

Computer Algebra Independent Integration Tests

Summer 2023 edition with Rubi V 4.17.3

7-Inverse-hyperbolic-functions/7.3-Inverse-hyperbolic-tangent/193-
7.3.3-d+e-x-^m-a+b-arctanh-c-xⁿ-^p

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CHAPTER 1

INTRODUCTION

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This report gives the result of running the computer algebra independent integration test. The download section in on the main webpage contains links to download the problems in plain text format used for all CAS systems. The number of integrals in this report is [49]. This is test number [193].

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 (49)	0.00 (0)
Mathematica	97.96 (48)	2.04 (1)
Maple	97.96 (48)	2.04 (1)
Maxima	59.18 (29)	40.82 (20)
Fricas	34.69 (17)	65.31 (32)
Mupad	34.69 (17)	65.31 (32)
Giac	34.69 (17)	65.31 (32)
Sympy	20.41 (10)	79.59 (39)

Table 1.1: Percentage solved for each CAS

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

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

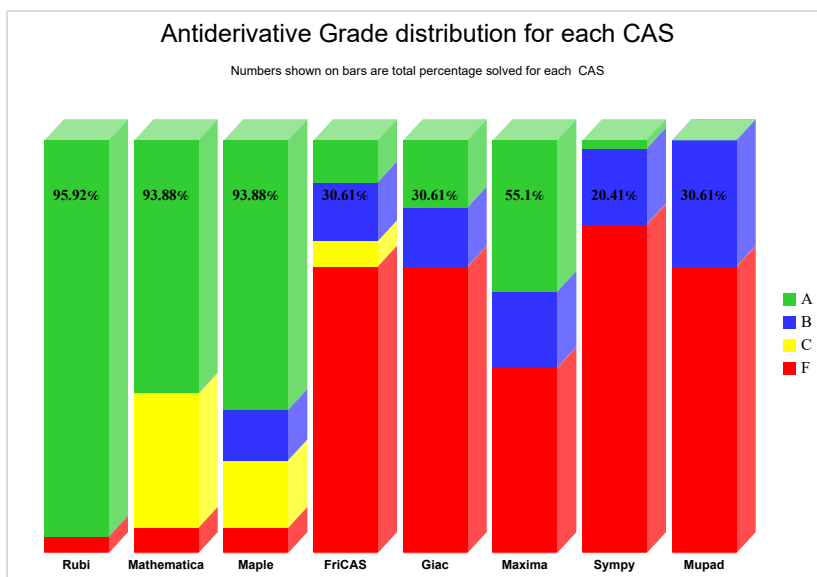
Table 1.2: Description of grading applied to integration result

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

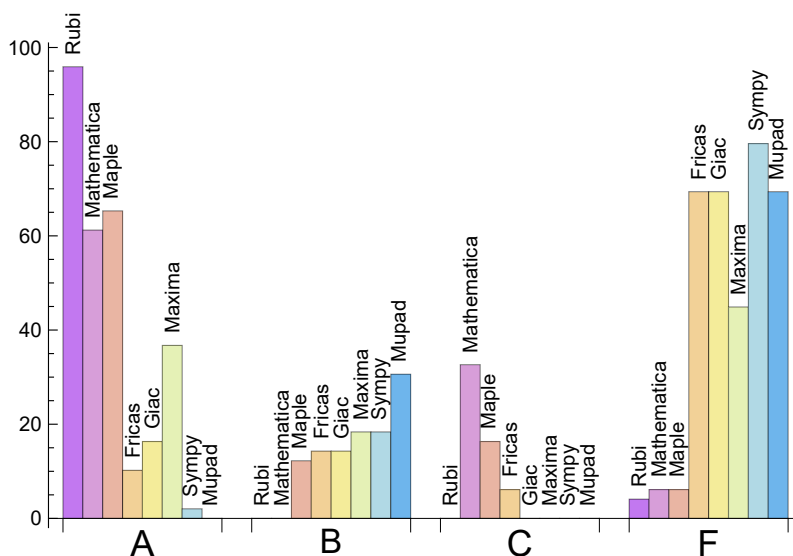
System	% A grade	% B grade	% C grade	% F grade
Rubi	95.918	0.000	0.000	4.082
Maple	65.306	12.245	16.327	6.122
Mathematica	61.224	0.000	32.653	6.122
Maxima	36.735	18.367	0.000	44.898
Giac	16.327	14.286	0.000	69.388
Fricas	10.204	14.286	6.122	69.388
Sympy	2.041	18.367	0.000	79.592
Mupad	0.000	30.612	0.000	69.388

Table 1.3: Antiderivative Grade distribution of each CAS

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



The figure below compares the grades of the CAS systems.



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

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

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

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

System	Number failed	Percentage normal failure	Percentage time-out failure	Percentage exception failure
Rubi	0	0.00	0.00	0.00
Mathematica	1	100.00	0.00	0.00
Maple	1	100.00	0.00	0.00
Maxima	20	100.00	0.00	0.00
Fricas	32	100.00	0.00	0.00
Mupad	32	0.00	100.00	0.00
Giac	32	100.00	0.00	0.00
Sympy	39	66.67	33.33	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)
Maxima	0.33
Rubi	0.77
Sympy	2.74
Giac	4.00
Maple	4.08
Mupad	4.49
Mathematica	5.21
Fricas	9.68

Table 1.5: Time performance for each CAS

System	Mean size	Normalized mean	Median size	Normalized median
Maxima	247.31	2.07	240.00	1.43
Rubi	275.94	1.05	223.00	1.00
Mathematica	364.92	1.52	273.00	1.15
Giac	502.35	3.42	269.00	1.60
Mupad	595.53	2.84	309.00	2.07
Maple	1780.12	3.66	284.00	1.38
Fricas	1884.76	6.64	401.00	2.54
Sympy	2349.20	15.21	1074.50	9.91

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.

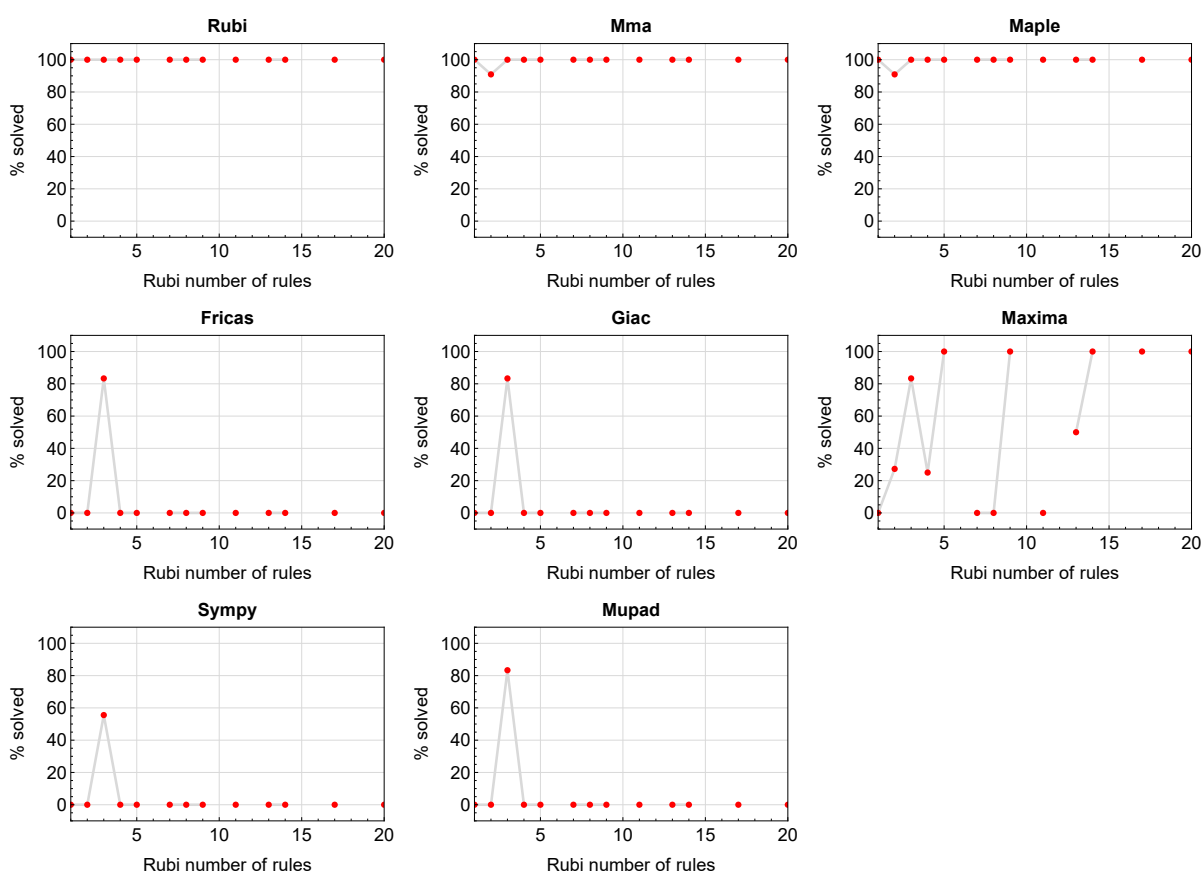


Figure 1.1: Solving statistics per number of Rubi rules used

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.

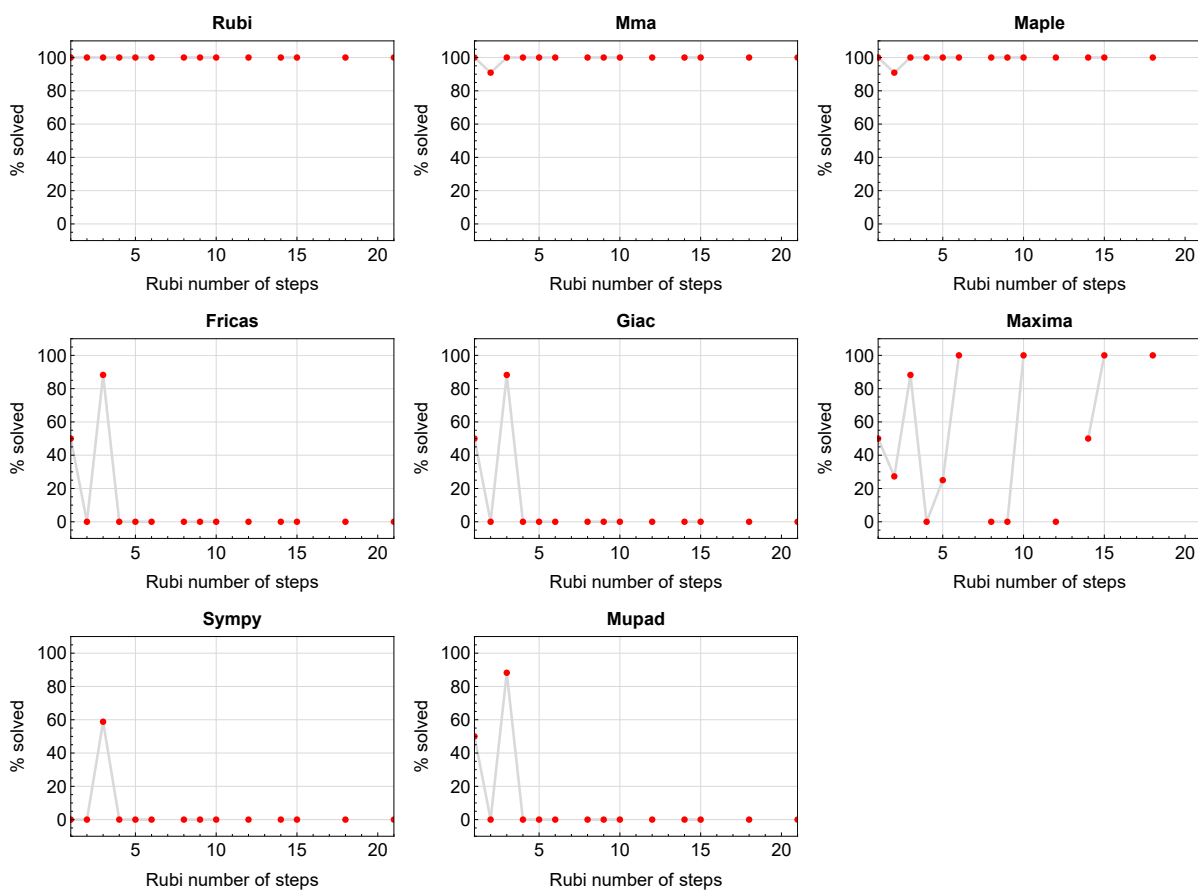


Figure 1.2: Solving statistics per number of Rubi steps used

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

1.6 Solved integrals histogram based on leaf size of result

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

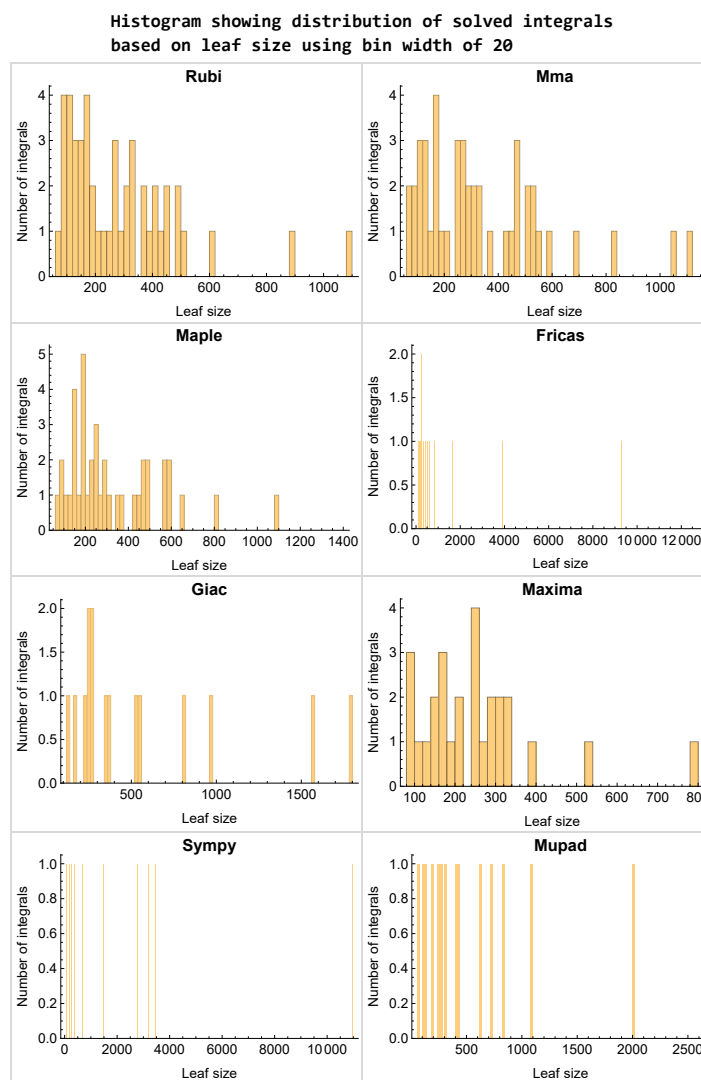


Figure 1.3: Solved integrals based on leaf size distribution

1.7 Solved integrals histogram based on CPU time used

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

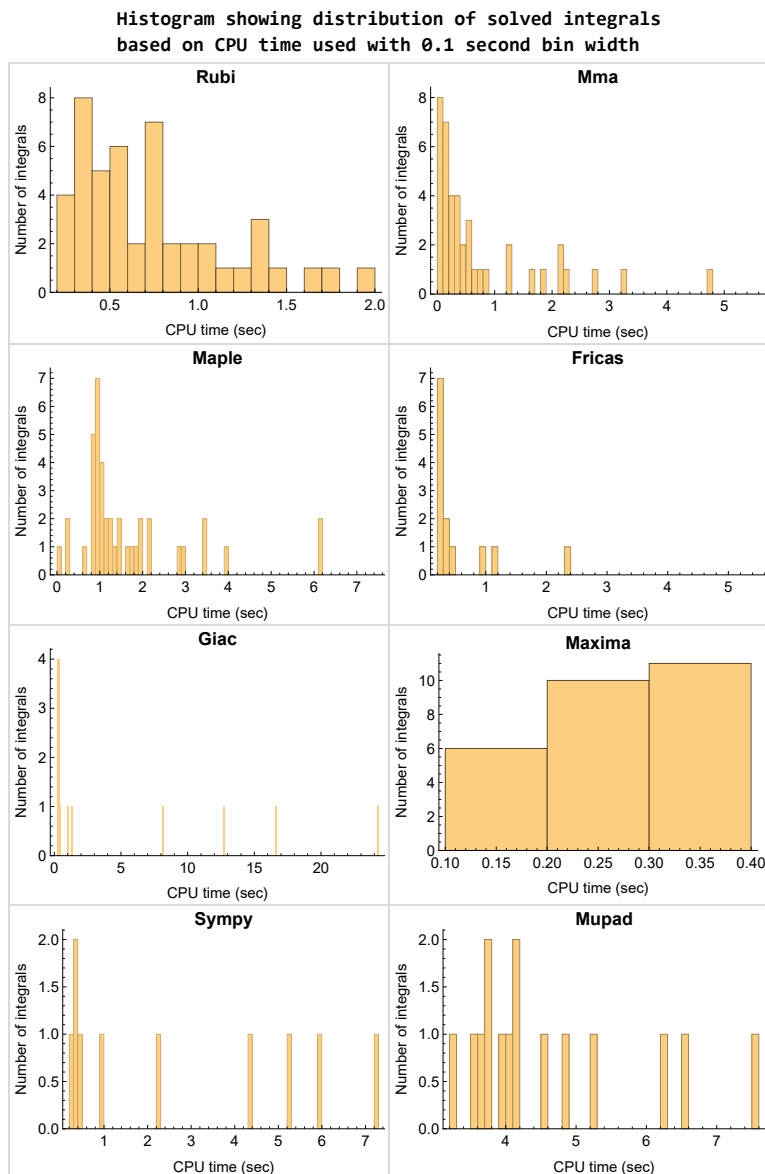


Figure 1.4: Solved integrals histogram based on CPU time used

1.8 Leaf size vs. CPU time used

The following 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.

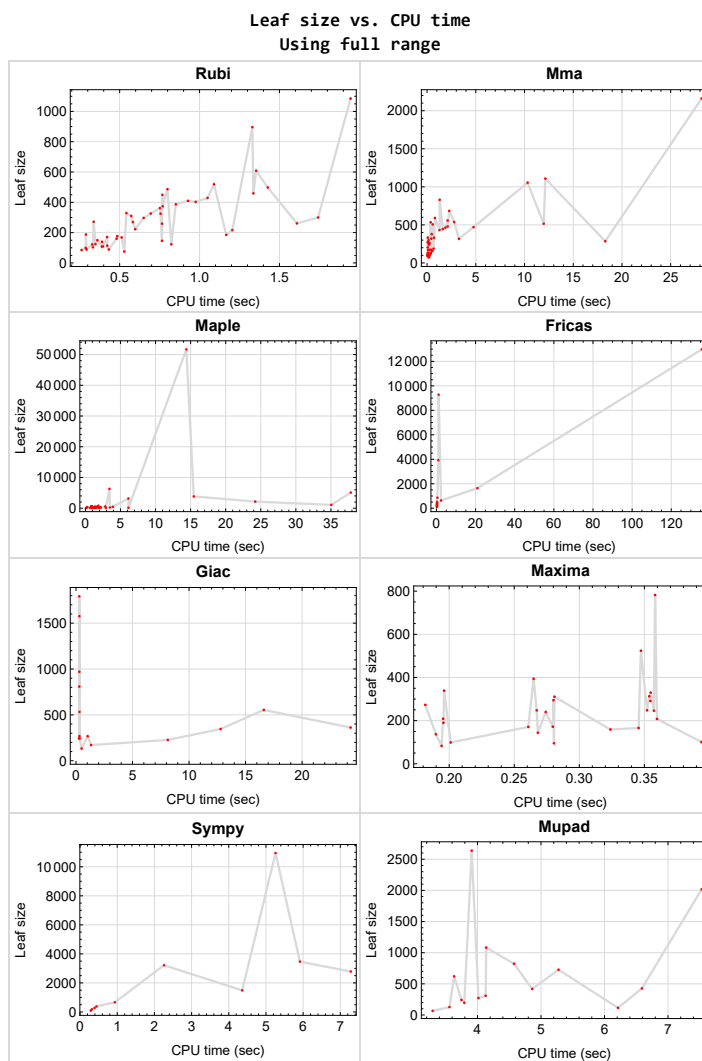


Figure 1.5: Leaf size vs. CPU time. Full range

1.9 list of integrals with no known antiderivative

{30, 31}

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

Rubi {}

Mathematica {}

Maple {}

Maxima {}

Fricas {}

Sympy {}

Giac {}

Mupad {}

1.11 list of integrals solved by CAS but failed verification

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

Rubi {}

Mathematica {}

Maple {12, 15, 16, 17, 18, 19, 20}

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.

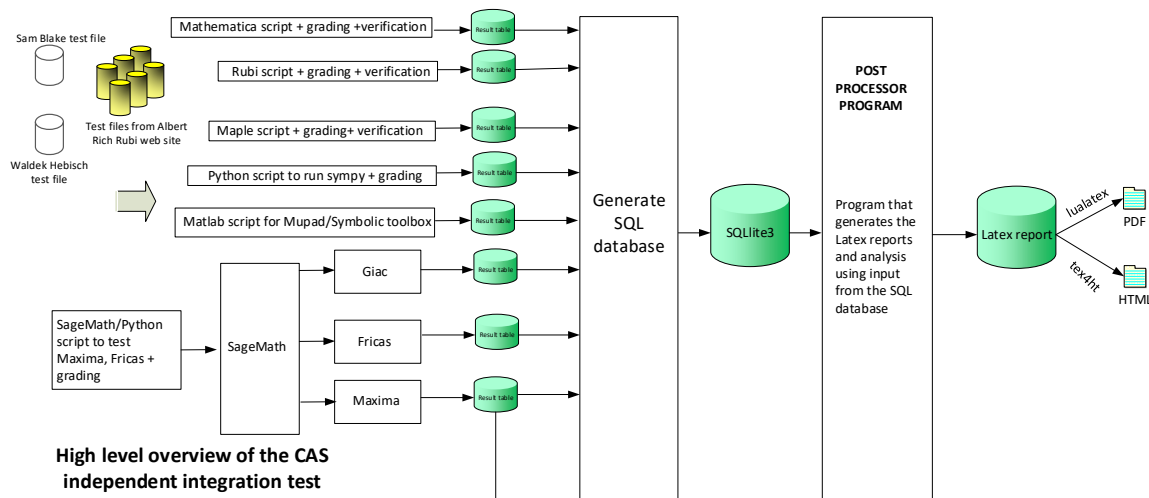
The following is an example of using Matlab's symbolic toolbox (Mupad) to solve an integral

```
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.



High level overview of the CAS independent integration test build system

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

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

The following fields are present only in Rubi Table file

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

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June 27, 2023
Design v0.01

CHAPTER 2

DETAILED SUMMARY TABLES OF RESULTS

2.1	List of integrals sorted by grade for each CAS	21
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2.1 List of integrals sorted by grade for each CAS

2.1.1	Rubi	21
2.1.2	Mma	21
2.1.3	Maple	22
2.1.4	Fricas	22
2.1.5	Maxima	22
2.1.6	Giac	23
2.1.7	Mupad	23
2.1.8	Sympy	23

2.1.1 Rubi

A grade { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49 }

B grade { }

C grade { }

F normal fail { }

F(-1) timeout fail { }

F(-2) exception fail { }

2.1.2 Mma

A grade { 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 15, 16, 17, 23, 24, 25, 27, 28, 29, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43 }

B grade { }

C grade { 5, 12, 13, 14, 18, 19, 21, 22, 26, 34, 44, 45, 46, 47, 48, 49 }

F normal fail { 20 }

F(-1) timeout fail { }

F(-2) exception fail { }

2.1.3 Maple

A grade { 2, 3, 4, 5, 6, 7, 8, 11, 13, 14, 21, 22, 23, 24, 25, 26, 27, 28, 32, 33, 35, 36, 37, 38, 39, 43, 44, 45, 46, 47, 48, 49 }

B grade { 1, 9, 10, 40, 41, 42 }

C grade { 12, 15, 16, 17, 18, 19, 20, 34 }

F normal fail { 29 }

F(-1) timedout fail { }

F(-2) exception fail { }

2.1.4 Fricas

A grade { 3, 4, 23, 24, 25 }

B grade { 1, 2, 6, 7, 8, 27, 28 }

C grade { 32, 33, 35 }

F normal fail { 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 26, 29, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49 }

F(-1) timedout fail { }

F(-2) exception fail { }

2.1.5 Maxima

A grade { 1, 2, 3, 4, 6, 7, 23, 24, 25, 27, 28, 32, 33, 35, 36, 37, 38, 39 }

B grade { 8, 9, 10, 11, 22, 40, 41, 42, 43 }

C grade { }

F normal fail { 5, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 26, 29, 34, 44, 45, 46, 47, 48, 49 }

F(-1) timedout fail { }

F(-2) exception fail { }

2.1.6 Giac

A grade { 23, 24, 25, 27, 28, 32, 33, 35 }

B grade { 1, 2, 3, 4, 6, 7, 8 }

C grade { }

F normal fail { 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 26, 29, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49 }

F(-1) timeout fail { }

F(-2) exception fail { }

2.1.7 Mupad

A grade { }

B grade { 1, 2, 3, 4, 6, 7, 8, 23, 24, 25, 27, 28, 32, 33, 35 }

C grade { }

F normal fail { }

F(-1) timeout fail { 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 26, 29, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49 }

F(-2) exception fail { }

2.1.8 Sympy

A grade { 4 }

B grade { 1, 2, 3, 6, 7, 8, 23, 24, 25 }

C grade { }

F normal fail { 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 29, 36, 37, 38, 39, 40, 41, 42, 43, 45, 46 }

F(-1) timeout fail { 26, 27, 28, 30, 31, 32, 33, 34, 35, 44, 47, 48, 49 }

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	A	B	B	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	149	150	274	295	273	322	381	1576	272
N.S.	1	1.01	1.84	1.98	1.83	2.16	2.56	10.58	1.83
time (sec)	N/A	0.364	0.086	1.997	0.182	0.256	0.442	0.302	4.015

Problem 2	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	B	B	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	125	122	205	227	209	244	279	970	197
N.S.	1	0.98	1.64	1.82	1.67	1.95	2.23	7.76	1.58
time (sec)	N/A	0.332	0.067	0.846	0.195	0.259	0.391	0.296	3.792

Problem 3	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	B	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	96	99	129	165	137	163	178	532	127
N.S.	1	1.03	1.34	1.72	1.43	1.70	1.85	5.54	1.32
time (sec)	N/A	0.302	0.060	0.838	0.190	0.265	0.318	0.310	3.558

Problem 4	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	A	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	84	85	96	78	83	98	92	245	67
N.S.	1	1.01	1.14	0.93	0.99	1.17	1.10	2.92	0.80
time (sec)	N/A	0.282	0.018	0.073	0.194	0.261	0.289	0.274	3.294

Problem 5	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	114	114	257	145	0	0	0	0	0
N.S.	1	1.00	2.25	1.27	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.448	0.181	6.148	0.000	0.000	0.000	0.000	0.000

Problem 6	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	B	B	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	93	89	102	114	99	182	663	243	115
N.S.	1	0.96	1.10	1.23	1.06	1.96	7.13	2.61	1.24
time (sec)	N/A	0.303	0.091	0.922	0.201	0.290	0.935	0.320	6.212

Problem 7	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	B	B	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	130	124	133	142	190	454	3216	809	427
N.S.	1	0.95	1.02	1.09	1.46	3.49	24.74	6.22	3.28
time (sec)	N/A	0.364	0.111	1.084	0.196	0.325	2.258	0.294	6.589

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	175	171	173	184	339	859	10946	1792	418
N.S.	1	0.98	0.99	1.05	1.94	4.91	62.55	10.24	2.39
time (sec)	N/A	0.426	0.179	1.299	0.196	0.479	5.258	0.294	4.862

Problem 9	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	359	362	506	804	782	0	0	0	0
N.S.	1	1.01	1.41	2.24	2.18	0.00	0.00	0.00	0.00
time (sec)	N/A	0.789	0.574	1.858	0.358	0.000	0.000	0.000	0.000

Problem 10	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	257	270	319	590	524	0	0	0	0
N.S.	1	1.05	1.24	2.30	2.04	0.00	0.00	0.00	0.00
time (sec)	N/A	0.608	0.433	0.923	0.347	0.000	0.000	0.000	0.000

Problem 11	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	160	177	174	298	313	0	0	0	0
N.S.	1	1.11	1.09	1.86	1.96	0.00	0.00	0.00	0.00
time (sec)	N/A	0.513	0.384	0.259	0.354	0.000	0.000	0.000	0.000

Problem 12	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	C	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	No	TBD	TBD	TBD	TBD	TBD
size	188	188	1055	1087	0	0	0	0	0
N.S.	1	1.00	5.61	5.78	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.311	10.317	35.051	0.000	0.000	0.000	0.000	0.000

Problem 13	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	321	310	317	451	0	0	0	0	0
N.S.	1	0.97	0.99	1.40	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.616	3.275	3.911	0.000	0.000	0.000	0.000	0.000

Problem 14	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	480	450	470	592	0	0	0	0	0
N.S.	1	0.94	0.98	1.23	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.815	4.767	1.724	0.000	0.000	0.000	0.000	0.000

Problem 15	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	C	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	No	TBD	TBD	TBD	TBD	TBD
size	614	608	830	5093	0	0	0	0	0
N.S.	1	0.99	1.35	8.29	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	1.463	1.296	37.826	0.000	0.000	0.000	0.000	0.000

Problem 16	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	C	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	No	TBD	TBD	TBD	TBD	TBD
size	387	403	591	3848	0	0	0	0	0
N.S.	1	1.04	1.53	9.94	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	1.037	0.804	15.453	0.000	0.000	0.000	0.000	0.000

Problem 17	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	C	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	No	TBD	TBD	TBD	TBD	TBD
size	244	259	331	6324	0	0	0	0	0
N.S.	1	1.06	1.36	25.92	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.804	0.724	3.428	0.000	0.000	0.000	0.000	0.000

Problem 18	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	C	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	No	TBD	TBD	TBD	TBD	TBD
size	272	272	2160	2160	0	0	0	0	0
N.S.	1	1.00	7.94	7.94	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.360	28.175	24.211	0.000	0.000	0.000	0.000	0.000

Problem 19	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	C	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	No	TBD	TBD	TBD	TBD	TBD
size	517	487	1107	3154	0	0	0	0	0
N.S.	1	0.94	2.14	6.10	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.878	12.142	6.135	0.000	0.000	0.000	0.000	0.000

Problem 20	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	F	C	F	F	F	F	F(-1)
verified	N/A	Yes	N/A	No	TBD	TBD	TBD	TBD	TBD
size	953	896	0	51695	0	0	0	0	0
N.S.	1	0.94	0.00	54.24	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	1.430	0.000	14.389	0.000	0.000	0.000	0.000	0.000

Problem 21	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	67	109	240	92	0	0	0	0	0
N.S.	1	1.63	3.58	1.37	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.435	0.206	2.918	0.000	0.000	0.000	0.000	0.000

Problem 22	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	88	108	272	127	144	0	0	0	0
N.S.	1	1.23	3.09	1.44	1.64	0.00	0.00	0.00	0.00
time (sec)	N/A	0.408	0.084	1.472	0.268	0.000	0.000	0.000	0.000

Problem 23	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	B	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	182	160	254	242	240	519	2786	227	823
N.S.	1	0.88	1.40	1.33	1.32	2.85	15.31	1.25	4.52
time (sec)	N/A	0.509	0.146	2.191	0.274	0.322	7.281	8.121	4.576

Problem 24	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	B	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	158	140	170	199	171	401	3465	171	309
N.S.	1	0.89	1.08	1.26	1.08	2.54	21.93	1.08	1.96
time (sec)	N/A	0.417	0.115	1.690	0.261	0.286	5.913	1.333	4.128

Problem 25	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	A	B	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	117	103	104	92	95	249	1486	133	242
N.S.	1	0.88	0.89	0.79	0.81	2.13	12.70	1.14	2.07
time (sec)	N/A	0.351	0.045	0.684	0.280	0.264	4.361	0.497	3.747

Problem 26	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F(-1)	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	325	325	285	347	0	0	0	0	0
N.S.	1	1.00	0.88	1.07	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.800	18.286	1.040	0.000	0.000	0.000	0.000	0.000

Problem 27	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	B	F(-1)	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	166	168	261	155	172	634	0	269	727
N.S.	1	1.01	1.57	0.93	1.04	3.82	0.00	1.62	4.38
time (sec)	N/A	0.539	0.257	1.956	0.280	2.340	0.000	0.308	5.276

Problem 28	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	B	F(-1)	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	226	223	379	229	311	1639	0	362	2016
N.S.	1	0.99	1.68	1.01	1.38	7.25	0.00	1.60	8.92
time (sec)	N/A	0.629	0.476	2.142	0.281	20.912	0.000	24.291	7.530

Problem 29	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	F	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	N/A	TBD	TBD	TBD	TBD	TBD
size	1085	1085	684	0	0	0	0	0	0
N.S.	1	1.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	2.100	2.274	0.000	0.000	0.000	0.000	0.000	0.000

Problem 30	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	N/A	N/A	N/A	N/A	N/A	F(-1)	N/A	N/A
verified	N/A	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	20	20	22	20	81	36	0	22	22
N.S.	1	1.00	1.10	1.00	4.05	1.80	0.00	1.10	1.10
time (sec)	N/A	0.216	51.474	0.552	0.346	0.262	0.000	0.320	3.469

Problem 31	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	N/A	N/A	N/A	N/A	N/A	F(-1)	N/A	N/A
verified	N/A	N/A	N/A	N/A	TBD	TBD	TBD	TBD	TBD
size	20	20	22	20	323	47	0	22	22
N.S.	1	1.00	1.10	1.00	16.15	2.35	0.00	1.10	1.10
time (sec)	N/A	0.211	85.397	0.592	1.385	0.259	0.000	0.543	3.562

Problem 32	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	C	F(-1)	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	336	326	299	467	295	9282	0	346	1081
N.S.	1	0.97	0.89	1.39	0.88	27.62	0.00	1.03	3.22
time (sec)	N/A	0.761	0.155	1.377	0.280	1.119	0.000	12.798	4.137

Problem 33	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	C	F(-1)	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	285	297	333	363	248	3928	0	267	621
N.S.	1	1.04	1.17	1.27	0.87	13.78	0.00	0.94	2.18
time (sec)	N/A	0.697	0.080	0.263	0.267	0.975	0.000	1.034	3.632

Problem 34	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	C	F	F	F(-1)	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	523	519	515	182	0	0	0	0	0
N.S.	1	0.99	0.98	0.35	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	1.138	11.969	1.128	0.000	0.000	0.000	0.000	0.000

Problem 35	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	C	F(-1)	A	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	414	410	534	461	394	12984	0	554	2638
N.S.	1	0.99	1.29	1.11	0.95	31.36	0.00	1.34	6.37
time (sec)	N/A	0.978	0.367	1.484	0.265	135.621	0.000	16.616	3.909

Problem 36	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	195	300	160	247	246	0	0	0	0
N.S.	1	1.54	0.82	1.27	1.26	0.00	0.00	0.00	0.00
time (sec)	N/A	1.826	0.519	3.487	0.357	0.000	0.000	0.000	0.000

Problem 37	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	160	217	130	216	208	0	0	0	0
N.S.	1	1.36	0.81	1.35	1.30	0.00	0.00	0.00	0.00
time (sec)	N/A	1.282	0.386	0.935	0.360	0.000	0.000	0.000	0.000

Problem 38	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	120	146	96	185	166	0	0	0	0
N.S.	1	1.22	0.80	1.54	1.38	0.00	0.00	0.00	0.00
time (sec)	N/A	0.804	0.252	0.980	0.346	0.000	0.000	0.000	0.000

Problem 39	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	78	89	75	140	101	0	0	0	0
N.S.	1	1.14	0.96	1.79	1.29	0.00	0.00	0.00	0.00
time (sec)	N/A	0.449	0.154	0.915	0.394	0.000	0.000	0.000	0.000

Problem 40	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	69	75	74	180	159	0	0	0	0
N.S.	1	1.09	1.07	2.61	2.30	0.00	0.00	0.00	0.00
time (sec)	N/A	0.555	0.208	1.052	0.324	0.000	0.000	0.000	0.000

Problem 41	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	117	123	118	243	248	0	0	0	0
N.S.	1	1.05	1.01	2.08	2.12	0.00	0.00	0.00	0.00
time (sec)	N/A	0.865	0.338	1.089	0.352	0.000	0.000	0.000	0.000

Problem 42	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	B	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	157	185	158	273	291	0	0	0	0
N.S.	1	1.18	1.01	1.74	1.85	0.00	0.00	0.00	0.00
time (sec)	N/A	1.224	0.537	1.127	0.355	0.000	0.000	0.000	0.000

Problem 43	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	A	A	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	192	261	187	303	330	0	0	0	0
N.S.	1	1.36	0.97	1.58	1.72	0.00	0.00	0.00	0.00
time (sec)	N/A	1.695	0.668	1.208	0.355	0.000	0.000	0.000	0.000

Problem 44	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F(-1)	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	460	459	558	564	0	0	0	0	0
N.S.	1	1.00	1.21	1.23	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	1.401	2.109	2.840	0.000	0.000	0.000	0.000	0.000

Problem 45	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	374	387	463	494	0	0	0	0	0
N.S.	1	1.03	1.24	1.32	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.893	1.880	0.854	0.000	0.000	0.000	0.000	0.000

Problem 46	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	318	329	432	433	0	0	0	0	0
N.S.	1	1.03	1.36	1.36	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.575	1.281	0.902	0.000	0.000	0.000	0.000	0.000

Problem 47	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F(-1)	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	358	374	445	499	0	0	0	0	0
N.S.	1	1.04	1.24	1.39	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.814	1.609	0.869	0.000	0.000	0.000	0.000	0.000

Problem 48	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F(-1)	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	413	429	479	577	0	0	0	0	0
N.S.	1	1.04	1.16	1.40	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	1.132	2.114	0.994	0.000	0.000	0.000	0.000	0.000

Problem 49	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Mupad
grade	N/A	A	C	A	F	F	F(-1)	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD
size	506	498	538	650	0	0	0	0	0
N.S.	1	0.98	1.06	1.28	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	1.499	2.780	0.835	0.000	0.000	0.000	0.000	0.000

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 [43] had the largest ratio of [.769230999999999998]

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	3	3	1.01	16	0.188
2	A	3	3	0.98	16	0.188
3	A	3	3	1.03	16	0.188
4	A	3	3	1.01	14	0.214
5	A	5	4	1.00	16	0.250
6	A	3	3	0.96	16	0.188
7	A	3	3	0.95	16	0.188
8	A	3	3	0.98	16	0.188
9	A	2	2	1.01	18	0.111
10	A	2	2	1.05	18	0.111
11	A	2	2	1.11	16	0.125
12	A	1	1	1.00	18	0.056
13	A	2	2	0.97	18	0.111
14	A	2	2	0.94	18	0.111
15	A	2	2	0.99	18	0.111
16	A	2	2	1.04	18	0.111
17	A	2	2	1.06	16	0.125
18	A	1	1	1.00	18	0.056
19	A	2	2	0.94	18	0.111
20	A	2	2	0.94	18	0.111
21	A	5	4	1.63	17	0.235
22	A	5	4	1.23	15	0.267

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	0.88	18	0.167
24	A	3	3	0.89	18	0.167
25	A	3	3	0.88	16	0.188
26	A	3	3	1.00	18	0.167
27	A	3	3	1.01	18	0.167
28	A	3	3	0.99	18	0.167
29	A	2	2	1.00	18	0.111
30	N/A	1	0	1.00	20	0.000
31	N/A	1	0	1.00	20	0.000
32	A	3	3	0.97	18	0.167
33	A	3	3	1.04	16	0.188
34	A	3	3	0.99	18	0.167
35	A	3	3	0.99	18	0.167
36	A	18	17	1.54	26	0.654
37	A	14	13	1.36	26	0.500
38	A	10	9	1.22	24	0.375
39	A	6	5	1.14	23	0.217
40	A	6	5	1.09	26	0.192
41	A	10	9	1.05	26	0.346
42	A	15	14	1.18	26	0.538
43	A	21	20	1.36	26	0.769
44	A	12	11	1.00	23	0.478
45	A	8	7	1.03	21	0.333
46	A	4	3	1.03	20	0.150
47	A	5	4	1.04	23	0.174
48	A	9	8	1.04	23	0.348
49	A	14	13	0.98	23	0.565

CHAPTER 3

LISTING OF INTEGRALS

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3.1 $\int (d + ex)^4 (a + \operatorname{barctanh}(cx)) dx$

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3.1.1 Optimal result

Integrand size = 16, antiderivative size = 149

$$\int (d + ex)^4 (a + \operatorname{barctanh}(cx)) dx = \frac{bde(2c^2d^2 + e^2)x}{c^3} + \frac{be^2(10c^2d^2 + e^2)x^2}{10c^3} + \frac{bde^3x^3}{3c} + \frac{be^4x^4}{20c} + \frac{(d + ex)^5(a + \operatorname{barctanh}(cx))}{5e} + \frac{b(cd + e)^5 \log(1 - cx)}{10c^5e} - \frac{b(cd - e)^5 \log(1 + cx)}{10c^5e}$$

