) - 32*I*c^3*f^3*e^(4*I*f*x + 4*I*e) + 48*c*d^2*f^2*
x*e^(4*I*f*x + 4*I*e) + 128*I*c^3*f^3*e^(2*I*f*x + 2*I*e) - 384*c*d^2*f^2*
x*e^(2*I*f*x + 2*I*e) + 24*c^2*d*f^2*e^(4*I*f*x + 4*I*e) + 12*I*d^3*f*x*e^
(4*I*f*x + 4*I*e) - 192*c^2*d*f^2*e^(2*I*f*x + 2*I*e) - 192*I*d^3*f*x*e^(2
*I*f*x + 2*I*e) + 12*I*c*d^2*f*e^(4*I*f*x + 4*I*e) - 192*I*c*d^2*f*e^(2*I*
f*x + 2*I*e) - 3*d^3*e^(4*I*f*x + 4*I*e) + 96*d^3*e^(2*I*f*x + 2*I*e))/(a^
2*f^4)
```

3.22.9 Mupad [B] (verification not implemented)

Time = 0.92 (sec) , antiderivative size = 294, normalized size of antiderivative = 1.09

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^2}\,dx = \mathrm{e}^{e\,2\mathrm{i}+f\,x\,2\mathrm{i}}\left(-\frac{\left(-4\,c^3\,f^3-c^2\,d\,f^2\,6\mathrm{i}+6\,c\,d^2\,f+d^3\,3\mathrm{i}\right)\,1\mathrm{i}}{16\,a^2\,f^4}+\frac{d^3\,x^3\,1\mathrm{i}}{4\,a^2\,f}+\frac{d\,x\,\left(2\,c^2\,f^2+c\,d\,f\,2\mathrm{i}-d^2\right)\,3\mathrm{i}}{8\,a^2\,f^3}+\frac{d^2\,x^2\,\left(2\,c\,f+d\,1\mathrm{i}\right)\,3\mathrm{i}}{8\,a^2\,f^2}\right)-\mathrm{e}^{e\,4\mathrm{i}+f\,x\,4\mathrm{i}}\left(-\frac{\left(-32\,c^3\,f^3-c^2\,d\,f^2\,24\mathrm{i}+12\,c\,d^2\,f+d^3\,3\mathrm{i}\right)\,1\mathrm{i}}{512\,a^2\,f^4}+\frac{d^3\,x^3\,1\mathrm{i}}{16\,a^2\,f}+\frac{d\,x\,\left(8\,c^2\,f^2+c\,d\,f\,4\mathrm{i}-d^2\right)\,3\mathrm{i}}{128\,a^2\,f^3}+\frac{d^2\,x^2\,\left(4\,c\,f+d\,1\mathrm{i}\right)\,3\mathrm{i}}{64\,a^2\,f^2}\right)+\frac{c^3\,x}{4\,a^2}+\frac{d^3\,x^4}{16\,a^2}+\frac{3\,c^2\,d\,x^2}{8\,a^2}+\frac{c\,d^2\,x^3}{4\,a^2}$$

input
```
int((c + d*x)^3/(a + a*cot(e + f*x)*1i)^2,x)
```

output
```
exp(e*2i + f*x*2i)*((d^3*x^3*1i)/(4*a^2*f) - ((d^3*3i - 4*c^3*f^3 - c^2*d*
f^2*6i + 6*c*d^2*f)*1i)/(16*a^2*f^4) + (d*x*(2*c^2*f^2 - d^2 + c*d*f*2i)*3
i)/(8*a^2*f^3) + (d^2*x^2*(d*1i + 2*c*f)*3i)/(8*a^2*f^2)) - exp(e*4i + f*x
*4i)*((d^3*x^3*1i)/(16*a^2*f) - ((d^3*3i - 32*c^3*f^3 - c^2*d*f^2*24i + 12
*c*d^2*f)*1i)/(512*a^2*f^4) + (d*x*(8*c^2*f^2 - d^2 + c*d*f*4i)*3i)/(128*a
^2*f^3) + (d^2*x^2*(d*1i + 4*c*f)*3i)/(64*a^2*f^2)) + (c^3*x)/(4*a^2) + (d
^3*x^4)/(16*a^2) + (3*c^2*d*x^2)/(8*a^2) + (c*d^2*x^3)/(4*a^2)
```

3.23 $\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^2}\,dx$

3.23.1 Optimal result

Integrand size = 23, antiderivative size = 202

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^2}\,dx = -\frac{id^2e^{2ie+2ifx}}{8a^2f^3} + \frac{id^2e^{4ie+4ifx}}{128a^2f^3} - \frac{de^{2ie+2ifx}(c+dx)}{4a^2f^2} + \frac{de^{4ie+4ifx}(c+dx)}{32a^2f^2} + \frac{ie^{2ie+2ifx}(c+dx)^2}{4a^2f} - \frac{ie^{4ie+4ifx}(c+dx)^2}{16a^2f} + \frac{(c+dx)^3}{12a^2d}$$

output
```
-1/8*I*d^2*exp(2*I*e+2*I*f*x)/a^2/f^3+1/128*I*d^2*exp(4*I*e+4*I*f*x)/a^2/f
^3-1/4*d*exp(2*I*e+2*I*f*x)*(d*x+c)/a^2/f^2+1/32*d*exp(4*I*e+4*I*f*x)*(d*x
+c)/a^2/f^2+1/4*I*exp(2*I*e+2*I*f*x)*(d*x+c)^2/a^2/f-1/16*I*exp(4*I*e+4*I*
f*x)*(d*x+c)^2/a^2/f+1/12*(d*x+c)^3/a^2/d
```

3.23.2 Mathematica [A] (verified)

Time = 1.00 (sec) , antiderivative size = 255, normalized size of antiderivative = 1.26

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^2}\,dx = \frac{32f^3x(3c^2+3cdx+d^2x^2)+48((1+i)cf+d(-1+(1+i)fx))((1+i)cf+d(i+(1+i)fx))\cos(2fx)(c}{}$$

input
```
Integrate[(c + d*x)^2/(a + I*a*Cot[e + f*x])^2,x]
```

output
```
(32*f^3*x*(3*c^2 + 3*c*d*x + d^2*x^2) + 48*((1 + I)*c*f + d*(-1 + (1 + I)*
f*x))*((1 + I)*c*f + d*(I + (1 + I)*f*x))*Cos[2*f*x]*(Cos[2*e] + I*Sin[2*e
]) - 3*((2 + 2*I)*c*f + d*(-1 + (2 + 2*I)*f*x))*((2 + 2*I)*c*f + d*(I + (2
 + 2*I)*f*x))*Cos[4*f*x]*(Cos[4*e] + I*Sin[4*e]) + (48*I)*((1 + I)*c*f + d
*(-1 + (1 + I)*f*x))*((1 + I)*c*f + d*(I + (1 + I)*f*x))*(Cos[2*e] + I*Sin
[2*e])*Sin[2*f*x] - 3*(d - (2 + 2*I)*c*f - (2 + 2*I)*d*f*x)*(d + (2 - 2*I)
*c*f + (2 - 2*I)*d*f*x)*(Cos[4*e] + I*Sin[4*e])*Sin[4*f*x])/(384*a^2*f^3)
```

3.23.3 Rubi [A] (verified)

Time = 0.41 (sec) , antiderivative size = 202, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.130, Rules used = {3042, 4212, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^2}dx$$
$$\Big\downarrow \text{3042}$$
$$\int \frac{(c+dx)^2}{\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$
$$\Big\downarrow \text{4212}$$
$$\int \left(-\frac{(c+dx)^2e^{2ie+2ifx}}{2a^2}+\frac{(c+dx)^2e^{4ie+4ifx}}{4a^2}+\frac{(c+dx)^2}{4a^2}\right)dx$$
$$\Big\downarrow \text{2009}$$
$$-\frac{d(c+dx)e^{2ie+2ifx}}{4a^2f^2}+\frac{d(c+dx)e^{4ie+4ifx}}{32a^2f^2}+\frac{i(c+dx)^2e^{2ie+2ifx}}{4a^2f}-\frac{i(c+dx)^2e^{4ie+4ifx}}{16a^2f}+\frac{(c+dx)^3}{12a^2d}-\frac{id^2e^{2ie+2ifx}}{8a^2f^3}+\frac{id^2e^{4ie+4ifx}}{128a^2f^3}$$

input
```
Int[(c + d*x)^2/(a + I*a*Cot[e + f*x])^2,x]
```

output
```
((-1/8*I)*d^2*E^((2*I)*e + (2*I)*f*x))/(a^2*f^3) + ((I/128)*d^2*E^((4*I)*e
 + (4*I)*f*x))/(a^2*f^3) - (d*E^((2*I)*e + (2*I)*f*x)*(c + d*x))/(4*a^2*f^
2) + (d*E^((4*I)*e + (4*I)*f*x)*(c + d*x))/(32*a^2*f^2) + ((I/4)*E^((2*I)*
e + (2*I)*f*x)*(c + d*x)^2)/(a^2*f) - ((I/16)*E^((4*I)*e + (4*I)*f*x)*(c +
 d*x)^2)/(a^2*f) + (c + d*x)^3/(12*a^2*d)
```

3.23.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4212
```
Int[((c_.) + (d_.)*(x_))^(m_)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(2*a) + E^(2*(a/b)*(e + f*
x))/(2*a))^(-n), x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && EqQ[a^2 + b^2
, 0] && ILtQ[n, 0]
```

3.23.4 Maple [A] (verified)

Time = 0.69 (sec) , antiderivative size = 173, normalized size of antiderivative = 0.86

method	result
risch	$\frac{d^{2} x^{3}}{12 a^{2}}+\frac{d c \,x^{2}}{4 a^{2}}+\frac{c^{2} x}{4 a^{2}}+\frac{c^{3}}{12 a^{2} d}-\frac{i \left(8 d^{2} x^{2} f^{2}+16 c d \,f^{2} x +4 i d^{2} f x +8 c^{2} f^{2}+4 i c d f -d^{2}\right) {\mathrm e}^{4 i \left(f x +e \right)}}{128 a^{2} f^{3}}+\frac{i \left(2 d^{2} x^{2} f^{2}+4 c d \,f^{2} x +2\right)}{}$
parallelrisch	$\frac{-60 \left(\left(-\frac{2}{15} d^{2} x^{2}-\frac{2}{5} c d x -\frac{2}{5} c^{2}\right) f^{2}+i \left(\frac{d x}{2}+c \right) d f -\frac{9 d^{2}}{20}\right) f x \tan \left(f x +e \right)^{2}+\left(48 i \left(\frac{1}{3} d^{2} x^{2}+c d x +c^{2}\right) x \,f^{3}+\left(-12 d^{2} x^{2}-24 c d x -72 c^{2}\right) f\right)}{96 f^{3} a^{2} \left(-1+2 i \tan \left(f\right)\right)}$

input
```
int((d*x+c)^2/(a+I*a*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
1/12/a^2*d^2*x^3+1/4/a^2*d*c*x^2+1/4/a^2*c^2*x+1/12/a^2/d*c^3-1/128*I*(8*d
^2*x^2*f^2+4*I*d^2*f*x+16*c*d*f^2*x+4*I*c*d*f+8*c^2*f^2-d^2)/a^2/f^3*exp(4
*I*(f*x+e))+1/8*I*(2*d^2*x^2*f^2+2*I*d^2*f*x+4*c*d*f^2*x+2*I*c*d*f+2*c^2*f
^2-d^2)/a^2/f^3*exp(2*I*(f*x+e))
```

3.23.5 Fricas [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 154, normalized size of antiderivative = 0.76

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^2}\,dx$$
$$= \frac{32\,d^2f^3x^3 + 96\,cdf^3x^2 + 96\,c^2f^3x - 3\,(8i\,d^2f^2x^2 + 8i\,c^2f^2 - 4\,cdf - i\,d^2 + 4\,(4i\,cdf^2 - d^2f)x)e^{(4i\,fx+4i\,e)} -}{384\,a^2f^3}$$

input
```
integrate((d*x+c)^2/(a+I*a*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
1/384*(32*d^2*f^3*x^3 + 96*c*d*f^3*x^2 + 96*c^2*f^3*x - 3*(8*I*d^2*f^2*x^2
 + 8*I*c^2*f^2 - 4*c*d*f - I*d^2 + 4*(4*I*c*d*f^2 - d^2*f)*x)*e^(4*I*f*x +
 4*I*e) - 48*(-2*I*d^2*f^2*x^2 - 2*I*c^2*f^2 + 2*c*d*f + I*d^2 + 2*(-2*I*c
*d*f^2 + d^2*f)*x)*e^(2*I*f*x + 2*I*e))/(a^2*f^3)
```

3.23.6 Sympy [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 405, normalized size of antiderivative = 2.00

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^2}\,dx$$
$$= \begin{cases} \frac{(256ia^2c^2f^5e^{2ie}+512ia^2cdf^5xe^{2ie}-256a^2cdf^4e^{2ie}+256ia^2d^2f^5x^2e^{2ie}-256a^2d^2f^4xe^{2ie}-128ia^2d^2f^3e^{2ie})e^{2ifx}+(-64ia^2c^2f^5e^{4ie}-128ia^2cd}{1024a^4f^6} \\ \frac{x^3(d^2e^{4ie}-2d^2e^{2ie})}{12a^2} + \frac{x^2(cde^{4ie}-2cde^{2ie})}{4a^2} + \frac{x(c^2e^{4ie}-2c^2e^{2ie})}{4a^2} \end{cases}$$
$$+ \frac{c^2x}{4a^2} + \frac{cdx^2}{4a^2} + \frac{d^2x^3}{12a^2}$$

input
```
integrate((d*x+c)**2/(a+I*a*cot(f*x+e))**2,x)
```

output
```
Piecewise((((256*I*a**2*c**2*f**5*exp(2*I*e) + 512*I*a**2*c*d*f**5*x*exp(2
*I*e) - 256*a**2*c*d*f**4*exp(2*I*e) + 256*I*a**2*d**2*f**5*x**2*exp(2*I*e
) - 256*a**2*d**2*f**4*x*exp(2*I*e) - 128*I*a**2*d**2*f**3*exp(2*I*e))*exp
(2*I*f*x) + (-64*I*a**2*c**2*f**5*exp(4*I*e) - 128*I*a**2*c*d*f**5*x*exp(4
*I*e) + 32*a**2*c*d*f**4*exp(4*I*e) - 64*I*a**2*d**2*f**5*x**2*exp(4*I*e)
+ 32*a**2*d**2*f**4*x*exp(4*I*e) + 8*I*a**2*d**2*f**3*exp(4*I*e))*exp(4*I*
f*x))/(1024*a**4*f**6), Ne(a**4*f**6, 0)), (x**3*(d**2*exp(4*I*e) - 2*d**2
*exp(2*I*e))/(12*a**2) + x**2*(c*d*exp(4*I*e) - 2*c*d*exp(2*I*e))/(4*a**2)
 + x*(c**2*exp(4*I*e) - 2*c**2*exp(2*I*e))/(4*a**2), True)) + c**2*x/(4*a*
*2) + c*d*x**2/(4*a**2) + d**2*x**3/(12*a**2)
```

3.23.7 Maxima [F(-2)]

Exception generated.

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^2}\,dx = \text{Exception raised: RuntimeError}$$

input
```
integrate((d*x+c)^2/(a+I*a*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
Exception raised: RuntimeError >> ECL says: expt: undefined: 0 to a negati
ve exponent.
```

3.23.8 Giac [A] (verification not implemented)

Time = 0.31 (sec) , antiderivative size = 235, normalized size of antiderivative = 1.16

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^2}\,dx = \frac{32\,d^2f^3x^3 + 96\,cdf^3x^2 - 24i\,d^2f^2x^2e^{(4i\,fx+4i\,e)} + 96i\,d^2f^2x^2e^{(2i\,fx+2i\,e)} + 96\,c^2f^3x - 48i\,cdf^2xe^{(4i\,fx+4i\,e)} + }{}$$

input
```
integrate((d*x+c)^2/(a+I*a*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
1/384*(32*d^2*f^3*x^3 + 96*c*d*f^3*x^2 - 24*I*d^2*f^2*x^2*e^(4*I*f*x + 4*I
*e) + 96*I*d^2*f^2*x^2*e^(2*I*f*x + 2*I*e) + 96*c^2*f^3*x - 48*I*c*d*f^2*x
*e^(4*I*f*x + 4*I*e) + 192*I*c*d*f^2*x*e^(2*I*f*x + 2*I*e) - 24*I*c^2*f^2*
e^(4*I*f*x + 4*I*e) + 12*d^2*f*x*e^(4*I*f*x + 4*I*e) + 96*I*c^2*f^2*e^(2*I
*f*x + 2*I*e) - 96*d^2*f*x*e^(2*I*f*x + 2*I*e) + 12*c*d*f*e^(4*I*f*x + 4*I
*e) - 96*c*d*f*e^(2*I*f*x + 2*I*e) + 3*I*d^2*e^(4*I*f*x + 4*I*e) - 48*I*d^
2*e^(2*I*f*x + 2*I*e))/(a^2*f^3)
```

3.23.9 Mupad [B] (verification not implemented)

Time = 0.60 (sec) , antiderivative size = 186, normalized size of antiderivative = 0.92

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^2}\,dx = \mathrm{e}^{e\,2\mathrm{i}+f\,x\,2\mathrm{i}}\left(\frac{\left(2\,c^2\,f^2+c\,d\,f\,2\mathrm{i}-d^2\right)\,1\mathrm{i}}{8\,a^2\,f^3}+\frac{d^2\,x^2\,1\mathrm{i}}{4\,a^2\,f}+\frac{d\,x\,\left(2\,c\,f+d\,1\mathrm{i}\right)\,1\mathrm{i}}{4\,a^2\,f^2}\right)-\mathrm{e}^{e\,4\mathrm{i}+f\,x\,4\mathrm{i}}\left(\frac{\left(8\,c^2\,f^2+c\,d\,f\,4\mathrm{i}-d^2\right)\,1\mathrm{i}}{128\,a^2\,f^3}+\frac{d^2\,x^2\,1\mathrm{i}}{16\,a^2\,f}+\frac{d\,x\,\left(4\,c\,f+d\,1\mathrm{i}\right)\,1\mathrm{i}}{32\,a^2\,f^2}\right)+\frac{c^2\,x}{4\,a^2}+\frac{d^2\,x^3}{12\,a^2}+\frac{c\,d\,x^2}{4\,a^2}$$

input
```
int((c + d*x)^2/(a + a*cot(e + f*x)*1i)^2,x)
```

output
```
exp(e*2i + f*x*2i)*(((2*c^2*f^2 - d^2 + c*d*f*2i)*1i)/(8*a^2*f^3) + (d^2*x
^2*1i)/(4*a^2*f) + (d*x*(d*1i + 2*c*f)*1i)/(4*a^2*f^2)) - exp(e*4i + f*x*4
i)*(((8*c^2*f^2 - d^2 + c*d*f*4i)*1i)/(128*a^2*f^3) + (d^2*x^2*1i)/(16*a^2
*f) + (d*x*(d*1i + 4*c*f)*1i)/(32*a^2*f^2)) + (c^2*x)/(4*a^2) + (d^2*x^3)/
(12*a^2) + (c*d*x^2)/(4*a^2)
```

3.24 $\int \frac{c+dx}{(a+ia\cot(e+fx))^2}\,dx$

3.24.1 Optimal result

Integrand size = 21, antiderivative size = 151

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^2}\,dx = \frac{3idx}{16a^2f}-\frac{dx^2}{8a^2}+\frac{x(c+dx)}{4a^2}+\frac{d}{16f^2(a+ia\cot(e+fx))^2}-\frac{i(c+dx)}{4f(a+ia\cot(e+fx))^2}+\frac{3d}{16f^2\left(a^2+ia^2\cot(e+fx)\right)}-\frac{i(c+dx)}{4f\left(a^2+ia^2\cot(e+fx)\right)}$$

output
```
3/16*I*d*x/a^2/f-1/8*d*x^2/a^2+1/4*x*(d*x+c)/a^2+1/16*d/f^2/(a+I*a*cot(f*x
+e))^2-1/4*I*(d*x+c)/f/(a+I*a*cot(f*x+e))^2+3/16*d/f^2/(a^2+I*a^2*cot(f*x+
e))-1/4*I*(d*x+c)/f/(a^2+I*a^2*cot(f*x+e))
```

3.24.2 Mathematica [A] (verified)

Time = 1.15 (sec) , antiderivative size = 165, normalized size of antiderivative = 1.09

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^2}\,dx = \frac{-8de^2+16cef+16cf^2x+8df^2x^2+8i(2cf+d(i+2fx))\cos(2(e+fx))+(d-4icf-4idfx)\cos(4(e+$$

input
```
Integrate[(c + d*x)/(a + I*a*Cot[e + f*x])^2,x]
```

output
```
(-8*d*e^2 + 16*c*e*f + 16*c*f^2*x + 8*d*f^2*x^2 + (8*I)*(2*c*f + d*(I + 2*
f*x))*Cos[2*(e + f*x)] + (d - (4*I)*c*f - (4*I)*d*f*x)*Cos[4*(e + f*x)] -
(8*I)*d*Sin[2*(e + f*x)] - 16*c*f*Sin[2*(e + f*x)] - 16*d*f*x*Sin[2*(e + f
*x)] + I*d*Sin[4*(e + f*x)] + 4*c*f*Sin[4*(e + f*x)] + 4*d*f*x*Sin[4*(e +
f*x)])/(64*a^2*f^2)
```

3.24.3 Rubi [A] (verified)

Time = 0.37 (sec) , antiderivative size = 151, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.143$, Rules used = {3042, 4213, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^2}dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int \frac{c+dx}{\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$

$$\Big\downarrow \text{ 4213}$$

$$-d\int \left(\frac{x}{4a^2}-\frac{i}{4f\left(i\cot(e+fx)a^2+a^2\right)}-\frac{i}{4f(i\cot(e+fx)a+a)^2}\right)dx-\frac{i(c+dx)}{4f\left(a^2+ia^2\cot(e+fx)\right)}+\frac{x(c+dx)}{4a^2}-\frac{i(c+dx)}{4f(a+ia\cot(e+fx))^2}$$

$$\Big\downarrow \text{ 2009}$$

$$-\frac{i(c+dx)}{4f\left(a^2+ia^2\cot(e+fx)\right)}+\frac{x(c+dx)}{4a^2}-d\left(-\frac{3}{16f^2\left(a^2+ia^2\cot(e+fx)\right)}-\frac{3ix}{16a^2f}+\frac{x^2}{8a^2}-\frac{1}{16f^2(a+ia\cot(e+fx))^2}\right)-\frac{i(c+dx)}{4f(a+ia\cot(e+fx))^2}$$

input
```
Int[(c + d*x)/(a + I*a*Cot[e + f*x])^2,x]
```

output
```
(x*(c + d*x))/(4*a^2) - ((I/4)*(c + d*x))/(f*(a + I*a*Cot[e + f*x])^2) - (
(I/4)*(c + d*x))/(f*(a^2 + I*a^2*Cot[e + f*x])) - d*((((-3*I)/16)*x)/(a^2*
f) + x^2/(8*a^2) - 1/(16*f^2*(a + I*a*Cot[e + f*x])^2) - 3/(16*f^2*(a^2 +
I*a^2*Cot[e + f*x])))
```

3.24.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4213
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
 x_Symbol] :> With[{u = IntHide[(a + b*Tan[e + f*x])^n, x]}, Simp[(c + d*x)
^m   u, x] - Simp[d*m   Int[(c + d*x)^(m - 1)   u, x], x]] /; FreeQ[{a, b,
c, d, e, f}, x] && EqQ[a^2 + b^2, 0] && ILtQ[n, -1] && GtQ[m, 0]
```

3.24.4 Maple [A] (verified)

Time = 0.64 (sec) , antiderivative size = 82, normalized size of antiderivative = 0.54

method	result
risch	$\frac{d\,x^2}{8a^2}+\frac{xc}{4a^2}-\frac{i(4dfx+4cf+id)\mathrm{e}^{4i(fx+e)}}{64a^2f^2}+\frac{i(2dfx+2cf+id)\mathrm{e}^{2i(fx+e)}}{8a^2f^2}$
parallelrisch	$\frac{\left(\left(2d\,x^2+4xc\right)f^2-5idfx\right)\tan(fx+e)^2+\left(8i\left(\frac{dx}{2}+c\right)x\,f^2+(-2dx-12c)f-5id\right)\tan(fx+e)+\left(-2d\,x^2-4xc\right)f^2+(-3idx-8ic)f+}{16f^2a^2\left(-1+2i\tan(fx+e)+\tan(fx+e)^2\right)}$

input
```
int((d*x+c)/(a+I*a*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
1/8*d*x^2/a^2+1/4/a^2*x*c-1/64*I*(4*d*f*x+I*d+4*c*f)/a^2/f^2*exp(4*I*(f*x+
e))+1/8*I*(2*d*f*x+I*d+2*c*f)/a^2/f^2*exp(2*I*(f*x+e))
```

3.24.5 Fricas [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 68, normalized size of antiderivative = 0.45

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^2}\,dx = \frac{8\,df^2x^2+16\,cf^2x+(-4i\,dfx-4i\,cf+d)e^{(4i\,fx+4i\,e)}-8\,(-2i\,dfx-2i\,cf+d)e^{(2i\,fx+2i\,e)}}{64\,a^2f^2}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
1/64*(8*d*f^2*x^2 + 16*c*f^2*x + (-4*I*d*f*x - 4*I*c*f + d)*e^(4*I*f*x + 4
*I*e) - 8*(-2*I*d*f*x - 2*I*c*f + d)*e^(2*I*f*x + 2*I*e))/(a^2*f^2)
```

3.24.6 Sympy [A] (verification not implemented)

Time = 0.20 (sec) , antiderivative size = 212, normalized size of antiderivative = 1.40

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^2}\,dx = \begin{cases} \frac{(128ia^2cf^3e^{2ie}+128ia^2df^3xe^{2ie}-64a^2df^2e^{2ie})e^{2ifx}+(-32ia^2cf^3e^{4ie}-32ia^2df^3xe^{4ie}+8a^2df^2e^{4ie})e^{4ifx}}{512a^4f^4} & \text{for } a^4f^4\neq 0 \\ \frac{x^2(de^{4ie}-2de^{2ie})}{8a^2}+\frac{x(ce^{4ie}-2ce^{2ie})}{4a^2} & \text{otherwise} \end{cases} + \frac{cx}{4a^2}+\frac{dx^2}{8a^2}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e))**2,x)
```

output
```
Piecewise((((128*I*a**2*c*f**3*exp(2*I*e) + 128*I*a**2*d*f**3*x*exp(2*I*e)
 - 64*a**2*d*f**2*exp(2*I*e))*exp(2*I*f*x) + (-32*I*a**2*c*f**3*exp(4*I*e)
 - 32*I*a**2*d*f**3*x*exp(4*I*e) + 8*a**2*d*f**2*exp(4*I*e))*exp(4*I*f*x))
/(512*a**4*f**4), Ne(a**4*f**4, 0)), (x**2*(d*exp(4*I*e) - 2*d*exp(2*I*e))
/(8*a**2) + x*(c*exp(4*I*e) - 2*c*exp(2*I*e))/(4*a**2), True)) + c*x/(4*a*
*2) + d*x**2/(8*a**2)
```

3.24.7 Maxima [F(-2)]

Exception generated.

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^2}\,dx = \text{Exception raised: RuntimeError}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
Exception raised: RuntimeError >> ECL says: expt: undefined: 0 to a negati
ve exponent.
```

3.24.8 Giac [A] (verification not implemented)

Time = 0.29 (sec) , antiderivative size = 102, normalized size of antiderivative = 0.68

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^2}\,dx = \frac{8\,df^2x^2 + 16\,cf^2x - 4i\,dfxe^{(4i\,fx+4i\,e)} + 16i\,dfxe^{(2i\,fx+2i\,e)} - 4i\,cfe^{(4i\,fx+4i\,e)} + 16i\,cfe^{(2i\,fx+2i\,e)} + de^{(4i\,fx+4}}{64\,a^2f^2}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
1/64*(8*d*f^2*x^2 + 16*c*f^2*x - 4*I*d*f*x*e^(4*I*f*x + 4*I*e) + 16*I*d*f*
x*e^(2*I*f*x + 2*I*e) - 4*I*c*f*e^(4*I*f*x + 4*I*e) + 16*I*c*f*e^(2*I*f*x
+ 2*I*e) + d*e^(4*I*f*x + 4*I*e) - 8*d*e^(2*I*f*x + 2*I*e))/(a^2*f^2)
```

3.24.9 Mupad [B] (verification not implemented)

Time = 0.35 (sec) , antiderivative size = 102, normalized size of antiderivative = 0.68

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^2}\,dx = \mathrm{e}^{e\,2\mathrm{i}+f\,x\,2\mathrm{i}}\left(\frac{(2\,c\,f+d\,1\mathrm{i})\,1\mathrm{i}}{8\,a^2\,f^2}+\frac{d\,x\,1\mathrm{i}}{4\,a^2\,f}\right) - \mathrm{e}^{e\,4\mathrm{i}+f\,x\,4\mathrm{i}}\left(\frac{(4\,c\,f+d\,1\mathrm{i})\,1\mathrm{i}}{64\,a^2\,f^2}+\frac{d\,x\,1\mathrm{i}}{16\,a^2\,f}\right)+\frac{d\,x^2}{8\,a^2}+\frac{c\,x}{4\,a^2}$$

input
```
int((c + d*x)/(a + a*cot(e + f*x)*1i)^2,x)
```

output
```
exp(e*2i + f*x*2i)*(((d*1i + 2*c*f)*1i)/(8*a^2*f^2) + (d*x*1i)/(4*a^2*f))
- exp(e*4i + f*x*4i)*(((d*1i + 4*c*f)*1i)/(64*a^2*f^2) + (d*x*1i)/(16*a^2*
f)) + (d*x^2)/(8*a^2) + (c*x)/(4*a^2)
```

3.24. $\int \frac{c+dx}{(a+ia\cot(e+fx))^2}\,dx$

3.25 $\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^2}\,dx$

3.25.1 Optimal result

Integrand size = 23, antiderivative size = 305

$$\begin{aligned}\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^2}\,dx = &-\frac{\cos\left(2e-\frac{2cf}{d}\right)\operatorname{CosIntegral}\left(\frac{2cf}{d}+2fx\right)}{2a^2d}\\
&+\frac{\cos\left(4e-\frac{4cf}{d}\right)\operatorname{CosIntegral}\left(\frac{4cf}{d}+4fx\right)}{4a^2d}\\
&+\frac{\log(c+dx)}{4a^2d}\\
&+\frac{i\operatorname{CosIntegral}\left(\frac{4cf}{d}+4fx\right)\sin\left(4e-\frac{4cf}{d}\right)}{4a^2d}\\
&-\frac{i\operatorname{CosIntegral}\left(\frac{2cf}{d}+2fx\right)\sin\left(2e-\frac{2cf}{d}\right)}{2a^2d}\\
&-\frac{i\cos\left(2e-\frac{2cf}{d}\right)\operatorname{Si}\left(\frac{2cf}{d}+2fx\right)}{2a^2d}\\
&+\frac{\sin\left(2e-\frac{2cf}{d}\right)\operatorname{Si}\left(\frac{2cf}{d}+2fx\right)}{2a^2d}\\
&+\frac{i\cos\left(4e-\frac{4cf}{d}\right)\operatorname{Si}\left(\frac{4cf}{d}+4fx\right)}{4a^2d}\\
&-\frac{\sin\left(4e-\frac{4cf}{d}\right)\operatorname{Si}\left(\frac{4cf}{d}+4fx\right)}{4a^2d}\end{aligned}$$

output
```
1/4*Ci(4*c*f/d+4*f*x)*cos(-4*e+4*c*f/d)/a^2/d-1/2*Ci(2*c*f/d+2*f*x)*cos(-2
*e+2*c*f/d)/a^2/d+1/4*ln(d*x+c)/a^2/d-1/2*I*cos(-2*e+2*c*f/d)*Si(2*c*f/d+2
*f*x)/a^2/d+1/4*I*cos(-4*e+4*c*f/d)*Si(4*c*f/d+4*f*x)/a^2/d-1/4*I*Ci(4*c*f
/d+4*f*x)*sin(-4*e+4*c*f/d)/a^2/d+1/4*Si(4*c*f/d+4*f*x)*sin(-4*e+4*c*f/d)/
a^2/d+1/2*I*Ci(2*c*f/d+2*f*x)*sin(-2*e+2*c*f/d)/a^2/d-1/2*Si(2*c*f/d+2*f*x
)*sin(-2*e+2*c*f/d)/a^2/d
```

3.25.2 Mathematica [A] (verified)

Time = 0.76 (sec) , antiderivative size = 136, normalized size of antiderivative = 0.45

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^2}\,dx$$
$$= \frac{\log(c+dx)-2\left(\cos\left(2e-\frac{2cf}{d}\right)+i\sin\left(2e-\frac{2cf}{d}\right)\right)\left(\text{CosIntegral}\left(\frac{2f(c+dx)}{d}\right)+i\text{Si}\left(\frac{2f(c+dx)}{d}\right)\right)+\left(\cos\left(4e-\right.\right.}{4a^2d}$$

input
```
Integrate[1/((c + d*x)*(a + I*a*Cot[e + f*x])^2),x]
```

output
```
(Log[c + d*x] - 2*(Cos[2*e - (2*c*f)/d] + I*Sin[2*e - (2*c*f)/d])*(CosInte
gral[(2*f*(c + d*x))/d] + I*SinIntegral[(2*f*(c + d*x))/d]) + (Cos[4*e - (
4*c*f)/d] + I*Sin[4*e - (4*c*f)/d])*(CosIntegral[(4*f*(c + d*x))/d] + I*Si
nIntegral[(4*f*(c + d*x))/d]))/(4*a^2*d)
```

3.25.3 Rubi [A] (verified)

Time = 0.98 (sec) , antiderivative size = 305, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.130, Rules used = {3042, 4211, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^2}\,dx$$
$$\Big\downarrow \; 3042$$
$$\int \frac{1}{(c+dx)\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$

$$\Big\downarrow \text{4211}$$

$$\int \left(-\frac{\sin^2(2e+2fx)}{4a^2(c+dx)}-\frac{i\sin(2e+2fx)}{2a^2(c+dx)}+\frac{i\sin(4e+4fx)}{4a^2(c+dx)}+\frac{\cos^2(2e+2fx)}{4a^2(c+dx)}-\frac{\cos(2e+2fx)}{2a^2(c+dx)}+\frac{1}{4a^2(c+dx)}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{i\,\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\sin\left(2e-\frac{2cf}{d}\right)}{2a^2d}+\frac{i\,\text{CosIntegral}\left(4xf+\frac{4cf}{d}\right)\sin\left(4e-\frac{4cf}{d}\right)}{4a^2d}-\frac{\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\cos\left(2e-\frac{2cf}{d}\right)}{2a^2d}+\frac{\text{CosIntegral}\left(4xf+\frac{4cf}{d}\right)\cos\left(4e-\frac{4cf}{d}\right)}{4a^2d}+\frac{\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{2a^2d}-\frac{\sin\left(4e-\frac{4cf}{d}\right)\text{Si}\left(4xf+\frac{4cf}{d}\right)}{4a^2d}-\frac{i\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{2a^2d}+\frac{i\cos\left(4e-\frac{4cf}{d}\right)\text{Si}\left(4xf+\frac{4cf}{d}\right)}{4a^2d}+\frac{\log(c+dx)}{4a^2d}$$

input
```
Int[1/((c + d*x)*(a + I*a*Cot[e + f*x])^2),x]
```

output
```
-1/2*(Cos[2*e - (2*c*f)/d]*CosIntegral[(2*c*f)/d + 2*f*x])/(a^2*d) + (Cos[
4*e - (4*c*f)/d]*CosIntegral[(4*c*f)/d + 4*f*x])/(4*a^2*d) + Log[c + d*x]/
(4*a^2*d) + ((I/4)*CosIntegral[(4*c*f)/d + 4*f*x]*Sin[4*e - (4*c*f)/d])/(a
^2*d) - ((I/2)*CosIntegral[(2*c*f)/d + 2*f*x]*Sin[2*e - (2*c*f)/d])/(a^2*d
) - ((I/2)*Cos[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/(a^2*d) +
(Sin[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/(2*a^2*d) + ((I/4)*C
os[4*e - (4*c*f)/d]*SinIntegral[(4*c*f)/d + 4*f*x])/(a^2*d) - (Sin[4*e - (
4*c*f)/d]*SinIntegral[(4*c*f)/d + 4*f*x])/(4*a^2*d)
```

3.25.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4211
```
Int[((c_.) + (d_.)*(x_))^(m_)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(2*a) + Cos[2*e + 2*f*x]/(
2*a) + Sin[2*e + 2*f*x]/(2*b))^(-n), x], x] /; FreeQ[{a, b, c, d, e, f}, x]
 && EqQ[a^2 + b^2, 0] && ILtQ[m, 0] && ILtQ[n, 0]
```

3.25.4 Maple [A] (verified)

Time = 0.71 (sec) , antiderivative size = 118, normalized size of antiderivative = 0.39

method	result	size
risch	$\frac{\ln(dx+c)}{4a^2d}+\frac{\mathrm{e}^{-\frac{2i(cf-de)}{d}}\mathrm{Ei}_1\left(-2ifx-2ie-\frac{2(icf-ide)}{d}\right)}{2a^2d}-\frac{\mathrm{e}^{-\frac{4i(cf-de)}{d}}\mathrm{Ei}_1\left(-4ifx-4ie-\frac{4(icf-ide)}{d}\right)}{4a^2d}$	118

input
```
int(1/(d*x+c)/(a+I*a*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
1/4*ln(d*x+c)/a^2/d+1/2/a^2/d*exp(-2*I*(c*f-d*e)/d)*Ei(1,-2*I*f*x-2*I*e-2*
(I*c*f-I*d*e)/d)-1/4/a^2/d*exp(-4*I*(c*f-d*e)/d)*Ei(1,-4*I*f*x-4*I*e-4*(I*
c*f-I*d*e)/d)
```

3.25.5 Fricas [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 87, normalized size of antiderivative = 0.29

$$\int\frac{1}{(c+dx)(a+ia\cot(e+fx))^2}\,dx = -\frac{2\,\mathrm{Ei}\left(-\frac{2\,(-i\,dfx-i\,cf)}{d}\right)e^{\left(-\frac{2\,(-i\,de+i\,cf)}{d}\right)}-\mathrm{Ei}\left(-\frac{4\,(-i\,dfx-i\,cf)}{d}\right)e^{\left(-\frac{4\,(-i\,de+i\,cf)}{d}\right)}-\log\left(\frac{dx+c}{d}\right)}{4\,a^2d}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
-1/4*(2*Ei(-2*(-I*d*f*x - I*c*f)/d)*e^(-2*(-I*d*e + I*c*f)/d) - Ei(-4*(-I*
d*f*x - I*c*f)/d)*e^(-4*(-I*d*e + I*c*f)/d) - log((d*x + c)/d))/(a^2*d)
```

3.25.6 Sympy [F]

$$\int\frac{1}{(c+dx)(a+ia\cot(e+fx))^2}\,dx = -\frac{\int\frac{1}{c\cot^2(e+fx)-2ic\cot(e+fx)-c+dx\cot^2(e+fx)-2idx\cot(e+fx)-dx}\,dx}{a^2}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e))**2,x)
```

output
```
-Integral(1/(c*cot(e + f*x)**2 - 2*I*c*cot(e + f*x) - c + d*x*cot(e + f*x)
**2 - 2*I*d*x*cot(e + f*x) - d*x), x)/a**2
```

3.25.7 Maxima [A] (verification not implemented)

Time = 0.39 (sec) , antiderivative size = 194, normalized size of antiderivative = 0.64

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^2}\,dx =$$
$$-\frac{f\cos\left(-\frac{4\,(de-cf)}{d}\right)E_1\left(\frac{4\,(-i\,(fx+e)d+i\,de-i\,cf)}{d}\right) - 2\,f\cos\left(-\frac{2\,(de-cf)}{d}\right)E_1\left(\frac{2\,(-i\,(fx+e)d+i\,de-i\,cf)}{d}\right) + 2i\,fE_1\left(2\right.}{}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
-1/4*(f*cos(-4*(d*e - c*f)/d)*exp_integral_e(1, 4*(-I*(f*x + e)*d + I*d*e
- I*c*f)/d) - 2*f*cos(-2*(d*e - c*f)/d)*exp_integral_e(1, 2*(-I*(f*x + e)*
d + I*d*e - I*c*f)/d) + 2*I*f*exp_integral_e(1, 2*(-I*(f*x + e)*d + I*d*e
- I*c*f)/d)*sin(-2*(d*e - c*f)/d) - I*f*exp_integral_e(1, 4*(-I*(f*x + e)*
d + I*d*e - I*c*f)/d)*sin(-4*(d*e - c*f)/d) - f*log((f*x + e)*d - d*e + c*
f))/(a^2*d*f)
```

3.25.8 Giac [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 939 vs. 2(279) = 558.

Time = 0.30 (sec) , antiderivative size = 939, normalized size of antiderivative = 3.08

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^2}\,dx = \text{Too large to display}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
1/4*(cos(e)^4*cos(4*c*f/d)*cos_integral(4*(d*f*x + c*f)/d) + 4*I*cos(e)^3*
cos(4*c*f/d)*cos_integral(4*(d*f*x + c*f)/d)*sin(e) - 6*cos(e)^2*cos(4*c*f
/d)*cos_integral(4*(d*f*x + c*f)/d)*sin(e)^2 - 4*I*cos(e)*cos(4*c*f/d)*cos
_integral(4*(d*f*x + c*f)/d)*sin(e)^3 + cos(4*c*f/d)*cos_integral(4*(d*f*x
 + c*f)/d)*sin(e)^4 - I*cos(e)^4*cos_integral(4*(d*f*x + c*f)/d)*sin(4*c*f
/d) + 4*cos(e)^3*cos_integral(4*(d*f*x + c*f)/d)*sin(e)*sin(4*c*f/d) + 6*I
*cos(e)^2*cos_integral(4*(d*f*x + c*f)/d)*sin(e)^2*sin(4*c*f/d) - 4*cos(e)
*cos_integral(4*(d*f*x + c*f)/d)*sin(e)^3*sin(4*c*f/d) - I*cos_integral(4*
(d*f*x + c*f)/d)*sin(e)^4*sin(4*c*f/d) + I*cos(e)^4*cos(4*c*f/d)*sin_integ
ral(4*(d*f*x + c*f)/d) - 4*cos(e)^3*cos(4*c*f/d)*sin(e)*sin_integral(4*(d*
f*x + c*f)/d) - 6*I*cos(e)^2*cos(4*c*f/d)*sin(e)^2*sin_integral(4*(d*f*x +
 c*f)/d) + 4*cos(e)*cos(4*c*f/d)*sin(e)^3*sin_integral(4*(d*f*x + c*f)/d)
+ I*cos(4*c*f/d)*sin(e)^4*sin_integral(4*(d*f*x + c*f)/d) + cos(e)^4*sin(4
*c*f/d)*sin_integral(4*(d*f*x + c*f)/d) + 4*I*cos(e)^3*sin(e)*sin(4*c*f/d)
*sin_integral(4*(d*f*x + c*f)/d) - 6*cos(e)^2*sin(e)^2*sin(4*c*f/d)*sin_in
tegral(4*(d*f*x + c*f)/d) - 4*I*cos(e)*sin(e)^3*sin(4*c*f/d)*sin_integral(
4*(d*f*x + c*f)/d) + sin(e)^4*sin(4*c*f/d)*sin_integral(4*(d*f*x + c*f)/d)
 - 2*cos(e)^2*cos(2*c*f/d)*cos_integral(2*(d*f*x + c*f)/d) - 4*I*cos(e)*co
s(2*c*f/d)*cos_integral(2*(d*f*x + c*f)/d)*sin(e) + 2*cos(2*c*f/d)*cos_int
egral(2*(d*f*x + c*f)/d)*sin(e)^2 + 2*I*cos(e)^2*cos_integral(2*(d*f*x ...
```

3.25.9 Mupad [F(-1)]

Timed out.

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^2}\,dx = \int \frac{1}{\left(a+a\cot\left(e+f\,x\right)\,1\mathrm{i}\right)^2\,\left(c+d\,x\right)}\,dx$$

input
```
int(1/((a + a*cot(e + f*x)*1i)^2*(c + d*x)),x)
```

output
```
int(1/((a + a*cot(e + f*x)*1i)^2*(c + d*x)), x)
```

3.26 $\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx$

3.26.1 Optimal result

Integrand size = 23, antiderivative size = 434

$$\begin{aligned}\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx &= -\frac{1}{4a^2d(c+dx)}+\frac{\cos(2e+2fx)}{2a^2d(c+dx)}-\frac{\cos^2(2e+2fx)}{4a^2d(c+dx)}\\
&\quad-\frac{if\cos\left(2e-\frac{2cf}{d}\right)\operatorname{CosIntegral}\left(\frac{2cf}{d}+2fx\right)}{a^2d^2}\\
&\quad+\frac{if\cos\left(4e-\frac{4cf}{d}\right)\operatorname{CosIntegral}\left(\frac{4cf}{d}+4fx\right)}{a^2d^2}\\
&\quad-\frac{f\operatorname{CosIntegral}\left(\frac{4cf}{d}+4fx\right)\sin\left(4e-\frac{4cf}{d}\right)}{a^2d^2}\\
&\quad+\frac{f\operatorname{CosIntegral}\left(\frac{2cf}{d}+2fx\right)\sin\left(2e-\frac{2cf}{d}\right)}{a^2d^2}\\
&\quad+\frac{i\sin(2e+2fx)}{2a^2d(c+dx)}+\frac{\sin^2(2e+2fx)}{4a^2d(c+dx)}\\
&\quad-\frac{i\sin(4e+4fx)}{4a^2d(c+dx)}+\frac{f\cos\left(2e-\frac{2cf}{d}\right)\operatorname{Si}\left(\frac{2cf}{d}+2fx\right)}{a^2d^2}\\
&\quad+\frac{if\sin\left(2e-\frac{2cf}{d}\right)\operatorname{Si}\left(\frac{2cf}{d}+2fx\right)}{a^2d^2}\\
&\quad-\frac{f\cos\left(4e-\frac{4cf}{d}\right)\operatorname{Si}\left(\frac{4cf}{d}+4fx\right)}{a^2d^2}\\
&\quad-\frac{if\sin\left(4e-\frac{4cf}{d}\right)\operatorname{Si}\left(\frac{4cf}{d}+4fx\right)}{a^2d^2}\end{aligned}$$

output
```
-1/4/a^2/d/(d*x+c)+I*f*Ci(4*c*f/d+4*f*x)*cos(-4*e+4*c*f/d)/a^2/d^2-I*f*Ci(
2*c*f/d+2*f*x)*cos(-2*e+2*c*f/d)/a^2/d^2+1/2*cos(2*f*x+2*e)/a^2/d/(d*x+c)-
1/4*cos(2*f*x+2*e)^2/a^2/d/(d*x+c)+f*cos(-2*e+2*c*f/d)*Si(2*c*f/d+2*f*x)/a
^2/d^2-f*cos(-4*e+4*c*f/d)*Si(4*c*f/d+4*f*x)/a^2/d^2+f*Ci(4*c*f/d+4*f*x)*s
in(-4*e+4*c*f/d)/a^2/d^2+I*f*Si(4*c*f/d+4*f*x)*sin(-4*e+4*c*f/d)/a^2/d^2-f
*Ci(2*c*f/d+2*f*x)*sin(-2*e+2*c*f/d)/a^2/d^2-I*f*Si(2*c*f/d+2*f*x)*sin(-2*
e+2*c*f/d)/a^2/d^2+1/2*I*sin(2*f*x+2*e)/a^2/d/(d*x+c)+1/4*sin(2*f*x+2*e)^2
/a^2/d/(d*x+c)-1/4*I*sin(4*f*x+4*e)/a^2/d/(d*x+c)
```

3.26.2 Mathematica [A] (verified)

Time = 0.68 (sec) , antiderivative size = 203, normalized size of antiderivative = 0.47

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx$$
$$= \frac{-d+2d(\cos(2(e+fx))+i\sin(2(e+fx)))-d(\cos(4(e+fx))+i\sin(4(e+fx)))+4f(c+dx)\left(-i\cos\right.}{}$$

input
```
Integrate[1/((c + d*x)^2*(a + I*a*Cot[e + f*x])^2),x]
```

output
```
(-d + 2*d*(Cos[2*(e + f*x)] + I*Sin[2*(e + f*x)]) - d*(Cos[4*(e + f*x)] +
I*Sin[4*(e + f*x)]) + 4*f*(c + d*x)*((-I)*Cos[2*e - (2*c*f)/d] + Sin[2*e -
 (2*c*f)/d])*(CosIntegral[(2*f*(c + d*x))/d] + I*SinIntegral[(2*f*(c + d*x
))/d]) + (c + d*x)*((4*I)*f*Cos[4*e - (4*c*f)/d] - 4*f*Sin[4*e - (4*c*f)/d
])*(CosIntegral[(4*f*(c + d*x))/d] + I*SinIntegral[(4*f*(c + d*x))/d]))/(4
*a^2*d^2*(c + d*x))
```

3.26.3 Rubi [A] (verified)

Time = 1.00 (sec) , antiderivative size = 434, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.130, Rules used = {3042, 4211, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx$$

$$\Big\downarrow \ 3042$$

$$\int \frac{1}{(c+dx)^2 \left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$

$$\Big\downarrow \ 4211$$

$$\int \left(-\frac{\sin^2(2e+2fx)}{4a^2(c+dx)^2}-\frac{i\sin(2e+2fx)}{2a^2(c+dx)^2}+\frac{i\sin(4e+4fx)}{4a^2(c+dx)^2}+\frac{\cos^2(2e+2fx)}{4a^2(c+dx)^2}-\frac{\cos(2e+2fx)}{2a^2(c+dx)^2}+\frac{1}{4a^2(c+dx)^2}\right)dx$$

$$\Big\downarrow \ 2009$$

$$-\frac{f\,\text{CosIntegral}\left(4xf+\frac{4cf}{d}\right)\sin\left(4e-\frac{4cf}{d}\right)}{a^2d^2}+\frac{f\,\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\sin\left(2e-\frac{2cf}{d}\right)}{a^2d^2}-\frac{if\,\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\cos\left(2e-\frac{2cf}{d}\right)}{a^2d^2}+\frac{if\,\text{CosIntegral}\left(4xf+\frac{4cf}{d}\right)\cos\left(4e-\frac{4cf}{d}\right)}{a^2d^2}+\frac{if\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{a^2d^2}-\frac{if\sin\left(4e-\frac{4cf}{d}\right)\text{Si}\left(4xf+\frac{4cf}{d}\right)}{a^2d^2}+\frac{f\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{a^2d^2}-\frac{f\cos\left(4e-\frac{4cf}{d}\right)\text{Si}\left(4xf+\frac{4cf}{d}\right)}{a^2d^2}+\frac{\sin^2(2e+2fx)}{4a^2d(c+dx)}+\frac{i\sin(2e+2fx)}{2a^2d(c+dx)}-\frac{i\sin(4e+4fx)}{4a^2d(c+dx)}-\frac{\cos^2(2e+2fx)}{4a^2d(c+dx)}+\frac{\cos(2e+2fx)}{2a^2d(c+dx)}-\frac{1}{4a^2d(c+dx)}$$

input
```
Int[1/((c + d*x)^2*(a + I*a*Cot[e + f*x])^2),x]
```

output
```
-1/4*1/(a^2*d*(c + d*x)) + Cos[2*e + 2*f*x]/(2*a^2*d*(c + d*x)) - Cos[2*e
+ 2*f*x]^2/(4*a^2*d*(c + d*x)) - (I*f*Cos[2*e - (2*c*f)/d]*CosIntegral[(2*
c*f)/d + 2*f*x])/(a^2*d^2) + (I*f*Cos[4*e - (4*c*f)/d]*CosIntegral[(4*c*f)
/d + 4*f*x])/(a^2*d^2) - (f*CosIntegral[(4*c*f)/d + 4*f*x]*Sin[4*e - (4*c*
f)/d])/(a^2*d^2) + (f*CosIntegral[(2*c*f)/d + 2*f*x]*Sin[2*e - (2*c*f)/d])
/(a^2*d^2) + ((I/2)*Sin[2*e + 2*f*x])/(a^2*d*(c + d*x)) + Sin[2*e + 2*f*x]
^2/(4*a^2*d*(c + d*x)) - ((I/4)*Sin[4*e + 4*f*x])/(a^2*d*(c + d*x)) + (f*C
os[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/(a^2*d^2) + (I*f*Sin[2
*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/(a^2*d^2) - (f*Cos[4*e - (
4*c*f)/d]*SinIntegral[(4*c*f)/d + 4*f*x])/(a^2*d^2) - (I*f*Sin[4*e - (4*c*
f)/d]*SinIntegral[(4*c*f)/d + 4*f*x])/(a^2*d^2)
```

3.26. $\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx$

3.26.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4211
```
Int[((c_.) + (d_.)*(x_))^(m_)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(2*a) + Cos[2*e + 2*f*x]/(
2*a) + Sin[2*e + 2*f*x]/(2*b))^(-n), x], x] /; FreeQ[{a, b, c, d, e, f}, x]
 && EqQ[a^2 + b^2, 0] && ILtQ[m, 0] && ILtQ[n, 0]
```

3.26.4 Maple [A] (verified)

Time = 0.82 (sec) , antiderivative size = 193, normalized size of antiderivative = 0.44

method	result
risch	$-\frac{1}{4a^2d(dx+c)}+\frac{if\,\mathrm{e}^{2i(fx+e)}}{2a^2d^2\left(ifx+\frac{icf}{d}\right)}+\frac{if\,\mathrm{e}^{-\frac{2i(cf-de)}{d}}\operatorname{Ei}_1\left(-2ifx-2ie-\frac{2(icf-ide)}{d}\right)}{a^2d^2}-\frac{if\,\mathrm{e}^{4i(fx+e)}}{4a^2d^2\left(ifx+\frac{icf}{d}\right)}-\frac{if\,\mathrm{e}^{-\frac{4i(cf-de)}{d}}\operatorname{Ei}}{}$

input
```
int(1/(d*x+c)^2/(a+I*a*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
-1/4/a^2/d/(d*x+c)+1/2*I/a^2*f/d^2*exp(2*I*(f*x+e))/(I*f*x+I/d*c*f)+I/a^2*
f/d^2*exp(-2*I*(c*f-d*e)/d)*Ei(1,-2*I*f*x-2*I*e-2*(I*c*f-I*d*e)/d)-1/4*I/a
^2*f/d^2*exp(4*I*(f*x+e))/(I*f*x+I/d*c*f)-I/a^2*f/d^2*exp(-4*I*(c*f-d*e)/d
)*Ei(1,-4*I*f*x-4*I*e-4*(I*c*f-I*d*e)/d)
```

3.26.5 Fricas [A] (verification not implemented)

Time = 0.30 (sec) , antiderivative size = 132, normalized size of antiderivative = 0.30

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx =$$
$$-\frac{4\,(i\,dfx+i\,cf)\operatorname{Ei}\left(-\frac{2\,(-i\,dfx-i\,cf)}{d}\right)e^{\left(-\frac{2\,(-i\,de+i\,cf)}{d}\right)}+4\,(-i\,dfx-i\,cf)\operatorname{Ei}\left(-\frac{4\,(-i\,dfx-i\,cf)}{d}\right)e^{\left(-\frac{4\,(-i\,de+i\,cf)}{d}\right)}+}{4\,(a^2d^3x+a^2cd^2)}$$

input
```
integrate(1/(d*x+c)^2/(a+I*a*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
-1/4*(4*(I*d*f*x + I*c*f)*Ei(-2*(-I*d*f*x - I*c*f)/d)*e^(-2*(-I*d*e + I*c*
f)/d) + 4*(-I*d*f*x - I*c*f)*Ei(-4*(-I*d*f*x - I*c*f)/d)*e^(-4*(-I*d*e + I
*c*f)/d) + d*e^(4*I*f*x + 4*I*e) - 2*d*e^(2*I*f*x + 2*I*e) + d)/(a^2*d^3*x
 + a^2*c*d^2)
```

3.26.6 Sympy [F]

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx = -\frac{\int \frac{1}{c^2\cot^2(e+fx)-2ic^2\cot(e+fx)-c^2+2cdx\cot^2(e+fx)-4icdx\cot(e+fx)-2cdx+d^2x^2\cot^2(e+fx)-2id^2x^2\cot(e+fx)-d^2x^2}\,dx}{a^2}$$

input
```
integrate(1/(d*x+c)**2/(a+I*a*cot(f*x+e))**2,x)
```

output
```
-Integral(1/(c**2*cot(e + f*x)**2 - 2*I*c**2*cot(e + f*x) - c**2 + 2*c*d*x
*cot(e + f*x)**2 - 4*I*c*d*x*cot(e + f*x) - 2*c*d*x + d**2*x**2*cot(e + f*
x)**2 - 2*I*d**2*x**2*cot(e + f*x) - d**2*x**2), x)/a**2
```

3.26.7 Maxima [A] (verification not implemented)

Time = 0.44 (sec) , antiderivative size = 211, normalized size of antiderivative = 0.49

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx = -\frac{f^2\cos\left(-\frac{4(de-cf)}{d}\right)E_2\left(\frac{4(-i(fx+e)d+ide-icf)}{d}\right)-2f^2\cos\left(-\frac{2(de-cf)}{d}\right)E_2\left(\frac{2(-i(fx+e)d+ide-icf)}{d}\right)+2if^2E_2}{4((fx+e)a^2d^2-a^2d^2}$$

input
```
integrate(1/(d*x+c)^2/(a+I*a*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
-1/4*(f^2*cos(-4*(d*e - c*f)/d)*exp_integral_e(2, 4*(-I*(f*x + e)*d + I*d*
e - I*c*f)/d) - 2*f^2*cos(-2*(d*e - c*f)/d)*exp_integral_e(2, 2*(-I*(f*x +
 e)*d + I*d*e - I*c*f)/d) + 2*I*f^2*exp_integral_e(2, 2*(-I*(f*x + e)*d +
I*d*e - I*c*f)/d)*sin(-2*(d*e - c*f)/d) - I*f^2*exp_integral_e(2, 4*(-I*(f
*x + e)*d + I*d*e - I*c*f)/d)*sin(-4*(d*e - c*f)/d) + f^2)/(((f*x + e)*a^2
*d^2 - a^2*d^2*e + a^2*c*d*f)*f)
```

3.26.8 Giac [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 2249 vs. $2(410) = 820$.

Time = 1.44 (sec) , antiderivative size = 2249, normalized size of antiderivative = 5.18

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx = \text{Too large to display}$$

input
```
integrate(1/(d*x+c)^2/(a+I*a*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
1/4*(4*I*d*f*x*cos(e)^4*cos(4*c*f/d)*cos_integral(4*(d*f*x + c*f)/d) - 16*
d*f*x*cos(e)^3*cos(4*c*f/d)*cos_integral(4*(d*f*x + c*f)/d)*sin(e) - 24*I*
d*f*x*cos(e)^2*cos(4*c*f/d)*cos_integral(4*(d*f*x + c*f)/d)*sin(e)^2 + 16*
d*f*x*cos(e)*cos(4*c*f/d)*cos_integral(4*(d*f*x + c*f)/d)*sin(e)^3 + 4*I*d
*f*x*cos(4*c*f/d)*cos_integral(4*(d*f*x + c*f)/d)*sin(e)^4 + 4*d*f*x*cos(e
)^4*cos_integral(4*(d*f*x + c*f)/d)*sin(4*c*f/d) + 16*I*d*f*x*cos(e)^3*cos
_integral(4*(d*f*x + c*f)/d)*sin(e)*sin(4*c*f/d) - 24*d*f*x*cos(e)^2*cos_i
ntegral(4*(d*f*x + c*f)/d)*sin(e)^2*sin(4*c*f/d) - 16*I*d*f*x*cos(e)*cos_i
ntegral(4*(d*f*x + c*f)/d)*sin(e)^3*sin(4*c*f/d) + 4*d*f*x*cos_integral(4*
(d*f*x + c*f)/d)*sin(e)^4*sin(4*c*f/d) - 4*d*f*x*cos(e)^4*cos(4*c*f/d)*sin
_integral(4*(d*f*x + c*f)/d) - 16*I*d*f*x*cos(e)^3*cos(4*c*f/d)*sin(e)*sin
_integral(4*(d*f*x + c*f)/d) + 24*d*f*x*cos(e)^2*cos(4*c*f/d)*sin(e)^2*sin
_integral(4*(d*f*x + c*f)/d) + 16*I*d*f*x*cos(e)*cos(4*c*f/d)*sin(e)^3*sin
_integral(4*(d*f*x + c*f)/d) - 4*d*f*x*cos(4*c*f/d)*sin(e)^4*sin_integral(
4*(d*f*x + c*f)/d) + 4*I*d*f*x*cos(e)^4*sin(4*c*f/d)*sin_integral(4*(d*f*x
 + c*f)/d) - 16*d*f*x*cos(e)^3*sin(e)*sin(4*c*f/d)*sin_integral(4*(d*f*x +
 c*f)/d) - 24*I*d*f*x*cos(e)^2*sin(e)^2*sin(4*c*f/d)*sin_integral(4*(d*f*x
 + c*f)/d) + 16*d*f*x*cos(e)*sin(e)^3*sin(4*c*f/d)*sin_integral(4*(d*f*x +
 c*f)/d) + 4*I*d*f*x*sin(e)^4*sin(4*c*f/d)*sin_integral(4*(d*f*x + c*f)/d)
 + 4*I*c*f*cos(e)^4*cos(4*c*f/d)*cos_integral(4*(d*f*x + c*f)/d) - 16*c...
```

3.26.9 Mupad [F(-1)]

Timed out.