```
output b*d*e*(2*c^2*d^2+e^2)*x/c^3+1/10*b*e^2*(10*c^2*d^2+e^2)*x^2/c^3+1/3*b*d*e^3*x^3/c+1/20*b*e^4*x^4/c+1/5*(e*x+d)^5*(a+b*arctanh(c*x))/e+1/10*b*(c*d+e)^5*ln(-c*x+1)/c^5/e-1/10*b*(c*d-e)^5*ln(c*x+1)/c^5/e
```

3.1.2 Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 274, normalized size of antiderivative = 1.84

$$\int (d + ex)^4 (a + \operatorname{barctanh}(cx)) dx = \frac{60c^2d(ac^3d^3 + be(2c^2d^2 + e^2))x + 6c^2e(20ac^3d^3 + be(10c^2d^2 + e^2))x^2 + 20c^4de^2(6acd + be)x^3 + 3c^4e^3(20$$

```
input Integrate[(d + e*x)^4*(a + b*ArcTanh[c*x]),x]
```

output $(60*c^2*d*(a*c^3*d^3 + b*e*(2*c^2*d^2 + e^2))*x + 6*c^2*e*(20*a*c^3*d^3 + b*e*(10*c^2*d^2 + e^2))*x^2 + 20*c^4*d*e^2*(6*a*c*d + b*e)*x^3 + 3*c^4*e^3*(20*a*c*d + b*e)*x^4 + 12*a*c^5*e^4*x^5 + 12*b*c^5*x*(5*d^4 + 10*d^3*e*x + 10*d^2*e^2*x^2 + 5*d*e^3*x^3 + e^4*x^4)*ArcTanh[c*x] + 6*b*(5*c^4*d^4 + 10*c^3*d^3*e + 10*c^2*d^2*e^2 + 5*c*d*e^3 + e^4)*Log[1 - c*x] + 6*b*(5*c^4*d^4 - 10*c^3*d^3*e + 10*c^2*d^2*e^2 - 5*c*d*e^3 + e^4)*Log[1 + c*x])/(60*c^5)$

3.1.3 Rubi [A] (verified)

Time = 0.36 (sec) , antiderivative size = 150, normalized size of antiderivative = 1.01, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.188$, Rules used = {6478, 477, 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.

$$\int (d + ex)^4 (a + b \operatorname{arctanh}(cx)) dx$$

$$\downarrow 6478$$

$$\frac{(d + ex)^5 (a + b \operatorname{arctanh}(cx))}{5e} - \frac{bc \int \frac{(d+ex)^5}{1-c^2x^2} dx}{5e}$$

$$\downarrow 477$$

$$\frac{(d + ex)^5 (a + b \operatorname{arctanh}(cx))}{5e} - \frac{bc \int \left(\frac{(cd-e)^5}{2c^5(cx+1)} - \frac{e^5x^3}{c^2} - \frac{5de^4x^2}{c^2} - \frac{5de^2(2c^2d^2+e^2)}{c^4} - \frac{e^3(10c^2d^2+e^2)x}{c^4} + \frac{(cd+e)^5}{2c^5(1-cx)} \right) dx}{5e}$$

$$\downarrow 2009$$

$$\frac{(d + ex)^5 (a + b \operatorname{arctanh}(cx))}{5e} - \frac{bc \left(\frac{(cd-e)^5 \log(cx+1)}{2c^6} - \frac{(cd+e)^5 \log(1-cx)}{2c^6} - \frac{5de^4x^3}{3c^2} - \frac{e^5x^4}{4c^2} - \frac{5de^2x(2c^2d^2+e^2)}{c^4} - \frac{e^3x^2(10c^2d^2+e^2)}{2c^4} \right)}{5e}$$

input `Int[(d + e*x)^4*(a + b*ArcTanh[c*x]), x]`

```
output ((d + e*x)^5*(a + b*ArcTanh[c*x]))/(5*e) - (b*c*((-5*d*e^2*(2*c^2*d^2 + e^
2)*x)/c^4 - (e^3*(10*c^2*d^2 + e^2)*x^2)/(2*c^4) - (5*d*e^4*x^3)/(3*c^2) -
(e^5*x^4)/(4*c^2) - ((c*d + e)^5*Log[1 - c*x])/(2*c^6) + ((c*d - e)^5*Log
[1 + c*x])/(2*c^6)))/(5*e)
```

3.1.3.1 Defintions of rubi rules used

```
rule 477 Int[((c_) + (d_.)*(x_))^(n_)*((a_) + (b_.)*(x_)^2)^(p_), x_Symbol] :> Simp[
a^p Int[ExpandIntegrand[(c + d*x)^n*(1 - Rt[-b/a, 2]*x)^p*(1 + Rt[-b/a, 2
]*x)^p, x], x] /; FreeQ[{a, b, c, d}, x] && ILtQ[p, 0] && IntegerQ[n] &
& NiceSqrtQ[-b/a] && !FractionalPowerFactorQ[Rt[-b/a, 2]]
```

```
rule 2009 Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

```
rule 6478 Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.)*((d_) + (e_.)*(x_))^(q_.), x_Symbol
] :> Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])/(e*(q + 1))), x] - Simp[b
*(c/(e*(q + 1))) Int[(d + e*x)^(q + 1)/(1 - c^2*x^2), x], x] /; FreeQ[{a,
b, c, d, e, q}, x] && NeQ[q, -1]
```

3.1.4 Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 294 vs. $2(137) = 274$.

Time = 2.00 (sec) , antiderivative size = 295, normalized size of antiderivative = 1.98

method	result
parts	$\frac{a(ex+d)^5}{5e} + \frac{b \left(\frac{ce^4 \operatorname{arctanh}(cx)x^5}{5} + ce^3 \operatorname{arctanh}(cx)x^4d + 2ce^2 \operatorname{arctanh}(cx)x^3d^2 + 2ce \operatorname{arctanh}(cx)x^2d^3 + \operatorname{arctanh}(cx)cx \right)}{5e}$
derivatividevides	$\frac{a(ecx+cd)^5}{5c^4e} + \frac{b \left(\frac{\operatorname{arctanh}(cx)c^5d^5}{5e} + \operatorname{arctanh}(cx)c^5d^4x + 2e \operatorname{arctanh}(cx)c^5d^3x^2 + 2e^2 \operatorname{arctanh}(cx)c^5d^2x^3 + e^3 \operatorname{arctanh}(cx)c^5dx^4 + \frac{e^4}{5} \operatorname{arctanh}(cx) \right)}{5c^4e}$
default	$\frac{a(ecx+cd)^5}{5c^4e} + \frac{b \left(\frac{\operatorname{arctanh}(cx)c^5d^5}{5e} + \operatorname{arctanh}(cx)c^5d^4x + 2e \operatorname{arctanh}(cx)c^5d^3x^2 + 2e^2 \operatorname{arctanh}(cx)c^5d^2x^3 + e^3 \operatorname{arctanh}(cx)c^5dx^4 + \frac{e^4}{5} \operatorname{arctanh}(cx) \right)}{5c^4e}$
parallelrisch	$60b c^2 d^2 e^2 + 120a c^3 d^3 e + 12 \operatorname{arctanh}(cx) b e^4 + 12 \ln(cx-1) b e^4 + 120x^2 a c^5 d^3 e + 120 \ln(cx-1) b c^2 d^2 e^2 + 60b d^4 \operatorname{arctanh}(cx)$
risch	$\frac{bd e^3 x^3}{3c} + \frac{b e^4 x^4}{20c} + \frac{e^3 b d x}{c^3} - \frac{e \ln(cx+1) b d^3}{c^2} + \frac{e \ln(-cx+1) b d^3}{c^2} + \frac{e^2 \ln(cx+1) b d^2}{c^3} + \frac{e^2 \ln(-cx+1) b d^2}{c^3} - \frac{e^3 \ln(cx+1) b d}{c^3}$

input `int((e*x+d)^4*(a+b*arctanh(c*x)),x,method=_RETURNVERBOSE)`

output `1/5*a*(e*x+d)^5/e+b/c*(1/5*c*e^4*arctanh(c*x)*x^5+c*e^3*arctanh(c*x)*x^4*d+2*c*e^2*arctanh(c*x)*x^3*d^2+2*c*e*arctanh(c*x)*x^2*d^3+arctanh(c*x)*c*x*d^4+1/5*c/e*arctanh(c*x)*d^5-1/5/c^4/e*(-5/3*c^4*d*e^4*x^3-10*c^4*d^3*e^2*x-5*c^2*d*e^4*x-5*c^4*d^2*e^3*x^2+1/2*(c^5*d^5-5*c^4*d^4*e+10*c^3*d^3*e^2-10*c^2*d^2*e^3+5*c*d*e^4-e^5)*ln(c*x+1)-1/2*(c^5*d^5+5*c^4*d^4*e+10*c^3*d^3*e^2+10*c^2*d^2*e^3+5*c*d*e^4+e^5)*ln(c*x-1)-1/2*e^5*c^2*x^2-1/4*e^5*c^4*x^4))`

3.1.5 Fracas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 322 vs. $2(137) = 274$.

Time = 0.26 (sec) , antiderivative size = 322, normalized size of antiderivative = 2.16

$$\int (d + ex)^4 (a + b \operatorname{arctanh}(cx)) dx = \frac{12 ac^5 e^4 x^5 + 3 (20 ac^5 d e^3 + bc^4 e^4) x^4 + 20 (6 ac^5 d^2 e^2 + bc^4 d e^3) x^3 + 6 (20 ac^5 d^3 e + 10 bc^4 d^2 e^2 + bc^2 e^4) x^2 + \dots}{1}$$

input `integrate((e*x+d)^4*(a+b*arctanh(c*x)),x,algorithm="fricas")`

```
output 1/60*(12*a*c^5*e^4*x^5 + 3*(20*a*c^5*d*e^3 + b*c^4*e^4)*x^4 + 20*(6*a*c^5*
d^2*e^2 + b*c^4*d*e^3)*x^3 + 6*(20*a*c^5*d^3*e + 10*b*c^4*d^2*e^2 + b*c^2*
e^4)*x^2 + 60*(a*c^5*d^4 + 2*b*c^4*d^3*e + b*c^2*d*e^3)*x + 6*(5*b*c^4*d^4
- 10*b*c^3*d^3*e + 10*b*c^2*d^2*e^2 - 5*b*c*d*e^3 + b*e^4)*log(c*x + 1) +
6*(5*b*c^4*d^4 + 10*b*c^3*d^3*e + 10*b*c^2*d^2*e^2 + 5*b*c*d*e^3 + b*e^4)
*log(c*x - 1) + 6*(b*c^5*e^4*x^5 + 5*b*c^5*d*e^3*x^4 + 10*b*c^5*d^2*e^2*x^
3 + 10*b*c^5*d^3*e*x^2 + 5*b*c^5*d^4*x)*log(-(c*x + 1)/(c*x - 1))/c^5
```

3.1.6 Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 381 vs. $2(134) = 268$.

Time = 0.44 (sec) , antiderivative size = 381, normalized size of antiderivative = 2.56

$$\int (d + ex)^4 (a + \operatorname{barctanh}(cx)) dx$$

$$= \begin{cases} ad^4x + 2ad^3ex^2 + 2ad^2e^2x^3 + ade^3x^4 + \frac{ae^4x^5}{5} + bd^4x \operatorname{atanh}(cx) + 2bd^3ex^2 \operatorname{atanh}(cx) + 2bd^2e^2x^3 \operatorname{atanh}(cx) \\ a(d^4x + 2d^3ex^2 + 2d^2e^2x^3 + de^3x^4 + \frac{e^4x^5}{5}) \end{cases}$$

```
input integrate((e*x+d)**4*(a+b*atanh(c*x)),x)
```

```
output Piecewise((a*d**4*x + 2*a*d**3*e*x**2 + 2*a*d**2*e**2*x**3 + a*d*e**3*x**4
+ a*e**4*x**5/5 + b*d**4*x*atanh(c*x) + 2*b*d**3*e*x**2*atanh(c*x) + 2*b*
d**2*e**2*x**3*atanh(c*x) + b*d*e**3*x**4*atanh(c*x) + b*e**4*x**5*atanh(c
*x)/5 + b*d**4*log(x - 1/c)/c + b*d**4*atanh(c*x)/c + 2*b*d**3*e*x/c + b*d
**2*e**2*x**2/c + b*d*e**3*x**3/(3*c) + b*e**4*x**4/(20*c) - 2*b*d**3*e*at
anh(c*x)/c**2 + 2*b*d**2*e**2*log(x - 1/c)/c**3 + 2*b*d**2*e**2*atanh(c*x)
/c**3 + b*d*e**3*x/c**3 + b*e**4*x**2/(10*c**3) - b*d*e**3*atanh(c*x)/c**4
+ b*e**4*log(x - 1/c)/(5*c**5) + b*e**4*atanh(c*x)/(5*c**5), Ne(c, 0)), (
a*(d**4*x + 2*d**3*e*x**2 + 2*d**2*e**2*x**3 + d*e**3*x**4 + e**4*x**5/5),
True))
```

3.1.7 Maxima [A] (verification not implemented)

Time = 0.18 (sec) , antiderivative size = 273, normalized size of antiderivative = 1.83

$$\begin{aligned} & \int (d + ex)^4 (a + b \operatorname{arctanh}(cx)) dx \\ &= \frac{1}{5} a e^4 x^5 + a d e^3 x^4 + 2 a d^2 e^2 x^3 + 2 a d^3 e x^2 \\ &+ \left(2 x^2 \operatorname{artanh}(cx) + c \left(\frac{2x}{c^2} - \frac{\log(cx+1)}{c^3} + \frac{\log(cx-1)}{c^3} \right) \right) b d^3 e \\ &+ \left(2 x^3 \operatorname{artanh}(cx) + c \left(\frac{x^2}{c^2} + \frac{\log(c^2 x^2 - 1)}{c^4} \right) \right) b d^2 e^2 \\ &+ \frac{1}{6} \left(6 x^4 \operatorname{artanh}(cx) + c \left(\frac{2(c^2 x^3 + 3x)}{c^4} - \frac{3 \log(cx+1)}{c^5} + \frac{3 \log(cx-1)}{c^5} \right) \right) b d e^3 \\ &+ \frac{1}{20} \left(4 x^5 \operatorname{artanh}(cx) + c \left(\frac{c^2 x^4 + 2x^2}{c^4} + \frac{2 \log(c^2 x^2 - 1)}{c^6} \right) \right) b e^4 \\ &+ a d^4 x + \frac{(2 c x \operatorname{artanh}(cx) + \log(-c^2 x^2 + 1)) b d^4}{2 c} \end{aligned}$$

input `integrate((e*x+d)^4*(a+b*arctanh(c*x)),x, algorithm="maxima")`

output `1/5*a*e^4*x^5 + a*d*e^3*x^4 + 2*a*d^2*e^2*x^3 + 2*a*d^3*e*x^2 + (2*x^2*arc
tanh(c*x) + c*(2*x/c^2 - log(c*x + 1)/c^3 + log(c*x - 1)/c^3))*b*d^3*e + (
2*x^3*arctanh(c*x) + c*(x^2/c^2 + log(c^2*x^2 - 1)/c^4))*b*d^2*e^2 + 1/6*(
6*x^4*arctanh(c*x) + c*(2*(c^2*x^3 + 3*x)/c^4 - 3*log(c*x + 1)/c^5 + 3*log
(c*x - 1)/c^5))*b*d*e^3 + 1/20*(4*x^5*arctanh(c*x) + c*((c^2*x^4 + 2*x^2)/
c^4 + 2*log(c^2*x^2 - 1)/c^6))*b*e^4 + a*d^4*x + 1/2*(2*c*x*arctanh(c*x) +
log(-c^2*x^2 + 1))*b*d^4/c`

3.1.8 Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1576 vs. 2(137) = 274.

Time = 0.30 (sec) , antiderivative size = 1576, normalized size of antiderivative = 10.58

$$\int (d + ex)^4 (a + b \operatorname{arctanh}(cx)) dx = \text{Too large to display}$$

input `integrate((e*x+d)^4*(a+b*arctanh(c*x)),x, algorithm="giac")`

output

```

1/15*c*(3*(5*(c*x + 1)^4*b*c^4*d^4/(c*x - 1)^4 - 20*(c*x + 1)^3*b*c^4*d^4/
(c*x - 1)^3 + 30*(c*x + 1)^2*b*c^4*d^4/(c*x - 1)^2 - 20*(c*x + 1)*b*c^4*d^
4/(c*x - 1) + 5*b*c^4*d^4 + 20*(c*x + 1)^4*b*c^3*d^3*e/(c*x - 1)^4 - 60*(c
*x + 1)^3*b*c^3*d^3*e/(c*x - 1)^3 + 60*(c*x + 1)^2*b*c^3*d^3*e/(c*x - 1)^2
- 20*(c*x + 1)*b*c^3*d^3*e/(c*x - 1) + 30*(c*x + 1)^4*b*c^2*d^2*e^2/(c*x
- 1)^4 - 60*(c*x + 1)^3*b*c^2*d^2*e^2/(c*x - 1)^3 + 40*(c*x + 1)^2*b*c^2*d
^2*e^2/(c*x - 1)^2 - 20*(c*x + 1)*b*c^2*d^2*e^2/(c*x - 1) + 10*b*c^2*d^2*e
^2 + 20*(c*x + 1)^4*b*c*d*e^3/(c*x - 1)^4 - 20*(c*x + 1)^3*b*c*d*e^3/(c*x
- 1)^3 + 20*(c*x + 1)^2*b*c*d*e^3/(c*x - 1)^2 - 20*(c*x + 1)*b*c*d*e^3/(c
*x - 1) + 5*(c*x + 1)^4*b*e^4/(c*x - 1)^4 + 10*(c*x + 1)^2*b*e^4/(c*x - 1)^
2 + b*e^4)*log(-(c*x + 1)/(c*x - 1))/((c*x + 1)^5*c^6/(c*x - 1)^5 - 5*(c*x
+ 1)^4*c^6/(c*x - 1)^4 + 10*(c*x + 1)^3*c^6/(c*x - 1)^3 - 10*(c*x + 1)^2*
c^6/(c*x - 1)^2 + 5*(c*x + 1)*c^6/(c*x - 1) - c^6) + 2*(15*(c*x + 1)^4*a*c
^4*d^4/(c*x - 1)^4 - 60*(c*x + 1)^3*a*c^4*d^4/(c*x - 1)^3 + 90*(c*x + 1)^2
*a*c^4*d^4/(c*x - 1)^2 - 60*(c*x + 1)*a*c^4*d^4/(c*x - 1) + 15*a*c^4*d^4 +
60*(c*x + 1)^4*a*c^3*d^3*e/(c*x - 1)^4 - 180*(c*x + 1)^3*a*c^3*d^3*e/(c*x
- 1)^3 + 180*(c*x + 1)^2*a*c^3*d^3*e/(c*x - 1)^2 - 60*(c*x + 1)*a*c^3*d^3
*e/(c*x - 1) + 30*(c*x + 1)^4*b*c^3*d^3*e/(c*x - 1)^4 - 120*(c*x + 1)^3*b*
c^3*d^3*e/(c*x - 1)^3 + 180*(c*x + 1)^2*b*c^3*d^3*e/(c*x - 1)^2 - 120*(c*x
+ 1)*b*c^3*d^3*e/(c*x - 1) + 30*b*c^3*d^3*e + 90*(c*x + 1)^4*a*c^2*d^2...

```

3.1.9 Mupad [B] (verification not implemented)

Time = 4.02 (sec) , antiderivative size = 272, normalized size of antiderivative = 1.83

$$\begin{aligned}
 \int (d + ex)^4 (a + b \operatorname{arctanh}(cx)) dx &= \frac{ae^4 x^5}{5} + ad^4 x + \frac{bd^4 \ln(c^2 x^2 - 1)}{2c} + \frac{be^4 \ln(c^2 x^2 - 1)}{10c^5} \\
 &+ 2ad^2 e^2 x^3 + \frac{be^4 x^4}{20c} + \frac{be^4 x^2}{10c^3} + bd^4 x \operatorname{atanh}(cx) \\
 &+ 2ad^3 e x^2 + ade^3 x^4 + \frac{be^4 x^5 \operatorname{atanh}(cx)}{5} \\
 &+ \frac{2bd^3 e x}{c} + \frac{bde^3 x}{c^3} - \frac{2bd^3 e \operatorname{atanh}(cx)}{c^2} \\
 &- \frac{bde^3 \operatorname{atanh}(cx)}{c^4} + 2bd^3 e x^2 \operatorname{atanh}(cx) \\
 &+ bde^3 x^4 \operatorname{atanh}(cx) + \frac{bde^3 x^3}{3c} + 2bd^2 e^2 x^3 \operatorname{atanh}(cx) \\
 &+ \frac{bd^2 e^2 \ln(c^2 x^2 - 1)}{c^3} + \frac{bd^2 e^2 x^2}{c}
 \end{aligned}$$

input `int((a + b*atanh(c*x))*(d + e*x)^4,x)`

3.1. $\int (d + ex)^4 (a + b \operatorname{arctanh}(cx)) dx$

output $(a e^{4x^5})/5 + a d^4 x + (b d^4 \log(c^2 x^2 - 1))/(2c) + (b e^4 \log(c^2 x^2 - 1))/(10 c^5) + 2 a d^2 e^2 x^3 + (b e^4 x^4)/(20 c) + (b e^4 x^2)/(10 c^3) + b d^4 x \operatorname{atanh}(c x) + 2 a d^3 e x^2 + a d e^3 x^4 + (b e^4 x^5 \operatorname{atanh}(c x))/5 + (2 b d^3 e x)/c + (b d e^3 x)/c^3 - (2 b d^3 e \operatorname{atanh}(c x))/c^2 - (b d e^3 \operatorname{atanh}(c x))/c^4 + 2 b d^3 e x^2 \operatorname{atanh}(c x) + b d e^3 x^4 \operatorname{atanh}(c x) + (b d e^3 x^3)/(3 c) + 2 b d^2 e^2 x^3 \operatorname{atanh}(c x) + (b d^2 e^2 \log(c^2 x^2 - 1))/c^3 + (b d^2 e^2 x^2)/c$

3.2 $\int (d + ex)^3 (a + \operatorname{barctanh}(cx)) dx$

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3.2.1 Optimal result

Integrand size = 16, antiderivative size = 125

$$\int (d + ex)^3 (a + \operatorname{barctanh}(cx)) dx = \frac{be(6c^2d^2 + e^2)x}{4c^3} + \frac{bde^2x^2}{2c} + \frac{be^3x^3}{12c} + \frac{(d + ex)^4 (a + \operatorname{barctanh}(cx))}{4e} + \frac{b(cd + e)^4 \log(1 - cx)}{8c^4e} - \frac{b(cd - e)^4 \log(1 + cx)}{8c^4e}$$

output `1/4*b*e*(6*c^2*d^2+e^2)*x/c^3+1/2*b*d*e^2*x^2/c+1/12*b*e^3*x^3/c+1/4*(e*x+d)^4*(a+b*arctanh(c*x))/e+1/8*b*(c*d+e)^4*ln(-c*x+1)/c^4/e-1/8*b*(c*d-e)^4*ln(c*x+1)/c^4/e`

3.2.2 Mathematica [A] (verified)

Time = 0.07 (sec) , antiderivative size = 205, normalized size of antiderivative = 1.64

$$\int (d + ex)^3 (a + \operatorname{barctanh}(cx)) dx = \frac{6c(4ac^3d^3 + be(6c^2d^2 + e^2))x + 12c^3de(3acd + be)x^2 + 2c^3e^2(12acd + be)x^3 + 6ac^4e^3x^4 + 6bc^4x(4d^3 + 6cd^2 + 4d^2e + 2de^2 + e^3)}{12c^4e}$$

input `Integrate[(d + e*x)^3*(a + b*ArcTanh[c*x]),x]`

output $(6*c*(4*a*c^3*d^3 + b*e*(6*c^2*d^2 + e^2))*x + 12*c^3*d*e*(3*a*c*d + b*e)*x^2 + 2*c^3*e^2*(12*a*c*d + b*e)*x^3 + 6*a*c^4*e^3*x^4 + 6*b*c^4*x*(4*d^3 + 6*d^2*e*x + 4*d*e^2*x^2 + e^3*x^3)*ArcTanh[c*x] + 3*b*(4*c^3*d^3 + 6*c^2*d^2*e + 4*c*d*e^2 + e^3)*Log[1 - c*x] + 3*b*(4*c^3*d^3 - 6*c^2*d^2*e + 4*c*d*e^2 - e^3)*Log[1 + c*x])/(24*c^4)$

3.2.3 Rubi [A] (verified)

Time = 0.33 (sec) , antiderivative size = 122, normalized size of antiderivative = 0.98, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.188$, Rules used = {6478, 477, 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.

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx)) dx$$

$$\downarrow 6478$$

$$\frac{(d + ex)^4 (a + b \operatorname{arctanh}(cx))}{4e} - \frac{bc \int \frac{(d+ex)^4}{1-c^2x^2} dx}{4e}$$

$$\downarrow 477$$

$$\frac{(d + ex)^4 (a + b \operatorname{arctanh}(cx))}{4e} - \frac{bc \int \left(\frac{(cd-e)^4}{2c^4(cx+1)} - \frac{e^4x^2}{c^2} - \frac{e^2(6c^2d^2+e^2)}{c^4} - \frac{4de^3x}{c^2} + \frac{(cd+e)^4}{2c^4(1-cx)} \right) dx}{4e}$$

$$\downarrow 2009$$

$$\frac{(d + ex)^4 (a + b \operatorname{arctanh}(cx))}{4e} - \frac{bc \left(\frac{(cd-e)^4 \log(cx+1)}{2c^5} - \frac{(cd+e)^4 \log(1-cx)}{2c^5} - \frac{2de^3x^2}{c^2} - \frac{e^4x^3}{3c^2} - \frac{e^2x(6c^2d^2+e^2)}{c^4} \right)}{4e}$$

input `Int[(d + e*x)^3*(a + b*ArcTanh[c*x]),x]`

output $((d + e*x)^4*(a + b*ArcTanh[c*x]))/(4*e) - (b*c*(-((e^2*(6*c^2*d^2 + e^2)*x)/c^4) - (2*d*e^3*x^2)/c^2 - (e^4*x^3)/(3*c^2) - ((c*d + e)^4*Log[1 - c*x]))/(2*c^5) + ((c*d - e)^4*Log[1 + c*x])/(2*c^5))/(4*e)$

3.2.3.1 Defintions of rubi rules used

rule 477 `Int[((c_) + (d_)*(x_))^(n_)*((a_) + (b_)*(x_)^2)^(p_), x_Symbol] := Simp[
a^p Int[ExpandIntegrand[(c + d*x)^n*(1 - Rt[-b/a, 2]*x)^p*(1 + Rt[-b/a, 2]
]*x)^p, x], x] /; FreeQ[{a, b, c, d}, x] && ILtQ[p, 0] && IntegerQ[n] &
& NiceSqrtQ[-b/a] && !FractionalPowerFactorQ[Rt[-b/a, 2]]`

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6478 `Int[((a_) + ArcTanh[(c_)*(x_)]*(b_))*((d_) + (e_)*(x_))^(q_), x_Symbol
] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])/(e*(q + 1))), x] - Simp[b
(c/(e(q + 1))) Int[(d + e*x)^(q + 1)/(1 - c^2*x^2), x], x] /; FreeQ[{a,
b, c, d, e, q}, x] && NeQ[q, -1]`

3.2.4 Maple [A] (verified)

Time = 0.85 (sec) , antiderivative size = 227, normalized size of antiderivative = 1.82

method	result
parts	$\frac{a(e^3 \operatorname{arctanh}(cx)x^4 + ce^2 \operatorname{arctanh}(cx)x^3 d + \frac{3ce \operatorname{arctanh}(cx)x^2 d^2}{2} + \operatorname{arctanh}(cx)cx d^3 + \frac{c \operatorname{arctanh}(cx)d^4}{4e} - \frac{6e^2 c^3}{4e})}{4e} + \frac{b \left(\frac{ce^3 \operatorname{arctanh}(cx)x^4}{4} + ce^2 \operatorname{arctanh}(cx)x^3 d + \frac{3ce \operatorname{arctanh}(cx)x^2 d^2}{2} + \operatorname{arctanh}(cx)cx d^3 + \frac{c \operatorname{arctanh}(cx)d^4}{4e} - \frac{6e^2 c^3}{4e} \right)}{4e}$
parallelrisch	$\frac{3x^4 \operatorname{arctanh}(cx)bc^4e^3 + 3x^4ac^4e^3 + 12x^3 \operatorname{arctanh}(cx)bc^4de^2 + 12x^3ac^4de^2 + 18x^2 \operatorname{arctanh}(cx)bc^4d^2e + x^3bc^3e^3 + 18x^2a}{4c^3e}$
derivativedivides	$\frac{a(e^3 \operatorname{arctanh}(cx)c^4d^4 + \operatorname{arctanh}(cx)c^4d^3x + \frac{3e \operatorname{arctanh}(cx)c^4d^2x^2}{2} + e^2 \operatorname{arctanh}(cx)c^4dx^3 + \frac{e^3 \operatorname{arctanh}(cx)c^4x^4}{4} - \frac{6e^2c^3}{4})}{4c^3e} + \frac{b \left(\frac{\operatorname{arctanh}(cx)c^4d^4}{4e} + \operatorname{arctanh}(cx)c^4d^3x + \frac{3e \operatorname{arctanh}(cx)c^4d^2x^2}{2} + e^2 \operatorname{arctanh}(cx)c^4dx^3 + \frac{e^3 \operatorname{arctanh}(cx)c^4x^4}{4} - \frac{6e^2c^3}{4} \right)}{4c^3e}$
default	$\frac{a(e^3 \operatorname{arctanh}(cx)c^4d^4 + \operatorname{arctanh}(cx)c^4d^3x + \frac{3e \operatorname{arctanh}(cx)c^4d^2x^2}{2} + e^2 \operatorname{arctanh}(cx)c^4dx^3 + \frac{e^3 \operatorname{arctanh}(cx)c^4x^4}{4} - \frac{6e^2c^3}{4})}{4c^3e} + \frac{b \left(\frac{\operatorname{arctanh}(cx)c^4d^4}{4e} + \operatorname{arctanh}(cx)c^4d^3x + \frac{3e \operatorname{arctanh}(cx)c^4d^2x^2}{2} + e^2 \operatorname{arctanh}(cx)c^4dx^3 + \frac{e^3 \operatorname{arctanh}(cx)c^4x^4}{4} - \frac{6e^2c^3}{4} \right)}{4c^3e}$
risch	$\frac{(ex+d)^4 b \ln(cx+1)}{8e} - \frac{e^3 b x^4 \ln(-cx+1)}{8} - \frac{e^2 b d x^3 \ln(-cx+1)}{2} + \frac{e^3 a x^4}{4} - \frac{3eb d^2 x^2 \ln(-cx+1)}{4} + e^2 a d x^3 -$

input `int((e*x+d)^3*(a+b*arctanh(c*x)),x,method=_RETURNVERBOSE)`

output $\frac{1}{4}a(e^x+d)^4/e+b/c\left(\frac{1}{4}c^3e^3\operatorname{arctanh}(cx)x^4+c^2e^2\operatorname{arctanh}(cx)x^3d+3/2c^2e\operatorname{arctanh}(cx)x^2d^2+\operatorname{arctanh}(cx)cx^2d^3+1/4c/e\operatorname{arctanh}(cx)d^4-1/4/c^3/e(-6e^2c^3d^2x-2c^3de^3x^2-1/3e^4c^3x^3-e^4cx-1/2(c^4d^4+4c^3d^3e+6c^2d^2e^2+4cde^3+e^4)\ln(cx-1)+1/2(c^4d^4-4c^3d^3e+6c^2d^2e^2-4cde^3+e^4)\ln(cx+1))\right)$

3.2.5 Fracas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 244 vs. 2(113) = 226.

Time = 0.26 (sec) , antiderivative size = 244, normalized size of antiderivative = 1.95

$$\int (d+ex)^3(a+b\operatorname{arctanh}(cx))dx$$

$$= \frac{6ac^4e^3x^4 + 2(12ac^4de^2 + bc^3e^3)x^3 + 12(3ac^4d^2e + bc^3de^2)x^2 + 6(4ac^4d^3 + 6bc^3d^2e + bce^3)x + 3(4bc^3d^4 + 4ac^4d^3 + 6bc^3d^2e + bce^3)}{c^4}$$

input `integrate((e*x+d)^3*(a+b*arctanh(c*x)),x, algorithm="fricas")`

output $\frac{1}{24}*(6*a*c^4*e^3*x^4 + 2*(12*a*c^4*d*e^2 + b*c^3*e^3)*x^3 + 12*(3*a*c^4*d^2*e + b*c^3*d*e^2)*x^2 + 6*(4*a*c^4*d^3 + 6*b*c^3*d^2*e + b*c*e^3)*x + 3*(4*b*c^3*d^3 - 6*b*c^2*d^2*e + 4*b*c*d*e^2 - b*e^3)*\log(cx + 1) + 3*(4*b*c^3*d^3 + 6*b*c^2*d^2*e + 4*b*c*d*e^2 + b*e^3)*\log(cx - 1) + 3*(b*c^4*e^3*x^4 + 4*b*c^4*d*e^2*x^3 + 6*b*c^4*d^2*e*x^2 + 4*b*c^4*d^3*x)*\log(-(cx + 1)/(cx - 1)))/c^4$

3.2.6 Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 279 vs. 2(109) = 218.

Time = 0.39 (sec) , antiderivative size = 279, normalized size of antiderivative = 2.23

$$\int (d+ex)^3(a+b\operatorname{arctanh}(cx))dx$$

$$= \begin{cases} ad^3x + \frac{3ad^2ex^2}{2} + ade^2x^3 + \frac{ae^3x^4}{4} + bd^3x \operatorname{atanh}(cx) + \frac{3bd^2ex^2 \operatorname{atanh}(cx)}{2} + bde^2x^3 \operatorname{atanh}(cx) + \frac{be^3x^4 \operatorname{atanh}(cx)}{4} \\ a\left(d^3x + \frac{3d^2ex^2}{2} + de^2x^3 + \frac{e^3x^4}{4}\right) \end{cases}$$

input `integrate((e*x+d)**3*(a+b*atanh(c*x)),x)`

output `Piecewise((a*d**3*x + 3*a*d**2*e*x**2/2 + a*d*e**2*x**3 + a*e**3*x**4/4 + b*d**3*x*atanh(c*x) + 3*b*d**2*e*x**2*atanh(c*x)/2 + b*d*e**2*x**3*atanh(c*x) + b*e**3*x**4*atanh(c*x)/4 + b*d**3*log(x - 1/c)/c + b*d**3*atanh(c*x)/c + 3*b*d**2*e*x/(2*c) + b*d*e**2*x**2/(2*c) + b*e**3*x**3/(12*c) - 3*b*d**2*e*atanh(c*x)/(2*c**2) + b*d*e**2*log(x - 1/c)/c**3 + b*d*e**2*atanh(c*x)/c**3 + b*e**3*x/(4*c**3) - b*e**3*atanh(c*x)/(4*c**4), Ne(c, 0)), (a*(d**3*x + 3*d**2*e*x**2/2 + d*e**2*x**3 + e**3*x**4/4), True))`

3.2.7 Maxima [A] (verification not implemented)

Time = 0.20 (sec) , antiderivative size = 209, normalized size of antiderivative = 1.67

$$\begin{aligned} & \int (d + ex)^3 (a + \operatorname{arctanh}(cx)) dx \\ &= \frac{1}{4} ae^3 x^4 + ade^2 x^3 + \frac{3}{2} ad^2 ex^2 \\ &+ \frac{3}{4} \left(2x^2 \operatorname{arctanh}(cx) + c \left(\frac{2x}{c^2} - \frac{\log(cx+1)}{c^3} + \frac{\log(cx-1)}{c^3} \right) \right) bd^2 e \\ &+ \frac{1}{2} \left(2x^3 \operatorname{arctanh}(cx) + c \left(\frac{x^2}{c^2} + \frac{\log(c^2 x^2 - 1)}{c^4} \right) \right) bde^2 \\ &+ \frac{1}{24} \left(6x^4 \operatorname{arctanh}(cx) + c \left(\frac{2(c^2 x^3 + 3x)}{c^4} - \frac{3 \log(cx+1)}{c^5} + \frac{3 \log(cx-1)}{c^5} \right) \right) be^3 \\ &+ ad^3 x + \frac{(2cx \operatorname{arctanh}(cx) + \log(-c^2 x^2 + 1))bd^3}{2c} \end{aligned}$$

input `integrate((e*x+d)^3*(a+b*arctanh(c*x)),x, algorithm="maxima")`

output `1/4*a*e^3*x^4 + a*d*e^2*x^3 + 3/2*a*d^2*e*x^2 + 3/4*(2*x^2*arctanh(c*x) + c*(2*x/c^2 - log(c*x + 1)/c^3 + log(c*x - 1)/c^3))*b*d^2*e + 1/2*(2*x^3*arctanh(c*x) + c*(x^2/c^2 + log(c^2*x^2 - 1)/c^4))*b*d*e^2 + 1/24*(6*x^4*arctanh(c*x) + c*(2*(c^2*x^3 + 3*x)/c^4 - 3*log(c*x + 1)/c^5 + 3*log(c*x - 1)/c^5))*b*e^3 + a*d^3*x + 1/2*(2*c*x*arctanh(c*x) + log(-c^2*x^2 + 1))*b*d^3/c`

3.2.8 Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 970 vs. $2(113) = 226$.

Time = 0.30 (sec) , antiderivative size = 970, normalized size of antiderivative = 7.76

$$\int (d + ex)^3 (a + \operatorname{barctanh}(cx)) dx = \text{Too large to display}$$

input `integrate((e*x+d)^3*(a+b*arctanh(c*x)),x, algorithm="giac")`

output

```

1/3*c*(3*((c*x + 1)^3*b*c^3*d^3/(c*x - 1)^3 - 3*(c*x + 1)^2*b*c^3*d^3/(c*x
- 1)^2 + 3*(c*x + 1)*b*c^3*d^3/(c*x - 1) - b*c^3*d^3 + 3*(c*x + 1)^3*b*c^
2*d^2*e/(c*x - 1)^3 - 6*(c*x + 1)^2*b*c^2*d^2*e/(c*x - 1)^2 + 3*(c*x + 1)*
b*c^2*d^2*e/(c*x - 1) + 3*(c*x + 1)^3*b*c*d*e^2/(c*x - 1)^3 - 3*(c*x + 1)^
2*b*c*d*e^2/(c*x - 1)^2 + (c*x + 1)*b*c*d*e^2/(c*x - 1) - b*c*d*e^2 + (c*x
+ 1)^3*b*e^3/(c*x - 1)^3 + (c*x + 1)*b*e^3/(c*x - 1))*log(-(c*x + 1)/(c*x
- 1))/((c*x + 1)^4*c^5/(c*x - 1)^4 - 4*(c*x + 1)^3*c^5/(c*x - 1)^3 + 6*(c
*x + 1)^2*c^5/(c*x - 1)^2 - 4*(c*x + 1)*c^5/(c*x - 1) + c^5) + (6*(c*x + 1
)^3*a*c^3*d^3/(c*x - 1)^3 - 18*(c*x + 1)^2*a*c^3*d^3/(c*x - 1)^2 + 18*(c*x
+ 1)*a*c^3*d^3/(c*x - 1) - 6*a*c^3*d^3 + 18*(c*x + 1)^3*a*c^2*d^2*e/(c*x
- 1)^3 - 36*(c*x + 1)^2*a*c^2*d^2*e/(c*x - 1)^2 + 18*(c*x + 1)*a*c^2*d^2*e
/(c*x - 1) + 9*(c*x + 1)^3*b*c^2*d^2*e/(c*x - 1)^3 - 27*(c*x + 1)^2*b*c^2*
d^2*e/(c*x - 1)^2 + 27*(c*x + 1)*b*c^2*d^2*e/(c*x - 1) - 9*b*c^2*d^2*e + 1
8*(c*x + 1)^3*a*c*d*e^2/(c*x - 1)^3 - 18*(c*x + 1)^2*a*c*d*e^2/(c*x - 1)^2
+ 6*(c*x + 1)*a*c*d*e^2/(c*x - 1) - 6*a*c*d*e^2 + 6*(c*x + 1)^3*b*c*d*e^2
/(c*x - 1)^3 - 12*(c*x + 1)^2*b*c*d*e^2/(c*x - 1)^2 + 6*(c*x + 1)*b*c*d*e^
2/(c*x - 1) + 6*(c*x + 1)^3*a*e^3/(c*x - 1)^3 + 6*(c*x + 1)*a*e^3/(c*x - 1
) + 3*(c*x + 1)^3*b*e^3/(c*x - 1)^3 - 6*(c*x + 1)^2*b*e^3/(c*x - 1)^2 + 5*
(c*x + 1)*b*e^3/(c*x - 1) - 2*b*e^3)/((c*x + 1)^4*c^5/(c*x - 1)^4 - 4*(c*x
+ 1)^3*c^5/(c*x - 1)^3 + 6*(c*x + 1)^2*c^5/(c*x - 1)^2 - 4*(c*x + 1)*c...
```

3.2.9 Mupad [B] (verification not implemented)

Time = 3.79 (sec) , antiderivative size = 197, normalized size of antiderivative = 1.58

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx)) dx = \frac{a e^3 x^4}{4} + a d^3 x + \frac{b d^3 \ln(c^2 x^2 - 1)}{2c} + \frac{b e^3 x^3}{12c} + b d^3 x \operatorname{atanh}(cx) + \frac{3 a d^2 e x^2}{2} + a d e^2 x^3 + \frac{b e^3 x}{4 c^3} - \frac{b e^3 \operatorname{atanh}(cx)}{4 c^4} + \frac{b e^3 x^4 \operatorname{atanh}(cx)}{4} + \frac{3 b d^2 e x}{2 c} - \frac{3 b d^2 e \operatorname{atanh}(cx)}{2 c^2} + \frac{3 b d^2 e x^2 \operatorname{atanh}(cx)}{2} + b d e^2 x^3 \operatorname{atanh}(cx) + \frac{b d e^2 \ln(c^2 x^2 - 1)}{2 c^3} + \frac{b d e^2 x^2}{2 c}$$

input `int((a + b*atanh(c*x))*(d + e*x)^3,x)`

output `(a*e^3*x^4)/4 + a*d^3*x + (b*d^3*log(c^2*x^2 - 1))/(2*c) + (b*e^3*x^3)/(12*c) + b*d^3*x*atanh(c*x) + (3*a*d^2*e*x^2)/2 + a*d*e^2*x^3 + (b*e^3*x)/(4*c^3) - (b*e^3*atanh(c*x))/(4*c^4) + (b*e^3*x^4*atanh(c*x))/4 + (3*b*d^2*e*x)/(2*c) - (3*b*d^2*e*atanh(c*x))/(2*c^2) + (3*b*d^2*e*x^2*atanh(c*x))/2 + b*d*e^2*x^3*atanh(c*x) + (b*d*e^2*log(c^2*x^2 - 1))/(2*c^3) + (b*d*e^2*x^2)/(2*c)`

3.3 $\int (d + ex)^2(a + \operatorname{barctanh}(cx)) dx$

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3.3.1 Optimal result

Integrand size = 16, antiderivative size = 96

$$\int (d + ex)^2(a + \operatorname{barctanh}(cx)) dx = \frac{bdex}{c} + \frac{be^2x^2}{6c} + \frac{(d + ex)^3(a + \operatorname{barctanh}(cx))}{3e} + \frac{b(cd + e)^3 \log(1 - cx)}{6c^3e} - \frac{b(cd - e)^3 \log(1 + cx)}{6c^3e}$$

output `b*d*e*x/c+1/6*b*e^2*x^2/c+1/3*(e*x+d)^3*(a+b*arctanh(c*x))/e+1/6*b*(c*d+e)^3*ln(-c*x+1)/c^3/e-1/6*b*(c*d-e)^3*ln(c*x+1)/c^3/e`

3.3.2 Mathematica [A] (verified)

Time = 0.06 (sec) , antiderivative size = 129, normalized size of antiderivative = 1.34

$$\int (d + ex)^2(a + \operatorname{barctanh}(cx)) dx = \frac{1}{6} \left(\frac{6d(acd + be)x}{c} + \frac{e(6acd + be)x^2}{c} + 2ae^2x^3 + 2bx(3d^2 + 3dex + e^2x^2) \operatorname{arctanh}(cx) + \frac{b(3c^2d^2 + 3cde + e^2) \log(1 - cx)}{c^3} + \frac{b(3c^2d^2 - 3cde + e^2) \log(1 + cx)}{c^3} \right)$$

input `Integrate[(d + e*x)^2*(a + b*ArcTanh[c*x]),x]`

output $((6*d*(a*c*d + b*e)*x)/c + (e*(6*a*c*d + b*e)*x^2)/c + 2*a*e^2*x^3 + 2*b*x*(3*d^2 + 3*d*e*x + e^2*x^2)*ArcTanh[c*x] + (b*(3*c^2*d^2 + 3*c*d*e + e^2)*Log[1 - c*x])/c^3 + (b*(3*c^2*d^2 - 3*c*d*e + e^2)*Log[1 + c*x])/c^3)/6$

3.3.3 Rubi [A] (verified)

Time = 0.30 (sec) , antiderivative size = 99, normalized size of antiderivative = 1.03, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.188$, Rules used = {6478, 477, 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.

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx)) dx$$

$$\downarrow 6478$$

$$\frac{(d + ex)^3 (a + b \operatorname{arctanh}(cx))}{3e} - \frac{bc \int \frac{(d+ex)^3}{1-c^2x^2} dx}{3e}$$

$$\downarrow 477$$

$$\frac{(d + ex)^3 (a + b \operatorname{arctanh}(cx))}{3e} - \frac{bc \int \left(\frac{(cd-e)^3}{2c^3(cx+1)} - \frac{3de^2}{c^2} - \frac{e^3x}{c^2} + \frac{(cd+e)^3}{2c^3(1-cx)} \right) dx}{3e}$$

$$\downarrow 2009$$

$$\frac{(d + ex)^3 (a + b \operatorname{arctanh}(cx))}{3e} - \frac{bc \left(\frac{(cd-e)^3 \log(cx+1)}{2c^4} - \frac{(cd+e)^3 \log(1-cx)}{2c^4} - \frac{3de^2x}{c^2} - \frac{e^3x^2}{2c^2} \right)}{3e}$$

input `Int[(d + e*x)^2*(a + b*ArcTanh[c*x]),x]`

output $((d + e*x)^3*(a + b*ArcTanh[c*x]))/(3*e) - (b*c*((-3*d*e^2*x)/c^2 - (e^3*x^2)/(2*c^2) - ((c*d + e)^3*Log[1 - c*x])/(2*c^4) + ((c*d - e)^3*Log[1 + c*x])/(2*c^4)))/(3*e)$

3.3.3.1 Defintions of rubi rules used

```
rule 477 Int[((c_) + (d_)*(x_))^(n_)*((a_) + (b_)*(x_)^2)^(p_), x_Symbol] := Simp[
a^p Int[ExpandIntegrand[(c + d*x)^n*(1 - Rt[-b/a, 2]*x)^p*(1 + Rt[-b/a, 2
]*x)^p, x], x] /; FreeQ[{a, b, c, d}, x] && ILtQ[p, 0] && IntegerQ[n] &
& NiceSqrtQ[-b/a] && !FractionalPowerFactorQ[Rt[-b/a, 2]]
```

```
rule 2009 Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]
```

```
rule 6478 Int[((a_) + ArcTanh[(c_)*(x_)]*(b_))*((d_) + (e_)*(x_))^(q_), x_Symbol
] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])/(e*(q + 1))), x] - Simp[b
*(c/(e*(q + 1))) Int[(d + e*x)^(q + 1)/(1 - c^2*x^2), x], x] /; FreeQ[{a,
b, c, d, e, q}, x] && NeQ[q, -1]
```

3.3.4 Maple [A] (verified)

Time = 0.84 (sec) , antiderivative size = 165, normalized size of antiderivative = 1.72

method	result
parallelrisch	$\frac{2x^3 \operatorname{arctanh}(cx)bc^3e^2+2x^3a^3c^3e^2+6x^2 \operatorname{arctanh}(cx)bc^3de+6x^2a^3c^3de+6d^2b \operatorname{arctanh}(cx)xc^3+x^2bc^2e^2+6xa^3c^3d^2+6 \ln(\dots)}{6c^3}$
parts	$\frac{a(ex+d)^3}{3e} + \frac{b \left(\frac{ce^2 \operatorname{arctanh}(cx)x^3}{3} + ce \operatorname{arctanh}(cx)x^2d + \operatorname{arctanh}(cx)cx d^2 + \frac{c \operatorname{arctanh}(cx)d^3}{3e} - \frac{-3c^2xd e^2 - \frac{c^2x^2e^3}{2} - \frac{(c^3d^3+3c}{3e} \right)}{c}$
derivativedivides	$\frac{a(ecx+cd)^3}{3c^2e} + \frac{b \left(\frac{\operatorname{arctanh}(cx)c^3d^3}{3e} + \operatorname{arctanh}(cx)c^3d^2x + e \operatorname{arctanh}(cx)c^3dx^2 + \frac{e^2 \operatorname{arctanh}(cx)c^3x^3}{3} - \frac{-3c^2xd e^2 - \frac{c^2x^2e^3}{2} - \frac{(c^3d^3+3c}{3e} \right)}{c^2}$
default	$\frac{a(ecx+cd)^3}{3c^2e} + \frac{b \left(\frac{\operatorname{arctanh}(cx)c^3d^3}{3e} + \operatorname{arctanh}(cx)c^3d^2x + e \operatorname{arctanh}(cx)c^3dx^2 + \frac{e^2 \operatorname{arctanh}(cx)c^3x^3}{3} - \frac{-3c^2xd e^2 - \frac{c^2x^2e^3}{2} - \frac{(c^3d^3+3c}{3e} \right)}{c^2}$
risch	$\frac{(ex+d)^3b \ln(cx+1)}{6e} - \frac{e^2bx^3 \ln(-cx+1)}{6} - \frac{ebdx^2 \ln(-cx+1)}{2} + \frac{e^2ax^3}{3} - \frac{bd^2x \ln(-cx+1)}{2} + eadx^2 - \frac{\ln(cx)}{c}$

```
input int((e*x+d)^2*(a+b*arctanh(c*x)),x,method=_RETURNVERBOSE)
```

output $1/6*(2*x^3*\operatorname{arctanh}(c*x)*b*c^3*e^2+2*x^3*a*c^3*e^2+6*x^2*\operatorname{arctanh}(c*x)*b*c^3*d*e+6*x^2*a*c^3*d*e+6*d^2*b*\operatorname{arctanh}(c*x)*x*c^3+x^2*b*c^2*e^2+6*x*a*c^3*d^2+6*\ln(c*x-1)*b*c^2*d^2+6*x*b*c^2*d*e+6*\operatorname{arctanh}(c*x)*b*c^2*d^2-6*\operatorname{arctanh}(c*x)*b*c*d*e+2*\ln(c*x-1)*b*e^2+2*\operatorname{arctanh}(c*x)*b*e^2)/c^3$

3.3.5 Fracas [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 163, normalized size of antiderivative = 1.70

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx)) dx$$

$$= \frac{2ac^3e^2x^3 + (6ac^3de + bc^2e^2)x^2 + 6(ac^3d^2 + bc^2de)x + (3bc^2d^2 - 3bcde + be^2) \log(cx + 1) + (3bc^2d^2 + 3bcde - be^2) \log(cx - 1)}{6c^3}$$

input `integrate((e*x+d)^2*(a+b*arctanh(c*x)),x, algorithm="fricas")`

output $1/6*(2*a*c^3*e^2*x^3 + (6*a*c^3*d*e + b*c^2*e^2)*x^2 + 6*(a*c^3*d^2 + b*c^2*d*e)*x + (3*b*c^2*d^2 - 3*b*c*d*e + b*e^2)*\log(c*x + 1) + (3*b*c^2*d^2 + 3*b*c*d*e + b*e^2)*\log(c*x - 1) + (b*c^3*e^2*x^3 + 3*b*c^3*d*e*x^2 + 3*b*c^3*d^2*x)*\log(-(c*x + 1)/(c*x - 1)))/c^3$

3.3.6 Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 178 vs. 2(82) = 164.

Time = 0.32 (sec) , antiderivative size = 178, normalized size of antiderivative = 1.85

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx)) dx$$

$$= \begin{cases} ad^2x + adex^2 + \frac{ae^2x^3}{3} + bd^2x \operatorname{atanh}(cx) + bdex^2 \operatorname{atanh}(cx) + \frac{be^2x^3 \operatorname{atanh}(cx)}{3} + \frac{bd^2 \log(x - \frac{1}{c})}{c} + \frac{bd^2 \operatorname{atanh}(cx)}{c} \\ a \left(d^2x + dex^2 + \frac{e^2x^3}{3} \right) \end{cases}$$

input `integrate((e*x+d)**2*(a+b*atanh(c*x)),x)`

```
output Piecewise((a*d**2*x + a*d*e*x**2 + a*e**2*x**3/3 + b*d**2*x*atanh(c*x) + b
*d*e*x**2*atanh(c*x) + b*e**2*x**3*atanh(c*x)/3 + b*d**2*log(x - 1/c)/c +
b*d**2*atanh(c*x)/c + b*d*e*x/c + b*e**2*x**2/(6*c) - b*d*e*atanh(c*x)/c**
2 + b*e**2*log(x - 1/c)/(3*c**3) + b*e**2*atanh(c*x)/(3*c**3), Ne(c, 0)),
(a*(d**2*x + d*e*x**2 + e**2*x**3/3), True))
```

3.3.7 Maxima [A] (verification not implemented)

Time = 0.19 (sec) , antiderivative size = 137, normalized size of antiderivative = 1.43

$$\begin{aligned} & \int (d + ex)^2 (a + b \operatorname{arctanh}(cx)) dx \\ &= \frac{1}{3} a e^2 x^3 + a d e x^2 + \frac{1}{2} \left(2 x^2 \operatorname{arctanh}(cx) + c \left(\frac{2x}{c^2} - \frac{\log(cx+1)}{c^3} + \frac{\log(cx-1)}{c^3} \right) \right) b d e \\ &+ \frac{1}{6} \left(2 x^3 \operatorname{arctanh}(cx) + c \left(\frac{x^2}{c^2} + \frac{\log(c^2 x^2 - 1)}{c^4} \right) \right) b e^2 \\ &+ a d^2 x + \frac{(2 c x \operatorname{arctanh}(cx) + \log(-c^2 x^2 + 1)) b d^2}{2 c} \end{aligned}$$

```
input integrate((e*x+d)^2*(a+b*arctanh(c*x)),x, algorithm="maxima")
```

```
output 1/3*a*e^2*x^3 + a*d*e*x^2 + 1/2*(2*x^2*arctanh(c*x) + c*(2*x/c^2 - log(c*x
+ 1)/c^3 + log(c*x - 1)/c^3))*b*d*e + 1/6*(2*x^3*arctanh(c*x) + c*(x^2/c^
2 + log(c^2*x^2 - 1)/c^4))*b*e^2 + a*d^2*x + 1/2*(2*c*x*arctanh(c*x) + log
(-c^2*x^2 + 1))*b*d^2/c
```

3.3.8 Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 532 vs. 2(88) = 176.