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx = \int \frac{1}{\left(a+a\cot\left(e+f\,x\right)\,1\mathrm{i}\right)^2\,\left(c+d\,x\right)^2}\,dx$$

input
```
int(1/((a + a*cot(e + f*x)*1i)^2*(c + d*x)^2),x)
```

output
```
int(1/((a + a*cot(e + f*x)*1i)^2*(c + d*x)^2), x)
```

3.26. $\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^2}\,dx$

3.27 $\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^3}\,dx$

3.27.1 Optimal result

Integrand size = 23, antiderivative size = 396

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^3}\,dx = \frac{9d^3e^{2ie+2ifx}}{64a^3f^4}-\frac{9d^3e^{4ie+4ifx}}{1024a^3f^4}+\frac{d^3e^{6ie+6ifx}}{1728a^3f^4}-\frac{9id^2e^{2ie+2ifx}(c+dx)}{32a^3f^3}+\frac{9id^2e^{4ie+4ifx}(c+dx)}{256a^3f^3}-\frac{id^2e^{6ie+6ifx}(c+dx)}{288a^3f^3}-\frac{9de^{2ie+2ifx}(c+dx)^2}{32a^3f^2}+\frac{9de^{4ie+4ifx}(c+dx)^2}{128a^3f^2}-\frac{de^{6ie+6ifx}(c+dx)^2}{96a^3f^2}+\frac{3ie^{2ie+2ifx}(c+dx)^3}{16a^3f}-\frac{3ie^{4ie+4ifx}(c+dx)^3}{32a^3f}+\frac{ie^{6ie+6ifx}(c+dx)^3}{48a^3f}+\frac{(c+dx)^4}{32a^3d}$$

output
```
9/64*d^3*exp(2*I*e+2*I*f*x)/a^3/f^4-9/1024*d^3*exp(4*I*e+4*I*f*x)/a^3/f^4+
1/1728*d^3*exp(6*I*e+6*I*f*x)/a^3/f^4-9/32*I*d^2*exp(2*I*e+2*I*f*x)*(d*x+c
)/a^3/f^3+9/256*I*d^2*exp(4*I*e+4*I*f*x)*(d*x+c)/a^3/f^3-1/288*I*d^2*exp(6
*I*e+6*I*f*x)*(d*x+c)/a^3/f^3-9/32*d*exp(2*I*e+2*I*f*x)*(d*x+c)^2/a^3/f^2+
9/128*d*exp(4*I*e+4*I*f*x)*(d*x+c)^2/a^3/f^2-1/96*d*exp(6*I*e+6*I*f*x)*(d*
x+c)^2/a^3/f^2+3/16*I*exp(2*I*e+2*I*f*x)*(d*x+c)^3/a^3/f-3/32*I*exp(4*I*e+
4*I*f*x)*(d*x+c)^3/a^3/f+1/48*I*exp(6*I*e+6*I*f*x)*(d*x+c)^3/a^3/f+1/32*(d
*x+c)^4/a^3/d
```

3.27.2 Mathematica [A] (verified)

Time = 3.03 (sec) , antiderivative size = 664, normalized size of antiderivative = 1.68

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^3}\,dx$$
$$= \frac{(\cos(3(e+fx))+i\sin(3(e+fx)))\,(81i(32c^3f^3+24c^2df^2(3i+4fx)+12cd^2f(-7+12ifx+8f^2x^2)+d$$

input
```
Integrate[(c + d*x)^3/(a + I*a*Cot[e + f*x])^3,x]
```

output
```
((Cos[3*(e + f*x)] + I*Sin[3*(e + f*x)])*((81*I)*(32*c^3*f^3 + 24*c^2*d*f^
2*(3*I + 4*f*x) + 12*c*d^2*f*(-7 + (12*I)*f*x + 8*f^2*x^2) + d^3*(-45*I -
84*f*x + (72*I)*f^2*x^2 + 32*f^3*x^3))*Cos[e + f*x] + 16*(36*c^3*f^3*(I +
6*f*x) + 18*c^2*d*f^2*(-1 + (6*I)*f*x + 18*f^2*x^2) + 6*c*d^2*f*(-I - 6*f*
x + (18*I)*f^2*x^2 + 36*f^3*x^3) + d^3*(1 - (6*I)*f*x - 18*f^2*x^2 + (36*I
)*f^3*x^3 + 54*f^4*x^4))*Cos[3*(e + f*x)] - (4131*I)*d^3*Sin[e + f*x] - 87
48*c*d^2*f*Sin[e + f*x] + (9720*I)*c^2*d*f^2*Sin[e + f*x] + 7776*c^3*f^3*S
in[e + f*x] - 8748*d^3*f*x*Sin[e + f*x] + (19440*I)*c*d^2*f^2*x*Sin[e + f*
x] + 23328*c^2*d*f^3*x*Sin[e + f*x] + (9720*I)*d^3*f^2*x^2*Sin[e + f*x] +
23328*c*d^2*f^3*x^2*Sin[e + f*x] + 7776*d^3*f^3*x^3*Sin[e + f*x] + (16*I)*
d^3*Sin[3*(e + f*x)] + 96*c*d^2*f*Sin[3*(e + f*x)] - (288*I)*c^2*d*f^2*Sin
[3*(e + f*x)] - 576*c^3*f^3*Sin[3*(e + f*x)] + 96*d^3*f*x*Sin[3*(e + f*x)]
 - (576*I)*c*d^2*f^2*x*Sin[3*(e + f*x)] - 1728*c^2*d*f^3*x*Sin[3*(e + f*x)
] - (3456*I)*c^3*f^4*x*Sin[3*(e + f*x)] - (288*I)*d^3*f^2*x^2*Sin[3*(e + f
*x)] - 1728*c*d^2*f^3*x^2*Sin[3*(e + f*x)] - (5184*I)*c^2*d*f^4*x^2*Sin[3*
(e + f*x)] - 576*d^3*f^3*x^3*Sin[3*(e + f*x)] - (3456*I)*c*d^2*f^4*x^3*Sin
[3*(e + f*x)] - (864*I)*d^3*f^4*x^4*Sin[3*(e + f*x)]))/(27648*a^3*f^4)
```

3.27.3 Rubi [A] (verified)

Time = 0.63 (sec) , antiderivative size = 396, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.130$, Rules used = {3042, 4212, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^3}\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{(c+dx)^3}{\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3}dx$$

$$\Big\downarrow \text{4212}$$

$$\int \left(-\frac{3(c+dx)^3e^{2ie+2ifx}}{8a^3}+\frac{3(c+dx)^3e^{4ie+4ifx}}{8a^3}-\frac{(c+dx)^3e^{6ie+6ifx}}{8a^3}+\frac{(c+dx)^3}{8a^3}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{9id^2(c+dx)e^{2ie+2ifx}}{32a^3f^3}+\frac{9id^2(c+dx)e^{4ie+4ifx}}{256a^3f^3}-\frac{id^2(c+dx)e^{6ie+6ifx}}{288a^3f^3}-\frac{9d(c+dx)^2e^{2ie+2ifx}}{32a^3f^2}+\frac{9d(c+dx)^2e^{4ie+4ifx}}{128a^3f^2}-\frac{d(c+dx)^2e^{6ie+6ifx}}{96a^3f^2}+\frac{3i(c+dx)^3e^{2ie+2ifx}}{16a^3f}-\frac{3i(c+dx)^3e^{4ie+4ifx}}{32a^3f}+\frac{i(c+dx)^3e^{6ie+6ifx}}{48a^3f}+\frac{(c+dx)^4}{32a^3d}+\frac{9d^3e^{2ie+2ifx}}{64a^3f^4}-\frac{9d^3e^{4ie+4ifx}}{1024a^3f^4}+\frac{d^3e^{6ie+6ifx}}{1728a^3f^4}$$

input
```
Int[(c + d*x)^3/(a + I*a*Cot[e + f*x])^3,x]
```

output
```
(9*d^3*E^((2*I)*e + (2*I)*f*x))/(64*a^3*f^4) - (9*d^3*E^((4*I)*e + (4*I)*f
*x))/(1024*a^3*f^4) + (d^3*E^((6*I)*e + (6*I)*f*x))/(1728*a^3*f^4) - (((9*
I)/32)*d^2*E^((2*I)*e + (2*I)*f*x)*(c + d*x))/(a^3*f^3) + (((9*I)/256)*d^2
*E^((4*I)*e + (4*I)*f*x)*(c + d*x))/(a^3*f^3) - ((I/288)*d^2*E^((6*I)*e +
(6*I)*f*x)*(c + d*x))/(a^3*f^3) - (9*d*E^((2*I)*e + (2*I)*f*x)*(c + d*x)^2
)/(32*a^3*f^2) + (9*d*E^((4*I)*e + (4*I)*f*x)*(c + d*x)^2)/(128*a^3*f^2) -
 (d*E^((6*I)*e + (6*I)*f*x)*(c + d*x)^2)/(96*a^3*f^2) + (((3*I)/16)*E^((2*
I)*e + (2*I)*f*x)*(c + d*x)^3)/(a^3*f) - (((3*I)/32)*E^((4*I)*e + (4*I)*f*
x)*(c + d*x)^3)/(a^3*f) + ((I/48)*E^((6*I)*e + (6*I)*f*x)*(c + d*x)^3)/(a^
3*f) + (c + d*x)^4/(32*a^3*d)
```

3.27.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4212
```
Int[((c_.) + (d_.)*(x_))^(m_)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(2*a) + E^(2*(a/b)*(e + f*
x))/(2*a))^(-n), x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && EqQ[a^2 + b^2
, 0] && ILtQ[n, 0]
```

3.27.4 Maple [A] (verified)

Time = 1.00 (sec) , antiderivative size = 396, normalized size of antiderivative = 1.00

method	result
risch	$\frac{d^3x^4}{32a^3}+\frac{d^2c\,x^3}{8a^3}+\frac{3d\,c^2x^2}{16a^3}+\frac{c^3x}{8a^3}+\frac{c^4}{32a^3d}+\frac{i(36d^3x^3f^3+108c\,d^2f^3x^2+18id^3f^2x^2+108c^2d\,f^3x+36ic\,d^2f^2x+36}{1728a^3f^4}$
parallelrisch	$\frac{-6264\left(-\frac{4\left(\frac{dx}{2}+c\right)\left(\frac{1}{2}d^2x^2+cdx+c^2\right)f^3}{29}+id\left(\frac{1}{3}d^2x^2+cdx+c^2\right)f^2-\frac{139\left(\frac{dx}{2}+c\right)d^2f}{174}-\frac{737id^3}{2088}\right)fx\tan(fx+e)^3+\left(2592i\left(\frac{dx}{2}\right.\right.}{}$
derivativedivides	Expression too large to display
default	Expression too large to display

input
```
int((d*x+c)^3/(a+I*a*cot(f*x+e))^3,x,method=_RETURNVERBOSE)
```

output
```
1/32/a^3*d^3*x^4+1/8/a^3*d^2*c*x^3+3/16/a^3*d*c^2*x^2+1/8/a^3*c^3*x+1/32/a
^3/d*c^4+1/1728*I*(36*d^3*x^3*f^3+18*I*d^3*f^2*x^2+108*c*d^2*f^3*x^2+36*I*
c*d^2*f^2*x+108*c^2*d*f^3*x+18*I*c^2*d*f^2+36*c^3*f^3-6*d^3*f*x-I*d^3-6*c*
d^2*f)/a^3/f^4*exp(6*I*(f*x+e))-3/1024*I*(32*d^3*x^3*f^3+24*I*d^3*f^2*x^2+
96*c*d^2*f^3*x^2+48*I*c*d^2*f^2*x+96*c^2*d*f^3*x+24*I*c^2*d*f^2+32*c^3*f^3
-12*d^3*f*x-3*I*d^3-12*c*d^2*f)/a^3/f^4*exp(4*I*(f*x+e))+3/64*I*(4*d^3*x^3
*f^3+6*I*d^3*f^2*x^2+12*c*d^2*f^3*x^2+12*I*c*d^2*f^2*x+12*c^2*d*f^3*x+6*I*
c^2*d*f^2+4*c^3*f^3-6*d^3*f*x-3*I*d^3-6*c*d^2*f)/a^3/f^4*exp(2*I*(f*x+e))
```

3.27.5 Fricas [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 360, normalized size of antiderivative = 0.91

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^3}\,dx$$
$$=\frac{864\,d^3f^4x^4+3456\,cd^2f^4x^3+5184\,c^2df^4x^2+3456\,c^3f^4x-16\,(-36i\,d^3f^3x^3-36i\,c^3f^3+18\,c^2df^2+6i\,cd^2}{}$$

input
```
integrate((d*x+c)^3/(a+I*a*cot(f*x+e))^3,x, algorithm="fricas")
```

output
```
1/27648*(864*d^3*f^4*x^4 + 3456*c*d^2*f^4*x^3 + 5184*c^2*d*f^4*x^2 + 3456*
c^3*f^4*x - 16*(-36*I*d^3*f^3*x^3 - 36*I*c^3*f^3 + 18*c^2*d*f^2 + 6*I*c*d^
2*f - d^3 + 18*(-6*I*c*d^2*f^3 + d^3*f^2)*x^2 + 6*(-18*I*c^2*d*f^3 + 6*c*d
^2*f^2 + I*d^3*f)*x)*e^(6*I*f*x + 6*I*e) - 81*(32*I*d^3*f^3*x^3 + 32*I*c^3
*f^3 - 24*c^2*d*f^2 - 12*I*c*d^2*f + 3*d^3 + 24*(4*I*c*d^2*f^3 - d^3*f^2)*
x^2 + 12*(8*I*c^2*d*f^3 - 4*c*d^2*f^2 - I*d^3*f)*x)*e^(4*I*f*x + 4*I*e) -
1296*(-4*I*d^3*f^3*x^3 - 4*I*c^3*f^3 + 6*c^2*d*f^2 + 6*I*c*d^2*f - 3*d^3 +
 6*(-2*I*c*d^2*f^3 + d^3*f^2)*x^2 + 6*(-2*I*c^2*d*f^3 + 2*c*d^2*f^2 + I*d^
3*f)*x)*e^(2*I*f*x + 2*I*e))/(a^3*f^4)
```

3.27.6 Sympy [A] (verification not implemented)

Time = 0.44 (sec) , antiderivative size = 932, normalized size of antiderivative = 2.35

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^3}\,dx$$
$$= \begin{cases} \frac{(21233664ia^6c^3f^{11}e^{2ie}+63700992ia^6c^2df^{11}xe^{2ie}-31850496a^6c^2df^{10}e^{2ie}+63700992ia^6cd^2f^{11}x^2e^{2ie}-63700992a^6cd^2f^{10}xe^{2ie}-31850496ia^6\cdots}{\cdots} \\ \frac{x^4(-d^3e^{6ie}+3d^3e^{4ie}-3d^3e^{2ie})}{32a^3}+\frac{x^3(-cd^2e^{6ie}+3cd^2e^{4ie}-3cd^2e^{2ie})}{8a^3}+\frac{x^2(-3c^2de^{6ie}+9c^2de^{4ie}-9c^2de^{2ie})}{16a^3}+\frac{x(-c^3e^{6ie}+3c^3e^{4ie}-3c^3e\cdots}{8a^3} \end{cases}$$
$$+\frac{c^3x}{8a^3}+\frac{3c^2dx^2}{16a^3}+\frac{cd^2x^3}{8a^3}+\frac{d^3x^4}{32a^3}$$

input
```
integrate((d*x+c)**3/(a+I*a*cot(f*x+e))**3,x)
```

output
```
Piecewise((((21233664*I*a**6*c**3*f**11*exp(2*I*e) + 63700992*I*a**6*c**2*
d*f**11*x*exp(2*I*e) - 31850496*a**6*c**2*d*f**10*exp(2*I*e) + 63700992*I*
a**6*c*d**2*f**11*x**2*exp(2*I*e) - 63700992*a**6*c*d**2*f**10*x*exp(2*I*e
) - 31850496*I*a**6*c*d**2*f**9*exp(2*I*e) + 21233664*I*a**6*d**3*f**11*x*
*3*exp(2*I*e) - 31850496*a**6*d**3*f**10*x**2*exp(2*I*e) - 31850496*I*a**6
*d**3*f**9*x*exp(2*I*e) + 15925248*a**6*d**3*f**8*exp(2*I*e))*exp(2*I*f*x)
 + (-10616832*I*a**6*c**3*f**11*exp(4*I*e) - 31850496*I*a**6*c**2*d*f**11*
x*exp(4*I*e) + 7962624*a**6*c**2*d*f**10*exp(4*I*e) - 31850496*I*a**6*c*d*
*2*f**11*x**2*exp(4*I*e) + 15925248*a**6*c*d**2*f**10*x*exp(4*I*e) + 39813
12*I*a**6*c*d**2*f**9*exp(4*I*e) - 10616832*I*a**6*d**3*f**11*x**3*exp(4*I
*e) + 7962624*a**6*d**3*f**10*x**2*exp(4*I*e) + 3981312*I*a**6*d**3*f**9*x
*exp(4*I*e) - 995328*a**6*d**3*f**8*exp(4*I*e))*exp(4*I*f*x) + (2359296*I*
a**6*c**3*f**11*exp(6*I*e) + 7077888*I*a**6*c**2*d*f**11*x*exp(6*I*e) - 11
79648*a**6*c**2*d*f**10*exp(6*I*e) + 7077888*I*a**6*c*d**2*f**11*x**2*exp(
6*I*e) - 2359296*a**6*c*d**2*f**10*x*exp(6*I*e) - 393216*I*a**6*c*d**2*f**
9*exp(6*I*e) + 2359296*I*a**6*d**3*f**11*x**3*exp(6*I*e) - 1179648*a**6*d*
*3*f**10*x**2*exp(6*I*e) - 393216*I*a**6*d**3*f**9*x*exp(6*I*e) + 65536*a*
*6*d**3*f**8*exp(6*I*e))*exp(6*I*f*x))/(113246208*a**9*f**12), Ne(a**9*f**
12, 0)), (x**4*(-d**3*exp(6*I*e) + 3*d**3*exp(4*I*e) - 3*d**3*exp(2*I*e))/
(32*a**3) + x**3*(-c*d**2*exp(6*I*e) + 3*c*d**2*exp(4*I*e) - 3*c*d**2*e...
```

3.27.7 Maxima [F(-2)]

Exception generated.

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^3}\,dx = \text{Exception raised: RuntimeError}$$

input
```
integrate((d*x+c)^3/(a+I*a*cot(f*x+e))^3,x, algorithm="maxima")
```

output
```
Exception raised: RuntimeError >> ECL says: expt: undefined: 0 to a negati
ve exponent.
```

3.27.8 Giac [A] (verification not implemented)

Time = 0.40 (sec) , antiderivative size = 593, normalized size of antiderivative = 1.50

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^3}\,dx$$
$$= \frac{864\,d^3f^4x^4 + 3456\,cd^2f^4x^3 + 576i\,d^3f^3x^3e^{(6i\,fx+6i\,e)} - 2592i\,d^3f^3x^3e^{(4i\,fx+4i\,e)} + 5184i\,d^3f^3x^3e^{(2i\,fx+2i\,e)} + \cdots}{\cdots}$$

input
```
integrate((d*x+c)^3/(a+I*a*cot(f*x+e))^3,x, algorithm="giac")
```

output
```
1/27648*(864*d^3*f^4*x^4 + 3456*c*d^2*f^4*x^3 + 576*I*d^3*f^3*x^3*e^(6*I*f
*x + 6*I*e) - 2592*I*d^3*f^3*x^3*e^(4*I*f*x + 4*I*e) + 5184*I*d^3*f^3*x^3*
e^(2*I*f*x + 2*I*e) + 5184*c^2*d*f^4*x^2 + 1728*I*c*d^2*f^3*x^2*e^(6*I*f*x
 + 6*I*e) - 7776*I*c*d^2*f^3*x^2*e^(4*I*f*x + 4*I*e) + 15552*I*c*d^2*f^3*x
^2*e^(2*I*f*x + 2*I*e) + 3456*c^3*f^4*x + 1728*I*c^2*d*f^3*x*e^(6*I*f*x +
6*I*e) - 288*d^3*f^2*x^2*e^(6*I*f*x + 6*I*e) - 7776*I*c^2*d*f^3*x*e^(4*I*f
*x + 4*I*e) + 1944*d^3*f^2*x^2*e^(4*I*f*x + 4*I*e) + 15552*I*c^2*d*f^3*x*e
^(2*I*f*x + 2*I*e) - 7776*d^3*f^2*x^2*e^(2*I*f*x + 2*I*e) + 576*I*c^3*f^3*
e^(6*I*f*x + 6*I*e) - 576*c*d^2*f^2*x*e^(6*I*f*x + 6*I*e) - 2592*I*c^3*f^3
*e^(4*I*f*x + 4*I*e) + 3888*c*d^2*f^2*x*e^(4*I*f*x + 4*I*e) + 5184*I*c^3*f
^3*e^(2*I*f*x + 2*I*e) - 15552*c*d^2*f^2*x*e^(2*I*f*x + 2*I*e) - 288*c^2*d
*f^2*e^(6*I*f*x + 6*I*e) - 96*I*d^3*f*x*e^(6*I*f*x + 6*I*e) + 1944*c^2*d*f
^2*e^(4*I*f*x + 4*I*e) + 972*I*d^3*f*x*e^(4*I*f*x + 4*I*e) - 7776*c^2*d*f^
2*e^(2*I*f*x + 2*I*e) - 7776*I*d^3*f*x*e^(2*I*f*x + 2*I*e) - 96*I*c*d^2*f*
e^(6*I*f*x + 6*I*e) + 972*I*c*d^2*f*e^(4*I*f*x + 4*I*e) - 7776*I*c*d^2*f*e
^(2*I*f*x + 2*I*e) + 16*d^3*e^(6*I*f*x + 6*I*e) - 243*d^3*e^(4*I*f*x + 4*I
*e) + 3888*d^3*e^(2*I*f*x + 2*I*e))/(a^3*f^4)
```

3.27.9 Mupad [B] (verification not implemented)

Time = 13.93 (sec) , antiderivative size = 418, normalized size of antiderivative = 1.06

$$\int \frac{(c+dx)^3}{(a+ia\cot(e+fx))^3}\,dx = e^{e\,2i+f\,x\,2i}\left(-\frac{(-12\,c^3\,f^3-c^2\,d\,f^2\,18i+18\,c\,d^2\,f+d^3\,9i)\,1i}{64\,a^3\,f^4}+\frac{d^3\,x^3\,3i}{16\,a^3\,f}+\frac{d\,x\,(2\,c^2\,f^2+c\,d\,f\,2i-d^2)\,9i}{32\,a^3\,f^3}+\frac{d^2\,x^2\,(2\,c\,f+d\,1i)\,9i}{32\,a^3\,f^2}\right)-e^{e\,4i+f\,x\,4i}\left(-\frac{(-96\,c^3\,f^3-c^2\,d\,f^2\,72i+36\,c\,d^2\,f+d^3\,9i)\,1i}{1024\,a^3\,f^4}+\frac{d^3\,x^3\,3i}{32\,a^3\,f}+\frac{d\,x\,(8\,c^2\,f^2+c\,d\,f\,4i-d^2)\,9i}{256\,a^3\,f^3}+\frac{d^2\,x^2\,(4\,c\,f+d\,1i)\,9i}{128\,a^3\,f^2}\right)+e^{e\,6i+f\,x\,6i}\left(-\frac{(-36\,c^3\,f^3-c^2\,d\,f^2\,18i+6\,c\,d^2\,f+d^3\,1i)\,1i}{1728\,a^3\,f^4}+\frac{d^3\,x^3\,1i}{48\,a^3\,f}+\frac{d\,x\,(18\,c^2\,f^2+c\,d\,f\,6i-d^2)\,1i}{288\,a^3\,f^3}+\frac{d^2\,x^2\,(6\,c\,f+d\,1i)\,1i}{96\,a^3\,f^2}\right)+\frac{c^3\,x}{8\,a^3}+\frac{d^3\,x^4}{32\,a^3}+\frac{3\,c^2\,d\,x^2}{16\,a^3}+\frac{c\,d^2\,x^3}{8\,a^3}$$

input
```
int((c + d*x)^3/(a + a*cot(e + f*x)*1i)^3,x)
```

output
```
exp(e*2i + f*x*2i)*((d^3*x^3*3i)/(16*a^3*f) - ((d^3*9i - 12*c^3*f^3 - c^2*
d*f^2*18i + 18*c*d^2*f)*1i)/(64*a^3*f^4) + (d*x*(2*c^2*f^2 - d^2 + c*d*f*2
i)*9i)/(32*a^3*f^3) + (d^2*x^2*(d*1i + 2*c*f)*9i)/(32*a^3*f^2)) - exp(e*4i
 + f*x*4i)*((d^3*x^3*3i)/(32*a^3*f) - ((d^3*9i - 96*c^3*f^3 - c^2*d*f^2*72
i + 36*c*d^2*f)*1i)/(1024*a^3*f^4) + (d*x*(8*c^2*f^2 - d^2 + c*d*f*4i)*9i)
/(256*a^3*f^3) + (d^2*x^2*(d*1i + 4*c*f)*9i)/(128*a^3*f^2)) + exp(e*6i + f
*x*6i)*((d^3*x^3*1i)/(48*a^3*f) - ((d^3*1i - 36*c^3*f^3 - c^2*d*f^2*18i +
6*c*d^2*f)*1i)/(1728*a^3*f^4) + (d*x*(18*c^2*f^2 - d^2 + c*d*f*6i)*1i)/(28
8*a^3*f^3) + (d^2*x^2*(d*1i + 6*c*f)*1i)/(96*a^3*f^2)) + (c^3*x)/(8*a^3) +
 (d^3*x^4)/(32*a^3) + (3*c^2*d*x^2)/(16*a^3) + (c*d^2*x^3)/(8*a^3)
```

3.28 $\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^3}\,dx$

3.28.1 Optimal result

Integrand size = 23, antiderivative size = 294

$$\begin{aligned}\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^3}\,dx = &-\frac{3id^2e^{2ie+2ifx}}{32a^3f^3}+\frac{3id^2e^{4ie+4ifx}}{256a^3f^3}-\frac{id^2e^{6ie+6ifx}}{864a^3f^3}\\&-\frac{3de^{2ie+2ifx}(c+dx)}{16a^3f^2}+\frac{3de^{4ie+4ifx}(c+dx)}{64a^3f^2}\\&-\frac{de^{6ie+6ifx}(c+dx)}{144a^3f^2}+\frac{3ie^{2ie+2ifx}(c+dx)^2}{16a^3f}\\&-\frac{3ie^{4ie+4ifx}(c+dx)^2}{32a^3f}+\frac{ie^{6ie+6ifx}(c+dx)^2}{48a^3f}+\frac{(c+dx)^3}{24a^3d}\end{aligned}$$

output
```
-3/32*I*d^2*exp(2*I*e+2*I*f*x)/a^3/f^3+3/256*I*d^2*exp(4*I*e+4*I*f*x)/a^3/
f^3-1/864*I*d^2*exp(6*I*e+6*I*f*x)/a^3/f^3-3/16*d*exp(2*I*e+2*I*f*x)*(d*x+
c)/a^3/f^2+3/64*d*exp(4*I*e+4*I*f*x)*(d*x+c)/a^3/f^2-1/144*d*exp(6*I*e+6*I
*f*x)*(d*x+c)/a^3/f^2+3/16*I*exp(2*I*e+2*I*f*x)*(d*x+c)^2/a^3/f-3/32*I*exp
(4*I*e+4*I*f*x)*(d*x+c)^2/a^3/f+1/48*I*exp(6*I*e+6*I*f*x)*(d*x+c)^2/a^3/f+
1/24*(d*x+c)^3/a^3/d
```

3.28.2 Mathematica [A] (verified)

Time = 1.04 (sec) , antiderivative size = 369, normalized size of antiderivative = 1.26

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^3}\,dx$$
$$= \frac{288f^3x(3c^2+3cdx+d^2x^2)+648((1+i)cf+d(-1+(1+i)fx))((1+i)cf+d(i+(1+i)fx))\cos(2fx}{}$$

input
```
Integrate[(c + d*x)^2/(a + I*a*Cot[e + f*x])^3,x]
```

output
```
(288*f^3*x*(3*c^2 + 3*c*d*x + d^2*x^2) + 648*((1 + I)*c*f + d*(-1 + (1 + I
)*f*x))*((1 + I)*c*f + d*(I + (1 + I)*f*x))*Cos[2*f*x]*(Cos[2*e] + I*Sin[2
*e]) - 81*((2 + 2*I)*c*f + d*(-1 + (2 + 2*I)*f*x))*((2 + 2*I)*c*f + d*(I +
 (2 + 2*I)*f*x))*Cos[4*f*x]*(Cos[4*e] + I*Sin[4*e]) + 8*((3 + 3*I)*c*f + d
*(-1 + (3 + 3*I)*f*x))*((3 + 3*I)*c*f + d*(I + (3 + 3*I)*f*x))*Cos[6*f*x]*
(Cos[6*e] + I*Sin[6*e]) + (648*I)*((1 + I)*c*f + d*(-1 + (1 + I)*f*x))*((1
 + I)*c*f + d*(I + (1 + I)*f*x))*(Cos[2*e] + I*Sin[2*e])*Sin[2*f*x] - 81*(
d - (2 + 2*I)*c*f - (2 + 2*I)*d*f*x)*(d + (2 - 2*I)*c*f + (2 - 2*I)*d*f*x)
*(Cos[4*e] + I*Sin[4*e])*Sin[4*f*x] + (8*I)*((3 + 3*I)*c*f + d*(-1 + (3 +
3*I)*f*x))*((3 + 3*I)*c*f + d*(I + (3 + 3*I)*f*x))*(Cos[6*e] + I*Sin[6*e])
*Sin[6*f*x])/(6912*a^3*f^3)
```

3.28.3 Rubi [A] (verified)

Time = 0.51 (sec) , antiderivative size = 294, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.130$, Rules used = {3042, 4212, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^3}\,dx$$
$$\Big\downarrow \text{ 3042}$$
$$\int \frac{(c+dx)^2}{\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3}dx$$
$$\Big\downarrow \text{ 4212}$$

$$\int \left(-\frac{3(c+dx)^2e^{2ie+2ifx}}{8a^3}+\frac{3(c+dx)^2e^{4ie+4ifx}}{8a^3}-\frac{(c+dx)^2e^{6ie+6ifx}}{8a^3}+\frac{(c+dx)^2}{8a^3}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{3d(c+dx)e^{2ie+2ifx}}{16a^3f^2}+\frac{3d(c+dx)e^{4ie+4ifx}}{64a^3f^2}-\frac{d(c+dx)e^{6ie+6ifx}}{144a^3f^2}+\frac{3i(c+dx)^2e^{2ie+2ifx}}{16a^3f}-\frac{3i(c+dx)^2e^{4ie+4ifx}}{32a^3f}+\frac{i(c+dx)^2e^{6ie+6ifx}}{48a^3f}+\frac{(c+dx)^3}{24a^3d}-\frac{3id^2e^{2ie+2ifx}}{32a^3f^3}+\frac{3id^2e^{4ie+4ifx}}{256a^3f^3}-\frac{id^2e^{6ie+6ifx}}{864a^3f^3}$$

input
```
Int[(c + d*x)^2/(a + I*a*Cot[e + f*x])^3,x]
```

output
```
(((-3*I)/32)*d^2*E^((2*I)*e + (2*I)*f*x))/(a^3*f^3) + (((3*I)/256)*d^2*E^(
(4*I)*e + (4*I)*f*x))/(a^3*f^3) - ((I/864)*d^2*E^((6*I)*e + (6*I)*f*x))/(a
^3*f^3) - (3*d*E^((2*I)*e + (2*I)*f*x)*(c + d*x))/(16*a^3*f^2) + (3*d*E^((
4*I)*e + (4*I)*f*x)*(c + d*x))/(64*a^3*f^2) - (d*E^((6*I)*e + (6*I)*f*x)*(
c + d*x))/(144*a^3*f^2) + (((3*I)/16)*E^((2*I)*e + (2*I)*f*x)*(c + d*x)^2)
/(a^3*f) - (((3*I)/32)*E^((4*I)*e + (4*I)*f*x)*(c + d*x)^2)/(a^3*f) + ((I/
48)*E^((6*I)*e + (6*I)*f*x)*(c + d*x)^2)/(a^3*f) + (c + d*x)^3/(24*a^3*d)
```

3.28.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4212
```
Int[((c_.) + (d_.)*(x_))^(m_)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(2*a) + E^(2*(a/b)*(e + f*
x))/(2*a))^(-n), x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && EqQ[a^2 + b^2
, 0] && ILtQ[n, 0]
```

3.28.4 Maple [A] (verified)

Time = 0.54 (sec) , antiderivative size = 238, normalized size of antiderivative = 0.81

method	result
risch	$\frac{d^2x^3}{24a^3}+\frac{dc\,x^2}{8a^3}+\frac{c^2x}{8a^3}+\frac{c^3}{24a^3d}+\frac{i(18d^2x^2f^2+36cd\,f^2x+6id^2fx+18c^2f^2+6icdf-d^2)\,\mathrm{e}^{6i(fx+e)}}{864a^3f^3}-\frac{3i(8d^2x^2f^2+1$
parallelrisch	$\frac{3(24(d^2x^3+3d\,x^2c+3x\,c^2)f^3+6i(-29d^2x^2-58cdx-36c^2)f^2+(139d^2x+180cd)f+81id^2)\tan(fx+e)^3+6\Big(108i(\frac{1}{3}d^2x^2-}{}$
derivativedivides	Expression too large to display
default	Expression too large to display

input
```
int((d*x+c)^2/(a+I*a*cot(f*x+e))^3,x,method=_RETURNVERBOSE)
```

output
```
1/24/a^3*d^2*x^3+1/8/a^3*d*c*x^2+1/8/a^3*c^2*x+1/24/a^3/d*c^3+1/864*I*(18*
d^2*x^2*f^2+6*I*d^2*f*x+36*c*d*f^2*x+6*I*c*d*f+18*c^2*f^2-d^2)/a^3/f^3*exp
(6*I*(f*x+e))-3/256*I*(8*d^2*x^2*f^2+4*I*d^2*f*x+16*c*d*f^2*x+4*I*c*d*f+8*
c^2*f^2-d^2)/a^3/f^3*exp(4*I*(f*x+e))+3/32*I*(2*d^2*x^2*f^2+2*I*d^2*f*x+4*
c*d*f^2*x+2*I*c*d*f+2*c^2*f^2-d^2)/a^3/f^3*exp(2*I*(f*x+e))
```

3.28.5 Fricas [A] (verification not implemented)

Time = 0.28 (sec) , antiderivative size = 211, normalized size of antiderivative = 0.72

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^3}\,dx$$
$$=\frac{288\,d^2f^3x^3+864\,cdf^3x^2+864\,c^2f^3x-8\,(-18i\,d^2f^2x^2-18i\,c^2f^2+6\,cdf+i\,d^2+6\,(-6i\,cdf^2+d^2f)x)e^{(}}{}$$

input
```
integrate((d*x+c)^2/(a+I*a*cot(f*x+e))^3,x, algorithm="fricas")
```

output
```
1/6912*(288*d^2*f^3*x^3 + 864*c*d*f^3*x^2 + 864*c^2*f^3*x - 8*(-18*I*d^2*f
^2*x^2 - 18*I*c^2*f^2 + 6*c*d*f + I*d^2 + 6*(-6*I*c*d*f^2 + d^2*f)*x)*e^(6
*I*f*x + 6*I*e) - 81*(8*I*d^2*f^2*x^2 + 8*I*c^2*f^2 - 4*c*d*f - I*d^2 + 4*
(4*I*c*d*f^2 - d^2*f)*x)*e^(4*I*f*x + 4*I*e) - 648*(-2*I*d^2*f^2*x^2 - 2*I
*c^2*f^2 + 2*c*d*f + I*d^2 + 2*(-2*I*c*d*f^2 + d^2*f)*x)*e^(2*I*f*x + 2*I*
e))/(a^3*f^3)
```

3.28.6 Sympy [A] (verification not implemented)

Time = 0.34 (sec) , antiderivative size = 575, normalized size of antiderivative = 1.96

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^3}\,dx$$
$$= \begin{cases} \frac{(1327104ia^6c^2f^8e^{2ie}+2654208ia^6cdf^8xe^{2ie}-1327104a^6cdf^7e^{2ie}+1327104ia^6d^2f^8x^2e^{2ie}-1327104a^6d^2f^7xe^{2ie}-663552ia^6d^2f^6e^{2ie})e^{2ifx}+}{} \\ \frac{x^3(-d^2e^{6ie}+3d^2e^{4ie}-3d^2e^{2ie})}{24a^3}+\frac{x^2(-cde^{6ie}+3cde^{4ie}-3cde^{2ie})}{8a^3}+\frac{x(-c^2e^{6ie}+3c^2e^{4ie}-3c^2e^{2ie})}{8a^3} \end{cases}$$
$$+\frac{c^2x}{8a^3}+\frac{cdx^2}{8a^3}+\frac{d^2x^3}{24a^3}$$

input
```
integrate((d*x+c)**2/(a+I*a*cot(f*x+e))**3,x)
```

output
```
Piecewise((((1327104*I*a**6*c**2*f**8*exp(2*I*e) + 2654208*I*a**6*c*d*f**8
*x*exp(2*I*e) - 1327104*a**6*c*d*f**7*exp(2*I*e) + 1327104*I*a**6*d**2*f**
8*x**2*exp(2*I*e) - 1327104*a**6*d**2*f**7*x*exp(2*I*e) - 663552*I*a**6*d*
*2*f**6*exp(2*I*e))*exp(2*I*f*x) + (-663552*I*a**6*c**2*f**8*exp(4*I*e) -
1327104*I*a**6*c*d*f**8*x*exp(4*I*e) + 331776*a**6*c*d*f**7*exp(4*I*e) - 6
63552*I*a**6*d**2*f**8*x**2*exp(4*I*e) + 331776*a**6*d**2*f**7*x*exp(4*I*e
) + 82944*I*a**6*d**2*f**6*exp(4*I*e))*exp(4*I*f*x) + (147456*I*a**6*c**2*
f**8*exp(6*I*e) + 294912*I*a**6*c*d*f**8*x*exp(6*I*e) - 49152*a**6*c*d*f**
7*exp(6*I*e) + 147456*I*a**6*d**2*f**8*x**2*exp(6*I*e) - 49152*a**6*d**2*f
**7*x*exp(6*I*e) - 8192*I*a**6*d**2*f**6*exp(6*I*e))*exp(6*I*f*x))/(707788
8*a**9*f**9), Ne(a**9*f**9, 0)), (x**3*(-d**2*exp(6*I*e) + 3*d**2*exp(4*I*
e) - 3*d**2*exp(2*I*e))/(24*a**3) + x**2*(-c*d*exp(6*I*e) + 3*c*d*exp(4*I*
e) - 3*c*d*exp(2*I*e))/(8*a**3) + x*(-c**2*exp(6*I*e) + 3*c**2*exp(4*I*e)
- 3*c**2*exp(2*I*e))/(8*a**3), True)) + c**2*x/(8*a**3) + c*d*x**2/(8*a**3
) + d**2*x**3/(24*a**3)
```

3.28.7 Maxima [F(-2)]

Exception generated.

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^3}\,dx = \text{Exception raised: RuntimeError}$$

input
```
integrate((d*x+c)^2/(a+I*a*cot(f*x+e))^3,x, algorithm="maxima")
```

output
```
Exception raised: RuntimeError >> ECL says: expt: undefined: 0 to a negati
ve exponent.
```

3.28.8 Giac [A] (verification not implemented)

Time = 0.38 (sec) , antiderivative size = 333, normalized size of antiderivative = 1.13

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^3}\,dx$$
$$= \frac{288\,d^2f^3x^3 + 864\,cdf^3x^2 + 144i\,d^2f^2x^2e^{(6i\,fx+6i\,e)} - 648i\,d^2f^2x^2e^{(4i\,fx+4i\,e)} + 1296i\,d^2f^2x^2e^{(2i\,fx+2i\,e)} + 864}{}$$

input
```
integrate((d*x+c)^2/(a+I*a*cot(f*x+e))^3,x, algorithm="giac")
```

output
```
1/6912*(288*d^2*f^3*x^3 + 864*c*d*f^3*x^2 + 144*I*d^2*f^2*x^2*e^(6*I*f*x +
 6*I*e) - 648*I*d^2*f^2*x^2*e^(4*I*f*x + 4*I*e) + 1296*I*d^2*f^2*x^2*e^(2*
I*f*x + 2*I*e) + 864*c^2*f^3*x + 288*I*c*d*f^2*x*e^(6*I*f*x + 6*I*e) - 129
6*I*c*d*f^2*x*e^(4*I*f*x + 4*I*e) + 2592*I*c*d*f^2*x*e^(2*I*f*x + 2*I*e) +
 144*I*c^2*f^2*e^(6*I*f*x + 6*I*e) - 48*d^2*f*x*e^(6*I*f*x + 6*I*e) - 648*
I*c^2*f^2*e^(4*I*f*x + 4*I*e) + 324*d^2*f*x*e^(4*I*f*x + 4*I*e) + 1296*I*c
^2*f^2*e^(2*I*f*x + 2*I*e) - 1296*d^2*f*x*e^(2*I*f*x + 2*I*e) - 48*c*d*f*e
^(6*I*f*x + 6*I*e) + 324*c*d*f*e^(4*I*f*x + 4*I*e) - 1296*c*d*f*e^(2*I*f*x
 + 2*I*e) - 8*I*d^2*e^(6*I*f*x + 6*I*e) + 81*I*d^2*e^(4*I*f*x + 4*I*e) - 6
48*I*d^2*e^(2*I*f*x + 2*I*e))/(a^3*f^3)
```

3.28.9 Mupad [B] (verification not implemented)

Time = 1.04 (sec) , antiderivative size = 263, normalized size of antiderivative = 0.89

$$\int \frac{(c+dx)^2}{(a+ia\cot(e+fx))^3}\,dx = \mathrm{e}^{e\,2\mathrm{i}+f\,x\,2\mathrm{i}}\left(\frac{(6\,c^2\,f^2+c\,d\,f\,6\mathrm{i}-3\,d^2)\,1\mathrm{i}}{32\,a^3\,f^3}+\frac{d^2\,x^2\,3\mathrm{i}}{16\,a^3\,f}+\frac{d\,x\,(2\,c\,f+d\,1\mathrm{i})\,3\mathrm{i}}{16\,a^3\,f^2}\right)-\mathrm{e}^{e\,4\mathrm{i}+f\,x\,4\mathrm{i}}\left(\frac{(24\,c^2\,f^2+c\,d\,f\,12\mathrm{i}-3\,d^2)\,1\mathrm{i}}{256\,a^3\,f^3}+\frac{d^2\,x^2\,3\mathrm{i}}{32\,a^3\,f}+\frac{d\,x\,(4\,c\,f+d\,1\mathrm{i})\,3\mathrm{i}}{64\,a^3\,f^2}\right)+\mathrm{e}^{e\,6\mathrm{i}+f\,x\,6\mathrm{i}}\left(\frac{(18\,c^2\,f^2+c\,d\,f\,6\mathrm{i}-d^2)\,1\mathrm{i}}{864\,a^3\,f^3}+\frac{d^2\,x^2\,1\mathrm{i}}{48\,a^3\,f}+\frac{d\,x\,(6\,c\,f+d\,1\mathrm{i})\,1\mathrm{i}}{144\,a^3\,f^2}\right)+\frac{c^2\,x}{8\,a^3}+\frac{d^2\,x^3}{24\,a^3}+\frac{c\,d\,x^2}{8\,a^3}$$

input
```
int((c + d*x)^2/(a + a*cot(e + f*x)*1i)^3,x)
```

output
```
exp(e*2i + f*x*2i)*(((6*c^2*f^2 - 3*d^2 + c*d*f*6i)*1i)/(32*a^3*f^3) + (d^
2*x^2*3i)/(16*a^3*f) + (d*x*(d*1i + 2*c*f)*3i)/(16*a^3*f^2)) - exp(e*4i +
f*x*4i)*(((24*c^2*f^2 - 3*d^2 + c*d*f*12i)*1i)/(256*a^3*f^3) + (d^2*x^2*3i
)/(32*a^3*f) + (d*x*(d*1i + 4*c*f)*3i)/(64*a^3*f^2)) + exp(e*6i + f*x*6i)*
(((18*c^2*f^2 - d^2 + c*d*f*6i)*1i)/(864*a^3*f^3) + (d^2*x^2*1i)/(48*a^3*f
) + (d*x*(d*1i + 6*c*f)*1i)/(144*a^3*f^2)) + (c^2*x)/(8*a^3) + (d^2*x^3)/(
24*a^3) + (c*d*x^2)/(8*a^3)
```

3.29 $\int \frac{c+dx}{(a+ia\cot(e+fx))^3}\,dx$

3.29.1 Optimal result

Integrand size = 21, antiderivative size = 209

$$\begin{aligned}\int \frac{c+dx}{(a+ia\cot(e+fx))^3}\,dx =& \frac{11idx}{96a^3f}-\frac{dx^2}{16a^3}+\frac{x(c+dx)}{8a^3}+\frac{d}{36f^2(a+ia\cot(e+fx))^3}\\ &-\frac{i(c+dx)}{6f(a+ia\cot(e+fx))^3}+\frac{5d}{96af^2(a+ia\cot(e+fx))^2}\\ &-\frac{i(c+dx)}{8af(a+ia\cot(e+fx))^2}+\frac{11d}{96f^2(a^3+ia^3\cot(e+fx))}\\ &-\frac{i(c+dx)}{8f(a^3+ia^3\cot(e+fx))}\end{aligned}$$

output
```
11/96*I*d*x/a^3/f-1/16*d*x^2/a^3+1/8*x*(d*x+c)/a^3+1/36*d/f^2/(a+I*a*cot(f
*x+e))^3-1/6*I*(d*x+c)/f/(a+I*a*cot(f*x+e))^3+5/96*d/a/f^2/(a+I*a*cot(f*x+
e))^2-1/8*I*(d*x+c)/a/f/(a+I*a*cot(f*x+e))^2+11/96*d/f^2/(a^3+I*a^3*cot(f*
x+e))-1/8*I*(d*x+c)/f/(a^3+I*a^3*cot(f*x+e))
```

3.29.2 Mathematica [A] (verified)

Time = 1.21 (sec) , antiderivative size = 244, normalized size of antiderivative = 1.17

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^3}\,dx$$
$$=\frac{-72de^2+144cef+144cf^2x+72df^2x^2+108i(2cf+d(i+2fx))\cos(2(e+fx))+27(d-4icf-4idfx)}{}$$

input
```
Integrate[(c + d*x)/(a + I*a*Cot[e + f*x])^3,x]
```

output
```
(-72*d*e^2 + 144*c*e*f + 144*c*f^2*x + 72*d*f^2*x^2 + (108*I)*(2*c*f + d*(
I + 2*f*x))*Cos[2*(e + f*x)] + 27*(d - (4*I)*c*f - (4*I)*d*f*x)*Cos[4*(e +
 f*x)] - 4*d*Cos[6*(e + f*x)] + (24*I)*c*f*Cos[6*(e + f*x)] + (24*I)*d*f*x
*Cos[6*(e + f*x)] - (108*I)*d*Sin[2*(e + f*x)] - 216*c*f*Sin[2*(e + f*x)]
- 216*d*f*x*Sin[2*(e + f*x)] + (27*I)*d*Sin[4*(e + f*x)] + 108*c*f*Sin[4*(
e + f*x)] + 108*d*f*x*Sin[4*(e + f*x)] - (4*I)*d*Sin[6*(e + f*x)] - 24*c*f
*Sin[6*(e + f*x)] - 24*d*f*x*Sin[6*(e + f*x)])/(1152*a^3*f^2)
```

3.29.3 Rubi [A] (verified)

Time = 0.46 (sec) , antiderivative size = 208, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.143, Rules used = {3042, 4213, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^3}\,dx$$
$$\Big\downarrow \text{3042}$$
$$\int \frac{c+dx}{\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3}dx$$
$$\Big\downarrow \text{4213}$$
$$-d\int \left(\frac{x}{8a^3}-\frac{i}{8f\left(i\cot(e+fx)a^3+a^3\right)}-\frac{i}{8af(i\cot(e+fx)a+a)^2}-\frac{i}{6f(i\cot(e+fx)a+a)^3}\right)dx- \frac{i(c+dx)}{8f\left(a^3+ia^3\cot(e+fx)\right)}+\frac{x(c+dx)}{8a^3}-\frac{i(c+dx)}{8af(a+ia\cot(e+fx))^2}-\frac{i(c+dx)}{6f(a+ia\cot(e+fx))^3}$$

$$\Big\downarrow \text{2009}$$

$$-\frac{i(c+dx)}{8f\left(a^3+ia^3\cot(e+fx)\right)}+\frac{x(c+dx)}{8a^3}-d\left(-\frac{11}{96f^2\left(a^3+ia^3\cot(e+fx)\right)}-\frac{11ix}{96a^3f}+\frac{x^2}{16a^3}-\frac{5}{96af^2(a+ia\cot(e+fx))^2}-\frac{1}{36f^2(a+ia\cot(e+fx))^3}\right)-\frac{i(c+dx)}{8af(a+ia\cot(e+fx))^2}-\frac{i(c+dx)}{6f(a+ia\cot(e+fx))^3}$$

input
```
Int[(c + d*x)/(a + I*a*Cot[e + f*x])^3,x]
```

output
```
(x*(c + d*x))/(8*a^3) - ((I/6)*(c + d*x))/(f*(a + I*a*Cot[e + f*x])^3) - (
(I/8)*(c + d*x))/(a*f*(a + I*a*Cot[e + f*x])^2) - ((I/8)*(c + d*x))/(f*(a^
3 + I*a^3*Cot[e + f*x])) - d*((((-11*I)/96)*x)/(a^3*f) + x^2/(16*a^3) - 1/
(36*f^2*(a + I*a*Cot[e + f*x])^3) - 5/(96*a*f^2*(a + I*a*Cot[e + f*x])^2)
- 11/(96*f^2*(a^3 + I*a^3*Cot[e + f*x])))
```

3.29.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4213
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
 x_Symbol] :> With[{u = IntHide[(a + b*Tan[e + f*x])^n, x]}, Simp[(c + d*x)
^m   u, x] - Simp[d*m   Int[(c + d*x)^(m - 1)   u, x], x]] /; FreeQ[{a, b,
c, d, e, f}, x] && EqQ[a^2 + b^2, 0] && ILtQ[n, -1] && GtQ[m, 0]
```

3.29.4 Maple [A] (verified)

Time = 0.77 (sec) , antiderivative size = 114, normalized size of antiderivative = 0.55

method	result
risch	$\frac{d\,x^2}{16a^3}+\frac{xc}{8a^3}+\frac{i(6dfx+6cf+id)\mathrm{e}^{6i(fx+e)}}{288a^3f^2}-\frac{3i(4dfx+4cf+id)\mathrm{e}^{4i(fx+e)}}{128a^3f^2}+\frac{3i(2dfx+2cf+id)\mathrm{e}^{2i(fx+e)}}{32a^3f^2}$
parallelrisch	$\frac{3(6(d\,x^2+2xc)f^2+i(-29dx-36c)f+15d)\tan(fx+e)^3+3\left(36i\left(\frac{dx}{2}+c\right)x\,f^2+3f(dx+8c)+16id\right)\tan(fx+e)^2-63\left(\frac{6(dx+2c)f}{7}+i\right.}{288f^2a^3\left(-i-3\tan(fx+e)+3i\tan(fx+e)^2+\tan(fx+e)^3\right)}$

input
```
int((d*x+c)/(a+I*a*cot(f*x+e))^3,x,method=_RETURNVERBOSE)
```

output
```
1/16*d*x^2/a^3+1/8/a^3*x*c+1/288*I*(6*d*f*x+I*d+6*c*f)/a^3/f^2*exp(6*I*(f*
x+e))-3/128*I*(4*d*f*x+I*d+4*c*f)/a^3/f^2*exp(4*I*(f*x+e))+3/32*I*(2*d*f*x
+I*d+2*c*f)/a^3/f^2*exp(2*I*(f*x+e))
```

3.29.5 Fricas [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 93, normalized size of antiderivative = 0.44

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^3}\,dx$$
$$=\frac{72\,df^2x^2+144\,cf^2x-4\,(-6i\,dfx-6i\,cf+d)e^{(6i\,fx+6i\,e)}-27\,(4i\,dfx+4i\,cf-d)e^{(4i\,fx+4i\,e)}-108\,(-2i\,d}{1152\,a^3f^2}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e))^3,x, algorithm="fricas")
```

output
```
1/1152*(72*d*f^2*x^2 + 144*c*f^2*x - 4*(-6*I*d*f*x - 6*I*c*f + d)*e^(6*I*f
*x + 6*I*e) - 27*(4*I*d*f*x + 4*I*c*f - d)*e^(4*I*f*x + 4*I*e) - 108*(-2*I
*d*f*x - 2*I*c*f + d)*e^(2*I*f*x + 2*I*e))/(a^3*f^2)
```

3.29.6 Sympy [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 298, normalized size of antiderivative = 1.43

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^3}\,dx$$
$$=\begin{cases}\frac{(221184ia^6cf^5e^{2ie}+221184ia^6df^5xe^{2ie}-110592a^6df^4e^{2ie})e^{2ifx}+(-110592ia^6cf^5e^{4ie}-110592ia^6df^5xe^{4ie}+27648a^6df^4e^{4ie})e^{4ifx}+(24576i}{1179648a^9f^6} \\ \frac{x^2\left(-de^{6ie}+3de^{4ie}-3de^{2ie}\right)}{16a^3}+\frac{x\left(-ce^{6ie}+3ce^{4ie}-3ce^{2ie}\right)}{8a^3}\end{cases}$$
$$+\frac{cx}{8a^3}+\frac{dx^2}{16a^3}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e))**3,x)
```

output
```
Piecewise((((221184*I*a**6*c*f**5*exp(2*I*e) + 221184*I*a**6*d*f**5*x*exp(
2*I*e) - 110592*a**6*d*f**4*exp(2*I*e))*exp(2*I*f*x) + (-110592*I*a**6*c*f
**5*exp(4*I*e) - 110592*I*a**6*d*f**5*x*exp(4*I*e) + 27648*a**6*d*f**4*exp
(4*I*e))*exp(4*I*f*x) + (24576*I*a**6*c*f**5*exp(6*I*e) + 24576*I*a**6*d*f
**5*x*exp(6*I*e) - 4096*a**6*d*f**4*exp(6*I*e))*exp(6*I*f*x))/(1179648*a**
9*f**6), Ne(a**9*f**6, 0)), (x**2*(-d*exp(6*I*e) + 3*d*exp(4*I*e) - 3*d*ex
p(2*I*e))/(16*a**3) + x*(-c*exp(6*I*e) + 3*c*exp(4*I*e) - 3*c*exp(2*I*e))/
(8*a**3), True)) + c*x/(8*a**3) + d*x**2/(16*a**3)
```

3.29.7 Maxima [F(-2)]

Exception generated.

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^3}\,dx = \text{Exception raised: RuntimeError}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e))^3,x, algorithm="maxima")
```

output
```
Exception raised: RuntimeError >> ECL says: expt: undefined: 0 to a negati
ve exponent.
```

3.29.8 Giac [A] (verification not implemented)

Time = 0.36 (sec) , antiderivative size = 142, normalized size of antiderivative = 0.68

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^3}\,dx = \frac{72\,df^2x^2 + 144\,cf^2x + 24i\,dfxe^{(6i\,fx+6i\,e)} - 108i\,dfxe^{(4i\,fx+4i\,e)} + 216i\,dfxe^{(2i\,fx+2i\,e)} + 24i\,cfe^{(6i\,fx+6i\,e)} - \cdots}{1152\,a^3f^2}$$

input
```
integrate((d*x+c)/(a+I*a*cot(f*x+e))^3,x, algorithm="giac")
```

output
```
1/1152*(72*d*f^2*x^2 + 144*c*f^2*x + 24*I*d*f*x*e^(6*I*f*x + 6*I*e) - 108*
I*d*f*x*e^(4*I*f*x + 4*I*e) + 216*I*d*f*x*e^(2*I*f*x + 2*I*e) + 24*I*c*f*e
^(6*I*f*x + 6*I*e) - 108*I*c*f*e^(4*I*f*x + 4*I*e) + 216*I*c*f*e^(2*I*f*x
+ 2*I*e) - 4*d*e^(6*I*f*x + 6*I*e) + 27*d*e^(4*I*f*x + 4*I*e) - 108*d*e^(2
*I*f*x + 2*I*e))/(a^3*f^2)
```

3.29.9 Mupad [B] (verification not implemented)

Time = 0.64 (sec) , antiderivative size = 144, normalized size of antiderivative = 0.69

$$\int \frac{c+dx}{(a+ia\cot(e+fx))^3}\,dx = e^{e\,2i+f\,x\,2i}\left(\frac{(6\,c\,f+d\,3i)\ 1i}{32\,a^3\,f^2}+\frac{d\,x\,3i}{16\,a^3\,f}\right) - e^{e\,4i+f\,x\,4i}\left(\frac{(12\,c\,f+d\,3i)\ 1i}{128\,a^3\,f^2}+\frac{d\,x\,3i}{32\,a^3\,f}\right) + e^{e\,6i+f\,x\,6i}\left(\frac{(6\,c\,f+d\,1i)\ 1i}{288\,a^3\,f^2}+\frac{d\,x\,1i}{48\,a^3\,f}\right)+\frac{d\,x^2}{16\,a^3}+\frac{c\,x}{8\,a^3}$$

input
```
int((c + d*x)/(a + a*cot(e + f*x)*1i)^3,x)
```

output
```
exp(e*2i + f*x*2i)*(((d*3i + 6*c*f)*1i)/(32*a^3*f^2) + (d*x*3i)/(16*a^3*f)
) - exp(e*4i + f*x*4i)*(((d*3i + 12*c*f)*1i)/(128*a^3*f^2) + (d*x*3i)/(32*
a^3*f)) + exp(e*6i + f*x*6i)*(((d*1i + 6*c*f)*1i)/(288*a^3*f^2) + (d*x*1i)
/(48*a^3*f)) + (d*x^2)/(16*a^3) + (c*x)/(8*a^3)
```

3.30 $\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^3}\,dx$

3.30.1 Optimal result

Integrand size = 23, antiderivative size = 449

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^3}\,dx = -\frac{3\cos\left(2e-\frac{2cf}{d}\right)\text{CosIntegral}\left(\frac{2cf}{d}+2fx\right)}{8a^3d} + \frac{3\cos\left(4e-\frac{4cf}{d}\right)\text{CosIntegral}\left(\frac{4cf}{d}+4fx\right)}{8a^3d} - \frac{\cos\left(6e-\frac{6cf}{d}\right)\text{CosIntegral}\left(\frac{6cf}{d}+6fx\right)}{8a^3d} + \frac{\log(c+dx)}{8a^3d} - \frac{i\,\text{CosIntegral}\left(\frac{6cf}{d}+6fx\right)\sin\left(6e-\frac{6cf}{d}\right)}{8a^3d} + \frac{3i\,\text{CosIntegral}\left(\frac{4cf}{d}+4fx\right)\sin\left(4e-\frac{4cf}{d}\right)}{8a^3d} - \frac{3i\,\text{CosIntegral}\left(\frac{2cf}{d}+2fx\right)\sin\left(2e-\frac{2cf}{d}\right)}{8a^3d} - \frac{3i\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(\frac{2cf}{d}+2fx\right)}{8a^3d} + \frac{3\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(\frac{2cf}{d}+2fx\right)}{8a^3d} + \frac{3i\cos\left(4e-\frac{4cf}{d}\right)\text{Si}\left(\frac{4cf}{d}+4fx\right)}{8a^3d} - \frac{3\sin\left(4e-\frac{4cf}{d}\right)\text{Si}\left(\frac{4cf}{d}+4fx\right)}{8a^3d} - \frac{i\cos\left(6e-\frac{6cf}{d}\right)\text{Si}\left(\frac{6cf}{d}+6fx\right)}{8a^3d} + \frac{\sin\left(6e-\frac{6cf}{d}\right)\text{Si}\left(\frac{6cf}{d}+6fx\right)}{8a^3d}$$

output
```
-1/8*Ci(6*c*f/d+6*f*x)*cos(-6*e+6*c*f/d)/a^3/d+3/8*Ci(4*c*f/d+4*f*x)*cos(-
4*e+4*c*f/d)/a^3/d-3/8*Ci(2*c*f/d+2*f*x)*cos(-2*e+2*c*f/d)/a^3/d+1/8*ln(d*
x+c)/a^3/d-3/8*I*cos(-2*e+2*c*f/d)*Si(2*c*f/d+2*f*x)/a^3/d+3/8*I*cos(-4*e+
4*c*f/d)*Si(4*c*f/d+4*f*x)/a^3/d-1/8*I*cos(-6*e+6*c*f/d)*Si(6*c*f/d+6*f*x)
/a^3/d+1/8*I*Ci(6*c*f/d+6*f*x)*sin(-6*e+6*c*f/d)/a^3/d-1/8*Si(6*c*f/d+6*f*
x)*sin(-6*e+6*c*f/d)/a^3/d-3/8*I*Ci(4*c*f/d+4*f*x)*sin(-4*e+4*c*f/d)/a^3/d
+3/8*Si(4*c*f/d+4*f*x)*sin(-4*e+4*c*f/d)/a^3/d+3/8*I*Ci(2*c*f/d+2*f*x)*sin
(-2*e+2*c*f/d)/a^3/d-3/8*Si(2*c*f/d+2*f*x)*sin(-2*e+2*c*f/d)/a^3/d
```

3.30.2 Mathematica [A] (verified)

Time = 0.74 (sec) , antiderivative size = 197, normalized size of antiderivative = 0.44

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^3}\,dx$$
$$= \frac{\log(c+dx) - 3\left(\cos\left(2e-\frac{2cf}{d}\right)+i\sin\left(2e-\frac{2cf}{d}\right)\right)\left(\text{CosIntegral}\left(\frac{2f(c+dx)}{d}\right)+i\text{Si}\left(\frac{2f(c+dx)}{d}\right)\right)+3\left(\cos\left(4e\right.\right.}{}$$

input
```
Integrate[1/((c + d*x)*(a + I*a*Cot[e + f*x])^3),x]
```

output
```
(Log[c + d*x] - 3*(Cos[2*e - (2*c*f)/d] + I*Sin[2*e - (2*c*f)/d])*(CosInte
gral[(2*f*(c + d*x))/d] + I*SinIntegral[(2*f*(c + d*x))/d]) + 3*(Cos[4*e -
 (4*c*f)/d] + I*Sin[4*e - (4*c*f)/d])*(CosIntegral[(4*f*(c + d*x))/d] + I*
SinIntegral[(4*f*(c + d*x))/d]) - (Cos[6*e - (6*c*f)/d] + I*Sin[6*e - (6*c
*f)/d])*(CosIntegral[(6*f*(c + d*x))/d] + I*SinIntegral[(6*f*(c + d*x))/d]
))/(8*a^3*d)
```

3.30.3 Rubi [A] (verified)

Time = 1.85 (sec) , antiderivative size = 449, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.130, Rules used = {3042, 4211, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^3}\,dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int \frac{1}{(c+dx)\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3}dx$$

$$\Big\downarrow \text{ 4211}$$

$$\int \left(\frac{i\sin^3(2e+2fx)}{8a^3(c+dx)}-\frac{3\sin^2(2e+2fx)}{8a^3(c+dx)}-\frac{3i\sin(2e+2fx)}{8a^3(c+dx)}+\frac{3\sin(2e+2fx)\sin(4e+4fx)}{16a^3(c+dx)}+\frac{3i\sin(4e+4fx)}{8a^3(c+dx)}\right.$$

$$\Big\downarrow \text{ 2009}$$

$$-\frac{3i\,\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\sin\left(2e-\frac{2cf}{d}\right)}{8a^3d}-\frac{i\,\text{CosIntegral}\left(6xf+\frac{6cf}{d}\right)\sin\left(6e-\frac{6cf}{d}\right)}{8a^3d}+\frac{3i\,\text{CosIntegral}\left(4xf+\frac{4cf}{d}\right)\sin\left(4e-\frac{4cf}{d}\right)}{8a^3d}-\frac{3\,\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\cos\left(2e-\frac{2cf}{d}\right)}{8a^3d}+\frac{3\,\text{CosIntegral}\left(4xf+\frac{4cf}{d}\right)\cos\left(4e-\frac{4cf}{d}\right)}{8a^3d}-\frac{\text{CosIntegral}\left(6xf+\frac{6cf}{d}\right)\cos\left(6e-\frac{6cf}{d}\right)}{8a^3d}+\frac{3\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{8a^3d}-\frac{3\sin\left(4e-\frac{4cf}{d}\right)\text{Si}\left(4xf+\frac{4cf}{d}\right)}{8a^3d}+\frac{\sin\left(6e-\frac{6cf}{d}\right)\text{Si}\left(6xf+\frac{6cf}{d}\right)}{8a^3d}-\frac{3i\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{8a^3d}+\frac{3i\cos\left(4e-\frac{4cf}{d}\right)\text{Si}\left(4xf+\frac{4cf}{d}\right)}{8a^3d}-\frac{i\cos\left(6e-\frac{6cf}{d}\right)\text{Si}\left(6xf+\frac{6cf}{d}\right)}{8a^3d}+\frac{\log(c+dx)}{8a^3d}$$

input
```
Int[1/((c + d*x)*(a + I*a*Cot[e + f*x])^3),x]
```

output
```
(-3*Cos[2*e - (2*c*f)/d]*CosIntegral[(2*c*f)/d + 2*f*x])/(8*a^3*d) + (3*Co
s[4*e - (4*c*f)/d]*CosIntegral[(4*c*f)/d + 4*f*x])/(8*a^3*d) - (Cos[6*e -
(6*c*f)/d]*CosIntegral[(6*c*f)/d + 6*f*x])/(8*a^3*d) + Log[c + d*x]/(8*a^3
*d) - ((I/8)*CosIntegral[(6*c*f)/d + 6*f*x]*Sin[6*e - (6*c*f)/d])/(a^3*d)
+ (((3*I)/8)*CosIntegral[(4*c*f)/d + 4*f*x]*Sin[4*e - (4*c*f)/d])/(a^3*d)
- (((3*I)/8)*CosIntegral[(2*c*f)/d + 2*f*x]*Sin[2*e - (2*c*f)/d])/(a^3*d)
- (((3*I)/8)*Cos[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/(a^3*d)
+ (3*Sin[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/(8*a^3*d) + (((3
*I)/8)*Cos[4*e - (4*c*f)/d]*SinIntegral[(4*c*f)/d + 4*f*x])/(a^3*d) - (3*S
in[4*e - (4*c*f)/d]*SinIntegral[(4*c*f)/d + 4*f*x])/(8*a^3*d) - ((I/8)*Cos
[6*e - (6*c*f)/d]*SinIntegral[(6*c*f)/d + 6*f*x])/(a^3*d) + (Sin[6*e - (6*
c*f)/d]*SinIntegral[(6*c*f)/d + 6*f*x])/(8*a^3*d)
```

3.30.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4211
```
Int[((c_.) + (d_.)*(x_))^(m_)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(2*a) + Cos[2*e + 2*f*x]/(
2*a) + Sin[2*e + 2*f*x]/(2*b))^(-n), x], x] /; FreeQ[{a, b, c, d, e, f}, x]
 && EqQ[a^2 + b^2, 0] && ILtQ[m, 0] && ILtQ[n, 0]
```

3.30.4 Maple [A] (verified)

Time = 1.09 (sec) , antiderivative size = 169, normalized size of antiderivative = 0.38

method	result
risch	$\frac{\ln(dx+c)}{8a^3d}+\frac{3\,\mathrm{e}^{-\frac{2i(cf-de)}{d}}\,\mathrm{Ei}_1\left(-2ifx-2ie-\frac{2(icf-ide)}{d}\right)}{8a^3d}-\frac{3\,\mathrm{e}^{-\frac{4i(cf-de)}{d}}\,\mathrm{Ei}_1\left(-4ifx-4ie-\frac{4(icf-ide)}{d}\right)}{8a^3d}+\frac{\mathrm{e}^{-\frac{6i(cf-de)}{d}}\,\mathrm{Ei}_1\left(-\right.}{8}$

input
```
int(1/(d*x+c)/(a+I*a*cot(f*x+e))^3,x,method=_RETURNVERBOSE)
```

output
```
1/8*ln(d*x+c)/a^3/d+3/8/a^3/d*exp(-2*I*(c*f-d*e)/d)*Ei(1,-2*I*f*x-2*I*e-2*
(I*c*f-I*d*e)/d)-3/8/a^3/d*exp(-4*I*(c*f-d*e)/d)*Ei(1,-4*I*f*x-4*I*e-4*(I*
c*f-I*d*e)/d)+1/8/a^3/d*exp(-6*I*(c*f-d*e)/d)*Ei(1,-6*I*f*x-6*I*e-6*(I*c*f
-I*d*e)/d)
```

3.30.5 Fricas [A] (verification not implemented)

Time = 0.28 (sec) , antiderivative size = 119, normalized size of antiderivative = 0.27

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^3}\,dx =$$
$$-\frac{3\,\mathrm{Ei}\left(-\frac{2\,(-i\,dfx-i\,cf)}{d}\right)e^{\left(-\frac{2\,(-i\,de+i\,cf)}{d}\right)}-3\,\mathrm{Ei}\left(-\frac{4\,(-i\,dfx-i\,cf)}{d}\right)e^{\left(-\frac{4\,(-i\,de+i\,cf)}{d}\right)}+\mathrm{Ei}\left(-\frac{6\,(-i\,dfx-i\,cf)}{d}\right)e^{\left(-\frac{6\,(-i\,d}{}\right.}}{8\,a^3d}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e))^3,x, algorithm="fricas")
```

output
```
-1/8*(3*Ei(-2*(-I*d*f*x - I*c*f)/d)*e^(-2*(-I*d*e + I*c*f)/d) - 3*Ei(-4*(-
I*d*f*x - I*c*f)/d)*e^(-4*(-I*d*e + I*c*f)/d) + Ei(-6*(-I*d*f*x - I*c*f)/d
)*e^(-6*(-I*d*e + I*c*f)/d) - log((d*x + c)/d))/(a^3*d)
```

3.30.6 Sympy [F]

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^3}\,dx = \frac{i\int \frac{1}{c\cot^3(e+fx)-3ic\cot^2(e+fx)-3c\cot(e+fx)+ic+dx\cot^3(e+fx)-3idx\cot^2(e+fx)-3dx\cot(e+fx)+idx}\,dx}{a^3}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e))**3,x)
```

output
```
I*Integral(1/(c*cot(e + f*x)**3 - 3*I*c*cot(e + f*x)**2 - 3*c*cot(e + f*x)
 + I*c + d*x*cot(e + f*x)**3 - 3*I*d*x*cot(e + f*x)**2 - 3*d*x*cot(e + f*x
) + I*d*x), x)/a**3
```

3.30.7 Maxima [A] (verification not implemented)

Time = 0.42 (sec) , antiderivative size = 275, normalized size of antiderivative = 0.61

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^3}\,dx = \frac{f\cos\left(-\frac{6(de-cf)}{d}\right)E_1\left(\frac{6(-i(fx+e)d+ide-icf)}{d}\right)-3f\cos\left(-\frac{4(de-cf)}{d}\right)E_1\left(\frac{4(-i(fx+e)d+ide-icf)}{d}\right)+3f\cos\left(-\frac{2}{}\right.}{}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e))^3,x, algorithm="maxima")
```

output
```
1/8*(f*cos(-6*(d*e - c*f)/d)*exp_integral_e(1, 6*(-I*(f*x + e)*d + I*d*e -
 I*c*f)/d) - 3*f*cos(-4*(d*e - c*f)/d)*exp_integral_e(1, 4*(-I*(f*x + e)*d
 + I*d*e - I*c*f)/d) + 3*f*cos(-2*(d*e - c*f)/d)*exp_integral_e(1, 2*(-I*(
f*x + e)*d + I*d*e - I*c*f)/d) - 3*I*f*exp_integral_e(1, 2*(-I*(f*x + e)*d
 + I*d*e - I*c*f)/d)*sin(-2*(d*e - c*f)/d) + 3*I*f*exp_integral_e(1, 4*(-I
*(f*x + e)*d + I*d*e - I*c*f)/d)*sin(-4*(d*e - c*f)/d) - I*f*exp_integral_
e(1, 6*(-I*(f*x + e)*d + I*d*e - I*c*f)/d)*sin(-6*(d*e - c*f)/d) + f*log((
f*x + e)*d - d*e + c*f))/(a^3*d*f)
```

3.30.8 Giac [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 1791 vs. $2(411) = 822$.

Time = 0.39 (sec) , antiderivative size = 1791, normalized size of antiderivative = 3.99

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^3}\,dx = \text{Too large to display}$$

input
```
integrate(1/(d*x+c)/(a+I*a*cot(f*x+e))^3,x, algorithm="giac")
```

output
```
-1/8*(cos(e)^6*cos(6*c*f/d)*cos_integral(6*(d*f*x + c*f)/d) + 6*I*cos(e)^5
*cos(6*c*f/d)*cos_integral(6*(d*f*x + c*f)/d)*sin(e) - 15*cos(e)^4*cos(6*c
*f/d)*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^2 - 20*I*cos(e)^3*cos(6*c*f/d
)*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^3 + 15*cos(e)^2*cos(6*c*f/d)*cos_
integral(6*(d*f*x + c*f)/d)*sin(e)^4 + 6*I*cos(e)*cos(6*c*f/d)*cos_integra
l(6*(d*f*x + c*f)/d)*sin(e)^5 - cos(6*c*f/d)*cos_integral(6*(d*f*x + c*f)/
d)*sin(e)^6 - I*cos(e)^6*cos_integral(6*(d*f*x + c*f)/d)*sin(6*c*f/d) + 6*
cos(e)^5*cos_integral(6*(d*f*x + c*f)/d)*sin(e)*sin(6*c*f/d) + 15*I*cos(e)
^4*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^2*sin(6*c*f/d) - 20*cos(e)^3*cos
_integral(6*(d*f*x + c*f)/d)*sin(e)^3*sin(6*c*f/d) - 15*I*cos(e)^2*cos_int
egral(6*(d*f*x + c*f)/d)*sin(e)^4*sin(6*c*f/d) + 6*cos(e)*cos_integral(6*(
d*f*x + c*f)/d)*sin(e)^5*sin(6*c*f/d) + I*cos_integral(6*(d*f*x + c*f)/d)*
sin(e)^6*sin(6*c*f/d) + I*cos(e)^6*cos(6*c*f/d)*sin_integral(6*(d*f*x + c*
f)/d) - 6*cos(e)^5*cos(6*c*f/d)*sin(e)*sin_integral(6*(d*f*x + c*f)/d) - 1
5*I*cos(e)^4*cos(6*c*f/d)*sin(e)^2*sin_integral(6*(d*f*x + c*f)/d) + 20*co
s(e)^3*cos(6*c*f/d)*sin(e)^3*sin_integral(6*(d*f*x + c*f)/d) + 15*I*cos(e)
^2*cos(6*c*f/d)*sin(e)^4*sin_integral(6*(d*f*x + c*f)/d) - 6*cos(e)*cos(6*
c*f/d)*sin(e)^5*sin_integral(6*(d*f*x + c*f)/d) - I*cos(6*c*f/d)*sin(e)^6*
sin_integral(6*(d*f*x + c*f)/d) + cos(e)^6*sin(6*c*f/d)*sin_integral(6*(d*
f*x + c*f)/d) + 6*I*cos(e)^5*sin(e)*sin(6*c*f/d)*sin_integral(6*(d*f*x ...
```

3.30.9 Mupad [F(-1)]

Timed out.

$$\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^3}\,dx = \int \frac{1}{\left(a+a\cot\left(e+f\,x\right)\,1\mathrm{i}\right)^3\,\left(c+d\,x\right)}\,dx$$

input
```
int(1/((a + a*cot(e + f*x)*1i)^3*(c + d*x)),x)
```

output
```
int(1/((a + a*cot(e + f*x)*1i)^3*(c + d*x)), x)
```

3.30. $\int \frac{1}{(c+dx)(a+ia\cot(e+fx))^3}\,dx$

3.31 $\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^3}\,dx$

3.31.1 Optimal result

Integrand size = 23, antiderivative size = 712

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^3}\,dx = -\frac{1}{8a^3d(c+dx)}+\frac{9\cos(2e+2fx)}{32a^3d(c+dx)}-\frac{3\cos^2(2e+2fx)}{8a^3d(c+dx)}+\frac{\cos^3(2e+2fx)}{8a^3d(c+dx)}+\frac{3\cos(6e+6fx)}{32a^3d(c+dx)}-\frac{3if\cos\left(2e-\frac{2cf}{d}\right)\text{CosIntegral}\left(\frac{2cf}{d}+2fx\right)}{4a^3d^2}+\frac{3if\cos\left(4e-\frac{4cf}{d}\right)\text{CosIntegral}\left(\frac{4cf}{d}+4fx\right)}{2a^3d^2}-\frac{3if\cos\left(6e-\frac{6cf}{d}\right)\text{CosIntegral}\left(\frac{6cf}{d}+6fx\right)}{4a^3d^2}+\frac{3f\,\text{CosIntegral}\left(\frac{6cf}{d}+6fx\right)\sin\left(6e-\frac{6cf}{d}\right)}{4a^3d^2}-\frac{3f\,\text{CosIntegral}\left(\frac{4cf}{d}+4fx\right)\sin\left(4e-\frac{4cf}{d}\right)}{2a^3d^2}+\frac{3f\,\text{CosIntegral}\left(\frac{2cf}{d}+2fx\right)\sin\left(2e-\frac{2cf}{d}\right)}{4a^3d^2}+\frac{15i\sin(2e+2fx)}{32a^3d(c+dx)}+\frac{3\sin^2(2e+2fx)}{8a^3d(c+dx)}-\frac{i\sin^3(2e+2fx)}{8a^3d(c+dx)}-\frac{3i\sin(4e+4fx)}{8a^3d(c+dx)}+\frac{3i\sin(6e+6fx)}{32a^3d(c+dx)}+\frac{3f\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(\frac{2cf}{d}+2fx\right)}{4a^3d^2}+\frac{3if\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(\frac{2cf}{d}+2fx\right)}{4a^3d^2}-\frac{3f\cos\left(4e-\frac{4cf}{d}\right)\text{Si}\left(\frac{4cf}{d}+4fx\right)}{2a^3d^2}-\frac{3if\sin\left(4e-\frac{4cf}{d}\right)\text{Si}\left(\frac{4cf}{d}+4fx\right)}{2a^3d^2}+\frac{3f\cos\left(6e-\frac{6cf}{d}\right)\text{Si}\left(\frac{6cf}{d}+6fx\right)}{4a^3d^2}+\frac{3if\sin\left(6e-\frac{6cf}{d}\right)\text{Si}\left(\frac{6cf}{d}+6fx\right)}{4a^3d^2}$$

output
```
-1/8/a^3/d/(d*x+c)+15/32*I*sin(2*f*x+2*e)/a^3/d/(d*x+c)-1/8*I*sin(2*f*x+2*
e)^3/a^3/d/(d*x+c)-3/4*I*f*Ci(2*c*f/d+2*f*x)*cos(-2*e+2*c*f/d)/a^3/d^2+9/3
2*cos(2*f*x+2*e)/a^3/d/(d*x+c)-3/8*cos(2*f*x+2*e)^2/a^3/d/(d*x+c)+1/8*cos(
2*f*x+2*e)^3/a^3/d/(d*x+c)+3/32*cos(6*f*x+6*e)/a^3/d/(d*x+c)+3/4*f*cos(-2*
e+2*c*f/d)*Si(2*c*f/d+2*f*x)/a^3/d^2-3/2*f*cos(-4*e+4*c*f/d)*Si(4*c*f/d+4*
f*x)/a^3/d^2+3/4*f*cos(-6*e+6*c*f/d)*Si(6*c*f/d+6*f*x)/a^3/d^2-3/4*f*Ci(6*
c*f/d+6*f*x)*sin(-6*e+6*c*f/d)/a^3/d^2-3/4*I*f*Si(6*c*f/d+6*f*x)*sin(-6*e+
6*c*f/d)/a^3/d^2+3/2*f*Ci(4*c*f/d+4*f*x)*sin(-4*e+4*c*f/d)/a^3/d^2+3/2*I*f
*Ci(4*c*f/d+4*f*x)*cos(-4*e+4*c*f/d)/a^3/d^2-3/4*f*Ci(2*c*f/d+2*f*x)*sin(-
2*e+2*c*f/d)/a^3/d^2+3/2*I*f*Si(4*c*f/d+4*f*x)*sin(-4*e+4*c*f/d)/a^3/d^2-3
/4*I*f*Ci(6*c*f/d+6*f*x)*cos(-6*e+6*c*f/d)/a^3/d^2+3/8*sin(2*f*x+2*e)^2/a^
3/d/(d*x+c)-3/4*I*f*Si(2*c*f/d+2*f*x)*sin(-2*e+2*c*f/d)/a^3/d^2-3/8*I*sin(
4*f*x+4*e)/a^3/d/(d*x+c)+3/32*I*sin(6*f*x+6*e)/a^3/d/(d*x+c)
```

3.31.2 Mathematica [A] (verified)

Time = 0.78 (sec) , antiderivative size = 292, normalized size of antiderivative = 0.41

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^3}\,dx$$
$$= \frac{-d+3d(\cos(2(e+fx))+i\sin(2(e+fx)))-3d(\cos(4(e+fx))+i\sin(4(e+fx)))+d(\cos(6(e+fx))\cdots}{}$$

input
```
Integrate[1/((c + d*x)^2*(a + I*a*Cot[e + f*x])^3),x]
```

output
```
(-d + 3*d*(Cos[2*(e + f*x)] + I*Sin[2*(e + f*x)]) - 3*d*(Cos[4*(e + f*x)]
+ I*Sin[4*(e + f*x)]) + d*(Cos[6*(e + f*x)] + I*Sin[6*(e + f*x)]) + 6*f*(c
 + d*x)*((-I)*Cos[2*e - (2*c*f)/d] + Sin[2*e - (2*c*f)/d])*(CosIntegral[(2
*f*(c + d*x))/d] + I*SinIntegral[(2*f*(c + d*x))/d]) + (12*I)*f*(c + d*x)*
(Cos[4*e - (4*c*f)/d] + I*Sin[4*e - (4*c*f)/d])*(CosIntegral[(4*f*(c + d*x
))/d] + I*SinIntegral[(4*f*(c + d*x))/d]) + 6*f*(c + d*x)*((-I)*Cos[6*e -
(6*c*f)/d] + Sin[6*e - (6*c*f)/d])*(CosIntegral[(6*f*(c + d*x))/d] + I*Sin
Integral[(6*f*(c + d*x))/d]))/(8*a^3*d^2*(c + d*x))
```

3.31.3 Rubi [A] (verified)

Time = 1.96 (sec) , antiderivative size = 712, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.130, Rules used = {3042, 4211, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^3}dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{1}{(c+dx)^2\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3}dx$$

$$\Big\downarrow \text{4211}$$

$$\int \left(\frac{i\sin^3(2e+2fx)}{8a^3(c+dx)^2}-\frac{3\sin^2(2e+2fx)}{8a^3(c+dx)^2}-\frac{3i\sin(2e+2fx)}{8a^3(c+dx)^2}+\frac{3\sin(2e+2fx)\sin(4e+4fx)}{16a^3(c+dx)^2}+\frac{3i\sin(4e+4fx)}{8a^3(c+dx)^2}\right.$$

$$\Big\downarrow \text{2009}$$

$$\frac{3f\,\text{CosIntegral}\left(6xf+\frac{6cf}{d}\right)\sin\left(6e-\frac{6cf}{d}\right)}{4a^3d^2}-\frac{3f\,\text{CosIntegral}\left(4xf+\frac{4cf}{d}\right)\sin\left(4e-\frac{4cf}{d}\right)}{2a^3d^2}+\frac{3f\,\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\sin\left(2e-\frac{2cf}{d}\right)}{4a^3d^2}-\frac{3if\,\text{CosIntegral}\left(2xf+\frac{2cf}{d}\right)\cos\left(2e-\frac{2cf}{d}\right)}{4a^3d^2}+\frac{3if\,\text{CosIntegral}\left(4xf+\frac{4cf}{d}\right)\cos\left(4e-\frac{4cf}{d}\right)}{2a^3d^2}-\frac{3if\,\text{CosIntegral}\left(6xf+\frac{6cf}{d}\right)\cos\left(6e-\frac{6cf}{d}\right)}{4a^3d^2}+\frac{3if\sin\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{4a^3d^2}-\frac{3if\sin\left(4e-\frac{4cf}{d}\right)\text{Si}\left(4xf+\frac{4cf}{d}\right)}{2a^3d^2}+\frac{3if\sin\left(6e-\frac{6cf}{d}\right)\text{Si}\left(6xf+\frac{6cf}{d}\right)}{4a^3d^2}+\frac{3f\cos\left(2e-\frac{2cf}{d}\right)\text{Si}\left(2xf+\frac{2cf}{d}\right)}{4a^3d^2}-\frac{3f\cos\left(4e-\frac{4cf}{d}\right)\text{Si}\left(4xf+\frac{4cf}{d}\right)}{2a^3d^2}+\frac{3f\cos\left(6e-\frac{6cf}{d}\right)\text{Si}\left(6xf+\frac{6cf}{d}\right)}{4a^3d^2}-\frac{i\sin^3(2e+2fx)}{8a^3d(c+dx)}+\frac{3\sin^2(2e+2fx)}{8a^3d(c+dx)}+\frac{15i\sin(2e+2fx)}{32a^3d(c+dx)}-\frac{3i\sin(4e+4fx)}{8a^3d(c+dx)}+\frac{3i\sin(6e+6fx)}{32a^3d(c+dx)}+\frac{\cos^3(2e+2fx)}{8a^3d(c+dx)}-\frac{3\cos^2(2e+2fx)}{8a^3d(c+dx)}+\frac{9\cos(2e+2fx)}{32a^3d(c+dx)}+\frac{3\cos(6e+6fx)}{32a^3d(c+dx)}-\frac{1}{8a^3d(c+dx)}$$

input
```
Int[1/((c + d*x)^2*(a + I*a*Cot[e + f*x])^3),x]
```

output
```
-1/8*1/(a^3*d*(c + d*x)) + (9*Cos[2*e + 2*f*x])/(32*a^3*d*(c + d*x)) - (3*
Cos[2*e + 2*f*x]^2)/(8*a^3*d*(c + d*x)) + Cos[2*e + 2*f*x]^3/(8*a^3*d*(c +
 d*x)) + (3*Cos[6*e + 6*f*x])/(32*a^3*d*(c + d*x)) - (((3*I)/4)*f*Cos[2*e
- (2*c*f)/d]*CosIntegral[(2*c*f)/d + 2*f*x])/(a^3*d^2) + (((3*I)/2)*f*Cos[
4*e - (4*c*f)/d]*CosIntegral[(4*c*f)/d + 4*f*x])/(a^3*d^2) - (((3*I)/4)*f*
Cos[6*e - (6*c*f)/d]*CosIntegral[(6*c*f)/d + 6*f*x])/(a^3*d^2) + (3*f*CosI
ntegral[(6*c*f)/d + 6*f*x]*Sin[6*e - (6*c*f)/d])/(4*a^3*d^2) - (3*f*CosInt
egral[(4*c*f)/d + 4*f*x]*Sin[4*e - (4*c*f)/d])/(2*a^3*d^2) + (3*f*CosInteg
ral[(2*c*f)/d + 2*f*x]*Sin[2*e - (2*c*f)/d])/(4*a^3*d^2) + (((15*I)/32)*Si
n[2*e + 2*f*x])/(a^3*d*(c + d*x)) + (3*Sin[2*e + 2*f*x]^2)/(8*a^3*d*(c + d
*x)) - ((I/8)*Sin[2*e + 2*f*x]^3)/(a^3*d*(c + d*x)) - (((3*I)/8)*Sin[4*e +
 4*f*x])/(a^3*d*(c + d*x)) + (((3*I)/32)*Sin[6*e + 6*f*x])/(a^3*d*(c + d*x
)) + (3*f*Cos[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/(4*a^3*d^2)
 + (((3*I)/4)*f*Sin[2*e - (2*c*f)/d]*SinIntegral[(2*c*f)/d + 2*f*x])/(a^3*
d^2) - (3*f*Cos[4*e - (4*c*f)/d]*SinIntegral[(4*c*f)/d + 4*f*x])/(2*a^3*d^
2) - (((3*I)/2)*f*Sin[4*e - (4*c*f)/d]*SinIntegral[(4*c*f)/d + 4*f*x])/(a^
3*d^2) + (3*f*Cos[6*e - (6*c*f)/d]*SinIntegral[(6*c*f)/d + 6*f*x])/(4*a^3*
d^2) + (((3*I)/4)*f*Sin[6*e - (6*c*f)/d]*SinIntegral[(6*c*f)/d + 6*f*x])/(
a^3*d^2)
```

3.31.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4211
```
Int[((c_.) + (d_.)*(x_))^(m_)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(2*a) + Cos[2*e + 2*f*x]/(
2*a) + Sin[2*e + 2*f*x]/(2*b))^(-n), x], x] /; FreeQ[{a, b, c, d, e, f}, x]
 && EqQ[a^2 + b^2, 0] && ILtQ[m, 0] && ILtQ[n, 0]
```

3.31.4 Maple [A] (verified)

Time = 1.11 (sec) , antiderivative size = 281, normalized size of antiderivative = 0.39

method	result
risch	$-\frac{1}{8a^3d(dx+c)}+\frac{3if\,\mathrm{e}^{2i(fx+e)}}{8a^3d^2\left(ifx+\frac{icf}{d}\right)}+\frac{3if\,\mathrm{e}^{-\frac{2i(cf-de)}{d}}\,\mathrm{Ei}_1\left(-2ifx-2ie-\frac{2(icf-ide)}{d}\right)}{4a^3d^2}-\frac{3if\,\mathrm{e}^{4i(fx+e)}}{8a^3d^2\left(ifx+\frac{icf}{d}\right)}-\frac{3if\,\mathrm{e}^{-\frac{4i(cf-de)}{d}}}{}$

input
```
int(1/(d*x+c)^2/(a+I*a*cot(f*x+e))^3,x,method=_RETURNVERBOSE)
```

output
```
-1/8/a^3/d/(d*x+c)+3/8*I/a^3*f/d^2*exp(2*I*(f*x+e))/(I*f*x+I/d*c*f)+3/4*I/
a^3*f/d^2*exp(-2*I*(c*f-d*e)/d)*Ei(1,-2*I*f*x-2*I*e-2*(I*c*f-I*d*e)/d)-3/8
*I/a^3*f/d^2*exp(4*I*(f*x+e))/(I*f*x+I/d*c*f)-3/2*I/a^3*f/d^2*exp(-4*I*(c*
f-d*e)/d)*Ei(1,-4*I*f*x-4*I*e-4*(I*c*f-I*d*e)/d)+1/8*I/a^3*f/d^2*exp(6*I*(
f*x+e))/(I*f*x+I/d*c*f)+3/4*I/a^3*f/d^2*exp(-6*I*(c*f-d*e)/d)*Ei(1,-6*I*f*
x-6*I*e-6*(I*c*f-I*d*e)/d)
```

3.31.5 Fricas [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 188, normalized size of antiderivative = 0.26

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^3}\,dx =$$
$$-\frac{6\,(i\,dfx+i\,cf)\mathrm{Ei}\left(-\frac{2\,(-i\,dfx-i\,cf)}{d}\right)e^{\left(-\frac{2\,(-i\,de+i\,cf)}{d}\right)}+12\,(-i\,dfx-i\,cf)\mathrm{Ei}\left(-\frac{4\,(-i\,dfx-i\,cf)}{d}\right)e^{\left(-\frac{4\,(-i\,de+i\,cf)}{d}\right)}}{8\,(a^3d^3x+}$$

input
```
integrate(1/(d*x+c)^2/(a+I*a*cot(f*x+e))^3,x, algorithm="fricas")
```

output
```
-1/8*(6*(I*d*f*x + I*c*f)*Ei(-2*(-I*d*f*x - I*c*f)/d)*e^(-2*(-I*d*e + I*c*
f)/d) + 12*(-I*d*f*x - I*c*f)*Ei(-4*(-I*d*f*x - I*c*f)/d)*e^(-4*(-I*d*e +
I*c*f)/d) + 6*(I*d*f*x + I*c*f)*Ei(-6*(-I*d*f*x - I*c*f)/d)*e^(-6*(-I*d*e
+ I*c*f)/d) - d*e^(6*I*f*x + 6*I*e) + 3*d*e^(4*I*f*x + 4*I*e) - 3*d*e^(2*I
*f*x + 2*I*e) + d)/(a^3*d^3*x + a^3*c*d^2)
```

3.31.6 Sympy [F(-1)]

Timed out.

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^3}\,dx = \text{Timed out}$$

input
```
integrate(1/(d*x+c)**2/(a+I*a*cot(f*x+e))**3,x)
```

output
```
Timed out
```

3.31.7 Maxima [A] (verification not implemented)

Time = 0.52 (sec) , antiderivative size = 299, normalized size of antiderivative = 0.42

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^3}\,dx$$
$$= \frac{f^2\cos\left(-\frac{6(de-cf)}{d}\right)E_2\left(\frac{6(-i(fx+e)d+ide-icf)}{d}\right) - 3f^2\cos\left(-\frac{4(de-cf)}{d}\right)E_2\left(\frac{4(-i(fx+e)d+ide-icf)}{d}\right) + 3f^2\cos\left(\right.}{}$$

input
```
integrate(1/(d*x+c)^2/(a+I*a*cot(f*x+e))^3,x, algorithm="maxima")
```

output
```
1/8*(f^2*cos(-6*(d*e - c*f)/d)*exp_integral_e(2, 6*(-I*(f*x + e)*d + I*d*e
 - I*c*f)/d) - 3*f^2*cos(-4*(d*e - c*f)/d)*exp_integral_e(2, 4*(-I*(f*x +
e)*d + I*d*e - I*c*f)/d) + 3*f^2*cos(-2*(d*e - c*f)/d)*exp_integral_e(2, 2
*(-I*(f*x + e)*d + I*d*e - I*c*f)/d) - 3*I*f^2*exp_integral_e(2, 2*(-I*(f*
x + e)*d + I*d*e - I*c*f)/d)*sin(-2*(d*e - c*f)/d) + 3*I*f^2*exp_integral_
e(2, 4*(-I*(f*x + e)*d + I*d*e - I*c*f)/d)*sin(-4*(d*e - c*f)/d) - I*f^2*e
xp_integral_e(2, 6*(-I*(f*x + e)*d + I*d*e - I*c*f)/d)*sin(-6*(d*e - c*f)/
d) - f^2)/(((f*x + e)*a^3*d^2 - a^3*d^2*e + a^3*c*d*f)*f)
```

3.31.8 Giac [B] (verification not implemented)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 4284 vs. 2(648) = 1296.

Time = 1.37 (sec) , antiderivative size = 4284, normalized size of antiderivative = 6.02

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^3}\,dx = \text{Too large to display}$$

input
```
integrate(1/(d*x+c)^2/(a+I*a*cot(f*x+e))^3,x, algorithm="giac")
```

output
```
1/8*(-6*I*d*f*x*cos(e)^6*cos(6*c*f/d)*cos_integral(6*(d*f*x + c*f)/d) + 36
*d*f*x*cos(e)^5*cos(6*c*f/d)*cos_integral(6*(d*f*x + c*f)/d)*sin(e) + 90*I
*d*f*x*cos(e)^4*cos(6*c*f/d)*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^2 - 12
0*d*f*x*cos(e)^3*cos(6*c*f/d)*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^3 - 9
0*I*d*f*x*cos(e)^2*cos(6*c*f/d)*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^4 +
 36*d*f*x*cos(e)*cos(6*c*f/d)*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^5 + 6
*I*d*f*x*cos(6*c*f/d)*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^6 - 6*d*f*x*c
os(e)^6*cos_integral(6*(d*f*x + c*f)/d)*sin(6*c*f/d) - 36*I*d*f*x*cos(e)^5
*cos_integral(6*(d*f*x + c*f)/d)*sin(e)*sin(6*c*f/d) + 90*d*f*x*cos(e)^4*c
os_integral(6*(d*f*x + c*f)/d)*sin(e)^2*sin(6*c*f/d) + 120*I*d*f*x*cos(e)^
3*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^3*sin(6*c*f/d) - 90*d*f*x*cos(e)^
2*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^4*sin(6*c*f/d) - 36*I*d*f*x*cos(e
)*cos_integral(6*(d*f*x + c*f)/d)*sin(e)^5*sin(6*c*f/d) + 6*d*f*x*cos_inte
gral(6*(d*f*x + c*f)/d)*sin(e)^6*sin(6*c*f/d) + 6*d*f*x*cos(e)^6*cos(6*c*f
/d)*sin_integral(6*(d*f*x + c*f)/d) + 36*I*d*f*x*cos(e)^5*cos(6*c*f/d)*sin
(e)*sin_integral(6*(d*f*x + c*f)/d) - 90*d*f*x*cos(e)^4*cos(6*c*f/d)*sin(e
)^2*sin_integral(6*(d*f*x + c*f)/d) - 120*I*d*f*x*cos(e)^3*cos(6*c*f/d)*si
n(e)^3*sin_integral(6*(d*f*x + c*f)/d) + 90*d*f*x*cos(e)^2*cos(6*c*f/d)*si
n(e)^4*sin_integral(6*(d*f*x + c*f)/d) + 36*I*d*f*x*cos(e)*cos(6*c*f/d)*si
n(e)^5*sin_integral(6*(d*f*x + c*f)/d) - 6*d*f*x*cos(6*c*f/d)*sin(e)^6*...
```

3.31.9 Mupad [F(-1)]

Timed out.

$$\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^3}\,dx = \int \frac{1}{{\left(a+a\cot\left(e+f\,x\right)\,1{}\mathrm{i}\right)}^3\,{\left(c+d\,x\right)}^2}\,dx$$

input
```
int(1/((a + a*cot(e + f*x)*1i)^3*(c + d*x)^2),x)
```

output
```
int(1/((a + a*cot(e + f*x)*1i)^3*(c + d*x)^2), x)
```

3.31. $\int \frac{1}{(c+dx)^2(a+ia\cot(e+fx))^3}\,dx$

3.32 $\int (c+dx)^m(a+ia\cot(e+fx))^2\,dx$

3.32.1 Optimal result

Integrand size = 23, antiderivative size = 23

$$\int (c+dx)^m(a+ia\cot(e+fx))^2\,dx=\text{Int}\big((c+dx)^m(a+ia\cot(e+fx))^2,x\big)$$

output
```
Unintegrable((d*x+c)^m*(a+I*a*cot(f*x+e))^2,x)
```

3.32.2 Mathematica [N/A]

Not integrable

Time = 13.56 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.09

$$\int (c+dx)^m(a+ia\cot(e+fx))^2\,dx=\int (c+dx)^m(a+ia\cot(e+fx))^2\,dx$$

input
```
Integrate[(c + d*x)^m*(a + I*a*Cot[e + f*x])^2,x]
```

output
```
Integrate[(c + d*x)^m*(a + I*a*Cot[e + f*x])^2, x]
```

3.32.3 Rubi [N/A]

Not integrable

Time = 0.21 (sec) , antiderivative size = 23, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)^m(a+ia\cot(e+fx))^2\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int (c+dx)^m\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2dx$$

$$\Big\downarrow \text{4223}$$

$$\int (c+dx)^m(a+ia\cot(e+fx))^2dx$$

input
```
Int[(c + d*x)^m*(a + I*a*Cot[e + f*x])^2,x]
```

output
```
$Aborted
```

3.32.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.32.4 Maple [N/A] (verified)

Not integrable

Time = 0.18 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.91

$$\int (dx+c)^m (a+ia\cot(fx+e))^2 \, dx$$

input
```
int((d*x+c)^m*(a+I*a*cot(f*x+e))^2,x)
```

output
```
int((d*x+c)^m*(a+I*a*cot(f*x+e))^2,x)
```

3.32.5 Fricas [N/A]

Not integrable

Time = 0.26 (sec) , antiderivative size = 110, normalized size of antiderivative = 4.78

$$\int (c+dx)^m(a+ia\cot(e+fx))^2 \, dx = \int (i\,a\cot(fx+e)+a)^2(dx+c)^m \, dx$$

input
```
integrate((d*x+c)^m*(a+I*a*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
(2*I*(d*x + c)^m*a^2 + (f*e^(2*I*f*x + 2*I*e) - f)*integral(2*(2*a^2*d*f*x
 + 2*a^2*c*f + I*a^2*d*m)*(d*x + c)^m/(d*f*x + c*f - (d*f*x + c*f)*e^(2*I*
f*x + 2*I*e)), x))/(f*e^(2*I*f*x + 2*I*e) - f)
```

3.32.6 Sympy [N/A]

Not integrable

Time = 4.04 (sec) , antiderivative size = 51, normalized size of antiderivative = 2.22

$$\int (c+dx)^m(a+ia\cot(e+fx))^2 \, dx = -a^2\left(\int (c+dx)^m\cot^2(e+fx)\, dx + \int \left(-2i(c+dx)^m\cot(e+fx)\right) dx + \int \left(-(c+dx)^m\right) dx\right)$$

input
```
integrate((d*x+c)**m*(a+I*a*cot(f*x+e))**2,x)
```

output
```
-a**2*(Integral((c + d*x)**m*cot(e + f*x)**2, x) + Integral(-2*I*(c + d*x)
**m*cot(e + f*x), x) + Integral(-(c + d*x)**m, x))
```

3.32.7 Maxima [N/A]

Not integrable

Time = 1.16 (sec) , antiderivative size = 496, normalized size of antiderivative = 21.57

$$\int (c+dx)^m(a+ia\cot(e+fx))^2\,dx = \int (i\,a\cot\left(fx+e\right)+a)^2(dx+c)^m\,dx$$

input
```
integrate((d*x+c)^m*(a+I*a*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
(d*x + c)^(m + 1)*a^2/(d*(m + 1)) - integrate(-((d*x + c)^m*a^2*cos(4*f*x
+ 4*e)^2 + 4*(d*x + c)^m*a^2*cos(2*f*x + 2*e)^2 + (d*x + c)^m*a^2*sin(4*f*
x + 4*e)^2 - 4*(d*x + c)^m*a^2*sin(4*f*x + 4*e)*sin(2*f*x + 2*e) + 4*(d*x
+ c)^m*a^2*sin(2*f*x + 2*e)^2 + 4*(d*x + c)^m*a^2*cos(2*f*x + 2*e) - 3*(d*
x + c)^m*a^2 - 2*(2*(d*x + c)^m*a^2*cos(2*f*x + 2*e) + (d*x + c)^m*a^2)*co
s(4*f*x + 4*e))/(2*(2*cos(2*f*x + 2*e) - 1)*cos(4*f*x + 4*e) - cos(4*f*x +
 4*e)^2 - 4*cos(2*f*x + 2*e)^2 - sin(4*f*x + 4*e)^2 + 4*sin(4*f*x + 4*e)*s
in(2*f*x + 2*e) - 4*sin(2*f*x + 2*e)^2 + 4*cos(2*f*x + 2*e) - 1), x) - I*i
ntegrate(-4*((d*x + c)^m*a^2*sin(4*f*x + 4*e) - 2*(d*x + c)^m*a^2*sin(2*f*
x + 2*e))/(2*(2*cos(2*f*x + 2*e) - 1)*cos(4*f*x + 4*e) - cos(4*f*x + 4*e)^
2 - 4*cos(2*f*x + 2*e)^2 - sin(4*f*x + 4*e)^2 + 4*sin(4*f*x + 4*e)*sin(2*f
*x + 2*e) - 4*sin(2*f*x + 2*e)^2 + 4*cos(2*f*x + 2*e) - 1), x)
```

3.32.8 Giac [N/A]

Not integrable

Time = 0.41 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.00

$$\int (c+dx)^m(a+ia\cot(e+fx))^2\,dx = \int (i\,a\cot\left(fx+e\right)+a)^2(dx+c)^m\,dx$$

input
```
integrate((d*x+c)^m*(a+I*a*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
integrate((I*a*cot(f*x + e) + a)^2*(d*x + c)^m, x)
```

3.32.9 Mupad [N/A]

Not integrable

Time = 12.37 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.04

$$\int (c+dx)^m(a+ia\cot(e+fx))^2\,dx = \int (a+a\cot(e+f\,x)\ 1\mathrm{i})^2\,(c+d\,x)^m\,dx$$

input
```
int((a + a*cot(e + f*x)*1i)^2*(c + d*x)^m,x)
```

output
```
int((a + a*cot(e + f*x)*1i)^2*(c + d*x)^m, x)
```

3.33 $\int (c+dx)^m(a+ia\cot(e+fx))\,dx$

3.33.1 Optimal result

Integrand size = 21, antiderivative size = 21

$$\int (c+dx)^m(a+ia\cot(e+fx))\,dx = \text{Int}((c+dx)^m(a+ia\cot(e+fx)),x)$$

output
```
Unintegrable((d*x+c)^m*(a+I*a*cot(f*x+e)),x)
```

3.33.2 Mathematica [N/A]

Not integrable

Time = 6.59 (sec) , antiderivative size = 23, normalized size of antiderivative = 1.10

$$\int (c+dx)^m(a+ia\cot(e+fx))\,dx = \int (c+dx)^m(a+ia\cot(e+fx))\,dx$$

input
```
Integrate[(c + d*x)^m*(a + I*a*Cot[e + f*x]),x]
```

output
```
Integrate[(c + d*x)^m*(a + I*a*Cot[e + f*x]), x]
```

3.33.3 Rubi [N/A]

Not integrable

Time = 0.19 (sec) , antiderivative size = 21, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)^m(a+ia\cot(e+fx))\,dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int (c+dx)^m\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)dx$$

$$\Big\downarrow \text{ 4223}$$

$$\int (c+dx)^m(a+ia\cot(e+fx))dx$$

input
```
Int[(c + d*x)^m*(a + I*a*Cot[e + f*x]),x]
```

output
```
$Aborted
```

3.33.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.33.4 Maple [N/A] (verified)

Not integrable

Time = 0.12 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.90

$$\int (dx+c)^m (a+ia\cot(fx+e))\,dx$$

input
```
int((d*x+c)^m*(a+I*a*cot(f*x+e)),x)
```

output
```
int((d*x+c)^m*(a+I*a*cot(f*x+e)),x)
```

3.33.5 Fricas [N/A]

Not integrable

Time = 0.29 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.19

$$\int (c+dx)^m(a+ia\cot(e+fx))\,dx = \int (i\,a\cot(fx+e)+a)(dx+c)^m\,dx$$

input
```
integrate((d*x+c)^m*(a+I*a*cot(f*x+e)),x, algorithm="fricas")
```

output
```
integral(-2*(d*x + c)^m*a/(e^(2*I*f*x + 2*I*e) - 1), x)
```

3.33.6 Sympy [N/A]

Not integrable

Time = 1.83 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.38

$$\int (c+dx)^m(a+ia\cot(e+fx))\,dx = ia\left(\int (-i(c+dx)^m)\,dx + \int (c+dx)^m\cot(e+fx)\,dx\right)$$

input
```
integrate((d*x+c)**m*(a+I*a*cot(f*x+e)),x)
```

output
```
I*a*(Integral(-I*(c + d*x)**m, x) + Integral((c + d*x)**m*cot(e + f*x), x)
)
```

3.33.7 Maxima [N/A]

Not integrable

Time = 0.50 (sec) , antiderivative size = 79, normalized size of antiderivative = 3.76

$$\int (c+dx)^m(a+ia\cot(e+fx))\,dx=\int (i\,a\cot{(fx+e)}+a)(dx+c)^m\,dx$$

input
```
integrate((d*x+c)^m*(a+I*a*cot(f*x+e)),x, algorithm="maxima")
```

output
```
2*I*a*integrate((d*x + c)^m*sin(2*f*x + 2*e)/(cos(2*f*x + 2*e)^2 + sin(2*f
*x + 2*e)^2 - 2*cos(2*f*x + 2*e) + 1), x) + (d*x + c)^(m + 1)*a/(d*(m + 1)
)
```

3.33.8 Giac [N/A]

Not integrable

Time = 0.30 (sec) , antiderivative size = 21, normalized size of antiderivative = 1.00

$$\int (c+dx)^m(a+ia\cot(e+fx))\,dx=\int (i\,a\cot{(fx+e)}+a)(dx+c)^m\,dx$$

input
```
integrate((d*x+c)^m*(a+I*a*cot(f*x+e)),x, algorithm="giac")
```

output
```
integrate((I*a*cot(f*x + e) + a)*(d*x + c)^m, x)
```

3.33.9 Mupad [N/A]

Not integrable

Time = 12.40 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.05

$$\int (c+dx)^m(a+ia\cot(e+fx))\,dx=\int \left(a+a\cot(e+f\,x)\,1\mathrm{i}\right)\,{\left(c+d\,x\right)}^m\,dx$$

input
```
int((a + a*cot(e + f*x)*1i)*(c + d*x)^m,x)
```

output
```
int((a + a*cot(e + f*x)*1i)*(c + d*x)^m, x)
```

3.34 $\int \frac{(c+dx)^m}{a+ia\cot(e+fx)}\,dx$

3.34.1 Optimal result

Integrand size = 23, antiderivative size = 98

$$\int \frac{(c+dx)^m}{a+ia\cot(e+fx)}\,dx = \frac{(c+dx)^{1+m}}{2ad(1+m)} + \frac{i2^{-2-m}e^{2i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(1+m,-\frac{2if(c+dx)}{d}\right)}{af}$$

output
```
1/2*(d*x+c)^(1+m)/a/d/(1+m)+I*2^(-2-m)*exp(2*I*(e-c*f/d))*(d*x+c)^m*GAMMA(
1+m,-2*I*f*(d*x+c)/d)/a/f/((-I*f*(d*x+c)/d)^m)
```

3.34.2 Mathematica [A] (verified)

Time = 0.74 (sec) , antiderivative size = 91, normalized size of antiderivative = 0.93

$$\int \frac{(c+dx)^m}{a+ia\cot(e+fx)}\,dx = -\frac{(c+dx)^m\left(-\frac{2(c+dx)}{d(1+m)}-\frac{i2^{-m}e^{2i\left(e-\frac{cf}{d}\right)}\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(1+m,-\frac{2if(c+dx)}{d}\right)}{f}\right)}{4a}$$

input
```
Integrate[(c + d*x)^m/(a + I*a*Cot[e + f*x]),x]
```

output
```
-1/4*((c + d*x)^m*((-2*(c + d*x))/(d*(1 + m)) - (I*E^((2*I)*(e - (c*f)/d))
*Gamma[1 + m, ((-2*I)*f*(c + d*x))/d])/(2^m*f*(((-I)*f*(c + d*x))/d)^m)))/
a
```

3.34.3 Rubi [A] (verified)

Time = 0.32 (sec) , antiderivative size = 98, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.130, Rules used = {3042, 4210, 2612}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^m}{a+ia\cot(e+fx)}dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int \frac{(c+dx)^m}{a-ia\tan\left(e+fx+\frac{\pi}{2}\right)}dx$$

$$\Big\downarrow \text{ 4210}$$

$$\frac{(c+dx)^{m+1}}{2ad(m+1)}+\frac{\int e^{i(2e+2fx+\pi)}(c+dx)^m dx}{2a}$$

$$\Big\downarrow \text{ 2612}$$

$$\frac{(c+dx)^{m+1}}{2ad(m+1)}+\frac{i2^{-m-2}e^{2i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(m+1,-\frac{2if(c+dx)}{d}\right)}{af}$$

input
```
Int[(c + d*x)^m/(a + I*a*Cot[e + f*x]),x]
```

output
```
(c + d*x)^(1 + m)/(2*a*d*(1 + m)) + (I*2^(-2 - m)*E^((2*I)*(e - (c*f)/d))*
(c + d*x)^m*Gamma[1 + m, ((-2*I)*f*(c + d*x))/d])/(a*f*(((-I)*f*(c + d*x))
/d)^m)
```

3.34.3.1 Defintions of rubi rules used

rule 2612
```
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 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4210
```
Int[((c_.) + (d_.)*(x_))^(m_)/((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)]), x_Sym
bol] :> Simp[(c + d*x)^(m + 1)/(2*a*d*(m + 1)), x] + Simp[1/(2*a)   Int[(c
+ d*x)^m*E^(2*(a/b)*(e + f*x)), x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] &
& EqQ[a^2 + b^2, 0] &&  !IntegerQ[m]
```

3.34.4 Maple [F]

$$\int \frac{(dx+c)^m}{a+ia\cot(fx+e)}dx$$

input
```
int((d*x+c)^m/(a+I*a*cot(f*x+e)),x)
```

output
```
int((d*x+c)^m/(a+I*a*cot(f*x+e)),x)
```

3.34.5 Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 85, normalized size of antiderivative = 0.87

$$\int \frac{(c+dx)^m}{a+ia\cot(e+fx)}\,dx = \frac{(i\,dm+i\,d)e^{\left(-\frac{dm\log\left(-\frac{2i\,f}{d}\right)-2i\,de+2i\,cf}{d}\right)}\Gamma\left(m+1,-\frac{2\,(i\,dfx+i\,cf)}{d}\right)+2\,(dfx+cf)(dx+c)^m}{4\,(adfm+adf)}$$

input
```
integrate((d*x+c)^m/(a+I*a*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/4*((I*d*m + I*d)*e^(-(d*m*log(-2*I*f/d) - 2*I*d*e + 2*I*c*f)/d)*gamma(m
+ 1, -2*(I*d*f*x + I*c*f)/d) + 2*(d*f*x + c*f)*(d*x + c)^m)/(a*d*f*m + a*d
*f)
```

3.34.6 Sympy [F]

$$\int \frac{(c+dx)^m}{a+ia\cot(e+fx)}\,dx = -\frac{i\int \frac{(c+dx)^m}{\cot(e+fx)-i}\,dx}{a}$$

input
```
integrate((d*x+c)**m/(a+I*a*cot(f*x+e)),x)
```

output
```
-I*Integral((c + d*x)**m/(cot(e + f*x) - I), x)/a
```

3.34.7 Maxima [F]

$$\int \frac{(c+dx)^m}{a+ia\cot(e+fx)}\,dx = \int \frac{(dx+c)^m}{i\,a\cot(fx+e)+a}\,dx$$

input
```
integrate((d*x+c)^m/(a+I*a*cot(f*x+e)),x, algorithm="maxima")
```

output
```
-1/2*((d*m + d)*integrate((d*x + c)^m*cos(2*f*x + 2*e), x) + (I*d*m + I*d)
*integrate((d*x + c)^m*sin(2*f*x + 2*e), x) - e^(m*log(d*x + c) + log(d*x
+ c)))/(a*d*m + a*d)
```

3.34.8 Giac [F]

$$\int \frac{(c+dx)^m}{a+ia\cot(e+fx)}\,dx = \int \frac{(dx+c)^m}{i\,a\cot(fx+e)+a}\,dx$$

input
```
integrate((d*x+c)^m/(a+I*a*cot(f*x+e)),x, algorithm="giac")
```

output
```
integrate((d*x + c)^m/(I*a*cot(f*x + e) + a), x)
```

3.34.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx)^m}{a+ia\cot(e+fx)}\,dx=\int \frac{(c+d\,x)^m}{a+a\cot\left(e+f\,x\right)\,1\mathrm{i}}\,dx$$

input
```
int((c + d*x)^m/(a + a*cot(e + f*x)*1i),x)
```

output
```
int((c + d*x)^m/(a + a*cot(e + f*x)*1i), x)
```

3.35 $\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^2}\,dx$

3.35.1 Optimal result

Integrand size = 23, antiderivative size = 171

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^2}\,dx = \frac{(c+dx)^{1+m}}{4a^2d(1+m)} + \frac{i2^{-2-m}e^{2i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(1+m,-\frac{2if(c+dx)}{d}\right)}{a^2f} - \frac{i4^{-2-m}e^{4i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(1+m,-\frac{4if(c+dx)}{d}\right)}{a^2f}$$

output
```
1/4*(d*x+c)^(1+m)/a^2/d/(1+m)+I*2^(-2-m)*exp(2*I*(e-c*f/d))*(d*x+c)^m*GAMM
A(1+m,-2*I*f*(d*x+c)/d)/a^2/f/((-I*f*(d*x+c)/d)^m)-I*4^(-2-m)*exp(4*I*(e-c
*f/d))*(d*x+c)^m*GAMMA(1+m,-4*I*f*(d*x+c)/d)/a^2/f/((-I*f*(d*x+c)/d)^m)
```

3.35.2 Mathematica [A] (verified)

Time = 4.43 (sec) , antiderivative size = 152, normalized size of antiderivative = 0.89

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^2}\,dx = \frac{(c+dx)^m\left(\frac{4f(c+dx)}{d(1+m)} + i2^{2-m}e^{2i\left(e-\frac{cf}{d}\right)}\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(1+m,-\frac{2if(c+dx)}{d}\right) - i4^{-m}e^{4i\left(e-\frac{cf}{d}\right)}\left(-\frac{if(c+dx)}{d}\right)^{-m}}{16a^2f}$$

input
```
Integrate[(c + d*x)^m/(a + I*a*Cot[e + f*x])^2,x]
```

output
```
((c + d*x)^m*((4*f*(c + d*x))/(d*(1 + m)) + (I*2^(2 - m)*E^((2*I)*(e - (c*
f)/d))*Gamma[1 + m, ((-2*I)*f*(c + d*x))/d])/(((-I)*f*(c + d*x))/d)^m - (I
*E^((4*I)*(e - (c*f)/d))*Gamma[1 + m, ((-4*I)*f*(c + d*x))/d])/(4^m*(((-I)
*f*(c + d*x))/d)^m)))/(16*a^2*f)
```

3.35.3 Rubi [A] (verified)

Time = 0.40 (sec) , antiderivative size = 171, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.130, Rules used = {3042, 4212, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^2}dx$$
$$\Big\downarrow \text{3042}$$
$$\int \frac{(c+dx)^m}{\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$
$$\Big\downarrow \text{4212}$$
$$\int \left(-\frac{e^{2ie+2ifx}(c+dx)^m}{2a^2}+\frac{e^{4ie+4ifx}(c+dx)^m}{4a^2}+\frac{(c+dx)^m}{4a^2}\right)dx$$
$$\Big\downarrow \text{2009}$$
$$\frac{i2^{-m-2}e^{2i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(m+1,-\frac{2if(c+dx)}{d}\right)}{a^2f}-\frac{i4^{-m-2}e^{4i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(m+1,-\frac{4if(c+dx)}{d}\right)}{a^2f}+\frac{(c+dx)^{m+1}}{4a^2d(m+1)}$$

input
```
Int[(c + d*x)^m/(a + I*a*Cot[e + f*x])^2,x]
```

output
```
(c + d*x)^(1 + m)/(4*a^2*d*(1 + m)) + (I*2^(-2 - m)*E^((2*I)*(e - (c*f)/d)
)*(c + d*x)^m*Gamma[1 + m, ((-2*I)*f*(c + d*x))/d])/(a^2*f*(((-I)*f*(c + d
*x))/d)^m) - (I*4^(-2 - m)*E^((4*I)*(e - (c*f)/d))*(c + d*x)^m*Gamma[1 + m
, ((-4*I)*f*(c + d*x))/d])/(a^2*f*(((-I)*f*(c + d*x))/d)^m)
```

3.35.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4212
```
Int[((c_.) + (d_.)*(x_))^(m_)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(2*a) + E^(2*(a/b)*(e + f*
x))/(2*a))^(-n), x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && EqQ[a^2 + b^2
, 0] && ILtQ[n, 0]
```

3.35.4 Maple [F]

$$\int \frac{(dx+c)^m}{(a+ia\cot(fx+e))^2}\,dx$$

input
```
int((d*x+c)^m/(a+I*a*cot(f*x+e))^2,x)
```

output
```
int((d*x+c)^m/(a+I*a*cot(f*x+e))^2,x)
```

3.35.5 Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 144, normalized size of antiderivative = 0.84

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^2}\,dx = -\frac{4\left(-i\,dm-i\,d\right)e^{\left(-\frac{dm\log\left(-\frac{2i\,f}{d}\right)-2i\,de+2i\,cf}{d}\right)}\Gamma\left(m+1,-\frac{2\,(i\,dfx+i\,cf)}{d}\right)-\left(-i\,dm-i\,d\right)e^{\left(-\frac{dm\log\left(-\frac{4i\,f}{d}\right)-4i\,de+4i\,cf}{d}\right.}}{16\left(a^2dfm+a^2df\right)}$$

input
```
integrate((d*x+c)^m/(a+I*a*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
-1/16*(4*(-I*d*m - I*d)*e^(-(d*m*log(-2*I*f/d) - 2*I*d*e + 2*I*c*f)/d)*gam
ma(m + 1, -2*(I*d*f*x + I*c*f)/d) - (-I*d*m - I*d)*e^(-(d*m*log(-4*I*f/d)
- 4*I*d*e + 4*I*c*f)/d)*gamma(m + 1, -4*(I*d*f*x + I*c*f)/d) - 4*(d*f*x +
c*f)*(d*x + c)^m)/(a^2*d*f*m + a^2*d*f)
```

3.35.6 Sympy [F]

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^2}\,dx = -\frac{\int \frac{(c+dx)^m}{\cot^2(e+fx)-2i\cot(e+fx)-1}\,dx}{a^2}$$

input
```
integrate((d*x+c)**m/(a+I*a*cot(f*x+e))**2,x)
```

output
```
-Integral((c + d*x)**m/(cot(e + f*x)**2 - 2*I*cot(e + f*x) - 1), x)/a**2
```

3.35.7 Maxima [F]

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^2}\,dx = \int \frac{(dx+c)^m}{(i\,a\cot(fx+e)+a)^2}\,dx$$

input
```
integrate((d*x+c)^m/(a+I*a*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
1/4*((d*m + d)*integrate((d*x + c)^m*cos(4*f*x + 4*e), x) - 2*(d*m + d)*in
tegrate((d*x + c)^m*cos(2*f*x + 2*e), x) + (I*d*m + I*d)*integrate((d*x +
c)^m*sin(4*f*x + 4*e), x) - 2*(I*d*m + I*d)*integrate((d*x + c)^m*sin(2*f*
x + 2*e), x) + e^(m*log(d*x + c) + log(d*x + c)))/(a^2*d*m + a^2*d)
```

3.35.8 Giac [F]

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^2}\,dx = \int \frac{(dx+c)^m}{(i\,a\cot(fx+e)+a)^2}\,dx$$

input
```
integrate((d*x+c)^m/(a+I*a*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
integrate((d*x + c)^m/(I*a*cot(f*x + e) + a)^2, x)
```

3.35.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^2}\,dx = \int \frac{(c+d\,x)^m}{(a+a\cot(e+f\,x)\ 1\mathrm{i})^2}\,dx$$

input
```
int((c + d*x)^m/(a + a*cot(e + f*x)*1i)^2,x)
```

output
```
int((c + d*x)^m/(a + a*cot(e + f*x)*1i)^2, x)
```

3.36 $\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^3}\,dx$

3.36.1 Optimal result

Integrand size = 23, antiderivative size = 251

$$\begin{aligned}\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^3}\,dx &= \frac{(c+dx)^{1+m}}{8a^3d(1+m)}+\frac{3i2^{-4-m}e^{2i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(1+m,-\frac{2if(c+dx)}{d}\right)}{a^3f}\\ &\quad-\frac{3i2^{-5-2m}e^{4i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(1+m,-\frac{4if(c+dx)}{d}\right)}{a^3f}\\ &\quad+\frac{i2^{-4-m}3^{-1-m}e^{6i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(1+m,-\frac{6if(c+dx)}{d}\right)}{a^3f}\end{aligned}$$

output
```
1/8*(d*x+c)^(1+m)/a^3/d/(1+m)+3*I*2^(-4-m)*exp(2*I*(e-c*f/d))*(d*x+c)^m*GA
MMA(1+m,-2*I*f*(d*x+c)/d)/a^3/f/((-I*f*(d*x+c)/d)^m)-3*I*2^(-5-2*m)*exp(4*
I*(e-c*f/d))*(d*x+c)^m*GAMMA(1+m,-4*I*f*(d*x+c)/d)/a^3/f/((-I*f*(d*x+c)/d)
^m)+I*2^(-4-m)*3^(-1-m)*exp(6*I*(e-c*f/d))*(d*x+c)^m*GAMMA(1+m,-6*I*f*(d*x
+c)/d)/a^3/f/((-I*f*(d*x+c)/d)^m)
```

3.36.2 Mathematica [A] (verified)

Time = 6.05 (sec) , antiderivative size = 238, normalized size of antiderivative = 0.95

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^3}\,dx$$
$$= \frac{2^{-5-2m}3^{-1-m}e^{-\frac{6icf}{d}}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\left(12^{1+m}e^{\frac{6icf}{d}}f(c+dx)\left(-\frac{if(c+dx)}{d}\right)^m+i2^{1+m}3^{2+m}de^{2ie+\frac{4icf}{d}}(\right.}{}$$

input
```
Integrate[(c + d*x)^m/(a + I*a*Cot[e + f*x])^3,x]
```

output
```
(2^(-5 - 2*m)*3^(-1 - m)*(c + d*x)^m*(12^(1 + m)*E^(((6*I)*c*f)/d)*f*(c +
d*x)*(((-I)*f*(c + d*x))/d)^m + I*2^(1 + m)*3^(2 + m)*d*E^((2*I)*e + ((4*I
)*c*f)/d)*(1 + m)*Gamma[1 + m, ((-2*I)*f*(c + d*x))/d] - I*3^(2 + m)*d*E^(
(2*I)*(2*e + (c*f)/d))*(1 + m)*Gamma[1 + m, ((-4*I)*f*(c + d*x))/d] + I*2^
(1 + m)*d*E^((6*I)*e)*(1 + m)*Gamma[1 + m, ((-6*I)*f*(c + d*x))/d]))/(a^3*
d*E^(((6*I)*c*f)/d)*f*(1 + m)*(((-I)*f*(c + d*x))/d)^m)
```

3.36.3 Rubi [A] (verified)

Time = 0.47 (sec) , antiderivative size = 251, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.130$, Rules used = {3042, 4212, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^3}\,dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int \frac{(c+dx)^m}{\left(a-ia\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3}dx$$

$$\Big\downarrow \text{ 4212}$$

$$\int \left(-\frac{3e^{2ie+2ifx}(c+dx)^m}{8a^3}+\frac{3e^{4ie+4ifx}(c+dx)^m}{8a^3}-\frac{e^{6ie+6ifx}(c+dx)^m}{8a^3}+\frac{(c+dx)^m}{8a^3}\right)dx$$

$$\Big\downarrow \text{ 2009}$$

$$\frac{3i2^{-m-4}e^{2i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(m+1,-\frac{2if(c+dx)}{d}\right)}{a^3f}-\frac{3i2^{-2m-5}e^{4i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(m+1,-\frac{4if(c+dx)}{d}\right)}{a^3f}+\frac{i2^{-m-4}3^{-m-1}e^{6i\left(e-\frac{cf}{d}\right)}(c+dx)^m\left(-\frac{if(c+dx)}{d}\right)^{-m}\Gamma\left(m+1,-\frac{6if(c+dx)}{d}\right)}{a^3f}+\frac{(c+dx)^{m+1}}{8a^3d(m+1)}$$

input
```
Int[(c + d*x)^m/(a + I*a*Cot[e + f*x])^3,x]
```

output
```
(c + d*x)^(1 + m)/(8*a^3*d*(1 + m)) + ((3*I)*2^(-4 - m)*E^((2*I)*(e - (c*f
)/d))*(c + d*x)^m*Gamma[1 + m, ((-2*I)*f*(c + d*x))/d])/(a^3*f*(((-I)*f*(c
 + d*x))/d)^m) - ((3*I)*2^(-5 - 2*m)*E^((4*I)*(e - (c*f)/d))*(c + d*x)^m*G
amma[1 + m, ((-4*I)*f*(c + d*x))/d])/(a^3*f*(((-I)*f*(c + d*x))/d)^m) + (I
*2^(-4 - m)*3^(-1 - m)*E^((6*I)*(e - (c*f)/d))*(c + d*x)^m*Gamma[1 + m, ((
-6*I)*f*(c + d*x))/d])/(a^3*f*(((-I)*f*(c + d*x))/d)^m)
```

3.36.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4212
```
Int[((c_.) + (d_.)*(x_))^(m_)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(2*a) + E^(2*(a/b)*(e + f*
x))/(2*a))^(-n), x], x] /; FreeQ[{a, b, c, d, e, f, m}, x] && EqQ[a^2 + b^2
, 0] && ILtQ[n, 0]
```

3.36.4 Maple [F]

$$\int \frac{(dx+c)^m}{(a+ia\cot(fx+e))^3}dx$$

input
```
int((d*x+c)^m/(a+I*a*cot(f*x+e))^3,x)
```

output
```
int((d*x+c)^m/(a+I*a*cot(f*x+e))^3,x)
```

3.36.5 Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 198, normalized size of antiderivative = 0.79

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^3}\,dx =$$
$$-\frac{18\,(-i\,dm-i\,d)e^{\left(-\frac{dm\log\left(-\frac{2i\,f}{d}\right)-2i\,de+2i\,cf}{d}\right)}\Gamma\left(m+1,-\frac{2\,(i\,dfx+i\,cf)}{d}\right)+9\,(i\,dm+i\,d)e^{\left(-\frac{dm\log\left(-\frac{4i\,f}{d}\right)-4i\,de+4i\,cf}{d}\right.}}{96}$$

input
```
integrate((d*x+c)^m/(a+I*a*cot(f*x+e))^3,x, algorithm="fricas")
```

output
```
-1/96*(18*(-I*d*m - I*d)*e^(-(d*m*log(-2*I*f/d) - 2*I*d*e + 2*I*c*f)/d)*ga
mma(m + 1, -2*(I*d*f*x + I*c*f)/d) + 9*(I*d*m + I*d)*e^(-(d*m*log(-4*I*f/d
) - 4*I*d*e + 4*I*c*f)/d)*gamma(m + 1, -4*(I*d*f*x + I*c*f)/d) + 2*(-I*d*m
 - I*d)*e^(-(d*m*log(-6*I*f/d) - 6*I*d*e + 6*I*c*f)/d)*gamma(m + 1, -6*(I*
d*f*x + I*c*f)/d) - 12*(d*f*x + c*f)*(d*x + c)^m)/(a^3*d*f*m + a^3*d*f)
```

3.36.6 Sympy [F(-1)]

Timed out.

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^3}\,dx = \text{Timed out}$$

input
```
integrate((d*x+c)**m/(a+I*a*cot(f*x+e))**3,x)
```

output
```
Timed out
```

3.36.7 Maxima [F]

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^3}\,dx = \int \frac{(dx+c)^m}{(i\,a\cot(fx+e)+a)^3}\,dx$$

input
```
integrate((d*x+c)^m/(a+I*a*cot(f*x+e))^3,x, algorithm="maxima")
```

output
```
-1/8*((d*m + d)*integrate((d*x + c)^m*cos(6*f*x + 6*e), x) - 3*(d*m + d)*i
ntegrate((d*x + c)^m*cos(4*f*x + 4*e), x) + 3*(d*m + d)*integrate((d*x + c
)^m*cos(2*f*x + 2*e), x) + (I*d*m + I*d)*integrate((d*x + c)^m*sin(6*f*x +
 6*e), x) - 3*(I*d*m + I*d)*integrate((d*x + c)^m*sin(4*f*x + 4*e), x) - 3
*(-I*d*m - I*d)*integrate((d*x + c)^m*sin(2*f*x + 2*e), x) - e^(m*log(d*x
+ c) + log(d*x + c)))/(a^3*d*m + a^3*d)
```

3.36.8 Giac [F]

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^3}\,dx = \int \frac{(dx+c)^m}{(i\,a\cot(fx+e)+a)^3}\,dx$$

input
```
integrate((d*x+c)^m/(a+I*a*cot(f*x+e))^3,x, algorithm="giac")
```

output
```
integrate((d*x + c)^m/(I*a*cot(f*x + e) + a)^3, x)
```

3.36.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx)^m}{(a+ia\cot(e+fx))^3}\,dx = \int \frac{(c+d\,x)^m}{(a+a\cot(e+f\,x)\ 1\mathrm{i})^3}\,dx$$

input
```
int((c + d*x)^m/(a + a*cot(e + f*x)*1i)^3,x)
```

output
```
int((c + d*x)^m/(a + a*cot(e + f*x)*1i)^3, x)
```

3.37 $\int (c+dx)^3(a+b\cot(e+fx))\,dx$

3.37.1 Optimal result

Integrand size = 18, antiderivative size = 147

$$\int (c+dx)^3(a+b\cot(e+fx))\,dx=\frac{a(c+dx)^4}{4d}-\frac{ib(c+dx)^4}{4d}+\frac{b(c+dx)^3\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{3ibd(c+dx)^2\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2}+\frac{3bd^2(c+dx)\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3}+\frac{3ibd^3\operatorname{PolyLog}\left(4,e^{2i(e+fx)}\right)}{4f^4}$$

output
```
1/4*a*(d*x+c)^4/d-1/4*I*b*(d*x+c)^4/d+b*(d*x+c)^3*ln(1-exp(2*I*(f*x+e)))/f
-3/2*I*b*d*(d*x+c)^2*polylog(2,exp(2*I*(f*x+e)))/f^2+3/2*b*d^2*(d*x+c)*pol
ylog(3,exp(2*I*(f*x+e)))/f^3+3/4*I*b*d^3*polylog(4,exp(2*I*(f*x+e)))/f^4
```

3.37.2 Mathematica [B] (verified)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 632 vs. 2(147) = 294.

Time = 5.20 (sec) , antiderivative size = 632, normalized size of antiderivative = 4.30

$$\int (c+dx)^3(a+b\cot(e+fx))\,dx$$

$$=\frac{4ac^3f^4x+6ibc^2df^3\pi x+6ac^2df^4x^2+4acd^2f^4x^3+4ibcd^2f^4x^3+ad^3f^4x^4+ibd^3f^4x^4-12ibc^2df^3x\arctan}{}$$

input
```
Integrate[(c + d*x)^3*(a + b*Cot[e + f*x]),x]
```

output
```
(4*a*c^3*f^4*x + (6*I)*b*c^2*d*f^3*Pi*x + 6*a*c^2*d*f^4*x^2 + 4*a*c*d^2*f^
4*x^3 + (4*I)*b*c*d^2*f^4*x^3 + a*d^3*f^4*x^4 + I*b*d^3*f^4*x^4 - (12*I)*b
*c^2*d*f^3*x*ArcTan[Tan[e]] + 6*b*c^2*d*f^4*x^2*Cot[e] + 6*b*c^2*d*f^2*Pi*
Log[1 + E^((-2*I)*f*x)] + 12*b*c*d^2*f^3*x^2*Log[1 - E^((-I)*(e + f*x))] +
 4*b*d^3*f^3*x^3*Log[1 - E^((-I)*(e + f*x))] + 12*b*c*d^2*f^3*x^2*Log[1 +
E^((-I)*(e + f*x))] + 4*b*d^3*f^3*x^3*Log[1 + E^((-I)*(e + f*x))] + 12*b*c
^2*d*f^3*x*Log[1 - E^((2*I)*(f*x + ArcTan[Tan[e]]))] + 12*b*c^2*d*f^2*ArcT
an[Tan[e]]*Log[1 - E^((2*I)*(f*x + ArcTan[Tan[e]]))] - 6*b*c^2*d*f^2*Pi*Lo
g[Cos[f*x]] + 4*b*c^3*f^3*Log[Sin[e + f*x]] - 12*b*c^2*d*f^2*ArcTan[Tan[e]
]*Log[Sin[f*x + ArcTan[Tan[e]]]] + (12*I)*b*d^2*f^2*x*(2*c + d*x)*PolyLog[
2, -E^((-I)*(e + f*x))] + (12*I)*b*d^2*f^2*x*(2*c + d*x)*PolyLog[2, E^((-I
)*(e + f*x))] - (6*I)*b*c^2*d*f^2*PolyLog[2, E^((2*I)*(f*x + ArcTan[Tan[e]
]))] + 24*b*c*d^2*f*PolyLog[3, -E^((-I)*(e + f*x))] + 24*b*d^3*f*x*PolyLog
[3, -E^((-I)*(e + f*x))] + 24*b*c*d^2*f*PolyLog[3, E^((-I)*(e + f*x))] + 2
4*b*d^3*f*x*PolyLog[3, E^((-I)*(e + f*x))] - (24*I)*b*d^3*PolyLog[4, -E^((
-I)*(e + f*x))] - (24*I)*b*d^3*PolyLog[4, E^((-I)*(e + f*x))] - 6*b*c^2*d*
E^(I*ArcTan[Tan[e]])*f^4*x^2*Cot[e]*Sqrt[Sec[e]^2])/(4*f^4)
```

3.37.3 Rubi [A] (verified)

Time = 0.48 (sec) , antiderivative size = 147, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {3042, 4205, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)^3(a+b\cot(e+fx))\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int (c+dx)^3\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)dx$$

$$\Big\downarrow \text{4205}$$

$$\int \left(a(c+dx)^3+b(c+dx)^3\cot(e+fx)\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{a(c+dx)^4}{4d} + \frac{3bd^2(c+dx)\operatorname{PolyLog}\left(3, e^{2i(e+fx)}\right)}{2f^3} - \frac{3ibd(c+dx)^2\operatorname{PolyLog}\left(2, e^{2i(e+fx)}\right)}{2f^2} + \frac{b(c+dx)^3\log\left(1-e^{2i(e+fx)}\right)}{f} - \frac{ib(c+dx)^4}{4d} + \frac{3ibd^3\operatorname{PolyLog}\left(4, e^{2i(e+fx)}\right)}{4f^4}$$

input
```
Int[(c + d*x)^3*(a + b*Cot[e + f*x]),x]
```

output
```
(a*(c + d*x)^4)/(4*d) - ((I/4)*b*(c + d*x)^4)/d + (b*(c + d*x)^3*Log[1 - E
^((2*I)*(e + f*x))])/f - (((3*I)/2)*b*d*(c + d*x)^2*PolyLog[2, E^((2*I)*(e
 + f*x))])/f^2 + (3*b*d^2*(c + d*x)*PolyLog[3, E^((2*I)*(e + f*x))])/(2*f^
3) + (((3*I)/4)*b*d^3*PolyLog[4, E^((2*I)*(e + f*x))])/f^4
```

3.37.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4205
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.)
, x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (a + b*Tan[e + f*x])^n, x],
 x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

3.37.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 875 vs. 2(126) = 252.