Time = 0.31 (sec) , antiderivative size = 532, normalized size of antiderivative = 5.54

$$\begin{aligned} & \int (d + ex)^2 (a + b \operatorname{arctanh}(cx)) dx \\ &= \frac{1}{3} c \left(\frac{\left(\frac{3(cx+1)^2 b c^2 d^2}{(cx-1)^2} - \frac{6(cx+1) b c^2 d^2}{cx-1} + 3 b c^2 d^2 + \frac{6(cx+1)^2 b c d e}{(cx-1)^2} - \frac{6(cx+1) b c d e}{cx-1} + \frac{3(cx+1)^2 b e^2}{(cx-1)^2} + b e^2 \right) \log\left(-\frac{cx+1}{cx-1}\right) + 2}{\frac{(cx+1)^3 c^4}{(cx-1)^3} - \frac{3(cx+1)^2 c^4}{(cx-1)^2} + \frac{3(cx+1) c^4}{cx-1} - c^4} + \dots \right) \end{aligned}$$

input `integrate((e*x+d)^2*(a+b*arctanh(c*x)),x, algorithm="giac")`

output `1/3*c*((3*(c*x + 1)^2*b*c^2*d^2/(c*x - 1)^2 - 6*(c*x + 1)*b*c^2*d^2/(c*x - 1) + 3*b*c^2*d^2 + 6*(c*x + 1)^2*b*c*d*e/(c*x - 1)^2 - 6*(c*x + 1)*b*c*d*e/(c*x - 1) + 3*(c*x + 1)^2*b*e^2/(c*x - 1)^2 + b*e^2)*log(-(c*x + 1)/(c*x - 1))/((c*x + 1)^3*c^4/(c*x - 1)^3 - 3*(c*x + 1)^2*c^4/(c*x - 1)^2 + 3*(c*x + 1)*c^4/(c*x - 1) - c^4) + 2*(3*(c*x + 1)^2*a*c^2*d^2/(c*x - 1)^2 - 6*(c*x + 1)*a*c^2*d^2/(c*x - 1) + 3*a*c^2*d^2 + 6*(c*x + 1)^2*a*c*d*e/(c*x - 1)^2 - 6*(c*x + 1)*a*c*d*e/(c*x - 1) + 3*(c*x + 1)^2*b*c*d*e/(c*x - 1)^2 - 6*(c*x + 1)*b*c*d*e/(c*x - 1) + 3*b*c*d*e + 3*(c*x + 1)^2*a*e^2/(c*x - 1)^2 + a*e^2 + (c*x + 1)^2*b*e^2/(c*x - 1)^2 - (c*x + 1)*b*e^2/(c*x - 1))/((c*x + 1)^3*c^4/(c*x - 1)^3 - 3*(c*x + 1)^2*c^4/(c*x - 1)^2 + 3*(c*x + 1)*c^4/(c*x - 1) - c^4) - (3*b*c^2*d^2 + b*e^2)*log(-(c*x + 1)/(c*x - 1) + 1)/c^4 + (3*b*c^2*d^2 + b*e^2)*log(-(c*x + 1)/(c*x - 1))/c^4)`

3.3.9 Mupad [B] (verification not implemented)

Time = 3.56 (sec) , antiderivative size = 127, normalized size of antiderivative = 1.32

$$\int (d + ex)^2(a + b \operatorname{arctanh}(cx)) dx = \frac{ae^2x^3}{3} + ad^2x + \frac{bd^2 \ln(c^2x^2 - 1)}{2c} + \frac{be^2 \ln(c^2x^2 - 1)}{6c^3} + \frac{be^2x^2}{6c} + ade^2x + bd^2x \operatorname{atanh}(cx) + \frac{be^2x^3 \operatorname{atanh}(cx)}{3} + \frac{bdex}{c} - \frac{bdex \operatorname{atanh}(cx)}{c^2} + bde^2x^2 \operatorname{atanh}(cx)$$

input `int((a + b*atanh(c*x))*(d + e*x)^2,x)`

output `(a*e^2*x^3)/3 + a*d^2*x + (b*d^2*log(c^2*x^2 - 1))/(2*c) + (b*e^2*log(c^2*x^2 - 1))/(6*c^3) + (b*e^2*x^2)/(6*c) + a*d*e*x^2 + b*d^2*x*atanh(c*x) + (b*e^2*x^3*atanh(c*x))/3 + (b*d*e*x)/c - (b*d*e*atanh(c*x))/c^2 + b*d*e*x^2*atanh(c*x)`

3.4 $\int (d + ex)(a + \operatorname{barctanh}(cx)) dx$

3.4.1	Optimal result	62
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3.4.1 Optimal result

Integrand size = 14, antiderivative size = 84

$$\int (d + ex)(a + \operatorname{barctanh}(cx)) dx = \frac{bex}{2c} + \frac{(d + ex)^2(a + \operatorname{barctanh}(cx))}{2e} + \frac{b(cd + e)^2 \log(1 - cx)}{4c^2e} - \frac{b(cd - e)^2 \log(1 + cx)}{4c^2e}$$

output $1/2*b*e*x/c+1/2*(e*x+d)^2*(a+b*\arctanh(c*x))/e+1/4*b*(c*d+e)^2*\ln(-c*x+1)/c^2/e-1/4*b*(c*d-e)^2*\ln(c*x+1)/c^2/e$

3.4.2 Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 96, normalized size of antiderivative = 1.14

$$\int (d + ex)(a + \operatorname{barctanh}(cx)) dx = adx + \frac{bex}{2c} + \frac{1}{2}aex^2 + bdx\operatorname{arctanh}(cx) + \frac{1}{2}bex^2\operatorname{arctanh}(cx) + \frac{be \log(1 - cx)}{4c^2} - \frac{be \log(1 + cx)}{4c^2} + \frac{bd \log(1 - c^2x^2)}{2c}$$

input `Integrate[(d + e*x)*(a + b*ArcTanh[c*x]),x]`

output $a*d*x + (b*e*x)/(2*c) + (a*e*x^2)/2 + b*d*x*ArcTanh[c*x] + (b*e*x^2*ArcTanh[c*x])/2 + (b*e*Log[1 - c*x])/(4*c^2) - (b*e*Log[1 + c*x])/(4*c^2) + (b*d*Log[1 - c^2*x^2])/(2*c)$

3.4.3 Rubi [A] (verified)

Time = 0.28 (sec) , antiderivative size = 85, normalized size of antiderivative = 1.01, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.214$, Rules used = {6478, 477, 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.

$$\int (d + ex)(a + b \operatorname{arctanh}(cx)) dx$$

$$\downarrow 6478$$

$$\frac{(d + ex)^2(a + b \operatorname{arctanh}(cx))}{2e} - \frac{bc \int \frac{(d+ex)^2}{1-c^2x^2} dx}{2e}$$

$$\downarrow 477$$

$$\frac{(d + ex)^2(a + b \operatorname{arctanh}(cx))}{2e} - \frac{bc \int \left(\frac{(cd-e)^2}{2c^2(cx+1)} - \frac{e^2}{c^2} + \frac{(cd+e)^2}{2c^2(1-cx)} \right) dx}{2e}$$

$$\downarrow 2009$$

$$\frac{(d + ex)^2(a + b \operatorname{arctanh}(cx))}{2e} - \frac{bc \left(\frac{(cd-e)^2 \log(cx+1)}{2c^3} - \frac{(cd+e)^2 \log(1-cx)}{2c^3} - \frac{e^2 x}{c^2} \right)}{2e}$$

input `Int[(d + e*x)*(a + b*ArcTanh[c*x]),x]`

output `((d + e*x)^2*(a + b*ArcTanh[c*x]))/(2*e) - (b*c*(-((e^2*x)/c^2) - ((c*d + e)^2*Log[1 - c*x])/(2*c^3) + ((c*d - e)^2*Log[1 + c*x])/(2*c^3)))/(2*e)`

3.4.3.1 Defintions of rubi rules used

rule 477 `Int[((c_) + (d_)*(x_))^(n_)*((a_) + (b_)*(x_)^2)^(p_), x_Symbol] :> Simp[a^p Int[ExpandIntegrand[(c + d*x)^n*(1 - Rt[-b/a, 2]*x)^p*(1 + Rt[-b/a, 2]*x)^p, x], x] /; FreeQ[{a, b, c, d}, x] && ILtQ[p, 0] && IntegerQ[n] && NiceSqrtQ[-b/a] && !FractionalPowerFactorQ[Rt[-b/a, 2]]`

rule 2009 `Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]`


```
rule 6478 Int[((a_.) + ArcTanh[(c_.)*(x_.)]*(b_.))*((d_.) + (e_.)*(x_.))^(q_.), x_Symbol
] :> Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])/(e*(q + 1))), x] - Simp[b
*(c/(e*(q + 1))) Int[(d + e*x)^(q + 1)/(1 - c^2*x^2), x], x] /; FreeQ[{a,
b, c, d, e, q}, x] && NeQ[q, -1]
```

3.4.4 Maple [A] (verified)

Time = 0.07 (sec) , antiderivative size = 78, normalized size of antiderivative = 0.93

method	result
parts	$a\left(\frac{1}{2}ex^2 + dx\right) + \frac{b\left(\frac{c \operatorname{arctanh}(cx)x^2e + \operatorname{arctanh}(cx)cxd - \frac{-ecx - \frac{(2cd+e)\ln(cx-1)}{2} + \frac{(-2cd+e)\ln(cx+1)}{2}}{2c}}{c}\right)}{c}$
parallelrisch	$\frac{\operatorname{arctanh}(cx)bc^2ex^2 + ac^2ex^2 + 2bd \operatorname{arctanh}(cx)xc^2 + 2ac^2dx + 2\ln(cx-1)bcd + bcex + 2 \operatorname{arctanh}(cx)bcd - \operatorname{arctanh}(cx)be}{2c^2}$
derivativedivides	$\frac{a\left(\frac{dc^2x + \frac{1}{2}c^2ex^2}{c}\right) + \frac{b\left(\operatorname{arctanh}(cx)dc^2x + \frac{\operatorname{arctanh}(cx)ec^2x^2}{2} + \frac{ecx}{2} + \frac{(2cd+e)\ln(cx-1)}{4} - \frac{(-2cd+e)\ln(cx+1)}{4}\right)}{c}}{c}$
default	$\frac{a\left(\frac{dc^2x + \frac{1}{2}c^2ex^2}{c}\right) + \frac{b\left(\operatorname{arctanh}(cx)dc^2x + \frac{\operatorname{arctanh}(cx)ec^2x^2}{2} + \frac{ecx}{2} + \frac{(2cd+e)\ln(cx-1)}{4} - \frac{(-2cd+e)\ln(cx+1)}{4}\right)}{c}}{c}$
risch	$\frac{bx(ex+2d)\ln(cx+1)}{4} - \frac{be x^2 \ln(-cx+1)}{4} - \frac{bdx \ln(-cx+1)}{2} + \frac{ae x^2}{2} + adx + \frac{\ln(cx+1)bd}{2c} + \frac{\ln(-cx+1)bd}{2c} +$

```
input int((e*x+d)*(a+b*arctanh(c*x)),x,method=_RETURNVERBOSE)
```

```
output a*(1/2*e*x^2+d*x)+b/c*(1/2*c*arctanh(c*x)*x^2*e+arctanh(c*x)*c*x*d-1/2/c*(
-e*c*x-1/2*(2*c*d+e)*ln(c*x-1)+1/2*(-2*c*d+e)*ln(c*x+1))
```

3.4.5 Fracas [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 98, normalized size of antiderivative = 1.17

$$\int (d + ex)(a + b \operatorname{arctanh}(cx)) dx$$

$$= \frac{2ac^2ex^2 + 2(2ac^2d + bce)x + (2bcd - be) \log(cx + 1) + (2bcd + be) \log(cx - 1) + (bc^2ex^2 + 2bc^2dx) \log}{4c^2}$$

```
input integrate((e*x+d)*(a+b*arctanh(c*x)),x, algorithm="fricas")
```

output $1/4*(2*a*c^2*e*x^2 + 2*(2*a*c^2*d + b*c*e)*x + (2*b*c*d - b*e)*\log(c*x + 1) + (2*b*c*d + b*e)*\log(c*x - 1) + (b*c^2*e*x^2 + 2*b*c^2*d*x)*\log(-(c*x + 1)/(c*x - 1)))/c^2$

3.4.6 Sympy [A] (verification not implemented)

Time = 0.29 (sec) , antiderivative size = 92, normalized size of antiderivative = 1.10

$$\int (d + ex)(a + b \operatorname{arctanh}(cx)) dx$$

$$= \begin{cases} adx + \frac{aex^2}{2} + bdx \operatorname{atanh}(cx) + \frac{bex^2 \operatorname{atanh}(cx)}{2} + \frac{bd \log(x - \frac{1}{c})}{c} + \frac{bd \operatorname{atanh}(cx)}{c} + \frac{bex}{2c} - \frac{be \operatorname{atanh}(cx)}{2c^2} & \text{for } c \neq 0 \\ a\left(dx + \frac{ex^2}{2}\right) & \text{otherwise} \end{cases}$$

input `integrate((e*x+d)*(a+b*atanh(c*x)),x)`

output `Piecewise((a*d*x + a*e*x**2/2 + b*d*x*atanh(c*x) + b*e*x**2*atanh(c*x)/2 + b*d*log(x - 1/c)/c + b*d*atanh(c*x)/c + b*e*x/(2*c) - b*e*atanh(c*x)/(2*c**2), Ne(c, 0)), (a*(d*x + e*x**2/2), True))`

3.4.7 Maxima [A] (verification not implemented)

Time = 0.19 (sec) , antiderivative size = 83, normalized size of antiderivative = 0.99

$$\int (d + ex)(a + b \operatorname{arctanh}(cx)) dx$$

$$= \frac{1}{2} aex^2 + \frac{1}{4} \left(2x^2 \operatorname{artanh}(cx) + c \left(\frac{2x}{c^2} - \frac{\log(cx + 1)}{c^3} + \frac{\log(cx - 1)}{c^3} \right) \right) be$$

$$+ adx + \frac{(2cx \operatorname{artanh}(cx) + \log(-c^2x^2 + 1))bd}{2c}$$

input `integrate((e*x+d)*(a+b*arctanh(c*x)),x, algorithm="maxima")`

output $1/2*a*e*x^2 + 1/4*(2*x^2*arctanh(c*x) + c*(2*x/c^2 - \log(c*x + 1)/c^3 + \log(c*x - 1)/c^3))*b*e + a*d*x + 1/2*(2*c*x*arctanh(c*x) + \log(-c^2*x^2 + 1))*b*d/c$

3.4.8 Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 245 vs. 2(76) = 152.

Time = 0.27 (sec) , antiderivative size = 245, normalized size of antiderivative = 2.92

$$\int (d + ex)(a + b \operatorname{arctanh}(cx)) dx =$$

$$-c \left(\frac{bd \log\left(-\frac{cx+1}{cx-1} + 1\right)}{c^2} - \frac{\left(\frac{(cx+1)bcd}{cx-1} - bcd + \frac{(cx+1)be}{cx-1}\right) \log\left(-\frac{cx+1}{cx-1}\right)}{\frac{(cx+1)^2 c^3}{(cx-1)^2} - \frac{2(cx+1)c^3}{cx-1} + c^3} - \frac{bd \log\left(-\frac{cx+1}{cx-1}\right)}{c^2} - \frac{\frac{2(cx+1)acd}{cx-1} - 2ac}{\frac{(cx+1)^2 c}{(cx-1)^2}} \right)$$

input `integrate((e*x+d)*(a+b*arctanh(c*x)),x, algorithm="giac")`

output `-c*(b*d*log(-(c*x + 1)/(c*x - 1) + 1)/c^2 - ((c*x + 1)*b*c*d/(c*x - 1) - b*c*d + (c*x + 1)*b*e/(c*x - 1))*log(-(c*x + 1)/(c*x - 1))/((c*x + 1)^2*c^3/(c*x - 1)^2 - 2*(c*x + 1)*c^3/(c*x - 1) + c^3) - b*d*log(-(c*x + 1)/(c*x - 1))/c^2 - (2*(c*x + 1)*a*c*d/(c*x - 1) - 2*a*c*d + 2*(c*x + 1)*a*e/(c*x - 1) + (c*x + 1)*b*e/(c*x - 1) - b*e)/((c*x + 1)^2*c^3/(c*x - 1)^2 - 2*(c*x + 1)*c^3/(c*x - 1) + c^3))`

3.4.9 Mupad [B] (verification not implemented)

Time = 3.29 (sec) , antiderivative size = 67, normalized size of antiderivative = 0.80

$$\int (d + ex)(a + b \operatorname{arctanh}(cx)) dx = a dx + \frac{a e x^2}{2} + b d x \operatorname{atanh}(cx) + \frac{b e x}{2c}$$

$$- \frac{b e \operatorname{atanh}(cx)}{2c^2} + \frac{b e x^2 \operatorname{atanh}(cx)}{2} + \frac{b d \ln(c^2 x^2 - 1)}{2c}$$

input `int((a + b*atanh(c*x))*(d + e*x),x)`

output `a*d*x + (a*e*x^2)/2 + b*d*x*atanh(c*x) + (b*e*x)/(2*c) - (b*e*atanh(c*x))/(2*c^2) + (b*e*x^2*atanh(c*x))/2 + (b*d*log(c^2*x^2 - 1))/(2*c)`

3.5 $\int \frac{a+b\operatorname{arctanh}(cx)}{d+ex} dx$

3.5.1	Optimal result	67
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3.5.5	Fricas [F]	70
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3.5.8	Giac [F]	71
3.5.9	Mupad [F(-1)]	72

3.5.1 Optimal result

Integrand size = 16, antiderivative size = 114

$$\int \frac{a + b\operatorname{arctanh}(cx)}{d + ex} dx = -\frac{(a + b\operatorname{arctanh}(cx)) \log\left(\frac{2}{1+cx}\right)}{e} + \frac{(a + b\operatorname{arctanh}(cx)) \log\left(\frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{e} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{2e} - \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{2e}$$

output `-(a+b*arctanh(c*x))*ln(2/(c*x+1))/e+(a+b*arctanh(c*x))*ln(2*c*(e*x+d)/(c*d+e)/(c*x+1))/e+1/2*b*polylog(2,1-2/(c*x+1))/e-1/2*b*polylog(2,1-2*c*(e*x+d)/(c*d+e)/(c*x+1))/e`

3.5.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 0.18 (sec) , antiderivative size = 257, normalized size of antiderivative = 2.25

$$\int \frac{a + b\operatorname{arctanh}(cx)}{d + ex} dx = \frac{a \log(d + ex) + b\operatorname{arctanh}(cx) \left(\frac{1}{2} \log(1 - c^2x^2) + \log\left(i \sinh\left(\operatorname{arctanh}\left(\frac{cd}{e}\right) + \operatorname{arctanh}(cx)\right)\right)\right) - \frac{1}{2}ib \left(-\frac{1}{4}i(\pi\right)}{e}$$

input `Integrate[(a + b*ArcTanh[c*x])/(d + e*x),x]`

output $(a \operatorname{Log}[d + e x] + b \operatorname{ArcTanh}[c x] * (\operatorname{Log}[1 - c^2 x^2] / 2 + \operatorname{Log}[I * \operatorname{Sinh}[\operatorname{ArcTanh}[(c d) / e] + \operatorname{ArcTanh}[c x]]]) - (I / 2) * b * ((-1 / 4 * I) * (\operatorname{Pi} - (2 * I) * \operatorname{ArcTanh}[c x])^2 + I * (\operatorname{ArcTanh}[(c d) / e] + \operatorname{ArcTanh}[c x])^2 + (\operatorname{Pi} - (2 * I) * \operatorname{ArcTanh}[c x]) * \operatorname{Log}[1 + E^{(2 * \operatorname{ArcTanh}[c x])}] + (2 * I) * (\operatorname{ArcTanh}[(c d) / e] + \operatorname{ArcTanh}[c x]) * \operatorname{Log}[1 - E^{-(2 * (\operatorname{ArcTanh}[(c d) / e] + \operatorname{ArcTanh}[c x])})] - (\operatorname{Pi} - (2 * I) * \operatorname{ArcTanh}[c x]) * \operatorname{Log}[2 / \operatorname{Sqrt}[1 - c^2 x^2]] - (2 * I) * (\operatorname{ArcTanh}[(c d) / e] + \operatorname{ArcTanh}[c x]) * \operatorname{Log}[(2 * I) * \operatorname{Sinh}[\operatorname{ArcTanh}[(c d) / e] + \operatorname{ArcTanh}[c x]]] - I * \operatorname{PolyLog}[2, -E^{(2 * \operatorname{ArcTanh}[c x])}] - I * \operatorname{PolyLog}[2, E^{-(2 * (\operatorname{ArcTanh}[(c d) / e] + \operatorname{ArcTanh}[c x])})])]) / e$

3.5.3 Rubi [A] (verified)

Time = 0.45 (sec) , antiderivative size = 114, normalized size of antiderivative = 1.00, number of steps used = 5, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.250$, Rules used = {6472, 2849, 2752, 2897}

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.

$$\int \frac{a + b \operatorname{arctanh}(cx)}{d + ex} dx$$

$$\downarrow \text{6472}$$

$$-\frac{bc \int \frac{\log\left(\frac{2c(d+ex)}{(cd+e)(cx+1)}\right)}{1-c^2x^2} dx}{e} + \frac{bc \int \frac{\log\left(\frac{2}{cx+1}\right)}{1-c^2x^2} dx}{e} + \frac{(a + b \operatorname{arctanh}(cx)) \log\left(\frac{2c(d+ex)}{(cx+1)(cd+e)}\right)}{e} -$$

$$\frac{\log\left(\frac{2}{cx+1}\right) (a + b \operatorname{arctanh}(cx))}{e}$$

$$\downarrow \text{2849}$$

$$-\frac{bc \int \frac{\log\left(\frac{2c(d+ex)}{(cd+e)(cx+1)}\right)}{1-c^2x^2} dx}{e} + b \int \frac{\log\left(\frac{2}{cx+1}\right) d \frac{1}{cx+1}}{1-\frac{2}{cx+1}} + \frac{(a + b \operatorname{arctanh}(cx)) \log\left(\frac{2c(d+ex)}{(cx+1)(cd+e)}\right)}{e} -$$

$$\frac{\log\left(\frac{2}{cx+1}\right) (a + b \operatorname{arctanh}(cx))}{e}$$

$$\downarrow \text{2752}$$

3.5. $\int \frac{a + b \operatorname{arctanh}(cx)}{d + ex} dx$

$$\begin{aligned}
& -bc \int \frac{\log\left(\frac{2c(d+ex)}{(cd+e)(cx+1)}\right)}{1-c^2x^2} dx + \frac{(a + b \operatorname{arctanh}(cx)) \log\left(\frac{2c(d+ex)}{(cx+1)(cd+e)}\right)}{e} - \\
& \frac{\log\left(\frac{2}{cx+1}\right) (a + b \operatorname{arctanh}(cx))}{e} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{cx+1}\right)}{2e} \\
& \quad \downarrow \text{2897} \\
& \frac{(a + b \operatorname{arctanh}(cx)) \log\left(\frac{2c(d+ex)}{(cx+1)(cd+e)}\right)}{e} - \frac{\log\left(\frac{2}{cx+1}\right) (a + b \operatorname{arctanh}(cx))}{e} - \\
& \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(cx+1)}\right)}{2e} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{cx+1}\right)}{2e}
\end{aligned}$$

input `Int[(a + b*ArcTanh[c*x])/(d + e*x), x]`

output `-(((a + b*ArcTanh[c*x])*Log[2/(1 + c*x)])/e) + ((a + b*ArcTanh[c*x])*Log[(2*c*(d + e*x))/((c*d + e)*(1 + c*x))])/e + (b*PolyLog[2, 1 - 2/(1 + c*x)])/(2*e) - (b*PolyLog[2, 1 - (2*c*(d + e*x))/((c*d + e)*(1 + c*x))])/(2*e)`

3.5.3.1 Defintions of rubi rules used

rule 2752 `Int[Log[(c_.)*(x_)]/((d_) + (e_.)*(x_)), x_Symbol] := Simp[(-e^(-1))*PolyLog[2, 1 - c*x], x] /; FreeQ[{c, d, e}, x] && EqQ[e + c*d, 0]`

rule 2849 `Int[Log[(c_.)/((d_) + (e_.)*(x_))]/((f_) + (g_.)*(x_)^2), x_Symbol] := Simp[-e/g Subst[Int[Log[2*d*x]/(1 - 2*d*x), x], x, 1/(d + e*x)], x] /; FreeQ[{c, d, e, f, g}, x] && EqQ[c, 2*d] && EqQ[e^2*f + d^2*g, 0]`

rule 2897 `Int[Log[u_]*(Pq_)^(m_.), x_Symbol] := With[{C = FullSimplify[Pq^m*((1 - u)/D[u, x])]}, Simp[C*PolyLog[2, 1 - u], x] /; FreeQ[C, x] /; IntegerQ[m] && PolyQ[Pq, x] && RationalFunctionQ[u, x] && LeQ[RationalFunctionExponents[u, x][[2]], Expon[Pq, x]]`

```
rule 6472 Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))/((d_) + (e_.)*(x_)), x_Symbol] := S
imp[(-a + b*ArcTanh[c*x])*(Log[2/(1 + c*x)]/e), x] + (Simp[(a + b*ArcTanh
[c*x])*(Log[2*c*((d + e*x)/((c*d + e)*(1 + c*x)))]/e), x] + Simp[b*(c/e)
Int[Log[2/(1 + c*x)]/(1 - c^2*x^2), x], x] - Simp[b*(c/e) Int[Log[2*c*((d
+ e*x)/((c*d + e)*(1 + c*x)))]/(1 - c^2*x^2), x], x) /; FreeQ[{a, b, c, d
, e}, x] && NeQ[c^2*d^2 - e^2, 0]
```

3.5.4 Maple [A] (verified)

Time = 6.15 (sec) , antiderivative size = 145, normalized size of antiderivative = 1.27

method	result
parts	$\frac{a \ln(ex+d)}{e} + \frac{b \ln(ecx+cd) \operatorname{arctanh}(cx)}{e} + \frac{b \ln\left(\frac{ecx-e}{-cd-e}\right) \ln(ecx+cd)}{2e} + \frac{b \operatorname{dilog}\left(\frac{ecx-e}{-cd-e}\right)}{2e} - \frac{b \ln(ecx+cd) \ln\left(\frac{ecx+e}{-cd+e}\right)}{2e}$
derivativedivides	$\frac{ac \ln(ecx+cd)}{e} + bc \left(\frac{\ln(ecx+cd) \operatorname{arctanh}(cx)}{e} - \frac{e \left(\operatorname{dilog}\left(\frac{ecx+e}{-cd+e}\right) + \ln(ecx+cd) \ln\left(\frac{ecx+e}{-cd+e}\right) \right)}{2} \right) - \frac{e \left(\operatorname{dilog}\left(\frac{ecx-e}{-cd-e}\right) + \ln(ecx+cd) \ln\left(\frac{ecx}{-cd}\right) \right)}{e^2}$
default	$\frac{ac \ln(ecx+cd)}{e} + bc \left(\frac{\ln(ecx+cd) \operatorname{arctanh}(cx)}{e} - \frac{e \left(\operatorname{dilog}\left(\frac{ecx+e}{-cd+e}\right) + \ln(ecx+cd) \ln\left(\frac{ecx+e}{-cd+e}\right) \right)}{2} \right) - \frac{e \left(\operatorname{dilog}\left(\frac{ecx-e}{-cd-e}\right) + \ln(ecx+cd) \ln\left(\frac{ecx}{-cd}\right) \right)}{e^2}$
risch	$-\frac{b \operatorname{dilog}\left(\frac{e(-cx+1)-cd-e}{-cd-e}\right)}{2e} - \frac{b \ln(-cx+1) \ln\left(\frac{e(-cx+1)-cd-e}{-cd-e}\right)}{2e} + \frac{a \ln(e(-cx+1)-cd-e)}{e} + \frac{b \operatorname{dilog}\left(\frac{e(cx+1)+cd-e}{cd-e}\right)}{2e}$

```
input int((a+b*arctanh(c*x))/(e*x+d),x,method=_RETURNVERBOSE)
```

```
output a*ln(e*x+d)/e+b*ln(c*e*x+c*d)/e*arctanh(c*x)+1/2*b/e*ln((c*e*x-e)/(-c*d-e)
)*ln(c*e*x+c*d)+1/2*b/e*dilog((c*e*x-e)/(-c*d-e))-1/2*b/e*ln(c*e*x+c*d)*ln
((c*e*x+e)/(-c*d+e))-1/2*b/e*dilog((c*e*x+e)/(-c*d+e))
```

3.5.5 Fracas [F]

$$\int \frac{a + b \operatorname{arctanh}(cx)}{d + ex} dx = \int \frac{b \operatorname{arctanh}(cx) + a}{ex + d} dx$$

```
input integrate((a+b*arctanh(c*x))/(e*x+d),x, algorithm="fracas")
```

```
output integral((b*arctanh(c*x) + a)/(e*x + d), x)
```

3.5. $\int \frac{a+b \operatorname{arctanh}(cx)}{d+ex} dx$

3.5.6 Sympy [F]

$$\int \frac{a + b \operatorname{arctanh}(cx)}{d + ex} dx = \int \frac{a + b \operatorname{atanh}(cx)}{d + ex} dx$$

input `integrate((a+b*atanh(c*x))/(e*x+d), x)`

output `Integral((a + b*atanh(c*x))/(d + e*x), x)`

3.5.7 Maxima [F]

$$\int \frac{a + b \operatorname{arctanh}(cx)}{d + ex} dx = \int \frac{b \operatorname{artanh}(cx) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x))/(e*x+d), x, algorithm="maxima")`

output `1/2*b*integrate((log(c*x + 1) - log(-c*x + 1))/(e*x + d), x) + a*log(e*x + d)/e`

3.5.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(cx)}{d + ex} dx = \int \frac{b \operatorname{artanh}(cx) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x))/(e*x+d), x, algorithm="giac")`

output `integrate((b*arctanh(c*x) + a)/(e*x + d), x)`

3.5.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(cx)}{d + ex} dx = \int \frac{a + b \operatorname{atanh}(cx)}{d + ex} dx$$

input `int((a + b*atanh(c*x))/(d + e*x),x)`output `int((a + b*atanh(c*x))/(d + e*x), x)`

3.6 $\int \frac{a+b\operatorname{arctanh}(cx)}{(d+ex)^2} dx$

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3.6.1 Optimal result

Integrand size = 16, antiderivative size = 93

$$\int \frac{a + b\operatorname{arctanh}(cx)}{(d + ex)^2} dx = -\frac{a + b\operatorname{arctanh}(cx)}{e(d + ex)} - \frac{bc \log(1 - cx)}{2e(cd + e)} + \frac{bc \log(1 + cx)}{2(cd - e)e} - \frac{bc \log(d + ex)}{c^2 d^2 - e^2}$$

output `(-a-b*arctanh(c*x))/e/(e*x+d)-1/2*b*c*ln(-c*x+1)/e/(c*d+e)+1/2*b*c*ln(c*x+1)/(c*d-e)/e-b*c*ln(e*x+d)/(c^2*d^2-e^2)`

3.6.2 Mathematica [A] (verified)

Time = 0.09 (sec) , antiderivative size = 102, normalized size of antiderivative = 1.10

$$\int \frac{a + b\operatorname{arctanh}(cx)}{(d + ex)^2} dx = -\frac{a}{e(d + ex)} - \frac{b\operatorname{arctanh}(cx)}{e(d + ex)} - \frac{bc \log(1 - cx)}{2e(cd + e)} - \frac{bc \log(1 + cx)}{2e(-cd + e)} - \frac{bc \log(d + ex)}{c^2 d^2 - e^2}$$

input `Integrate[(a + b*ArcTanh[c*x])/(d + e*x)^2,x]`

output `-(a/(e*(d + e*x))) - (b*ArcTanh[c*x])/(e*(d + e*x)) - (b*c*Log[1 - c*x])/(2*e*(c*d + e)) - (b*c*Log[1 + c*x])/(2*e*(-(c*d) + e)) - (b*c*Log[d + e*x])/(c^2*d^2 - e^2)`

3.6. $\int \frac{a+b\operatorname{arctanh}(cx)}{(d+ex)^2} dx$

3.6.3 Rubi [A] (verified)

Time = 0.30 (sec) , antiderivative size = 89, normalized size of antiderivative = 0.96, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.188$, Rules used = {6478, 477, 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.

$$\begin{aligned}
 & \int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^2} dx \\
 & \quad \downarrow 6478 \\
 & \frac{bc \int \frac{1}{(d+ex)(1-c^2x^2)} dx}{e} - \frac{a + b \operatorname{arctanh}(cx)}{e(d + ex)} \\
 & \quad \downarrow 477 \\
 & \frac{bc \int \left(-\frac{e^2}{(c^2d^2 - e^2)(d+ex)} + \frac{c}{2(cd+e)(1-cx)} + \frac{c}{2(cd-e)(cx+1)} \right) dx}{e} - \frac{a + b \operatorname{arctanh}(cx)}{e(d + ex)} \\
 & \quad \downarrow 2009 \\
 & \frac{bc \left(-\frac{e \log(d+ex)}{c^2d^2 - e^2} - \frac{\log(1-cx)}{2(cd+e)} + \frac{\log(cx+1)}{2(cd-e)} \right)}{e} - \frac{a + b \operatorname{arctanh}(cx)}{e(d + ex)}
 \end{aligned}$$

input `Int[(a + b*ArcTanh[c*x])/(d + e*x)^2,x]`

output `-(a + b*ArcTanh[c*x])/(e*(d + e*x)) + (b*c*(-1/2*Log[1 - c*x]/(c*d + e) + Log[1 + c*x]/(2*(c*d - e)) - (e*Log[d + e*x])/(c^2*d^2 - e^2)))/e`

3.6.3.1 Defintions of rubi rules used

rule 477 `Int[((c_) + (d_.)*(x_)^(n_))*((a_) + (b_.)*(x_)^2)^(p_), x_Symbol] := Simp[a^p Int[ExpandIntegrand[(c + d*x)^n*(1 - Rt[-b/a, 2]*x)^p*(1 + Rt[-b/a, 2]*x)^p, x], x] /; FreeQ[{a, b, c, d}, x] && ILtQ[p, 0] && IntegerQ[n] && NiceSqrtQ[-b/a] && !FractionalPowerFactorQ[Rt[-b/a, 2]]`

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

```
rule 6478 Int[((a_.) + ArcTanh[(c_.)*(x_.)]*(b_.))*((d_.) + (e_.)*(x_.))^(q_.), x_Symbol
] :> Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])/(e*(q + 1))), x] - Simp[b
*(c/(e*(q + 1))) Int[(d + e*x)^(q + 1)/(1 - c^2*x^2), x], x] /; FreeQ[{a,
b, c, d, e, q}, x] && NeQ[q, -1]
```

3.6.4 Maple [A] (verified)

Time = 0.92 (sec) , antiderivative size = 114, normalized size of antiderivative = 1.23

method	result
parts	$-\frac{a}{(ex+d)e} + \frac{b \left(-\frac{c^2 \operatorname{arctanh}(cx)}{(ecx+cd)e} + \frac{c^2 \left(\frac{\ln(cx+1)}{2cd-2e} - \frac{\ln(cx-1)}{2cd+2e} - \frac{e \ln(ecx+cd)}{(cd+e)(cd-e)} \right)}{e} \right)}{c}$
derivativedivides	$-\frac{a c^2}{(ecx+cd)e} + b c^2 \left(-\frac{\operatorname{arctanh}(cx)}{(ecx+cd)e} + \frac{\frac{\ln(cx+1)}{2cd-2e} - \frac{\ln(cx-1)}{2cd+2e} - \frac{e \ln(ecx+cd)}{(cd+e)(cd-e)}}{e} \right)$
default	$-\frac{a c^2}{(ecx+cd)e} + b c^2 \left(-\frac{\operatorname{arctanh}(cx)}{(ecx+cd)e} + \frac{\frac{\ln(cx+1)}{2cd-2e} - \frac{\ln(cx-1)}{2cd+2e} - \frac{e \ln(ecx+cd)}{(cd+e)(cd-e)}}{e} \right)$
parallelrisch	$\frac{-x a e^2 + \ln(cx-1) x b c d e - \ln(ex+d) x b c d e + x \operatorname{arctanh}(cx) b c d e + x \operatorname{arctanh}(cx) b c^2 d^2 + x a c^2 d^2 + \operatorname{arctanh}(cx) b c d^2 + \operatorname{arctanh}(cx) b c^2 d^2}{(c^2 d^2 - e^2)(ex+d)d}$
risch	$-\frac{b \ln(cx+1)}{2e(ex+d)} - \frac{\ln(cx-1) b c^2 d e x - \ln(-cx-1) b c^2 d e x + \ln(cx-1) b c^2 d^2 - \ln(cx-1) b c e^2 x + 2 \ln(-ex-d) b c e^2 x - \ln(-cx-1) b c e^2 x}{2e(ex+d)}$

```
input int((a+b*arctanh(c*x))/(e*x+d)^2,x,method=_RETURNVERBOSE)
```

```
output -a/(e*x+d)/e+b/c*(-c^2/(c*e*x+c*d)/e*arctanh(c*x)+c^2/e*(1/(2*c*d-2*e)*ln(
c*x+1)-1/(2*c*d+2*e)*ln(c*x-1)-e/(c*d+e)/(c*d-e)*ln(c*e*x+c*d)))
```

3.6.5 Fracas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 182 vs. 2(89) = 178.

Time = 0.29 (sec) , antiderivative size = 182, normalized size of antiderivative = 1.96

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^2} dx = \frac{2 a c^2 d^2 - 2 a e^2 - (b c^2 d^2 + b c d e + (b c^2 d e + b c e^2) x) \log(cx + 1) + (b c^2 d^2 - b c d e + (b c^2 d e - b c e^2) x) \log(-cx - 1)}{2 (c^2 d^3 e - d e^3 + (c^2 d^2 e^2 - e^4) x)}$$

3.6. $\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^2} dx$

input `integrate((a+b*arctanh(c*x))/(e*x+d)^2,x, algorithm="fricas")`

output `-1/2*(2*a*c^2*d^2 - 2*a*e^2 - (b*c^2*d^2 + b*c*d*e + (b*c^2*d*e + b*c*e^2)*x)*log(c*x + 1) + (b*c^2*d^2 - b*c*d*e + (b*c^2*d*e - b*c*e^2)*x)*log(c*x - 1) + 2*(b*c*e^2*x + b*c*d*e)*log(e*x + d) + (b*c^2*d^2 - b*e^2)*log(-(c*x + 1)/(c*x - 1)))/(c^2*d^3*e - d*e^3 + (c^2*d^2*e^2 - e^4)*x)`

3.6.6 Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 663 vs. $2(73) = 146$.