Time = 0.51 (sec) , antiderivative size = 876, normalized size of antiderivative = 5.96

method	result	size
risch	Expression too large to display	876

input
```
int((d*x+c)^3*(a+b*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
3/f^2*b*d*c^2*ln(1-exp(I*(f*x+e)))*e-6/f^3*b*e^2*c*d^2*ln(exp(I*(f*x+e)))+
3/f^3*b*e^2*c*d^2*ln(exp(I*(f*x+e))-1)+6/f^2*b*e*c^2*d*ln(exp(I*(f*x+e)))-
3/f^2*b*e*c^2*d*ln(exp(I*(f*x+e))-1)+3/f*b*c*d^2*ln(1-exp(I*(f*x+e)))*x^2+
3/f*b*c*d^2*ln(exp(I*(f*x+e))+1)*x^2+3/f*b*d*c^2*ln(1-exp(I*(f*x+e)))*x+3/
f*b*d*c^2*ln(exp(I*(f*x+e))+1)*x-3*I/f^2*b*d^3*polylog(2,-exp(I*(f*x+e)))*
x^2-3*I/f^2*b*d^3*polylog(2,exp(I*(f*x+e)))*x^2-3*I/f^2*b*d*c^2*polylog(2,
-exp(I*(f*x+e)))-2*I/f^3*b*d^3*e^3*x+4*I/f^3*b*c*d^2*e^3-3*I/f^2*b*d*c^2*e
^2-3*I/f^2*b*d*c^2*polylog(2,exp(I*(f*x+e)))+6/f^3*b*d^3*polylog(3,-exp(I*
(f*x+e)))*x+6/f^3*b*c*d^2*polylog(3,exp(I*(f*x+e)))+6/f^3*b*c*d^2*polylog(
3,-exp(I*(f*x+e)))+2/f^4*b*e^3*d^3*ln(exp(I*(f*x+e)))-1/f^4*b*e^3*d^3*ln(e
xp(I*(f*x+e))-1)+6*I/f^4*b*d^3*polylog(4,exp(I*(f*x+e)))+6*I/f^4*b*d^3*pol
ylog(4,-exp(I*(f*x+e)))-3/2*I/f^4*b*d^3*e^4-I*d^2*b*c*x^3-3/2*I*d*b*c^2*x^
2-6*I/f*b*d*c^2*e*x-6*I/f^2*b*c*d^2*polylog(2,exp(I*(f*x+e)))*x-6*I/f^2*b*
c*d^2*polylog(2,-exp(I*(f*x+e)))*x+6*I/f^2*b*c*d^2*e^2*x+1/f*b*d^3*ln(exp(
I*(f*x+e))+1)*x^3+1/f*b*d^3*ln(1-exp(I*(f*x+e)))*x^3+1/f^4*b*d^3*ln(1-exp(
I*(f*x+e)))*e^3+6/f^3*b*d^3*polylog(3,exp(I*(f*x+e)))*x+1/4*d^3*a*x^4+1/4/
d*a*c^4+1/f*b*c^3*ln(exp(I*(f*x+e))+1)-2/f*b*c^3*ln(exp(I*(f*x+e)))+1/f*b*
c^3*ln(exp(I*(f*x+e))-1)-1/4*I*d^3*b*x^4+d^2*a*c*x^3+3/2*d*a*c^2*x^2+a*c^3
*x+I*b*c^3*x+1/4*I/d*b*c^4-3/f^3*b*c*d^2*ln(1-exp(I*(f*x+e)))*e^2
```

3.37.5 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. 628 vs. $2(122) = 244$.

Time = 0.29 (sec) , antiderivative size = 628, normalized size of antiderivative = 4.27

$$\int (c+dx)^3(a+b\cot(e+fx))\,dx$$
$$= \frac{2\,ad^3f^4x^4 + 8\,acd^2f^4x^3 + 12\,ac^2df^4x^2 + 8\,ac^3f^4x + 3i\,bd^3\text{polylog}(4, \cos(2\,fx+2\,e) + i\,\sin(2\,fx+2\,e)) \cdots}{}$$

input
```
integrate((d*x+c)^3*(a+b*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/8*(2*a*d^3*f^4*x^4 + 8*a*c*d^2*f^4*x^3 + 12*a*c^2*d*f^4*x^2 + 8*a*c^3*f^
4*x + 3*I*b*d^3*polylog(4, cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e)) - 3*I*b*
d^3*polylog(4, cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e)) - 6*(I*b*d^3*f^2*x^2
 + 2*I*b*c*d^2*f^2*x + I*b*c^2*d*f^2)*dilog(cos(2*f*x + 2*e) + I*sin(2*f*x
 + 2*e)) - 6*(-I*b*d^3*f^2*x^2 - 2*I*b*c*d^2*f^2*x - I*b*c^2*d*f^2)*dilog(
cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e)) - 4*(b*d^3*e^3 - 3*b*c*d^2*e^2*f +
3*b*c^2*d*e*f^2 - b*c^3*f^3)*log(-1/2*cos(2*f*x + 2*e) + 1/2*I*sin(2*f*x +
 2*e) + 1/2) - 4*(b*d^3*e^3 - 3*b*c*d^2*e^2*f + 3*b*c^2*d*e*f^2 - b*c^3*f^
3)*log(-1/2*cos(2*f*x + 2*e) - 1/2*I*sin(2*f*x + 2*e) + 1/2) + 4*(b*d^3*f^
3*x^3 + 3*b*c*d^2*f^3*x^2 + 3*b*c^2*d*f^3*x + b*d^3*e^3 - 3*b*c*d^2*e^2*f
+ 3*b*c^2*d*e*f^2)*log(-cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e) + 1) + 4*(b*
d^3*f^3*x^3 + 3*b*c*d^2*f^3*x^2 + 3*b*c^2*d*f^3*x + b*d^3*e^3 - 3*b*c*d^2*
e^2*f + 3*b*c^2*d*e*f^2)*log(-cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e) + 1) +
 6*(b*d^3*f*x + b*c*d^2*f)*polylog(3, cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e
)) + 6*(b*d^3*f*x + b*c*d^2*f)*polylog(3, cos(2*f*x + 2*e) - I*sin(2*f*x +
 2*e)))/f^4
```

3.37.6 Sympy [F]

$$\int (c+dx)^3(a+b\cot(e+fx))\,dx = \int (a+b\cot{(e+fx)})\,(c+dx)^3\,dx$$

input
```
integrate((d*x+c)**3*(a+b*cot(f*x+e)),x)
```

output
```
Integral((a + b*cot(e + f*x))*(c + d*x)**3, x)
```

3.37.7 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. 978 vs. $2(122) = 244$.

Time = 0.49 (sec) , antiderivative size = 978, normalized size of antiderivative = 6.65

$$\int (c+dx)^3(a+b\cot(e+fx))\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^3*(a+b*cot(f*x+e)),x, algorithm="maxima")
```

output
```
1/4*(4*(f*x + e)*a*c^3 + (f*x + e)^4*a*d^3/f^3 - 4*(f*x + e)^3*a*d^3*e/f^3
 + 6*(f*x + e)^2*a*d^3*e^2/f^3 - 4*(f*x + e)*a*d^3*e^3/f^3 + 4*(f*x + e)^3
*a*c*d^2/f^2 - 12*(f*x + e)^2*a*c*d^2*e/f^2 + 12*(f*x + e)*a*c*d^2*e^2/f^2
 + 6*(f*x + e)^2*a*c^2*d/f - 12*(f*x + e)*a*c^2*d*e/f + 4*b*c^3*log(sin(f*
x + e)) - 4*b*d^3*e^3*log(sin(f*x + e))/f^3 + 12*b*c*d^2*e^2*log(sin(f*x +
 e))/f^2 - 12*b*c^2*d*e*log(sin(f*x + e))/f + (-I*(f*x + e)^4*b*d^3 + 24*I
*b*d^3*polylog(4, -e^(I*f*x + I*e)) + 24*I*b*d^3*polylog(4, e^(I*f*x + I*e
)) - 4*(-I*b*d^3*e + I*b*c*d^2*f)*(f*x + e)^3 - 6*(I*b*d^3*e^2 - 2*I*b*c*d
^2*e*f + I*b*c^2*d*f^2)*(f*x + e)^2 - 4*(-I*(f*x + e)^3*b*d^3 + 3*(I*b*d^3
*e - I*b*c*d^2*f)*(f*x + e)^2 + 3*(-I*b*d^3*e^2 + 2*I*b*c*d^2*e*f - I*b*c^
2*d*f^2)*(f*x + e))*arctan2(sin(f*x + e), cos(f*x + e) + 1) - 4*(I*(f*x +
e)^3*b*d^3 + 3*(-I*b*d^3*e + I*b*c*d^2*f)*(f*x + e)^2 + 3*(I*b*d^3*e^2 - 2
*I*b*c*d^2*e*f + I*b*c^2*d*f^2)*(f*x + e))*arctan2(sin(f*x + e), -cos(f*x
+ e) + 1) - 12*(I*(f*x + e)^2*b*d^3 + I*b*d^3*e^2 - 2*I*b*c*d^2*e*f + I*b*
c^2*d*f^2 + 2*(-I*b*d^3*e + I*b*c*d^2*f)*(f*x + e))*dilog(-e^(I*f*x + I*e)
) - 12*(I*(f*x + e)^2*b*d^3 + I*b*d^3*e^2 - 2*I*b*c*d^2*e*f + I*b*c^2*d*f^
2 + 2*(-I*b*d^3*e + I*b*c*d^2*f)*(f*x + e))*dilog(e^(I*f*x + I*e)) + 2*((f
*x + e)^3*b*d^3 - 3*(b*d^3*e - b*c*d^2*f)*(f*x + e)^2 + 3*(b*d^3*e^2 - 2*b
*c*d^2*e*f + b*c^2*d*f^2)*(f*x + e))*log(cos(f*x + e)^2 + sin(f*x + e)^2 +
 2*cos(f*x + e) + 1) + 2*((f*x + e)^3*b*d^3 - 3*(b*d^3*e - b*c*d^2*f)*(...
```

3.37.8 Giac [F]

$$\int (c+dx)^3(a+b\cot(e+fx))\,dx=\int (dx+c)^3(b\cot(fx+e)+a)\,dx$$

input
```
integrate((d*x+c)^3*(a+b*cot(f*x+e)),x, algorithm="giac")
```

output
```
integrate((d*x + c)^3*(b*cot(f*x + e) + a), x)
```

3.37.9 Mupad [F(-1)]

Timed out.

$$\int (c+dx)^3(a+b\cot(e+fx))\,dx = \int (a+b\cot(e+f\,x))\,\left(c+d\,x\right)^3\,dx$$

input
```
int((a + b*cot(e + f*x))*(c + d*x)^3,x)
```

output
```
int((a + b*cot(e + f*x))*(c + d*x)^3, x)
```

3.38 $\int (c+dx)^2(a+b\cot(e+fx))\,dx$

3.38.1 Optimal result

Integrand size = 18, antiderivative size = 112

$$\int (c+dx)^2(a+b\cot(e+fx))\,dx = \frac{a(c+dx)^3}{3d} - \frac{ib(c+dx)^3}{3d} + \frac{b(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f} - \frac{ibd(c+dx)\,\mathrm{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2} + \frac{bd^2\,\mathrm{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3}$$

output
```
1/3*a*(d*x+c)^3/d-1/3*I*b*(d*x+c)^3/d+b*(d*x+c)^2*ln(1-exp(2*I*(f*x+e)))/f
-I*b*d*(d*x+c)*polylog(2,exp(2*I*(f*x+e)))/f^2+1/2*b*d^2*polylog(3,exp(2*I
*(f*x+e)))/f^3
```

3.38.2 Mathematica [B] (verified)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 406 vs. 2(112) = 224.

Time = 2.28 (sec) , antiderivative size = 406, normalized size of antiderivative = 3.62

$$\int (c+dx)^2(a+b\cot(e+fx))\,dx = \frac{3ac^2f^3x + 3ibcdf^2\pi x + 3acdf^3x^2 + ad^2f^3x^3 + ibd^2f^3x^3 - 6ibcdf^2x\arctan(\tan(e)) + 3bcdf^3x^2\cot(e) + 3b}{}$$

input
```
Integrate[(c + d*x)^2*(a + b*Cot[e + f*x]),x]
```

output
```
(3*a*c^2*f^3*x + (3*I)*b*c*d*f^2*Pi*x + 3*a*c*d*f^3*x^2 + a*d^2*f^3*x^3 +
I*b*d^2*f^3*x^3 - (6*I)*b*c*d*f^2*x*ArcTan[Tan[e]] + 3*b*c*d*f^3*x^2*Cot[e
] + 3*b*c*d*f*Pi*Log[1 + E^((-2*I)*f*x)] + 3*b*d^2*f^2*x^2*Log[1 - E^((-I)
*(e + f*x))] + 3*b*d^2*f^2*x^2*Log[1 + E^((-I)*(e + f*x))] + 6*b*c*d*f^2*x
*Log[1 - E^((2*I)*(f*x + ArcTan[Tan[e]]))] + 6*b*c*d*f*ArcTan[Tan[e]]*Log[
1 - E^((2*I)*(f*x + ArcTan[Tan[e]]))] - 3*b*c*d*f*Pi*Log[Cos[f*x]] + 3*b*c
^2*f^2*Log[Sin[e + f*x]] - 6*b*c*d*f*ArcTan[Tan[e]]*Log[Sin[f*x + ArcTan[T
an[e]]]] + (6*I)*b*d^2*f*x*PolyLog[2, -E^((-I)*(e + f*x))] + (6*I)*b*d^2*f
*x*PolyLog[2, E^((-I)*(e + f*x))] - (3*I)*b*c*d*f*PolyLog[2, E^((2*I)*(f*x
 + ArcTan[Tan[e]]))] + 6*b*d^2*PolyLog[3, -E^((-I)*(e + f*x))] + 6*b*d^2*P
olyLog[3, E^((-I)*(e + f*x))] - 3*b*c*d*E^(I*ArcTan[Tan[e]])*f^3*x^2*Cot[e
]*Sqrt[Sec[e]^2])/(3*f^3)
```

3.38.3 Rubi [A] (verified)

Time = 0.41 (sec) , antiderivative size = 112, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.167, Rules used = {3042, 4205, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)^2(a+b\cot(e+fx))\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int (c+dx)^2\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)dx$$

$$\Big\downarrow \text{4205}$$

$$\int \left(a(c+dx)^2+b(c+dx)^2\cot(e+fx)\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{a(c+dx)^3}{3d}-\frac{ibd(c+dx)\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2}+\frac{b(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{ib(c+dx)^3}{3d}+\frac{bd^2\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3}$$

input
```
Int[(c + d*x)^2*(a + b*Cot[e + f*x]),x]
```

output
```
(a*(c + d*x)^3)/(3*d) - ((I/3)*b*(c + d*x)^3)/d + (b*(c + d*x)^2*Log[1 - E
^((2*I)*(e + f*x))])/f - (I*b*d*(c + d*x)*PolyLog[2, E^((2*I)*(e + f*x))])
/f^2 + (b*d^2*PolyLog[3, E^((2*I)*(e + f*x))])/(2*f^3)
```

3.38.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4205
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.)
, x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (a + b*Tan[e + f*x])^n, x],
 x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

3.38.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 534 vs. $2(98) = 196$.

Time = 0.41 (sec) , antiderivative size = 535, normalized size of antiderivative = 4.78

method	result
risch	$\frac{2b\,d^2\,\mathrm{polylog}\left(3,\mathrm{e}^{i(fx+e)}\right)}{f^3}+\frac{2b\,d^2\,\mathrm{polylog}\left(3,-\mathrm{e}^{i(fx+e)}\right)}{f^3}+\frac{b\,c^2\ln\left(\mathrm{e}^{i(fx+e)}+1\right)}{f}-\frac{2b\,c^2\ln\left(\mathrm{e}^{i(fx+e)}\right)}{f}+\frac{b\,c^2\ln\left(\mathrm{e}^{i(fx+e)}-1\right)}{f}-$

input
```
int((d*x+c)^2*(a+b*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
2/f*b*d*c*ln(1-exp(I*(f*x+e)))*x+2/f*b*d*c*ln(exp(I*(f*x+e))+1)*x+4/f^2*b*
e*c*d*ln(exp(I*(f*x+e)))-2/f^2*b*e*c*d*ln(exp(I*(f*x+e))-1)+2/f^2*b*d*c*ln
(1-exp(I*(f*x+e)))*e-2*I/f^2*b*d*c*e^2-2*I/f^2*b*d*c*polylog(2,exp(I*(f*x+
e)))-2*I/f^2*b*d*c*polylog(2,-exp(I*(f*x+e)))+2*I/f^2*b*d^2*e^2*x-2*I/f^2*
b*d^2*polylog(2,exp(I*(f*x+e)))*x-2*I/f^2*b*d^2*polylog(2,-exp(I*(f*x+e)))
*x+2/f^3*b*d^2*polylog(3,exp(I*(f*x+e)))+2/f^3*b*d^2*polylog(3,-exp(I*(f*x
+e)))+1/f*b*c^2*ln(exp(I*(f*x+e))+1)-2/f*b*c^2*ln(exp(I*(f*x+e)))+1/f*b*c^
2*ln(exp(I*(f*x+e))-1)-1/3*I*d^2*b*x^3+1/3*d^2*a*x^3+1/3/d*a*c^3-I*d*b*c*x
^2+d*a*c*x^2+a*c^2*x+1/f*b*d^2*ln(1-exp(I*(f*x+e)))*x^2+1/f*b*d^2*ln(exp(I
*(f*x+e))+1)*x^2-2/f^3*b*e^2*d^2*ln(exp(I*(f*x+e)))+1/f^3*b*e^2*d^2*ln(exp
(I*(f*x+e))-1)-1/f^3*b*d^2*ln(1-exp(I*(f*x+e)))*e^2+4/3*I/f^3*b*d^2*e^3+I*
b*c^2*x+1/3*I/d*b*c^3-4*I/f*b*d*c*e*x
```

3.38.5 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. 405 vs. $2(95) = 190$.

Time = 0.29 (sec) , antiderivative size = 405, normalized size of antiderivative = 3.62

$$\int (c+dx)^2(a+b\cot(e+fx))\,dx = \frac{4\,ad^2f^3x^3 + 12\,acdf^3x^2 + 12\,ac^2f^3x + 3\,bd^2\text{polylog}(3, \cos(2\,fx+2\,e) + i\,\sin(2\,fx+2\,e)) + 3\,bd^2\text{polylog}}{}$$

input
```
integrate((d*x+c)^2*(a+b*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/12*(4*a*d^2*f^3*x^3 + 12*a*c*d*f^3*x^2 + 12*a*c^2*f^3*x + 3*b*d^2*polylo
g(3, cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e)) + 3*b*d^2*polylog(3, cos(2*f*x
 + 2*e) - I*sin(2*f*x + 2*e)) - 6*(I*b*d^2*f*x + I*b*c*d*f)*dilog(cos(2*f*
x + 2*e) + I*sin(2*f*x + 2*e)) - 6*(-I*b*d^2*f*x - I*b*c*d*f)*dilog(cos(2*
f*x + 2*e) - I*sin(2*f*x + 2*e)) + 6*(b*d^2*e^2 - 2*b*c*d*e*f + b*c^2*f^2)
*log(-1/2*cos(2*f*x + 2*e) + 1/2*I*sin(2*f*x + 2*e) + 1/2) + 6*(b*d^2*e^2
- 2*b*c*d*e*f + b*c^2*f^2)*log(-1/2*cos(2*f*x + 2*e) - 1/2*I*sin(2*f*x + 2
*e) + 1/2) + 6*(b*d^2*f^2*x^2 + 2*b*c*d*f^2*x - b*d^2*e^2 + 2*b*c*d*e*f)*l
og(-cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e) + 1) + 6*(b*d^2*f^2*x^2 + 2*b*c*
d*f^2*x - b*d^2*e^2 + 2*b*c*d*e*f)*log(-cos(2*f*x + 2*e) - I*sin(2*f*x + 2
*e) + 1))/f^3
```

3.38.6 Sympy [F]

$$\int (c+dx)^2(a+b\cot(e+fx))\,dx = \int (a+b\cot(e+fx))\,(c+dx)^2\,dx$$

input
```
integrate((d*x+c)**2*(a+b*cot(f*x+e)),x)
```

output
```
Integral((a + b*cot(e + f*x))*(c + d*x)**2, x)
```

3.38.7 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. 527 vs. $2(95) = 190$.

Time = 0.44 (sec) , antiderivative size = 527, normalized size of antiderivative = 4.71

$$\int (c+dx)^2(a+b\cot(e+fx))\,dx$$

$$= \frac{6\,(fx+e)ac^2 + \frac{2\,(fx+e)^3ad^2}{f^2} - \frac{6\,(fx+e)^2ad^2e}{f^2} + \frac{6\,(fx+e)ad^2e^2}{f^2} + \frac{6\,(fx+e)^2acd}{f} - \frac{12\,(fx+e)acde}{f} + 6\,bc^2\log(\sin(fx+}{}$$

input
```
integrate((d*x+c)^2*(a+b*cot(f*x+e)),x, algorithm="maxima")
```

output
```
1/6*(6*(f*x + e)*a*c^2 + 2*(f*x + e)^3*a*d^2/f^2 - 6*(f*x + e)^2*a*d^2*e/f
^2 + 6*(f*x + e)*a*d^2*e^2/f^2 + 6*(f*x + e)^2*a*c*d/f - 12*(f*x + e)*a*c*
d*e/f + 6*b*c^2*log(sin(f*x + e)) + 6*b*d^2*e^2*log(sin(f*x + e))/f^2 - 12
*b*c*d*e*log(sin(f*x + e))/f + (-2*I*(f*x + e)^3*b*d^2 + 12*b*d^2*polylog(
3, -e^(I*f*x + I*e)) + 12*b*d^2*polylog(3, e^(I*f*x + I*e)) - 6*(-I*b*d^2*
e + I*b*c*d*f)*(f*x + e)^2 - 6*(-I*(f*x + e)^2*b*d^2 + 2*(I*b*d^2*e - I*b*
c*d*f)*(f*x + e))*arctan2(sin(f*x + e), cos(f*x + e) + 1) - 6*(I*(f*x + e)
^2*b*d^2 + 2*(-I*b*d^2*e + I*b*c*d*f)*(f*x + e))*arctan2(sin(f*x + e), -co
s(f*x + e) + 1) - 12*(I*(f*x + e)*b*d^2 - I*b*d^2*e + I*b*c*d*f)*dilog(-e^
(I*f*x + I*e)) - 12*(I*(f*x + e)*b*d^2 - I*b*d^2*e + I*b*c*d*f)*dilog(e^(I
*f*x + I*e)) + 3*((f*x + e)^2*b*d^2 - 2*(b*d^2*e - b*c*d*f)*(f*x + e))*log
(cos(f*x + e)^2 + sin(f*x + e)^2 + 2*cos(f*x + e) + 1) + 3*((f*x + e)^2*b*
d^2 - 2*(b*d^2*e - b*c*d*f)*(f*x + e))*log(cos(f*x + e)^2 + sin(f*x + e)^2
 - 2*cos(f*x + e) + 1))/f^2)/f
```

3.38.8 Giac [F]

$$\int (c+dx)^2(a+b\cot(e+fx))\,dx = \int (dx+c)^2(b\cot(fx+e)+a)\,dx$$

input
```
integrate((d*x+c)^2*(a+b*cot(f*x+e)),x, algorithm="giac")
```

output
```
integrate((d*x + c)^2*(b*cot(f*x + e) + a), x)
```

3.38.9 Mupad [F(-1)]

Timed out.

$$\int (c+dx)^2(a+b\cot(e+fx))\,dx = \int (a+b\cot(e+f\,x))\,\left(c+d\,x\right)^2\,dx$$

input
```
int((a + b*cot(e + f*x))*(c + d*x)^2,x)
```

output
```
int((a + b*cot(e + f*x))*(c + d*x)^2, x)
```

3.39 $\int (c+dx)(a+b\cot(e+fx))\,dx$

3.39.1 Optimal result

Integrand size = 16, antiderivative size = 83

$$\int (c+dx)(a+b\cot(e+fx))\,dx=\frac{a(c+dx)^2}{2d}-\frac{ib(c+dx)^2}{2d}+\frac{b(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{ibd\,\text{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2}$$

output

```
1/2*a*(d*x+c)^2/d-1/2*I*b*(d*x+c)^2/d+b*(d*x+c)*ln(1-exp(2*I*(f*x+e)))/f-1
/2*I*b*d*polylog(2,exp(2*I*(f*x+e)))/f^2
```

3.39.2 Mathematica [B] (verified)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 209 vs. 2(83) = 166.

Time = 5.75 (sec) , antiderivative size = 209, normalized size of antiderivative = 2.52

$$\int (c+dx)(a+b\cot(e+fx))\,dx$$
$$=acx+\frac{1}{2}adx^2+\frac{1}{2}bdx^2\cot(e)+\frac{bc\log(\cos(e+fx))}{f}+\frac{bc\log(\tan(e+fx))}{f}$$
$$-\frac{bd\csc(e)\sec(e)\left(e^{i\arctan(\tan(e))}f^2x^2+\frac{(ifx(-\pi+2\arctan(\tan(e)))-\pi\log\left(1+e^{-2ifx}\right)-2(fx+\arctan(\tan(e)))\log\left(1-e^{2i(fx+\text{arcta}}\right.}{}\right.}{2f^2\sqrt{\sec^2(e)\left(\cos^2(e)+\right.}}$$

input
```
Integrate[(c + d*x)*(a + b*Cot[e + f*x]),x]
```

output
```
a*c*x + (a*d*x^2)/2 + (b*d*x^2*Cot[e])/2 + (b*c*Log[Cos[e + f*x]])/f + (b*
c*Log[Tan[e + f*x]])/f - (b*d*Csc[e]*Sec[e]*(E^(I*ArcTan[Tan[e]])*f^2*x^2
+ ((I*f*x*(-Pi + 2*ArcTan[Tan[e]]) - Pi*Log[1 + E^((-2*I)*f*x)] - 2*(f*x +
 ArcTan[Tan[e]])*Log[1 - E^((2*I)*(f*x + ArcTan[Tan[e]]))] + Pi*Log[Cos[f*
x]] + 2*ArcTan[Tan[e]]*Log[Sin[f*x + ArcTan[Tan[e]]]] + I*PolyLog[2, E^((2
*I)*(f*x + ArcTan[Tan[e]]))])*Tan[e])/Sqrt[1 + Tan[e]^2]))/(2*f^2*Sqrt[Sec
[e]^2*(Cos[e]^2 + Sin[e]^2)])
```

3.39.3 Rubi [A] (verified)

Time = 0.32 (sec) , antiderivative size = 83, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.188$, Rules used = {3042, 4205, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)(a+b\cot(e+fx))\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int (c+dx)\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)dx$$

$$\Big\downarrow \text{4205}$$

$$\int (a(c+dx)+b(c+dx)\cot(e+fx))dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{a(c+dx)^2}{2d}+\frac{b(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{ib(c+dx)^2}{2d}-\frac{ibd\,\text{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2}$$

input
```
Int[(c + d*x)*(a + b*Cot[e + f*x]),x]
```

output
```
(a*(c + d*x)^2)/(2*d) - ((I/2)*b*(c + d*x)^2)/d + (b*(c + d*x)*Log[1 - E^(
(2*I)*(e + f*x))])/f - ((I/2)*b*d*PolyLog[2, E^((2*I)*(e + f*x))])/f^2
```

3.39.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4205
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.)
, x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (a + b*Tan[e + f*x])^n, x],
 x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

3.39.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 239 vs. $2(71) = 142$.

Time = 0.37 (sec) , antiderivative size = 240, normalized size of antiderivative = 2.89

method	result
risch	$-\frac{ibd\,e^2}{f^2}+\frac{ad\,x^2}{2}-\frac{ibd\,\mathrm{polylog}(2,-\mathrm{e}^{i(fx+e)})}{f^2}+acx+\frac{bc\ln(\mathrm{e}^{i(fx+e)}+1)}{f}-\frac{2bc\ln(\mathrm{e}^{i(fx+e)})}{f}+\frac{bc\ln(\mathrm{e}^{i(fx+e)}-1)}{f}-\frac{2ibd}{f}$

input
```
int((d*x+c)*(a+b*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
-I/f^2*b*d*e^2+1/2*a*d*x^2-I/f^2*b*d*polylog(2,-exp(I*(f*x+e)))+a*c*x+1/f*
b*c*ln(exp(I*(f*x+e))+1)-2/f*b*c*ln(exp(I*(f*x+e)))+1/f*b*c*ln(exp(I*(f*x+
e))-1)-2*I/f*b*d*e*x-I/f^2*b*d*polylog(2,exp(I*(f*x+e)))-1/2*I*b*d*x^2+1/f
*b*d*ln(1-exp(I*(f*x+e)))*x+1/f^2*b*d*ln(1-exp(I*(f*x+e)))*e+I*b*c*x+1/f*b
*d*ln(exp(I*(f*x+e))+1)*x+2/f^2*b*d*e*ln(exp(I*(f*x+e)))-1/f^2*b*d*e*ln(ex
p(I*(f*x+e))-1)
```

3.39.5 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. 224 vs. $2(68) = 136$.

Time = 0.27 (sec) , antiderivative size = 224, normalized size of antiderivative = 2.70

$$\int (c+dx)(a+b\cot(e+fx))\,dx$$
$$= \frac{2\,adf^2x^2 + 4\,acf^2x - i\,bd\mathrm{Li}_2(\cos(2\,fx+2\,e) + i\,\sin(2\,fx+2\,e)) + i\,bd\mathrm{Li}_2(\cos(2\,fx+2\,e) - i\,\sin(2\,fx$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/4*(2*a*d*f^2*x^2 + 4*a*c*f^2*x - I*b*d*dilog(cos(2*f*x + 2*e) + I*sin(2*
f*x + 2*e)) + I*b*d*dilog(cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e)) - 2*(b*d*
e - b*c*f)*log(-1/2*cos(2*f*x + 2*e) + 1/2*I*sin(2*f*x + 2*e) + 1/2) - 2*(
b*d*e - b*c*f)*log(-1/2*cos(2*f*x + 2*e) - 1/2*I*sin(2*f*x + 2*e) + 1/2) +
 2*(b*d*f*x + b*d*e)*log(-cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e) + 1) + 2*(
b*d*f*x + b*d*e)*log(-cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e) + 1))/f^2
```

3.39.6 Sympy [F]

$$\int (c+dx)(a+b\cot(e+fx))\,dx = \int (a+b\cot(e+fx))\,(c+dx)\;dx$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e)),x)
```

output
```
Integral((a + b*cot(e + f*x))*(c + d*x), x)
```

3.39.7 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. 209 vs. $2(68) = 136$.

Time = 0.42 (sec) , antiderivative size = 209, normalized size of antiderivative = 2.52

$$\int (c+dx)(a+b\cot(e+fx))\,dx$$
$$= \frac{(a-ib)df^2x^2 + 2(a-ib)cf^2x - 2ibdfx\arctan(\sin(fx+e), -\cos(fx+e)+1) + 2ibcf\arctan(\sin(f}{}$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e)),x, algorithm="maxima")
```

output
```
1/2*((a - I*b)*d*f^2*x^2 + 2*(a - I*b)*c*f^2*x - 2*I*b*d*f*x*arctan2(sin(f
*x + e), -cos(f*x + e) + 1) + 2*I*b*c*f*arctan2(sin(f*x + e), cos(f*x + e)
 - 1) - 2*I*b*d*dilog(-e^(I*f*x + I*e)) - 2*I*b*d*dilog(e^(I*f*x + I*e)) -
 2*(-I*b*d*f*x - I*b*c*f)*arctan2(sin(f*x + e), cos(f*x + e) + 1) + (b*d*f
*x + b*c*f)*log(cos(f*x + e)^2 + sin(f*x + e)^2 + 2*cos(f*x + e) + 1) + (b
*d*f*x + b*c*f)*log(cos(f*x + e)^2 + sin(f*x + e)^2 - 2*cos(f*x + e) + 1))
/f^2
```

3.39.8 Giac [F]

$$\int (c+dx)(a+b\cot(e+fx))\,dx = \int (dx+c)(b\cot(fx+e)+a)\,dx$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e)),x, algorithm="giac")
```

output
```
integrate((d*x + c)*(b*cot(f*x + e) + a), x)
```

3.39.9 Mupad [F(-1)]

Timed out.

$$\int (c+dx)(a+b\cot(e+fx))\,dx=\int (a+b\cot(e+f\,x))\;(c+d\,x)\;dx$$

input
```
int((a + b*cot(e + f*x))*(c + d*x),x)
```

output
```
int((a + b*cot(e + f*x))*(c + d*x), x)
```

3.40 $\int \frac{a+b\cot(e+fx)}{c+dx} \, dx$

3.40.1 Optimal result

Integrand size = 18, antiderivative size = 18

$$\int \frac{a+b\cot(e+fx)}{c+dx} \, dx = \text{Int}\left(\frac{a+b\cot(e+fx)}{c+dx},x\right)$$

output
```
Unintegrable((a+b*cot(f*x+e))/(d*x+c),x)
```

3.40.2 Mathematica [N/A]

Not integrable

Time = 3.65 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.11

$$\int \frac{a+b\cot(e+fx)}{c+dx} \, dx = \int \frac{a+b\cot(e+fx)}{c+dx} \, dx$$

input
```
Integrate[(a + b*Cot[e + f*x])/(c + d*x),x]
```

output
```
Integrate[(a + b*Cot[e + f*x])/(c + d*x), x]
```

3.40.3 Rubi [N/A]

Not integrable

Time = 0.20 (sec) , antiderivative size = 18, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{a+b\cot(e+fx)}{c+dx}\,dx$$

$$\Big\downarrow \ 3042$$

$$\int \frac{a-b\tan\left(e+fx+\frac{\pi}{2}\right)}{c+dx}dx$$

$$\Big\downarrow \ 4223$$

$$\int \frac{a+b\cot(e+fx)}{c+dx}dx$$

input
```
Int[(a + b*Cot[e + f*x])/(c + d*x),x]
```

output
```
$Aborted
```

3.40.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.40.4 Maple [N/A] (verified)

Not integrable

Time = 0.19 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00

$$\int \frac{a+b\cot(fx+e)}{dx+c}dx$$

input
```
int((a+b*cot(f*x+e))/(d*x+c),x)
```

output
```
int((a+b*cot(f*x+e))/(d*x+c),x)
```

3.40.5 Fricas [N/A]

Not integrable

Time = 0.25 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.11

$$\int \frac{a+b\cot(e+fx)}{c+dx}\,dx = \int \frac{b\cot(fx+e)+a}{dx+c}\,dx$$

input
```
integrate((a+b*cot(f*x+e))/(d*x+c),x, algorithm="fricas")
```

output
```
integral((b*cot(f*x + e) + a)/(d*x + c), x)
```

3.40.6 Sympy [N/A]

Not integrable

Time = 0.67 (sec) , antiderivative size = 15, normalized size of antiderivative = 0.83

$$\int \frac{a+b\cot(e+fx)}{c+dx}\,dx = \int \frac{a+b\cot(e+fx)}{c+dx}\,dx$$

input
```
integrate((a+b*cot(f*x+e))/(d*x+c),x)
```

output
```
Integral((a + b*cot(e + f*x))/(c + d*x), x)
```

3.40.7 Maxima [N/A]

Not integrable

Time = 0.42 (sec) , antiderivative size = 136, normalized size of antiderivative = 7.56

$$\int \frac{a+b\cot(e+fx)}{c+dx}\,dx=\int \frac{b\cot\left(fx+e\right)+a}{dx+c}\,dx$$

input
```
integrate((a+b*cot(f*x+e))/(d*x+c),x, algorithm="maxima")
```

output
```
-(b*d*integrate(sin(f*x + e)/((d*x + c)*cos(f*x + e)^2 + (d*x + c)*sin(f*x
 + e)^2 + d*x + 2*(d*x + c)*cos(f*x + e) + c), x) - b*d*integrate(sin(f*x
+ e)/((d*x + c)*cos(f*x + e)^2 + (d*x + c)*sin(f*x + e)^2 + d*x - 2*(d*x +
 c)*cos(f*x + e) + c), x) - a*log(d*x + c))/d
```

3.40.8 Giac [N/A]

Not integrable

Time = 0.27 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.11

$$\int \frac{a+b\cot(e+fx)}{c+dx}\,dx=\int \frac{b\cot\left(fx+e\right)+a}{dx+c}\,dx$$

input
```
integrate((a+b*cot(f*x+e))/(d*x+c),x, algorithm="giac")
```

output
```
integrate((b*cot(f*x + e) + a)/(d*x + c), x)
```

3.40.9 Mupad [N/A]

Not integrable

Time = 12.32 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.11

$$\int \frac{a+b\cot(e+fx)}{c+dx}\,dx=\int \frac{a+b\cot(e+f\,x)}{c+d\,x}\,dx$$

input
```
int((a + b*cot(e + f*x))/(c + d*x),x)
```

output
```
int((a + b*cot(e + f*x))/(c + d*x), x)
```

3.41 $\int \frac{a+b\cot(e+fx)}{(c+dx)^2}\,dx$

3.41.1 Optimal result

Integrand size = 18, antiderivative size = 18

$$\int \frac{a+b\cot(e+fx)}{(c+dx)^2}\,dx=\text{Int}\left(\frac{a+b\cot(e+fx)}{(c+dx)^2},x\right)$$

output
```
Unintegrable((a+b*cot(f*x+e))/(d*x+c)^2,x)
```

3.41.2 Mathematica [N/A]

Not integrable

Time = 9.98 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.11

$$\int \frac{a+b\cot(e+fx)}{(c+dx)^2}\,dx=\int \frac{a+b\cot(e+fx)}{(c+dx)^2}\,dx$$

input
```
Integrate[(a + b*Cot[e + f*x])/(c + d*x)^2,x]
```

output
```
Integrate[(a + b*Cot[e + f*x])/(c + d*x)^2, x]
```

3.41.3 Rubi [N/A]

Not integrable

Time = 0.20 (sec) , antiderivative size = 18, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{a+b\cot(e+fx)}{(c+dx)^2}dx$$
$$\Big\downarrow \text{3042}$$
$$\int \frac{a-b\tan\left(e+fx+\frac{\pi}{2}\right)}{(c+dx)^2}dx$$
$$\Big\downarrow \text{4223}$$
$$\int \frac{a+b\cot(e+fx)}{(c+dx)^2}dx$$

input
```
Int[(a + b*Cot[e + f*x])/(c + d*x)^2,x]
```

output
```
$Aborted
```

3.41.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.41.4 Maple [N/A] (verified)

Not integrable

Time = 0.19 (sec) , antiderivative size = 18, normalized size of antiderivative = 1.00

$$\int \frac{a+b\cot(fx+e)}{(dx+c)^2}dx$$

input
```
int((a+b*cot(f*x+e))/(d*x+c)^2,x)
```

output
```
int((a+b*cot(f*x+e))/(d*x+c)^2,x)
```

3.41.5 Fricas [N/A]

Not integrable

Time = 0.25 (sec) , antiderivative size = 31, normalized size of antiderivative = 1.72

$$\int \frac{a+b\cot(e+fx)}{(c+dx)^2}\,dx = \int \frac{b\cot(fx+e)+a}{(dx+c)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))/(d*x+c)^2,x, algorithm="fricas")
```

output
```
integral((b*cot(f*x + e) + a)/(d^2*x^2 + 2*c*d*x + c^2), x)
```

3.41.6 Sympy [N/A]

Not integrable

Time = 2.48 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.94

$$\int \frac{a+b\cot(e+fx)}{(c+dx)^2}\,dx = \int \frac{a+b\cot(e+fx)}{(c+dx)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))/(d*x+c)**2,x)
```

output
```
Integral((a + b*cot(e + f*x))/(c + d*x)**2, x)
```

3.41.7 Maxima [N/A]

Not integrable

Time = 0.52 (sec) , antiderivative size = 242, normalized size of antiderivative = 13.44

$$\int \frac{a+b\cot(e+fx)}{(c+dx)^2}\,dx = \int \frac{b\cot\left(fx+e\right)+a}{\left(dx+c\right)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))/(d*x+c)^2,x, algorithm="maxima")
```

output
```
-((b*d^2*x + b*c*d)*integrate(sin(f*x + e)/(d^2*x^2 + 2*c*d*x + (d^2*x^2 +
 2*c*d*x + c^2)*cos(f*x + e)^2 + (d^2*x^2 + 2*c*d*x + c^2)*sin(f*x + e)^2
+ c^2 + 2*(d^2*x^2 + 2*c*d*x + c^2)*cos(f*x + e)), x) - (b*d^2*x + b*c*d)*
integrate(sin(f*x + e)/(d^2*x^2 + 2*c*d*x + (d^2*x^2 + 2*c*d*x + c^2)*cos(
f*x + e)^2 + (d^2*x^2 + 2*c*d*x + c^2)*sin(f*x + e)^2 + c^2 - 2*(d^2*x^2 +
 2*c*d*x + c^2)*cos(f*x + e)), x) + a)/(d^2*x + c*d)
```

3.41.8 Giac [N/A]

Not integrable

Time = 1.99 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.11

$$\int \frac{a+b\cot(e+fx)}{(c+dx)^2}\,dx = \int \frac{b\cot\left(fx+e\right)+a}{\left(dx+c\right)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))/(d*x+c)^2,x, algorithm="giac")
```

output
```
integrate((b*cot(f*x + e) + a)/(d*x + c)^2, x)
```

3.41.9 Mupad [N/A]

Not integrable

Time = 12.48 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.11

$$\int \frac{a+b\cot(e+fx)}{(c+dx)^2}\,dx = \int \frac{a+b\cot(e+f\,x)}{\left(c+d\,x\right)^2}\,dx$$

input
```
int((a + b*cot(e + f*x))/(c + d*x)^2,x)
```

output
```
int((a + b*cot(e + f*x))/(c + d*x)^2, x)
```

3.41. $\int \frac{a+b\cot(e+fx)}{(c+dx)^2} \, dx$

3.42 $\int (c+dx)^3(a+b\cot(e+fx))^2\,dx$

3.42.1 Optimal result

Integrand size = 20, antiderivative size = 295

$$\begin{aligned}\int (c+dx)^3(a+b\cot(e+fx))^2\,dx =& -\frac{ib^2(c+dx)^3}{f}+\frac{a^2(c+dx)^4}{4d}-\frac{iab(c+dx)^4}{2d}\\ &-\frac{b^2(c+dx)^4}{4d}-\frac{b^2(c+dx)^3\cot(e+fx)}{f}\\ &+\frac{3b^2d(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f^2}\\ &+\frac{2ab(c+dx)^3\log\left(1-e^{2i(e+fx)}\right)}{f}\\ &-\frac{3ib^2d^2(c+dx)\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^3}\\ &-\frac{3iabd(c+dx)^2\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2}\\ &+\frac{3b^2d^3\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^4}\\ &+\frac{3abd^2(c+dx)\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{f^3}\\ &+\frac{3iabd^3\operatorname{PolyLog}\left(4,e^{2i(e+fx)}\right)}{2f^4}\end{aligned}$$

output
```
-I*b^2*(d*x+c)^3/f+1/4*a^2*(d*x+c)^4/d-1/2*I*a*b*(d*x+c)^4/d-1/4*b^2*(d*x+
c)^4/d-b^2*(d*x+c)^3*cot(f*x+e)/f+3*b^2*d*(d*x+c)^2*ln(1-exp(2*I*(f*x+e)))
/f^2+2*a*b*(d*x+c)^3*ln(1-exp(2*I*(f*x+e)))/f-3*I*b^2*d^2*(d*x+c)*polylog(
2,exp(2*I*(f*x+e)))/f^3-3*I*a*b*d*(d*x+c)^2*polylog(2,exp(2*I*(f*x+e)))/f^
2+3/2*b^2*d^3*polylog(3,exp(2*I*(f*x+e)))/f^4+3*a*b*d^2*(d*x+c)*polylog(3,
exp(2*I*(f*x+e)))/f^3+3/2*I*a*b*d^3*polylog(4,exp(2*I*(f*x+e)))/f^4
```

3.42.2 Mathematica [B] (warning: unable to verify)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 1657 vs. $2(295) = 590$.

Time = 7.24 (sec) , antiderivative size = 1657, normalized size of antiderivative = 5.62

$$\int (c+dx)^3(a+b\cot(e+fx))^2\,dx = \text{Too large to display}$$

input
```
Integrate[(c + d*x)^3*(a + b*Cot[e + f*x])^2,x]
```

output
```
-1/2*(b^2*d^3*E^(I*e)*Csc[e]*((2*f^3*x^3)/E^((2*I)*e) + (3*I)*(1 - E^((-2*
I)*e))*f^2*x^2*Log[1 - E^((-I)*(e + f*x))] + (3*I)*(1 - E^((-2*I)*e))*f^2*
x^2*Log[1 + E^((-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, -E^(
(-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, E^((-I)*(e + f*x))]
 + (6*I)*(1 - E^((-2*I)*e))*PolyLog[3, -E^((-I)*(e + f*x))] + (6*I)*(1 - E
^((-2*I)*e))*PolyLog[3, E^((-I)*(e + f*x))]))/f^4 - (a*b*c*d^2*E^(I*e)*Csc
[e]*((2*f^3*x^3)/E^((2*I)*e) + (3*I)*(1 - E^((-2*I)*e))*f^2*x^2*Log[1 - E^
((-I)*(e + f*x))] + (3*I)*(1 - E^((-2*I)*e))*f^2*x^2*Log[1 + E^((-I)*(e +
f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, -E^((-I)*(e + f*x))] - 6*(1 -
 E^((-2*I)*e))*f*x*PolyLog[2, E^((-I)*(e + f*x))] + (6*I)*(1 - E^((-2*I)*e
))*PolyLog[3, -E^((-I)*(e + f*x))] + (6*I)*(1 - E^((-2*I)*e))*PolyLog[3, E
^((-I)*(e + f*x))]))/f^3 - (a*b*d^3*E^(I*e)*Csc[e]*((f^4*x^4)/E^((2*I)*e)
+ (2*I)*(1 - E^((-2*I)*e))*f^3*x^3*Log[1 - E^((-I)*(e + f*x))] + (2*I)*(1
- E^((-2*I)*e))*f^3*x^3*Log[1 + E^((-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))
*f^2*x^2*PolyLog[2, -E^((-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))*f^2*x^2*Po
lyLog[2, E^((-I)*(e + f*x))] + (12*I)*(1 - E^((-2*I)*e))*f*x*PolyLog[3, -E
^((-I)*(e + f*x))] + (12*I)*(1 - E^((-2*I)*e))*f*x*PolyLog[3, E^((-I)*(e +
 f*x))] + 12*(1 - E^((-2*I)*e))*PolyLog[4, -E^((-I)*(e + f*x))] + 12*(1 -
E^((-2*I)*e))*PolyLog[4, E^((-I)*(e + f*x))]))/(2*f^4) + (3*b^2*c^2*d*Csc[
e]*(-(f*x*Cos[e]) + Log[Cos[f*x]*Sin[e] + Cos[e]*Sin[f*x]]*Sin[e]))/(f^...
```

3.42.3 Rubi [A] (verified)

Time = 0.77 (sec) , antiderivative size = 295, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.150, Rules used = {3042, 4205, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)^3(a+b\cot(e+fx))^2\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int (c+dx)^3\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2dx$$

$$\Big\downarrow \text{4205}$$

$$\int \left(a^2(c+dx)^3+2ab(c+dx)^3\cot(e+fx)+b^2(c+dx)^3\cot^2(e+fx)\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{a^2(c+dx)^4}{4d}+\frac{3abd^2(c+dx)\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{f^3}-\frac{3iabd(c+dx)^2\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2}+\frac{2ab(c+dx)^3\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{iab(c+dx)^4}{2d}+\frac{3iabd^3\operatorname{PolyLog}\left(4,e^{2i(e+fx)}\right)}{2f^4}-\frac{3ib^2d^2(c+dx)\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^3}+\frac{3b^2d(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f^2}-\frac{b^2(c+dx)^3\cot(e+fx)}{f}-\frac{ib^2(c+dx)^3}{f}-\frac{b^2(c+dx)^4}{4d}+\frac{3b^2d^3\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^4}$$

input
```
Int[(c + d*x)^3*(a + b*Cot[e + f*x])^2,x]
```

output
```
((-I)*b^2*(c + d*x)^3)/f + (a^2*(c + d*x)^4)/(4*d) - ((I/2)*a*b*(c + d*x)^
4)/d - (b^2*(c + d*x)^4)/(4*d) - (b^2*(c + d*x)^3*Cot[e + f*x])/f + (3*b^2
*d*(c + d*x)^2*Log[1 - E^((2*I)*(e + f*x))])/f^2 + (2*a*b*(c + d*x)^3*Log[
1 - E^((2*I)*(e + f*x))])/f - ((3*I)*b^2*d^2*(c + d*x)*PolyLog[2, E^((2*I)
*(e + f*x))])/f^3 - ((3*I)*a*b*d*(c + d*x)^2*PolyLog[2, E^((2*I)*(e + f*x)
)])/f^2 + (3*b^2*d^3*PolyLog[3, E^((2*I)*(e + f*x))])/(2*f^4) + (3*a*b*d^2
*(c + d*x)*PolyLog[3, E^((2*I)*(e + f*x))])/f^3 + (((3*I)/2)*a*b*d^3*PolyL
og[4, E^((2*I)*(e + f*x))])/f^4
```

3.42.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4205
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.)
, x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (a + b*Tan[e + f*x])^n, x],
 x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

3.42.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 1603 vs. $2(266) = 532$.

Time = 0.85 (sec) , antiderivative size = 1604, normalized size of antiderivative = 5.44

method	result	size
risch	Expression too large to display	1604

input
```
int((d*x+c)^3*(a+b*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
4/f^4*b*e^3*d^3*a*ln(exp(I*(f*x+e)))-2/f^4*b*e^3*d^3*a*ln(exp(I*(f*x+e))-1
)+12*I/f^4*b*d^3*a*polylog(4,-exp(I*(f*x+e)))-3*I/f^4*b*d^3*a*e^4-6*I/f^3*
b^2*d^3*polylog(2,exp(I*(f*x+e)))*x-6*I/f^3*b^2*d^3*polylog(2,-exp(I*(f*x+
e)))*x+6*I/f^3*b^2*e^2*d^3*x-6*I/f*b^2*d^2*c*x^2-6*I/f^3*b^2*d^2*c*e^2-6*I
/f^3*b^2*d^2*c*polylog(2,exp(I*(f*x+e)))-6*I/f^3*b^2*d^2*c*polylog(2,-exp(
I*(f*x+e)))+12*I/f^4*b*d^3*a*polylog(4,exp(I*(f*x+e)))-2*I*d^2*a*b*c*x^3-3
*I*d*a*b*c^2*x^2+d^2*a^2*c*x^3+3/2*d*a^2*c^2*x^2+a^2*c^3*x-d^2*b^2*c*x^3-3
/2*d*b^2*c^2*x^2+2*I*a*b*c^3*x+1/2*I/d*a*b*c^4-1/2*I*d^3*a*b*x^4+12/f^2*b*
e*a*c^2*d*ln(exp(I*(f*x+e)))+12/f^3*b^2*e*c*d^2*ln(exp(I*(f*x+e)))-6/f^3*b
^2*e*c*d^2*ln(exp(I*(f*x+e))-1)+6/f^3*b^2*d^2*c*ln(1-exp(I*(f*x+e)))*e+6/f
^2*b^2*d^2*c*ln(1-exp(I*(f*x+e)))*x+6/f^2*b^2*d^2*c*ln(exp(I*(f*x+e))+1)*x
+12/f^3*b*d^3*a*polylog(3,-exp(I*(f*x+e)))*x+12/f^3*b*d^3*a*polylog(3,exp(
I*(f*x+e)))*x+2/f*b*d^3*a*ln(exp(I*(f*x+e))+1)*x^3+2/f^4*b*d^3*a*ln(1-exp(
I*(f*x+e)))*e^3+2/f*b*d^3*a*ln(1-exp(I*(f*x+e)))*x^3+12/f^3*b*a*c*d^2*poly
log(3,exp(I*(f*x+e)))+12/f^3*b*a*c*d^2*polylog(3,-exp(I*(f*x+e)))+3/f^2*b^
2*d^3*ln(exp(I*(f*x+e))+1)*x^2+2/f*b*a*c^3*ln(exp(I*(f*x+e))+1)-4/f*b*a*c^
3*ln(exp(I*(f*x+e)))+2/f*b*a*c^3*ln(exp(I*(f*x+e))-1)+3/f^2*b^2*c^2*d*ln(e
xp(I*(f*x+e))+1)-6/f^2*b^2*c^2*d*ln(exp(I*(f*x+e)))+3/f^2*b^2*c^2*d*ln(exp
(I*(f*x+e))-1)-6/f^4*b^2*e^2*d^3*ln(exp(I*(f*x+e)))+3/f^4*b^2*e^2*d^3*ln(e
xp(I*(f*x+e))-1)-3/f^4*b^2*e^2*d^3*ln(1-exp(I*(f*x+e)))+3/f^2*b^2*d^3*l...
```

3.42.5 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. 1154 vs. $2(259) = 518$.

Time = 0.35 (sec) , antiderivative size = 1154, normalized size of antiderivative = 3.91

$$\int (c+dx)^3(a+b\cot(e+fx))^2\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^3*(a+b*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
-1/4*(4*b^2*d^3*f^3*x^3 + 12*b^2*c*d^2*f^3*x^2 + 12*b^2*c^2*d*f^3*x + 4*b^
2*c^3*f^3 - 3*I*a*b*d^3*polylog(4, cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e))*
sin(2*f*x + 2*e) + 3*I*a*b*d^3*polylog(4, cos(2*f*x + 2*e) - I*sin(2*f*x +
 2*e))*sin(2*f*x + 2*e) + 6*(I*a*b*d^3*f^2*x^2 + I*a*b*c^2*d*f^2 + I*b^2*c
*d^2*f + I*(2*a*b*c*d^2*f^2 + b^2*d^3*f)*x)*dilog(cos(2*f*x + 2*e) + I*sin
(2*f*x + 2*e))*sin(2*f*x + 2*e) + 6*(-I*a*b*d^3*f^2*x^2 - I*a*b*c^2*d*f^2
- I*b^2*c*d^2*f - I*(2*a*b*c*d^2*f^2 + b^2*d^3*f)*x)*dilog(cos(2*f*x + 2*e
) - I*sin(2*f*x + 2*e))*sin(2*f*x + 2*e) + 2*(2*a*b*d^3*e^3 - 2*a*b*c^3*f^
3 - 3*b^2*d^3*e^2 + 3*(2*a*b*c^2*d*e - b^2*c^2*d)*f^2 - 6*(a*b*c*d^2*e^2 -
 b^2*c*d^2*e)*f)*log(-1/2*cos(2*f*x + 2*e) + 1/2*I*sin(2*f*x + 2*e) + 1/2)
*sin(2*f*x + 2*e) + 2*(2*a*b*d^3*e^3 - 2*a*b*c^3*f^3 - 3*b^2*d^3*e^2 + 3*(
2*a*b*c^2*d*e - b^2*c^2*d)*f^2 - 6*(a*b*c*d^2*e^2 - b^2*c*d^2*e)*f)*log(-1
/2*cos(2*f*x + 2*e) - 1/2*I*sin(2*f*x + 2*e) + 1/2)*sin(2*f*x + 2*e) - 2*(
2*a*b*d^3*f^3*x^3 + 2*a*b*d^3*e^3 + 6*a*b*c^2*d*e*f^2 - 3*b^2*d^3*e^2 + 3*
(2*a*b*c*d^2*f^3 + b^2*d^3*f^2)*x^2 - 6*(a*b*c*d^2*e^2 - b^2*c*d^2*e)*f +
6*(a*b*c^2*d*f^3 + b^2*c*d^2*f^2)*x)*log(-cos(2*f*x + 2*e) + I*sin(2*f*x +
 2*e) + 1)*sin(2*f*x + 2*e) - 2*(2*a*b*d^3*f^3*x^3 + 2*a*b*d^3*e^3 + 6*a*b
*c^2*d*e*f^2 - 3*b^2*d^3*e^2 + 3*(2*a*b*c*d^2*f^3 + b^2*d^3*f^2)*x^2 - 6*(
a*b*c*d^2*e^2 - b^2*c*d^2*e)*f + 6*(a*b*c^2*d*f^3 + b^2*c*d^2*f^2)*x)*log(
-cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e) + 1)*sin(2*f*x + 2*e) - 3*(2*a*b...
```

3.42.6 Sympy [F]

$$\int (c+dx)^3(a+b\cot(e+fx))^2\,dx = \int (a+b\cot(e+fx))^2\,(c+dx)^3\;dx$$

input
```
integrate((d*x+c)**3*(a+b*cot(f*x+e))**2,x)
```

output
```
Integral((a + b*cot(e + f*x))**2*(c + d*x)**3, x)
```

3.42.7 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. 4024 vs. 2(259) = 518.