Time = 0.94 (sec) , antiderivative size = 663, normalized size of antiderivative = 7.13

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^2} dx$$

$$= \begin{cases} \frac{ax}{d^2} \\ -\frac{a}{de + e^2x} \\ \frac{ax + bx \operatorname{atanh}(cx) + \frac{b \log\left(x - \frac{1}{c}\right)}{c} + \frac{b \operatorname{atanh}(cx)}{c}}{d^2} \\ -\frac{2ad}{2d^2e + 2de^2x} + \frac{bd \operatorname{atanh}\left(\frac{ex}{d}\right)}{2d^2e + 2de^2x} + \frac{bd}{2d^2e + 2de^2x} - \frac{bex \operatorname{atanh}\left(\frac{ex}{d}\right)}{2d^2e + 2de^2x} \\ -\frac{2ad}{2d^2e + 2de^2x} - \frac{bd \operatorname{atanh}\left(\frac{ex}{d}\right)}{2d^2e + 2de^2x} - \frac{bd}{2d^2e + 2de^2x} + \frac{bex \operatorname{atanh}\left(\frac{ex}{d}\right)}{2d^2e + 2de^2x} \\ -\frac{ac^2d^2}{c^2d^3e + c^2d^2e^2x - de^3 - e^4x} + \frac{ae^2}{c^2d^3e + c^2d^2e^2x - de^3 - e^4x} + \frac{bc^2dex \operatorname{atanh}(cx)}{c^2d^3e + c^2d^2e^2x - de^3 - e^4x} + \frac{bcde \log\left(x - \frac{1}{c}\right)}{c^2d^3e + c^2d^2e^2x - de^3 - e^4x} - \frac{bcde \log\left(\frac{cx + 1}{cx - 1}\right)}{c^2d^3e + c^2d^2e^2x - de^3 - e^4x} \end{cases}$$

input `integrate((a+b*atanh(c*x))/(e*x+d)**2,x)`

```
output Piecewise((a*x/d**2, Eq(c, 0) & Eq(e, 0)), (-a/(d*e + e**2*x), Eq(c, 0)),
((a*x + b*x*atanh(c*x) + b*log(x - 1/c)/c + b*atanh(c*x)/c)/d**2, Eq(e, 0)
), (-2*a*d/(2*d**2*e + 2*d*e**2*x) + b*d*atanh(e*x/d)/(2*d**2*e + 2*d*e**2
*x) + b*d/(2*d**2*e + 2*d*e**2*x) - b*e*x*atanh(e*x/d)/(2*d**2*e + 2*d*e**
2*x), Eq(c, -e/d)), (-2*a*d/(2*d**2*e + 2*d*e**2*x) - b*d*atanh(e*x/d)/(2*
d**2*e + 2*d*e**2*x) - b*d/(2*d**2*e + 2*d*e**2*x) + b*e*x*atanh(e*x/d)/(2
*d**2*e + 2*d*e**2*x), Eq(c, e/d)), (-a*c**2*d**2/(c**2*d**3*e + c**2*d**2
*e**2*x - d*e**3 - e**4*x) + a*e**2/(c**2*d**3*e + c**2*d**2*e**2*x - d*e
**3 - e**4*x) + b*c**2*d*e*x*atanh(c*x)/(c**2*d**3*e + c**2*d**2*e**2*x - d
*e**3 - e**4*x) + b*c*d*e*log(x - 1/c)/(c**2*d**3*e + c**2*d**2*e**2*x - d
*e**3 - e**4*x) - b*c*d*e*log(d/e + x)/(c**2*d**3*e + c**2*d**2*e**2*x - d
*e**3 - e**4*x) + b*c*d*e*atanh(c*x)/(c**2*d**3*e + c**2*d**2*e**2*x - d*e
**3 - e**4*x) + b*c*e**2*x*log(x - 1/c)/(c**2*d**3*e + c**2*d**2*e**2*x -
d*e**3 - e**4*x) - b*c*e**2*x*log(d/e + x)/(c**2*d**3*e + c**2*d**2*e**2*x
- d*e**3 - e**4*x) + b*c*e**2*x*atanh(c*x)/(c**2*d**3*e + c**2*d**2*e**2*
x - d*e**3 - e**4*x) + b*e**2*atanh(c*x)/(c**2*d**3*e + c**2*d**2*e**2*x -
d*e**3 - e**4*x), True))
```

3.6.7 Maxima [A] (verification not implemented)

Time = 0.20 (sec) , antiderivative size = 99, normalized size of antiderivative = 1.06

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^2} dx$$

$$= \frac{1}{2} \left(c \left(\frac{\log(cx + 1)}{cde - e^2} - \frac{\log(cx - 1)}{cde + e^2} - \frac{2 \log(ex + d)}{c^2 d^2 - e^2} \right) - \frac{2 \operatorname{artanh}(cx)}{e^2 x + de} \right) b - \frac{a}{e^2 x + de}$$

```
input integrate((a+b*arctanh(c*x))/(e*x+d)^2,x, algorithm="maxima")
```

```
output 1/2*(c*(log(c*x + 1)/(c*d*e - e^2) - log(c*x - 1)/(c*d*e + e^2) - 2*log(e*
x + d)/(c^2*d^2 - e^2)) - 2*arctanh(c*x)/(e^2*x + d*e))*b - a/(e^2*x + d*e
)
```

3.6.8 Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 243 vs. 2(89) = 178.

Time = 0.32 (sec) , antiderivative size = 243, normalized size of antiderivative = 2.61

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^2} dx = -c \left(\frac{b \log\left(\frac{(cx+1)cd}{cx-1} - cd + \frac{(cx+1)e}{cx-1} + e\right)}{c^2 d^2 - e^2} - \frac{b \log\left(-\frac{cx+1}{cx-1}\right)}{\frac{(cx+1)c^2 d^2}{cx-1} - c^2 d^2 + \frac{2(cx+1)cde}{cx-1} + \frac{(cx+1)e^2}{cx-1} + e^2} - \frac{b \log\left(-\frac{cx+1}{cx-1}\right)}{c^2 d^2 - e^2} \right)$$

input `integrate((a+b*arctanh(c*x))/(e*x+d)^2,x, algorithm="giac")`

output `-c*(b*log((c*x + 1)*c*d/(c*x - 1) - c*d + (c*x + 1)*e/(c*x - 1) + e)/(c^2*d^2 - e^2) - b*log(-(c*x + 1)/(c*x - 1))/((c*x + 1)*c^2*d^2/(c*x - 1) - c^2*d^2 + 2*(c*x + 1)*c*d*e/(c*x - 1) + (c*x + 1)*e^2/(c*x - 1) + e^2) - b*log(-(c*x + 1)/(c*x - 1))/(c^2*d^2 - e^2) - 2*a/((c*x + 1)*c^2*d^2/(c*x - 1) - c^2*d^2 + 2*(c*x + 1)*c*d*e/(c*x - 1) + (c*x + 1)*e^2/(c*x - 1) + e^2))`

3.6.9 Mupad [B] (verification not implemented)

Time = 6.21 (sec) , antiderivative size = 115, normalized size of antiderivative = 1.24

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^2} dx = \frac{d^2 \left(\frac{bc \ln(c^2 x^2 - 1)}{2} - bc \ln(d + ex) + a c^2 x + b c^2 x \operatorname{atanh}(cx) \right) + de \left(b \operatorname{atanh}(cx) - bc x \ln(d + ex) \right)}{d (e^2 - c^2 d^2) (d + ex)}$$

input `int((a + b*atanh(c*x))/(d + e*x)^2,x)`

output `-(d^2*((b*c*log(c^2*x^2 - 1))/2 - b*c*log(d + e*x) + a*c^2*x + b*c^2*x*atanh(c*x)) + d*e*(b*atanh(c*x) - b*c*x*log(d + e*x) + (b*c*x*log(c^2*x^2 - 1))/2) - a*e^2*x)/(d*(e^2 - c^2*d^2)*(d + e*x))`

3.7 $\int \frac{a+b\operatorname{arctanh}(cx)}{(d+ex)^3} dx$

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3.7.1 Optimal result

Integrand size = 16, antiderivative size = 130

$$\int \frac{a + b\operatorname{arctanh}(cx)}{(d + ex)^3} dx = \frac{bc}{2(c^2d^2 - e^2)(d + ex)} - \frac{a + b\operatorname{arctanh}(cx)}{2e(d + ex)^2} - \frac{bc^2 \log(1 - cx)}{4e(cd + e)^2} + \frac{bc^2 \log(1 + cx)}{4(cd - e)^2e} - \frac{bc^3d \log(d + ex)}{(c^2d^2 - e^2)^2}$$

output $\frac{1}{2}bc/(c^2d^2-e^2)/(e*x+d)+1/2*(-a-b*\operatorname{arctanh}(c*x))/e/(e*x+d)^2-1/4*b*c^2*\ln(-c*x+1)/e/(c*d+e)^2+1/4*b*c^2*\ln(c*x+1)/(c*d-e)^2/e-b*c^3*d*\ln(e*x+d)/(c^2*d^2-e^2)^2$

3.7.2 Mathematica [A] (verified)

Time = 0.11 (sec) , antiderivative size = 133, normalized size of antiderivative = 1.02

$$\int \frac{a + b\operatorname{arctanh}(cx)}{(d + ex)^3} dx = \frac{1}{4} \left(-\frac{2a}{e(d + ex)^2} + \frac{2bc}{(c^2d^2 - e^2)(d + ex)} - \frac{2b\operatorname{arctanh}(cx)}{e(d + ex)^2} - \frac{bc^2 \log(1 - cx)}{e(cd + e)^2} + \frac{bc^2 \log(1 + cx)}{e(-cd + e)^2} - \frac{4bc^3d \log(d + ex)}{(-c^2d^2 + e^2)^2} \right)$$

input `Integrate[(a + b*ArcTanh[c*x])/(d + e*x)^3,x]`

output $((-2*a)/(e*(d + e*x)^2) + (2*b*c)/((c^2*d^2 - e^2)*(d + e*x)) - (2*b*ArcTanh[c*x])/(e*(d + e*x)^2) - (b*c^2*Log[1 - c*x])/(e*(c*d + e)^2) + (b*c^2*Log[1 + c*x])/(e*(-(c*d) + e)^2) - (4*b*c^3*d*Log[d + e*x])/(-(c^2*d^2) + e^2)^2)/4$

3.7.3 Rubi [A] (verified)

Time = 0.36 (sec) , antiderivative size = 124, normalized size of antiderivative = 0.95, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.188$, Rules used = {6478, 477, 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.

$$\int \frac{a + \text{barctanh}(cx)}{(d + ex)^3} dx$$

↓ 6478

$$\frac{bc \int \frac{1}{(d+ex)^2(1-c^2x^2)} dx}{2e} - \frac{a + \text{barctanh}(cx)}{2e(d + ex)^2}$$

↓ 477

$$\frac{bc \int \left(\frac{c^2}{2(cd+e)^2(1-cx)} + \frac{c^2}{2(cd-e)^2(cx+1)} - \frac{2de^2c^2}{(c^2d^2-e^2)^2(d+ex)} - \frac{e^2}{(c^2d^2-e^2)(d+ex)^2} \right) dx}{2e} - \frac{a + \text{barctanh}(cx)}{2e(d + ex)^2}$$

↓ 2009

$$\frac{bc \left(\frac{e}{(c^2d^2-e^2)(d+ex)} - \frac{2c^2de \log(d+ex)}{(c^2d^2-e^2)^2} - \frac{c \log(1-cx)}{2(cd+e)^2} + \frac{c \log(cx+1)}{2(cd-e)^2} \right)}{2e} - \frac{a + \text{barctanh}(cx)}{2e(d + ex)^2}$$

input `Int[(a + b*ArcTanh[c*x])/(d + e*x)^3,x]`

output $-1/2*(a + b*ArcTanh[c*x])/(e*(d + e*x)^2) + (b*c*(e/((c^2*d^2 - e^2)*(d + e*x)) - (c*Log[1 - c*x])/(2*(c*d + e)^2) + (c*Log[1 + c*x])/(2*(c*d - e)^2) - (2*c^2*d*e*Log[d + e*x])/(c^2*d^2 - e^2)^2)/(2*e)$

3.7.3.1 Defintions of rubi rules used

rule 477 `Int[((c_) + (d_)*(x_))^(n_)*((a_) + (b_)*(x_)^2)^(p_), x_Symbol] := Simp[
a^p Int[ExpandIntegrand[(c + d*x)^n*(1 - Rt[-b/a, 2]*x)^p*(1 + Rt[-b/a, 2]
]*x)^p, x], x] /; FreeQ[{a, b, c, d}, x] && ILtQ[p, 0] && IntegerQ[n] &
& NiceSqrtQ[-b/a] && !FractionalPowerFactorQ[Rt[-b/a, 2]]`

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6478 `Int[((a_) + ArcTanh[(c_)*(x_)]*(b_))*((d_) + (e_)*(x_))^(q_), x_Symbol
] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])/(e*(q + 1))), x] - Simp[b
(c/(e(q + 1))) Int[(d + e*x)^(q + 1)/(1 - c^2*x^2), x], x] /; FreeQ[{a,
b, c, d, e, q}, x] && NeQ[q, -1]`

3.7.4 Maple [A] (verified)

Time = 1.08 (sec) , antiderivative size = 142, normalized size of antiderivative = 1.09

method	result
parts	$-\frac{a}{2(ex+d)^2e} + \frac{b \left(-\frac{c^3 \operatorname{arctanh}(cx)}{2(ecx+cd)^2e} + \frac{c^3 \left(\frac{\ln(cx+1)}{2(cd-e)^2} - \frac{\ln(cx-1)}{2(cd+e)^2} + \frac{e}{(cd+e)(cd-e)(ecx+cd)} - \frac{2ecd \ln(ecx+cd)}{(cd+e)^2(cd-e)^2} \right)}{2e} \right)}{c}$
derivativedivides	$-\frac{ac^3}{2(ecx+cd)^2e} + bc^3 \left(-\frac{\operatorname{arctanh}(cx)}{2(ecx+cd)^2e} + \frac{\ln(cx+1)}{2(cd-e)^2} - \frac{\ln(cx-1)}{2(cd+e)^2} + \frac{e}{(cd+e)(cd-e)(ecx+cd)} - \frac{2ecd \ln(ecx+cd)}{(cd+e)^2(cd-e)^2} \right)$
default	$-\frac{ac^3}{2(ecx+cd)^2e} + bc^3 \left(-\frac{\operatorname{arctanh}(cx)}{2(ecx+cd)^2e} + \frac{\ln(cx+1)}{2(cd-e)^2} - \frac{\ln(cx-1)}{2(cd+e)^2} + \frac{e}{(cd+e)(cd-e)(ecx+cd)} - \frac{2ecd \ln(ecx+cd)}{(cd+e)^2(cd-e)^2} \right)$
parallelrisch	$-e^3a+x^2 \operatorname{arctanh}(cx)bc^4d^2e+a^2c^2d^2e-\operatorname{arctanh}(cx)be^3+2xa^4d^3+2 \ln(cx-1)bc^3d^3+2 \operatorname{arctanh}(cx)bc^3d^3-xbce^3-bd$
risch	$-\frac{b \ln(cx+1)}{4e(ex+d)^2} - \frac{2ac^4d^4-2bc^3d^3e+2bcd^3e^3-4a^2c^2d^2e^2+2e^4a+bc^4d^2e^2x^2 \ln(-cx+1)+2bc^4d^3ex \ln(-cx+1)-e^4 \ln(-$

input `int((a+b*arctanh(c*x))/(e*x+d)^3,x,method=_RETURNVERBOSE)`

output `-1/2*a/(e*x+d)^2/e+b/c*(-1/2*c^3/(c*e*x+c*d)^2/e*arctanh(c*x)+1/2*c^3/e*(1
/2/(c*d-e)^2*ln(c*x+1)-1/2/(c*d+e)^2*ln(c*x-1)+e/(c*d+e)/(c*d-e)/(c*e*x+c
d)-2*e*c*d/(c*d+e)^2/(c*d-e)^2*ln(c*e*x+c*d)))`

$$3.7. \int \frac{a+b \operatorname{arctanh}(cx)}{(d+ex)^3} dx$$

3.7.5 Fracas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 454 vs. $2(122) = 244$.

Time = 0.33 (sec) , antiderivative size = 454, normalized size of antiderivative = 3.49

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^3} dx = \frac{2ac^4d^4 - 2bc^3d^3e - 4ac^2d^2e^2 + 2bcde^3 + 2ae^4 - 2(bc^3d^2e^2 - bce^4)x - (bc^4d^4 + 2bc^3d^3e + bc^2d^2e^2 + ($$

input `integrate((a+b*arctanh(c*x))/(e*x+d)^3,x, algorithm="fricas")`

output `-1/4*(2*a*c^4*d^4 - 2*b*c^3*d^3*e - 4*a*c^2*d^2*e^2 + 2*b*c*d*e^3 + 2*a*e^4 - 2*(b*c^3*d^2*e^2 - b*c*e^4)*x - (b*c^4*d^4 + 2*b*c^3*d^3*e + b*c^2*d^2*e^2 + (b*c^4*d^2*e^2 + 2*b*c^3*d*e^3 + b*c^2*e^4)*x^2 + 2*(b*c^4*d^3*e + 2*b*c^3*d^2*e^2 + b*c^2*d*e^3)*x)*log(c*x + 1) + (b*c^4*d^4 - 2*b*c^3*d^3*e + b*c^2*d^2*e^2 + (b*c^4*d^2*e^2 - 2*b*c^3*d*e^3 + b*c^2*e^4)*x^2 + 2*(b*c^4*d^3*e - 2*b*c^3*d^2*e^2 + b*c^2*d*e^3)*x)*log(c*x - 1) + 4*(b*c^3*d*e^3*x^2 + 2*b*c^3*d^2*e^2*x + b*c^3*d^3*e)*log(e*x + d) + (b*c^4*d^4 - 2*b*c^2*d^2*e^2 + b*e^4)*log(-(c*x + 1)/(c*x - 1)))/(c^4*d^6*e - 2*c^2*d^4*e^3 + d^2*e^5 + (c^4*d^4*e^3 - 2*c^2*d^2*e^5 + e^7)*x^2 + 2*(c^4*d^5*e^2 - 2*c^2*d^3*e^4 + d*e^6)*x)`

3.7.6 Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 3216 vs. $2(110) = 220$.

Time = 2.26 (sec) , antiderivative size = 3216, normalized size of antiderivative = 24.74

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^3} dx = \text{Too large to display}$$

input `integrate((a+b*atanh(c*x))/(e*x+d)**3,x)`

```
output Piecewise((a*x/d**3, Eq(c, 0) & Eq(e, 0)), (-a/(2*d**2*e + 4*d*e**2*x + 2*
e**3*x**2), Eq(c, 0)), ((a*x + b*x*atanh(c*x) + b*log(x - 1/c)/c + b*atanh
(c*x)/c)/d**3, Eq(e, 0)), (-4*a*d**2/(8*d**4*e + 16*d**3*e**2*x + 8*d**2*e
**3*x**2) + 3*b*d**2*atanh(e*x/d)/(8*d**4*e + 16*d**3*e**2*x + 8*d**2*e**3
*x**2) + 2*b*d**2/(8*d**4*e + 16*d**3*e**2*x + 8*d**2*e**3*x**2) - 2*b*d*e
*x*atanh(e*x/d)/(8*d**4*e + 16*d**3*e**2*x + 8*d**2*e**3*x**2) + b*d*e*x/(
8*d**4*e + 16*d**3*e**2*x + 8*d**2*e**3*x**2) - b*e**2*x**2*atanh(e*x/d)/(
8*d**4*e + 16*d**3*e**2*x + 8*d**2*e**3*x**2), Eq(c, -e/d)), (-4*a*d**2/(8
*d**4*e + 16*d**3*e**2*x + 8*d**2*e**3*x**2) - 3*b*d**2*atanh(e*x/d)/(8*d
**4*e + 16*d**3*e**2*x + 8*d**2*e**3*x**2) - 2*b*d**2/(8*d**4*e + 16*d**3*e
**2*x + 8*d**2*e**3*x**2) + 2*b*d*e*x*atanh(e*x/d)/(8*d**4*e + 16*d**3*e**
2*x + 8*d**2*e**3*x**2) - b*d*e*x/(8*d**4*e + 16*d**3*e**2*x + 8*d**2*e**3
*x**2) + b*e**2*x**2*atanh(e*x/d)/(8*d**4*e + 16*d**3*e**2*x + 8*d**2*e**3
*x**2), Eq(c, e/d)), (-a*c**4*d**4/(2*c**4*d**6*e + 4*c**4*d**5*e**2*x + 2
*c**4*d**4*e**3*x**2 - 4*c**2*d**4*e**3 - 8*c**2*d**3*e**4*x - 4*c**2*d**2
*e**5*x**2 + 2*d**2*e**5 + 4*d*e**6*x + 2*e**7*x**2) + 2*a*c**2*d**2*e**2/
(2*c**4*d**6*e + 4*c**4*d**5*e**2*x + 2*c**4*d**4*e**3*x**2 - 4*c**2*d**4*
e**3 - 8*c**2*d**3*e**4*x - 4*c**2*d**2*e**5*x**2 + 2*d**2*e**5 + 4*d*e**6
*x + 2*e**7*x**2) - a*e**4/(2*c**4*d**6*e + 4*c**4*d**5*e**2*x + 2*c**4*d*
**4*e**3*x**2 - 4*c**2*d**4*e**3 - 8*c**2*d**3*e**4*x - 4*c**2*d**2*e**5...
```

3.7.7 Maxima [A] (verification not implemented)

Time = 0.20 (sec) , antiderivative size = 190, normalized size of antiderivative = 1.46

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^3} dx =$$

$$-\frac{1}{4} \left(\frac{4c^2d \log(ex + d)}{c^4d^4 - 2c^2d^2e^2 + e^4} - \frac{c \log(cx + 1)}{c^2d^2e - 2cde^2 + e^3} + \frac{c \log(cx - 1)}{c^2d^2e + 2cde^2 + e^3} - \frac{2}{c^2d^3 - de^2 + (c^2d^2e - e^3)x} \right)$$

$$- \frac{a}{2(e^3x^2 + 2de^2x + d^2e)}$$

```
input integrate((a+b*arctanh(c*x))/(e*x+d)^3,x, algorithm="maxima")
```

```
output -1/4*((4*c^2*d*log(e*x + d)/(c^4*d^4 - 2*c^2*d^2*e^2 + e^4) - c*log(c*x +
1)/(c^2*d^2*e - 2*c*d*e^2 + e^3) + c*log(c*x - 1)/(c^2*d^2*e + 2*c*d*e^2 +
e^3) - 2/(c^2*d^3 - d*e^2 + (c^2*d^2*e - e^3)*x))*c + 2*arctanh(c*x)/(e^3
*x^2 + 2*d*e^2*x + d^2*e))*b - 1/2*a/(e^3*x^2 + 2*d*e^2*x + d^2*e)
```

3.7.8 Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 809 vs. $2(122) = 244$.

Time = 0.29 (sec) , antiderivative size = 809, normalized size of antiderivative = 6.22

$$\int \frac{a + \operatorname{arctanh}(cx)}{(d + ex)^3} dx =$$

$$-\left(\frac{bc^2 d \log\left(-\frac{(cx+1)cd}{cx-1} + cd - \frac{(cx+1)e}{cx-1} - e\right)}{c^4 d^4 - 2c^2 d^2 e^2 + e^4} - \frac{bc^2 d \log\left(-\frac{cx+1}{cx-1}\right)}{c^4 d^4 - 2c^2 d^2 e^2 + e^4} - \frac{(cx+1)^2 c^4 d^4}{(cx-1)^2} - \frac{2(cx+1)c^4 d^4}{cx-1} + c^4 d^4 + \frac{4}{(cx-1)^2} \right)$$

input `integrate((a+b*arctanh(c*x))/(e*x+d)^3,x, algorithm="giac")`

output

```

-(b*c^2*d*log(-(c*x + 1)*c*d/(c*x - 1) + c*d - (c*x + 1)*e/(c*x - 1) - e)/
(c^4*d^4 - 2*c^2*d^2*e^2 + e^4) - b*c^2*d*log(-(c*x + 1)/(c*x - 1))/(c^4*d
^4 - 2*c^2*d^2*e^2 + e^4) - ((c*x + 1)*b*c^2*d/(c*x - 1) - b*c^2*d + (c*x
+ 1)*b*c*e/(c*x - 1))*log(-(c*x + 1)/(c*x - 1))/((c*x + 1)^2*c^4*d^4/(c*x
- 1)^2 - 2*(c*x + 1)*c^4*d^4/(c*x - 1) + c^4*d^4 + 4*(c*x + 1)^2*c^3*d^3*e
/(c*x - 1)^2 - 4*(c*x + 1)*c^3*d^3*e/(c*x - 1) + 6*(c*x + 1)^2*c^2*d^2*e^2
/(c*x - 1)^2 - 2*c^2*d^2*e^2 + 4*(c*x + 1)^2*c*d*e^3/(c*x - 1)^2 + 4*(c*x
+ 1)*c*d*e^3/(c*x - 1) + (c*x + 1)^2*e^4/(c*x - 1)^2 + 2*(c*x + 1)*e^4/(c*
x - 1) + e^4) - (2*(c*x + 1)*a*c^3*d^2/(c*x - 1) - 2*a*c^3*d^2 + 2*a*c^2*d
*e - (c*x + 1)*b*c^2*d*e/(c*x - 1) + b*c^2*d*e - 2*(c*x + 1)*a*c*e^2/(c*x
- 1) - (c*x + 1)*b*c*e^2/(c*x - 1) - b*c*e^2)/((c*x + 1)^2*c^5*d^5/(c*x -
1)^2 - 2*(c*x + 1)*c^5*d^5/(c*x - 1) + c^5*d^5 + 3*(c*x + 1)^2*c^4*d^4*e/(
c*x - 1)^2 - 2*(c*x + 1)*c^4*d^4*e/(c*x - 1) - c^4*d^4*e + 2*(c*x + 1)^2*c
^3*d^3*e^2/(c*x - 1)^2 + 4*(c*x + 1)*c^3*d^3*e^2/(c*x - 1) - 2*c^3*d^3*e^2
- 2*(c*x + 1)^2*c^2*d^2*e^3/(c*x - 1)^2 + 4*(c*x + 1)*c^2*d^2*e^3/(c*x -
1) + 2*c^2*d^2*e^3 - 3*(c*x + 1)^2*c*d*e^4/(c*x - 1)^2 - 2*(c*x + 1)*c*d*e
^4/(c*x - 1) + c*d*e^4 - (c*x + 1)^2*e^5/(c*x - 1)^2 - 2*(c*x + 1)*e^5/(c*
x - 1) - e^5))*c

```

3.7.9 Mupad [B] (verification not implemented)

Time = 6.59 (sec) , antiderivative size = 427, normalized size of antiderivative = 3.28

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^3} dx = \frac{bc^3 d \ln(c^2 x^2 - 1)}{2(c^4 d^4 - 2c^2 d^2 e^2 + e^4)} - \frac{\operatorname{atan}\left(\frac{c^2 x}{\sqrt{-c^2}}\right) (bc^5 d^2 + bc^3 e^2)}{2e^5 \sqrt{-c^2} - c^2 \left(2d^4 e (-c^2)^{3/2} + 4d^2 e^3 \sqrt{-c^2}\right)} - \frac{bc^3 d \ln(d + ex)}{c^4 d^4 - 2c^2 d^2 e^2 + e^4} - \frac{\frac{b \operatorname{atanh}(cx)}{2e} - \frac{x(-ac^2 d^2 + \frac{bcde}{2} + ae^2)}{d(e^2 - c^2 d^2)}}{-c^2 d^2 x^2 - 2c^2 dex^3 - c^2 e^2 x^4 + d^2 + 2dex + e^2 x^2} - \frac{x^2 \left(-\frac{ac^2 d^2 e}{2} + \frac{bcde^2}{2} + \frac{ae^3}{2}\right)}{d^2 (e^2 - c^2 d^2)} + \frac{x^4 \left(-\frac{ac^4 d^2 e}{2} + \frac{bc^3 de^2}{2} + \frac{ac^2 e^3}{2}\right)}{d^2 (e^2 - c^2 d^2)} + \frac{x^3 \left(-ac^4 d^2 + \frac{bc^3 d}{2}\right)}{d(e^2 - c^2 d^2)}$$

input `int((a + b*atanh(c*x))/(d + e*x)^3,x)`

output $(bc^3 d \log(c^2 x^2 - 1)) / (2(e^4 + c^4 d^4 - 2c^2 d^2 e^2)) - (\operatorname{atan}((c^2 x) / (-c^2)^{(1/2)}) * (bc^5 d^2 + bc^3 e^2)) / (2e^5 * (-c^2)^{(1/2)} - c^2 * (2d^4 e * (-c^2)^{(3/2)} + 4d^2 e^3 * (-c^2)^{(1/2)})) - (bc^3 d \log(d + ex)) / (e^4 + c^4 d^4 - 2c^2 d^2 e^2) - ((b \operatorname{atanh}(c*x)) / (2e) - (x * (a * e^2 - a * c^2 * d^2 + (bc * d * e) / 2))) / (d * (e^2 - c^2 * d^2)) - (x^2 * ((a * e^3) / 2 + (bc * d * e^2) / 2 - (a * c^2 * d^2 * e) / 2)) / (d^2 * (e^2 - c^2 * d^2)) + (x^4 * ((a * c^2 * e^3) / 2 - (a * c^4 * d^2 * e) / 2 + (bc^3 * d * e^2) / 2)) / (d^2 * (e^2 - c^2 * d^2)) + (x^3 * (a * c^2 * e^2 - a * c^4 * d^2 + (bc^3 * d * e) / 2)) / (d * (e^2 - c^2 * d^2)) - (bc^3 d * x^2 * \operatorname{atanh}(c*x)) / (2e) / (d^2 + e^2 * x^2 + 2 * d * e * x - c^2 * d^2 * x^2 - c^2 * e^2 * x^4 - 2 * c^2 * d * e * x^3)$

3.8 $\int \frac{a+b\operatorname{arctanh}(cx)}{(d+ex)^4} dx$

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3.8.1 Optimal result

Integrand size = 16, antiderivative size = 175

$$\int \frac{a + b\operatorname{arctanh}(cx)}{(d + ex)^4} dx = \frac{bc}{6(c^2d^2 - e^2)(d + ex)^2} + \frac{2bc^3d}{3(c^2d^2 - e^2)^2(d + ex)} - \frac{a + b\operatorname{arctanh}(cx)}{3e(d + ex)^3} - \frac{bc^3 \log(1 - cx)}{6e(cd + e)^3} + \frac{bc^3 \log(1 + cx)}{6(cd - e)^3e} - \frac{bc^3(3c^2d^2 + e^2) \log(d + ex)}{3(cd - e)^3(cd + e)^3}$$

output $\frac{1}{6} \frac{b^2 c^3}{(c^2 d^2 - e^2)^2 (e x + d)^2} + \frac{2 b^2 c^3 d}{3 (c^2 d^2 - e^2)^2 (e x + d)} + \frac{1}{3} \frac{(-a - b \operatorname{arctanh}(c x))}{e (e x + d)^3} - \frac{1}{6} \frac{b^2 c^3 \ln(-c x + 1)}{e (c d + e)^3} + \frac{1}{6} \frac{b^2 c^3 \ln(c x + 1)}{(c d - e)^3} - \frac{1}{3} \frac{b^2 c^3 (3 c^2 d^2 + e^2) \ln(e x + d)}{(c^2 d^2 - e^2)^3}$

3.8.2 Mathematica [A] (verified)

Time = 0.18 (sec) , antiderivative size = 173, normalized size of antiderivative = 0.99

$$\int \frac{a + b\operatorname{arctanh}(cx)}{(d + ex)^4} dx = \frac{1}{6} \left(-\frac{2a}{e(d + ex)^3} + \frac{bc}{(c^2d^2 - e^2)(d + ex)^2} + \frac{4bc^3d}{(-c^2d^2 + e^2)^2(d + ex)} - \frac{2b\operatorname{arctanh}(cx)}{e(d + ex)^3} - \frac{bc^3 \log(1 - cx)}{e(cd + e)^3} + \frac{bc^3 \log(1 + cx)}{(cd - e)^3e} - \frac{2bc^3(3c^2d^2 + e^2) \log(d + ex)}{(c^2d^2 - e^2)^3} \right)$$

input `Integrate[(a + b*ArcTanh[c*x])/(d + e*x)^4,x]`

output
$$\begin{aligned} &((-2*a)/(e*(d + e*x)^3) + (b*c)/((c^2*d^2 - e^2)*(d + e*x)^2) + (4*b*c^3*d) \\ &)/((-c^2*d^2 + e^2)^2*(d + e*x)) - (2*b*ArcTanh[c*x])/(e*(d + e*x)^3) - \\ &(b*c^3*Log[1 - c*x])/(e*(c*d + e)^3) + (b*c^3*Log[1 + c*x])/((c*d - e)^3*e) \\ &) - (2*b*c^3*(3*c^2*d^2 + e^2)*Log[d + e*x])/(c^2*d^2 - e^2)^3/6 \end{aligned}$$

3.8.3 Rubi [A] (verified)

Time = 0.43 (sec) , antiderivative size = 171, normalized size of antiderivative = 0.98, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.188$, Rules used = {6478, 477, 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.

$$\begin{aligned} &\int \frac{a + \text{barctanh}(cx)}{(d + ex)^4} dx \\ &\quad \downarrow \text{6478} \\ &\frac{bc \int \frac{1}{(d+ex)^3(1-c^2x^2)} dx}{3e} - \frac{a + \text{barctanh}(cx)}{3e(d + ex)^3} \\ &\quad \downarrow \text{477} \\ &\frac{bc \int \left(\frac{c^3}{2(cd+e)^3(1-cx)} + \frac{c^3}{2(cd-e)^3(cx+1)} - \frac{e^2(3c^2d^2+e^2)c^2}{(c^2d^2-e^2)^3(d+ex)} - \frac{2de^2c^2}{(c^2d^2-e^2)^2(d+ex)^2} - \frac{e^2}{(c^2d^2-e^2)(d+ex)^3} \right) dx}{3e} - \frac{a + \text{barctanh}(cx)}{3e(d + ex)^3} \\ &\quad \downarrow \text{2009} \\ &\frac{bc \left(\frac{2c^2de}{(c^2d^2-e^2)^2(d+ex)} + \frac{e}{2(c^2d^2-e^2)(d+ex)^2} - \frac{c^2e(3c^2d^2+e^2) \log(d+ex)}{(c^2d^2-e^2)^3} - \frac{c^2 \log(1-cx)}{2(cd+e)^3} + \frac{c^2 \log(cx+1)}{2(cd-e)^3} \right)}{3e} - \frac{a + \text{barctanh}(cx)}{3e(d + ex)^3} \end{aligned}$$

input `Int[(a + b*ArcTanh[c*x])/(d + e*x)^4,x]`

output
$$\begin{aligned} &-1/3*(a + b*ArcTanh[c*x])/(e*(d + e*x)^3) + (b*c*(e/(2*(c^2*d^2 - e^2)*(d + e*x)^2) \\ &+ (2*c^2*d*e)/((c^2*d^2 - e^2)^2*(d + e*x)) - (c^2*Log[1 - c*x])/(2*(c*d + e)^3) + (c^2*Log[1 + c*x])/(2*(c*d - e)^3) - (c^2*e*(3*c^2*d^2 + e^2)*Log[d + e*x])/(c^2*d^2 - e^2)^3)/(3*e) \end{aligned}$$

3.8. $\int \frac{a + \text{barctanh}(cx)}{(d + ex)^4} dx$

3.8.3.1 Defintions of rubi rules used

rule 477 `Int[((c_) + (d_)*(x_))^(n_)*((a_) + (b_)*(x_)^2)^(p_), x_Symbol] := Simp[a^p Int[ExpandIntegrand[(c + d*x)^n*(1 - Rt[-b/a, 2]*x)^p*(1 + Rt[-b/a, 2]*x)^p, x], x] /; FreeQ[{a, b, c, d}, x] && ILtQ[p, 0] && IntegerQ[n] && NiceSqrtQ[-b/a] && !FractionalPowerFactorQ[Rt[-b/a, 2]]`

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6478 `Int[((a_) + ArcTanh[(c_)*(x_)]*(b_))*((d_) + (e_)*(x_))^(q_), x_Symbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])/(e*(q + 1))), x] - Simp[b*(c/(e*(q + 1))) Int[(d + e*x)^(q + 1)/(1 - c^2*x^2), x], x] /; FreeQ[{a, b, c, d, e, q}, x] && NeQ[q, -1]`

3.8.4 Maple [A] (verified)

Time = 1.30 (sec) , antiderivative size = 184, normalized size of antiderivative = 1.05

method	result
parts	$-\frac{a}{3(ex+d)^3e} + \frac{b}{c} \left(-\frac{c^4 \operatorname{arctanh}(cx)}{3(ecx+cd)^3e} + \frac{c^4}{2(cd-e)^3} \frac{\ln(cx+1) - \ln(cx-1)}{2(cd+e)^3} + \frac{e}{2(cd+e)(cd-e)(ecx+cd)^2} - \frac{e(3c^2d^2+e^2) \ln(ecx+cd)}{3e(cd+e)^3(cd-e)^3} + \frac{e}{(cd+e)^2(cd-e)^2} \right)$
derivativedivides	$-\frac{ac^4}{3(ecx+cd)^3e} + bc^4 \left(-\frac{\operatorname{arctanh}(cx)}{3(ecx+cd)^3e} + \frac{\ln(cx+1) - \ln(cx-1)}{2(cd-e)^3} + \frac{e}{2(cd+e)(cd-e)(ecx+cd)^2} - \frac{e(3c^2d^2+e^2) \ln(ecx+cd)}{3e(cd+e)^3(cd-e)^3} + \frac{e}{(cd+e)^2(cd-e)^2} \right)$
default	$-\frac{ac^4}{3(ecx+cd)^3e} + bc^4 \left(-\frac{\operatorname{arctanh}(cx)}{3(ecx+cd)^3e} + \frac{\ln(cx+1) - \ln(cx-1)}{2(cd-e)^3} + \frac{e}{2(cd+e)(cd-e)(ecx+cd)^2} - \frac{e(3c^2d^2+e^2) \ln(ecx+cd)}{3e(cd+e)^3(cd-e)^3} + \frac{e}{(cd+e)^2(cd-e)^2} \right)$
parallelrisch	$-18 \ln(ex+d)x^2b^5d^6e^2 + 2 \ln(cx-1)x^3b^3d^3e^5 + 18 \ln(cx-1)xb^5d^7e - 2 \ln(ex+d)x^3b^3d^3e^5 - 18 \ln(ex+d)xb^5d^7e + 6$
risch	Expression too large to display

input `int((a+b*arctanh(c*x))/(e*x+d)^4,x,method=_RETURNVERBOSE)`

3.8. $\int \frac{a+b \operatorname{arctanh}(cx)}{(d+ex)^4} dx$

output
$$-1/3*a/(e*x+d)^3/e+b/c*(-1/3*c^4/(c*e*x+c*d)^3/e*\operatorname{arctanh}(c*x)+1/3*c^4/e*(1/2/(c*d-e)^3*\ln(c*x+1)-1/2/(c*d+e)^3*\ln(c*x-1)+1/2*e/(c*d+e)/(c*d-e)/(c*e*x+c*d)^2-e*(3*c^2*d^2+e^2)/(c*d+e)^3/(c*d-e)^3*\ln(c*e*x+c*d)+2*e*c*d/(c*d+e)^2/(c*d-e)^2/(c*e*x+c*d))$$

3.8.5 Fracas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 859 vs. $2(162) = 324$.

Time = 0.48 (sec) , antiderivative size = 859, normalized size of antiderivative = 4.91

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^4} dx = \frac{2ac^6d^6 - 5bc^5d^5e - 6ac^4d^4e^2 + 6bc^3d^3e^3 + 6ac^2d^2e^4 - bcde^5 - 2ae^6 - 4(bc^5d^3e^3 - bc^3de^5)x^2 - (9bc^5d^5e^2 - 10bc^3d^2e^4 + bce^6)x - (bc^6d^6 + 3bc^5d^5e + 3bc^4d^4e^2 + bc^3d^3e^3 + (bc^6d^3e^3 + 3bc^5d^2e^4 + 3bc^4d^2e^5 + bc^3e^6)x^3 + 3(bc^6d^4e^2 + 3bc^5d^3e^3 + 3bc^4d^2e^4 + bc^3d^2e^5)x^2 + 3(bc^6d^5e + 3bc^5d^4e^2 + 3bc^4d^3e^3 + bc^3d^2e^4)x}{(d + ex)^4} \log(cx + 1) + (bc^6d^6 - 3bc^5d^5e + 3bc^4d^4e^2 - bc^3d^3e^3 + (bc^6d^3e^3 - 3bc^5d^2e^4 + 3bc^4d^2e^5 - bc^3e^6)x^3 + 3(bc^6d^4e^2 - 3bc^5d^3e^3 + 3bc^4d^2e^4 - bc^3d^2e^5)x^2 + 3(bc^6d^5e - 3bc^5d^4e^2 + 3bc^4d^3e^3 - bc^3d^2e^4)x}{(d + ex)^4} \log(cx - 1) + 2(3bc^5d^5e + bc^3d^3e^3 + (3bc^5d^2e^4 + bc^3e^6)x^3 + 3(3bc^5d^3e^3 + bc^3d^2e^4)x^2 + 3(3bc^5d^4e^2 + bc^3d^2e^4)x) \log(ex + d) + (bc^6d^6 - 3bc^5d^5e + 3bc^4d^4e^2 + 3bc^3d^3e^3 - bc^2d^2e^4 - bce^6) \log(-(cx + 1)/(cx - 1)) / (c^6d^9e - 3c^4d^7e^3 + 3c^2d^5e^5 - d^3e^7 + (c^6d^6e^4 - 3c^4d^4e^6 + 3c^2d^2e^8 - e^{10})x^3 + 3(c^6d^7e^3 - 3c^4d^5e^5 + 3c^2d^3e^7 - d^2e^9)x^2 + 3(c^6d^8e^2 - 3c^4d^6e^4 + 3c^2d^4e^6 - d^2e^8)x)$$

input `integrate((a+b*arctanh(c*x))/(e*x+d)^4,x, algorithm="fricas")`

output
$$-1/6*(2*a*c^6*d^6 - 5*b*c^5*d^5*e - 6*a*c^4*d^4*e^2 + 6*b*c^3*d^3*e^3 + 6*a*c^2*d^2*e^4 - b*c*d*e^5 - 2*a*e^6 - 4*(b*c^5*d^3*e^3 - b*c^3*d^2*e^5)*x^2 - (9*b*c^5*d^4*e^2 - 10*b*c^3*d^2*e^4 + b*c*e^6)*x - (b*c^6*d^6 + 3*b*c^5*d^5*e + 3*b*c^4*d^4*e^2 + b*c^3*d^3*e^3 + (b*c^6*d^3*e^3 + 3*b*c^5*d^2*e^4 + 3*b*c^4*d^2*e^5 + b*c^3*e^6)*x^3 + 3*(b*c^6*d^4*e^2 + 3*b*c^5*d^3*e^3 + 3*b*c^4*d^2*e^4 + b*c^3*d^2*e^5)*x^2 + 3*(b*c^6*d^5*e + 3*b*c^5*d^4*e^2 + 3*b*c^4*d^3*e^3 + b*c^3*d^2*e^4)*x)*\log(c*x + 1) + (b*c^6*d^6 - 3*b*c^5*d^5*e + 3*b*c^4*d^4*e^2 - b*c^3*d^3*e^3 + (b*c^6*d^3*e^3 - 3*b*c^5*d^2*e^4 + 3*b*c^4*d^2*e^5 - b*c^3*e^6)*x^3 + 3*(b*c^6*d^4*e^2 - 3*b*c^5*d^3*e^3 + 3*b*c^4*d^2*e^4 - b*c^3*d^2*e^5)*x^2 + 3*(b*c^6*d^5*e - 3*b*c^5*d^4*e^2 + 3*b*c^4*d^3*e^3 - b*c^3*d^2*e^4)*x)*\log(c*x - 1) + 2*(3*b*c^5*d^5*e + b*c^3*d^3*e^3 + (3*b*c^5*d^2*e^4 + b*c^3*e^6)*x^3 + 3*(3*b*c^5*d^3*e^3 + b*c^3*d^2*e^4)*x^2 + 3*(3*b*c^5*d^4*e^2 + b*c^3*d^2*e^4)*x)*\log(e*x + d) + (b*c^6*d^6 - 3*b*c^5*d^5*e + 3*b*c^4*d^4*e^2 + 3*b*c^3*d^3*e^3 - b*c^2*d^2*e^4 - b*e^6)*\log(-(c*x + 1)/(c*x - 1)))/(c^6*d^9*e - 3*c^4*d^7*e^3 + 3*c^2*d^5*e^5 - d^3*e^7 + (c^6*d^6*e^4 - 3*c^4*d^4*e^6 + 3*c^2*d^2*e^8 - e^{10})*x^3 + 3*(c^6*d^7*e^3 - 3*c^4*d^5*e^5 + 3*c^2*d^3*e^7 - d^2*e^9)*x^2 + 3*(c^6*d^8*e^2 - 3*c^4*d^6*e^4 + 3*c^2*d^4*e^6 - d^2*e^8)*x)$$

3.8.6 Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 10946 vs. $2(151) = 302$.

Time = 5.26 (sec) , antiderivative size = 10946, normalized size of antiderivative = 62.55

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^4} dx = \text{Too large to display}$$

input `integrate((a+b*atanh(c*x))/(e*x+d)**4,x)`

output `Piecewise((a*x/d**4, Eq(c, 0) & Eq(e, 0)), (-a/(3*d**3*e + 9*d**2*e**2*x + 9*d*e**3*x**2 + 3*e**4*x**3), Eq(c, 0)), ((a*x + b*x*atanh(c*x) + b*log(x - 1/c)/c + b*atanh(c*x)/c)/d**4, Eq(e, 0)), (-24*a*d**3/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) + 21*b*d**3*atanh(e*x/d)/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) + 10*b*d**3/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) - 9*b*d**2*e*x*atanh(e*x/d)/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) + 9*b*d**2*e*x/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) - 9*b*d*e**2*x**2*atanh(e*x/d)/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) + 3*b*d*e**2*x**2/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) - 3*b*e**3*x**3*atanh(e*x/d)/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3), Eq(c, -e/d)), (-24*a*d**3/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) - 21*b*d**3*atanh(e*x/d)/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) - 10*b*d**3/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) + 9*b*d**2*e*x*atanh(e*x/d)/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) - 9*b*d**2*e*x/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 72*d**3*e**4*x**3) + 9*b*d*e**2*x**2*atanh(e*x/d)/(72*d**6*e + 216*d**5*e**2*x + 216*d**4*e**3*x**2 + 7...`

3.8.7 Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 339 vs. $2(162) = 324$.

Time = 0.20 (sec) , antiderivative size = 339, normalized size of antiderivative = 1.94

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^4} dx$$

$$= \frac{1}{6} \left(\left(\frac{c^2 \log(cx + 1)}{c^3 d^3 e - 3 c^2 d^2 e^2 + 3 c d e^3 - e^4} - \frac{c^2 \log(cx - 1)}{c^3 d^3 e + 3 c^2 d^2 e^2 + 3 c d e^3 + e^4} - \frac{2(3 c^4 d^2 + c^2 e^2) \log(ex + d)}{c^6 d^6 - 3 c^4 d^4 e^2 + 3 c^2 d^2 e^4 - e^6} + \frac{a}{3(e^4 x^3 + 3 d e^3 x^2 + 3 d^2 e^2 x + d^3 e)} \right) \right)$$

3.8. $\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^4} dx$

input `integrate((a+b*arctanh(c*x))/(e*x+d)^4,x, algorithm="maxima")`

output `1/6*((c^2*log(c*x + 1)/(c^3*d^3*e - 3*c^2*d^2*e^2 + 3*c*d*e^3 - e^4) - c^2*log(c*x - 1)/(c^3*d^3*e + 3*c^2*d^2*e^2 + 3*c*d*e^3 + e^4) - 2*(3*c^4*d^2 + c^2*e^2)*log(e*x + d)/(c^6*d^6 - 3*c^4*d^4*e^2 + 3*c^2*d^2*e^4 - e^6) + (4*c^2*d*e*x + 5*c^2*d^2 - e^2)/(c^4*d^6 - 2*c^2*d^4*e^2 + d^2*e^4 + (c^4*d^4*e^2 - 2*c^2*d^2*e^4 + e^6)*x^2 + 2*(c^4*d^5*e - 2*c^2*d^3*e^3 + d*e^5)*x))*c - 2*arctanh(c*x)/(e^4*x^3 + 3*d*e^3*x^2 + 3*d^2*e^2*x + d^3*e))*b - 1/3*a/(e^4*x^3 + 3*d*e^3*x^2 + 3*d^2*e^2*x + d^3*e)`

3.8.8 Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1792 vs. $2(162) = 324$.

Time = 0.29 (sec) , antiderivative size = 1792, normalized size of antiderivative = 10.24

$$\int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^4} dx = \text{Too large to display}$$

input `integrate((a+b*arctanh(c*x))/(e*x+d)^4,x, algorithm="giac")`

output

```

-1/3*c*((3*b*c^4*d^2 + b*c^2*e^2)*log(-(c*x + 1)*c*d/(c*x - 1) + c*d - (c*
x + 1)*e/(c*x - 1) - e)/(c^6*d^6 - 3*c^4*d^4*e^2 + 3*c^2*d^2*e^4 - e^6) -
(3*(c*x + 1)^2*b*c^4*d^2/(c*x - 1)^2 - 6*(c*x + 1)*b*c^4*d^2/(c*x - 1) + 3
*b*c^4*d^2 + 6*(c*x + 1)^2*b*c^3*d*e/(c*x - 1)^2 - 6*(c*x + 1)*b*c^3*d*e/(
c*x - 1) + 3*(c*x + 1)^2*b*c^2*e^2/(c*x - 1)^2 + b*c^2*e^2)*log(-(c*x + 1)
/(c*x - 1))/((c*x + 1)^3*c^6*d^6/(c*x - 1)^3 - 3*(c*x + 1)^2*c^6*d^6/(c*x
- 1)^2 + 3*(c*x + 1)*c^6*d^6/(c*x - 1) - c^6*d^6 + 6*(c*x + 1)^3*c^5*d^5*e
/(c*x - 1)^3 - 12*(c*x + 1)^2*c^5*d^5*e/(c*x - 1)^2 + 6*(c*x + 1)*c^5*d^5*
e/(c*x - 1) + 15*(c*x + 1)^3*c^4*d^4*e^2/(c*x - 1)^3 - 15*(c*x + 1)^2*c^4*
d^4*e^2/(c*x - 1)^2 - 3*(c*x + 1)*c^4*d^4*e^2/(c*x - 1) + 3*c^4*d^4*e^2 +
20*(c*x + 1)^3*c^3*d^3*e^3/(c*x - 1)^3 - 12*(c*x + 1)*c^3*d^3*e^3/(c*x - 1
) + 15*(c*x + 1)^3*c^2*d^2*e^4/(c*x - 1)^3 + 15*(c*x + 1)^2*c^2*d^2*e^4/(c
*x - 1)^2 - 3*(c*x + 1)*c^2*d^2*e^4/(c*x - 1) - 3*c^2*d^2*e^4 + 6*(c*x + 1
)^3*c*d*e^5/(c*x - 1)^3 + 12*(c*x + 1)^2*c*d*e^5/(c*x - 1)^2 + 6*(c*x + 1)
*c*d*e^5/(c*x - 1) + (c*x + 1)^3*e^6/(c*x - 1)^3 + 3*(c*x + 1)^2*e^6/(c*x
- 1)^2 + 3*(c*x + 1)*e^6/(c*x - 1) + e^6) - (3*b*c^4*d^2 + b*c^2*e^2)*log(
-(c*x + 1)/(c*x - 1))/(c^6*d^6 - 3*c^4*d^4*e^2 + 3*c^2*d^2*e^4 - e^6) - 2*
(3*(c*x + 1)^2*a*c^6*d^4/(c*x - 1)^2 - 6*(c*x + 1)*a*c^6*d^4/(c*x - 1) + 3
*a*c^6*d^4 + 6*(c*x + 1)*a*c^5*d^3*e/(c*x - 1) - 6*a*c^5*d^3*e - 3*(c*x +
1)^2*b*c^5*d^3*e/(c*x - 1)^2 + 6*(c*x + 1)*b*c^5*d^3*e/(c*x - 1) - 3*b*...

```

3.8.9 Mupad [B] (verification not implemented)

Time = 4.86 (sec) , antiderivative size = 418, normalized size of antiderivative = 2.39

$$\begin{aligned}
& \int \frac{a + b \operatorname{arctanh}(cx)}{(d + ex)^4} dx \\
&= \ln(d + ex) \left(\frac{bc^3}{6e(e + cd)^3} + \frac{bc^3}{6e(e - cd)^3} \right) \\
&\quad - \frac{\frac{2ac^4d^4 - 5b^2c^3d^3e - 4ac^2d^2e^2 + bcde^3 + 2ae^4}{2(c^4d^4 - 2c^2d^2e^2 + e^4)} + \frac{x(bc^4e^4 - 9bc^3d^2e^2)}{2(c^4d^4 - 2c^2d^2e^2 + e^4)} - \frac{2bc^3de^3x^2}{c^4d^4 - 2c^2d^2e^2 + e^4}}{3d^3e + 9d^2e^2x + 9de^3x^2 + 3e^4x^3} \\
&\quad - \frac{bc^3 \ln(cx - 1)}{6c^3d^3e + 18c^2d^2e^2 + 18cde^3 + 6e^4} - \frac{bc^3 \ln(cx + 1)}{-6c^3d^3e + 18c^2d^2e^2 - 18cde^3 + 6e^4} \\
&\quad - \frac{b \ln(cx + 1)}{6e(d^3 + 3d^2ex + 3de^2x^2 + e^3x^3)} + \frac{b \ln(1 - cx)}{3e(2d^3 + 6d^2ex + 6de^2x^2 + 2e^3x^3)}
\end{aligned}$$

input `int((a + b*atanh(c*x))/(d + e*x)^4,x)`

output $\log(d + ex) * ((b*c^3)/(6*e*(e + c*d)^3) + (b*c^3)/(6*e*(e - c*d)^3)) - ((2*a*e^4 + 2*a*c^4*d^4 - 4*a*c^2*d^2*e^2 + b*c*d*e^3 - 5*b*c^3*d^3*e)/(2*(e^4 + c^4*d^4 - 2*c^2*d^2*e^2)) + (x*(b*c*e^4 - 9*b*c^3*d^2*e^2))/(2*(e^4 + c^4*d^4 - 2*c^2*d^2*e^2)) - (2*b*c^3*d*e^3*x^2)/(e^4 + c^4*d^4 - 2*c^2*d^2*e^2))/(3*d^3*e + 3*e^4*x^3 + 9*d^2*e^2*x + 9*d*e^3*x^2) - (b*c^3*\log(cx - 1))/(6*e^4 + 6*c^3*d^3*e + 18*c^2*d^2*e^2 + 18*c*d*e^3) - (b*c^3*\log(cx + 1))/(6*e^4 - 6*c^3*d^3*e + 18*c^2*d^2*e^2 - 18*c*d*e^3) - (b*\log(cx + 1))/(6*e*(d^3 + e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x)) + (b*\log(1 - cx))/(3*e*(2*d^3 + 2*e^3*x^3 + 6*d*e^2*x^2 + 6*d^2*e*x))$

3.9 $\int (d + ex)^3 (a + \operatorname{barctanh}(cx))^2 dx$

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3.9.1 Optimal result

Integrand size = 18, antiderivative size = 359

$$\begin{aligned}
 \int (d + ex)^3 (a + \operatorname{barctanh}(cx))^2 dx = & \frac{b^2 d e^2 x}{c^2} + \frac{a b e (6 c^2 d^2 + e^2) x}{2 c^3} + \frac{b^2 e^3 x^2}{12 c^2} \\
 & - \frac{b^2 d e^2 \operatorname{arctanh}(cx)}{c^3} + \frac{b^2 e (6 c^2 d^2 + e^2) x \operatorname{arctanh}(cx)}{2 c^3} \\
 & + \frac{b d e^2 x^2 (a + \operatorname{barctanh}(cx))}{c} \\
 & + \frac{b e^3 x^3 (a + \operatorname{barctanh}(cx))}{6 c} \\
 & + \frac{d (c^2 d^2 + e^2) (a + \operatorname{barctanh}(cx))^2}{c^3} \\
 & - \frac{(c^4 d^4 + 6 c^2 d^2 e^2 + e^4) (a + \operatorname{barctanh}(cx))^2}{4 c^4 e} \\
 & + \frac{(d + ex)^4 (a + \operatorname{barctanh}(cx))^2}{4 e} \\
 & - \frac{2 b d (c^2 d^2 + e^2) (a + \operatorname{barctanh}(cx)) \log\left(\frac{2}{1-cx}\right)}{c^3} \\
 & + \frac{b^2 e^3 \log(1 - c^2 x^2)}{12 c^4} + \frac{b^2 e (6 c^2 d^2 + e^2) \log(1 - c^2 x^2)}{4 c^4} \\
 & - \frac{b^2 d (c^2 d^2 + e^2) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{c^3}
 \end{aligned}$$

output
$$\begin{aligned} & b^2 d e^{2x} / c^2 + 1/2 a b e^{2x} (6 c^2 d^2 + e^2) x / c^3 + 1/12 b^2 e^3 x^2 / c^2 - b^2 d e^{2x} \operatorname{arctanh}(c x) / c^3 + 1/2 b^2 e^{2x} (6 c^2 d^2 + e^2) x \operatorname{arctanh}(c x) / c^3 + b^2 d e^{2x} x^2 (a + b \operatorname{arctanh}(c x)) / c + 1/6 b e^3 x^3 (a + b \operatorname{arctanh}(c x)) / c + d (c^2 d^2 + e^2) (a + b \operatorname{arctanh}(c x))^2 / c^3 - 1/4 (c^4 d^4 + 6 c^2 d^2 e^2 + e^4) (a + b \operatorname{arctanh}(c x))^2 / c^4 + e^{1/4} (e x + d)^4 (a + b \operatorname{arctanh}(c x))^2 / e - 2 b d (c^2 d^2 + e^2) (a + b \operatorname{arctanh}(c x)) \ln(2 / (-c x + 1)) / c^3 + 1/12 b^2 e^3 \ln(-c^2 x^2 + 1) / c^4 + 1/4 b^2 e (6 c^2 d^2 + e^2) \ln(-c^2 x^2 + 1) / c^4 - b^2 d (c^2 d^2 + e^2) \operatorname{polylog}(2, 1 - 2 / (-c x + 1)) / c^3 \end{aligned}$$

3.9.2 Mathematica [A] (verified)

Time = 0.57 (sec) , antiderivative size = 506, normalized size of antiderivative = 1.41

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^2 dx = \frac{-b^2 e^3 + 12 a^2 c^4 d^3 x + 36 a b c^3 d^2 e x + 12 b^2 c^2 d e^2 x + 6 a b c e^3 x + 18 a^2 c^4 d^2 e x^2 + 12 a b c^3 d e^2 x^2 + b^2 c^2 e^3 x^2 + 12 a^2 c^4 d^3 x^3 + 2 a^2 b c^3 e^3 x^3 + 3 a^2 c^4 e^3 x^4 + 3 b^2 (-4 c^3 d^3 - 6 c^2 d^2 e - 4 c d e^2 - e^3 + c^4 x (4 d^3 + 6 d^2 e x + 4 d e^2 x^2 + e^3 x^3)) \operatorname{ArcTanh}[c x]^2 + 2 b c \operatorname{ArcTanh}[c x] (3 a c^3 x (4 d^3 + 6 d^2 e x + 4 d e^2 x^2 + e^3 x^3) + b e (18 c^2 d^2 x + 6 d e (-1 + c^2 x^2) + e^2 x (3 + c^2 x^2))) - 12 b d (c^2 d^2 + e^2) \operatorname{Log}[1 + E^{-2 \operatorname{ArcTanh}[c x]}]} + 18 a b c^2 d^2 e \operatorname{Log}[1 - c x] + 3 a b e^3 \operatorname{Log}[1 - c x] - 18 a b c^2 d^2 e \operatorname{Log}[1 + c x] - 3 a b e^3 \operatorname{Log}[1 + c x] + 12 a b c^3 d^3 \operatorname{Log}[1 - c^2 x^2] + 18 b^2 c^2 d^2 e \operatorname{Log}[1 - c^2 x^2] + 4 b^2 e^3 \operatorname{Log}[1 - c^2 x^2] + 12 a b c d e^2 \operatorname{Log}[-1 + c^2 x^2] + 12 b^2 c d (c^2 d^2 + e^2) \operatorname{PolyLog}[2, -E^{-2 \operatorname{ArcTanh}[c x]}]} / (12 c^4)$$

input `Integrate[(d + e*x)^3*(a + b*ArcTanh[c*x])^2,x]`

output
$$\begin{aligned} & (-b^2 e^3) + 12 a^2 c^4 d^3 x + 36 a b c^3 d^2 e x + 12 b^2 c^2 d e^2 x + 6 a^2 b c e^3 x + 18 a^2 c^4 d^2 e x^2 + 12 a b c^3 d e^2 x^2 + b^2 c^2 e^3 x^2 + 12 a^2 c^4 d e^2 x^3 + 2 a^2 b c^3 e^3 x^3 + 3 a^2 c^4 e^3 x^4 + 3 b^2 (-4 c^3 d^3 - 6 c^2 d^2 e - 4 c d e^2 - e^3 + c^4 x (4 d^3 + 6 d^2 e x + 4 d e^2 x^2 + e^3 x^3)) \operatorname{ArcTanh}[c x]^2 + 2 b c \operatorname{ArcTanh}[c x] (3 a c^3 x (4 d^3 + 6 d^2 e x + 4 d e^2 x^2 + e^3 x^3) + b e (18 c^2 d^2 x + 6 d e (-1 + c^2 x^2) + e^2 x (3 + c^2 x^2))) - 12 b d (c^2 d^2 + e^2) \operatorname{Log}[1 + E^{-2 \operatorname{ArcTanh}[c x]}]} + 18 a b c^2 d^2 e \operatorname{Log}[1 - c x] + 3 a b e^3 \operatorname{Log}[1 - c x] - 18 a b c^2 d^2 e \operatorname{Log}[1 + c x] - 3 a b e^3 \operatorname{Log}[1 + c x] + 12 a b c^3 d^3 \operatorname{Log}[1 - c^2 x^2] + 18 b^2 c^2 d^2 e \operatorname{Log}[1 - c^2 x^2] + 4 b^2 e^3 \operatorname{Log}[1 - c^2 x^2] + 12 a b c d e^2 \operatorname{Log}[-1 + c^2 x^2] + 12 b^2 c d (c^2 d^2 + e^2) \operatorname{PolyLog}[2, -E^{-2 \operatorname{ArcTanh}[c x]}]} / (12 c^4) \end{aligned}$$

3.9.3 Rubi [A] (verified)

Time = 0.79 (sec) , antiderivative size = 362, normalized size of antiderivative = 1.01, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {6480, 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.