Time = 1.51 (sec) , antiderivative size = 4024, normalized size of antiderivative = 13.64

$$\int (c+dx)^3(a+b\cot(e+fx))^2\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^3*(a+b*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
1/4*(4*(f*x + e)*a^2*c^3 + (f*x + e)^4*a^2*d^3/f^3 - 4*(f*x + e)^3*a^2*d^3
*e/f^3 + 6*(f*x + e)^2*a^2*d^3*e^2/f^3 - 4*(f*x + e)*a^2*d^3*e^3/f^3 + 4*(
f*x + e)^3*a^2*c*d^2/f^2 - 12*(f*x + e)^2*a^2*c*d^2*e/f^2 + 12*(f*x + e)*a
^2*c*d^2*e^2/f^2 + 6*(f*x + e)^2*a^2*c^2*d/f - 12*(f*x + e)*a^2*c^2*d*e/f
+ 8*a*b*c^3*log(sin(f*x + e)) - 8*a*b*d^3*e^3*log(sin(f*x + e))/f^3 + 24*a
*b*c*d^2*e^2*log(sin(f*x + e))/f^2 - 24*a*b*c^2*d*e*log(sin(f*x + e))/f +
4*((2*a*b - I*b^2)*(f*x + e)^4*d^3 + 8*b^2*d^3*e^3 - 24*b^2*c*d^2*e^2*f +
24*b^2*c^2*d*e*f^2 - 8*b^2*c^3*f^3 - 4*((2*a*b - I*b^2)*d^3*e - (2*a*b - I
*b^2)*c*d^2*f)*(f*x + e)^3 + 6*((2*a*b - I*b^2)*d^3*e^2 - 2*(2*a*b - I*b^2
)*c*d^2*e*f + (2*a*b - I*b^2)*c^2*d*f^2)*(f*x + e)^2 - 4*(-I*b^2*d^3*e^3 +
 3*I*b^2*c*d^2*e^2*f - 3*I*b^2*c^2*d*e*f^2 + I*b^2*c^3*f^3)*(f*x + e) - 4*
(2*(f*x + e)^3*a*b*d^3 + 3*b^2*d^3*e^2 - 6*b^2*c*d^2*e*f + 3*b^2*c^2*d*f^2
 - 3*(2*a*b*d^3*e - 2*a*b*c*d^2*f - b^2*d^3)*(f*x + e)^2 + 6*(a*b*d^3*e^2
+ a*b*c^2*d*f^2 - b^2*d^3*e - (2*a*b*c*d^2*e - b^2*c*d^2)*f)*(f*x + e) - (
2*(f*x + e)^3*a*b*d^3 + 3*b^2*d^3*e^2 - 6*b^2*c*d^2*e*f + 3*b^2*c^2*d*f^2
- 3*(2*a*b*d^3*e - 2*a*b*c*d^2*f - b^2*d^3)*(f*x + e)^2 + 6*(a*b*d^3*e^2 +
 a*b*c^2*d*f^2 - b^2*d^3*e - (2*a*b*c*d^2*e - b^2*c*d^2)*f)*(f*x + e))*cos
(2*f*x + 2*e) + (-2*I*(f*x + e)^3*a*b*d^3 - 3*I*b^2*d^3*e^2 + 6*I*b^2*c*d^
2*e*f - 3*I*b^2*c^2*d*f^2 + 3*(2*I*a*b*d^3*e - 2*I*a*b*c*d^2*f - I*b^2*d^3
)*(f*x + e)^2 + 6*(-I*a*b*d^3*e^2 - I*a*b*c^2*d*f^2 + I*b^2*d^3*e + (2*...
```

3.42.8 Giac [F]

$$\int (c+dx)^3(a+b\cot(e+fx))^2\,dx = \int (dx+c)^3(b\cot(fx+e)+a)^2\,dx$$

input
```
integrate((d*x+c)^3*(a+b*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
integrate((d*x + c)^3*(b*cot(f*x + e) + a)^2, x)
```

3.42.9 Mupad [F(-1)]

Timed out.

$$\int (c+dx)^3(a+b\cot(e+fx))^2\,dx = \int \left(a+b\cot(e+f\,x)\right)^2\,\left(c+d\,x\right)^3\,dx$$

input
```
int((a + b*cot(e + f*x))^2*(c + d*x)^3,x)
```

output
```
int((a + b*cot(e + f*x))^2*(c + d*x)^3, x)
```

3.43 $\int (c+dx)^2(a+b\cot(e+fx))^2\,dx$

3.43.1 Optimal result

Integrand size = 20, antiderivative size = 227

$$\begin{aligned}\int (c+dx)^2(a+b\cot(e+fx))^2\,dx = &-\frac{ib^2(c+dx)^2}{f}+\frac{a^2(c+dx)^3}{3d}-\frac{2iab(c+dx)^3}{3d}\\ &-\frac{b^2(c+dx)^3}{3d}-\frac{b^2(c+dx)^2\cot(e+fx)}{f}\\ &+\frac{2b^2d(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f^2}\\ &+\frac{2ab(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f}\\ &-\frac{ib^2d^2\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^3}\\ &-\frac{2iabd(c+dx)\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2}\\ &+\frac{abd^2\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{f^3}\end{aligned}$$

output
```
-I*b^2*(d*x+c)^2/f+1/3*a^2*(d*x+c)^3/d-2/3*I*a*b*(d*x+c)^3/d-1/3*b^2*(d*x+
c)^3/d-b^2*(d*x+c)^2*cot(f*x+e)/f+2*b^2*d*(d*x+c)*ln(1-exp(2*I*(f*x+e)))/f
^2+2*a*b*(d*x+c)^2*ln(1-exp(2*I*(f*x+e)))/f-I*b^2*d^2*polylog(2,exp(2*I*(f
*x+e)))/f^3-2*I*a*b*d*(d*x+c)*polylog(2,exp(2*I*(f*x+e)))/f^2+a*b*d^2*poly
log(3,exp(2*I*(f*x+e)))/f^3
```

3.43.2 Mathematica [B] (warning: unable to verify)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 737 vs. 2(227) = 454.

Time = 7.15 (sec) , antiderivative size = 737, normalized size of antiderivative = 3.25

$$\int (c+dx)^2(a+b\cot(e+fx))^2\,dx =$$
$$-\frac{abd^2e^{ie}\csc(e)\left(2e^{-2ie}f^3x^3+3i(1-e^{-2ie})f^2x^2\log\left(1-e^{-i(e+fx)}\right)+3i(1-e^{-2ie})f^2x^2\log\left(1+e^{-i(e+fx)}\right.\right.}{}$$
$$+\frac{1}{3}x\left(3c^2+3cdx+d^2x^2\right)\csc(e)\left(2ab\cos(e)+a^2\sin(e)-b^2\sin(e)\right)$$
$$+\frac{2b^2cd\csc(e)(-fx\cos(e)+\log(\cos(fx)\sin(e)+\cos(e)\sin(fx))\sin(e))}{f^2\left(\cos^2(e)+\sin^2(e)\right)}$$
$$+\frac{2abc^2\csc(e)(-fx\cos(e)+\log(\cos(fx)\sin(e)+\cos(e)\sin(fx))\sin(e))}{f\left(\cos^2(e)+\sin^2(e)\right)}$$
$$+\frac{\csc(e)\csc(e+fx)\left(b^2c^2\sin(fx)+2b^2cdx\sin(fx)+b^2d^2x^2\sin(fx)\right)}{f}$$
$$-\frac{b^2d^2\csc(e)\sec(e)\left(e^{i\arctan(\tan(e))}f^2x^2+\frac{(ifx(-\pi+2\arctan(\tan(e)))-\pi\log(1+e^{-2ifx})-2(fx+\arctan(\tan(e)))\log(1-e^{2i(fx+\mathrm{ar}}}{}\right.}{f^3\sqrt{\sec^2(e)\left(\cos^2(e)+\right.}}$$
$$-\frac{2abcd\csc(e)\sec(e)\left(e^{i\arctan(\tan(e))}f^2x^2+\frac{(ifx(-\pi+2\arctan(\tan(e)))-\pi\log(1+e^{-2ifx})-2(fx+\arctan(\tan(e)))\log(1-e^{2i(fx+}}{}\right.}{f^2\sqrt{\sec^2(e)\left(\cos^2(e)\right.}}$$

input
```
Integrate[(c + d*x)^2*(a + b*Cot[e + f*x])^2,x]
```

output
```
-1/3*(a*b*d^2*E^(I*e)*Csc[e]*((2*f^3*x^3)/E^((2*I)*e) + (3*I)*(1 - E^((-2*
I)*e))*f^2*x^2*Log[1 - E^((-I)*(e + f*x))] + (3*I)*(1 - E^((-2*I)*e))*f^2*
x^2*Log[1 + E^((-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, -E^(
(-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, E^((-I)*(e + f*x))]
 + (6*I)*(1 - E^((-2*I)*e))*PolyLog[3, -E^((-I)*(e + f*x))] + (6*I)*(1 - E
^((-2*I)*e))*PolyLog[3, E^((-I)*(e + f*x))]))/f^3 + (x*(3*c^2 + 3*c*d*x +
d^2*x^2)*Csc[e]*(2*a*b*Cos[e] + a^2*Sin[e] - b^2*Sin[e]))/3 + (2*b^2*c*d*C
sc[e]*(-(f*x*Cos[e]) + Log[Cos[f*x]*Sin[e] + Cos[e]*Sin[f*x]]*Sin[e]))/(f^
2*(Cos[e]^2 + Sin[e]^2)) + (2*a*b*c^2*Csc[e]*(-(f*x*Cos[e]) + Log[Cos[f*x]
*Sin[e] + Cos[e]*Sin[f*x]]*Sin[e]))/(f*(Cos[e]^2 + Sin[e]^2)) + (Csc[e]*Cs
c[e + f*x]*(b^2*c^2*Sin[f*x] + 2*b^2*c*d*x*Sin[f*x] + b^2*d^2*x^2*Sin[f*x]
))/f - (b^2*d^2*Csc[e]*Sec[e]*(E^(I*ArcTan[Tan[e]])*f^2*x^2 + ((I*f*x*(-Pi
 + 2*ArcTan[Tan[e]]) - Pi*Log[1 + E^((-2*I)*f*x)] - 2*(f*x + ArcTan[Tan[e]
])*Log[1 - E^((2*I)*(f*x + ArcTan[Tan[e]]))] + Pi*Log[Cos[f*x]] + 2*ArcTan
[Tan[e]]*Log[Sin[f*x + ArcTan[Tan[e]]]] + I*PolyLog[2, E^((2*I)*(f*x + Arc
Tan[Tan[e]]))])*Tan[e])/Sqrt[1 + Tan[e]^2]))/(f^3*Sqrt[Sec[e]^2*(Cos[e]^2
+ Sin[e]^2)]) - (2*a*b*c*d*Csc[e]*Sec[e]*(E^(I*ArcTan[Tan[e]])*f^2*x^2 + (
(I*f*x*(-Pi + 2*ArcTan[Tan[e]]) - Pi*Log[1 + E^((-2*I)*f*x)] - 2*(f*x + Ar
cTan[Tan[e]])*Log[1 - E^((2*I)*(f*x + ArcTan[Tan[e]]))] + Pi*Log[Cos[f*x]]
 + 2*ArcTan[Tan[e]]*Log[Sin[f*x + ArcTan[Tan[e]]]] + I*PolyLog[2, E^((2...
```

3.43.3 Rubi [A] (verified)

Time = 0.61 (sec) , antiderivative size = 227, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.150, Rules used = {3042, 4205, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)^2(a+b\cot(e+fx))^2\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int (c+dx)^2\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2dx$$

$$\Big\downarrow \text{4205}$$

$$\int \left(a^2(c+dx)^2+2ab(c+dx)^2\cot(e+fx)+b^2(c+dx)^2\cot^2(e+fx)\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{a^2(c+dx)^3}{3d}-\frac{2iabd(c+dx)\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2}+\frac{2ab(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{2iab(c+dx)^3}{3d}+\frac{abd^2\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{f^3}+\frac{2b^2d(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f^2}-\frac{b^2(c+dx)^2\cot(e+fx)}{f}-\frac{ib^2(c+dx)^2}{f}-\frac{b^2(c+dx)^3}{3d}-\frac{ib^2d^2\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^3}$$

input
```
Int[(c + d*x)^2*(a + b*Cot[e + f*x])^2,x]
```

output
```
((-I)*b^2*(c + d*x)^2)/f + (a^2*(c + d*x)^3)/(3*d) - (((2*I)/3)*a*b*(c + d
*x)^3)/d - (b^2*(c + d*x)^3)/(3*d) - (b^2*(c + d*x)^2*Cot[e + f*x])/f + (2
*b^2*d*(c + d*x)*Log[1 - E^((2*I)*(e + f*x))])/f^2 + (2*a*b*(c + d*x)^2*Lo
g[1 - E^((2*I)*(e + f*x))])/f - (I*b^2*d^2*PolyLog[2, E^((2*I)*(e + f*x))]
)/f^3 - ((2*I)*a*b*d*(c + d*x)*PolyLog[2, E^((2*I)*(e + f*x))])/f^2 + (a*b
*d^2*PolyLog[3, E^((2*I)*(e + f*x))])/f^3
```

3.43.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4205
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.)
, x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (a + b*Tan[e + f*x])^n, x],
 x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

3.43.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 931 vs. 2(207) = 414.

Time = 0.80 (sec) , antiderivative size = 932, normalized size of antiderivative = 4.11

method	result	size
risch	Expression too large to display	932

input
```
int((d*x+c)^2*(a+b*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
d*a^2*c*x^2+a^2*c^2*x-d*b^2*c*x^2+4/f^3*b^2*e*d^2*ln(exp(I*(f*x+e)))-2/f^3
*b^2*e*d^2*ln(exp(I*(f*x+e))-1)+2/f*b*a*c^2*ln(exp(I*(f*x+e))+1)-4/f*b*a*c
^2*ln(exp(I*(f*x+e)))+2/f*b*a*c^2*ln(exp(I*(f*x+e))-1)+2/f^2*b^2*c*d*ln(ex
p(I*(f*x+e))+1)-4/f^2*b^2*c*d*ln(exp(I*(f*x+e)))+2/f^2*b^2*c*d*ln(exp(I*(f
*x+e))-1)+4/f^3*b*a*d^2*polylog(3,exp(I*(f*x+e)))+4/f^3*b*a*d^2*polylog(3,
-exp(I*(f*x+e)))+2/f^3*b^2*d^2*ln(1-exp(I*(f*x+e)))*e+2/f^2*b^2*d^2*ln(1-e
xp(I*(f*x+e)))*x+2/f^2*b^2*d^2*ln(exp(I*(f*x+e))+1)*x-2*I/f*b^2*d^2*x^2-2*
I/f^3*b^2*d^2*e^2-2*I/f^3*b^2*d^2*polylog(2,exp(I*(f*x+e)))-2*I/f^3*b^2*d^
2*polylog(2,-exp(I*(f*x+e)))-2/3*I*d^2*a*b*x^3-2*I*b^2*(d^2*x^2+2*c*d*x+c^
2)/f/(exp(2*I*(f*x+e))-1)-2/f^3*b*a*d^2*ln(1-exp(I*(f*x+e)))*e^2+2/f*b*a*d
^2*ln(exp(I*(f*x+e))+1)*x^2+2/f*b*a*d^2*ln(1-exp(I*(f*x+e)))*x^2-4/f^3*b*e
^2*a*d^2*ln(exp(I*(f*x+e)))+2/f^3*b*e^2*a*d^2*ln(exp(I*(f*x+e))-1)+8/3*I/f
^3*b*a*d^2*e^3-4*I/f^2*b^2*d^2*e*x-2*I*d*a*b*c*x^2-8*I/f*b*d*c*a*e*x-4*I/f
^2*b*a*d^2*polylog(2,-exp(I*(f*x+e)))*x+4*I/f^2*b*a*d^2*e^2*x-4*I/f^2*b*a*
d^2*polylog(2,exp(I*(f*x+e)))*x-4*I/f^2*b*d*c*a*e^2+8/f^2*b*e*a*c*d*ln(exp
(I*(f*x+e)))-4/f^2*b*e*a*c*d*ln(exp(I*(f*x+e))-1)+4/f*b*d*c*a*ln(1-exp(I*(
f*x+e)))*x+4/f*b*d*c*a*ln(exp(I*(f*x+e))+1)*x+4/f^2*b*d*c*a*ln(1-exp(I*(f*
x+e)))*e-4*I/f^2*b*d*c*a*polylog(2,exp(I*(f*x+e)))-4*I/f^2*b*d*c*a*polylog
(2,-exp(I*(f*x+e)))+2*I*a*b*c^2*x+2/3*I/d*a*b*c^3+1/3*d^2*a^2*x^3+1/3/d*a^
2*c^3-1/3*d^2*b^2*x^3-b^2*c^2*x-1/3/d*b^2*c^3
```

3.43.5 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. 715 vs. $2(201) = 402$.

Time = 0.29 (sec) , antiderivative size = 715, normalized size of antiderivative = 3.15

$$\int (c+dx)^2(a+b\cot(e+fx))^2\,dx =$$

$$-\frac{6\,b^2d^2f^2x^2 + 12\,b^2cdf^2x + 6\,b^2c^2f^2 - 3\,abd^2\mathrm{polylog}(3, \cos(2\,fx+2\,e) + i\,\sin(2\,fx+2\,e))\sin(2\,fx+2}{}$$

input
```
integrate((d*x+c)^2*(a+b*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
-1/6*(6*b^2*d^2*f^2*x^2 + 12*b^2*c*d*f^2*x + 6*b^2*c^2*f^2 - 3*a*b*d^2*pol
ylog(3, cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e))*sin(2*f*x + 2*e) - 3*a*b*d^
2*polylog(3, cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e))*sin(2*f*x + 2*e) + 3*(
2*I*a*b*d^2*f*x + 2*I*a*b*c*d*f + I*b^2*d^2)*dilog(cos(2*f*x + 2*e) + I*si
n(2*f*x + 2*e))*sin(2*f*x + 2*e) + 3*(-2*I*a*b*d^2*f*x - 2*I*a*b*c*d*f - I
*b^2*d^2)*dilog(cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e))*sin(2*f*x + 2*e) -
6*(a*b*d^2*e^2 + a*b*c^2*f^2 - b^2*d^2*e - (2*a*b*c*d*e - b^2*c*d)*f)*log(
-1/2*cos(2*f*x + 2*e) + 1/2*I*sin(2*f*x + 2*e) + 1/2)*sin(2*f*x + 2*e) - 6
*(a*b*d^2*e^2 + a*b*c^2*f^2 - b^2*d^2*e - (2*a*b*c*d*e - b^2*c*d)*f)*log(-
1/2*cos(2*f*x + 2*e) - 1/2*I*sin(2*f*x + 2*e) + 1/2)*sin(2*f*x + 2*e) - 6*
(a*b*d^2*f^2*x^2 - a*b*d^2*e^2 + 2*a*b*c*d*e*f + b^2*d^2*e + (2*a*b*c*d*f^
2 + b^2*d^2*f)*x)*log(-cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e) + 1)*sin(2*f*
x + 2*e) - 6*(a*b*d^2*f^2*x^2 - a*b*d^2*e^2 + 2*a*b*c*d*e*f + b^2*d^2*e +
(2*a*b*c*d*f^2 + b^2*d^2*f)*x)*log(-cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e)
+ 1)*sin(2*f*x + 2*e) + 6*(b^2*d^2*f^2*x^2 + 2*b^2*c*d*f^2*x + b^2*c^2*f^2
)*cos(2*f*x + 2*e) - 2*((a^2 - b^2)*d^2*f^3*x^3 + 3*(a^2 - b^2)*c*d*f^3*x^
2 + 3*(a^2 - b^2)*c^2*f^3*x)*sin(2*f*x + 2*e))/(f^3*sin(2*f*x + 2*e))
```

3.43.6 Sympy [F]

$$\int (c+dx)^2(a+b\cot(e+fx))^2\,dx=\int \left(a+b\cot\left(e+fx\right)\right)^2\left(c+dx\right)^2\,dx$$

input
```
integrate((d*x+c)**2*(a+b*cot(f*x+e))**2,x)
```

output
```
Integral((a + b*cot(e + f*x))**2*(c + d*x)**2, x)
```

3.43.7 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. 1948 vs. 2(201) = 402.

Time = 0.59 (sec) , antiderivative size = 1948, normalized size of antiderivative = 8.58

$$\int (c+dx)^2(a+b\cot(e+fx))^2\,dx=\text{Too large to display}$$

input
```
integrate((d*x+c)^2*(a+b*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
1/3*(3*(f*x + e)*a^2*c^2 + (f*x + e)^3*a^2*d^2/f^2 - 3*(f*x + e)^2*a^2*d^2
*e/f^2 + 3*(f*x + e)*a^2*d^2*e^2/f^2 + 3*(f*x + e)^2*a^2*c*d/f - 6*(f*x +
e)*a^2*c*d*e/f + 6*a*b*c^2*log(sin(f*x + e)) + 6*a*b*d^2*e^2*log(sin(f*x +
 e))/f^2 - 12*a*b*c*d*e*log(sin(f*x + e))/f + 3*((2*a*b - I*b^2)*(f*x + e)
^3*d^2 - 6*b^2*d^2*e^2 + 12*b^2*c*d*e*f - 6*b^2*c^2*f^2 - 3*((2*a*b - I*b^
2)*d^2*e - (2*a*b - I*b^2)*c*d*f)*(f*x + e)^2 - 3*(I*b^2*d^2*e^2 - 2*I*b^2
*c*d*e*f + I*b^2*c^2*f^2)*(f*x + e) - 6*((f*x + e)^2*a*b*d^2 - b^2*d^2*e +
 b^2*c*d*f - (2*a*b*d^2*e - 2*a*b*c*d*f - b^2*d^2)*(f*x + e) - ((f*x + e)^
2*a*b*d^2 - b^2*d^2*e + b^2*c*d*f - (2*a*b*d^2*e - 2*a*b*c*d*f - b^2*d^2)*
(f*x + e))*cos(2*f*x + 2*e) + (-I*(f*x + e)^2*a*b*d^2 + I*b^2*d^2*e - I*b^
2*c*d*f + (2*I*a*b*d^2*e - 2*I*a*b*c*d*f - I*b^2*d^2)*(f*x + e))*sin(2*f*x
 + 2*e))*arctan2(sin(f*x + e), cos(f*x + e) + 1) + 6*(b^2*d^2*e - b^2*c*d*
f - (b^2*d^2*e - b^2*c*d*f)*cos(2*f*x + 2*e) - (I*b^2*d^2*e - I*b^2*c*d*f)
*sin(2*f*x + 2*e))*arctan2(sin(f*x + e), cos(f*x + e) - 1) + 6*((f*x + e)^
2*a*b*d^2 - (2*a*b*d^2*e - 2*a*b*c*d*f - b^2*d^2)*(f*x + e) - ((f*x + e)^2
*a*b*d^2 - (2*a*b*d^2*e - 2*a*b*c*d*f - b^2*d^2)*(f*x + e))*cos(2*f*x + 2*
e) - (I*(f*x + e)^2*a*b*d^2 + (-2*I*a*b*d^2*e + 2*I*a*b*c*d*f + I*b^2*d^2)
*(f*x + e))*sin(2*f*x + 2*e))*arctan2(sin(f*x + e), -cos(f*x + e) + 1) - (
(2*a*b - I*b^2)*(f*x + e)^3*d^2 + 3*(2*b^2*d^2 - (2*a*b - I*b^2)*d^2*e + (
2*a*b - I*b^2)*c*d*f)*(f*x + e)^2 + 3*(-I*b^2*d^2*e^2 - I*b^2*c^2*f^2 -...
```

3.43.8 Giac [F]

$$\int (c+dx)^2(a+b\cot(e+fx))^2\,dx=\int (dx+c)^2(b\cot(fx+e)+a)^2\,dx$$

input
```
integrate((d*x+c)^2*(a+b*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
integrate((d*x + c)^2*(b*cot(f*x + e) + a)^2, x)
```

3.43.9 Mupad [F(-1)]

Timed out.

$$\int (c+dx)^2(a+b\cot(e+fx))^2\,dx=\int \left(a+b\cot(e+f\,x)\right)^2\,{\left(c+d\,x\right)}^2\,dx$$

input
```
int((a + b*cot(e + f*x))^2*(c + d*x)^2,x)
```

output
```
int((a + b*cot(e + f*x))^2*(c + d*x)^2, x)
```

3.44 $\int (c+dx)(a+b\cot(e+fx))^2\,dx$

3.44.1 Optimal result

Integrand size = 18, antiderivative size = 137

$$\int (c+dx)(a+b\cot(e+fx))^2\,dx = -b^2cx-\frac{1}{2}b^2dx^2+\frac{a^2(c+dx)^2}{2d} -\frac{iab(c+dx)^2}{d}-\frac{b^2(c+dx)\cot(e+fx)}{f} +\frac{2ab(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f} +\frac{b^2d\log(\sin(e+fx))}{f^2}-\frac{iabd\,\mathrm{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2}$$

output
```
-b^2*c*x-1/2*b^2*d*x^2+1/2*a^2*(d*x+c)^2/d-I*a*b*(d*x+c)^2/d-b^2*(d*x+c)*c
ot(f*x+e)/f+2*a*b*(d*x+c)*ln(1-exp(2*I*(f*x+e)))/f+b^2*d*ln(sin(f*x+e))/f^
2-I*a*b*d*polylog(2,exp(2*I*(f*x+e)))/f^2
```

3.44.2 Mathematica [A] (verified)

Time = 8.52 (sec) , antiderivative size = 238, normalized size of antiderivative = 1.74

$$\int (c+dx)(a+b\cot(e+fx))^2\,dx = \frac{(a+b\cot(e+fx))^2\sin(e+fx)\left(-2b^2f(c+dx)\cos(e+fx)-(a-b)(a+b)(e+fx)(-2cf+d(e-fx)\right.}{}$$

input
```
Integrate[(c + d*x)*(a + b*Cot[e + f*x])^2,x]
```

output
```
((a + b*Cot[e + f*x])^2*Sin[e + f*x]*(-2*b^2*f*(c + d*x)*Cos[e + f*x] - (a
 - b)*(a + b)*(e + f*x)*(-2*c*f + d*(e - f*x))*Sin[e + f*x] + 2*b^2*d*(Log
[Cos[e + f*x]] + Log[Tan[e + f*x]])*Sin[e + f*x] - 4*a*b*d*e*(Log[Cos[e +
f*x]] + Log[Tan[e + f*x]])*Sin[e + f*x] + 4*a*b*c*f*(Log[Cos[e + f*x]] + L
og[Tan[e + f*x]])*Sin[e + f*x] + 4*a*b*d*((e + f*x)*Log[1 - E^((2*I)*(e +
f*x))] - (I/2)*((e + f*x)^2 + PolyLog[2, E^((2*I)*(e + f*x))]))*Sin[e + f*
x]))/(2*f^2*(b*Cos[e + f*x] + a*Sin[e + f*x])^2)
```

3.44.3 Rubi [A] (verified)

Time = 0.40 (sec) , antiderivative size = 136, normalized size of antiderivative = 0.99, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.167, Rules used = {3042, 4205, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)(a+b\cot(e+fx))^2\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int (c+dx)\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2dx$$

$$\Big\downarrow \text{4205}$$

$$\int \left(a^2(c+dx)+2ab(c+dx)\cot(e+fx)+b^2(c+dx)\cot^2(e+fx)\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{a^2(c+dx)^2}{2d}+\frac{2ab(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{iab(c+dx)^2}{d}-\frac{iabd\,\text{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2}-\frac{b^2(c+dx)\cot(e+fx)}{f}-\frac{b^2(c+dx)^2}{2d}+\frac{b^2d\log(\sin(e+fx))}{f^2}$$

input
```
Int[(c + d*x)*(a + b*Cot[e + f*x])^2,x]
```

output
```
(a^2*(c + d*x)^2)/(2*d) - (I*a*b*(c + d*x)^2)/d - (b^2*(c + d*x)^2)/(2*d)
- (b^2*(c + d*x)*Cot[e + f*x])/f + (2*a*b*(c + d*x)*Log[1 - E^((2*I)*(e +
f*x))])/f + (b^2*d*Log[Sin[e + f*x]])/f^2 - (I*a*b*d*PolyLog[2, E^((2*I)*(
e + f*x))])/f^2
```

3.44.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4205
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.)
, x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (a + b*Tan[e + f*x])^n, x],
 x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

3.44.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 364 vs. $2(127) = 254$.

Time = 0.72 (sec) , antiderivative size = 365, normalized size of antiderivative = 2.66

method	result
risch	$-\frac{b^2 d x^2}{2}-\frac{2ib^2(dx+c)}{f\left(e^{2i(fx+e)}-1\right)}+\frac{a^2 d x^2}{2}-b^2 c x-\frac{2ibad\,\mathrm{polylog}\left(2,e^{i(fx+e)}\right)}{f^2}+a^2 c x-\frac{4ibadex}{f}+\frac{b^2 d\ln\left(e^{i(fx+e)}+1\right)}{f^2}-$

input
```
int((d*x+c)*(a+b*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
-1/2*b^2*d*x^2-2*I*b^2*(d*x+c)/f/(exp(2*I*(f*x+e))-1)+1/2*a^2*d*x^2-b^2*c*
x-2*I/f^2*b*a*d*polylog(2,exp(I*(f*x+e)))+a^2*c*x-4*I/f*b*a*d*e*x+1/f^2*b^
2*d*ln(exp(I*(f*x+e))+1)-2/f^2*b^2*d*ln(exp(I*(f*x+e)))+1/f^2*b^2*d*ln(exp
(I*(f*x+e))-1)+2/f*b*a*c*ln(exp(I*(f*x+e))+1)-4/f*b*a*c*ln(exp(I*(f*x+e)))
+2/f*b*a*c*ln(exp(I*(f*x+e))-1)+4/f^2*b*e*a*d*ln(exp(I*(f*x+e)))-2/f^2*b*e
*a*d*ln(exp(I*(f*x+e))-1)-I*a*b*d*x^2+2*I*a*b*c*x-2*I/f^2*b*a*d*polylog(2,
-exp(I*(f*x+e)))+2/f*b*a*d*ln(1-exp(I*(f*x+e)))*x+2/f^2*b*a*d*ln(1-exp(I*(
f*x+e)))*e-2*I/f^2*b*a*d*e^2+2/f*b*a*d*ln(exp(I*(f*x+e))+1)*x
```

3.44.5 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. 378 vs. 2(124) = 248.

Time = 0.28 (sec) , antiderivative size = 378, normalized size of antiderivative = 2.76

$$\int (c+dx)(a+b\cot(e+fx))^2\,dx =$$
$$-\frac{2\,b^2 d f x + i\,abd\mathrm{Li}_2(\cos(2\,fx+2\,e)+i\,\sin(2\,fx+2\,e))\sin(2\,fx+2\,e) - i\,abd\mathrm{Li}_2(\cos(2\,fx+2\,e) - i\,\mathrm{s}}{}$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
-1/2*(2*b^2*d*f*x + I*a*b*d*dilog(cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e))*s
in(2*f*x + 2*e) - I*a*b*d*dilog(cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e))*sin
(2*f*x + 2*e) + 2*b^2*c*f + (2*a*b*d*e - 2*a*b*c*f - b^2*d)*log(-1/2*cos(2
*f*x + 2*e) + 1/2*I*sin(2*f*x + 2*e) + 1/2)*sin(2*f*x + 2*e) + (2*a*b*d*e
- 2*a*b*c*f - b^2*d)*log(-1/2*cos(2*f*x + 2*e) - 1/2*I*sin(2*f*x + 2*e) +
1/2)*sin(2*f*x + 2*e) - 2*(a*b*d*f*x + a*b*d*e)*log(-cos(2*f*x + 2*e) + I*
sin(2*f*x + 2*e) + 1)*sin(2*f*x + 2*e) - 2*(a*b*d*f*x + a*b*d*e)*log(-cos(
2*f*x + 2*e) - I*sin(2*f*x + 2*e) + 1)*sin(2*f*x + 2*e) + 2*(b^2*d*f*x + b
^2*c*f)*cos(2*f*x + 2*e) - ((a^2 - b^2)*d*f^2*x^2 + 2*(a^2 - b^2)*c*f^2*x)
*sin(2*f*x + 2*e))/(f^2*sin(2*f*x + 2*e))
```

3.44.6 Sympy [F]

$$\int (c+dx)(a+b\cot(e+fx))^2\,dx = \int (a+b\cot(e+fx))^2\,(c+dx)\,dx$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e))**2,x)
```

output
```
Integral((a + b*cot(e + f*x))**2*(c + d*x), x)
```

3.44.7 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. 774 vs. $2(124) = 248$.

Time = 0.34 (sec) , antiderivative size = 774, normalized size of antiderivative = 5.65

$$\int (c+dx)(a+b\cot(e+fx))^2\,dx$$
$$= \frac{2\,(fx+e)a^2c + \frac{(fx+e)^2a^2d}{f} - \frac{2\,(fx+e)a^2de}{f} + 4\,abc\log\left(\sin\left(fx+e\right)\right) - \frac{4\,abde\log(\sin(fx+e))}{f} + \frac{2\left((2\,ab-i\,b^2)(fx+e)^2d+\right.}{}}{}$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
1/2*(2*(f*x + e)*a^2*c + (f*x + e)^2*a^2*d/f - 2*(f*x + e)*a^2*d*e/f + 4*a
*b*c*log(sin(f*x + e)) - 4*a*b*d*e*log(sin(f*x + e))/f + 2*((2*a*b - I*b^2
)*(f*x + e)^2*d + 4*b^2*d*e - 4*b^2*c*f - 2*(-I*b^2*d*e + I*b^2*c*f)*(f*x
+ e) - 2*(2*(f*x + e)*a*b*d + b^2*d - (2*(f*x + e)*a*b*d + b^2*d)*cos(2*f*
x + 2*e) + (-2*I*(f*x + e)*a*b*d - I*b^2*d)*sin(2*f*x + 2*e))*arctan2(sin(
f*x + e), cos(f*x + e) + 1) + 2*(b^2*d*cos(2*f*x + 2*e) + I*b^2*d*sin(2*f*
x + 2*e) - b^2*d)*arctan2(sin(f*x + e), cos(f*x + e) - 1) - 4*((f*x + e)*a
*b*d*cos(2*f*x + 2*e) + I*(f*x + e)*a*b*d*sin(2*f*x + 2*e) - (f*x + e)*a*b
*d)*arctan2(sin(f*x + e), -cos(f*x + e) + 1) - ((2*a*b - I*b^2)*(f*x + e)^
2*d + 2*(I*b^2*d*e - I*b^2*c*f + 2*b^2*d)*(f*x + e))*cos(2*f*x + 2*e) - 4*
(a*b*d*cos(2*f*x + 2*e) + I*a*b*d*sin(2*f*x + 2*e) - a*b*d)*dilog(-e^(I*f*
x + I*e)) - 4*(a*b*d*cos(2*f*x + 2*e) + I*a*b*d*sin(2*f*x + 2*e) - a*b*d)*
dilog(e^(I*f*x + I*e)) + (2*I*(f*x + e)*a*b*d + I*b^2*d + (-2*I*(f*x + e)*
a*b*d - I*b^2*d)*cos(2*f*x + 2*e) + (2*(f*x + e)*a*b*d + b^2*d)*sin(2*f*x
+ 2*e))*log(cos(f*x + e)^2 + sin(f*x + e)^2 + 2*cos(f*x + e) + 1) + (2*I*(
f*x + e)*a*b*d + I*b^2*d + (-2*I*(f*x + e)*a*b*d - I*b^2*d)*cos(2*f*x + 2*
e) + (2*(f*x + e)*a*b*d + b^2*d)*sin(2*f*x + 2*e))*log(cos(f*x + e)^2 + si
n(f*x + e)^2 - 2*cos(f*x + e) + 1) + ((-2*I*a*b - b^2)*(f*x + e)^2*d + 2*(
b^2*d*e - b^2*c*f - 2*I*b^2*d)*(f*x + e))*sin(2*f*x + 2*e))/(-2*I*f*cos(2*
f*x + 2*e) + 2*f*sin(2*f*x + 2*e) + 2*I*f))/f
```

3.44.8 Giac [F]

$$\int (c+dx)(a+b\cot(e+fx))^2\,dx = \int (dx+c)(b\cot(fx+e)+a)^2\,dx$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
integrate((d*x + c)*(b*cot(f*x + e) + a)^2, x)
```

3.44.9 Mupad [F(-1)]

Timed out.

$$\int (c+dx)(a+b\cot(e+fx))^2\,dx = \int (a+b\cot(e+f\,x))^2\,(c+d\,x)\,dx$$

input
```
int((a + b*cot(e + f*x))^2*(c + d*x),x)
```

output
```
int((a + b*cot(e + f*x))^2*(c + d*x), x)
```

3.45 $\int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx$

3.45.1 Optimal result

Integrand size = 20, antiderivative size = 20

$$\int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx=\operatorname{Int}\left(\frac{(a+b\cot(e+fx))^2}{c+dx},x\right)$$

output
```
Unintegrable((a+b*cot(f*x+e))^2/(d*x+c),x)
```

3.45.2 Mathematica [N/A]

Not integrable

Time = 25.48 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx=\int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx$$

input
```
Integrate[(a + b*Cot[e + f*x])^2/(c + d*x),x]
```

output
```
Integrate[(a + b*Cot[e + f*x])^2/(c + d*x), x]
```

3.45.3 Rubi [N/A]

Not integrable

Time = 0.22 (sec) , antiderivative size = 20, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}{c+dx}dx$$

$$\Big\downarrow \text{4223}$$

$$\int \frac{(a+b\cot(e+fx))^2}{c+dx}dx$$

input
```
Int[(a + b*Cot[e + f*x])^2/(c + d*x),x]
```

output
```
$Aborted
```

3.45.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.45.4 Maple [N/A] (verified)

Not integrable

Time = 0.36 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{(a+b\cot(fx+e))^2}{dx+c}dx$$

input
```
int((a+b*cot(f*x+e))^2/(d*x+c),x)
```

output
```
int((a+b*cot(f*x+e))^2/(d*x+c),x)
```

3.45.5 Fricas [N/A]

Not integrable

Time = 0.27 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.80

$$\int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx = \int \frac{(b\cot(fx+e)+a)^2}{dx+c}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^2/(d*x+c),x, algorithm="fricas")
```

output
```
integral((b^2*cot(f*x + e)^2 + 2*a*b*cot(f*x + e) + a^2)/(d*x + c), x)
```

3.45.6 Sympy [N/A]

Not integrable

Time = 1.07 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.85

$$\int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx = \int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx$$

input
```
integrate((a+b*cot(f*x+e))**2/(d*x+c),x)
```

output
```
Integral((a + b*cot(e + f*x))**2/(c + d*x), x)
```

3.45.7 Maxima [N/A]

Not integrable

Time = 1.17 (sec) , antiderivative size = 697, normalized size of antiderivative = 34.85

$$\int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx = \int \frac{(b\cot(fx+e)+a)^2}{dx+c}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^2/(d*x+c),x, algorithm="maxima")
```

output
```
(((a^2 - b^2)*d*f*x + (a^2 - b^2)*c*f)*cos(2*f*x + 2*e)^2*log(d*x + c) - 2
*b^2*d*sin(2*f*x + 2*e) + ((a^2 - b^2)*d*f*x + (a^2 - b^2)*c*f)*log(d*x +
c)*sin(2*f*x + 2*e)^2 - 2*((a^2 - b^2)*d*f*x + (a^2 - b^2)*c*f)*cos(2*f*x
+ 2*e)*log(d*x + c) - (d^2*f*x + c*d*f + (d^2*f*x + c*d*f)*cos(2*f*x + 2*e
)^2 + (d^2*f*x + c*d*f)*sin(2*f*x + 2*e)^2 - 2*(d^2*f*x + c*d*f)*cos(2*f*x
 + 2*e))*integrate((2*a*b*d*f*x + 2*a*b*c*f - b^2*d)*sin(f*x + e)/(d^2*f*x
^2 + 2*c*d*f*x + c^2*f + (d^2*f*x^2 + 2*c*d*f*x + c^2*f)*cos(f*x + e)^2 +
(d^2*f*x^2 + 2*c*d*f*x + c^2*f)*sin(f*x + e)^2 + 2*(d^2*f*x^2 + 2*c*d*f*x
+ c^2*f)*cos(f*x + e)), x) + (d^2*f*x + c*d*f + (d^2*f*x + c*d*f)*cos(2*f*
x + 2*e)^2 + (d^2*f*x + c*d*f)*sin(2*f*x + 2*e)^2 - 2*(d^2*f*x + c*d*f)*co
s(2*f*x + 2*e))*integrate((2*a*b*d*f*x + 2*a*b*c*f - b^2*d)*sin(f*x + e)/(
d^2*f*x^2 + 2*c*d*f*x + c^2*f + (d^2*f*x^2 + 2*c*d*f*x + c^2*f)*cos(f*x +
e)^2 + (d^2*f*x^2 + 2*c*d*f*x + c^2*f)*sin(f*x + e)^2 - 2*(d^2*f*x^2 + 2*c
*d*f*x + c^2*f)*cos(f*x + e)), x) + ((a^2 - b^2)*d*f*x + (a^2 - b^2)*c*f)*
log(d*x + c))/(d^2*f*x + c*d*f + (d^2*f*x + c*d*f)*cos(2*f*x + 2*e)^2 + (d
^2*f*x + c*d*f)*sin(2*f*x + 2*e)^2 - 2*(d^2*f*x + c*d*f)*cos(2*f*x + 2*e))
```

3.45.8 Giac [N/A]

Not integrable

Time = 0.37 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx = \int \frac{(b\cot(fx+e)+a)^2}{dx+c}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^2/(d*x+c),x, algorithm="giac")
```

output
```
integrate((b*cot(f*x + e) + a)^2/(d*x + c), x)
```

3.45.9 Mupad [N/A]

Not integrable

Time = 12.21 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^2}{c+dx}\,dx = \int \frac{(a+b\cot(e+f\,x))^2}{c+d\,x}\,dx$$

input
```
int((a + b*cot(e + f*x))^2/(c + d*x),x)
```

output
```
int((a + b*cot(e + f*x))^2/(c + d*x), x)
```

3.46 $\int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2} dx$

3.46.1 Optimal result

Integrand size = 20, antiderivative size = 20

$$\int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2} dx = \text{Int}\left(\frac{(a+b\cot(e+fx))^2}{(c+dx)^2}, x\right)$$

output
```
Unintegrable((a+b*cot(f*x+e))^2/(d*x+c)^2,x)
```

3.46.2 Mathematica [N/A]

Not integrable

Time = 20.01 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2} dx = \int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2} dx$$

input
```
Integrate[(a + b*Cot[e + f*x])^2/(c + d*x)^2,x]
```

output
```
Integrate[(a + b*Cot[e + f*x])^2/(c + d*x)^2, x]
```

3.46.3 Rubi [N/A]

Not integrable

Time = 0.22 (sec) , antiderivative size = 20, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2}\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}{(c+dx)^2}dx$$

$$\Big\downarrow \text{4223}$$

$$\int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2}dx$$

input
```
Int[(a + b*Cot[e + f*x])^2/(c + d*x)^2,x]
```

output
```
$Aborted
```

3.46.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.46.4 Maple [N/A] (verified)

Not integrable

Time = 0.49 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{(a+b\cot(fx+e))^2}{(dx+c)^2}dx$$

input
```
int((a+b*cot(f*x+e))^2/(d*x+c)^2,x)
```

output
```
int((a+b*cot(f*x+e))^2/(d*x+c)^2,x)
```

3.46.5 Fricas [N/A]

Not integrable

Time = 0.25 (sec) , antiderivative size = 47, normalized size of antiderivative = 2.35

$$\int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2}\,dx = \int \frac{(b\cot(fx+e)+a)^2}{(dx+c)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^2/(d*x+c)^2,x, algorithm="fricas")
```

output
```
integral((b^2*cot(f*x + e)^2 + 2*a*b*cot(f*x + e) + a^2)/(d^2*x^2 + 2*c*d*
x + c^2), x)
```

3.46.6 Sympy [N/A]

Not integrable

Time = 2.12 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.95

$$\int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2}\,dx = \int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))**2/(d*x+c)**2,x)
```

output
```
Integral((a + b*cot(e + f*x))**2/(c + d*x)**2, x)
```

3.46.7 Maxima [N/A]

Not integrable

Time = 1.94 (sec) , antiderivative size = 910, normalized size of antiderivative = 45.50

$$\int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2}\,dx = \int \frac{(b\cot(fx+e)+a)^2}{(dx+c)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^2/(d*x+c)^2,x, algorithm="maxima")
```

output
```
-((a^2 - b^2)*d*f*x + 2*b^2*d*sin(2*f*x + 2*e) + (a^2 - b^2)*c*f + ((a^2 -
 b^2)*d*f*x + (a^2 - b^2)*c*f)*cos(2*f*x + 2*e)^2 + ((a^2 - b^2)*d*f*x + (
a^2 - b^2)*c*f)*sin(2*f*x + 2*e)^2 - 2*((a^2 - b^2)*d*f*x + (a^2 - b^2)*c*
f)*cos(2*f*x + 2*e) + (d^3*f*x^2 + 2*c*d^2*f*x + c^2*d*f + (d^3*f*x^2 + 2*
c*d^2*f*x + c^2*d*f)*cos(2*f*x + 2*e)^2 + (d^3*f*x^2 + 2*c*d^2*f*x + c^2*d
*f)*sin(2*f*x + 2*e)^2 - 2*(d^3*f*x^2 + 2*c*d^2*f*x + c^2*d*f)*cos(2*f*x +
 2*e))*integrate(2*(a*b*d*f*x + a*b*c*f - b^2*d)*sin(f*x + e)/(d^3*f*x^3 +
 3*c*d^2*f*x^2 + 3*c^2*d*f*x + c^3*f + (d^3*f*x^3 + 3*c*d^2*f*x^2 + 3*c^2*
d*f*x + c^3*f)*cos(f*x + e)^2 + (d^3*f*x^3 + 3*c*d^2*f*x^2 + 3*c^2*d*f*x +
 c^3*f)*sin(f*x + e)^2 + 2*(d^3*f*x^3 + 3*c*d^2*f*x^2 + 3*c^2*d*f*x + c^3*
f)*cos(f*x + e)), x) - (d^3*f*x^2 + 2*c*d^2*f*x + c^2*d*f + (d^3*f*x^2 + 2
*c*d^2*f*x + c^2*d*f)*cos(2*f*x + 2*e)^2 + (d^3*f*x^2 + 2*c*d^2*f*x + c^2*
d*f)*sin(2*f*x + 2*e)^2 - 2*(d^3*f*x^2 + 2*c*d^2*f*x + c^2*d*f)*cos(2*f*x
+ 2*e))*integrate(2*(a*b*d*f*x + a*b*c*f - b^2*d)*sin(f*x + e)/(d^3*f*x^3
+ 3*c*d^2*f*x^2 + 3*c^2*d*f*x + c^3*f + (d^3*f*x^3 + 3*c*d^2*f*x^2 + 3*c^2
*d*f*x + c^3*f)*cos(f*x + e)^2 + (d^3*f*x^3 + 3*c*d^2*f*x^2 + 3*c^2*d*f*x
+ c^3*f)*sin(f*x + e)^2 - 2*(d^3*f*x^3 + 3*c*d^2*f*x^2 + 3*c^2*d*f*x + c^3
*f)*cos(f*x + e)), x))/(d^3*f*x^2 + 2*c*d^2*f*x + c^2*d*f + (d^3*f*x^2 + 2
*c*d^2*f*x + c^2*d*f)*cos(2*f*x + 2*e)^2 + (d^3*f*x^2 + 2*c*d^2*f*x + c^2*
d*f)*sin(2*f*x + 2*e)^2 - 2*(d^3*f*x^2 + 2*c*d^2*f*x + c^2*d*f)*cos(2*f...
```

3.46.8 Giac [N/A]

Not integrable

Time = 2.87 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^2}{(c+dx)^2}\,dx = \int \frac{(b\cot(fx+e)+a)^2}{(dx+c)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^2/(d*x+c)^2,x, algorithm="giac")
```

output
```
integrate((b*cot(f*x + e) + a)^2/(d*x + c)^2, x)
```

3.46.9 Mupad [N/A]

Not integrable

Time = 12.67 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a + b\cot(e + fx))^2}{(c + dx)^2} \, dx = \int \frac{(a + b\cot(e + f\,x))^2}{(c + d\,x)^2} \, dx$$

input
```
int((a + b*cot(e + f*x))^2/(c + d*x)^2,x)
```

output
```
int((a + b*cot(e + f*x))^2/(c + d*x)^2, x)
```

3.47 $\int (c+dx)^3(a+b\cot(e+fx))^3\,dx$

3.47.1 Optimal result

Integrand size = 20, antiderivative size = 603

$$\int (c+dx)^3(a+b\cot(e+fx))^3\,dx = -\frac{3ib^3d(c+dx)^2}{2f^2}-\frac{3iab^2(c+dx)^3}{f}-\frac{b^3(c+dx)^3}{2f}+\frac{a^3(c+dx)^4}{4d}-\frac{3ia^2b(c+dx)^4}{4d}-\frac{3ab^2(c+dx)^4}{4d}+\frac{ib^3(c+dx)^4}{4d}-\frac{3b^3d(c+dx)^2\cot(e+fx)}{2f^2}-\frac{3ab^2(c+dx)^3\cot(e+fx)}{f}-\frac{b^3(c+dx)^3\cot^2(e+fx)}{2f}+\frac{3b^3d^2(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f^3}+\frac{9ab^2d(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f^2}+\frac{3a^2b(c+dx)^3\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{b^3(c+dx)^3\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{3ib^3d^3\,\text{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^4}-\frac{9iab^2d^2(c+dx)\,\text{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^3}-\frac{9ia^2bd(c+dx)^2\,\text{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2}+\frac{3ib^3d(c+dx)^2\,\text{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2}+\frac{9ab^2d^3\,\text{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^4}+\frac{9a^2bd^2(c+dx)\,\text{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3}-\frac{3b^3d^2(c+dx)\,\text{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3}+\frac{9ia^2bd^3\,\text{PolyLog}\left(4,e^{2i(e+fx)}\right)}{4f^4}-\frac{3ib^3d^3\,\text{PolyLog}\left(4,e^{2i(e+fx)}\right)}{4f^4}$$

output
```
-3/4*I*b^3*d^3*polylog(4,exp(2*I*(f*x+e)))/f^4-3/2*I*b^3*d*(d*x+c)^2/f^2-1
/2*b^3*(d*x+c)^3/f+1/4*a^3*(d*x+c)^4/d-3*I*a*b^2*(d*x+c)^3/f-3/4*a*b^2*(d*
x+c)^4/d-3/2*I*b^3*d^3*polylog(2,exp(2*I*(f*x+e)))/f^4-3/2*b^3*d*(d*x+c)^2
*cot(f*x+e)/f^2-3*a*b^2*(d*x+c)^3*cot(f*x+e)/f-1/2*b^3*(d*x+c)^3*cot(f*x+e
)^2/f+3*b^3*d^2*(d*x+c)*ln(1-exp(2*I*(f*x+e)))/f^3+9*a*b^2*d*(d*x+c)^2*ln(
1-exp(2*I*(f*x+e)))/f^2+3*a^2*b*(d*x+c)^3*ln(1-exp(2*I*(f*x+e)))/f-b^3*(d*
x+c)^3*ln(1-exp(2*I*(f*x+e)))/f-3/4*I*a^2*b*(d*x+c)^4/d+3/2*I*b^3*d*(d*x+c
)^2*polylog(2,exp(2*I*(f*x+e)))/f^2+1/4*I*b^3*(d*x+c)^4/d+9/4*I*a^2*b*d^3*
polylog(4,exp(2*I*(f*x+e)))/f^4+9/2*a*b^2*d^3*polylog(3,exp(2*I*(f*x+e)))/
f^4+9/2*a^2*b*d^2*(d*x+c)*polylog(3,exp(2*I*(f*x+e)))/f^3-3/2*b^3*d^2*(d*x
+c)*polylog(3,exp(2*I*(f*x+e)))/f^3-9/2*I*a^2*b*d*(d*x+c)^2*polylog(2,exp(
2*I*(f*x+e)))/f^2-9*I*a*b^2*d^2*(d*x+c)*polylog(2,exp(2*I*(f*x+e)))/f^3
```

3.47.2 Mathematica [B] (warning: unable to verify)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 3129 vs. 2(603) = 1206.

Time = 8.22 (sec) , antiderivative size = 3129, normalized size of antiderivative = 5.19

$$\int (c+dx)^3(a+b\cot(e+fx))^3\,dx = \text{Result too large to show}$$

input
```
Integrate[(c + d*x)^3*(a + b*Cot[e + f*x])^3,x]
```

output
```
((-(b^3*c^3) - 3*b^3*c^2*d*x - 3*b^3*c*d^2*x^2 - b^3*d^3*x^3)*Csc[e + f*x]
^2)/(2*f) - (3*a*b^2*d^3*E^(I*e)*Csc[e]*((2*f^3*x^3)/E^((2*I)*e) + (3*I)*(
1 - E^((-2*I)*e))*f^2*x^2*Log[1 - E^((-I)*(e + f*x))] + (3*I)*(1 - E^((-2*
I)*e))*f^2*x^2*Log[1 + E^((-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))*f*x*Poly
Log[2, -E^((-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, E^((-I)*
(e + f*x))] + (6*I)*(1 - E^((-2*I)*e))*PolyLog[3, -E^((-I)*(e + f*x))] + (
6*I)*(1 - E^((-2*I)*e))*PolyLog[3, E^((-I)*(e + f*x))]))/(2*f^4) - (3*a^2*
b*c*d^2*E^(I*e)*Csc[e]*((2*f^3*x^3)/E^((2*I)*e) + (3*I)*(1 - E^((-2*I)*e))
*f^2*x^2*Log[1 - E^((-I)*(e + f*x))] + (3*I)*(1 - E^((-2*I)*e))*f^2*x^2*Lo
g[1 + E^((-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, -E^((-I)*(
e + f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, E^((-I)*(e + f*x))] + (6*
I)*(1 - E^((-2*I)*e))*PolyLog[3, -E^((-I)*(e + f*x))] + (6*I)*(1 - E^((-2*
I)*e))*PolyLog[3, E^((-I)*(e + f*x))]))/(2*f^3) + (b^3*c*d^2*E^(I*e)*Csc[e
]*((2*f^3*x^3)/E^((2*I)*e) + (3*I)*(1 - E^((-2*I)*e))*f^2*x^2*Log[1 - E^((
-I)*(e + f*x))] + (3*I)*(1 - E^((-2*I)*e))*f^2*x^2*Log[1 + E^((-I)*(e + f*
x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, -E^((-I)*(e + f*x))] - 6*(1 - E
^((-2*I)*e))*f*x*PolyLog[2, E^((-I)*(e + f*x))] + (6*I)*(1 - E^((-2*I)*e))
*PolyLog[3, -E^((-I)*(e + f*x))] + (6*I)*(1 - E^((-2*I)*e))*PolyLog[3, E^(
(-I)*(e + f*x))]))/(2*f^3) - (3*a^2*b*d^3*E^(I*e)*Csc[e]*((f^4*x^4)/E^((2*
I)*e) + (2*I)*(1 - E^((-2*I)*e))*f^3*x^3*Log[1 - E^((-I)*(e + f*x))] + ...
```

3.47.3 Rubi [A] (verified)

Time = 1.33 (sec) , antiderivative size = 603, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.150$, Rules used = {3042, 4205, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)^3(a+b\cot(e+fx))^3\,dx$$

$$\Big\downarrow \text{3042}$$

$$\int (c+dx)^3\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3dx$$

$$\Big\downarrow \text{4205}$$

$$\int \left(a^3(c+dx)^3+3a^2b(c+dx)^3\cot(e+fx)+3ab^2(c+dx)^3\cot^2(e+fx)+b^3(c+dx)^3\cot^3(e+fx)\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{a^3(c+dx)^4}{4d}+\frac{9a^2bd^2(c+dx)\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3}-\frac{9ia^2bd(c+dx)^2\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2}+\frac{3a^2b(c+dx)^3\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{3ia^2b(c+dx)^4}{4d}+\frac{9ia^2bd^3\operatorname{PolyLog}\left(4,e^{2i(e+fx)}\right)}{4f^4}-\frac{9iab^2d^2(c+dx)\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^3}+\frac{9ab^2d(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f^2}-\frac{3ab^2(c+dx)^3\cot(e+fx)}{f}-\frac{3iab^2(c+dx)^3}{f}-\frac{3ab^2(c+dx)^4}{4d}+\frac{9ab^2d^3\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^4}-\frac{3b^3d^2(c+dx)\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3}+\frac{3b^3d^2(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f^3}+\frac{3ib^3d(c+dx)^2\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2}-\frac{3b^3d(c+dx)^2\cot(e+fx)}{2f^2}-\frac{b^3(c+dx)^3\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{b^3(c+dx)^3\cot^2(e+fx)}{2f}-\frac{3ib^3d(c+dx)^2}{2f^2}-\frac{b^3(c+dx)^3}{2f}+\frac{ib^3(c+dx)^4}{4d}-\frac{3ib^3d^3\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^4}-\frac{3ib^3d^3\operatorname{PolyLog}\left(4,e^{2i(e+fx)}\right)}{4f^4}$$

input
```
Int[(c + d*x)^3*(a + b*Cot[e + f*x])^3,x]
```

output
```
(((-3*I)/2)*b^3*d*(c + d*x)^2)/f^2 - ((3*I)*a*b^2*(c + d*x)^3)/f - (b^3*(c
 + d*x)^3)/(2*f) + (a^3*(c + d*x)^4)/(4*d) - (((3*I)/4)*a^2*b*(c + d*x)^4)
/d - (3*a*b^2*(c + d*x)^4)/(4*d) + ((I/4)*b^3*(c + d*x)^4)/d - (3*b^3*d*(c
 + d*x)^2*Cot[e + f*x])/(2*f^2) - (3*a*b^2*(c + d*x)^3*Cot[e + f*x])/f - (
b^3*(c + d*x)^3*Cot[e + f*x]^2)/(2*f) + (3*b^3*d^2*(c + d*x)*Log[1 - E^((2
*I)*(e + f*x))])/f^3 + (9*a*b^2*d*(c + d*x)^2*Log[1 - E^((2*I)*(e + f*x))]
)/f^2 + (3*a^2*b*(c + d*x)^3*Log[1 - E^((2*I)*(e + f*x))])/f - (b^3*(c + d
*x)^3*Log[1 - E^((2*I)*(e + f*x))])/f - (((3*I)/2)*b^3*d^3*PolyLog[2, E^((
2*I)*(e + f*x))])/f^4 - ((9*I)*a*b^2*d^2*(c + d*x)*PolyLog[2, E^((2*I)*(e
+ f*x))])/f^3 - (((9*I)/2)*a^2*b*d*(c + d*x)^2*PolyLog[2, E^((2*I)*(e + f*
x))])/f^2 + (((3*I)/2)*b^3*d*(c + d*x)^2*PolyLog[2, E^((2*I)*(e + f*x))])/
f^2 + (9*a*b^2*d^3*PolyLog[3, E^((2*I)*(e + f*x))])/(2*f^4) + (9*a^2*b*d^2
*(c + d*x)*PolyLog[3, E^((2*I)*(e + f*x))])/(2*f^3) - (3*b^3*d^2*(c + d*x)
*PolyLog[3, E^((2*I)*(e + f*x))])/(2*f^3) + (((9*I)/4)*a^2*b*d^3*PolyLog[4
, E^((2*I)*(e + f*x))])/f^4 - (((3*I)/4)*b^3*d^3*PolyLog[4, E^((2*I)*(e +
f*x))])/f^4
```

3.47. $\int (c+dx)^3(a+b\cot(e+fx))^3\,dx$

3.47.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4205
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.)
, x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (a + b*Tan[e + f*x])^n, x],
 x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

3.47.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 3160 vs. $2(535) = 1070$.

Time $= 0.94$ (sec) , antiderivative size $= 3161$, normalized size of antiderivative $= 5.24$

method	result	size
risch	Expression too large to display	3161

input
```
int((d*x+c)^3*(a+b*cot(f*x+e))^3,x,method=_RETURNVERBOSE)
```

output
```
-1/f*b^3*c^3*ln(exp(I*(f*x+e))+1)+2/f*b^3*c^3*ln(exp(I*(f*x+e)))-1/f*b^3*c
^3*ln(exp(I*(f*x+e))-1)-3*I*d^2*a^2*b*c*x^3-9/2*I*d*a^2*b*c^2*x^2+18/f^3*b
*d^3*a^2*polylog(3,exp(I*(f*x+e)))*x+18/f^3*b*d^3*a^2*polylog(3,-exp(I*(f*
x+e)))*x-6/f^2*b^3*e*d*c^2*ln(exp(I*(f*x+e)))+3/f^2*b^3*e*d*c^2*ln(exp(I*(
f*x+e))-1)+9/f^2*b^2*a*c^2*d*ln(exp(I*(f*x+e))+1)-18/f^2*b^2*a*c^2*d*ln(ex
p(I*(f*x+e)))+9/f^2*b^2*a*c^2*d*ln(exp(I*(f*x+e))-1)-18/f^4*b^2*e^2*a*d^3*
ln(exp(I*(f*x+e)))+9/f^4*b^2*e^2*a*d^3*ln(exp(I*(f*x+e))-1)-3/f*b^3*c*d^2*
ln(1-exp(I*(f*x+e)))*x^2-3/f*b^3*c*d^2*ln(exp(I*(f*x+e))+1)*x^2+3/f^3*b^3*
c*d^2*ln(1-exp(I*(f*x+e)))*e^2-9/2*I/f^4*b*d^3*a^2*e^4+18*I/f^4*b*d^3*a^2*
polylog(4,exp(I*(f*x+e)))+18*I/f^4*b*d^3*a^2*polylog(4,-exp(I*(f*x+e)))+3*
I/f^2*b^3*d*c^2*e^2+3*I/f^2*b^3*d*c^2*polylog(2,exp(I*(f*x+e)))+3*I/f^2*b^
3*d*c^2*polylog(2,-exp(I*(f*x+e)))+2*I/f^3*b^3*d^3*e^3*x-6*I/f^3*b^3*d^3*e
*x+3*I/f^2*b^3*d^3*polylog(2,-exp(I*(f*x+e)))*x^2+3*I/f^2*b^3*d^3*polylog(
2,exp(I*(f*x+e)))*x^2-4*I/f^3*b^3*c*d^2*e^3-6*I/f*b^2*a*d^3*x^3+12*I/f^4*b
^2*a*d^3*e^3+6/f^4*b*e^3*d^3*a^2*ln(exp(I*(f*x+e)))-3/f^4*b*e^3*d^3*a^2*ln
(exp(I*(f*x+e))-1)+6/f^3*b^3*e^2*c*d^2*ln(exp(I*(f*x+e)))-3/f^3*b^3*e^2*c*
d^2*ln(exp(I*(f*x+e))-1)+3/f^4*b*d^3*a^2*ln(1-exp(I*(f*x+e)))*e^3+3/f*b*d^
3*a^2*ln(1-exp(I*(f*x+e)))*x^3+3/f*b*d^3*a^2*ln(exp(I*(f*x+e))+1)*x^3-3/f*
b^3*d*c^2*ln(1-exp(I*(f*x+e)))*x-3/f^2*b^3*d*c^2*ln(1-exp(I*(f*x+e)))*e-3/
f*b^3*d*c^2*ln(exp(I*(f*x+e))+1)*x+9/f^2*b^2*a*d^3*ln(1-exp(I*(f*x+e)))...
```

3.47.5 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. 2749 vs. $2(521) = 1042$.

Time = 0.37 (sec) , antiderivative size = 2749, normalized size of antiderivative = 4.56

$$\int (c+dx)^3(a+b\cot(e+fx))^3\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^3*(a+b*cot(f*x+e))^3,x, algorithm="fricas")
```

output
```
-1/8*(2*(a^3 - 3*a*b^2)*d^3*f^4*x^4 - 8*b^3*c^3*f^3 - 8*(b^3*d^3*f^3 - (a^
3 - 3*a*b^2)*c*d^2*f^4)*x^3 - 12*(2*b^3*c*d^2*f^3 - (a^3 - 3*a*b^2)*c^2*d*
f^4)*x^2 - 8*(3*b^3*c^2*d*f^3 - (a^3 - 3*a*b^2)*c^3*f^4)*x - 2*((a^3 - 3*a
*b^2)*d^3*f^4*x^4 + 4*(a^3 - 3*a*b^2)*c*d^2*f^4*x^3 + 6*(a^3 - 3*a*b^2)*c^
2*d*f^4*x^2 + 4*(a^3 - 3*a*b^2)*c^3*f^4*x)*cos(2*f*x + 2*e) + 6*(-I*(3*a^2
*b - b^3)*d^3*f^2*x^2 - 6*I*a*b^2*c*d^2*f - I*b^3*d^3 - I*(3*a^2*b - b^3)*
c^2*d*f^2 - 2*I*(3*a*b^2*d^3*f + (3*a^2*b - b^3)*c*d^2*f^2)*x + (I*(3*a^2*
b - b^3)*d^3*f^2*x^2 + 6*I*a*b^2*c*d^2*f + I*b^3*d^3 + I*(3*a^2*b - b^3)*c
^2*d*f^2 + 2*I*(3*a*b^2*d^3*f + (3*a^2*b - b^3)*c*d^2*f^2)*x)*cos(2*f*x +
2*e))*dilog(cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e)) + 6*(I*(3*a^2*b - b^3)*
d^3*f^2*x^2 + 6*I*a*b^2*c*d^2*f + I*b^3*d^3 + I*(3*a^2*b - b^3)*c^2*d*f^2
+ 2*I*(3*a*b^2*d^3*f + (3*a^2*b - b^3)*c*d^2*f^2)*x + (-I*(3*a^2*b - b^3)*
d^3*f^2*x^2 - 6*I*a*b^2*c*d^2*f - I*b^3*d^3 - I*(3*a^2*b - b^3)*c^2*d*f^2
- 2*I*(3*a*b^2*d^3*f + (3*a^2*b - b^3)*c*d^2*f^2)*x)*cos(2*f*x + 2*e))*dil
og(cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e)) + 4*(9*a*b^2*d^3*e^2 - 3*b^3*d^3
*e - (3*a^2*b - b^3)*d^3*e^3 + (3*a^2*b - b^3)*c^3*f^3 + 3*(3*a*b^2*c^2*d
- (3*a^2*b - b^3)*c^2*d*e)*f^2 - 3*(6*a*b^2*c*d^2*e - b^3*c*d^2 - (3*a^2*b
 - b^3)*c*d^2*e^2)*f - (9*a*b^2*d^3*e^2 - 3*b^3*d^3*e - (3*a^2*b - b^3)*d^
3*e^3 + (3*a^2*b - b^3)*c^3*f^3 + 3*(3*a*b^2*c^2*d - (3*a^2*b - b^3)*c^2*d
*e)*f^2 - 3*(6*a*b^2*c*d^2*e - b^3*c*d^2 - (3*a^2*b - b^3)*c*d^2*e^2)*f...
```

3.47.6 Sympy [F]

$$\int (c+dx)^3(a+b\cot(e+fx))^3\,dx = \int (a+b\cot(e+fx))^3\,(c+dx)^3\,dx$$

input
```
integrate((d*x+c)**3*(a+b*cot(f*x+e))**3,x)
```

output
```
Integral((a + b*cot(e + f*x))**3*(c + d*x)**3, x)
```

3.47.7 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. 11252 vs. 2(521) = 1042.

Time = 15.55 (sec) , antiderivative size = 11252, normalized size of antiderivative = 18.66

$$\int (c+dx)^3(a+b\cot(e+fx))^3\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^3*(a+b*cot(f*x+e))^3,x, algorithm="maxima")
```

output
```
1/4*(4*(f*x + e)*a^3*c^3 + (f*x + e)^4*a^3*d^3/f^3 - 4*(f*x + e)^3*a^3*d^3
*e/f^3 + 6*(f*x + e)^2*a^3*d^3*e^2/f^3 - 4*(f*x + e)*a^3*d^3*e^3/f^3 + 4*(
f*x + e)^3*a^3*c*d^2/f^2 - 12*(f*x + e)^2*a^3*c*d^2*e/f^2 + 12*(f*x + e)*a
^3*c*d^2*e^2/f^2 + 6*(f*x + e)^2*a^3*c^2*d/f - 12*(f*x + e)*a^3*c^2*d*e/f
+ 12*a^2*b*c^3*log(sin(f*x + e)) - 12*a^2*b*d^3*e^3*log(sin(f*x + e))/f^3
+ 36*a^2*b*c*d^2*e^2*log(sin(f*x + e))/f^2 - 36*a^2*b*c^2*d*e*log(sin(f*x
+ e))/f - 4*(24*a*b^2*d^3*e^3 - 24*a*b^2*c^3*f^3 + (3*a^2*b - 3*I*a*b^2 -
b^3)*(f*x + e)^4*d^3 - 12*b^3*d^3*e^2 - 4*((3*a^2*b - 3*I*a*b^2 - b^3)*d^3
*e - (3*a^2*b - 3*I*a*b^2 - b^3)*c*d^2*f)*(f*x + e)^3 + 6*((3*a^2*b - 3*I*
a*b^2 - b^3)*d^3*e^2 - 2*(3*a^2*b - 3*I*a*b^2 - b^3)*c*d^2*e*f + (3*a^2*b
- 3*I*a*b^2 - b^3)*c^2*d*f^2)*(f*x + e)^2 + 12*(6*a*b^2*c^2*d*e - b^3*c^2*
d)*f^2 - 4*((-3*I*a*b^2 - b^3)*d^3*e^3 + 3*(3*I*a*b^2 + b^3)*c*d^2*e^2*f +
 3*(-3*I*a*b^2 - b^3)*c^2*d*e*f^2 + (3*I*a*b^2 + b^3)*c^3*f^3)*(f*x + e) -
 24*(3*a*b^2*c*d^2*e^2 - b^3*c*d^2*e)*f - 4*(b^3*d^3*e^3 - b^3*c^3*f^3 + 9
*a*b^2*d^3*e^2 + (3*a^2*b - b^3)*(f*x + e)^3*d^3 - 3*b^3*d^3*e + 3*(3*a*b^
2*d^3 - (3*a^2*b - b^3)*d^3*e + (3*a^2*b - b^3)*c*d^2*f)*(f*x + e)^2 + 3*(
b^3*c^2*d*e + 3*a*b^2*c^2*d)*f^2 - 3*(6*a*b^2*d^3*e - b^3*d^3 - (3*a^2*b -
 b^3)*d^3*e^2 - (3*a^2*b - b^3)*c^2*d*f^2 - 2*(3*a*b^2*c*d^2 - (3*a^2*b -
b^3)*c*d^2*e)*f)*(f*x + e) - 3*(b^3*c*d^2*e^2 + 6*a*b^2*c*d^2*e - b^3*c*d^
2)*f + (b^3*d^3*e^3 - b^3*c^3*f^3 + 9*a*b^2*d^3*e^2 + (3*a^2*b - b^3)*(...
```

3.47.8 Giac [F]

$$\int (c+dx)^3(a+b\cot(e+fx))^3\,dx = \int (dx+c)^3(b\cot(fx+e)+a)^3\,dx$$

input
```
integrate((d*x+c)^3*(a+b*cot(f*x+e))^3,x, algorithm="giac")
```

output
```
integrate((d*x + c)^3*(b*cot(f*x + e) + a)^3, x)
```

3.47.9 Mupad [F(-1)]

Timed out.

$$\int (c+dx)^3(a+b\cot(e+fx))^3\,dx = \int (a+b\cot(e+f\,x))^3\,(c+d\,x)^3\,dx$$

input
```
int((a + b*cot(e + f*x))^3*(c + d*x)^3,x)
```

output
```
int((a + b*cot(e + f*x))^3*(c + d*x)^3, x)
```

3.48 $\int (c+dx)^2(a+b\cot(e+fx))^3\,dx$

3.48.1 Optimal result

Integrand size = 20, antiderivative size = 433

$$\int (c+dx)^2(a+b\cot(e+fx))^3\,dx = -\frac{b^3cdx}{f}-\frac{b^3d^2x^2}{2f}-\frac{3iab^2(c+dx)^2}{f}+\frac{a^3(c+dx)^3}{3d} -\frac{ia^2b(c+dx)^3}{d}-\frac{ab^2(c+dx)^3}{d}+\frac{ib^3(c+dx)^3}{3d} -\frac{b^3d(c+dx)\cot(e+fx)}{f^2}-\frac{3ab^2(c+dx)^2\cot(e+fx)}{f} -\frac{b^3(c+dx)^2\cot^2(e+fx)}{2f} +\frac{6ab^2d(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f^2} +\frac{3a^2b(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f} -\frac{b^3(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f} +\frac{b^3d^2\log(\sin(e+fx))}{f^3} -\frac{3iab^2d^2\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^3} -\frac{3ia^2bd(c+dx)\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2} +\frac{ib^3d(c+dx)\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2} +\frac{3a^2bd^2\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3} -\frac{b^3d^2\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3}$$

output
```
-b^3*c*d*x/f-1/2*b^3*d^2*x^2/f-3*I*a^2*b*d*(d*x+c)*polylog(2,exp(2*I*(f*x+
e)))/f^2+1/3*a^3*(d*x+c)^3/d-I*a^2*b*(d*x+c)^3/d-a*b^2*(d*x+c)^3/d-3*I*a*b
^2*d^2*polylog(2,exp(2*I*(f*x+e)))/f^3-b^3*d*(d*x+c)*cot(f*x+e)/f^2-3*a*b^
2*(d*x+c)^2*cot(f*x+e)/f-1/2*b^3*(d*x+c)^2*cot(f*x+e)^2/f+6*a*b^2*d*(d*x+c
)*ln(1-exp(2*I*(f*x+e)))/f^2+3*a^2*b*(d*x+c)^2*ln(1-exp(2*I*(f*x+e)))/f-b^
3*(d*x+c)^2*ln(1-exp(2*I*(f*x+e)))/f+b^3*d^2*ln(sin(f*x+e))/f^3-3*I*a*b^2*
(d*x+c)^2/f+1/3*I*b^3*(d*x+c)^3/d+I*b^3*d*(d*x+c)*polylog(2,exp(2*I*(f*x+e
)))/f^2+3/2*a^2*b*d^2*polylog(3,exp(2*I*(f*x+e)))/f^3-1/2*b^3*d^2*polylog(
3,exp(2*I*(f*x+e)))/f^3
```

3.48.2 Mathematica [B] (warning: unable to verify)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 2029 vs. 2(433) = 866.

Time = 7.66 (sec) , antiderivative size = 2029, normalized size of antiderivative = 4.69

$$\int (c+dx)^2(a+b\cot(e+fx))^3\,dx = \text{Result too large to show}$$

input
```
Integrate[(c + d*x)^2*(a + b*Cot[e + f*x])^3,x]
```

output
```
-1/2*(a^2*b*d^2*E^(I*e)*Csc[e]*((2*f^3*x^3)/E^((2*I)*e) + (3*I)*(1 - E^((-
2*I)*e))*f^2*x^2*Log[1 - E^((-I)*(e + f*x))] + (3*I)*(1 - E^((-2*I)*e))*f^
2*x^2*Log[1 + E^((-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, -E
^((-I)*(e + f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, E^((-I)*(e + f*x)
)] + (6*I)*(1 - E^((-2*I)*e))*PolyLog[3, -E^((-I)*(e + f*x))] + (6*I)*(1 -
 E^((-2*I)*e))*PolyLog[3, E^((-I)*(e + f*x))]))/f^3 + (b^3*d^2*E^(I*e)*Csc
[e]*((2*f^3*x^3)/E^((2*I)*e) + (3*I)*(1 - E^((-2*I)*e))*f^2*x^2*Log[1 - E^
((-I)*(e + f*x))] + (3*I)*(1 - E^((-2*I)*e))*f^2*x^2*Log[1 + E^((-I)*(e +
f*x))] - 6*(1 - E^((-2*I)*e))*f*x*PolyLog[2, -E^((-I)*(e + f*x))] - 6*(1 -
 E^((-2*I)*e))*f*x*PolyLog[2, E^((-I)*(e + f*x))] + (6*I)*(1 - E^((-2*I)*e
))*PolyLog[3, -E^((-I)*(e + f*x))] + (6*I)*(1 - E^((-2*I)*e))*PolyLog[3, E
^((-I)*(e + f*x))]))/(6*f^3) + (b^3*d^2*Csc[e]*(-(f*x*Cos[e]) + Log[Cos[f*
x]*Sin[e] + Cos[e]*Sin[f*x]]*Sin[e]))/(f^3*(Cos[e]^2 + Sin[e]^2)) + (6*a*b
^2*c*d*Csc[e]*(-(f*x*Cos[e]) + Log[Cos[f*x]*Sin[e] + Cos[e]*Sin[f*x]]*Sin[
e]))/(f^2*(Cos[e]^2 + Sin[e]^2)) + (3*a^2*b*c^2*Csc[e]*(-(f*x*Cos[e]) + Lo
g[Cos[f*x]*Sin[e] + Cos[e]*Sin[f*x]]*Sin[e]))/(f*(Cos[e]^2 + Sin[e]^2)) -
(b^3*c^2*Csc[e]*(-(f*x*Cos[e]) + Log[Cos[f*x]*Sin[e] + Cos[e]*Sin[f*x]]*Si
n[e]))/(f*(Cos[e]^2 + Sin[e]^2)) + (Csc[e]*Csc[e + f*x]^2*(6*b^3*c*d*Cos[e
] + 18*a*b^2*c^2*f*Cos[e] + 6*b^3*d^2*x*Cos[e] + 36*a*b^2*c*d*f*x*Cos[e] +
 18*a^2*b*c^2*f^2*x*Cos[e] - 6*b^3*c^2*f^2*x*Cos[e] + 18*a*b^2*d^2*f*x^...
```

3.48.3 Rubi [A] (verified)

Time = 0.95 (sec) , antiderivative size = 423, normalized size of antiderivative = 0.98, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.150$, Rules used = {3042, 4205, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)^2(a+b\cot(e+fx))^3\,dx$$

$\Big\downarrow$ 3042

$$\int (c+dx)^2\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3dx$$

$\Big\downarrow$ 4205

$$\int \left(a^3(c+dx)^2+3a^2b(c+dx)^2\cot(e+fx)+3ab^2(c+dx)^2\cot^2(e+fx)+b^3(c+dx)^2\cot^3(e+fx)\right)dx$$

$\Big\downarrow$ 2009

$$\frac{a^3(c+dx)^3}{3d}-\frac{3ia^2bd(c+dx)\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2}+\frac{3a^2b(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{ia^2b(c+dx)^3}{d}+\frac{3a^2bd^2\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3}+\frac{6ab^2d(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f^2}-\frac{3ab^2(c+dx)^2\cot(e+fx)}{f}-\frac{3iab^2(c+dx)^2}{f}-\frac{ab^2(c+dx)^3}{d}-\frac{3iab^2d^2\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^3}+\frac{ib^3d(c+dx)\operatorname{PolyLog}\left(2,e^{2i(e+fx)}\right)}{f^2}-\frac{b^3d(c+dx)\cot(e+fx)}{f^2}-\frac{b^3(c+dx)^2\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{b^3(c+dx)^2\cot^2(e+fx)}{2f}-\frac{b^3(c+dx)^2}{2f}+\frac{ib^3(c+dx)^3}{3d}-\frac{b^3d^2\operatorname{PolyLog}\left(3,e^{2i(e+fx)}\right)}{2f^3}+\frac{b^3d^2\log(\sin(e+fx))}{f^3}$$

input
```
Int[(c + d*x)^2*(a + b*Cot[e + f*x])^3,x]
```

output
```
((-3*I)*a*b^2*(c + d*x)^2)/f - (b^3*(c + d*x)^2)/(2*f) + (a^3*(c + d*x)^3)
/(3*d) - (I*a^2*b*(c + d*x)^3)/d - (a*b^2*(c + d*x)^3)/d + ((I/3)*b^3*(c +
 d*x)^3)/d - (b^3*d*(c + d*x)*Cot[e + f*x])/f^2 - (3*a*b^2*(c + d*x)^2*Cot
[e + f*x])/f - (b^3*(c + d*x)^2*Cot[e + f*x]^2)/(2*f) + (6*a*b^2*d*(c + d*
x)*Log[1 - E^((2*I)*(e + f*x))])/f^2 + (3*a^2*b*(c + d*x)^2*Log[1 - E^((2*
I)*(e + f*x))])/f - (b^3*(c + d*x)^2*Log[1 - E^((2*I)*(e + f*x))])/f + (b^
3*d^2*Log[Sin[e + f*x]])/f^3 - ((3*I)*a*b^2*d^2*PolyLog[2, E^((2*I)*(e + f
*x))])/f^3 - ((3*I)*a^2*b*d*(c + d*x)*PolyLog[2, E^((2*I)*(e + f*x))])/f^2
 + (I*b^3*d*(c + d*x)*PolyLog[2, E^((2*I)*(e + f*x))])/f^2 + (3*a^2*b*d^2*
PolyLog[3, E^((2*I)*(e + f*x))])/(2*f^3) - (b^3*d^2*PolyLog[3, E^((2*I)*(e
 + f*x))])/(2*f^3)
```

3.48. $\int (c+dx)^2(a+b\cot(e+fx))^3\,dx$

3.48.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4205
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.)
, x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (a + b*Tan[e + f*x])^n, x],
 x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

3.48.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 1787 vs. $2(399) = 798$.

Time = 0.93 (sec) , antiderivative size = 1788, normalized size of antiderivative = 4.13

method	result	size
risch	Expression too large to display	1788

input
```
int((d*x+c)^2*(a+b*cot(f*x+e))^3,x,method=_RETURNVERBOSE)
```

output
```
-2/f*b^3*c*d*ln(1-exp(I*(f*x+e)))*x-6/f^3*b*e^2*a^2*d^2*ln(exp(I*(f*x+e)))
+3/f^3*b*e^2*a^2*d^2*ln(exp(I*(f*x+e))-1)-4/f^2*b^3*e*d*c*ln(exp(I*(f*x+e)
))+2*b^2*(-3*I*a*d^2*f*x^2*exp(2*I*(f*x+e))-6*I*a*c*d*f*x*exp(2*I*(f*x+e))
+b*d^2*f*x^2*exp(2*I*(f*x+e))-3*I*a*c^2*f*exp(2*I*(f*x+e))+3*I*a*d^2*f*x^2
-I*b*d^2*x*exp(2*I*(f*x+e))+2*b*c*d*f*x*exp(2*I*(f*x+e))+6*I*a*c*d*f*x-I*b
*c*d*exp(2*I*(f*x+e))+b*c^2*f*exp(2*I*(f*x+e))+3*I*a*c^2*f+I*b*d^2*x+I*b*c
*d)/f^2/(exp(2*I*(f*x+e))-1)^2+2/f^3*b^3*e^2*d^2*ln(exp(I*(f*x+e)))-1/f^3*
b^3*e^2*d^2*ln(exp(I*(f*x+e))-1)+1/f^3*b^3*d^2*ln(1-exp(I*(f*x+e)))*e^2+I*
b^3*c*d*x^2-4/3*I/f^3*b^3*d^2*e^3-I*d^2*a^2*b*x^3-1/f*b^3*d^2*ln(1-exp(I*(
f*x+e)))*x^2-1/f*b^3*d^2*ln(exp(I*(f*x+e))+1)*x^2+6/f^3*b*a^2*d^2*polylog(
3,exp(I*(f*x+e)))+6/f^3*b*a^2*d^2*polylog(3,-exp(I*(f*x+e)))+3/f*b*a^2*c^2
*ln(exp(I*(f*x+e))+1)-6/f*b*a^2*c^2*ln(exp(I*(f*x+e)))+3/f*b*a^2*c^2*ln(ex
p(I*(f*x+e))-1)+2/f^2*b^3*e*d*c*ln(exp(I*(f*x+e))-1)-6*I/f^3*b^2*a*d^2*e^2
-6*I/f^3*b^2*a*d^2*polylog(2,exp(I*(f*x+e)))-2*I/f^2*b^3*d^2*e^2*x+2*I/f^2
*b^3*d^2*polylog(2,exp(I*(f*x+e)))*x+2*I/f^2*b^3*d^2*polylog(2,-exp(I*(f*x
+e)))*x+2*I/f^2*b^3*c*d*polylog(2,exp(I*(f*x+e)))+2*I/f^2*b^3*c*d*polylog(
2,-exp(I*(f*x+e)))-6*I/f^3*b^2*a*d^2*polylog(2,-exp(I*(f*x+e)))+4*I/f^3*b*
a^2*d^2*e^3+2*I/f^2*b^3*c*d*e^2-6*I/f*b^2*a*d^2*x^2+d*a^3*c*x^2+a^3*c^2*x-
d^2*a*b^2*x^3-I*b^3*c^2*x-3*a*b^2*c^2*x-1/d*a*b^2*c^3-1/3*I/d*b^3*c^3+1/3*
I*b^3*d^2*x^3+3*I*a^2*b*c^2*x-12*I/f*b*a^2*c*d*e*x-3*d*a*b^2*c*x^2+I/d*...
```

3.48.5 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. 1564 vs. 2(390) = 780.

Time = 0.31 (sec) , antiderivative size = 1564, normalized size of antiderivative = 3.61

$$\int (c+dx)^2(a+b\cot(e+fx))^3\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^2*(a+b*cot(f*x+e))^3,x, algorithm="fricas")
```

output
```
-1/12*(4*(a^3 - 3*a*b^2)*d^2*f^3*x^3 - 12*b^3*c^2*f^2 - 12*(b^3*d^2*f^2 -
(a^3 - 3*a*b^2)*c*d*f^3)*x^2 - 12*(2*b^3*c*d*f^2 - (a^3 - 3*a*b^2)*c^2*f^3
)*x - 4*((a^3 - 3*a*b^2)*d^2*f^3*x^3 + 3*(a^3 - 3*a*b^2)*c*d*f^3*x^2 + 3*(
a^3 - 3*a*b^2)*c^2*f^3*x)*cos(2*f*x + 2*e) + 6*(-3*I*a*b^2*d^2 - I*(3*a^2*
b - b^3)*d^2*f*x - I*(3*a^2*b - b^3)*c*d*f + (3*I*a*b^2*d^2 + I*(3*a^2*b -
 b^3)*d^2*f*x + I*(3*a^2*b - b^3)*c*d*f)*cos(2*f*x + 2*e))*dilog(cos(2*f*x
 + 2*e) + I*sin(2*f*x + 2*e)) + 6*(3*I*a*b^2*d^2 + I*(3*a^2*b - b^3)*d^2*f
*x + I*(3*a^2*b - b^3)*c*d*f + (-3*I*a*b^2*d^2 - I*(3*a^2*b - b^3)*d^2*f*x
 - I*(3*a^2*b - b^3)*c*d*f)*cos(2*f*x + 2*e))*dilog(cos(2*f*x + 2*e) - I*s
in(2*f*x + 2*e)) - 6*(6*a*b^2*d^2*e - b^3*d^2 - (3*a^2*b - b^3)*d^2*e^2 -
(3*a^2*b - b^3)*c^2*f^2 - 2*(3*a*b^2*c*d - (3*a^2*b - b^3)*c*d*e)*f - (6*a
*b^2*d^2*e - b^3*d^2 - (3*a^2*b - b^3)*d^2*e^2 - (3*a^2*b - b^3)*c^2*f^2 -
 2*(3*a*b^2*c*d - (3*a^2*b - b^3)*c*d*e)*f)*cos(2*f*x + 2*e))*log(-1/2*cos
(2*f*x + 2*e) + 1/2*I*sin(2*f*x + 2*e) + 1/2) - 6*(6*a*b^2*d^2*e - b^3*d^2
 - (3*a^2*b - b^3)*d^2*e^2 - (3*a^2*b - b^3)*c^2*f^2 - 2*(3*a*b^2*c*d - (3
*a^2*b - b^3)*c*d*e)*f - (6*a*b^2*d^2*e - b^3*d^2 - (3*a^2*b - b^3)*d^2*e^
2 - (3*a^2*b - b^3)*c^2*f^2 - 2*(3*a*b^2*c*d - (3*a^2*b - b^3)*c*d*e)*f)*c
os(2*f*x + 2*e))*log(-1/2*cos(2*f*x + 2*e) - 1/2*I*sin(2*f*x + 2*e) + 1/2)
 + 6*((3*a^2*b - b^3)*d^2*f^2*x^2 + 6*a*b^2*d^2*e - (3*a^2*b - b^3)*d^2*e^
2 + 2*(3*a^2*b - b^3)*c*d*e*f + 2*(3*a*b^2*d^2*f + (3*a^2*b - b^3)*c*d*...
```

3.48.6 Sympy [F]

$$\int (c+dx)^2(a+b\cot(e+fx))^3\,dx=\int\left(a+b\cot\left(e+fx\right)\right)^3\left(c+dx\right)^2\,dx$$

input
```
integrate((d*x+c)**2*(a+b*cot(f*x+e))**3,x)
```

output
```
Integral((a + b*cot(e + f*x))**3*(c + d*x)**2, x)
```

3.48.7 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. 5429 vs. $2(390) = 780$.

Time = 2.64 (sec) , antiderivative size = 5429, normalized size of antiderivative = 12.54

$$\int (c+dx)^2(a+b\cot(e+fx))^3\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^2*(a+b*cot(f*x+e))^3,x, algorithm="maxima")
```

output
```
1/3*(3*(f*x + e)*a^3*c^2 + (f*x + e)^3*a^3*d^2/f^2 - 3*(f*x + e)^2*a^3*d^2
*e/f^2 + 3*(f*x + e)*a^3*d^2*e^2/f^2 + 3*(f*x + e)^2*a^3*c*d/f - 6*(f*x +
e)*a^3*c*d*e/f + 9*a^2*b*c^2*log(sin(f*x + e)) + 9*a^2*b*d^2*e^2*log(sin(f
*x + e))/f^2 - 18*a^2*b*c*d*e*log(sin(f*x + e))/f + 3*(36*a*b^2*d^2*e^2 +
36*a*b^2*c^2*f^2 - 2*(3*a^2*b - 3*I*a*b^2 - b^3)*(f*x + e)^3*d^2 - 12*b^3*
d^2*e + 6*((3*a^2*b - 3*I*a*b^2 - b^3)*d^2*e - (3*a^2*b - 3*I*a*b^2 - b^3)
*c*d*f)*(f*x + e)^2 + 6*((3*I*a*b^2 + b^3)*d^2*e^2 + 2*(-3*I*a*b^2 - b^3)*
c*d*e*f + (3*I*a*b^2 + b^3)*c^2*f^2)*(f*x + e) - 12*(6*a*b^2*c*d*e - b^3*c
*d)*f - 6*(b^3*d^2*e^2 + b^3*c^2*f^2 + 6*a*b^2*d^2*e - (3*a^2*b - b^3)*(f*
x + e)^2*d^2 - b^3*d^2 - 2*(3*a*b^2*d^2 - (3*a^2*b - b^3)*d^2*e + (3*a^2*b
 - b^3)*c*d*f)*(f*x + e) - 2*(b^3*c*d*e + 3*a*b^2*c*d)*f + (b^3*d^2*e^2 +
b^3*c^2*f^2 + 6*a*b^2*d^2*e - (3*a^2*b - b^3)*(f*x + e)^2*d^2 - b^3*d^2 -
2*(3*a*b^2*d^2 - (3*a^2*b - b^3)*d^2*e + (3*a^2*b - b^3)*c*d*f)*(f*x + e)
- 2*(b^3*c*d*e + 3*a*b^2*c*d)*f)*cos(4*f*x + 4*e) - 2*(b^3*d^2*e^2 + b^3*c
^2*f^2 + 6*a*b^2*d^2*e - (3*a^2*b - b^3)*(f*x + e)^2*d^2 - b^3*d^2 - 2*(3*
a*b^2*d^2 - (3*a^2*b - b^3)*d^2*e + (3*a^2*b - b^3)*c*d*f)*(f*x + e) - 2*(
b^3*c*d*e + 3*a*b^2*c*d)*f)*cos(2*f*x + 2*e) - (-I*b^3*d^2*e^2 - I*b^3*c^2
*f^2 - 6*I*a*b^2*d^2*e + (3*I*a^2*b - I*b^3)*(f*x + e)^2*d^2 + I*b^3*d^2 +
 2*(3*I*a*b^2*d^2 + (-3*I*a^2*b + I*b^3)*d^2*e + (3*I*a^2*b - I*b^3)*c*d*f
)*(f*x + e) + 2*(I*b^3*c*d*e + 3*I*a*b^2*c*d)*f)*sin(4*f*x + 4*e) - 2*(...
```

3.48.8 Giac [F]

$$\int (c+dx)^2(a+b\cot(e+fx))^3\,dx = \int (dx+c)^2(b\cot(fx+e)+a)^3\,dx$$

input
```
integrate((d*x+c)^2*(a+b*cot(f*x+e))^3,x, algorithm="giac")
```

output
```
integrate((d*x + c)^2*(b*cot(f*x + e) + a)^3, x)
```

3.48.9 Mupad [F(-1)]

Timed out.

$$\int (c+dx)^2(a+b\cot(e+fx))^3\,dx = \int (a+b\cot(e+f\,x))^3\,(c+d\,x)^2\,dx$$

input
```
int((a + b*cot(e + f*x))^3*(c + d*x)^2,x)
```

output
```
int((a + b*cot(e + f*x))^3*(c + d*x)^2, x)
```

3.49 $\int (c+dx)(a+b\cot(e+fx))^3\,dx$

3.49.1 Optimal result

Integrand size = 18, antiderivative size = 278

$$\begin{aligned}\int (c+dx)(a+b\cot(e+fx))^3\,dx = {} & -3ab^2cx-\frac{b^3dx}{2f}-\frac{3}{2}ab^2dx^2+\frac{a^3(c+dx)^2}{2d} \\ & -\frac{3ia^2b(c+dx)^2}{2d}+\frac{ib^3(c+dx)^2}{2d}-\frac{b^3d\cot(e+fx)}{2f^2} \\ & -\frac{3ab^2(c+dx)\cot(e+fx)}{f}-\frac{b^3(c+dx)\cot^2(e+fx)}{2f} \\ & +\frac{3a^2b(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f} \\ & -\frac{b^3(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f} \\ & +\frac{3ab^2d\log(\sin(e+fx))}{f^2}-\frac{3ia^2bd\,\mathrm{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2} \\ & +\frac{ib^3d\,\mathrm{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2}\end{aligned}$$

output
```
-3*a*b^2*c*x-1/2*b^3*d*x/f-3/2*a*b^2*d*x^2+1/2*a^3*(d*x+c)^2/d-3/2*I*a^2*b
*(d*x+c)^2/d+1/2*I*b^3*(d*x+c)^2/d-1/2*b^3*d*cot(f*x+e)/f^2-3*a*b^2*(d*x+c
)*cot(f*x+e)/f-1/2*b^3*(d*x+c)*cot(f*x+e)^2/f+3*a^2*b*(d*x+c)*ln(1-exp(2*I
*(f*x+e)))/f-b^3*(d*x+c)*ln(1-exp(2*I*(f*x+e)))/f+3*a*b^2*d*ln(sin(f*x+e))
/f^2-3/2*I*a^2*b*d*polylog(2,exp(2*I*(f*x+e)))/f^2+1/2*I*b^3*d*polylog(2,e
xp(2*I*(f*x+e)))/f^2
```

3.49.2 Mathematica [A] (verified)

Time = 12.40 (sec) , antiderivative size = 433, normalized size of antiderivative = 1.56

$$\int (c+dx)(a+b\cot(e+fx))^3\,dx$$
$$= \frac{(a+b\cot(e+fx))^3\sin(e+fx)\left((-a^3de^2-3ia^2bde^2+3ab^2de^2+ib^3de^2+2a^3cef-6ab^2cef-6ia^2bdef\right.}{}$$

input
```
Integrate[(c + d*x)*(a + b*Cot[e + f*x])^3,x]
```

output
```
((a + b*Cot[e + f*x])^3*Sin[e + f*x]*((-(a^3*d*e^2) - (3*I)*a^2*b*d*e^2 +
3*a*b^2*d*e^2 + I*b^3*d*e^2 + 2*a^3*c*e*f - 6*a*b^2*c*e*f - (6*I)*a^2*b*d*
e*f*x + (2*I)*b^3*d*e*f*x + 2*a^3*c*f^2*x - 6*a*b^2*c*f^2*x + a^3*d*f^2*x^
2 - (3*I)*a^2*b*d*f^2*x^2 - 3*a*b^2*d*f^2*x^2 + I*b^3*d*f^2*x^2 - 2*b*(-3*
a^2 + b^2)*d*(e + f*x)*Log[1 - E^((2*I)*(e + f*x))] + 2*b*(3*a*b*d + b^2*(
d*e - c*f) + a^2*(-3*d*e + 3*c*f))*Log[Cos[e + f*x]] + 6*a*b^2*d*Log[Tan[e
 + f*x]] - 6*a^2*b*d*e*Log[Tan[e + f*x]] + 2*b^3*d*e*Log[Tan[e + f*x]] + 6
*a^2*b*c*f*Log[Tan[e + f*x]] - 2*b^3*c*f*Log[Tan[e + f*x]])*Sin[e + f*x]^2
 + I*b*(-3*a^2 + b^2)*d*PolyLog[2, E^((2*I)*(e + f*x))]*Sin[e + f*x]^2 - (
b^2*(2*b*f*(c + d*x) + (b*d + 6*a*f*(c + d*x))*Sin[2*(e + f*x)]))/2))/(2*f
^2*(b*Cos[e + f*x] + a*Sin[e + f*x])^3)
```

3.49.3 Rubi [A] (verified)

Time = 0.59 (sec) , antiderivative size = 276, normalized size of antiderivative = 0.99, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {3042, 4205, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int (c+dx)(a+b\cot(e+fx))^3\,dx$$
$$\Big\downarrow \; 3042$$
$$\int (c+dx)\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3dx$$
$$\Big\downarrow \; 4205$$

$$\int \left(a^3(c+dx)+3a^2b(c+dx)\cot(e+fx)+3ab^2(c+dx)\cot^2(e+fx)+b^3(c+dx)\cot^3(e+fx)\right)dx$$

$$\Big\downarrow \text{ 2009}$$

$$\frac{a^3(c+dx)^2}{2d}+\frac{3a^2b(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{3ia^2b(c+dx)^2}{2d}-\frac{3ia^2bd\,\text{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2}-\frac{3ab^2(c+dx)\cot(e+fx)}{f}-\frac{3ab^2(c+dx)^2}{2d}+\frac{3ab^2d\log(\sin(e+fx))}{f^2}-\frac{b^3(c+dx)\log\left(1-e^{2i(e+fx)}\right)}{f}-\frac{b^3(c+dx)\cot^2(e+fx)}{2f}+\frac{ib^3(c+dx)^2}{2d}+\frac{ib^3d\,\text{PolyLog}\left(2,e^{2i(e+fx)}\right)}{2f^2}-\frac{b^3d\cot(e+fx)}{2f^2}-\frac{b^3dx}{2f}$$

input
```
Int[(c + d*x)*(a + b*Cot[e + f*x])^3,x]
```

output
```
-1/2*(b^3*d*x)/f + (a^3*(c + d*x)^2)/(2*d) - (((3*I)/2)*a^2*b*(c + d*x)^2)
/d - (3*a*b^2*(c + d*x)^2)/(2*d) + ((I/2)*b^3*(c + d*x)^2)/d - (b^3*d*Cot[
e + f*x])/(2*f^2) - (3*a*b^2*(c + d*x)*Cot[e + f*x])/f - (b^3*(c + d*x)*Co
t[e + f*x]^2)/(2*f) + (3*a^2*b*(c + d*x)*Log[1 - E^((2*I)*(e + f*x))])/f -
 (b^3*(c + d*x)*Log[1 - E^((2*I)*(e + f*x))])/f + (3*a*b^2*d*Log[Sin[e + f
*x]])/f^2 - (((3*I)/2)*a^2*b*d*PolyLog[2, E^((2*I)*(e + f*x))])/f^2 + ((I/
2)*b^3*d*PolyLog[2, E^((2*I)*(e + f*x))])/f^2
```

3.49.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4205
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.)
, x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (a + b*Tan[e + f*x])^n, x],
 x] /; FreeQ[{a, b, c, d, e, f, m}, x] && IGtQ[m, 0] && IGtQ[n, 0]
```

3.49.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 744 vs. 2(248) = 496.

Time = 0.72 (sec) , antiderivative size = 745, normalized size of antiderivative = 2.68

method	result
risch	$-ib^3cx+\frac{ib^3dx^2}{2}+\frac{b^2\left(-6iadfx\,e^{2i(fx+e)}-6iacf\,e^{2i(fx+e)}+2bdfx\,e^{2i(fx+e)}+6iadfx-ibd\,e^{2i(fx+e)}+2bcf\,e^{2i(fx+e)}+6iacf+ib\right.}{f^2\left(e^{2i(fx+e)}-1\right)^2}$

input
```
int((d*x+c)*(a+b*cot(f*x+e))^3,x,method=_RETURNVERBOSE)
```

output
```
-I*b^3*c*x+6/f^2*b*e*d*a^2*ln(exp(I*(f*x+e)))-3/f^2*b*e*d*a^2*ln(exp(I*(f*
x+e))-1)+3/f*b*a^2*d*ln(1-exp(I*(f*x+e)))*x+3/f*b*a^2*d*ln(exp(I*(f*x+e))+
1)*x+3/f^2*b*a^2*d*ln(1-exp(I*(f*x+e)))*e-3*I/f^2*b*a^2*d*polylog(2,exp(I*
(f*x+e)))-3*I/f^2*b*a^2*d*polylog(2,-exp(I*(f*x+e)))-3*I/f^2*b*a^2*d*e^2+2
*I/f*b^3*d*e*x-6*I/f*b*a^2*d*e*x+1/2*a^3*d*x^2+a^3*c*x+1/2*I*b^3*d*x^2+b^2
*(-6*I*a*d*f*x*exp(2*I*(f*x+e))-6*I*a*c*f*exp(2*I*(f*x+e))+2*b*d*f*x*exp(2
*I*(f*x+e))+6*I*a*d*f*x-I*b*d*exp(2*I*(f*x+e))+2*b*c*f*exp(2*I*(f*x+e))+6*
I*a*c*f+I*b*d)/f^2/(exp(2*I*(f*x+e))-1)^2-3*a*b^2*c*x-3/2*a*b^2*d*x^2-3/2*
I*a^2*b*d*x^2-1/f*b^3*d*ln(1-exp(I*(f*x+e)))*x-1/f^2*b^3*d*ln(1-exp(I*(f*x
+e)))*e+I/f^2*b^3*d*polylog(2,exp(I*(f*x+e)))+I/f^2*b^3*d*polylog(2,-exp(I
*(f*x+e)))+3/f^2*b^2*a*d*ln(exp(I*(f*x+e))+1)-6/f^2*b^2*a*d*ln(exp(I*(f*x+
e)))+3/f^2*b^2*a*d*ln(exp(I*(f*x+e))-1)+3/f*b*a^2*c*ln(exp(I*(f*x+e))+1)-6
/f*b*a^2*c*ln(exp(I*(f*x+e)))+3/f*b*a^2*c*ln(exp(I*(f*x+e))-1)-2/f^2*b^3*e
*d*ln(exp(I*(f*x+e)))+1/f^2*b^3*e*d*ln(exp(I*(f*x+e))-1)+I/f^2*b^3*d*e^2-1
/f*b^3*d*ln(exp(I*(f*x+e))+1)*x+3*I*a^2*b*c*x-1/f*b^3*c*ln(exp(I*(f*x+e))+
1)+2/f*b^3*c*ln(exp(I*(f*x+e)))-1/f*b^3*c*ln(exp(I*(f*x+e))-1)
```

3.49.5 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. 721 vs. 2(242) = 484.

Time = 0.29 (sec) , antiderivative size = 721, normalized size of antiderivative = 2.59

$$\int (c+dx)(a+b\cot(e+fx))^3\,dx =$$

$$-\frac{2\,(a^3-3\,ab^2)df^2x^2-4\,b^3cf-4\,(b^3df-(a^3-3\,ab^2)cf^2)x-2\,((a^3-3\,ab^2)df^2x^2+2\,(a^3-3\,ab^2)cf^2x)}{}$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e))^3,x, algorithm="fricas")
```

output
```
-1/4*(2*(a^3 - 3*a*b^2)*d*f^2*x^2 - 4*b^3*c*f - 4*(b^3*d*f - (a^3 - 3*a*b^
2)*c*f^2)*x - 2*((a^3 - 3*a*b^2)*d*f^2*x^2 + 2*(a^3 - 3*a*b^2)*c*f^2*x)*co
s(2*f*x + 2*e) - (-I*(3*a^2*b - b^3)*d*cos(2*f*x + 2*e) + I*(3*a^2*b - b^3
)*d)*dilog(cos(2*f*x + 2*e) + I*sin(2*f*x + 2*e)) - (I*(3*a^2*b - b^3)*d*c
os(2*f*x + 2*e) - I*(3*a^2*b - b^3)*d)*dilog(cos(2*f*x + 2*e) - I*sin(2*f*
x + 2*e)) + 2*(3*a*b^2*d - (3*a^2*b - b^3)*d*e + (3*a^2*b - b^3)*c*f - (3*
a*b^2*d - (3*a^2*b - b^3)*d*e + (3*a^2*b - b^3)*c*f)*cos(2*f*x + 2*e))*log
(-1/2*cos(2*f*x + 2*e) + 1/2*I*sin(2*f*x + 2*e) + 1/2) + 2*(3*a*b^2*d - (3
*a^2*b - b^3)*d*e + (3*a^2*b - b^3)*c*f - (3*a*b^2*d - (3*a^2*b - b^3)*d*e
 + (3*a^2*b - b^3)*c*f)*cos(2*f*x + 2*e))*log(-1/2*cos(2*f*x + 2*e) - 1/2*
I*sin(2*f*x + 2*e) + 1/2) + 2*((3*a^2*b - b^3)*d*f*x + (3*a^2*b - b^3)*d*e
 - ((3*a^2*b - b^3)*d*f*x + (3*a^2*b - b^3)*d*e)*cos(2*f*x + 2*e))*log(-co
s(2*f*x + 2*e) + I*sin(2*f*x + 2*e) + 1) + 2*((3*a^2*b - b^3)*d*f*x + (3*a
^2*b - b^3)*d*e - ((3*a^2*b - b^3)*d*f*x + (3*a^2*b - b^3)*d*e)*cos(2*f*x
+ 2*e))*log(-cos(2*f*x + 2*e) - I*sin(2*f*x + 2*e) + 1) - 2*(6*a*b^2*d*f*x
 + 6*a*b^2*c*f + b^3*d)*sin(2*f*x + 2*e))/(f^2*cos(2*f*x + 2*e) - f^2)
```

3.49.6 Sympy [F]

$$\int (c+dx)(a+b\cot(e+fx))^3\,dx=\int (a+b\cot(e+fx))^3\,(c+dx)\,dx$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e))**3,x)
```

output
```
Integral((a + b*cot(e + f*x))**3*(c + d*x), x)
```

3.49.7 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. 2017 vs. $2(242) = 484$.

Time = 0.78 (sec) , antiderivative size = 2017, normalized size of antiderivative = 7.26

$$\int (c+dx)(a+b\cot(e+fx))^3\,dx=\text{Too large to display}$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e))^3,x, algorithm="maxima")
```

output
```
1/2*(2*(f*x + e)*a^3*c + (f*x + e)^2*a^3*d/f - 2*(f*x + e)*a^3*d*e/f + 6*a
^2*b*c*log(sin(f*x + e)) - 6*a^2*b*d*e*log(sin(f*x + e))/f - 2*(12*a*b^2*d
*e - 12*a*b^2*c*f + (3*a^2*b - 3*I*a*b^2 - b^3)*(f*x + e)^2*d - 2*b^3*d -
2*((-3*I*a*b^2 - b^3)*d*e + (3*I*a*b^2 + b^3)*c*f)*(f*x + e) - 2*(b^3*d*e
- b^3*c*f + 3*a*b^2*d + (3*a^2*b - b^3)*(f*x + e)*d + (b^3*d*e - b^3*c*f +
 3*a*b^2*d + (3*a^2*b - b^3)*(f*x + e)*d)*cos(4*f*x + 4*e) - 2*(b^3*d*e -
b^3*c*f + 3*a*b^2*d + (3*a^2*b - b^3)*(f*x + e)*d)*cos(2*f*x + 2*e) + (I*b
^3*d*e - I*b^3*c*f + 3*I*a*b^2*d + (3*I*a^2*b - I*b^3)*(f*x + e)*d)*sin(4*
f*x + 4*e) + 2*(-I*b^3*d*e + I*b^3*c*f - 3*I*a*b^2*d + (-3*I*a^2*b + I*b^3
)*(f*x + e)*d)*sin(2*f*x + 2*e))*arctan2(sin(f*x + e), cos(f*x + e) + 1) -
 2*(b^3*d*e - b^3*c*f + 3*a*b^2*d + (b^3*d*e - b^3*c*f + 3*a*b^2*d)*cos(4*
f*x + 4*e) - 2*(b^3*d*e - b^3*c*f + 3*a*b^2*d)*cos(2*f*x + 2*e) + (I*b^3*d
*e - I*b^3*c*f + 3*I*a*b^2*d)*sin(4*f*x + 4*e) + 2*(-I*b^3*d*e + I*b^3*c*f
 - 3*I*a*b^2*d)*sin(2*f*x + 2*e))*arctan2(sin(f*x + e), cos(f*x + e) - 1)
+ 2*((3*a^2*b - b^3)*(f*x + e)*d*cos(4*f*x + 4*e) - 2*(3*a^2*b - b^3)*(f*x
 + e)*d*cos(2*f*x + 2*e) - (-3*I*a^2*b + I*b^3)*(f*x + e)*d*sin(4*f*x + 4*
e) - 2*(3*I*a^2*b - I*b^3)*(f*x + e)*d*sin(2*f*x + 2*e) + (3*a^2*b - b^3)*
(f*x + e)*d)*arctan2(sin(f*x + e), -cos(f*x + e) + 1) + ((3*a^2*b - 3*I*a*
b^2 - b^3)*(f*x + e)^2*d + 2*(6*a*b^2*d - (-3*I*a*b^2 - b^3)*d*e - (3*I*a*
b^2 + b^3)*c*f)*(f*x + e))*cos(4*f*x + 4*e) - 2*((3*a^2*b - 3*I*a*b^2 -...
```

3.49.8 Giac [F]

$$\int (c+dx)(a+b\cot(e+fx))^3\,dx = \int (dx+c)(b\cot(fx+e)+a)^3\,dx$$

input
```
integrate((d*x+c)*(a+b*cot(f*x+e))^3,x, algorithm="giac")
```

output
```
integrate((d*x + c)*(b*cot(f*x + e) + a)^3, x)
```

3.49.9 Mupad [F(-1)]

Timed out.

$$\int (c+dx)(a+b\cot(e+fx))^3\,dx=\int {\left(a+b\,\cot\left(e+f\,x\right)\right)}^3\,\left(c+d\,x\right)\,dx$$

input
```
int((a + b*cot(e + f*x))^3*(c + d*x),x)
```

output
```
int((a + b*cot(e + f*x))^3*(c + d*x), x)
```

3.50 $\int \frac{(a+b\cot(e+fx))^3}{c+dx}\,dx$

3.50.1 Optimal result

Integrand size = 20, antiderivative size = 20

$$\int \frac{(a+b\cot(e+fx))^3}{c+dx}\,dx = \mathrm{Int}\left(\frac{(a+b\cot(e+fx))^3}{c+dx},x\right)$$

output
```
Unintegrable((a+b*cot(f*x+e))^3/(d*x+c),x)
```

3.50.2 Mathematica [N/A]

Not integrable

Time = 9.42 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^3}{c+dx}\,dx = \int \frac{(a+b\cot(e+fx))^3}{c+dx}\,dx$$

input
```
Integrate[(a + b*Cot[e + f*x])^3/(c + d*x),x]
```

output
```
Integrate[(a + b*Cot[e + f*x])^3/(c + d*x), x]
```

3.50.3 Rubi [N/A]

Not integrable

Time = 0.22 (sec) , antiderivative size = 20, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(a+b\cot(e+fx))^3}{c+dx}\,dx$$

$$\Big\downarrow \; 3042$$

$$\int \frac{\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3}{c+dx}dx$$

$$\Big\downarrow \; 4223$$

$$\int \frac{(a+b\cot(e+fx))^3}{c+dx}dx$$

input
```
Int[(a + b*Cot[e + f*x])^3/(c + d*x),x]
```

output
```
$Aborted
```

3.50.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.50.4 Maple [N/A] (verified)

Not integrable

Time = 0.48 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{(a + b\cot(fx + e))^3}{dx + c}dx$$

input
```
int((a+b*cot(f*x+e))^3/(d*x+c),x)
```

output
```
int((a+b*cot(f*x+e))^3/(d*x+c),x)
```

3.50.5 Fricas [N/A]

Not integrable

Time = 0.29 (sec) , antiderivative size = 52, normalized size of antiderivative = 2.60

$$\int \frac{(a + b\cot(e + fx))^3}{c + dx} dx = \int \frac{(b\cot(fx + e) + a)^3}{dx + c} dx$$

input
```
integrate((a+b*cot(f*x+e))^3/(d*x+c),x, algorithm="fricas")
```

output
```
integral((b^3*cot(f*x + e)^3 + 3*a*b^2*cot(f*x + e)^2 + 3*a^2*b*cot(f*x +
e) + a^3)/(d*x + c), x)
```

3.50.6 Sympy [N/A]

Not integrable

Time = 1.38 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.85

$$\int \frac{(a + b\cot(e + fx))^3}{c + dx} dx = \int \frac{(a + b\cot(e + fx))^3}{c + dx} dx$$

input
```
integrate((a+b*cot(f*x+e))**3/(d*x+c),x)
```

output
```
Integral((a + b*cot(e + f*x))**3/(c + d*x), x)
```

3.50.7 Maxima [N/A]

Not integrable

Time = 5.49 (sec) , antiderivative size = 2585, normalized size of antiderivative = 129.25

$$\int \frac{(a+b\cot(e+fx))^3}{c+dx}\,dx=\int \frac{(b\cot(fx+e)+a)^3}{dx+c}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^3/(d*x+c),x, algorithm="maxima")
```

output
```
(((a^3 - 3*a*b^2)*d^2*f^2*x^2 + 2*(a^3 - 3*a*b^2)*c*d*f^2*x + (a^3 - 3*a*b
^2)*c^2*f^2)*cos(4*f*x + 4*e)^2*log(d*x + c) + ((a^3 - 3*a*b^2)*d^2*f^2*x^
2 + 2*(a^3 - 3*a*b^2)*c*d*f^2*x + (a^3 - 3*a*b^2)*c^2*f^2)*log(d*x + c)*si
n(4*f*x + 4*e)^2 - 4*(b^3*d^2*f*x + b^3*c*d*f - ((a^3 - 3*a*b^2)*d^2*f^2*x
^2 + 2*(a^3 - 3*a*b^2)*c*d*f^2*x + (a^3 - 3*a*b^2)*c^2*f^2)*log(d*x + c))*
cos(2*f*x + 2*e)^2 - 4*(b^3*d^2*f*x + b^3*c*d*f - ((a^3 - 3*a*b^2)*d^2*f^2
*x^2 + 2*(a^3 - 3*a*b^2)*c*d*f^2*x + (a^3 - 3*a*b^2)*c^2*f^2)*log(d*x + c)
)*sin(2*f*x + 2*e)^2 + (2*(b^3*d^2*f*x + b^3*c*d*f - 2*((a^3 - 3*a*b^2)*d^
2*f^2*x^2 + 2*(a^3 - 3*a*b^2)*c*d*f^2*x + (a^3 - 3*a*b^2)*c^2*f^2)*log(d*x
 + c))*cos(2*f*x + 2*e) + 2*((a^3 - 3*a*b^2)*d^2*f^2*x^2 + 2*(a^3 - 3*a*b^
2)*c*d*f^2*x + (a^3 - 3*a*b^2)*c^2*f^2)*log(d*x + c) + (6*a*b^2*d^2*f*x +
6*a*b^2*c*d*f - b^3*d^2)*sin(2*f*x + 2*e))*cos(4*f*x + 4*e) + 2*(b^3*d^2*f
*x + b^3*c*d*f - 2*((a^3 - 3*a*b^2)*d^2*f^2*x^2 + 2*(a^3 - 3*a*b^2)*c*d*f^
2*x + (a^3 - 3*a*b^2)*c^2*f^2)*log(d*x + c))*cos(2*f*x + 2*e) + (d^3*f^2*x
^2 + 2*c*d^2*f^2*x + c^2*d*f^2 + (d^3*f^2*x^2 + 2*c*d^2*f^2*x + c^2*d*f^2)
*cos(4*f*x + 4*e)^2 + 4*(d^3*f^2*x^2 + 2*c*d^2*f^2*x + c^2*d*f^2)*cos(2*f*
x + 2*e)^2 + (d^3*f^2*x^2 + 2*c*d^2*f^2*x + c^2*d*f^2)*sin(4*f*x + 4*e)^2
- 4*(d^3*f^2*x^2 + 2*c*d^2*f^2*x + c^2*d*f^2)*sin(4*f*x + 4*e)*sin(2*f*x +
 2*e) + 4*(d^3*f^2*x^2 + 2*c*d^2*f^2*x + c^2*d*f^2)*sin(2*f*x + 2*e)^2 + 2
*(d^3*f^2*x^2 + 2*c*d^2*f^2*x + c^2*d*f^2 - 2*(d^3*f^2*x^2 + 2*c*d^2*f^...
```

3.50.8 Giac [N/A]

Not integrable

Time = 0.53 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^3}{c+dx}\,dx=\int \frac{(b\cot(fx+e)+a)^3}{dx+c}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^3/(d*x+c),x, algorithm="giac")
```

output
```
integrate((b*cot(f*x + e) + a)^3/(d*x + c), x)
```

3.50.9 Mupad [N/A]

Not integrable

Time = 12.63 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^3}{c+dx}\,dx=\int \frac{{\left(a+b\,\mathrm{cot}\left(e+f\,x\right)\right)}^3}{c+d\,x}\,dx$$

input
```
int((a + b*cot(e + f*x))^3/(c + d*x),x)
```

output
```
int((a + b*cot(e + f*x))^3/(c + d*x), x)
```

3.51 $\int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx$

3.51.1 Optimal result

Integrand size = 20, antiderivative size = 20

$$\int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx = \text{Int}\left(\frac{(a+b\cot(e+fx))^3}{(c+dx)^2},x\right)$$

output
```
Unintegrable((a+b*cot(f*x+e))^3/(d*x+c)^2,x)
```

3.51.2 Mathematica [N/A]

Not integrable

Time = 12.32 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx = \int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx$$

input
```
Integrate[(a + b*Cot[e + f*x])^3/(c + d*x)^2,x]
```

output
```
Integrate[(a + b*Cot[e + f*x])^3/(c + d*x)^2, x]
```

3.51.3 Rubi [N/A]

Not integrable

Time = 0.22 (sec) , antiderivative size = 20, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int \frac{\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^3}{(c+dx)^2}dx$$

$$\Big\downarrow \text{ 4223}$$

$$\int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}dx$$

input
```
Int[(a + b*Cot[e + f*x])^3/(c + d*x)^2,x]
```

output
```
$Aborted
```

3.51.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.51.4 Maple [N/A] (verified)

Not integrable

Time = 0.64 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{(a+b\cot(fx+e))^3}{(dx+c)^2}dx$$

input
```
int((a+b*cot(f*x+e))^3/(d*x+c)^2,x)
```

output
```
int((a+b*cot(f*x+e))^3/(d*x+c)^2,x)
```

3.51.5 Fricas [N/A]

Not integrable

Time = 0.26 (sec) , antiderivative size = 63, normalized size of antiderivative = 3.15

$$\int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx = \int \frac{(b\cot(fx+e)+a)^3}{(dx+c)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^3/(d*x+c)^2,x, algorithm="fricas")
```

output
```
integral((b^3*cot(f*x + e)^3 + 3*a*b^2*cot(f*x + e)^2 + 3*a^2*b*cot(f*x +
e) + a^3)/(d^2*x^2 + 2*c*d*x + c^2), x)
```

3.51.6 Sympy [N/A]

Not integrable

Time = 2.55 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.95

$$\int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx = \int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))**3/(d*x+c)**2,x)
```

output
```
Integral((a + b*cot(e + f*x))**3/(c + d*x)**2, x)
```

3.51.7 Maxima [N/A]

Not integrable

Time = 15.25 (sec) , antiderivative size = 3017, normalized size of antiderivative = 150.85

$$\int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx=\int \frac{(b\cot(fx+e)+a)^3}{(dx+c)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^3/(d*x+c)^2,x, algorithm="maxima")
```

output
```
-((a^3 - 3*a*b^2)*d^2*f^2*x^2 + 2*(a^3 - 3*a*b^2)*c*d*f^2*x + (a^3 - 3*a*b
^2)*c^2*f^2 + ((a^3 - 3*a*b^2)*d^2*f^2*x^2 + 2*(a^3 - 3*a*b^2)*c*d*f^2*x +
 (a^3 - 3*a*b^2)*c^2*f^2)*cos(4*f*x + 4*e)^2 + 4*((a^3 - 3*a*b^2)*d^2*f^2*
x^2 + b^3*c*d*f + (a^3 - 3*a*b^2)*c^2*f^2 + (b^3*d^2*f + 2*(a^3 - 3*a*b^2)
*c*d*f^2)*x)*cos(2*f*x + 2*e)^2 + ((a^3 - 3*a*b^2)*d^2*f^2*x^2 + 2*(a^3 -
3*a*b^2)*c*d*f^2*x + (a^3 - 3*a*b^2)*c^2*f^2)*sin(4*f*x + 4*e)^2 + 4*((a^3
 - 3*a*b^2)*d^2*f^2*x^2 + b^3*c*d*f + (a^3 - 3*a*b^2)*c^2*f^2 + (b^3*d^2*f
 + 2*(a^3 - 3*a*b^2)*c*d*f^2)*x)*sin(2*f*x + 2*e)^2 + 2*((a^3 - 3*a*b^2)*d
^2*f^2*x^2 + 2*(a^3 - 3*a*b^2)*c*d*f^2*x + (a^3 - 3*a*b^2)*c^2*f^2 - (2*(a
^3 - 3*a*b^2)*d^2*f^2*x^2 + b^3*c*d*f + 2*(a^3 - 3*a*b^2)*c^2*f^2 + (b^3*d
^2*f + 4*(a^3 - 3*a*b^2)*c*d*f^2)*x)*cos(2*f*x + 2*e) - (3*a*b^2*d^2*f*x +
 3*a*b^2*c*d*f - b^3*d^2)*sin(2*f*x + 2*e))*cos(4*f*x + 4*e) - 2*(2*(a^3 -
 3*a*b^2)*d^2*f^2*x^2 + b^3*c*d*f + 2*(a^3 - 3*a*b^2)*c^2*f^2 + (b^3*d^2*f
 + 4*(a^3 - 3*a*b^2)*c*d*f^2)*x)*cos(2*f*x + 2*e) - (d^4*f^2*x^3 + 3*c*d^3
*f^2*x^2 + 3*c^2*d^2*f^2*x + c^3*d*f^2 + (d^4*f^2*x^3 + 3*c*d^3*f^2*x^2 +
3*c^2*d^2*f^2*x + c^3*d*f^2)*cos(4*f*x + 4*e)^2 + 4*(d^4*f^2*x^3 + 3*c*d^3
*f^2*x^2 + 3*c^2*d^2*f^2*x + c^3*d*f^2)*cos(2*f*x + 2*e)^2 + (d^4*f^2*x^3
+ 3*c*d^3*f^2*x^2 + 3*c^2*d^2*f^2*x + c^3*d*f^2)*sin(4*f*x + 4*e)^2 - 4*(d
^4*f^2*x^3 + 3*c*d^3*f^2*x^2 + 3*c^2*d^2*f^2*x + c^3*d*f^2)*sin(4*f*x + 4*
e)*sin(2*f*x + 2*e) + 4*(d^4*f^2*x^3 + 3*c*d^3*f^2*x^2 + 3*c^2*d^2*f^2*...
```

3.51.8 Giac [N/A]

Not integrable

Time = 2.78 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx=\int \frac{(b\cot(fx+e)+a)^3}{(dx+c)^2}\,dx$$

input
```
integrate((a+b*cot(f*x+e))^3/(d*x+c)^2,x, algorithm="giac")
```

output
```
integrate((b*cot(f*x + e) + a)^3/(d*x + c)^2, x)
```

3.51.9 Mupad [N/A]

Not integrable

Time = 13.00 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a+b\cot(e+fx))^3}{(c+dx)^2}\,dx = \int \frac{{\left(a+b\,\mathrm{cot}\left(e+f\,x\right)\right)}^3}{{\left(c+d\,x\right)}^2}\,dx$$

input
```
int((a + b*cot(e + f*x))^3/(c + d*x)^2,x)
```

output
```
int((a + b*cot(e + f*x))^3/(c + d*x)^2, x)
```

3.52 $\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx$

3.52.1 Optimal result

Integrand size = 20, antiderivative size = 242

$$\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx = \frac{(c+dx)^4}{4(a-ib)d} - \frac{b(c+dx)^3\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{(a^2+b^2)\,f} + \frac{3ibd(c+dx)^2\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2\,(a^2+b^2)\,f^2} - \frac{3bd^2(c+dx)\operatorname{PolyLog}\left(3,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2\,(a^2+b^2)\,f^3} - \frac{3ibd^3\operatorname{PolyLog}\left(4,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{4\,(a^2+b^2)\,f^4}$$

output
```
1/4*(d*x+c)^4/(a-I*b)/d-b*(d*x+c)^3*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))
/(a^2+b^2)/f+3/2*I*b*d*(d*x+c)^2*polylog(2,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b
))/(a^2+b^2)/f^2-3/2*b*d^2*(d*x+c)*polylog(3,(a+I*b)*exp(2*I*(f*x+e))/(a-I
*b))/(a^2+b^2)/f^3-3/4*I*b*d^3*polylog(4,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))
/(a^2+b^2)/f^4
```

3.52.2 Mathematica [A] (verified)

Time = 2.19 (sec) , antiderivative size = 345, normalized size of antiderivative = 1.43

$$\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx$$
$$= \frac{b\left(\frac{2i(c+dx)^4}{(a+ib)d} - \frac{4\left(a\left(-1+e^{2ie}\right)+ib\left(1+e^{2ie}\right)\right)(c+dx)^3\log\left(1+\frac{(-a+ib)e^{-2i(e+fx)}}{a+ib}\right)}{(a^2+b^2)f} + \frac{3d\left(-ia\left(-1+e^{2ie}\right)+b\left(1+e^{2ie}\right)\right)\left(2f^2(c+dx)^2\,\mathrm{PolyLog}(\cdots\right.}{\cdots}\right.}{4\left(a\left(-1+e^{2ie}\right)+ib\left(1+e^{2\cdots}\right.\right.}$$
$$+ \frac{x(4c^3+6c^2dx+4cd^2x^2+d^3x^3)\sin(e)}{4(b\cos(e)+a\sin(e))}$$

input
```
Integrate[(c + d*x)^3/(a + b*Cot[e + f*x]),x]
```

output
```
(b*(((2*I)*(c + d*x)^4)/((a + I*b)*d) - (4*(a*(-1 + E^((2*I)*e)) + I*b*(1
+ E^((2*I)*e)))*(c + d*x)^3*Log[1 + (-a + I*b)/((a + I*b)*E^((2*I)*(e + f*
x)))])/((a^2 + b^2)*f) + (3*d*((-I)*a*(-1 + E^((2*I)*e)) + b*(1 + E^((2*I)
*e)))*(2*f^2*(c + d*x)^2*PolyLog[2, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*x
)))] + d*((-2*I)*f*(c + d*x)*PolyLog[3, (a - I*b)/((a + I*b)*E^((2*I)*(e +
 f*x)))] - d*PolyLog[4, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*x)))])))/((a^
2 + b^2)*f^4)))/(4*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((2*I)*e)))) + (x*(4
*c^3 + 6*c^2*d*x + 4*c*d^2*x^2 + d^3*x^3)*Sin[e])/(4*(b*Cos[e] + a*Sin[e])
)
```

3.52.3 Rubi [A] (verified)

Time = 0.92 (sec) , antiderivative size = 244, normalized size of antiderivative = 1.01, number of steps used = 9, number of rules used = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.400$, Rules used = {3042, 4214, 25, 2620, 3011, 7163, 2720, 7143}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx$$
$$\Big\downarrow \; 3042$$
$$\int \frac{(c+dx)^3}{a-b\tan\left(e+fx+\frac{\pi}{2}\right)}dx$$

$$\Big\downarrow \; 4214$$

$$\frac{(c+dx)^4}{4d(a-ib)}-2ib\int -\frac{e^{2i(e+fx)}(c+dx)^3}{(a-ib)^2-\left(a^2+b^2\right)e^{2i(e+fx)}}dx$$

$$\Big\downarrow \; 25$$

$$2ib\int \frac{e^{2i(e+fx)}(c+dx)^3}{(a-ib)^2-\left(a^2+b^2\right)e^{2i(e+fx)}}dx+\frac{(c+dx)^4}{4d(a-ib)}$$

$$\Big\downarrow \; 2620$$

$$2ib\left(\frac{i(c+dx)^3\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{3id\int (c+dx)^2\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)dx}{2f\left(a^2+b^2\right)}\right)+\frac{(c+dx)^4}{4d(a-ib)}$$

$$\Big\downarrow \; 3011$$

$$2ib\left(\frac{i(c+dx)^3\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{3id\left(\frac{i(c+dx)^2\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f}-\frac{id\int (c+dx)\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{f}\right.}{2f\left(a^2+b^2\right)}\right.$$

$$\frac{(c+dx)^4}{4d(a-ib)}$$

$$\Big\downarrow \; 7163$$

$$2ib\left(\frac{i(c+dx)^3\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{3id\left(\frac{i(c+dx)^2\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f}-\frac{id\left(\frac{id\int \operatorname{PolyLog}\left(3,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)dx}{2f}-\right.}{f}\right.}{2f\left(a^2+b^2\right)}\right.$$

$$\frac{(c+dx)^4}{4d(a-ib)}$$

$$\Big\downarrow \; 2720$$

3.52. $\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx$

$$2ib\left(\frac{i(c+dx)^3\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{3id\left(\frac{i(c+dx)^2\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f}-\frac{id\left(\frac{d\int e^{-2i(e+fx)}\operatorname{PolyLog}\left(3,\frac{(a+ib)e^{2i(e+\cdots}}{a-ib}\right.}{4f^2}\cdots\right.}{\cdots}\right.}{2f\left(a^2+b^2\right)}\right.$$

$$\frac{(c+dx)^4}{4d(a-ib)}$$

$$\Big\downarrow \; 7143$$

$$2ib\left(\frac{i(c+dx)^3\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{3id\left(\frac{i(c+dx)^2\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f}-\frac{id\left(\frac{d\operatorname{PolyLog}\left(4,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{4f^2}-\frac{i(c+\cdots}{\cdots}\right.}{f}\right.}{2f\left(a^2+b^2\right)}\right.$$

$$\frac{(c+dx)^4}{4d(a-ib)}$$

input
```
Int[(c + d*x)^3/(a + b*Cot[e + f*x]),x]
```

output
```
(c + d*x)^4/(4*(a - I*b)*d) + (2*I)*b*(((I/2)*(c + d*x)^3*Log[1 - ((a + I*
b)*E^((2*I)*(e + f*x)))/(a - I*b)])/((a^2 + b^2)*f) - (((3*I)/2)*d*(((I/2)
*(c + d*x)^2*PolyLog[2, ((a + I*b)*E^((2*I)*(e + f*x)))/(a - I*b)])/f - (I
*d*(((-1/2*I)*(c + d*x)*PolyLog[3, ((a + I*b)*E^((2*I)*(e + f*x)))/(a - I*
b)])/f + (d*PolyLog[4, ((a + I*b)*E^((2*I)*(e + f*x)))/(a - I*b)])/(4*f^2)
))/f))/((a^2 + b^2)*f))
```

3.52. $\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx$

3.52.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2720
```
Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Simp[v/D[v, x]
   Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Funct
ionOfExponentialQ[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 3011
```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.)]*((f_.) + (g_.)
*(x_))^(m_.), x_Symbol] :> Simp[(-(f + g*x)^m)*(PolyLog[2, (-e)*(F^(c*(a +
b*x)))^n]/(b*c*n*Log[F])), x] + Simp[g*(m/(b*c*n*Log[F]))   Int[(f + g*x)^(
m - 1)*PolyLog[2, (-e)*(F^(c*(a + b*x)))^n], x], x] /; FreeQ[{F, a, b, c, e
, f, g, n}, x] && GtQ[m, 0]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4214
```
Int[((c_.) + (d_.)*(x_))^(m_.)/((a_) + (b_.)*tan[(e_.) + Pi*(k_.) + (f_.)*(
x_)]), x_Symbol] :> Simp[(c + d*x)^(m + 1)/(d*(m + 1)*(a + I*b)), x] + Simp
[2*I*b   Int[(c + d*x)^m*E^(2*I*k*Pi)*(E^Simp[2*I*(e + f*x), x]/((a + I*b)^
2 + (a^2 + b^2)*E^(2*I*k*Pi)*E^Simp[2*I*(e + f*x), x])), x], x] /; FreeQ[{a
, b, c, d, e, f}, x] && IntegerQ[4*k] && NeQ[a^2 + b^2, 0] && IGtQ[m, 0]
```

rule 7143
```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] :> Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

rule 7163
```
Int[((e_.) + (f_.)*(x_))^(m_.)*PolyLog[n_, (d_.)*((F_)^((c_.)*((a_.) + (b_.
)*(x_))))^(p_.)], x_Symbol] :> Simp[(e + f*x)^m*(PolyLog[n + 1, d*(F^(c*(a
+ b*x)))^p]/(b*c*p*Log[F])), x] - Simp[f*(m/(b*c*p*Log[F]))   Int[(e + f*x)
^(m - 1)*PolyLog[n + 1, d*(F^(c*(a + b*x)))^p], x], x] /; FreeQ[{F, a, b, c
, d, e, f, n, p}, x] && GtQ[m, 0]
```

3.52.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 1401 vs. 2(215) = 430.

Time = 0.43 (sec) , antiderivative size = 1402, normalized size of antiderivative = 5.79

method	result	size
risch	Expression too large to display	1402

input
```
int((d*x+c)^3/(a+b*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
1/4*d^3/(a+I*b)*x^4+1/(a+I*b)*c^3*x+1/4/d/(a+I*b)*c^4+I/f^4/(b-I*a)*b*e^3*
d^3/(I*b-a)*ln(exp(2*I*(f*x+e))*a+I*b*exp(2*I*(f*x+e))-a+I*b)+6/f/(b-I*a)*
b/(a-I*b)*c^2*d*e*x+I/f^4/(b-I*a)*b/(a-I*b)*e^3*d^3*ln(1-(a+I*b)*exp(2*I*(
f*x+e))/(a-I*b))-6/f^2/(b-I*a)*b/(a-I*b)*e^2*c*d^2*x+I/f/(b-I*a)*b/(a-I*b)
*d^3*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))*x^3+3/f^2/(b-I*a)*b/(a-I*b)*d^
2*c*polylog(2,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))*x-2*I/f^4/(b-I*a)*b*e^3*d^
3/(I*b-a)*ln(exp(I*(f*x+e)))+3/2*I/f^3/(b-I*a)*b/(a-I*b)*d^2*c*polylog(3,(
a+I*b)*exp(2*I*(f*x+e))/(a-I*b))+3/2*I/f^3/(b-I*a)*b/(a-I*b)*d^3*polylog(3
,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))*x+3/f^2/(b-I*a)*b/(a-I*b)*c^2*d*e^2+3/2
/f^2/(b-I*a)*b/(a-I*b)*c^2*d*polylog(2,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))+2
/f^3/(b-I*a)*b/(a-I*b)*d^3*e^3*x-4/f^3/(b-I*a)*b/(a-I*b)*e^3*c*d^2+3/2/f^2
/(b-I*a)*b/(a-I*b)*d^3*polylog(2,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))*x^2+2*I
/f/(b-I*a)*b*c^3/(I*b-a)*ln(exp(I*(f*x+e)))-I/f/(b-I*a)*b*c^3/(I*b-a)*ln(e
xp(2*I*(f*x+e))*a+I*b*exp(2*I*(f*x+e))-a+I*b)+6*I/f^3/(b-I*a)*b*e^2*c*d^2/
(I*b-a)*ln(exp(I*(f*x+e)))-3*I/f^3/(b-I*a)*b*e^2*c*d^2/(I*b-a)*ln(exp(2*I*
(f*x+e))*a+I*b*exp(2*I*(f*x+e))-a+I*b)-6*I/f^2/(b-I*a)*b*e*c^2*d/(I*b-a)*l
n(exp(I*(f*x+e)))+3*I/f^2/(b-I*a)*b*e*c^2*d/(I*b-a)*ln(exp(2*I*(f*x+e))*a+
I*b*exp(2*I*(f*x+e))-a+I*b)+3*I/f/(b-I*a)*b/(a-I*b)*c^2*d*ln(1-(a+I*b)*exp
(2*I*(f*x+e))/(a-I*b))*x+3*I/f^2/(b-I*a)*b/(a-I*b)*c^2*d*ln(1-(a+I*b)*exp(
2*I*(f*x+e))/(a-I*b))*e-3*I/f^3/(b-I*a)*b/(a-I*b)*e^2*c*d^2*ln(1-(a+I*b...
```

3.52.5 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. 1031 vs. $2(203) = 406$.