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^2 dx$$

↓ 6480

$$\frac{(d + ex)^4 (a + b \operatorname{arctanh}(cx))^2}{4e} - \frac{bc \int \left(-\frac{x^2 (a + b \operatorname{arctanh}(cx)) e^4}{c^2} - \frac{4dx (a + b \operatorname{arctanh}(cx)) e^3}{c^2} - \frac{(6c^2 d^2 + e^2) (a + b \operatorname{arctanh}(cx)) e^2}{c^4} + \frac{(c^4 d^4 + 6c^2 e^2 d^2 + 4c^2 e (c^2 d^2 + e^2) x d + e^4)}{c^4 (1 - c^2 x^2)} \right) dx}{2e}$$

↓ 2009

$$\frac{(d + ex)^4 (a + b \operatorname{arctanh}(cx))^2}{4e} - bc \left(-\frac{2de^3 x^2 (a + b \operatorname{arctanh}(cx))}{c^2} - \frac{e^4 x^3 (a + b \operatorname{arctanh}(cx))}{3c^2} - \frac{2de (c^2 d^2 + e^2) (a + b \operatorname{arctanh}(cx))^2}{bc^4} + \frac{4de (c^2 d^2 + e^2) \log\left(\frac{2}{1 - cx}\right) (a + b \operatorname{arctanh}(cx))}{c^4} \right)$$

input `Int[(d + e*x)^3*(a + b*ArcTanh[c*x])^2,x]`

output `((d + e*x)^4*(a + b*ArcTanh[c*x])^2)/(4*e) - (b*c*((-2*b*d*e^3*x)/c^3 - (a*e^2*(6*c^2*d^2 + e^2)*x)/c^4 - (b*e^4*x^2)/(6*c^3) + (2*b*d*e^3*ArcTanh[c*x])/c^4 - (b*e^2*(6*c^2*d^2 + e^2)*x*ArcTanh[c*x])/c^4 - (2*d*e^3*x^2*(a + b*ArcTanh[c*x])/c^2 - (e^4*x^3*(a + b*ArcTanh[c*x]))/(3*c^2) - (2*d*e*(c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])^2)/(b*c^4) + ((c^4*d^4 + 6*c^2*d^2*e^2 + e^4)*(a + b*ArcTanh[c*x])^2)/(2*b*c^5) + (4*d*e*(c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])*Log[2/(1 - c*x)])/c^4 - (b*e^4*Log[1 - c^2*x^2])/(6*c^5) - (b*e^2*(6*c^2*d^2 + e^2)*Log[1 - c^2*x^2])/(2*c^5) + (2*b*d*e*(c^2*d^2 + e^2)*PolyLog[2, 1 - 2/(1 - c*x)])/c^4)/(2*e)`

3.9.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6480 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_)*((d_) + (e_.)*(x_))^(q_.), x_Symbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])^p/(e*(q + 1))), x] - Simp[b*c*(p/(e*(q + 1))) Int[ExpandIntegrand[(a + b*ArcTanh[c*x])^(p - 1), (d + e*x)^(q + 1)/(1 - c^2*x^2), x], x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 1] && IntegerQ[q] && NeQ[q, -1]`

3.9.4 Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 803 vs. 2(343) = 686.

Time = 1.86 (sec) , antiderivative size = 804, normalized size of antiderivative = 2.24

method	result
parts	$\frac{a^2(ex+d)^4}{4e} + \frac{b^2 \left(\frac{ce^3 \operatorname{arctanh}(cx)^2 x^4}{4} + ce^2 \operatorname{arctanh}(cx)^2 x^3 d + \frac{3ce \operatorname{arctanh}(cx)^2 x^2 d^2}{2} + \operatorname{arctanh}(cx)^2 cx d^3 + \frac{c \operatorname{arctanh}(cx)^2 d^4}{4e} \right)}{4e}$
derivativedivides	$\frac{a^2(ecx+cd)^4}{4e^3} + \frac{b^2 \left(\frac{\operatorname{arctanh}(cx)^2 c^4 d^4}{4e} + \operatorname{arctanh}(cx)^2 c^4 d^3 x + \frac{3e \operatorname{arctanh}(cx)^2 c^4 d^2 x^2}{2} + e^2 \operatorname{arctanh}(cx)^2 c^4 d x^3 + \frac{e^3 \operatorname{arctanh}(cx)^2 c^4 x^4}{4} \right)}{4e^3}$
default	$\frac{a^2(ecx+cd)^4}{4e^3} + \frac{b^2 \left(\frac{\operatorname{arctanh}(cx)^2 c^4 d^4}{4e} + \operatorname{arctanh}(cx)^2 c^4 d^3 x + \frac{3e \operatorname{arctanh}(cx)^2 c^4 d^2 x^2}{2} + e^2 \operatorname{arctanh}(cx)^2 c^4 d x^3 + \frac{e^3 \operatorname{arctanh}(cx)^2 c^4 x^4}{4} \right)}{4e^3}$
risch	Expression too large to display

input `int((e*x+d)^3*(a+b*arctanh(c*x))^2,x,method=_RETURNVERBOSE)`

output

```

1/4*a^2*(e*x+d)^4/e+b^2/c*(1/4*c*e^3*arctanh(c*x)^2*x^4+c*e^2*arctanh(c*x)
^2*x^3*d+3/2*c*e*arctanh(c*x)^2*x^2*d^2+arctanh(c*x)^2*c*x*d^3+1/4*c/e*arc
tanh(c*x)^2*d^4-1/2/c^3/e*(-6*arctanh(c*x)*e^2*c^3*d^2*x-2*arctanh(c*x)*c^
3*d*e^3*x^2-1/3*arctanh(c*x)*e^4*c^3*x^3-arctanh(c*x)*e^4*c*x-1/2*arctanh(
c*x)*ln(c*x-1)*c^4*d^4-2*arctanh(c*x)*ln(c*x-1)*e*c^3*d^3-3*arctanh(c*x)*l
n(c*x-1)*e^2*c^2*d^2-2*arctanh(c*x)*ln(c*x-1)*e^3*c*d-1/2*arctanh(c*x)*ln(
c*x-1)*e^4+1/2*arctanh(c*x)*ln(c*x+1)*c^4*d^4-2*arctanh(c*x)*ln(c*x+1)*e*c
^3*d^3+3*arctanh(c*x)*ln(c*x+1)*e^2*c^2*d^2-2*arctanh(c*x)*ln(c*x+1)*e^3*c
*d+1/2*arctanh(c*x)*ln(c*x+1)*e^4-1/6*(-3*c^4*d^4+12*c^3*d^3*e-18*c^2*d^2*
e^2+12*c*d*e^3-3*e^4)*(1/2*(ln(c*x+1)-ln(1/2*c*x+1/2))*ln(-1/2*c*x+1/2)-1/
2*dilog(1/2*c*x+1/2)-1/4*ln(c*x+1)^2)-1/6*(3*c^4*d^4+12*c^3*d^3*e+18*c^2*d
^2*e^2+12*c*d*e^3+3*e^4)*(-1/2*dilog(1/2*c*x+1/2)-1/2*ln(c*x-1)*ln(1/2*c*x
+1/2)+1/4*ln(c*x-1)^2)-1/3*e^2*(6*d*c^2*e*x+1/2*e^2*c^2*x^2+1/2*(18*c^2*d
^2+6*c*d*e+4*e^2)*ln(c*x-1)-1/2*(-18*c^2*d^2+6*c*d*e-4*e^2)*ln(c*x+1))))+2*
a*b/c*(1/4*c*e^3*arctanh(c*x)*x^4+c*e^2*arctanh(c*x)*x^3*d+3/2*c*e*arctanh
(c*x)*x^2*d^2+arctanh(c*x)*c*x*d^3+1/4*c/e*arctanh(c*x)*d^4-1/4/c^3/e*(-6*
e^2*c^3*d^2*x-2*c^3*d*e^3*x^2-1/3*e^4*c^3*x^3-e^4*c*x-1/2*(c^4*d^4+4*c^3*d
^3*e+6*c^2*d^2*e^2+4*c*d*e^3+e^4)*ln(c*x-1)+1/2*(c^4*d^4-4*c^3*d^3*e+6*c^2
*d^2*e^2-4*c*d*e^3+e^4)*ln(c*x+1)))

```

3.9.5 Fracas [F]

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^2 dx = \int (ex + d)^3 (b \operatorname{arctanh}(cx) + a)^2 dx$$

input `integrate((e*x+d)^3*(a+b*arctanh(c*x))^2,x, algorithm="fracas")`

output

```

integral(a^2*e^3*x^3 + 3*a^2*d*e^2*x^2 + 3*a^2*d^2*e*x + a^2*d^3 + (b^2*e^
3*x^3 + 3*b^2*d*e^2*x^2 + 3*b^2*d^2*e*x + b^2*d^3)*arctanh(c*x)^2 + 2*(a*b
*e^3*x^3 + 3*a*b*d*e^2*x^2 + 3*a*b*d^2*e*x + a*b*d^3)*arctanh(c*x), x)

```

3.9.6 Sympy [F]

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^2 dx = \int (a + b \operatorname{atanh}(cx))^2 (d + ex)^3 dx$$

input `integrate((e*x+d)**3*(a+b*atanh(c*x))**2,x)`

output `Integral((a + b*atanh(c*x))**2*(d + e*x)**3, x)`

3.9.7 Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 782 vs. $2(340) = 680$.

Time = 0.36 (sec) , antiderivative size = 782, normalized size of antiderivative = 2.18

$$\begin{aligned} \int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^2 dx &= \frac{1}{4} a^2 e^3 x^4 + a^2 d e^2 x^3 + \frac{3}{2} a^2 d^2 e x^2 \\ &+ \frac{3}{2} \left(2 x^2 \operatorname{artanh}(cx) + c \left(\frac{2x}{c^2} - \frac{\log(cx+1)}{c^3} + \frac{\log(cx-1)}{c^3} \right) \right) a b d^2 e \\ &+ \left(2 x^3 \operatorname{artanh}(cx) + c \left(\frac{x^2}{c^2} + \frac{\log(c^2 x^2 - 1)}{c^4} \right) \right) a b d e^2 \\ &+ \frac{1}{12} \left(6 x^4 \operatorname{artanh}(cx) + c \left(\frac{2(c^2 x^3 + 3x)}{c^4} - \frac{3 \log(cx+1)}{c^5} + \frac{3 \log(cx-1)}{c^5} \right) \right) a b e^3 \\ &+ a^2 d^3 x + \frac{(2cx \operatorname{artanh}(cx) + \log(-c^2 x^2 + 1)) a b d^3}{c} \\ &+ \frac{(c^2 d^3 + d e^2) (\log(cx+1) \log(-\frac{1}{2}cx + \frac{1}{2}) + \operatorname{Li}_2(\frac{1}{2}cx + \frac{1}{2})) b^2}{c^3} \\ &+ \frac{(9c^2 d^2 e - 3c d e^2 + 2e^3) b^2 \log(cx+1)}{6c^4} + \frac{(9c^2 d^2 e + 3c d e^2 + 2e^3) b^2 \log(cx-1)}{6c^4} \\ &+ \frac{4b^2 c^2 e^3 x^2 + 48b^2 c^2 d e^2 x + 3(b^2 c^4 e^3 x^4 + 4b^2 c^4 d e^2 x^3 + 6b^2 c^4 d^2 e x^2 + 4b^2 c^4 d^3 x + (4c^3 d^3 - 6c^2 d^2 e + 4c d e^2))}{6c^4} \end{aligned}$$

input `integrate((e*x+d)^3*(a+b*arctanh(c*x))^2,x, algorithm="maxima")`

output `1/4*a^2*e^3*x^4 + a^2*d*e^2*x^3 + 3/2*a^2*d^2*e*x^2 + 3/2*(2*x^2*arctanh(c*x) + c*(2*x/c^2 - log(c*x + 1)/c^3 + log(c*x - 1)/c^3))*a*b*d^2*e + (2*x^3*arctanh(c*x) + c*(x^2/c^2 + log(c^2*x^2 - 1)/c^4))*a*b*d*e^2 + 1/12*(6*x^4*arctanh(c*x) + c*(2*(c^2*x^3 + 3*x)/c^4 - 3*log(c*x + 1)/c^5 + 3*log(c*x - 1)/c^5))*a*b*e^3 + a^2*d^3*x + (2*c*x*arctanh(c*x) + log(-c^2*x^2 + 1))*a*b*d^3/c + (c^2*d^3 + d*e^2)*(log(c*x + 1)*log(-1/2*c*x + 1/2) + dilog(1/2*c*x + 1/2))*b^2/c^3 + 1/6*(9*c^2*d^2*e - 3*c*d*e^2 + 2*e^3)*b^2*log(c*x + 1)/c^4 + 1/6*(9*c^2*d^2*e + 3*c*d*e^2 + 2*e^3)*b^2*log(c*x - 1)/c^4 + 1/48*(4*b^2*c^2*e^3*x^2 + 48*b^2*c^2*d*e^2*x + 3*(b^2*c^4*e^3*x^4 + 4*b^2*c^4*d*e^2*x^3 + 6*b^2*c^4*d^2*e*x^2 + 4*b^2*c^4*d^3*x + (4*c^3*d^3 - 6*c^2*d^2*e + 4*c*d*e^2 - e^3)*b^2)*log(c*x + 1)^2 + 3*(b^2*c^4*e^3*x^4 + 4*b^2*c^4*d*e^2*x^3 + 6*b^2*c^4*d^2*e*x^2 + 4*b^2*c^4*d^3*x - (4*c^3*d^3 + 6*c^2*d^2*e + 4*c*d*e^2 + e^3)*b^2)*log(-c*x + 1)^2 + 4*(b^2*c^3*e^3*x^3 + 6*b^2*c^3*d*e^2*x^2 + 3*(6*c^3*d^2*e + c*e^3)*b^2*x)*log(c*x + 1) - 2*(2*b^2*c^3*e^3*x^3 + 12*b^2*c^3*d*e^2*x^2 + 6*(6*c^3*d^2*e + c*e^3)*b^2*x + 3*(b^2*c^4*e^3*x^4 + 4*b^2*c^4*d*e^2*x^3 + 6*b^2*c^4*d^2*e*x^2 + 4*b^2*c^4*d^3*x + (4*c^3*d^3 - 6*c^2*d^2*e + 4*c*d*e^2 - e^3)*b^2)*log(c*x + 1))*log(-c*x + 1))/c^4`

3.9.8 Giac [F]

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^2 dx = \int (ex + d)^3 (b \operatorname{atanh}(cx) + a)^2 dx$$

input `integrate((e*x+d)^3*(a+b*arctanh(c*x))^2,x, algorithm="giac")`

output `integrate((e*x + d)^3*(b*arctanh(c*x) + a)^2, x)`

3.9.9 Mupad [F(-1)]

Timed out.

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^2 dx = \int (a + b \operatorname{atanh}(cx))^2 (d + ex)^3 dx$$

input `int((a + b*atanh(c*x))^2*(d + e*x)^3,x)`

output `int((a + b*atanh(c*x))^2*(d + e*x)^3, x)`

3.9. $\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^2 dx$

3.10 $\int (d + ex)^2 (a + \operatorname{barctanh}(cx))^2 dx$

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3.10.1 Optimal result

Integrand size = 18, antiderivative size = 257

$$\begin{aligned} \int (d + ex)^2 (a + \operatorname{barctanh}(cx))^2 dx = & \frac{2abdex}{c} + \frac{b^2 e^2 x}{3c^2} - \frac{b^2 e^2 \operatorname{arctanh}(cx)}{3c^3} \\ & + \frac{2b^2 dex \operatorname{arctanh}(cx)}{c} + \frac{be^2 x^2 (a + \operatorname{barctanh}(cx))}{3c} \\ & + \frac{(3c^2 d^2 + e^2) (a + \operatorname{barctanh}(cx))^2}{3c^3} \\ & - \frac{d \left(d^2 + \frac{3e^2}{c^2} \right) (a + \operatorname{barctanh}(cx))^2}{3e} \\ & + \frac{(d + ex)^3 (a + \operatorname{barctanh}(cx))^2}{3e} \\ & - \frac{2b(3c^2 d^2 + e^2) (a + \operatorname{barctanh}(cx)) \log\left(\frac{2}{1-cx}\right)}{3c^3} \\ & + \frac{b^2 de \log(1 - c^2 x^2)}{c^2} \\ & - \frac{b^2 (3c^2 d^2 + e^2) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{3c^3} \end{aligned}$$

output

```
2*a*b*d*e*x/c+1/3*b^2*e^2*x/c^2-1/3*b^2*e^2*arctanh(c*x)/c^3+2*b^2*d*e*x*a
rctanh(c*x)/c+1/3*b*e^2*x^2*(a+b*arctanh(c*x))/c+1/3*(3*c^2*d^2+e^2)*(a+b*
arctanh(c*x))^2/c^3-1/3*d*(d^2+3*e^2/c^2)*(a+b*arctanh(c*x))^2/e+1/3*(e*x+
d)^3*(a+b*arctanh(c*x))^2/e-2/3*b*(3*c^2*d^2+e^2)*(a+b*arctanh(c*x))*ln(2/
(-c*x+1))/c^3+b^2*d*e*ln(-c^2*x^2+1)/c^2-1/3*b^2*(3*c^2*d^2+e^2)*polylog(2
,1-2/(-c*x+1))/c^3
```

3.10.2 Mathematica [A] (verified)

Time = 0.43 (sec) , antiderivative size = 319, normalized size of antiderivative = 1.24

$$\int (d + ex)^2 (a + \operatorname{barctanh}(cx))^2 dx$$

$$= \frac{3a^2c^3d^2x + 6abc^2dex + b^2ce^2x + 3a^2c^3dex^2 + abc^2e^2x^2 + a^2c^3e^2x^3 + b^2(-1 + cx)(e^2 + ce(3d + ex)) + c^2(\dots)}{\dots}$$

input `Integrate[(d + e*x)^2*(a + b*ArcTanh[c*x])^2,x]`

output `(3*a^2*c^3*d^2*x + 6*a*b*c^2*d*e*x + b^2*c*e^2*x + 3*a^2*c^3*d*e*x^2 + a*b*c^2*e^2*x^2 + a^2*c^3*e^2*x^3 + b^2*(-1 + c*x)*(e^2 + c*e*(3*d + e*x)) + c^2*(3*d^2 + 3*d*e*x + e^2*x^2))*ArcTanh[c*x]^2 + b*ArcTanh[c*x]*(b*e*(-e + 6*c^2*d*x + c^2*e*x^2) + 2*a*c^3*x*(3*d^2 + 3*d*e*x + e^2*x^2) - 2*b*(3*c^2*d^2 + e^2)*Log[1 + E^(-2*ArcTanh[c*x])]) + 3*a*b*c*d*e*Log[1 - c*x] - 3*a*b*c*d*e*Log[1 + c*x] + 3*a*b*c^2*d^2*Log[1 - c^2*x^2] + 3*b^2*c*d*e*Log[1 - c^2*x^2] + a*b*e^2*Log[-1 + c^2*x^2] + b^2*(3*c^2*d^2 + e^2)*PolyLog[2, -E^(-2*ArcTanh[c*x])])/(3*c^3)`

3.10.3 Rubi [A] (verified)

Time = 0.61 (sec) , antiderivative size = 270, normalized size of antiderivative = 1.05, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {6480, 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.

$$\int (d + ex)^2 (a + \operatorname{barctanh}(cx))^2 dx$$

$$\downarrow \text{6480}$$

$$\frac{(d + ex)^3 (a + \operatorname{barctanh}(cx))^2}{3e} -$$

$$2bc \int \left(-\frac{x(a + \operatorname{barctanh}(cx))e^3}{c^2} - \frac{3d(a + \operatorname{barctanh}(cx))e^2}{c^2} + \frac{(d(c^2d^2 + 3e^2) + e(3c^2d^2 + e^2)x)(a + \operatorname{barctanh}(cx))}{c^2(1 - c^2x^2)} \right) dx$$

$$\downarrow \text{2009}$$

$$\frac{(d+ex)^3(a+b\operatorname{arctanh}(cx))^2}{3e} - 2bc \left(-\frac{e^3x^2(a+b\operatorname{arctanh}(cx))}{2c^2} - \frac{e(3c^2d^2+e^2)(a+b\operatorname{arctanh}(cx))^2}{2bc^4} + \frac{e(3c^2d^2+e^2)\log\left(\frac{2}{1-cx}\right)(a+b\operatorname{arctanh}(cx))}{c^4} + \frac{d(c^2d^2+3e^2)(a+b\operatorname{arctanh}(cx))}{2bc^3} \right)$$

input `Int[(d + e*x)^2*(a + b*ArcTanh[c*x])^2, x]`

output `((d + e*x)^3*(a + b*ArcTanh[c*x])^2)/(3*e) - (2*b*c*((-3*a*d*e^2*x)/c^2 - (b*e^3*x)/(2*c^3) + (b*e^3*ArcTanh[c*x])/(2*c^4) - (3*b*d*e^2*x*ArcTanh[c*x])/c^2 - (e^3*x^2*(a + b*ArcTanh[c*x]))/(2*c^2) - (e*(3*c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])^2)/(2*b*c^4) + (d*(c^2*d^2 + 3*e^2)*(a + b*ArcTanh[c*x])^2)/(2*b*c^3) + (e*(3*c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])*Log[2/(1 - c*x)])/c^4 - (3*b*d*e^2*Log[1 - c^2*x^2])/(2*c^3) + (b*e*(3*c^2*d^2 + e^2)*PolyLog[2, 1 - 2/(1 - c*x)])/(2*c^4))/(3*e)`

3.10.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6480 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^p]*((d_) + (e_.)*(x_))^(q_.), x_Symbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])^p/(e*(q + 1))), x] - Simp[b*c*(p/(e*(q + 1))) Int[ExpandIntegrand[(a + b*ArcTanh[c*x])^(p - 1), (d + e*x)^(q + 1)/(1 - c^2*x^2), x], x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 1] && IntegerQ[q] && NeQ[q, -1]`

3.10.4 Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 589 vs. $2(241) = 482$.

Time = 0.92 (sec) , antiderivative size = 590, normalized size of antiderivative = 2.30

method	result
parts	$\frac{a^2(ex+d)^3}{3e} + \frac{b^2 \left(\frac{c e^2 \operatorname{arctanh}(cx)^2 x^3}{3} + ce \operatorname{arctanh}(cx)^2 x^2 d + \operatorname{arctanh}(cx)^2 cx d^2 + \frac{c \operatorname{arctanh}(cx)^2 d^3}{3e} - \frac{2 \left(-3 \operatorname{arctanh}(cx) c^2 d e^2 \right)}{\dots} \right)}{\dots}$
derivativedivides	$\frac{a^2(ecx+cd)^3}{3e^2} + \frac{b^2 \left(\frac{\operatorname{arctanh}(cx)^2 c^3 d^3}{3e} + \operatorname{arctanh}(cx)^2 c^3 d^2 x + e \operatorname{arctanh}(cx)^2 c^3 d x^2 + \frac{e^2 \operatorname{arctanh}(cx)^2 c^3 x^3}{3} - \frac{2 \left(-3 \operatorname{arctanh}(cx) c^2 d e^2 \right)}{\dots} \right)}{\dots}$
default	$\frac{a^2(ecx+cd)^3}{3e^2} + \frac{b^2 \left(\frac{\operatorname{arctanh}(cx)^2 c^3 d^3}{3e} + \operatorname{arctanh}(cx)^2 c^3 d^2 x + e \operatorname{arctanh}(cx)^2 c^3 d x^2 + \frac{e^2 \operatorname{arctanh}(cx)^2 c^3 x^3}{3} - \frac{2 \left(-3 \operatorname{arctanh}(cx) c^2 d e^2 \right)}{\dots} \right)}{\dots}$
risch	$\frac{b^2 e^2 x}{3c^2} + a^2 d^2 x + \frac{2abdex}{c} - \frac{b \ln(-cx-1)ade}{c^2} + \left(-\frac{(ex+d)^3 b^2 \ln(-cx+1)}{6e} - \frac{b(-2a c^3 e^3 x^3 - 6a c^3 d e^2 x^2 - 6a c^3 d^2 e x - 6a c^3 d^3)}{\dots} \right)$

input `int((e*x+d)^2*(a+b*arctanh(c*x))^2,x,method=_RETURNVERBOSE)`

3.10. $\int (d + ex)^2 (a + b \operatorname{arctanh}(cx))^2 dx$

output `1/3*a^2*(e*x+d)^3/e+b^2/c*(1/3*c*e^2*arctanh(c*x)^2*x^3+c*e*arctanh(c*x)^2*x^2*d+arctanh(c*x)^2*c*x*d^2+1/3*c/e*arctanh(c*x)^2*d^3-2/3/c^2/e*(-3*arctanh(c*x)*c^2*d*e^2*x-1/2*arctanh(c*x)*e^3*c^2*x^2-1/2*arctanh(c*x)*ln(c*x-1)*c^3*d^3-3/2*e*arctanh(c*x)*ln(c*x-1)*c^2*d^2-3/2*e^2*arctanh(c*x)*ln(c*x-1)*c*d-1/2*e^3*arctanh(c*x)*ln(c*x-1)+1/2*arctanh(c*x)*ln(c*x+1)*c^3*d^3-3/2*e*arctanh(c*x)*ln(c*x+1)*c^2*d^2+3/2*e^2*arctanh(c*x)*ln(c*x+1)*c*d-1/2*e^3*arctanh(c*x)*ln(c*x+1)-1/2*(c^3*d^3+3*c^2*d^2*e+3*c*d*e^2+e^3)*(-1/2*dilog(1/2*c*x+1/2)-1/2*ln(c*x-1)*ln(1/2*c*x+1/2)+1/4*ln(c*x-1)^2)-1/2*e^2*(e*c*x+1/2*(6*c*d+e)*ln(c*x-1)-1/2*(-6*c*d+e)*ln(c*x+1))-1/2*(-c^3*d^3+3*c^2*d^2*e-3*c*d*e^2+e^3)*(1/2*(ln(c*x+1)-ln(1/2*c*x+1/2))*ln(-1/2*c*x+1/2)-1/2*dilog(1/2*c*x+1/2)-1/4*ln(c*x+1)^2)))+2*a*b/c*(1/3*c*e^2*arctanh(c*x)*x^3+c*e*arctanh(c*x)*x^2*d+arctanh(c*x)*c*x*d^2+1/3*c/e*arctanh(c*x)*d^3-1/3/c^2/e*(-3*c^2*x*d*e^2-1/2*c^2*x^2*e^3-1/2*(c^3*d^3+3*c^2*d^2*e+3*c*d*e^2+e^3)*ln(c*x-1)+1/2*(c^3*d^3-3*c^2*d^2*e+3*c*d*e^2-e^3)*ln(c*x+1)))`

3.10.5 Fricas [F]

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx))^2 dx = \int (ex + d)^2 (b \operatorname{artanh}(cx) + a)^2 dx$$

input `integrate((e*x+d)^2*(a+b*arctanh(c*x))^2,x, algorithm="fricas")`

output `integral(a^2*e^2*x^2 + 2*a^2*d*e*x + a^2*d^2 + (b^2*e^2*x^2 + 2*b^2*d*e*x + b^2*d^2)*arctanh(c*x)^2 + 2*(a*b*e^2*x^2 + 2*a*b*d*e*x + a*b*d^2)*arctanh(c*x), x)`

3.10.6 Sympy [F]

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx))^2 dx = \int (a + b \operatorname{atanh}(cx))^2 (d + ex)^2 dx$$

input `integrate((e*x+d)**2*(a+b*atanh(c*x))**2,x)`

output `Integral((a + b*atanh(c*x))**2*(d + e*x)**2, x)`

3.10.7 Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 524 vs. $2(238) = 476$.

Time = 0.35 (sec) , antiderivative size = 524, normalized size of antiderivative = 2.04

$$\int (d + ex)^2 (a + \operatorname{barctanh}(cx))^2 dx$$

$$= \frac{1}{3} a^2 e^2 x^3 + a^2 d e x^2 + \left(2 x^2 \operatorname{artanh}(cx) + c \left(\frac{2x}{c^2} - \frac{\log(cx+1)}{c^3} + \frac{\log(cx-1)}{c^3} \right) \right) abde$$

$$+ \frac{1}{3} \left(2 x^3 \operatorname{artanh}(cx) + c \left(\frac{x^2}{c^2} + \frac{\log(c^2 x^2 - 1)}{c^4} \right) \right) abe^2$$

$$+ a^2 d^2 x + \frac{(2cx \operatorname{artanh}(cx) + \log(-c^2 x^2 + 1)) ab d^2}{c}$$

$$+ \frac{(3c^2 d^2 + e^2) (\log(cx+1) \log(-\frac{1}{2}cx + \frac{1}{2}) + \operatorname{Li}_2(\frac{1}{2}cx + \frac{1}{2})) b^2}{3c^3}$$

$$+ \frac{(6cde - e^2) b^2 \log(cx+1)}{6c^3} + \frac{(6cde + e^2) b^2 \log(cx-1)}{6c^3}$$

$$+ \frac{4b^2 c e^2 x + (b^2 c^3 e^2 x^3 + 3b^2 c^3 d e x^2 + 3b^2 c^3 d^2 x + (3c^2 d^2 - 3cde + e^2) b^2) \log(cx+1)^2 + (b^2 c^3 e^2 x^3 + 3b^2 c^3 d e x^2 + 3b^2 c^3 d^2 x + (3c^2 d^2 - 3cde + e^2) b^2) \log(cx-1)^2}{6c^3}$$

input `integrate((e*x+d)^2*(a+b*arctanh(c*x))^2,x, algorithm="maxima")`

output `1/3*a^2*e^2*x^3 + a^2*d*e*x^2 + (2*x^2*arctanh(c*x) + c*(2*x/c^2 - log(c*x + 1)/c^3 + log(c*x - 1)/c^3))*a*b*d*e + 1/3*(2*x^3*arctanh(c*x) + c*(x^2/c^2 + log(c^2*x^2 - 1)/c^4))*a*b*e^2 + a^2*d^2*x + (2*c*x*arctanh(c*x) + log(-c^2*x^2 + 1))*a*b*d^2/c + 1/3*(3*c^2*d^2 + e^2)*(log(c*x + 1)*log(-1/2*c*x + 1/2) + dilog(1/2*c*x + 1/2))*b^2/c^3 + 1/6*(6*c*d*e - e^2)*b^2*log(c*x + 1)/c^3 + 1/6*(6*c*d*e + e^2)*b^2*log(c*x - 1)/c^3 + 1/12*(4*b^2*c*e^2*x + (b^2*c^3*e^2*x^3 + 3*b^2*c^3*d*e*x^2 + 3*b^2*c^3*d^2*x + (3*c^2*d^2 - 3*c*d*e + e^2)*b^2)*log(c*x + 1)^2 + (b^2*c^3*e^2*x^3 + 3*b^2*c^3*d*e*x^2 + 3*b^2*c^3*d^2*x - (3*c^2*d^2 + 3*c*d*e + e^2)*b^2)*log(-c*x + 1)^2 + 2*(b^2*c^2*e^2*x^2 + 6*b^2*c^2*d*e*x)*log(c*x + 1) - 2*(b^2*c^2*e^2*x^2 + 6*b^2*c^2*d*e*x + (b^2*c^3*e^2*x^3 + 3*b^2*c^3*d*e*x^2 + 3*b^2*c^3*d^2*x + (3*c^2*d^2 - 3*c*d*e + e^2)*b^2)*log(c*x + 1))*log(-c*x + 1)/c^3`

3.10.8 Giac [F]

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx))^2 dx = \int (ex + d)^2 (b \operatorname{artanh}(cx) + a)^2 dx$$

input `integrate((e*x+d)^2*(a+b*arctanh(c*x))^2,x, algorithm="giac")`

output `integrate((e*x + d)^2*(b*arctanh(c*x) + a)^2, x)`

3.10.9 Mupad [F(-1)]

Timed out.