Time = 0.34 (sec) , antiderivative size = 1031, normalized size of antiderivative = 4.26

$$\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^3/(a+b*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/8*(2*a*d^3*f^4*x^4 + 8*a*c*d^2*f^4*x^3 + 12*a*c^2*d*f^4*x^2 + 8*a*c^3*f^
4*x - 3*I*b*d^3*polylog(4, ((a^2 + 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (I*a^
2 - 2*a*b - I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2)) + 3*I*b*d^3*polylog(4, (
(a^2 - 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (-I*a^2 - 2*a*b + I*b^2)*sin(2*f*
x + 2*e))/(a^2 + b^2)) - 6*(-I*b*d^3*f^2*x^2 - 2*I*b*c*d^2*f^2*x - I*b*c^2
*d*f^2)*dilog(-(a^2 + b^2 - (a^2 + 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (-I*a
^2 + 2*a*b + I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2) + 1) - 6*(I*b*d^3*f^2*x^
2 + 2*I*b*c*d^2*f^2*x + I*b*c^2*d*f^2)*dilog(-(a^2 + b^2 - (a^2 - 2*I*a*b
- b^2)*cos(2*f*x + 2*e) + (I*a^2 + 2*a*b - I*b^2)*sin(2*f*x + 2*e))/(a^2 +
 b^2) + 1) + 4*(b*d^3*e^3 - 3*b*c*d^2*e^2*f + 3*b*c^2*d*e*f^2 - b*c^3*f^3)
*log(1/2*a^2 + I*a*b - 1/2*b^2 - 1/2*(a^2 + b^2)*cos(2*f*x + 2*e) + 1/2*(I
*a^2 + I*b^2)*sin(2*f*x + 2*e)) + 4*(b*d^3*e^3 - 3*b*c*d^2*e^2*f + 3*b*c^2
*d*e*f^2 - b*c^3*f^3)*log(-1/2*a^2 + I*a*b + 1/2*b^2 + 1/2*(a^2 + b^2)*cos
(2*f*x + 2*e) + 1/2*(I*a^2 + I*b^2)*sin(2*f*x + 2*e)) - 4*(b*d^3*f^3*x^3 +
 3*b*c*d^2*f^3*x^2 + 3*b*c^2*d*f^3*x + b*d^3*e^3 - 3*b*c*d^2*e^2*f + 3*b*c
^2*d*e*f^2)*log((a^2 + b^2 - (a^2 + 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (-I*
a^2 + 2*a*b + I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2)) - 4*(b*d^3*f^3*x^3 + 3
*b*c*d^2*f^3*x^2 + 3*b*c^2*d*f^3*x + b*d^3*e^3 - 3*b*c*d^2*e^2*f + 3*b*c^2
*d*e*f^2)*log((a^2 + b^2 - (a^2 - 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (I*a^2
 + 2*a*b - I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2)) - 6*(b*d^3*f*x + b*c*d...
```

3.52.6 Sympy [F]

$$\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx = \int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx$$

input
```
integrate((d*x+c)**3/(a+b*cot(f*x+e)),x)
```

output
```
Integral((c + d*x)**3/(a + b*cot(e + f*x)), x)
```

3.52.7 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. 990 vs. 2(203) = 406.

Time = 0.57 (sec) , antiderivative size = 990, normalized size of antiderivative = 4.09

$$\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^3/(a+b*cot(f*x+e)),x, algorithm="maxima")
```

output
```
-1/12*(18*c^2*d*e*(2*(f*x + e)*a/((a^2 + b^2)*f) - 2*b*log(a*tan(f*x + e)
+ b)/((a^2 + b^2)*f) + b*log(tan(f*x + e)^2 + 1)/((a^2 + b^2)*f)) - 6*(2*(
f*x + e)*a/(a^2 + b^2) - 2*b*log(a*tan(f*x + e) + b)/(a^2 + b^2) + b*log(t
an(f*x + e)^2 + 1)/(a^2 + b^2))*c^3 - (3*(f*x + e)^4*(a + I*b)*d^3 - 12*I*
b*d^3*polylog(4, (I*a - b)*e^(2*I*f*x + 2*I*e)/(I*a + b)) - 12*((a + I*b)*
d^3*e - (a + I*b)*c*d^2*f)*(f*x + e)^3 + 18*((a + I*b)*d^3*e^2 - 2*(a + I*
b)*c*d^2*e*f + (a + I*b)*c^2*d*f^2)*(f*x + e)^2 - 12*((a + I*b)*d^3*e^3 -
3*(a + I*b)*c*d^2*e^2*f)*(f*x + e) + 12*(I*b*d^3*e^3 - 3*I*b*c*d^2*e^2*f)*
arctan2(b*cos(2*f*x + 2*e) + a*sin(2*f*x + 2*e) + b, a*cos(2*f*x + 2*e) -
b*sin(2*f*x + 2*e) - a) + 4*(-4*I*(f*x + e)^3*b*d^3 + 9*(I*b*d^3*e - I*b*c
*d^2*f)*(f*x + e)^2 + 9*(-I*b*d^3*e^2 + 2*I*b*c*d^2*e*f - I*b*c^2*d*f^2)*(
f*x + e))*arctan2(-(2*a*b*cos(2*f*x + 2*e) + (a^2 - b^2)*sin(2*f*x + 2*e))
/(a^2 + b^2), (2*a*b*sin(2*f*x + 2*e) + a^2 + b^2 - (a^2 - b^2)*cos(2*f*x
+ 2*e))/(a^2 + b^2)) + 6*(4*I*(f*x + e)^2*b*d^3 + 3*I*b*d^3*e^2 - 6*I*b*c*
d^2*e*f + 3*I*b*c^2*d*f^2 + 6*(-I*b*d^3*e + I*b*c*d^2*f)*(f*x + e))*dilog(
(I*a - b)*e^(2*I*f*x + 2*I*e)/(I*a + b)) + 6*(b*d^3*e^3 - 3*b*c*d^2*e^2*f)
*log((a^2 + b^2)*cos(2*f*x + 2*e)^2 + 4*a*b*sin(2*f*x + 2*e) + (a^2 + b^2)
*sin(2*f*x + 2*e)^2 + a^2 + b^2 - 2*(a^2 - b^2)*cos(2*f*x + 2*e)) - 2*(4*(
f*x + e)^3*b*d^3 - 9*(b*d^3*e - b*c*d^2*f)*(f*x + e)^2 + 9*(b*d^3*e^2 - 2*
b*c*d^2*e*f + b*c^2*d*f^2)*(f*x + e))*log(((a^2 + b^2)*cos(2*f*x + 2*e)...
```

3.52.8 Giac [F]

$$\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx=\int \frac{(dx+c)^3}{b\cot(fx+e)+a}\,dx$$

input
```
integrate((d*x+c)^3/(a+b*cot(f*x+e)),x, algorithm="giac")
```

output
```
integrate((d*x + c)^3/(b*cot(f*x + e) + a), x)
```

3.52.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx)^3}{a+b\cot(e+fx)}\,dx=\int \frac{(c+d\,x)^3}{a+b\cot(e+f\,x)}\,dx$$

input
```
int((c + d*x)^3/(a + b*cot(e + f*x)),x)
```

output
```
int((c + d*x)^3/(a + b*cot(e + f*x)), x)
```

3.53 $\int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx$

3.53.1 Optimal result

Integrand size = 20, antiderivative size = 181

$$\int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx = \frac{(c+dx)^3}{3(a-ib)d} - \frac{b(c+dx)^2\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{(a^2+b^2)f} + \frac{ibd(c+dx)\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{(a^2+b^2)f^2} - \frac{bd^2\operatorname{PolyLog}\left(3,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2(a^2+b^2)f^3}$$

output
```
1/3*(d*x+c)^3/(a-I*b)/d-b*(d*x+c)^2*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))
/(a^2+b^2)/f+I*b*d*(d*x+c)*polylog(2,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))/(a^
2+b^2)/f^2-1/2*b*d^2*polylog(3,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))/(a^2+b^2)
/f^3
```

3.53.2 Mathematica [A] (verified)

Time = 1.64 (sec) , antiderivative size = 289, normalized size of antiderivative = 1.60

$$\int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx$$
$$=\frac{b\left(\frac{4i(c+dx)^3}{(a+ib)d}-\frac{6\left(a\left(-1+e^{2ie}\right)+ib\left(1+e^{2ie}\right)\right)(c+dx)^2\log\left(1+\frac{(-a+ib)e^{-2i(e+fx)}}{a+ib}\right)}{(a^2+b^2)f}+\frac{3d\left(-ia\left(-1+e^{2ie}\right)+b\left(1+e^{2ie}\right)\right)\left(2f(c+dx)\operatorname{PolyLog}\left(2,\right.\right.}{(a^2+}\right.}{6\left(a\left(-1+e^{2ie}\right)+ib\left(1+e^{2ie}\right)\right)}$$
$$+\frac{x(3c^2+3cdx+d^2x^2)\sin(e)}{3(b\cos(e)+a\sin(e))}$$

input
```
Integrate[(c + d*x)^2/(a + b*Cot[e + f*x]),x]
```

output
```
(b*(((4*I)*(c + d*x)^3)/((a + I*b)*d) - (6*(a*(-1 + E^((2*I)*e)) + I*b*(1
+ E^((2*I)*e)))*(c + d*x)^2*Log[1 + (-a + I*b)/((a + I*b)*E^((2*I)*(e + f*
x)))])/((a^2 + b^2)*f) + (3*d*((-I)*a*(-1 + E^((2*I)*e)) + b*(1 + E^((2*I)
*e)))*(2*f*(c + d*x)*PolyLog[2, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*x)))]
 - I*d*PolyLog[3, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*x)))]))/((a^2 + b^2
)*f^3)))/(6*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((2*I)*e)))) + (x*(3*c^2 +
3*c*d*x + d^2*x^2)*Sin[e])/(3*(b*Cos[e] + a*Sin[e]))
```

3.53.3 Rubi [A] (verified)

Time = 0.70 (sec) , antiderivative size = 187, normalized size of antiderivative = 1.03, number of steps used = 8, number of rules used = 7, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.350, Rules used = {3042, 4214, 25, 2620, 3011, 2720, 7143}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx$$
$$\Big\downarrow \ 3042$$
$$\int \frac{(c+dx)^2}{a-b\tan\left(e+fx+\frac{\pi}{2}\right)}dx$$
$$\Big\downarrow \ 4214$$

$$\frac{(c+dx)^3}{3d(a-ib)}-2ib\int -\frac{e^{2i(e+fx)}(c+dx)^2}{(a-ib)^2-\left(a^2+b^2\right)e^{2i(e+fx)}}dx$$

$$\Big\downarrow \ 25$$

$$2ib\int \frac{e^{2i(e+fx)}(c+dx)^2}{(a-ib)^2-\left(a^2+b^2\right)e^{2i(e+fx)}}dx+\frac{(c+dx)^3}{3d(a-ib)}$$

$$\Big\downarrow \ 2620$$

$$2ib\left(\frac{i(c+dx)^2\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{id\int (c+dx)\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)dx}{f\left(a^2+b^2\right)}\right)+\frac{(c+dx)^3}{3d(a-ib)}$$

$$\Big\downarrow \ 3011$$

$$2ib\left(\frac{i(c+dx)^2\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{id\left(\frac{i(c+dx)\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f}-\frac{id\int \operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)dx}{2f}\right)}{f\left(a^2+b^2\right)}\right)+\frac{(c+dx)^3}{3d(a-ib)}$$

$$\Big\downarrow \ 2720$$

$$2ib\left(\frac{i(c+dx)^2\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{id\left(\frac{i(c+dx)\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f}-\frac{d\int e^{-2i(e+fx)}\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)de^{2i(e+fx)}}{4f^2}\right)}{f\left(a^2+b^2\right)}\right)+\frac{(c+dx)^3}{3d(a-ib)}$$

$$\Big\downarrow \ 7143$$

$$2ib\left(\frac{i(c+dx)^2\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{id\left(\frac{i(c+dx)\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f}-\frac{d\operatorname{PolyLog}\left(3,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{4f^2}\right)}{f\left(a^2+b^2\right)}\right)+\frac{(c+dx)^3}{3d(a-ib)}$$

3.53. $\int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx$

input
```
Int[(c + d*x)^2/(a + b*Cot[e + f*x]),x]
```

output
```
(c + d*x)^3/(3*(a - I*b)*d) + (2*I)*b*(((I/2)*(c + d*x)^2*Log[1 - ((a + I*
b)*E^((2*I)*(e + f*x)))/(a - I*b)])/((a^2 + b^2)*f) - (I*d*(((I/2)*(c + d*
x)*PolyLog[2, ((a + I*b)*E^((2*I)*(e + f*x)))/(a - I*b)])/f - (d*PolyLog[3
, ((a + I*b)*E^((2*I)*(e + f*x)))/(a - I*b)])/(4*f^2)))/((a^2 + b^2)*f))
```

3.53.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2720
```
Int[u_, x_Symbol] :> With[{v = FunctionOfExponential[u, x]}, Simp[v/D[v, x]
   Subst[Int[FunctionOfExponentialFunction[u, x]/x, x], x, v], x]] /; Funct
ionOfExponentialQ[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 3011
```
Int[Log[1 + (e_.)*((F_)^((c_.)*((a_.) + (b_.)*(x_))))^(n_.)]*((f_.) + (g_.)
*(x_))^(m_.), x_Symbol] :> Simp[(-(f + g*x)^m)*(PolyLog[2, (-e)*(F^(c*(a +
b*x)))^n]/(b*c*n*Log[F])), x] + Simp[g*(m/(b*c*n*Log[F]))   Int[(f + g*x)^(
m - 1)*PolyLog[2, (-e)*(F^(c*(a + b*x)))^n], x], x] /; FreeQ[{F, a, b, c, e
, f, g, n}, x] && GtQ[m, 0]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4214
```
Int[((c_.) + (d_.)*(x_))^(m_.)/((a_) + (b_.)*tan[(e_.) + Pi*(k_.) + (f_.)*(
x_)]), x_Symbol] :> Simp[(c + d*x)^(m + 1)/(d*(m + 1)*(a + I*b)), x] + Simp
[2*I*b   Int[(c + d*x)^m*E^(2*I*k*Pi)*(E^Simp[2*I*(e + f*x), x]/((a + I*b)^
2 + (a^2 + b^2)*E^(2*I*k*Pi)*E^Simp[2*I*(e + f*x), x])), x], x] /; FreeQ[{a
, b, c, d, e, f}, x] && IntegerQ[4*k] && NeQ[a^2 + b^2, 0] && IGtQ[m, 0]
```

rule 7143
```
Int[PolyLog[n_, (c_.)*((a_.) + (b_.)*(x_))^(p_.)]/((d_.) + (e_.)*(x_)), x_S
ymbol] :> Simp[PolyLog[n + 1, c*(a + b*x)^p]/(e*p), x] /; FreeQ[{a, b, c, d
, e, n, p}, x] && EqQ[b*d, a*e]
```

3.53.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 896 vs. $2(163) = 326$.

Time = 0.32 (sec) , antiderivative size = 897, normalized size of antiderivative = 4.96

method	result
risch	$\frac{d^2x^3}{3ib+3a}+\frac{dc\,x^2}{ib+a}+\frac{c^2x}{ib+a}+\frac{c^3}{3d(ib+a)}+\frac{2b\,d^2x^3}{3(-ia+b)(-ib+a)}+\frac{2ib\,c^2\ln\left(\mathrm{e}^{i(fx+e)}\right)}{f(-ia+b)(ib-a)}-\frac{ib\,e^2d^2\ln\left(1-\frac{(ib+a)\mathrm{e}^{2i(fx+e)}}{-ib+a}\right)}{f^3(-ia+b)(-ib+a)}+\frac{2ibc}{}$

input
```
int((d*x+c)^2/(a+b*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
1/3*d^2/(a+I*b)*x^3+d/(a+I*b)*c*x^2+1/(a+I*b)*c^2*x+1/3/d/(a+I*b)*c^3+2/3/
(b-I*a)*b/(a-I*b)*d^2*x^3+2*I/f/(b-I*a)*b*c^2/(I*b-a)*ln(exp(I*(f*x+e)))-I
/f^3/(b-I*a)*b/(a-I*b)*e^2*d^2*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))+2*I/
f^2/(b-I*a)*b/(a-I*b)*c*d*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))*e-I/f^3/(
b-I*a)*b*e^2*d^2/(I*b-a)*ln(exp(2*I*(f*x+e))*a+I*b*exp(2*I*(f*x+e))-a+I*b)
-4*I/f^2/(b-I*a)*b*e*c*d/(I*b-a)*ln(exp(I*(f*x+e)))-2/f^2/(b-I*a)*b/(a-I*b
)*e^2*d^2*x+1/f^2/(b-I*a)*b/(a-I*b)*d^2*polylog(2,(a+I*b)*exp(2*I*(f*x+e))
/(a-I*b))*x+2*I/f^3/(b-I*a)*b*e^2*d^2/(I*b-a)*ln(exp(I*(f*x+e)))+2*I/f^2/(
b-I*a)*b*e*c*d/(I*b-a)*ln(exp(2*I*(f*x+e))*a+I*b*exp(2*I*(f*x+e))-a+I*b)+2
/(b-I*a)*b/(a-I*b)*c*d*x^2+4/f/(b-I*a)*b/(a-I*b)*c*d*e*x+2/f^2/(b-I*a)*b/(
a-I*b)*c*d*e^2+1/f^2/(b-I*a)*b/(a-I*b)*c*d*polylog(2,(a+I*b)*exp(2*I*(f*x+
e))/(a-I*b))+1/2*I/f^3/(b-I*a)*b/(a-I*b)*d^2*polylog(3,(a+I*b)*exp(2*I*(f*
x+e))/(a-I*b))-I/f/(b-I*a)*b*c^2/(I*b-a)*ln(exp(2*I*(f*x+e))*a+I*b*exp(2*I
*(f*x+e))-a+I*b)+2*I/f/(b-I*a)*b/(a-I*b)*c*d*ln(1-(a+I*b)*exp(2*I*(f*x+e))
/(a-I*b))*x-4/3/f^3/(b-I*a)*b/(a-I*b)*e^3*d^2+I/f/(b-I*a)*b/(a-I*b)*d^2*ln
(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))*x^2
```

3.53.5 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. 732 vs. $2(154) = 308$.

Time = 0.31 (sec) , antiderivative size = 732, normalized size of antiderivative = 4.04

$$\int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx$$
$$= \frac{4\,ad^2f^3x^3 + 12\,acdf^3x^2 + 12\,ac^2f^3x - 3\,bd^2\text{polylog}\left(3, \frac{(a^2+2i\,ab-b^2)\cos(2\,fx+2\,e)+(i\,a^2-2\,ab-i\,b^2)\sin(2\,fx+2\,e)}{a^2+b^2}\right) - 3}{}$$

input
```
integrate((d*x+c)^2/(a+b*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/12*(4*a*d^2*f^3*x^3 + 12*a*c*d*f^3*x^2 + 12*a*c^2*f^3*x - 3*b*d^2*polylo
g(3, ((a^2 + 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (I*a^2 - 2*a*b - I*b^2)*sin
(2*f*x + 2*e))/(a^2 + b^2)) - 3*b*d^2*polylog(3, ((a^2 - 2*I*a*b - b^2)*co
s(2*f*x + 2*e) + (-I*a^2 - 2*a*b + I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2)) -
 6*(-I*b*d^2*f*x - I*b*c*d*f)*dilog(-(a^2 + b^2 - (a^2 + 2*I*a*b - b^2)*co
s(2*f*x + 2*e) + (-I*a^2 + 2*a*b + I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2) +
1) - 6*(I*b*d^2*f*x + I*b*c*d*f)*dilog(-(a^2 + b^2 - (a^2 - 2*I*a*b - b^2)
*cos(2*f*x + 2*e) + (I*a^2 + 2*a*b - I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2)
+ 1) - 6*(b*d^2*e^2 - 2*b*c*d*e*f + b*c^2*f^2)*log(1/2*a^2 + I*a*b - 1/2*b
^2 - 1/2*(a^2 + b^2)*cos(2*f*x + 2*e) + 1/2*(I*a^2 + I*b^2)*sin(2*f*x + 2*
e)) - 6*(b*d^2*e^2 - 2*b*c*d*e*f + b*c^2*f^2)*log(-1/2*a^2 + I*a*b + 1/2*b
^2 + 1/2*(a^2 + b^2)*cos(2*f*x + 2*e) + 1/2*(I*a^2 + I*b^2)*sin(2*f*x + 2*
e)) - 6*(b*d^2*f^2*x^2 + 2*b*c*d*f^2*x - b*d^2*e^2 + 2*b*c*d*e*f)*log((a^2
 + b^2 - (a^2 + 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (-I*a^2 + 2*a*b + I*b^2)
*sin(2*f*x + 2*e))/(a^2 + b^2)) - 6*(b*d^2*f^2*x^2 + 2*b*c*d*f^2*x - b*d^2
*e^2 + 2*b*c*d*e*f)*log((a^2 + b^2 - (a^2 - 2*I*a*b - b^2)*cos(2*f*x + 2*e
) + (I*a^2 + 2*a*b - I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2)))/((a^2 + b^2)*f
^3)
```

3.53.6 Sympy [F]

$$\int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx = \int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx$$

input
```
integrate((d*x+c)**2/(a+b*cot(f*x+e)),x)
```

output
```
Integral((c + d*x)**2/(a + b*cot(e + f*x)), x)
```

3.53.7 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. 720 vs. 2(154) = 308.

Time = 0.54 (sec) , antiderivative size = 720, normalized size of antiderivative = 3.98

$$\int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx =$$

$$-\frac{6\,cde\left(\frac{2\,(fx+e)a}{(a^2+b^2)f}-\frac{2\,b\log(a\tan(fx+e)+b)}{(a^2+b^2)f}+\frac{b\log\left(\tan(fx+e)^2+1\right)}{(a^2+b^2)f}\right)-3\left(\frac{2\,(fx+e)a}{a^2+b^2}-\frac{2\,b\log(a\tan(fx+e)+b)}{a^2+b^2}+\frac{b\log\left(\tan(f\dots\right.}{a^2+\dots}\right.}{\dots}$$

input
```
integrate((d*x+c)^2/(a+b*cot(f*x+e)),x, algorithm="maxima")
```

output
```
-1/6*(6*c*d*e*(2*(f*x + e)*a/((a^2 + b^2)*f) - 2*b*log(a*tan(f*x + e) + b)
/((a^2 + b^2)*f) + b*log(tan(f*x + e)^2 + 1)/((a^2 + b^2)*f)) - 3*(2*(f*x
+ e)*a/(a^2 + b^2) - 2*b*log(a*tan(f*x + e) + b)/(a^2 + b^2) + b*log(tan(f
*x + e)^2 + 1)/(a^2 + b^2))*c^2 - (2*(f*x + e)^3*(a + I*b)*d^2 + 6*(f*x +
e)*(a + I*b)*d^2*e^2 - 6*I*b*d^2*e^2*arctan2(b*cos(2*f*x + 2*e) + a*sin(2*
f*x + 2*e) + b, a*cos(2*f*x + 2*e) - b*sin(2*f*x + 2*e) - a) - 3*b*d^2*e^2
*log((a^2 + b^2)*cos(2*f*x + 2*e)^2 + 4*a*b*sin(2*f*x + 2*e) + (a^2 + b^2)
*sin(2*f*x + 2*e)^2 + a^2 + b^2 - 2*(a^2 - b^2)*cos(2*f*x + 2*e)) - 3*b*d^
2*polylog(3, (I*a - b)*e^(2*I*f*x + 2*I*e)/(I*a + b)) - 6*((a + I*b)*d^2*e
 - (a + I*b)*c*d*f)*(f*x + e)^2 + 6*(-I*(f*x + e)^2*b*d^2 + 2*(I*b*d^2*e -
 I*b*c*d*f)*(f*x + e))*arctan2(-(2*a*b*cos(2*f*x + 2*e) + (a^2 - b^2)*sin(
2*f*x + 2*e))/(a^2 + b^2), (2*a*b*sin(2*f*x + 2*e) + a^2 + b^2 - (a^2 - b^
2)*cos(2*f*x + 2*e))/(a^2 + b^2)) + 6*(I*(f*x + e)*b*d^2 - I*b*d^2*e + I*b
*c*d*f)*dilog((I*a - b)*e^(2*I*f*x + 2*I*e)/(I*a + b)) - 3*((f*x + e)^2*b*
d^2 - 2*(b*d^2*e - b*c*d*f)*(f*x + e))*log(((a^2 + b^2)*cos(2*f*x + 2*e)^2
 + 4*a*b*sin(2*f*x + 2*e) + (a^2 + b^2)*sin(2*f*x + 2*e)^2 + a^2 + b^2 - 2
*(a^2 - b^2)*cos(2*f*x + 2*e))/(a^2 + b^2)))/((a^2 + b^2)*f^2))/f
```

3.53.8 Giac [F]

$$\int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx = \int \frac{(dx+c)^2}{b\cot(fx+e)+a}\,dx$$

input
```
integrate((d*x+c)^2/(a+b*cot(f*x+e)),x, algorithm="giac")
```

output
```
integrate((d*x + c)^2/(b*cot(f*x + e) + a), x)
```

3.53.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx)^2}{a+b\cot(e+fx)}\,dx = \int \frac{(c+d\,x)^2}{a+b\cot(e+f\,x)}\,dx$$

input
```
int((c + d*x)^2/(a + b*cot(e + f*x)),x)
```

output
```
int((c + d*x)^2/(a + b*cot(e + f*x)), x)
```

3.54 $\int \frac{c+dx}{a+b\cot(e+fx)}\,dx$

3.54.1 Optimal result

Integrand size = 18, antiderivative size = 126

$$\int \frac{c+dx}{a+b\cot(e+fx)}\,dx = \frac{(c+dx)^2}{2(a-ib)d} - \frac{b(c+dx)\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{(a^2+b^2)\,f} + \frac{ibd\,\text{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2\,(a^2+b^2)\,f^2}$$

output
```
1/2*(d*x+c)^2/(a-I*b)/d-b*(d*x+c)*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))/(
a^2+b^2)/f+1/2*I*b*d*polylog(2,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))/(a^2+b^2)
/f^2
```

3.54.2 Mathematica [A] (verified)

Time = 2.13 (sec) , antiderivative size = 182, normalized size of antiderivative = 1.44

$$\int \frac{c+dx}{a+b\cot(e+fx)}\,dx = \frac{1}{2}b\left(\frac{2i(c+dx)^2}{(a+ib)d\,(a\,(-1+e^{2ie})+ib\,(1+e^{2ie}))} - \frac{2(c+dx)\log\left(1+\frac{(-a+ib)e^{-2i(e+fx)}}{a+ib}\right)}{(a^2+b^2)\,f} - \frac{id\,\text{PolyLog}\left(2,\frac{(a-ib)e^{-2i(e+fx)}}{a+ib}\right)}{(a^2+b^2)\,f^2}\right) + \frac{x(2c+dx)\sin(e)}{2(b\cos(e)+a\sin(e))}$$

input
```
Integrate[(c + d*x)/(a + b*Cot[e + f*x]),x]
```

output
```
(b*(((2*I)*(c + d*x)^2)/((a + I*b)*d*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((
2*I)*e)))) - (2*(c + d*x)*Log[1 + (-a + I*b)/((a + I*b)*E^((2*I)*(e + f*x)
))])/((a^2 + b^2)*f) - (I*d*PolyLog[2, (a - I*b)/((a + I*b)*E^((2*I)*(e +
f*x)))])/((a^2 + b^2)*f^2)))/2 + (x*(2*c + d*x)*Sin[e])/(2*(b*Cos[e] + a*S
in[e]))
```

3.54.3 Rubi [A] (verified)

Time = 0.47 (sec) , antiderivative size = 132, normalized size of antiderivative = 1.05, number of steps used = 7, number of rules used = 6, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {3042, 4214, 25, 2620, 2715, 2838}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{c+dx}{a+b\cot(e+fx)}dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int \frac{c+dx}{a-b\tan\left(e+fx+\frac{\pi}{2}\right)}dx$$

$$\Big\downarrow \text{ 4214}$$

$$\frac{(c+dx)^2}{2d(a-ib)}-2ib\int -\frac{e^{2i(e+fx)}(c+dx)}{(a-ib)^2-\left(a^2+b^2\right)e^{2i(e+fx)}}dx$$

$$\Big\downarrow \text{ 25}$$

$$2ib\int \frac{e^{2i(e+fx)}(c+dx)}{(a-ib)^2-\left(a^2+b^2\right)e^{2i(e+fx)}}dx+\frac{(c+dx)^2}{2d(a-ib)}$$

$$\Big\downarrow \text{ 2620}$$

$$2ib\left(\frac{i(c+dx)\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{id\int \log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)dx}{2f\left(a^2+b^2\right)}\right)+\frac{(c+dx)^2}{2d(a-ib)}$$

$$\Big\downarrow \text{ 2715}$$

$$2ib\left(\frac{i(c+dx)\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}-\frac{d\int e^{-2i(e+fx)}\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)de^{2i(e+fx)}}{4f^2\left(a^2+b^2\right)}\right)+\frac{(c+dx)^2}{2d(a-ib)}$$

$$\Big\downarrow \text{2838}$$

$$2ib\left(\frac{i(c+dx)\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f\left(a^2+b^2\right)}+\frac{d\,\text{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{4f^2\left(a^2+b^2\right)}\right)+\frac{(c+dx)^2}{2d(a-ib)}$$

input
```
Int[(c + d*x)/(a + b*Cot[e + f*x]),x]
```

output
```
(c + d*x)^2/(2*(a - I*b)*d) + (2*I)*b*(((I/2)*(c + d*x)*Log[1 - ((a + I*b)
*E^((2*I)*(e + f*x)))/(a - I*b)])/((a^2 + b^2)*f) + (d*PolyLog[2, ((a + I*
b)*E^((2*I)*(e + f*x)))/(a - I*b)])/(4*(a^2 + b^2)*f^2))
```

3.54.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2715
```
Int[Log[(a_) + (b_.)*((F_)^((e_.)*((c_.) + (d_.)*(x_))))^(n_.)], x_Symbol]
:> Simp[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 2838
```
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 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4214
```
Int[((c_.) + (d_.)*(x_))^(m_.)/((a_) + (b_.)*tan[(e_.) + Pi*(k_.) + (f_.)*(
x_)]), x_Symbol] :> Simp[(c + d*x)^(m + 1)/(d*(m + 1)*(a + I*b)), x] + Simp
[2*I*b   Int[(c + d*x)^m*E^(2*I*k*Pi)*(E^Simp[2*I*(e + f*x), x]/((a + I*b)^
2 + (a^2 + b^2)*E^(2*I*k*Pi)*E^Simp[2*I*(e + f*x), x])), x], x] /; FreeQ[{a
, b, c, d, e, f}, x] && IntegerQ[4*k] && NeQ[a^2 + b^2, 0] && IGtQ[m, 0]
```

3.54.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 444 vs. 2(112) = 224.

Time = 0.38 (sec) , antiderivative size = 445, normalized size of antiderivative = 3.53

method	result
risch	$\frac{d\,x^{2}}{2ib+2a}+\frac{xc}{ib+a}-\frac{2bc\ln\left(\mathrm{e}^{i(fx+e)}\right)}{f(ib+a)(ib-a)}+\frac{bc\ln\left(\mathrm{e}^{2i(fx+e)}a+ib\,\mathrm{e}^{2i(fx+e)}-a+ib\right)}{f(ib+a)(ib-a)}-\frac{bd\ln\left(1-\frac{(ib+a)\mathrm{e}^{2i(fx+e)}}{-ib+a}\right)x}{f(ib+a)(-ib+a)}+\frac{ibd\,x^{2}}{(ib+a)(-ib+a}$

input
```
int((d*x+c)/(a+b*cot(f*x+e)),x,method=_RETURNVERBOSE)
```

output
```
1/2/(a+I*b)*d*x^2+1/(a+I*b)*x*c-2/f*b/(a+I*b)*c/(I*b-a)*ln(exp(I*(f*x+e)))
+1/f*b/(a+I*b)*c/(I*b-a)*ln(exp(2*I*(f*x+e))*a+I*b*exp(2*I*(f*x+e))-a+I*b)
-1/f*b/(a+I*b)/(a-I*b)*d*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))*x+I*b/(a+I
*b)/(a-I*b)*d*x^2-1/f^2*b/(a+I*b)/(a-I*b)*d*ln(1-(a+I*b)*exp(2*I*(f*x+e))/
(a-I*b))*e+2*I/f*b/(a+I*b)/(a-I*b)*d*e*x+I/f^2*b/(a+I*b)/(a-I*b)*d*e^2+1/2
*I/f^2*b/(a+I*b)/(a-I*b)*d*polylog(2,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))+2/f
^2*b/(a+I*b)*d*e/(I*b-a)*ln(exp(I*(f*x+e)))-1/f^2*b/(a+I*b)*d*e/(I*b-a)*ln
(exp(2*I*(f*x+e))*a+I*b*exp(2*I*(f*x+e))-a+I*b)
```

3.54.5 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. 475 vs. 2(105) = 210.

Time = 0.29 (sec) , antiderivative size = 475, normalized size of antiderivative = 3.77

$$\int \frac{c+dx}{a+b\cot(e+fx)}\,dx = \frac{2\,adf^{2}x^{2}+4\,acf^{2}x+i\,bd\mathrm{Li}_2\left(-\frac{a^{2}+b^{2}-(a^{2}+2i\,ab-b^{2})\cos(2\,fx+2\,e)+(-i\,a^{2}+2\,ab+i\,b^{2})\sin(2\,fx+2\,e)}{a^{2}+b^{2}}+1\right)-i\,bd\mathrm{Li}_2\left(-\frac{a^{2}+\cdots}{\cdots}\right.}{\cdots}$$

input
```
integrate((d*x+c)/(a+b*cot(f*x+e)),x, algorithm="fricas")
```

output
```
1/4*(2*a*d*f^2*x^2 + 4*a*c*f^2*x + I*b*d*dilog(-(a^2 + b^2 - (a^2 + 2*I*a*
b - b^2)*cos(2*f*x + 2*e) + (-I*a^2 + 2*a*b + I*b^2)*sin(2*f*x + 2*e))/(a^
2 + b^2) + 1) - I*b*d*dilog(-(a^2 + b^2 - (a^2 - 2*I*a*b - b^2)*cos(2*f*x
+ 2*e) + (I*a^2 + 2*a*b - I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2) + 1) + 2*(b
*d*e - b*c*f)*log(1/2*a^2 + I*a*b - 1/2*b^2 - 1/2*(a^2 + b^2)*cos(2*f*x +
2*e) + 1/2*(I*a^2 + I*b^2)*sin(2*f*x + 2*e)) + 2*(b*d*e - b*c*f)*log(-1/2*
a^2 + I*a*b + 1/2*b^2 + 1/2*(a^2 + b^2)*cos(2*f*x + 2*e) + 1/2*(I*a^2 + I*
b^2)*sin(2*f*x + 2*e)) - 2*(b*d*f*x + b*d*e)*log((a^2 + b^2 - (a^2 + 2*I*a
*b - b^2)*cos(2*f*x + 2*e) + (-I*a^2 + 2*a*b + I*b^2)*sin(2*f*x + 2*e))/(a
^2 + b^2)) - 2*(b*d*f*x + b*d*e)*log((a^2 + b^2 - (a^2 - 2*I*a*b - b^2)*co
s(2*f*x + 2*e) + (I*a^2 + 2*a*b - I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2)))/(
(a^2 + b^2)*f^2)
```

3.54.6 Sympy [F]

$$\int \frac{c+dx}{a+b\cot(e+fx)}\,dx = \int \frac{c+dx}{a+b\cot(e+fx)}\,dx$$

input
```
integrate((d*x+c)/(a+b*cot(f*x+e)),x)
```

output
```
Integral((c + d*x)/(a + b*cot(e + f*x)), x)
```

3.54.7 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. 406 vs. $2(105) = 210$.

Time = 0.45 (sec) , antiderivative size = 406, normalized size of antiderivative = 3.22

$$\int \frac{c+dx}{a+b\cot(e+fx)}\,dx$$
$$= \frac{(a+ib)df^2x^2 + 2(a+ib)cf^2x - 2ibdfx\arctan\left(-\frac{2ab\cos(2fx+2e)+(a^2-b^2)\sin(2fx+2e)}{a^2+b^2}, \frac{2ab\sin(2fx+2e)+a^2+b^2-(}{a^2+b^2}\right.}{}$$

input
```
integrate((d*x+c)/(a+b*cot(f*x+e)),x, algorithm="maxima")
```

output
```
1/2*((a + I*b)*d*f^2*x^2 + 2*(a + I*b)*c*f^2*x - 2*I*b*d*f*x*arctan2(-(2*a
*b*cos(2*f*x + 2*e) + (a^2 - b^2)*sin(2*f*x + 2*e))/(a^2 + b^2), (2*a*b*si
n(2*f*x + 2*e) + a^2 + b^2 - (a^2 - b^2)*cos(2*f*x + 2*e))/(a^2 + b^2)) -
b*d*f*x*log(((a^2 + b^2)*cos(2*f*x + 2*e)^2 + 4*a*b*sin(2*f*x + 2*e) + (a^
2 + b^2)*sin(2*f*x + 2*e)^2 + a^2 + b^2 - 2*(a^2 - b^2)*cos(2*f*x + 2*e))/
(a^2 + b^2)) - 2*I*b*c*f*arctan2(b*cos(2*f*x + 2*e) + a*sin(2*f*x + 2*e) +
 b, a*cos(2*f*x + 2*e) - b*sin(2*f*x + 2*e) - a) - b*c*f*log((a^2 + b^2)*c
os(2*f*x + 2*e)^2 + 4*a*b*sin(2*f*x + 2*e) + (a^2 + b^2)*sin(2*f*x + 2*e)^
2 + a^2 + b^2 - 2*(a^2 - b^2)*cos(2*f*x + 2*e)) + I*b*d*dilog((I*a - b)*e^
(2*I*f*x + 2*I*e)/(I*a + b)))/((a^2 + b^2)*f^2)
```

3.54.8 Giac [F]

$$\int \frac{c+dx}{a+b\cot(e+fx)}\,dx=\int \frac{dx+c}{b\cot\left(fx+e\right)+a}\,dx$$

input
```
integrate((d*x+c)/(a+b*cot(f*x+e)),x, algorithm="giac")
```

output
```
integrate((d*x + c)/(b*cot(f*x + e) + a), x)
```

3.54.9 Mupad [F(-1)]

Timed out.

$$\int \frac{c+dx}{a+b\cot(e+fx)}\,dx=\int \frac{c+d\,x}{a+b\cot\left(e+f\,x\right)}\,dx$$

input
```
int((c + d*x)/(a + b*cot(e + f*x)),x)
```

output
```
int((c + d*x)/(a + b*cot(e + f*x)), x)
```

3.55 $\int \frac{1}{(c+dx)(a+b\cot(e+fx))}\,dx$

3.55.1 Optimal result

Integrand size = 20, antiderivative size = 20

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))}\,dx = \text{Int}\left(\frac{1}{(c+dx)(a+b\cot(e+fx))},x\right)$$

output
```
Unintegrable(1/(d*x+c)/(a+b*cot(f*x+e)),x)
```

3.55.2 Mathematica [N/A]

Not integrable

Time = 3.34 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))}\,dx = \int \frac{1}{(c+dx)(a+b\cot(e+fx))}\,dx$$

input
```
Integrate[1/((c + d*x)*(a + b*Cot[e + f*x])),x]
```

output
```
Integrate[1/((c + d*x)*(a + b*Cot[e + f*x])), x]
```

3.55.3 Rubi [N/A]

Not integrable

Time = 0.23 (sec) , antiderivative size = 20, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))}dx$$
$$\Big\downarrow \text{3042}$$
$$\int \frac{1}{(c+dx)\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)}dx$$
$$\Big\downarrow \text{4223}$$
$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))}dx$$

input
```
Int[1/((c + d*x)*(a + b*Cot[e + f*x])),x]
```

output
```
$Aborted
```

3.55.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.55.4 Maple [N/A] (verified)

Not integrable

Time = 0.28 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{1}{(dx+c)\,(a+b\cot{(fx+e)})}dx$$

input
```
int(1/(d*x+c)/(a+b*cot(f*x+e)),x)
```

output
```
int(1/(d*x+c)/(a+b*cot(f*x+e)),x)
```

3.55.5 Fricas [N/A]

Not integrable

Time = 0.27 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.35

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))}\,dx = \int \frac{1}{(dx+c)(b\cot{(fx+e)}+a)}\,dx$$

input
```
integrate(1/(d*x+c)/(a+b*cot(f*x+e)),x, algorithm="fricas")
```

output
```
integral(1/(a*d*x + a*c + (b*d*x + b*c)*cot(f*x + e)), x)
```

3.55.6 Sympy [N/A]

Not integrable

Time = 0.95 (sec) , antiderivative size = 17, normalized size of antiderivative = 0.85

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))}\,dx = \int \frac{1}{(a+b\cot{(e+fx)})\,(c+dx)}\,dx$$

input
```
integrate(1/(d*x+c)/(a+b*cot(f*x+e)),x)
```

output
```
Integral(1/((a + b*cot(e + f*x))*(c + d*x)), x)
```

3.55.7 Maxima [N/A]

Not integrable

Time = 0.94 (sec) , antiderivative size = 279, normalized size of antiderivative = 13.95

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))}\,dx = \int \frac{1}{(dx+c)(b\cot(fx+e)+a)}\,dx$$

input
```
integrate(1/(d*x+c)/(a+b*cot(f*x+e)),x, algorithm="maxima")
```

output
```
(2*(a^2*b + b^3)*d*integrate(-(2*a*b*cos(2*f*x + 2*e) + (a^2 - b^2)*sin(2*
f*x + 2*e))/((a^4 + 2*a^2*b^2 + b^4)*d*x + ((a^4 + 2*a^2*b^2 + b^4)*d*x +
(a^4 + 2*a^2*b^2 + b^4)*c)*cos(2*f*x + 2*e)^2 + ((a^4 + 2*a^2*b^2 + b^4)*d
*x + (a^4 + 2*a^2*b^2 + b^4)*c)*sin(2*f*x + 2*e)^2 + (a^4 + 2*a^2*b^2 + b^
4)*c - 2*((a^4 - b^4)*d*x + (a^4 - b^4)*c)*cos(2*f*x + 2*e) + 4*((a^3*b +
a*b^3)*d*x + (a^3*b + a*b^3)*c)*sin(2*f*x + 2*e)), x) + a*log(d*x + c))/((
a^2 + b^2)*d)
```

3.55.8 Giac [N/A]

Not integrable

Time = 0.31 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))}\,dx = \int \frac{1}{(dx+c)(b\cot(fx+e)+a)}\,dx$$

input
```
integrate(1/(d*x+c)/(a+b*cot(f*x+e)),x, algorithm="giac")
```

output
```
integrate(1/((d*x + c)*(b*cot(f*x + e) + a)), x)
```

3.55.9 Mupad [N/A]

Not integrable

Time = 12.66 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))}\,dx = \int \frac{1}{(a+b\cot(e+f\,x))\,\,(c+d\,x)}\,dx$$

input
```
int(1/((a + b*cot(e + f*x))*(c + d*x)),x)
```

output
```
int(1/((a + b*cot(e + f*x))*(c + d*x)), x)
```

3.56 $\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}\,dx$

3.56.1 Optimal result

Integrand size = 20, antiderivative size = 20

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}\,dx = \text{Int}\left(\frac{1}{(c+dx)^2(a+b\cot(e+fx))},x\right)$$

output
```
Unintegrable(1/(d*x+c)^2/(a+b*cot(f*x+e)),x)
```

3.56.2 Mathematica [N/A]

Not integrable

Time = 5.30 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}\,dx = \int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}\,dx$$

input
```
Integrate[1/((c + d*x)^2*(a + b*Cot[e + f*x])),x]
```

output
```
Integrate[1/((c + d*x)^2*(a + b*Cot[e + f*x])), x]
```

3.56.3 Rubi [N/A]

Not integrable

Time = 0.23 (sec) , antiderivative size = 20, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int \frac{1}{(c+dx)^2\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)}dx$$

$$\Big\downarrow \text{ 4223}$$

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}dx$$

input
```
Int[1/((c + d*x)^2*(a + b*Cot[e + f*x])),x]
```

output
```
$Aborted
```

3.56.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.56.4 Maple [N/A] (verified)

Not integrable

Time = 0.29 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{1}{(dx+c)^2 (a+b\cot(fx+e))}dx$$

input
```
int(1/(d*x+c)^2/(a+b*cot(f*x+e)),x)
```

output
```
int(1/(d*x+c)^2/(a+b*cot(f*x+e)),x)
```

3.56.5 Fricas [N/A]

Not integrable

Time = 0.26 (sec) , antiderivative size = 51, normalized size of antiderivative = 2.55

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}\,dx = \int \frac{1}{(dx+c)^2(b\cot(fx+e)+a)}\,dx$$

input
```
integrate(1/(d*x+c)^2/(a+b*cot(f*x+e)),x, algorithm="fricas")
```

output
```
integral(1/(a*d^2*x^2 + 2*a*c*d*x + a*c^2 + (b*d^2*x^2 + 2*b*c*d*x + b*c^2
)*cot(f*x + e)), x)
```

3.56.6 Sympy [N/A]

Not integrable

Time = 1.65 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.95

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}\,dx = \int \frac{1}{(a+b\cot(e+fx))\,(c+dx)^2}\,dx$$

input
```
integrate(1/(d*x+c)**2/(a+b*cot(f*x+e)),x)
```

output
```
Integral(1/((a + b*cot(e + f*x))*(c + d*x)**2), x)
```

3.56.7 Maxima [N/A]

Not integrable

Time = 2.50 (sec) , antiderivative size = 424, normalized size of antiderivative = 21.20

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}\,dx = \int \frac{1}{(dx+c)^2(b\cot(fx+e)+a)}\,dx$$

input
```
integrate(1/(d*x+c)^2/(a+b*cot(f*x+e)),x, algorithm="maxima")
```

output
```
(2*((a^2*b + b^3)*d^2*x + (a^2*b + b^3)*c*d)*integrate(-(2*a*b*cos(2*f*x +
 2*e) + (a^2 - b^2)*sin(2*f*x + 2*e))/((a^4 + 2*a^2*b^2 + b^4)*d^2*x^2 + 2
*(a^4 + 2*a^2*b^2 + b^4)*c*d*x + (a^4 + 2*a^2*b^2 + b^4)*c^2 + ((a^4 + 2*a
^2*b^2 + b^4)*d^2*x^2 + 2*(a^4 + 2*a^2*b^2 + b^4)*c*d*x + (a^4 + 2*a^2*b^2
 + b^4)*c^2)*cos(2*f*x + 2*e)^2 + ((a^4 + 2*a^2*b^2 + b^4)*d^2*x^2 + 2*(a^
4 + 2*a^2*b^2 + b^4)*c*d*x + (a^4 + 2*a^2*b^2 + b^4)*c^2)*sin(2*f*x + 2*e)
^2 - 2*((a^4 - b^4)*d^2*x^2 + 2*(a^4 - b^4)*c*d*x + (a^4 - b^4)*c^2)*cos(2
*f*x + 2*e) + 4*((a^3*b + a*b^3)*d^2*x^2 + 2*(a^3*b + a*b^3)*c*d*x + (a^3*
b + a*b^3)*c^2)*sin(2*f*x + 2*e)), x) - a)/((a^2 + b^2)*d^2*x + (a^2 + b^2
)*c*d)
```

3.56.8 Giac [N/A]

Not integrable

Time = 2.22 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}\,dx = \int \frac{1}{(dx+c)^2(b\cot(fx+e)+a)}\,dx$$

input
```
integrate(1/(d*x+c)^2/(a+b*cot(f*x+e)),x, algorithm="giac")
```

output
```
integrate(1/((d*x + c)^2*(b*cot(f*x + e) + a)), x)
```

3.56.9 Mupad [N/A]

Not integrable

Time = 12.16 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))}\,dx=\int \frac{1}{\left(a+b\cot\left(e+f\,x\right)\right)\,{\left(c+d\,x\right)}^2}\,dx$$

input
```
int(1/((a + b*cot(e + f*x))*(c + d*x)^2),x)
```

output
```
int(1/((a + b*cot(e + f*x))*(c + d*x)^2), x)
```

3.57 $\int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx$

3.57.1 Optimal result

Integrand size = 20, antiderivative size = 839

$$\int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx = -\frac{2ib^2(c+dx)^3}{\left(a^2+b^2\right)^2 f} - \frac{2b^2(c+dx)^3}{(a-ib)(a+ib)^2\left(ia+b-(ia-b)e^{2ie+2ifx}\right)f}$$
$$+\frac{(c+dx)^4}{4(a+ib)^2d} - \frac{b(c+dx)^4}{(a+ib)^2(ia+b)d} - \frac{b^2(c+dx)^4}{\left(a^2+b^2\right)^2 d}$$
$$+\frac{3b^2d(c+dx)^2\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{\left(a^2+b^2\right)^2 f^2}$$
$$-\frac{2b(c+dx)^3\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a-ib)(a+ib)^2 f}$$
$$-\frac{2ib^2(c+dx)^3\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{\left(a^2+b^2\right)^2 f}$$
$$-\frac{3ib^2d^2(c+dx)\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{\left(a^2+b^2\right)^2 f^3}$$
$$-\frac{3bd(c+dx)^2\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a+ib)^2(ia+b)f^2}$$
$$-\frac{3b^2d(c+dx)^2\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{\left(a^2+b^2\right)^2 f^2}$$
$$+\frac{3b^2d^3\operatorname{PolyLog}\left(3,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{2\left(a^2+b^2\right)^2 f^4}$$
$$-\frac{3bd^2(c+dx)\operatorname{PolyLog}\left(3,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a-ib)(a+ib)^2 f^3}$$
$$-\frac{3ib^2d^2(c+dx)\operatorname{PolyLog}\left(3,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{\left(a^2+b^2\right)^2 f^3}$$
$$+\frac{3bd^3\operatorname{PolyLog}\left(4,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{2(a+ib)^2(ia+b)f^4}$$
$$+\frac{3b^2d^3\operatorname{PolyLog}\left(4,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{2\left(a^2+b^2\right)^2 f^4}$$

output
```
-2*I*b^2*(d*x+c)^3/(a^2+b^2)^2/f-2*b^2*(d*x+c)^3/(a-I*b)/(a+I*b)^2/(I*a+b-
(I*a-b)*exp(2*I*e+2*I*f*x))/f+1/4*(d*x+c)^4/(a+I*b)^2/d-b*(d*x+c)^4/(a+I*b
)^2/(I*a+b)/d-b^2*(d*x+c)^4/(a^2+b^2)^2/d+3*b^2*d*(d*x+c)^2*ln(1-(a+I*b)*e
xp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+b^2)^2/f^2-2*b*(d*x+c)^3*ln(1-(a+I*b)*exp(
2*I*e+2*I*f*x)/(a-I*b))/(a-I*b)/(a+I*b)^2/f-2*I*b^2*(d*x+c)^3*ln(1-(a+I*b)
*exp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+b^2)^2/f-3*I*b^2*d^2*(d*x+c)*polylog(3,(
a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+b^2)^2/f^3-3*b*d*(d*x+c)^2*polylog
(2,(a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a+I*b)^2/(I*a+b)/f^2-3*b^2*d*(d*x+
c)^2*polylog(2,(a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+b^2)^2/f^2+3/2*b^2
*d^3*polylog(3,(a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+b^2)^2/f^4-3*b*d^2
*(d*x+c)*polylog(3,(a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a-I*b)/(a+I*b)^2/f
^3-3*I*b^2*d^2*(d*x+c)*polylog(2,(a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+
b^2)^2/f^3+3/2*b*d^3*polylog(4,(a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a+I*b)
^2/(I*a+b)/f^4+3/2*b^2*d^3*polylog(4,(a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(
a^2+b^2)^2/f^4
```

3.57.2 Mathematica [B] (warning: unable to verify)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 1733 vs. 2(839) = 1678.

Time = 11.55 (sec) , antiderivative size = 1733, normalized size of antiderivative = 2.07

$$\int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx = \text{Too large to display}$$

input
```
Integrate[(c + d*x)^3/(a + b*Cot[e + f*x])^2,x]
```

output
```
(b*((4*c^2*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((2*I)*e)))*(-3*b*d + 2*a*c*
f)*x)/(a^2 + b^2) - (4*b*(c + d*x)^3)/(a + I*b) + (2*a*f*(c + d*x)^4)/((a
+ I*b)*d) + (12*c*d*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((2*I)*e)))*(-(b*d)
 + a*c*f)*x*Log[1 + (-a + I*b)/((a + I*b)*E^((2*I)*(e + f*x)))])/((a - I*b
)*((-I)*a + b)*f) - (6*d^2*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((2*I)*e)))*
(b*d - 2*a*c*f)*x^2*Log[1 + (-a + I*b)/((a + I*b)*E^((2*I)*(e + f*x)))])/(
(a - I*b)*((-I)*a + b)*f) + (4*a*d^3*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((
2*I)*e)))*x^3*Log[1 + (-a + I*b)/((a + I*b)*E^((2*I)*(e + f*x)))])/((a - I
*b)*((-I)*a + b)) + (2*c^2*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((2*I)*e)))*
(-3*b*d + 2*a*c*f)*Log[a - I*b - (a + I*b)*E^((2*I)*(e + f*x))])/((a - I*b
)*((-I)*a + b)*f) - (6*c*d*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((2*I)*e)))*
(-(b*d) + a*c*f)*PolyLog[2, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*x)))])/((
a^2 + b^2)*f^2) + (3*d^2*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((2*I)*e)))*(b
*d - 2*a*c*f)*(2*f*x*PolyLog[2, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*x)))]
 - I*PolyLog[3, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*x)))]))/((a^2 + b^2)*
f^3) - (3*a*d^3*(a*(-1 + E^((2*I)*e)) + I*b*(1 + E^((2*I)*e)))*(2*f^2*x^2*
PolyLog[2, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*x)))] - (2*I)*f*x*PolyLog[
3, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*x)))] - PolyLog[4, (a - I*b)/((a +
 I*b)*E^((2*I)*(e + f*x)))]))/((a^2 + b^2)*f^3)))/(2*(a - I*b)*(a + I*b)*(
(-I)*a*(-1 + E^((2*I)*e)) + b*(1 + E^((2*I)*e)))*f) + (3*x^2*(-(a*c^2*d...
```

3.57.3 Rubi [A] (verified)

Time = 2.21 (sec) , antiderivative size = 839, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.150$, Rules used = {3042, 4217, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx$$

$$\Big\downarrow \text{ 3042}$$

$$\int \frac{(c+dx)^3}{\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$

$$\Big\downarrow \text{ 4217}$$

$$\int \left(-\frac{4b^2(c+dx)^3}{(-b+ia)^2\left(ia\left(1-\frac{ib}{a}\right)-ia\left(1+\frac{ib}{a}\right)e^{2ie+2ifx}\right)^2}+\frac{4b(c+dx)^3}{(a+ib)^2\left(ia\left(1+\frac{ib}{a}\right)e^{2ie+2ifx}-ia\left(1-\frac{ib}{a}\right)\right)}+\frac{(c+dx)^3}{(a+ib)^2}\right.$$

$\big\downarrow$ 2009

$$-\frac{b(c+dx)^4}{(a+ib)^2(ia+b)d}+\frac{(c+dx)^4}{4(a+ib)^2d}-\frac{b^2(c+dx)^4}{(a^2+b^2)^2\,d}-\frac{2b\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)(c+dx)^3}{(a-ib)(a+ib)^2f}-\frac{2ib^2\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)(c+dx)^3}{(a^2+b^2)^2\,f}-\frac{2b^2(c+dx)^3}{(a-ib)(a+ib)^2\left(ia-(ia-b)e^{2ie+2ifx}+b\right)f}-\frac{2ib^2(c+dx)^3}{(a^2+b^2)^2\,f}+\frac{3b^2d\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)(c+dx)^2}{(a^2+b^2)^2\,f^2}-\frac{3bd\,\text{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)(c+dx)^2}{(a+ib)^2(ia+b)f^2}-\frac{3b^2d\,\text{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)(c+dx)^2}{(a^2+b^2)^2\,f^2}-\frac{3ib^2d^2\,\text{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)(c+dx)}{(a^2+b^2)^2\,f^3}-\frac{3bd^2\,\text{PolyLog}\left(3,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)(c+dx)}{(a-ib)(a+ib)^2f^3}-\frac{3ib^2d^2\,\text{PolyLog}\left(3,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)(c+dx)}{(a^2+b^2)^2\,f^3}+\frac{3b^2d^3\,\text{PolyLog}\left(3,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{2\left(a^2+b^2\right)^2f^4}+\frac{3bd^3\,\text{PolyLog}\left(4,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{2(a+ib)^2(ia+b)f^4}+\frac{3b^2d^3\,\text{PolyLog}\left(4,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{2\left(a^2+b^2\right)^2f^4}$$

input
```
Int[(c + d*x)^3/(a + b*Cot[e + f*x])^2,x]
```

output
```
((-2*I)*b^2*(c + d*x)^3)/((a^2 + b^2)^2*f) - (2*b^2*(c + d*x)^3)/((a - I*b
)*(a + I*b)^2*(I*a + b - (I*a - b)*E^((2*I)*e + (2*I)*f*x))*f) + (c + d*x)
^4/(4*(a + I*b)^2*d) - (b*(c + d*x)^4)/((a + I*b)^2*(I*a + b)*d) - (b^2*(c
 + d*x)^4)/((a^2 + b^2)^2*d) + (3*b^2*d*(c + d*x)^2*Log[1 - ((a + I*b)*E^(
(2*I)*e + (2*I)*f*x))/(a - I*b)])/((a^2 + b^2)^2*f^2) - (2*b*(c + d*x)^3*L
og[1 - ((a + I*b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b)])/((a - I*b)*(a + I*b
)^2*f) - ((2*I)*b^2*(c + d*x)^3*Log[1 - ((a + I*b)*E^((2*I)*e + (2*I)*f*x)
)/(a - I*b)])/((a^2 + b^2)^2*f) - ((3*I)*b^2*d^2*(c + d*x)*PolyLog[2, ((a
+ I*b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b)])/((a^2 + b^2)^2*f^3) - (3*b*d*(
c + d*x)^2*PolyLog[2, ((a + I*b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b)])/((a
+ I*b)^2*(I*a + b)*f^2) - (3*b^2*d*(c + d*x)^2*PolyLog[2, ((a + I*b)*E^((2
*I)*e + (2*I)*f*x))/(a - I*b)])/((a^2 + b^2)^2*f^2) + (3*b^2*d^3*PolyLog[3
, ((a + I*b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b)])/(2*(a^2 + b^2)^2*f^4) -
(3*b*d^2*(c + d*x)*PolyLog[3, ((a + I*b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b
)])/((a - I*b)*(a + I*b)^2*f^3) - ((3*I)*b^2*d^2*(c + d*x)*PolyLog[3, ((a
+ I*b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b)])/((a^2 + b^2)^2*f^3) + (3*b*d^3
*PolyLog[4, ((a + I*b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b)])/(2*(a + I*b)^2
*(I*a + b)*f^4) + (3*b^2*d^3*PolyLog[4, ((a + I*b)*E^((2*I)*e + (2*I)*f*x)
)/(a - I*b)])/(2*(a^2 + b^2)^2*f^4)
```

3.57. $\int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx$

3.57.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4217
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
 x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(a - I*b) - 2*I*(b/(a^2 +
 b^2 + (a - I*b)^2*E^(2*I*(e + f*x)))))^(-n), x], x] /; FreeQ[{a, b, c, d,
e, f}, x] && NeQ[a^2 + b^2, 0] && ILtQ[n, 0] && IGtQ[m, 0]
```

3.57.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 5930 vs. 2(754) = 1508.

Time = 0.78 (sec) , antiderivative size = 5931, normalized size of antiderivative = 7.07

method	result	size
risch	Expression too large to display	5931

input
```
int((d*x+c)^3/(a+b*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
result too large to display
```

3.57.5 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. 3363 vs. 2(687) = 1374.

Time = 0.38 (sec) , antiderivative size = 3363, normalized size of antiderivative = 4.01

$$\int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^3/(a+b*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
1/4*((a^2*b - b^3)*d^3*f^4*x^4 - 4*a*b^2*c^3*f^3 - 4*(a*b^2*d^3*f^3 - (a^2
*b - b^3)*c*d^2*f^4)*x^3 - 6*(2*a*b^2*c*d^2*f^3 - (a^2*b - b^3)*c^2*d*f^4)
*x^2 - 4*(3*a*b^2*c^2*d*f^3 - (a^2*b - b^3)*c^3*f^4)*x + ((a^2*b - b^3)*d^
3*f^4*x^4 - 4*a*b^2*c^3*f^3 - 4*(a*b^2*d^3*f^3 - (a^2*b - b^3)*c*d^2*f^4)*
x^3 - 6*(2*a*b^2*c*d^2*f^3 - (a^2*b - b^3)*c^2*d*f^4)*x^2 - 4*(3*a*b^2*c^2
*d*f^3 - (a^2*b - b^3)*c^3*f^4)*x)*cos(2*f*x + 2*e) - 6*(-I*a*b^2*d^3*f^2*
x^2 - I*a*b^2*c^2*d*f^2 + I*b^3*c*d^2*f - I*(2*a*b^2*c*d^2*f^2 - b^3*d^3*f
)*x + (-I*a*b^2*d^3*f^2*x^2 - I*a*b^2*c^2*d*f^2 + I*b^3*c*d^2*f - I*(2*a*b
^2*c*d^2*f^2 - b^3*d^3*f)*x)*cos(2*f*x + 2*e) + (-I*a^2*b*d^3*f^2*x^2 - I*
a^2*b*c^2*d*f^2 + I*a*b^2*c*d^2*f - I*(2*a^2*b*c*d^2*f^2 - a*b^2*d^3*f)*x)
*sin(2*f*x + 2*e))*dilog(-(a^2 + b^2 - (a^2 + 2*I*a*b - b^2)*cos(2*f*x + 2
*e) + (-I*a^2 + 2*a*b + I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2) + 1) - 6*(I*a
*b^2*d^3*f^2*x^2 + I*a*b^2*c^2*d*f^2 - I*b^3*c*d^2*f + I*(2*a*b^2*c*d^2*f^
2 - b^3*d^3*f)*x + (I*a*b^2*d^3*f^2*x^2 + I*a*b^2*c^2*d*f^2 - I*b^3*c*d^2*
f + I*(2*a*b^2*c*d^2*f^2 - b^3*d^3*f)*x)*cos(2*f*x + 2*e) + (I*a^2*b*d^3*f
^2*x^2 + I*a^2*b*c^2*d*f^2 - I*a*b^2*c*d^2*f + I*(2*a^2*b*c*d^2*f^2 - a*b^
2*d^3*f)*x)*sin(2*f*x + 2*e))*dilog(-(a^2 + b^2 - (a^2 - 2*I*a*b - b^2)*co
s(2*f*x + 2*e) + (I*a^2 + 2*a*b - I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2) + 1
) + 2*(2*a*b^2*d^3*e^3 - 2*a*b^2*c^3*f^3 + 3*b^3*d^3*e^2 + 3*(2*a*b^2*c^2*
d*e + b^3*c^2*d)*f^2 - 6*(a*b^2*c*d^2*e^2 + b^3*c*d^2*e)*f + (2*a*b^2*d...
```

3.57.6 Sympy [F]

$$\int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx = \int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx$$

input
```
integrate((d*x+c)**3/(a+b*cot(f*x+e))**2,x)
```

output
```
Integral((c + d*x)**3/(a + b*cot(e + f*x))**2, x)
```

3.57.7 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. 4641 vs. 2(687) = 1374.

Time = 3.18 (sec) , antiderivative size = 4641, normalized size of antiderivative = 5.53

$$\int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^3/(a+b*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
1/12*(36*(b^2/((a^4 + a^2*b^2)*f*tan(f*x + e) + (a^3*b + a*b^3)*f) + 2*a*b
*log(a*tan(f*x + e) + b)/((a^4 + 2*a^2*b^2 + b^4)*f) - a*b*log(tan(f*x + e
)^2 + 1)/((a^4 + 2*a^2*b^2 + b^4)*f) - (a^2 - b^2)*(f*x + e)/((a^4 + 2*a^2
*b^2 + b^4)*f))*c^2*d*e - 12*(2*a*b*log(a*tan(f*x + e) + b)/(a^4 + 2*a^2*b
^2 + b^4) - a*b*log(tan(f*x + e)^2 + 1)/(a^4 + 2*a^2*b^2 + b^4) - (a^2 - b
^2)*(f*x + e)/(a^4 + 2*a^2*b^2 + b^4) + b^2/(a^3*b + a*b^3 + (a^4 + a^2*b^
2)*tan(f*x + e)))*c^3 - (3*(a^3 + I*a^2*b + a*b^2 + I*b^3)*(f*x + e)^4*d^3
 + 24*(-I*a*b^2 - b^3)*d^3*e^3 + 72*(I*a*b^2 + b^3)*c*d^2*e^2*f - 12*((a^3
 + I*a^2*b + a*b^2 + I*b^3)*d^3*e - (a^3 + I*a^2*b + a*b^2 + I*b^3)*c*d^2*
f)*(f*x + e)^3 + 18*((a^3 + I*a^2*b + a*b^2 + I*b^3)*d^3*e^2 - 2*(a^3 + I*
a^2*b + a*b^2 + I*b^3)*c*d^2*e*f + (a^3 + I*a^2*b + a*b^2 + I*b^3)*c^2*d*f
^2)*(f*x + e)^2 - 12*((a^3 + I*a^2*b + a*b^2 + I*b^3)*d^3*e^3 - 3*(a^3 + I
*a^2*b + a*b^2 + I*b^3)*c*d^2*e^2*f)*(f*x + e) + 12*(2*(I*a^2*b + a*b^2)*d
^3*e^3 + 3*(I*a*b^2 + b^3)*d^3*e^2 + 3*(I*a*b^2 + b^3)*c^2*d*f^2 + 6*((-I*
a^2*b - a*b^2)*c*d^2*e^2 + (-I*a*b^2 - b^3)*c*d^2*e)*f + (2*(-I*a^2*b + a*
b^2)*d^3*e^3 + 3*(-I*a*b^2 + b^3)*d^3*e^2 + 3*(-I*a*b^2 + b^3)*c^2*d*f^2 +
 6*((I*a^2*b - a*b^2)*c*d^2*e^2 + (I*a*b^2 - b^3)*c*d^2*e)*f)*cos(2*f*x +
2*e) + (2*(a^2*b + I*a*b^2)*d^3*e^3 + 3*(a*b^2 + I*b^3)*d^3*e^2 + 3*(a*b^2
 + I*b^3)*c^2*d*f^2 - 6*((a^2*b + I*a*b^2)*c*d^2*e^2 + (a*b^2 + I*b^3)*c*d
^2*e)*f)*sin(2*f*x + 2*e))*arctan2(b*cos(2*f*x + 2*e) + a*sin(2*f*x + 2...
```

3.57.8 Giac [F]

$$\int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx = \int \frac{(dx+c)^3}{(b\cot(fx+e)+a)^2}\,dx$$

input
```
integrate((d*x+c)^3/(a+b*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
integrate((d*x + c)^3/(b*cot(f*x + e) + a)^2, x)
```

3.57.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx)^3}{(a+b\cot(e+fx))^2}\,dx = \int \frac{(c+d\,x)^3}{(a+b\cot\left(e+f\,x\right))^2}\,dx$$

input
```
int((c + d*x)^3/(a + b*cot(e + f*x))^2,x)
```

output
```
int((c + d*x)^3/(a + b*cot(e + f*x))^2, x)
```

3.58 $\int \frac{(c+dx)^2}{(a+b\cot(e+fx))^2}\,dx$

3.58.1 Optimal result

Integrand size = 20, antiderivative size = 650

$$\int \frac{(c+dx)^2}{(a+b\cot(e+fx))^2}\,dx = -\frac{2ib^2(c+dx)^2}{(a^2+b^2)^2 f} - \frac{2b^2(c+dx)^2}{(a-ib)(a+ib)^2\left(ia+b-(ia-b)e^{2ie+2ifx}\right)f} + \frac{(c+dx)^3}{3(a+ib)^2 d} - \frac{4b(c+dx)^3}{3(a+ib)^2(ia+b)d} - \frac{4b^2(c+dx)^3}{3\left(a^2+b^2\right)^2 d} + \frac{2b^2d(c+dx)\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a^2+b^2)^2 f^2} - \frac{2b(c+dx)^2\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a-ib)(a+ib)^2 f} - \frac{2ib^2(c+dx)^2\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a^2+b^2)^2 f} - \frac{ib^2d^2\,\text{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a^2+b^2)^2 f^3} - \frac{2bd(c+dx)\,\text{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a+ib)^2(ia+b)f^2} - \frac{2b^2d(c+dx)\,\text{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a^2+b^2)^2 f^2} - \frac{bd^2\,\text{PolyLog}\left(3,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a-ib)(a+ib)^2 f^3} - \frac{ib^2d^2\,\text{PolyLog}\left(3,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{(a^2+b^2)^2 f^3}$$

output
```
-2*I*b^2*(d*x+c)^2/(a^2+b^2)^2/f-2*b^2*(d*x+c)^2/(a-I*b)/(a+I*b)^2/(I*a+b-
(I*a-b)*exp(2*I*e+2*I*f*x))/f+1/3*(d*x+c)^3/(a+I*b)^2/d-4/3*b*(d*x+c)^3/(a
+I*b)^2/(I*a+b)/d-4/3*b^2*(d*x+c)^3/(a^2+b^2)^2/d+2*b^2*d*(d*x+c)*ln(1-(a+
I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+b^2)^2/f^2-2*b*(d*x+c)^2*ln(1-(a+I*b
)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a-I*b)/(a+I*b)^2/f-2*I*b^2*(d*x+c)^2*ln(1-(
a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+b^2)^2/f-I*b^2*d^2*polylog(2,(a+I*
b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+b^2)^2/f^3-2*b*d*(d*x+c)*polylog(2,(a+
I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a+I*b)^2/(I*a+b)/f^2-2*b^2*d*(d*x+c)*pol
ylog(2,(a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+b^2)^2/f^2-b*d^2*polylog(3
,(a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a-I*b)/(a+I*b)^2/f^3-I*b^2*d^2*polyl
og(3,(a+I*b)*exp(2*I*e+2*I*f*x)/(a-I*b))/(a^2+b^2)^2/f^3
```

3.58.2 Mathematica [A] (verified)

Time = 9.73 (sec) , antiderivative size = 969, normalized size of antiderivative = 1.49

$$\int \frac{(c+dx)^2}{(a+b\cot(e+fx))^2}\,dx$$

$$= \frac{b\left(\frac{12c(-bd+acf)x}{a+ib} + \frac{12c(a(-1+e^{2ie})+ib(1+e^{2ie}))(-bd+acf)x}{a^2+b^2} + \frac{6d(-bd+2acf)x^2}{a+ib} + \frac{4ad^2fx^3}{a+ib} - \frac{6d(a(-1+e^{2ie})+ib(1+e^{2ie}))(bd-2a}{(a-ib)(-}\right.}{}$$

$$+ \frac{3a^2c^2fx\cos(fx) - 3b^2c^2fx\cos(fx) + 3a^2cdfx^2\cos(fx) - 3b^2cdfx^2\cos(fx) + a^2d^2fx^3\cos(fx) - b^2d^2f}{}$$

input
```
Integrate[(c + d*x)^2/(a + b*Cot[e + f*x])^2,x]
```

output
```
(b*((12*c*(-(b*d) + a*c*f)*x)/(a + I*b) + (12*c*(a*(-1 + E^((2*I)*e)) + I*
b*(1 + E^((2*I)*e)))*(-(b*d) + a*c*f)*x)/(a^2 + b^2) + (6*d*(-(b*d) + 2*a*
c*f)*x^2)/(a + I*b) + (4*a*d^2*f*x^3)/(a + I*b) - (6*d*(a*(-1 + E^((2*I)*e
)) + I*b*(1 + E^((2*I)*e)))*(b*d - 2*a*c*f)*x*Log[1 + (-a + I*b)/((a + I*b
)*E^((2*I)*(e + f*x)))])/((a - I*b)*((-I)*a + b)*f) + (6*a*d^2*(a*(-1 + E^
((2*I)*e)) + I*b*(1 + E^((2*I)*e)))*x^2*Log[1 + (-a + I*b)/((a + I*b)*E^((
2*I)*(e + f*x)))])/((a - I*b)*((-I)*a + b)) + (6*c*(a*(-1 + E^((2*I)*e)) +
 I*b*(1 + E^((2*I)*e)))*(-(b*d) + a*c*f)*Log[a - I*b - (a + I*b)*E^((2*I)*
(e + f*x))])/((a - I*b)*((-I)*a + b)*f) + (3*d*(a*(-1 + E^((2*I)*e)) + I*b
*(1 + E^((2*I)*e)))*(b*d - 2*a*c*f)*PolyLog[2, (a - I*b)/((a + I*b)*E^((2*
I)*(e + f*x)))])/((a^2 + b^2)*f^2) - (3*a*d^2*(a*(-1 + E^((2*I)*e)) + I*b*
(1 + E^((2*I)*e)))*(2*f*x*PolyLog[2, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*
x)))] - I*PolyLog[3, (a - I*b)/((a + I*b)*E^((2*I)*(e + f*x)))]))/((a^2 +
b^2)*f^2)))/(3*(a - I*b)*(a + I*b)*((-I)*a*(-1 + E^((2*I)*e)) + b*(1 + E^(
(2*I)*e)))*f) + (3*a^2*c^2*f*x*Cos[f*x] - 3*b^2*c^2*f*x*Cos[f*x] + 3*a^2*c
*d*f*x^2*Cos[f*x] - 3*b^2*c*d*f*x^2*Cos[f*x] + a^2*d^2*f*x^3*Cos[f*x] - b^
2*d^2*f*x^3*Cos[f*x] - 3*a^2*c^2*f*x*Cos[2*e + f*x] - 3*b^2*c^2*f*x*Cos[2*
e + f*x] - 3*a^2*c*d*f*x^2*Cos[2*e + f*x] - 3*b^2*c*d*f*x^2*Cos[2*e + f*x]
 - a^2*d^2*f*x^3*Cos[2*e + f*x] - b^2*d^2*f*x^3*Cos[2*e + f*x] + 6*b^2*c^2
*Sin[f*x] + 12*b^2*c*d*x*Sin[f*x] - 6*a*b*c^2*f*x*Sin[f*x] + 6*b^2*d^2*...
```

3.58.3 Rubi [A] (verified)

Time = 1.79 (sec) , antiderivative size = 650, normalized size of antiderivative = 1.00, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.150, Rules used = {3042, 4217, 2009}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{(c+dx)^2}{(a+b\cot(e+fx))^2}dx$$

$$\Big\downarrow \ 3042$$

$$\int \frac{(c+dx)^2}{\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$

$$\Big\downarrow \ 4217$$

$$\int \left(-\frac{4b^2(c+dx)^2}{(-b+ia)^2\left(ia\left(1-\frac{ib}{a}\right)-ia\left(1+\frac{ib}{a}\right)e^{2ie+2ifx}\right)^2}+\frac{4b(c+dx)^2}{(a+ib)^2\left(ia\left(1+\frac{ib}{a}\right)e^{2ie+2ifx}-ia\left(1-\frac{ib}{a}\right)\right)}+\frac{(c+dx)^2}{(a+ib)^2}\right.$$

$$\Big\downarrow \ 2009$$

$$-\frac{2b^2d(c+dx)\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{f^2\left(a^2+b^2\right)^2}+\frac{2b^2d(c+dx)\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{f^2\left(a^2+b^2\right)^2}-\frac{2ib^2(c+dx)^2\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{f\left(a^2+b^2\right)^2}-\frac{2ib^2(c+dx)^2}{f\left(a^2+b^2\right)^2}-\frac{4b^2(c+dx)^3}{3d\left(a^2+b^2\right)^2}-\frac{ib^2d^2\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{f^3\left(a^2+b^2\right)^2}-\frac{ib^2d^2\operatorname{PolyLog}\left(3,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{f^3\left(a^2+b^2\right)^2}-\frac{2b^2(c+dx)^2}{f(a-ib)(a+ib)^2\left(-(-b+ia)e^{2ie+2ifx}+ia+b\right)}-\frac{2bd(c+dx)\operatorname{PolyLog}\left(2,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{f^2(a+ib)^2(b+ia)}-\frac{2b(c+dx)^2\log\left(1-\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{f(a-ib)(a+ib)^2}-\frac{4b(c+dx)^3}{3d(a+ib)^2(b+ia)}+\frac{(c+dx)^3}{3d(a+ib)^2}-\frac{bd^2\operatorname{PolyLog}\left(3,\frac{(a+ib)e^{2ie+2ifx}}{a-ib}\right)}{f^3(a-ib)(a+ib)^2}$$

input
```
Int[(c + d*x)^2/(a + b*Cot[e + f*x])^2,x]
```

output
```
((-2*I)*b^2*(c + d*x)^2)/((a^2 + b^2)^2*f) - (2*b^2*(c + d*x)^2)/((a - I*b
)*(a + I*b)^2*(I*a + b - (I*a - b)*E^((2*I)*e + (2*I)*f*x))*f) + (c + d*x)
^3/(3*(a + I*b)^2*d) - (4*b*(c + d*x)^3)/(3*(a + I*b)^2*(I*a + b)*d) - (4*
b^2*(c + d*x)^3)/(3*(a^2 + b^2)^2*d) + (2*b^2*d*(c + d*x)*Log[1 - ((a + I*
b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b)])/((a^2 + b^2)^2*f^2) - (2*b*(c + d*
x)^2*Log[1 - ((a + I*b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b)])/((a - I*b)*(a
 + I*b)^2*f) - ((2*I)*b^2*(c + d*x)^2*Log[1 - ((a + I*b)*E^((2*I)*e + (2*I
)*f*x))/(a - I*b)])/((a^2 + b^2)^2*f) - (I*b^2*d^2*PolyLog[2, ((a + I*b)*E
^((2*I)*e + (2*I)*f*x))/(a - I*b)])/((a^2 + b^2)^2*f^3) - (2*b*d*(c + d*x)
*PolyLog[2, ((a + I*b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b)])/((a + I*b)^2*(
I*a + b)*f^2) - (2*b^2*d*(c + d*x)*PolyLog[2, ((a + I*b)*E^((2*I)*e + (2*I
)*f*x))/(a - I*b)])/((a^2 + b^2)^2*f^2) - (b*d^2*PolyLog[3, ((a + I*b)*E^(
(2*I)*e + (2*I)*f*x))/(a - I*b)])/((a - I*b)*(a + I*b)^2*f^3) - (I*b^2*d^2
*PolyLog[3, ((a + I*b)*E^((2*I)*e + (2*I)*f*x))/(a - I*b)])/((a^2 + b^2)^2
*f^3)
```

3.58.3.1 Defintions of rubi rules used

rule 2009
```
Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4217
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_),
 x_Symbol] :> Int[ExpandIntegrand[(c + d*x)^m, (1/(a - I*b) - 2*I*(b/(a^2 +
 b^2 + (a - I*b)^2*E^(2*I*(e + f*x)))))^(-n), x], x] /; FreeQ[{a, b, c, d,
e, f}, x] && NeQ[a^2 + b^2, 0] && ILtQ[n, 0] && IGtQ[m, 0]
```

3.58.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 3885 vs. 2(584) = 1168.

Time = 0.66 (sec) , antiderivative size = 3886, normalized size of antiderivative = 5.98

method	result	size
risch	Expression too large to display	3886

input
```
int((d*x+c)^2/(a+b*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
4/(b-I*a)^2/f^2/(I*a+b)*b*e*d*a^2*c/(I*b-a)/(a+I*b)*arctan(1/2/a*b*exp(2*I
*(f*x+e))+1/2/a*b+1/2/b*exp(2*I*(f*x+e))*a-1/2/b*a)+4/(b-I*a)^2/f^2/(I*a+b
)*b*e*d*a^2*c/(I*b-a)/(a+I*b)*arctan(1/b*a)+4*I/(b-I*a)^2/f/(I*a+b)*b/(a-I
*b)*d*a*c*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))*x-I/(b-I*a)^2/f^3/(I*a+b)
*b*e^2*d^2*a^2/(I*b-a)/(a+I*b)*ln(a^2*exp(4*I*(f*x+e))+b^2*exp(4*I*(f*x+e)
)-2*a^2*exp(2*I*(f*x+e))+2*b^2*exp(2*I*(f*x+e))+a^2+b^2)-2*I/(b-I*a)^2/f^3
/(I*a+b)*b^2*e^2*d^2*a/(I*b-a)/(a+I*b)*arctan(1/2/a*b*exp(2*I*(f*x+e))+1/2
/a*b+1/2/b*exp(2*I*(f*x+e))*a-1/2/b*a)-2*I/(b-I*a)^2/f^3/(I*a+b)*b^2*e^2*d
^2*a/(I*b-a)/(a+I*b)*arctan(1/b*a)-I/(b-I*a)^2/f^3/(I*a+b)*b^2*e*d^2/(I*b-
a)/(a+I*b)*ln(a^2*exp(4*I*(f*x+e))+b^2*exp(4*I*(f*x+e))-2*a^2*exp(2*I*(f*x
+e))+2*b^2*exp(2*I*(f*x+e))+a^2+b^2)*a-8*I/(b-I*a)^2/f^2/(I*a+b)*b*e*d*a*c
/(I*b-a)*ln(exp(I*(f*x+e)))+4*I/(b-I*a)^2/f^2/(I*a+b)*b/(a-I*b)*d*a*c*ln(1
-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))*e+2*I/(b-I*a)^2/f/(I*a+b)*b/(a-I*b)*d^2
*a*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))*x^2-2*I/(b-I*a)^2/f^3/(I*a+b)*b^
3*e*d^2/(I*b-a)/(a+I*b)*arctan(1/2/a*b*exp(2*I*(f*x+e))+1/2/a*b+1/2/b*exp(
2*I*(f*x+e))*a-1/2/b*a)-2*I/(b-I*a)^2/f^3/(I*a+b)*b^3*e*d^2/(I*b-a)/(a+I*b
)*arctan(1/b*a)-2*I/(b-I*a)^2/f/(I*a+b)*b^2*a*c^2/(I*b-a)/(a+I*b)*arctan(1
/2/a*b*exp(2*I*(f*x+e))+1/2/a*b+1/2/b*exp(2*I*(f*x+e))*a-1/2/b*a)-2*I/(b-I
*a)^2/f/(I*a+b)*b^2*a*c^2/(I*b-a)/(a+I*b)*arctan(1/b*a)-2*I/(b-I*a)^2/f^3/
(I*a+b)*b/(a-I*b)*e^2*d^2*a*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))+I/(b...
```

3.58.5 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. 2038 vs. 2(531) = 1062.

Time = 0.36 (sec) , antiderivative size = 2038, normalized size of antiderivative = 3.14

$$\int \frac{(c+dx)^2}{(a+b\cot(e+fx))^2}\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^2/(a+b*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
1/6*(2*(a^2*b - b^3)*d^2*f^3*x^3 - 6*a*b^2*c^2*f^2 - 6*(a*b^2*d^2*f^2 - (a
^2*b - b^3)*c*d*f^3)*x^2 - 6*(2*a*b^2*c*d*f^2 - (a^2*b - b^3)*c^2*f^3)*x +
 2*((a^2*b - b^3)*d^2*f^3*x^3 - 3*a*b^2*c^2*f^2 - 3*(a*b^2*d^2*f^2 - (a^2*
b - b^3)*c*d*f^3)*x^2 - 3*(2*a*b^2*c*d*f^2 - (a^2*b - b^3)*c^2*f^3)*x)*cos
(2*f*x + 2*e) - 3*(-2*I*a*b^2*d^2*f*x - 2*I*a*b^2*c*d*f + I*b^3*d^2 + (-2*
I*a*b^2*d^2*f*x - 2*I*a*b^2*c*d*f + I*b^3*d^2)*cos(2*f*x + 2*e) + (-2*I*a^
2*b*d^2*f*x - 2*I*a^2*b*c*d*f + I*a*b^2*d^2)*sin(2*f*x + 2*e))*dilog(-(a^2
 + b^2 - (a^2 + 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (-I*a^2 + 2*a*b + I*b^2)
*sin(2*f*x + 2*e))/(a^2 + b^2) + 1) - 3*(2*I*a*b^2*d^2*f*x + 2*I*a*b^2*c*d
*f - I*b^3*d^2 + (2*I*a*b^2*d^2*f*x + 2*I*a*b^2*c*d*f - I*b^3*d^2)*cos(2*f
*x + 2*e) + (2*I*a^2*b*d^2*f*x + 2*I*a^2*b*c*d*f - I*a*b^2*d^2)*sin(2*f*x
+ 2*e))*dilog(-(a^2 + b^2 - (a^2 - 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (I*a^
2 + 2*a*b - I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2) + 1) - 6*(a*b^2*d^2*e^2 +
 a*b^2*c^2*f^2 + b^3*d^2*e - (2*a*b^2*c*d*e + b^3*c*d)*f + (a*b^2*d^2*e^2
+ a*b^2*c^2*f^2 + b^3*d^2*e - (2*a*b^2*c*d*e + b^3*c*d)*f)*cos(2*f*x + 2*e
) + (a^2*b*d^2*e^2 + a^2*b*c^2*f^2 + a*b^2*d^2*e - (2*a^2*b*c*d*e + a*b^2*
c*d)*f)*sin(2*f*x + 2*e))*log(1/2*a^2 + I*a*b - 1/2*b^2 - 1/2*(a^2 + b^2)*
cos(2*f*x + 2*e) + 1/2*(I*a^2 + I*b^2)*sin(2*f*x + 2*e)) - 6*(a*b^2*d^2*e^
2 + a*b^2*c^2*f^2 + b^3*d^2*e - (2*a*b^2*c*d*e + b^3*c*d)*f + (a*b^2*d^2*e
^2 + a*b^2*c^2*f^2 + b^3*d^2*e - (2*a*b^2*c*d*e + b^3*c*d)*f)*cos(2*f*x...
```

3.58.6 Sympy [F]

$$\int \frac{(c+dx)^2}{(a+b\cot(e+fx))^2}\,dx = \int \frac{(c+dx)^2}{(a+b\cot{(e+fx)})^2}\,dx$$

input
```
integrate((d*x+c)**2/(a+b*cot(f*x+e))**2,x)
```

output
```
Integral((c + d*x)**2/(a + b*cot(e + f*x))**2, x)
```

3.58.7 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. 2552 vs. 2(531) = 1062.

Time = 1.26 (sec) , antiderivative size = 2552, normalized size of antiderivative = 3.93

$$\int \frac{(c+dx)^2}{(a+b\cot(e+fx))^2}\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)^2/(a+b*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
1/3*(6*(b^2/((a^4 + a^2*b^2)*f*tan(f*x + e) + (a^3*b + a*b^3)*f) + 2*a*b*l
og(a*tan(f*x + e) + b)/((a^4 + 2*a^2*b^2 + b^4)*f) - a*b*log(tan(f*x + e)^
2 + 1)/((a^4 + 2*a^2*b^2 + b^4)*f) - (a^2 - b^2)*(f*x + e)/((a^4 + 2*a^2*b
^2 + b^4)*f))*c*d*e - 3*(2*a*b*log(a*tan(f*x + e) + b)/(a^4 + 2*a^2*b^2 +
b^4) - a*b*log(tan(f*x + e)^2 + 1)/(a^4 + 2*a^2*b^2 + b^4) - (a^2 - b^2)*(
f*x + e)/(a^4 + 2*a^2*b^2 + b^4) + b^2/(a^3*b + a*b^3 + (a^4 + a^2*b^2)*ta
n(f*x + e)))*c^2 - ((a^3 + I*a^2*b + a*b^2 + I*b^3)*(f*x + e)^3*d^2 + 3*(a
^3 + I*a^2*b + a*b^2 + I*b^3)*(f*x + e)*d^2*e^2 + 6*(I*a*b^2 + b^3)*d^2*e^
2 - 3*((a^3 + I*a^2*b + a*b^2 + I*b^3)*d^2*e - (a^3 + I*a^2*b + a*b^2 + I*
b^3)*c*d*f)*(f*x + e)^2 + 6*((-I*a^2*b - a*b^2)*d^2*e^2 + (-I*a*b^2 - b^3)
*d^2*e + (I*a*b^2 + b^3)*c*d*f + ((I*a^2*b - a*b^2)*d^2*e^2 + (I*a*b^2 - b
^3)*d^2*e + (-I*a*b^2 + b^3)*c*d*f)*cos(2*f*x + 2*e) - ((a^2*b + I*a*b^2)*
d^2*e^2 + (a*b^2 + I*b^3)*d^2*e - (a*b^2 + I*b^3)*c*d*f)*sin(2*f*x + 2*e))
*arctan2(b*cos(2*f*x + 2*e) + a*sin(2*f*x + 2*e) + b, a*cos(2*f*x + 2*e) -
 b*sin(2*f*x + 2*e) - a) + 6*((-I*a^2*b - a*b^2)*(f*x + e)^2*d^2 + (2*(I*a
^2*b + a*b^2)*d^2*e + 2*(-I*a^2*b - a*b^2)*c*d*f + (I*a*b^2 + b^3)*d^2)*(f
*x + e) + ((I*a^2*b - a*b^2)*(f*x + e)^2*d^2 + (2*(-I*a^2*b + a*b^2)*d^2*e
 + 2*(I*a^2*b - a*b^2)*c*d*f + (-I*a*b^2 + b^3)*d^2)*(f*x + e))*cos(2*f*x
+ 2*e) - ((a^2*b + I*a*b^2)*(f*x + e)^2*d^2 - (2*(a^2*b + I*a*b^2)*d^2*e -
 2*(a^2*b + I*a*b^2)*c*d*f + (a*b^2 + I*b^3)*d^2)*(f*x + e))*sin(2*f*x ...
```

3.58.8 Giac [F]

$$\int \frac{(c+dx)^2}{(a+b\cot(e+fx))^2}\,dx = \int \frac{(dx+c)^2}{(b\cot(fx+e)+a)^2}\,dx$$

input
```
integrate((d*x+c)^2/(a+b*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
integrate((d*x + c)^2/(b*cot(f*x + e) + a)^2, x)
```

3.58.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx)^2}{(a+b\cot(e+fx))^2}\,dx=\int \frac{{\left(c+d\,x\right)}^2}{{\left(a+b\,\mathrm{cot}\left(e+f\,x\right)\right)}^2}\,dx$$

input
```
int((c + d*x)^2/(a + b*cot(e + f*x))^2,x)
```

output
```
int((c + d*x)^2/(a + b*cot(e + f*x))^2, x)
```

3.59 $\int \frac{c+dx}{(a+b\cot(e+fx))^2}\,dx$

3.59.1 Optimal result

Integrand size = 18, antiderivative size = 213

$$\int \frac{c+dx}{(a+b\cot(e+fx))^2}\,dx = -\frac{(c+dx)^2}{2(a^2+b^2)d}+\frac{(bd-2acf-2adfx)^2}{4a(a-ib)^2(a+ib)df^2}+\frac{b(c+dx)}{(a^2+b^2)f(a+b\cot(e+fx))}+\frac{b(bd-2acf-2adfx)\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{(a^2+b^2)^2f^2}+\frac{iabd\,\text{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{(a^2+b^2)^2f^2}$$

output
```
-1/2*(d*x+c)^2/(a^2+b^2)/d+1/4*(-2*a*d*f*x-2*a*c*f+b*d)^2/a/(a-I*b)^2/(a+I
*b)/d/f^2+b*(d*x+c)/(a^2+b^2)/f/(a+b*cot(f*x+e))+b*(-2*a*d*f*x-2*a*c*f+b*d
)*ln(1-(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))/(a^2+b^2)^2/f^2+I*a*b*d*polylog(2
,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))/(a^2+b^2)^2/f^2
```

3.59.2 Mathematica [B] (verified)

Both result and optimal contain complex but leaf count is larger than twice the leaf count of optimal. 730 vs. 2(213) = 426.

Time = 8.55 (sec) , antiderivative size = 730, normalized size of antiderivative = 3.43

$$\int \frac{c+dx}{(a+b\cot(e+fx))^2}\,dx$$
$$= -\frac{(e+fx)(-2de+2cf+d(e+fx))\csc^2(e+fx)(b\cos(e+fx)+a\sin(e+fx))^2}{2(-ia+b)(ia+b)f^2(a+b\cot(e+fx))^2}$$
$$+\frac{bd\csc^2(e+fx)(-a(e+fx)+b\log(b\cos(e+fx)+a\sin(e+fx)))(b\cos(e+fx)+a\sin(e+fx))^2}{(-ia+b)(ia+b)(a^2+b^2)f^2(a+b\cot(e+fx))^2}$$
$$+\frac{2ade\csc^2(e+fx)(-a(e+fx)+b\log(b\cos(e+fx)+a\sin(e+fx)))(b\cos(e+fx)+a\sin(e+fx))^2}{(-ia+b)(ia+b)(a^2+b^2)f^2(a+b\cot(e+fx))^2}$$
$$-\frac{2ac\csc^2(e+fx)(-a(e+fx)+b\log(b\cos(e+fx)+a\sin(e+fx)))(b\cos(e+fx)+a\sin(e+fx))^2}{(-ia+b)(ia+b)(a^2+b^2)f(a+b\cot(e+fx))^2}$$
$$+\frac{d\csc^2(e+fx)\left(e^{i\arctan\left(\frac{b}{a}\right)}(e+fx)^2+\frac{b\left(i(e+fx)\left(-\pi+2\arctan\left(\frac{b}{a}\right)\right)-\pi\log\left(1+e^{-2i(e+fx)}\right)-2\left(e+fx+\arctan\left(\frac{b}{a}\right)\right)\log\left(1-\right.\right.}{}\right.}{(-ia+b)(i}$$
$$+\frac{\csc^2(e+fx)(b\cos(e+fx)+a\sin(e+fx))(-bde\sin(e+fx)+bcf\sin(e+fx)+bd(e+fx)\sin(e+}{(-ia+b)(ia+b)f^2(a+b\cot(e+fx))^2}$$

input
```
Integrate[(c + d*x)/(a + b*Cot[e + f*x])^2,x]
```

output
```
-1/2*((e + f*x)*(-2*d*e + 2*c*f + d*(e + f*x))*Csc[e + f*x]^2*(b*Cos[e + f
*x] + a*Sin[e + f*x])^2)/(((-I)*a + b)*(I*a + b)*f^2*(a + b*Cot[e + f*x])^
2) + (b*d*Csc[e + f*x]^2*(-(a*(e + f*x)) + b*Log[b*Cos[e + f*x] + a*Sin[e
+ f*x]])*(b*Cos[e + f*x] + a*Sin[e + f*x])^2)/(((-I)*a + b)*(I*a + b)*(a^2
 + b^2)*f^2*(a + b*Cot[e + f*x])^2) + (2*a*d*e*Csc[e + f*x]^2*(-(a*(e + f*
x)) + b*Log[b*Cos[e + f*x] + a*Sin[e + f*x]])*(b*Cos[e + f*x] + a*Sin[e +
f*x])^2)/(((-I)*a + b)*(I*a + b)*(a^2 + b^2)*f^2*(a + b*Cot[e + f*x])^2) -
 (2*a*c*Csc[e + f*x]^2*(-(a*(e + f*x)) + b*Log[b*Cos[e + f*x] + a*Sin[e +
f*x]])*(b*Cos[e + f*x] + a*Sin[e + f*x])^2)/(((-I)*a + b)*(I*a + b)*(a^2 +
 b^2)*f*(a + b*Cot[e + f*x])^2) + (d*Csc[e + f*x]^2*(E^(I*ArcTan[b/a])*(e
+ f*x)^2 + (b*(I*(e + f*x)*(-Pi + 2*ArcTan[b/a]) - Pi*Log[1 + E^((-2*I)*(e
 + f*x))] - 2*(e + f*x + ArcTan[b/a])*Log[1 - E^((2*I)*(e + f*x + ArcTan[b
/a]))] + Pi*Log[Cos[e + f*x]] + 2*ArcTan[b/a]*Log[Sin[e + f*x + ArcTan[b/a
]]] + I*PolyLog[2, E^((2*I)*(e + f*x + ArcTan[b/a]))]))/(a*Sqrt[1 + b^2/a^
2]))*(b*Cos[e + f*x] + a*Sin[e + f*x])^2)/(((-I)*a + b)*(I*a + b)*Sqrt[(a^
2 + b^2)/a^2]*f^2*(a + b*Cot[e + f*x])^2) + (Csc[e + f*x]^2*(b*Cos[e + f*x
] + a*Sin[e + f*x])*(-(b*d*e*Sin[e + f*x]) + b*c*f*Sin[e + f*x] + b*d*(e +
 f*x)*Sin[e + f*x]))/(((-I)*a + b)*(I*a + b)*f^2*(a + b*Cot[e + f*x])^2)
```

3.59.3 Rubi [A] (verified)

Time = 0.77 (sec) , antiderivative size = 228, normalized size of antiderivative = 1.07, number of steps used = 10, number of rules used = 9, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.500, Rules used = {3042, 4216, 25, 3042, 4214, 25, 2620, 2715, 2838}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{c+dx}{(a+b\cot(e+fx))^2}dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{c+dx}{\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$

$$\Big\downarrow \text{4216}$$

$$\frac{\int -\frac{bd-2afxd-2acf}{a+b\cot(e+fx)}dx}{f\left(a^2+b^2\right)}+\frac{b(c+dx)}{f\left(a^2+b^2\right)(a+b\cot(e+fx))}-\frac{(c+dx)^2}{2d\left(a^2+b^2\right)}$$

$$\Big\downarrow \text{25}$$

$$-\frac{\int \frac{bd-2afxd-2acf}{a+b\cot(e+fx)}dx}{f\left(a^2+b^2\right)}+\frac{b(c+dx)}{f\left(a^2+b^2\right)(a+b\cot(e+fx))}-\frac{(c+dx)^2}{2d\left(a^2+b^2\right)}$$

$$\Big\downarrow \text{ 3042}$$

$$-\frac{\int \frac{bd-2afxd-2acf}{a-b\tan\left(e+fx+\frac{\pi}{2}\right)}dx}{f\left(a^2+b^2\right)}+\frac{b(c+dx)}{f\left(a^2+b^2\right)(a+b\cot(e+fx))}-\frac{(c+dx)^2}{2d\left(a^2+b^2\right)}$$

$$\Big\downarrow \text{ 4214}$$

$$-\frac{-2ib\int -\frac{e^{2i(e+fx)}(bd-2afxd-2acf)}{(a-ib)^2-(a^2+b^2)e^{2i(e+fx)}}dx-\frac{(-2acf-2adfx+bd)^2}{4adf(a-ib)}}{f\left(a^2+b^2\right)}+\frac{b(c+dx)}{f\left(a^2+b^2\right)(a+b\cot(e+fx))}-\frac{(c+dx)^2}{2d\left(a^2+b^2\right)}$$

$$\Big\downarrow \text{ 25}$$

$$-\frac{2ib\int \frac{e^{2i(e+fx)}(bd-2afxd-2acf)}{(a-ib)^2-(a^2+b^2)e^{2i(e+fx)}}dx-\frac{(-2acf-2adfx+bd)^2}{4adf(a-ib)}}{f\left(a^2+b^2\right)}+\frac{b(c+dx)}{f\left(a^2+b^2\right)(a+b\cot(e+fx))}-\frac{(c+dx)^2}{2d\left(a^2+b^2\right)}$$

$$\Big\downarrow \text{ 2620}$$

$$-\frac{2ib\left(\frac{iad\int \log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)dx}{a^2+b^2}+\frac{i(-2acf-2adfx+bd)\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f(a^2+b^2)}\right)-\frac{(-2acf-2adfx+bd)^2}{4adf(a-ib)}}{f\left(a^2+b^2\right)}+\frac{b(c+dx)}{f\left(a^2+b^2\right)(a+b\cot(e+fx))}-\frac{(c+dx)^2}{2d\left(a^2+b^2\right)}$$

$$\Big\downarrow \text{ 2715}$$

$$-\frac{2ib\left(\frac{ad\int e^{-2i(e+fx)}\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)de^{2i(e+fx)}}{2f(a^2+b^2)}+\frac{i(-2acf-2adfx+bd)\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f(a^2+b^2)}\right)-\frac{(-2acf-2adfx+bd)^2}{4adf(a-ib)}}{f\left(a^2+b^2\right)}+\frac{b(c+dx)}{f\left(a^2+b^2\right)(a+b\cot(e+fx))}-\frac{(c+dx)^2}{2d\left(a^2+b^2\right)}$$

$$\Big\downarrow \text{ 2838}$$

$$-\frac{2ib\left(\frac{i(-2acf-2adfx+bd)\log\left(1-\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f(a^2+b^2)}-\frac{ad\,\text{PolyLog}\left(2,\frac{(a+ib)e^{2i(e+fx)}}{a-ib}\right)}{2f(a^2+b^2)}\right)-\frac{(-2acf-2adfx+bd)^2}{4adf(a-ib)}}{f\left(a^2+b^2\right)}+\frac{b(c+dx)}{f\left(a^2+b^2\right)(a+b\cot(e+fx))}-\frac{(c+dx)^2}{2d\left(a^2+b^2\right)}$$

3.59. $\int \frac{c+dx}{(a+b\cot(e+fx))^2}\,dx$

input
```
Int[(c + d*x)/(a + b*Cot[e + f*x])^2,x]
```

output
```
-1/2*(c + d*x)^2/((a^2 + b^2)*d) + (b*(c + d*x))/((a^2 + b^2)*f*(a + b*Cot
[e + f*x])) - (-1/4*(b*d - 2*a*c*f - 2*a*d*f*x)^2/(a*(a - I*b)*d*f) + (2*I
)*b*(((I/2)*(b*d - 2*a*c*f - 2*a*d*f*x)*Log[1 - ((a + I*b)*E^((2*I)*(e + f
*x)))/(a - I*b)])/((a^2 + b^2)*f) - (a*d*PolyLog[2, ((a + I*b)*E^((2*I)*(e
 + f*x)))/(a - I*b)])/(2*(a^2 + b^2)*f)))/((a^2 + b^2)*f)
```

3.59.3.1 Defintions of rubi rules used

rule 25
```
Int[-(Fx_), x_Symbol] :> Simp[Identity[-1]   Int[Fx, x], x]
```

rule 2620
```
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] - Si
mp[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 2715
```
Int[Log[(a_) + (b_.)*((F_)^((e_.)*((c_.) + (d_.)*(x_))))^(n_.)], x_Symbol]
:> Simp[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 2838
```
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 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4214
```
Int[((c_.) + (d_.)*(x_))^(m_.)/((a_) + (b_.)*tan[(e_.) + Pi*(k_.) + (f_.)*(
x_)]), x_Symbol] :> Simp[(c + d*x)^(m + 1)/(d*(m + 1)*(a + I*b)), x] + Simp
[2*I*b   Int[(c + d*x)^m*E^(2*I*k*Pi)*(E^Simp[2*I*(e + f*x), x]/((a + I*b)^
2 + (a^2 + b^2)*E^(2*I*k*Pi)*E^Simp[2*I*(e + f*x), x])), x], x] /; FreeQ[{a
, b, c, d, e, f}, x] && IntegerQ[4*k] && NeQ[a^2 + b^2, 0] && IGtQ[m, 0]
```

rule 4216
```
Int[((c_.) + (d_.)*(x_))/((a_) + (b_.)*tan[(e_.) + (f_.)*(x_)])^2, x_Symbol
] :> Simp[-(c + d*x)^2/(2*d*(a^2 + b^2)), x] + (Simp[1/(f*(a^2 + b^2))   In
t[(b*d + 2*a*c*f + 2*a*d*f*x)/(a + b*Tan[e + f*x]), x], x] - Simp[b*((c + d
*x)/(f*(a^2 + b^2)*(a + b*Tan[e + f*x]))), x]) /; FreeQ[{a, b, c, d, e, f},
 x] && NeQ[a^2 + b^2, 0]
```

3.59.4 Maple [B] (verified)

Both result and optimal contain complex but leaf count of result is larger than twice the leaf count of optimal. 1996 vs. 2(198) = 396.

Time = 0.63 (sec) , antiderivative size = 1997, normalized size of antiderivative = 9.38

method	result	size
risch	Expression too large to display	1997

input
```
int((d*x+c)/(a+b*cot(f*x+e))^2,x,method=_RETURNVERBOSE)
```

output
```
I/(b-I*a)^2/f^2/(I*a+b)*b*a^2*d*e/(I*b-a)/(a+I*b)*ln(a^2*exp(4*I*(f*x+e))+
b^2*exp(4*I*(f*x+e))-2*a^2*exp(2*I*(f*x+e))+2*b^2*exp(2*I*(f*x+e))+a^2+b^2
)+2*I/(b-I*a)^2/f^2/(I*a+b)*b^2*a*d*e/(I*b-a)/(a+I*b)*arctan(1/2/a*b*exp(2
*I*(f*x+e))+1/2/a*b+1/2/b*exp(2*I*(f*x+e))*a-1/2/b*a)+2*I/(b-I*a)^2/f^2/(I
*a+b)*b^2*a*d*e/(I*b-a)/(a+I*b)*arctan(1/b*a)-1/(b-I*a)^2/f^2/(I*a+b)*b^2*
a*d*e/(I*b-a)/(a+I*b)*ln(a^2*exp(4*I*(f*x+e))+b^2*exp(4*I*(f*x+e))-2*a^2*e
xp(2*I*(f*x+e))+2*b^2*exp(2*I*(f*x+e))+a^2+b^2)+1/(b-I*a)^2/f^2/(I*a+b)*b^
2*d/(I*b-a)/(a+I*b)*arctan(1/2/a*b*exp(2*I*(f*x+e))+1/2/a*b+1/2/b*exp(2*I*
(f*x+e))*a-1/2/b*a)*a+I/(b-I*a)^2/f^2/(I*a+b)*b^3*d/(I*b-a)/(a+I*b)*arctan
(1/2/a*b*exp(2*I*(f*x+e))+1/2/a*b+1/2/b*exp(2*I*(f*x+e))*a-1/2/b*a)+4/(b-I
*a)^2/f/(I*a+b)*b/(a-I*b)*a*d*e*x+1/(b-I*a)^2/f/(I*a+b)*b^2*a*c/(I*b-a)/(a
+I*b)*ln(a^2*exp(4*I*(f*x+e))+b^2*exp(4*I*(f*x+e))-2*a^2*exp(2*I*(f*x+e))+
2*b^2*exp(2*I*(f*x+e))+a^2+b^2)-2/(b-I*a)^2/f/(I*a+b)*b*a^2*c/(I*b-a)/(a+I
*b)*arctan(1/2/a*b*exp(2*I*(f*x+e))+1/2/a*b+1/2/b*exp(2*I*(f*x+e))*a-1/2/b
*a)-2/(b-I*a)^2/f/(I*a+b)*b*a^2*c/(I*b-a)/(a+I*b)*arctan(1/b*a)+1/(b-I*a)^
2/f^2/(I*a+b)*b^2*d/(I*b-a)/(a+I*b)*arctan(1/b*a)*a+I/(b-I*a)^2/f^2/(I*a+b
)*b^3*d/(I*b-a)/(a+I*b)*arctan(1/b*a)+4*I/(b-I*a)^2/f/(I*a+b)*b*a*c/(I*b-a
)*ln(exp(I*(f*x+e)))+2/(b-I*a)^2/f^2/(I*a+b)*b/(a-I*b)*a*d*e^2+1/(b-I*a)^2
/f^2/(I*a+b)*b/(a-I*b)*a*d*polylog(2,(a+I*b)*exp(2*I*(f*x+e))/(a-I*b))-1/2
/(b-I*a)^2/f^2/(I*a+b)*b^3*d/(I*b-a)/(a+I*b)*ln(a^2*exp(4*I*(f*x+e))+b^...
```

3.59.5 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. 1053 vs. $2(193) = 386$.

Time = 0.33 (sec) , antiderivative size = 1053, normalized size of antiderivative = 4.94

$$\int \frac{c+dx}{(a+b\cot(e+fx))^2}\,dx = \text{Too large to display}$$

input
```
integrate((d*x+c)/(a+b*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
1/2*((a^2*b - b^3)*d*f^2*x^2 - 2*a*b^2*c*f - 2*(a*b^2*d*f - (a^2*b - b^3)*
c*f^2)*x + ((a^2*b - b^3)*d*f^2*x^2 - 2*a*b^2*c*f - 2*(a*b^2*d*f - (a^2*b
- b^3)*c*f^2)*x)*cos(2*f*x + 2*e) + (I*a*b^2*d*cos(2*f*x + 2*e) + I*a^2*b*
d*sin(2*f*x + 2*e) + I*a*b^2*d)*dilog(-(a^2 + b^2 - (a^2 + 2*I*a*b - b^2)*
cos(2*f*x + 2*e) + (-I*a^2 + 2*a*b + I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2)
+ 1) + (-I*a*b^2*d*cos(2*f*x + 2*e) - I*a^2*b*d*sin(2*f*x + 2*e) - I*a*b^2
*d)*dilog(-(a^2 + b^2 - (a^2 - 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (I*a^2 +
2*a*b - I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2) + 1) + (2*a*b^2*d*e - 2*a*b^2
*c*f + b^3*d + (2*a*b^2*d*e - 2*a*b^2*c*f + b^3*d)*cos(2*f*x + 2*e) + (2*a
^2*b*d*e - 2*a^2*b*c*f + a*b^2*d)*sin(2*f*x + 2*e))*log(1/2*a^2 + I*a*b -
1/2*b^2 - 1/2*(a^2 + b^2)*cos(2*f*x + 2*e) + 1/2*(I*a^2 + I*b^2)*sin(2*f*x
 + 2*e)) + (2*a*b^2*d*e - 2*a*b^2*c*f + b^3*d + (2*a*b^2*d*e - 2*a*b^2*c*f
 + b^3*d)*cos(2*f*x + 2*e) + (2*a^2*b*d*e - 2*a^2*b*c*f + a*b^2*d)*sin(2*f
*x + 2*e))*log(-1/2*a^2 + I*a*b + 1/2*b^2 + 1/2*(a^2 + b^2)*cos(2*f*x + 2*
e) + 1/2*(I*a^2 + I*b^2)*sin(2*f*x + 2*e)) - 2*(a*b^2*d*f*x + a*b^2*d*e +
(a*b^2*d*f*x + a*b^2*d*e)*cos(2*f*x + 2*e) + (a^2*b*d*f*x + a^2*b*d*e)*sin
(2*f*x + 2*e))*log((a^2 + b^2 - (a^2 + 2*I*a*b - b^2)*cos(2*f*x + 2*e) + (
-I*a^2 + 2*a*b + I*b^2)*sin(2*f*x + 2*e))/(a^2 + b^2)) - 2*(a*b^2*d*f*x +
a*b^2*d*e + (a*b^2*d*f*x + a*b^2*d*e)*cos(2*f*x + 2*e) + (a^2*b*d*f*x + a^
2*b*d*e)*sin(2*f*x + 2*e))*log((a^2 + b^2 - (a^2 - 2*I*a*b - b^2)*cos(2...
```

3.59.6 Sympy [F]

$$\int \frac{c+dx}{(a+b\cot(e+fx))^2}\,dx = \int \frac{c+dx}{(a+b\cot(e+fx))^2}\,dx$$

input
```
integrate((d*x+c)/(a+b*cot(f*x+e))**2,x)
```

output
```
Integral((c + d*x)/(a + b*cot(e + f*x))**2, x)
```

3.59.7 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. 1171 vs. $2(193) = 386$.

Time = 0.87 (sec) , antiderivative size = 1171, normalized size of antiderivative = 5.50

$$\int \frac{c + dx}{(a + b\cot(e + fx))^2}\, dx = \text{Too large to display}$$

input
```
integrate((d*x+c)/(a+b*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
-1/2*((a^3 + I*a^2*b + a*b^2 + I*b^3)*d*f^2*x^2 + 2*(a^3 + I*a^2*b + a*b^2
 + I*b^3)*c*f^2*x + 4*(I*a*b^2 + b^3)*c*f + 2*(2*(-I*a^2*b - a*b^2)*c*f +
(I*a*b^2 + b^3)*d + (2*(I*a^2*b - a*b^2)*c*f + (-I*a*b^2 + b^3)*d)*cos(2*f
*x + 2*e) - (2*(a^2*b + I*a*b^2)*c*f - (a*b^2 + I*b^3)*d)*sin(2*f*x + 2*e)
)*arctan2(b*cos(2*f*x + 2*e) + a*sin(2*f*x + 2*e) + b, a*cos(2*f*x + 2*e)
- b*sin(2*f*x + 2*e) - a) + 4*((I*a^2*b - a*b^2)*d*f*x*cos(2*f*x + 2*e) -
(a^2*b + I*a*b^2)*d*f*x*sin(2*f*x + 2*e) + (-I*a^2*b - a*b^2)*d*f*x)*arcta
n2(-(2*a*b*cos(2*f*x + 2*e) + (a^2 - b^2)*sin(2*f*x + 2*e))/(a^2 + b^2), (
2*a*b*sin(2*f*x + 2*e) + a^2 + b^2 - (a^2 - b^2)*cos(2*f*x + 2*e))/(a^2 +
b^2)) - ((a^3 + 3*I*a^2*b - 3*a*b^2 - I*b^3)*d*f^2*x^2 + 2*((a^3 + 3*I*a^2
*b - 3*a*b^2 - I*b^3)*c*f^2 - 2*(I*a*b^2 - b^3)*d*f)*x)*cos(2*f*x + 2*e) +
 2*((-I*a^2*b + a*b^2)*d*cos(2*f*x + 2*e) + (a^2*b + I*a*b^2)*d*sin(2*f*x
+ 2*e) + (I*a^2*b + a*b^2)*d)*dilog((I*a - b)*e^(2*I*f*x + 2*I*e)/(I*a + b
)) - (2*(a^2*b - I*a*b^2)*c*f - (a*b^2 - I*b^3)*d - (2*(a^2*b + I*a*b^2)*c
*f - (a*b^2 + I*b^3)*d)*cos(2*f*x + 2*e) - (2*(I*a^2*b - a*b^2)*c*f - (I*a
*b^2 - b^3)*d)*sin(2*f*x + 2*e))*log((a^2 + b^2)*cos(2*f*x + 2*e)^2 + 4*a*
b*sin(2*f*x + 2*e) + (a^2 + b^2)*sin(2*f*x + 2*e)^2 + a^2 + b^2 - 2*(a^2 -
 b^2)*cos(2*f*x + 2*e)) + 2*((a^2*b + I*a*b^2)*d*f*x*cos(2*f*x + 2*e) + (I
*a^2*b - a*b^2)*d*f*x*sin(2*f*x + 2*e) - (a^2*b - I*a*b^2)*d*f*x)*log(((a^
2 + b^2)*cos(2*f*x + 2*e)^2 + 4*a*b*sin(2*f*x + 2*e) + (a^2 + b^2)*sin(...
```

3.59.8 Giac [F]

$$\int \frac{c+dx}{(a+b\cot(e+fx))^2} \, dx = \int \frac{dx+c}{(b\cot(fx+e)+a)^2} \, dx$$

input
```
integrate((d*x+c)/(a+b*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
integrate((d*x + c)/(b*cot(f*x + e) + a)^2, x)
```

3.59.9 Mupad [F(-1)]

Timed out.

$$\int \frac{c+dx}{(a+b\cot(e+fx))^2} \, dx = \int \frac{c+d\,x}{(a+b\cot(e+f\,x))^2} \, dx$$

input
```
int((c + d*x)/(a + b*cot(e + f*x))^2,x)
```

output
```
int((c + d*x)/(a + b*cot(e + f*x))^2, x)
```

3.60 $\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2}\,dx$

3.60.1 Optimal result

Integrand size = 20, antiderivative size = 20

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2}\,dx=\text{Int}\left(\frac{1}{(c+dx)(a+b\cot(e+fx))^2},x\right)$$

output
```
Unintegrable(1/(d*x+c)/(a+b*cot(f*x+e))^2,x)
```

3.60.2 Mathematica [N/A]

Not integrable

Time = 22.63 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2}\,dx=\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2}\,dx$$

input
```
Integrate[1/((c + d*x)*(a + b*Cot[e + f*x])^2),x]
```

output
```
Integrate[1/((c + d*x)*(a + b*Cot[e + f*x])^2), x]
```

3.60.3 Rubi [N/A]

Not integrable

Time = 0.22 (sec) , antiderivative size = 20, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2} \, dx$$

$$\Big\downarrow \text{3042}$$

$$\int \frac{1}{(c+dx)\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$

$$\Big\downarrow \text{4223}$$

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2}dx$$

input
```
Int[1/((c + d*x)*(a + b*Cot[e + f*x])^2),x]
```

output
```
$Aborted
```

3.60.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.60.4 Maple [N/A] (verified)

Not integrable

Time = 0.58 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{1}{(dx+c)\left(a+b\cot\left(fx+e\right)\right)^{2}}dx$$

input
```
int(1/(d*x+c)/(a+b*cot(f*x+e))^2,x)
```

output
```
int(1/(d*x+c)/(a+b*cot(f*x+e))^2,x)
```

3.60.5 Fricas [N/A]

Not integrable

Time = 0.28 (sec) , antiderivative size = 55, normalized size of antiderivative = 2.75

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2}\,dx = \int \frac{1}{(dx+c)(b\cot\left(fx+e\right)+a)^{2}}\,dx$$

input
```
integrate(1/(d*x+c)/(a+b*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
integral(1/(a^2*d*x + a^2*c + (b^2*d*x + b^2*c)*cot(f*x + e)^2 + 2*(a*b*d*
x + a*b*c)*cot(f*x + e)), x)
```

3.60.6 Sympy [N/A]

Not integrable

Time = 1.56 (sec) , antiderivative size = 19, normalized size of antiderivative = 0.95

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2}\,dx = \int \frac{1}{\left(a+b\cot\left(e+fx\right)\right)^{2}\left(c+dx\right)}\,dx$$

input
```
integrate(1/(d*x+c)/(a+b*cot(f*x+e))**2,x)
```

output
```
Integral(1/((a + b*cot(e + f*x))**2*(c + d*x)), x)
```

3.60.7 Maxima [N/A]

Not integrable

Time = 10.99 (sec) , antiderivative size = 1494, normalized size of antiderivative = 74.70

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2}\,dx = \int \frac{1}{(dx+c)(b\cot(fx+e)+a)^2}\,dx$$

input
```
integrate(1/(d*x+c)/(a+b*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
(((a^4 - b^4)*d*f*x + (a^4 - b^4)*c*f)*cos(2*f*x + 2*e)^2*log(d*x + c) + (
(a^4 - b^4)*d*f*x + (a^4 - b^4)*c*f)*log(d*x + c)*sin(2*f*x + 2*e)^2 - 2*(
2*a*b^3*d + ((a^4 - 2*a^2*b^2 + b^4)*d*f*x + (a^4 - 2*a^2*b^2 + b^4)*c*f)*
log(d*x + c))*cos(2*f*x + 2*e) + ((a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*d^2*
f*x + (a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c*d*f + ((a^6 + 3*a^4*b^2 + 3*a^
2*b^4 + b^6)*d^2*f*x + (a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c*d*f)*cos(2*f*
x + 2*e)^2 + ((a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*d^2*f*x + (a^6 + 3*a^4*b
^2 + 3*a^2*b^4 + b^6)*c*d*f)*sin(2*f*x + 2*e)^2 - 2*((a^6 + a^4*b^2 - a^2*
b^4 - b^6)*d^2*f*x + (a^6 + a^4*b^2 - a^2*b^4 - b^6)*c*d*f)*cos(2*f*x + 2*
e) + 4*((a^5*b + 2*a^3*b^3 + a*b^5)*d^2*f*x + (a^5*b + 2*a^3*b^3 + a*b^5)*
c*d*f)*sin(2*f*x + 2*e))*integrate(-2*(2*(2*a^2*b^2*d*f*x + 2*a^2*b^2*c*f
+ a*b^3*d)*cos(2*f*x + 2*e) + (2*(a^3*b - a*b^3)*d*f*x + 2*(a^3*b - a*b^3)
*c*f + (a^2*b^2 - b^4)*d)*sin(2*f*x + 2*e))/((a^6 + 3*a^4*b^2 + 3*a^2*b^4
+ b^6)*d^2*f*x^2 + 2*(a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c*d*f*x + (a^6 +
3*a^4*b^2 + 3*a^2*b^4 + b^6)*c^2*f + ((a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*
d^2*f*x^2 + 2*(a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c*d*f*x + (a^6 + 3*a^4*b
^2 + 3*a^2*b^4 + b^6)*c^2*f)*cos(2*f*x + 2*e)^2 + ((a^6 + 3*a^4*b^2 + 3*a^
2*b^4 + b^6)*d^2*f*x^2 + 2*(a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c*d*f*x + (
a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c^2*f)*sin(2*f*x + 2*e)^2 - 2*((a^6 + a
^4*b^2 - a^2*b^4 - b^6)*d^2*f*x^2 + 2*(a^6 + a^4*b^2 - a^2*b^4 - b^6)*c...
```

3.60.8 Giac [N/A]

Not integrable

Time = 0.40 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2}\,dx = \int \frac{1}{(dx+c)(b\cot(fx+e)+a)^2}\,dx$$

input
```
integrate(1/(d*x+c)/(a+b*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
integrate(1/((d*x + c)*(b*cot(f*x + e) + a)^2), x)
```

3.60.9 Mupad [N/A]

Not integrable

Time = 13.05 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)(a+b\cot(e+fx))^2}\,dx = \int \frac{1}{\left(a+b\cot\left(e+f\,x\right)\right)^2\,\left(c+d\,x\right)}\,dx$$

input
```
int(1/((a + b*cot(e + f*x))^2*(c + d*x)),x)
```

output
```
int(1/((a + b*cot(e + f*x))^2*(c + d*x)), x)
```

3.61 $\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2}\,dx$

3.61.1 Optimal result

Integrand size = 20, antiderivative size = 20

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2}\,dx = \text{Int}\left(\frac{1}{(c+dx)^2(a+b\cot(e+fx))^2},x\right)$$

output
```
Unintegrable(1/(d*x+c)^2/(a+b*cot(f*x+e))^2,x)
```

3.61.2 Mathematica [N/A]

Not integrable

Time = 21.16 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2}\,dx = \int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2}\,dx$$

input
```
Integrate[1/((c + d*x)^2*(a + b*Cot[e + f*x])^2),x]
```

output
```
Integrate[1/((c + d*x)^2*(a + b*Cot[e + f*x])^2), x]
```

3.61.3 Rubi [N/A]

Not integrable

Time = 0.23 (sec) , antiderivative size = 20, 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 = {3042, 4223}

Below are the steps used by Rubi to obtain the solution. The rule number used for the transformation is given above next to the arrow. The rules definitions used are listed below.

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2}\,dx$$

$$\Big\downarrow \ 3042$$

$$\int \frac{1}{(c+dx)^2\left(a-b\tan\left(e+fx+\frac{\pi}{2}\right)\right)^2}dx$$

$$\Big\downarrow \ 4223$$

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2}dx$$

input
```
Int[1/((c + d*x)^2*(a + b*Cot[e + f*x])^2),x]
```

output
```
$Aborted
```

3.61.3.1 Defintions of rubi rules used

rule 3042
```
Int[u_, x_Symbol] :> Int[DeactivateTrig[u, x], x] /; FunctionOfTrigOfLinear
Q[u, x]
```

rule 4223
```
Int[((c_.) + (d_.)*(x_))^(m_.)*((a_.) + (b_.)*tan[(e_.) + (f_.)*(x_)])^(n_.
), x_Symbol] :> Unintegrable[(c + d*x)^m*(a + b*Tan[e + f*x])^n, x] /; Free
Q[{a, b, c, d, e, f, m, n}, x]
```

3.61.4 Maple [N/A] (verified)

Not integrable

Time = 0.58 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{1}{(dx+c)^2 (a+b\cot(fx+e))^2} dx$$

input
```
int(1/(d*x+c)^2/(a+b*cot(f*x+e))^2,x)
```

output
```
int(1/(d*x+c)^2/(a+b*cot(f*x+e))^2,x)
```

3.61.5 Fricas [N/A]

Not integrable

Time = 0.30 (sec) , antiderivative size = 96, normalized size of antiderivative = 4.80

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2} dx = \int \frac{1}{(dx+c)^2(b\cot(fx+e)+a)^2} dx$$

input
```
integrate(1/(d*x+c)^2/(a+b*cot(f*x+e))^2,x, algorithm="fricas")
```

output
```
integral(1/(a^2*d^2*x^2 + 2*a^2*c*d*x + a^2*c^2 + (b^2*d^2*x^2 + 2*b^2*c*d
*x + b^2*c^2)*cot(f*x + e)^2 + 2*(a*b*d^2*x^2 + 2*a*b*c*d*x + a*b*c^2)*cot
(f*x + e)), x)
```

3.61.6 Sympy [N/A]

Not integrable

Time = 3.11 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2} dx = \int \frac{1}{(a+b\cot(e+fx))^2 (c+dx)^2} dx$$

input
```
integrate(1/(d*x+c)**2/(a+b*cot(f*x+e))**2,x)
```

output
```
Integral(1/((a + b*cot(e + f*x))**2*(c + d*x)**2), x)
```

3.61.7 Maxima [N/A]

Not integrable

Time = 28.61 (sec) , antiderivative size = 1975, normalized size of antiderivative = 98.75

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2}\,dx = \int \frac{1}{(dx+c)^2(b\cot(fx+e)+a)^2}\,dx$$

input
```
integrate(1/(d*x+c)^2/(a+b*cot(f*x+e))^2,x, algorithm="maxima")
```

output
```
-((a^4 - b^4)*d*f*x + (a^4 - b^4)*c*f + ((a^4 - b^4)*d*f*x + (a^4 - b^4)*c
*f)*cos(2*f*x + 2*e)^2 + ((a^4 - b^4)*d*f*x + (a^4 - b^4)*c*f)*sin(2*f*x +
 2*e)^2 + 2*(2*a*b^3*d - (a^4 - 2*a^2*b^2 + b^4)*d*f*x - (a^4 - 2*a^2*b^2
+ b^4)*c*f)*cos(2*f*x + 2*e) - ((a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*d^3*f*
x^2 + 2*(a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c*d^2*f*x + (a^6 + 3*a^4*b^2 +
 3*a^2*b^4 + b^6)*c^2*d*f + ((a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*d^3*f*x^2
 + 2*(a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c*d^2*f*x + (a^6 + 3*a^4*b^2 + 3*
a^2*b^4 + b^6)*c^2*d*f)*cos(2*f*x + 2*e)^2 + ((a^6 + 3*a^4*b^2 + 3*a^2*b^4
 + b^6)*d^3*f*x^2 + 2*(a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c*d^2*f*x + (a^6
 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c^2*d*f)*sin(2*f*x + 2*e)^2 - 2*((a^6 + a^
4*b^2 - a^2*b^4 - b^6)*d^3*f*x^2 + 2*(a^6 + a^4*b^2 - a^2*b^4 - b^6)*c*d^2
*f*x + (a^6 + a^4*b^2 - a^2*b^4 - b^6)*c^2*d*f)*cos(2*f*x + 2*e) + 4*((a^5
*b + 2*a^3*b^3 + a*b^5)*d^3*f*x^2 + 2*(a^5*b + 2*a^3*b^3 + a*b^5)*c*d^2*f*
x + (a^5*b + 2*a^3*b^3 + a*b^5)*c^2*d*f)*sin(2*f*x + 2*e))*integrate(-4*(2
*(a^2*b^2*d*f*x + a^2*b^2*c*f + a*b^3*d)*cos(2*f*x + 2*e) + ((a^3*b - a*b^
3)*d*f*x + (a^3*b - a*b^3)*c*f + (a^2*b^2 - b^4)*d)*sin(2*f*x + 2*e))/((a^
6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*d^3*f*x^3 + 3*(a^6 + 3*a^4*b^2 + 3*a^2*b^
4 + b^6)*c*d^2*f*x^2 + 3*(a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c^2*d*f*x + (
a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c^3*f + ((a^6 + 3*a^4*b^2 + 3*a^2*b^4 +
 b^6)*d^3*f*x^3 + 3*(a^6 + 3*a^4*b^2 + 3*a^2*b^4 + b^6)*c*d^2*f*x^2 + 3...
```

3.61.8 Giac [N/A]

Not integrable

Time = 2.34 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2}\,dx = \int \frac{1}{(dx+c)^2(b\cot(fx+e)+a)^2}\,dx$$

input
```
integrate(1/(d*x+c)^2/(a+b*cot(f*x+e))^2,x, algorithm="giac")
```

output
```
integrate(1/((d*x + c)^2*(b*cot(f*x + e) + a)^2), x)
```

3.61.9 Mupad [N/A]

Not integrable

Time = 13.52 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{1}{(c+dx)^2(a+b\cot(e+fx))^2}\,dx = \int \frac{1}{\left(a+b\cot\left(e+f\,x\right)\right)^2\,\left(c+d\,x\right)^2}\,dx$$

input
```
int(1/((a + b*cot(e + f*x))^2*(c + d*x)^2),x)
```

output
```
int(1/((a + b*cot(e + f*x))^2*(c + d*x)^2), x)
```

CHAPTER 4

APPENDIX

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.

4.1.1 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,leafC
    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
                  ]
            ,(*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]
```

4.1.2 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. $2 (",
                                convert(leaf_count_optimal,string)," ) = ",convert(2*leaf_
            end if
        else #result contains complex but optimal is not
            if debug then
                    print("result contains complex but optimal is not");
            fi;
            return "C","Result contains complex when optimal does not.";
        fi;
    else # result do not contain complex
         # this assumes optimal do not as well. No check is needed here.
        if debug then
               print("result do not contain complex, this assumes optimal do not as well"
        fi;
        if leaf_count_result<=2*leaf_count_optimal then
            if debug then
                print("leaf_count_result<=2*leaf_count_optimal");
            fi;
            return "A"," ";
        else
            if debug then
                print("leaf_count_result>2*leaf_count_optimal");
            fi;
            return "B",cat("Leaf count of result is larger than twice the leaf count of o
                                convert(leaf_count_result,string),"$ vs. $2(",
                                convert(leaf_count_optimal,string),")=",convert(2*leaf_cou
        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:
```

4.1.3 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)),ExpnT
    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(le
        else:
            grade = "C"
            grade_annotation ="Result contains higher order function than in optimal. Order "+str(ExpnType_


    #print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)
```

```
    return grade, grade_annotation
```

4.1.4 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','arccoth','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-
   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 ("cought 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 =" "
            else:
                grade = "B"
                grade_annotation ="Both result and optimal contain complex but leaf count of result is larger t
        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_
else:
    grade = "C"
    grade_annotation ="Result contains higher order function than in optimal. Order "+str(expnType_resu


print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)
```

```
    return grade, grade_annotation
```