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx))^2 dx = \int (a + b \operatorname{atanh}(cx))^2 (d + ex)^2 dx$$

input `int((a + b*atanh(c*x))^2*(d + e*x)^2,x)`

output `int((a + b*atanh(c*x))^2*(d + e*x)^2, x)`

3.11 $\int (d + ex)(a + b \operatorname{arctanh}(cx))^2 dx$

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3.11.1 Optimal result

Integrand size = 16, antiderivative size = 160

$$\int (d + ex)(a + b \operatorname{arctanh}(cx))^2 dx = \frac{abex}{c} + \frac{b^2 ex \operatorname{arctanh}(cx)}{c} + \frac{d(a + b \operatorname{arctanh}(cx))^2}{c} - \frac{\left(d^2 + \frac{e^2}{c^2}\right) (a + b \operatorname{arctanh}(cx))^2}{2e} + \frac{(d + ex)^2 (a + b \operatorname{arctanh}(cx))^2}{2e} - \frac{2bd(a + b \operatorname{arctanh}(cx)) \log\left(\frac{2}{1-cx}\right)}{c} + \frac{b^2 e \log(1 - c^2 x^2)}{2c^2} - \frac{b^2 d \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{c}$$

```
output a*b*e*x/c+b^2*e*x*arctanh(c*x)/c+d*(a+b*arctanh(c*x))^2/c-1/2*(d^2+e^2/c^2)*(a+b*arctanh(c*x))^2/e+1/2*(e*x+d)^2*(a+b*arctanh(c*x))^2/e-2*b*d*(a+b*arctanh(c*x))*ln(2/(-c*x+1))/c+1/2*b^2*e*ln(-c^2*x^2+1)/c^2-b^2*d*polylog(2,1-2/(-c*x+1))/c
```

3.11.2 Mathematica [A] (verified)

Time = 0.38 (sec) , antiderivative size = 174, normalized size of antiderivative = 1.09

$$\int (d + ex)(a + \operatorname{arctanh}(cx))^2 dx$$

$$= \frac{2a^2c^2dx + 2abcecx + a^2c^2ex^2 + b^2(-1 + cx)(2cd + e + cex)\operatorname{arctanh}(cx)^2 + 2bc\operatorname{arctanh}(cx)(bex + acx(2d + ex))}{e}$$

input `Integrate[(d + e*x)*(a + b*ArcTanh[c*x])^2,x]`

output $(2a^2c^2dx + 2a*b*c*e*x + a^2c^2e*x^2 + b^2*(-1 + c*x)*(2*c*d + e + c*e*x)*\operatorname{ArcTanh}[c*x]^2 + 2*b*c*\operatorname{ArcTanh}[c*x]*(b*e*x + a*c*x*(2*d + e*x) - 2*b*d*\log[1 + E^(-2*\operatorname{ArcTanh}[c*x])]) + a*b*e*\log[1 - c*x] - a*b*e*\log[1 + c*x] + 2*a*b*c*d*\log[1 - c^2*x^2] + b^2*e*\log[1 - c^2*x^2] + 2*b^2*c*d*\operatorname{PolyLog}[2, -E^(-2*\operatorname{ArcTanh}[c*x])])/ (2*c^2)$

3.11.3 Rubi [A] (verified)

Time = 0.51 (sec) , antiderivative size = 177, normalized size of antiderivative = 1.11, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.125$, Rules used = {6480, 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.

$$\int (d + ex)(a + \operatorname{arctanh}(cx))^2 dx$$

$$\downarrow 6480$$

$$\frac{(d + ex)^2(a + \operatorname{arctanh}(cx))^2}{2e} - \frac{bc \int \left(\frac{(d^2c^2 + 2dexc^2 + e^2)(a + \operatorname{arctanh}(cx))}{c^2(1 - c^2x^2)} - \frac{e^2(a + \operatorname{arctanh}(cx))}{c^2} \right) dx}{e}$$

$$\downarrow 2009$$

$$\frac{(d + ex)^2(a + \operatorname{arctanh}(cx))^2}{2e} - \frac{bc \left(-\frac{de(a + \operatorname{arctanh}(cx))^2}{bc^2} + \frac{2de \log\left(\frac{2}{1 - cx}\right)(a + \operatorname{arctanh}(cx))}{c^2} + \frac{(c^2d^2 + e^2)(a + \operatorname{arctanh}(cx))^2}{2bc^3} - \frac{ae^2x}{c^2} - \frac{be^2x \operatorname{arctanh}(cx)}{c^2} + \frac{bc}{e} \right)}{e}$$

3.11. $\int (d + ex)(a + \operatorname{arctanh}(cx))^2 dx$

input `Int[(d + e*x)*(a + b*ArcTanh[c*x])^2,x]`

output $((d + e*x)^2*(a + b*ArcTanh[c*x])^2)/(2*e) - (b*c*(-((a*e^2*x)/c^2) - (b*e^2*x*ArcTanh[c*x])/c^2 - (d*e*(a + b*ArcTanh[c*x])^2)/(b*c^2) + ((c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])^2)/(2*b*c^3) + (2*d*e*(a + b*ArcTanh[c*x])*Log[2/(1 - c*x)])/c^2 - (b*e^2*Log[1 - c^2*x^2])/(2*c^3) + (b*d*e*PolyLog[2, 1 - 2/(1 - c*x)])/c^2)/e$

3.11.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6480 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.)^p)*((d_) + (e_.)*(x_))^(q_.), x_Symbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])^p/(e*(q + 1))), x] - Simp[b*c*(p/(e*(q + 1))) Int[ExpandIntegrand[(a + b*ArcTanh[c*x])^(p - 1), (d + e*x)^(q + 1)/(1 - c^2*x^2), x], x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 1] && IntegerQ[q] && NeQ[q, -1]`

3.11.4 Maple [A] (verified)

Time = 0.26 (sec) , antiderivative size = 298, normalized size of antiderivative = 1.86

method	result
parts	$a^2 \left(\frac{1}{2} e x^2 + dx \right) + \frac{b^2 \left(\frac{c \operatorname{arctanh}(cx)^2 x^2 e + \operatorname{arctanh}(cx)^2 c x d - c \operatorname{arctanh}(cx) x e - \operatorname{arctanh}(cx) \ln(cx-1) c d - \frac{\operatorname{arctanh}(cx) \ln(cx-1)}{2}}{2} \right)}{c}$
derivativedivides	$\frac{a^2 \left(d c^2 x + \frac{1}{2} c^2 e x^2 \right)}{c} + \frac{b^2 \left(\operatorname{arctanh}(cx)^2 d c^2 x + \frac{\operatorname{arctanh}(cx)^2 e c^2 x^2}{2} + c \operatorname{arctanh}(cx) x e + \operatorname{arctanh}(cx) \ln(cx-1) c d + \frac{\operatorname{arctanh}(cx) \ln(cx-1)}{2} \right)}{c}$
default	$\frac{a^2 \left(d c^2 x + \frac{1}{2} c^2 e x^2 \right)}{c} + \frac{b^2 \left(\operatorname{arctanh}(cx)^2 d c^2 x + \frac{\operatorname{arctanh}(cx)^2 e c^2 x^2}{2} + c \operatorname{arctanh}(cx) x e + \operatorname{arctanh}(cx) \ln(cx-1) c d + \frac{\operatorname{arctanh}(cx) \ln(cx-1)}{2} \right)}{c}$
risch	$\frac{abex}{c} + a^2 dx + \frac{b \ln(-cx-1) ad}{c} - \frac{b \ln(-cx-1) ae}{2c^2} - \frac{b^2 e \ln(-cx+1) x}{2c} + \frac{bae \ln(-cx+1)}{2c^2} + \frac{\ln(-cx+1) abd}{c} - 1$

3.11. $\int (d + ex)(a + b \operatorname{arctanh}(cx))^2 dx$

input `int((e*x+d)*(a+b*arctanh(c*x))^2,x,method=_RETURNVERBOSE)`

output `a^2*(1/2*e*x^2+d*x)+b^2/c*(1/2*c*arctanh(c*x)^2*x^2*e+arctanh(c*x)^2*c*x*d-1/c*(-c*arctanh(c*x)*x*e-arctanh(c*x)*ln(c*x-1)*c*d-1/2*arctanh(c*x)*ln(c*x-1)*e-arctanh(c*x)*ln(c*x+1)*c*d+1/2*arctanh(c*x)*ln(c*x+1)*e-1/2*(2*c*d-e)*(1/2*(ln(c*x+1)-ln(1/2*c*x+1/2))*ln(-1/2*c*x+1/2)-1/2*dilog(1/2*c*x+1/2)-1/4*ln(c*x+1)^2)-1/2*(2*c*d+e)*(-1/2*dilog(1/2*c*x+1/2)-1/2*ln(c*x-1)*ln(1/2*c*x+1/2)+1/4*ln(c*x-1)^2)-1/2*ln(c*x-1)*e-1/2*ln(c*x+1)*e))+2*a*b/c*(1/2*c*arctanh(c*x)*x^2*e+arctanh(c*x)*c*x*d-1/2/c*(-e*c*x-1/2*(2*c*d+e)*ln(c*x-1)+1/2*(-2*c*d+e)*ln(c*x+1)))`

3.11.5 Fricas [F]

$$\int (d + ex)(a + b \operatorname{arctanh}(cx))^2 dx = \int (ex + d)(b \operatorname{artanh}(cx) + a)^2 dx$$

input `integrate((e*x+d)*(a+b*arctanh(c*x))^2,x, algorithm="fricas")`

output `integral(a^2*e*x + a^2*d + (b^2*e*x + b^2*d)*arctanh(c*x)^2 + 2*(a*b*e*x + a*b*d)*arctanh(c*x), x)`

3.11.6 Sympy [F]

$$\int (d + ex)(a + b \operatorname{arctanh}(cx))^2 dx = \int (a + b \operatorname{atanh}(cx))^2 (d + ex) dx$$

input `integrate((e*x+d)*(a+b*atanh(c*x))**2,x)`

output `Integral((a + b*atanh(c*x))**2*(d + e*x), x)`

3.11.7 Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 313 vs. $2(151) = 302$.

Time = 0.35 (sec) , antiderivative size = 313, normalized size of antiderivative = 1.96

$$\int (d + ex)(a + \operatorname{arctanh}(cx))^2 dx$$

$$= \frac{1}{2} a^2 ex^2 + \frac{1}{2} \left(2x^2 \operatorname{artanh}(cx) + c \left(\frac{2x}{c^2} - \frac{\log(cx+1)}{c^3} + \frac{\log(cx-1)}{c^3} \right) \right) abe$$

$$+ a^2 dx + \frac{(2cx \operatorname{artanh}(cx) + \log(-c^2x^2 + 1))abd}{c}$$

$$+ \frac{(\log(cx+1) \log(-\frac{1}{2}cx + \frac{1}{2}) + \operatorname{Li}_2(\frac{1}{2}cx + \frac{1}{2}))b^2d}{c} + \frac{b^2e \log(cx+1)}{2c^2} + \frac{b^2e \log(cx-1)}{2c^2}$$

$$+ \frac{4b^2cex \log(cx+1) + (b^2c^2ex^2 + 2b^2c^2dx + (2cd - e)b^2) \log(cx+1)^2 + (b^2c^2ex^2 + 2b^2c^2dx - (2cd + e)b^2) \log(cx-1)^2}{8c^2}$$

input `integrate((e*x+d)*(a+b*arctanh(c*x))^2,x, algorithm="maxima")`

output `1/2*a^2*e*x^2 + 1/2*(2*x^2*arctanh(c*x) + c*(2*x/c^2 - log(c*x + 1)/c^3 + log(c*x - 1)/c^3))*a*b*e + a^2*d*x + (2*c*x*arctanh(c*x) + log(-c^2*x^2 + 1))*a*b*d/c + (log(c*x + 1)*log(-1/2*c*x + 1/2) + dilog(1/2*c*x + 1/2))*b^2*d/c + 1/2*b^2*e*log(c*x + 1)/c^2 + 1/2*b^2*e*log(c*x - 1)/c^2 + 1/8*(4*b^2*c*e*x*log(c*x + 1) + (b^2*c^2*e*x^2 + 2*b^2*c^2*d*x + (2*c*d - e)*b^2)*log(c*x + 1)^2 + (b^2*c^2*e*x^2 + 2*b^2*c^2*d*x - (2*c*d + e)*b^2)*log(-c*x + 1)^2 - 2*(2*b^2*c*e*x + (b^2*c^2*e*x^2 + 2*b^2*c^2*d*x + (2*c*d - e)*b^2)*log(c*x + 1))*log(-c*x + 1))/c^2`

3.11.8 Giac [F]

$$\int (d + ex)(a + \operatorname{arctanh}(cx))^2 dx = \int (ex + d)(b \operatorname{artanh}(cx) + a)^2 dx$$

input `integrate((e*x+d)*(a+b*arctanh(c*x))^2,x, algorithm="giac")`

output `integrate((e*x + d)*(b*arctanh(c*x) + a)^2, x)`

3.11.9 Mupad [F(-1)]

Timed out.

$$\int (d + ex)(a + b \operatorname{arctanh}(cx))^2 dx = \int (a + b \operatorname{atanh}(cx))^2 (d + ex) dx$$

input `int((a + b*atanh(c*x))^2*(d + e*x),x)`output `int((a + b*atanh(c*x))^2*(d + e*x), x)`

3.12 $\int \frac{(a+b\operatorname{arctanh}(cx))^2}{d+ex} dx$

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3.12.1 Optimal result

Integrand size = 18, antiderivative size = 188

$$\int \frac{(a + b\operatorname{arctanh}(cx))^2}{d + ex} dx = -\frac{(a + b\operatorname{arctanh}(cx))^2 \log\left(\frac{2}{1+cx}\right)}{e} + \frac{(a + b\operatorname{arctanh}(cx))^2 \log\left(\frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{e} + \frac{b(a + b\operatorname{arctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{e} - \frac{b(a + b\operatorname{arctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{e} + \frac{b^2 \operatorname{PolyLog}\left(3, 1 - \frac{2}{1+cx}\right)}{2e} - \frac{b^2 \operatorname{PolyLog}\left(3, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{2e}$$

output `-(a+b*arctanh(c*x))^2*ln(2/(c*x+1))/e+(a+b*arctanh(c*x))^2*ln(2*c*(e*x+d)/(c*d+e)/(c*x+1))/e+b*(a+b*arctanh(c*x))*polylog(2,1-2/(c*x+1))/e-b*(a+b*arctanh(c*x))*polylog(2,1-2*c*(e*x+d)/(c*d+e)/(c*x+1))/e+1/2*b^2*polylog(3,1-2/(c*x+1))/e-1/2*b^2*polylog(3,1-2*c*(e*x+d)/(c*d+e)/(c*x+1))/e`

3.12.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 10.32 (sec) , antiderivative size = 1055, normalized size of antiderivative = 5.61

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{d + ex} dx = \text{Too large to display}$$

input `Integrate[(a + b*ArcTanh[c*x])^2/(d + e*x),x]`

output

```
(6*a^2*Log[d + e*x] + 6*a*b*ArcTanh[c*x]*(Log[1 - c^2*x^2] + 2*Log[I*Sinh[
ArcTanh[(c*d)/e] + ArcTanh[c*x]]]) - (6*I)*a*b*((-1/4*I)*(Pi - (2*I)*ArcTan
h[c*x])^2 + I*(ArcTanh[(c*d)/e] + ArcTanh[c*x])^2 + (Pi - (2*I)*ArcTanh[c
*x])*Log[1 + E^(2*ArcTanh[c*x])] + (2*I)*(ArcTanh[(c*d)/e] + ArcTanh[c*x])
*Log[1 - E^(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x]))] - (Pi - (2*I)*ArcTanh[c
*x])*Log[2/Sqrt[1 - c^2*x^2]] - (2*I)*(ArcTanh[(c*d)/e] + ArcTanh[c*x])*Lo
g[(2*I)*Sinh[ArcTanh[(c*d)/e] + ArcTanh[c*x]]] - I*PolyLog[2, -E^(2*ArcTan
h[c*x])] - I*PolyLog[2, E^(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x]))]) + (b^2*
(-8*c*d*ArcTanh[c*x]^3 + 4*e*ArcTanh[c*x]^3 - (4*Sqrt[1 - (c^2*d^2)/e^2]*e
*ArcTanh[c*x]^3)/E^ArcTanh[(c*d)/e] - 6*c*d*ArcTanh[c*x]^2*Log[1 + E^(-2*A
rcTanh[c*x])] - (6*I)*c*d*Pi*ArcTanh[c*x]*Log[(E^(-ArcTanh[c*x]) + E^ArcTan
h[c*x])/2] - 6*c*d*ArcTanh[c*x]^2*Log[1 - (Sqrt[c*d + e]*E^ArcTanh[c*x])/
Sqrt[-(c*d) + e]] - 6*c*d*ArcTanh[c*x]^2*Log[1 + (Sqrt[c*d + e]*E^ArcTanh[
c*x])/Sqrt[-(c*d) + e]] + 6*c*d*ArcTanh[c*x]^2*Log[1 - E^(ArcTanh[(c*d)/e]
+ ArcTanh[c*x])] + 6*c*d*ArcTanh[c*x]^2*Log[1 + E^(ArcTanh[(c*d)/e] + Arc
Tanh[c*x])] + 6*c*d*ArcTanh[c*x]^2*Log[1 - E^(2*(ArcTanh[(c*d)/e] + ArcTan
h[c*x]))] + 12*c*d*ArcTanh[(c*d)/e]*ArcTanh[c*x]*Log[(I/2)*E^(-ArcTanh[(c*
d)/e] - ArcTanh[c*x])*(-1 + E^(2*(ArcTanh[(c*d)/e] + ArcTanh[c*x]))]) + 6*
c*d*ArcTanh[c*x]^2*Log[(e*(-1 + E^(2*ArcTanh[c*x])) + c*d*(1 + E^(2*ArcTan
h[c*x])))/(2*E^ArcTanh[c*x])] - 6*c*d*ArcTanh[c*x]^2*Log[(c*(d + e*x))/...
```

3.12.3 Rubi [A] (verified)

Time = 0.31 (sec) , antiderivative size = 188, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.056$, Rules used = {6474}

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.

3.12. $\int \frac{(a + b \operatorname{arctanh}(cx))^2}{d + ex} dx$

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{d + ex} dx$$

↓ 6474

$$\frac{b(a + b \operatorname{arctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(cx+1)}\right)}{e} + \frac{(a + b \operatorname{arctanh}(cx))^2 \log\left(\frac{2c(d+ex)}{(cx+1)(cd+e)}\right)}{e} +$$

$$\frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{cx+1}\right) (a + b \operatorname{arctanh}(cx))}{e} - \frac{\log\left(\frac{2}{cx+1}\right) (a + b \operatorname{arctanh}(cx))^2}{e} -$$

$$\frac{b^2 \operatorname{PolyLog}\left(3, 1 - \frac{2c(d+ex)}{(cd+e)(cx+1)}\right)}{2e} + \frac{b^2 \operatorname{PolyLog}\left(3, 1 - \frac{2}{cx+1}\right)}{2e}$$

input `Int[(a + b*ArcTanh[c*x])^2/(d + e*x), x]`

output `-((a + b*ArcTanh[c*x])^2*Log[2/(1 + c*x)]/e) + ((a + b*ArcTanh[c*x])^2*Log[(2*c*(d + e*x))/((c*d + e)*(1 + c*x))]/e) + (b*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - 2/(1 + c*x)]/e) - (b*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - (2*c*(d + e*x))/((c*d + e)*(1 + c*x))]/e) + (b^2*PolyLog[3, 1 - 2/(1 + c*x)]/(2*e)) - (b^2*PolyLog[3, 1 - (2*c*(d + e*x))/((c*d + e)*(1 + c*x))]/(2*e))`

3.12.3.1 Defintions of rubi rules used

rule 6474 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.)^2/((d_) + (e_.)*(x_)), x_Symbol] := Simp[(-(a + b*ArcTanh[c*x])^2)*(Log[2/(1 + c*x)]/e), x] + (Simp[(a + b*ArcTanh[c*x])^2*(Log[2*c*((d + e*x))/((c*d + e)*(1 + c*x))]/e), x] + Simp[b*(a + b*ArcTanh[c*x])*(PolyLog[2, 1 - 2/(1 + c*x)]/e), x] - Simp[b*(a + b*ArcTanh[c*x])*(PolyLog[2, 1 - 2*c*((d + e*x))/((c*d + e)*(1 + c*x))]/e), x] + Simp[b^2*(PolyLog[3, 1 - 2/(1 + c*x)]/(2*e)), x] - Simp[b^2*(PolyLog[3, 1 - 2*c*((d + e*x))/((c*d + e)*(1 + c*x))]/(2*e)), x]) /; FreeQ[{a, b, c, d, e}, x] && NeQ[c^2*d^2 - e^2, 0]`

3.12.4 Maple [C] (warning: unable to verify)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 35.05 (sec) , antiderivative size = 1087, normalized size of antiderivative = 5.78

method	result	size
derivativedivides	Expression too large to display	1087
default	Expression too large to display	1087
parts	Expression too large to display	1090

```
input int((a+b*arctanh(c*x))^2/(e*x+d), x, method=_RETURNVERBOSE)
```

```
output 1/c*(a^2*c*ln(c*e*x+c*d)/e+b^2*c*(ln(c*e*x+c*d)/e*arctanh(c*x)^2-2/e*(1/2*
arctanh(c*x)^2*ln(d*c*(1+(c*x+1)^2/(-c^2*x^2+1))+e*((c*x+1)^2/(-c^2*x^2+1)
-1))-1/4*I*Pi*csgn(I*(d*c*(1-(c*x+1)^2/(c^2*x^2-1))+e*(-(c*x+1)^2/(c^2*x^2
-1)-1))/(1-(c*x+1)^2/(c^2*x^2-1)))*(csgn(I*(d*c*(1-(c*x+1)^2/(c^2*x^2-1))+
e*(-(c*x+1)^2/(c^2*x^2-1)-1)))*csgn(I/(1-(c*x+1)^2/(c^2*x^2-1)))-csgn(I*(d
*c*(1-(c*x+1)^2/(c^2*x^2-1))+e*(-(c*x+1)^2/(c^2*x^2-1)-1))/(1-(c*x+1)^2/(c
^2*x^2-1)))*csgn(I/(1-(c*x+1)^2/(c^2*x^2-1)))-csgn(I*(d*c*(1-(c*x+1)^2/(c^
2*x^2-1))+e*(-(c*x+1)^2/(c^2*x^2-1)-1)))*csgn(I*(d*c*(1-(c*x+1)^2/(c^2*x^2
-1))+e*(-(c*x+1)^2/(c^2*x^2-1)-1))/(1-(c*x+1)^2/(c^2*x^2-1)))+csgn(I*(d*c*
(1-(c*x+1)^2/(c^2*x^2-1))+e*(-(c*x+1)^2/(c^2*x^2-1)-1))/(1-(c*x+1)^2/(c^2*
x^2-1)))^2)*arctanh(c*x)^2+1/2*arctanh(c*x)*polylog(2, -(c*x+1)^2/(-c^2*x^2
+1))-1/4*polylog(3, -(c*x+1)^2/(-c^2*x^2+1))-1/2*e/(c*d+e)*arctanh(c*x)^2*ln
(1-(c*d+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))-1/2*e/(c*d+e)*arctanh(c*x)*po
lylog(2, (c*d+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))+1/4*e/(c*d+e)*polylog(3, (
c*d+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))-1/2*d*c/(c*d+e)*arctanh(c*x)^2*ln(
1-(c*d+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))-1/2*d*c/(c*d+e)*arctanh(c*x)*po
lylog(2, (c*d+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))+1/4*d*c/(c*d+e)*polylog(3
, (c*d+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))))+2*a*b*c*(ln(c*e*x+c*d)/e*arcta
nh(c*x)-1/e^2*(1/2*e*(dilog((c*e*x+e)/(-c*d+e))+ln(c*e*x+c*d)*ln((c*e*x+e)
/(-c*d+e)))-1/2*e*(dilog((c*e*x-e)/(-c*d-e))+ln(c*e*x+c*d)*ln((c*e*x-e)...

```

3.12.5 Fricas [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{d + ex} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^2}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x))^2/(e*x+d),x, algorithm="fricas")`

output `integral((b^2*arctanh(c*x)^2 + 2*a*b*arctanh(c*x) + a^2)/(e*x + d), x)`

3.12.6 Sympy [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{d + ex} dx = \int \frac{(a + b \operatorname{atanh}(cx))^2}{d + ex} dx$$

input `integrate((a+b*atanh(c*x))**2/(e*x+d),x)`

output `Integral((a + b*atanh(c*x))**2/(d + e*x), x)`

3.12.7 Maxima [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{d + ex} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^2}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x))^2/(e*x+d),x, algorithm="maxima")`

output `a^2*log(e*x + d)/e + integrate(1/4*b^2*(log(c*x + 1) - log(-c*x + 1))^2/(e*x + d) + a*b*(log(c*x + 1) - log(-c*x + 1))/(e*x + d), x)`

3.12.8 Giac [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{d + ex} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^2}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x))^2/(e*x+d),x, algorithm="giac")`

output `integrate((b*arctanh(c*x) + a)^2/(e*x + d), x)`

3.12.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{d + ex} dx = \int \frac{(a + b \operatorname{atanh}(cx))^2}{d + ex} dx$$

input `int((a + b*atanh(c*x))^2/(d + e*x),x)`

output `int((a + b*atanh(c*x))^2/(d + e*x), x)`

3.13 $\int \frac{(a+b\operatorname{arctanh}(cx))^2}{(d+ex)^2} dx$

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3.13.1 Optimal result

Integrand size = 18, antiderivative size = 321

$$\int \frac{(a + b\operatorname{arctanh}(cx))^2}{(d + ex)^2} dx = -\frac{(a + b\operatorname{arctanh}(cx))^2}{e(d + ex)} + \frac{bc(a + b\operatorname{arctanh}(cx)) \log\left(\frac{2}{1-cx}\right)}{e(cd + e)}$$

$$- \frac{bc(a + b\operatorname{arctanh}(cx)) \log\left(\frac{2}{1+cx}\right)}{(cd - e)e}$$

$$+ \frac{2bc(a + b\operatorname{arctanh}(cx)) \log\left(\frac{2}{1+cx}\right)}{c^2d^2 - e^2}$$

$$- \frac{2bc(a + b\operatorname{arctanh}(cx)) \log\left(\frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{c^2d^2 - e^2}$$

$$+ \frac{b^2c \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{2e(cd + e)} + \frac{b^2c \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{2(cd - e)e}$$

$$- \frac{b^2c \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{c^2d^2 - e^2} + \frac{b^2c \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{c^2d^2 - e^2}$$

output

```

-(a+b*arctanh(c*x))^2/e/(e*x+d)+b*c*(a+b*arctanh(c*x))*ln(2/(-c*x+1))/e/(c
*d+e)-b*c*(a+b*arctanh(c*x))*ln(2/(c*x+1))/(c*d-e)/e+2*b*c*(a+b*arctanh(c*
x))*ln(2/(c*x+1))/(c^2*d^2-e^2)-2*b*c*(a+b*arctanh(c*x))*ln(2*c*(e*x+d)/(c
*d+e)/(c*x+1))/(c^2*d^2-e^2)+1/2*b^2*c*polylog(2,1-2/(-c*x+1))/e/(c*d+e)+1
/2*b^2*c*polylog(2,1-2/(c*x+1))/(c*d-e)/e-b^2*c*polylog(2,1-2/(c*x+1))/(c^
2*d^2-e^2)+b^2*c*polylog(2,1-2*c*(e*x+d)/(c*d+e)/(c*x+1))/(c^2*d^2-e^2)
    
```

3.13.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 3.27 (sec) , antiderivative size = 317, normalized size of antiderivative = 0.99

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^2} dx$$

$$= -\frac{a^2}{e(d + ex)} + \frac{abc \left(-\frac{2 \operatorname{arctanh}(cx)}{cd + cex} + \frac{(-cd + e) \log(1 - cx) + (cd + e) \log(1 + cx) - 2e \log(c(d + ex))}{(cd - e)(cd + e)} \right)}{e}$$

$$+ \frac{b^2 \left(-\frac{e^{-\operatorname{arctanh}\left(\frac{cd}{e}\right)} \operatorname{arctanh}(cx)^2}{\sqrt{1 - \frac{c^2 d^2}{e^2}}} + \frac{x \operatorname{arctanh}(cx)^2}{d + ex} + \frac{cd \left(i\pi \log\left(1 + e^{2 \operatorname{arctanh}(cx)}\right) - 2 \operatorname{arctanh}(cx) \log\left(1 - e^{-2 \operatorname{arctanh}\left(\frac{cd}{e}\right)}\right) \right)}{\dots} \right)}{\dots}$$

input `Integrate[(a + b*ArcTanh[c*x])^2/(d + e*x)^2,x]`

output `-(a^2/(e*(d + e*x))) + (a*b*c*((-2*ArcTanh[c*x])/(c*d + c*e*x) + ((-(c*d) + e)*Log[1 - c*x] + (c*d + e)*Log[1 + c*x] - 2*e*Log[c*(d + e*x)])/(c*d - e)*(c*d + e)))/e + (b^2*(-(ArcTanh[c*x]^2/(Sqrt[1 - (c^2*d^2)/e^2])*E^ArcTanh[(c*d)/e]) + (x*ArcTanh[c*x]^2)/(d + e*x) + (c*d*(I*Pi*Log[1 + E^(2*ArcTanh[c*x])] - 2*ArcTanh[c*x]*Log[1 - E^(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])]) - I*Pi*(ArcTanh[c*x] - Log[1 - c^2*x^2]/2) - 2*ArcTanh[(c*d)/e]*(ArcTanh[c*x] + Log[1 - E^(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])]) - Log[I*Sinh[ArcTanh[(c*d)/e] + ArcTanh[c*x]])] + PolyLog[2, E^(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])])))/(c^2*d^2 - e^2))/d`

3.13.3 Rubi [A] (verified)

Time = 0.62 (sec) , antiderivative size = 310, normalized size of antiderivative = 0.97, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {6480, 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.

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^2} dx$$

↓ 6480

3.13. $\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^2} dx$

$$\frac{2bc \int \left(-\frac{(a+\operatorname{barctanh}(cx))e^2}{(cd-e)(cd+e)(d+ex)} + \frac{c(a+\operatorname{barctanh}(cx))}{2(cd+e)(1-cx)} + \frac{c(a+\operatorname{barctanh}(cx))}{2(cd-e)(cx+1)} \right) dx - \frac{(a + \operatorname{barctanh}(cx))^2}{e(d + ex)}}{e}$$

↓ 2009

$$\frac{2bc \left(\frac{e \log\left(\frac{2}{cx+1}\right)(a+\operatorname{barctanh}(cx))}{c^2d^2-e^2} - \frac{e(a+\operatorname{barctanh}(cx)) \log\left(\frac{2c(d+ex)}{(cx+1)(cd+e)}\right)}{c^2d^2-e^2} + \frac{\log\left(\frac{2}{1-cx}\right)(a+\operatorname{barctanh}(cx))}{2(cd+e)} - \frac{\log\left(\frac{2}{cx+1}\right)(a+\operatorname{barctanh}(cx))}{2(cd-e)} \right) - \frac{(a + \operatorname{barctanh}(cx))^2}{e(d + ex)}}{e}$$

input `Int[(a + b*ArcTanh[c*x])^2/(d + e*x)^2,x]`

output `-((a + b*ArcTanh[c*x])^2/(e*(d + e*x))) + (2*b*c*((a + b*ArcTanh[c*x])*Log[2/(1 - c*x)])/(2*(c*d + e)) - ((a + b*ArcTanh[c*x])*Log[2/(1 + c*x)])/(2*(c*d - e)) + (e*(a + b*ArcTanh[c*x])*Log[2/(1 + c*x)])/(c^2*d^2 - e^2) - (e*(a + b*ArcTanh[c*x])*Log[(2*c*(d + e*x))/((c*d + e)*(1 + c*x))])/(c^2*d^2 - e^2) + (b*PolyLog[2, 1 - 2/(1 - c*x)])/(4*(c*d + e)) + (b*PolyLog[2, 1 - 2/(1 + c*x)])/(4*(c*d - e)) - (b*e*PolyLog[2, 1 - 2/(1 + c*x)])/(2*(c^2*d^2 - e^2)) + (b*e*PolyLog[2, 1 - (2*c*(d + e*x))/((c*d + e)*(1 + c*x))])/(2*(c^2*d^2 - e^2)))/e`

3.13.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6480 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.)^(p_)*((d_) + (e_.)*(x_))^(q_.), x_Symbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])^p/(e*(q + 1))), x] - Simp[b*c*(p/(e*(q + 1))) Int[ExpandIntegrand[(a + b*ArcTanh[c*x])^(p - 1), (d + e*x)^(q + 1)/(1 - c^2*x^2), x], x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 1] && IntegerQ[q] && NeQ[q, -1]`

3.13.4 Maple [A] (verified)

Time = 3.91 (sec) , antiderivative size = 451, normalized size of antiderivative = 1.40

method	result
derivativedivides	$-\frac{a^2 e^2}{(e c x+c d) e}+b^2 c^2 \left(-\frac{\operatorname{arctanh}(c x)^2}{(e c x+c d) e}+\frac{2 \operatorname{arctanh}(c x) \ln (c x+1)}{2 c d-2 e}-\frac{2 \operatorname{arctanh}(c x) \ln (c x-1)}{2 c d+2 e}-\frac{2 \operatorname{arctanh}(c x) e \ln (e c x+c d)}{(c d+e)(c d-e)}-\frac{e \operatorname{dilog}\left(-\frac{e}{c d+e}\right)}{2}\right)$
default	$-\frac{a^2 e^2}{(e c x+c d) e}+b^2 c^2 \left(-\frac{\operatorname{arctanh}(c x)^2}{(e c x+c d) e}+\frac{2 \operatorname{arctanh}(c x) \ln (c x+1)}{2 c d-2 e}-\frac{2 \operatorname{arctanh}(c x) \ln (c x-1)}{2 c d+2 e}-\frac{2 \operatorname{arctanh}(c x) e \ln (e c x+c d)}{(c d+e)(c d-e)}-\frac{e \operatorname{dilog}\left(-\frac{e}{c d+e}\right)}{2}\right)$
parts	$-\frac{a^2}{(e x+d) e}+\frac{b^2}{c^2} \left(-\frac{c^2 \operatorname{arctanh}(c x)^2}{(e c x+c d) e}+\frac{\operatorname{arctanh}(c x) \ln (c x+1)}{2 c d-2 e}-\frac{\operatorname{arctanh}(c x) \ln (c x-1)}{2 c d+2 e}-\frac{\operatorname{arctanh}(c x) e \ln (e c x+c d)}{(c d+e)(c d-e)}-\frac{e \operatorname{dilog}\left(-\frac{e}{c d+e}\right)}{2}\right)$

input `int((a+b*arctanh(c*x))^2/(e*x+d)^2,x,method=_RETURNVERBOSE)`

output `1/c*(-a^2*c^2/(c*e*x+c*d)/e+b^2*c^2*(-1/(c*e*x+c*d)/e*arctanh(c*x)^2+2/e*(arctanh(c*x)/(2*c*d-2*e)*ln(c*x+1)-arctanh(c*x)/(2*c*d+2*e)*ln(c*x-1)-arctanh(c*x)*e/(c*d+e)/(c*d-e)*ln(c*e*x+c*d)-1/(c*d+e)/(c*d-e)*(-1/2*e*(dilog((c*e*x+e)/(-c*d+e))+ln(c*e*x+c*d)*ln((c*e*x+e)/(-c*d+e))))+1/2*e*(dilog((c*e*x-e)/(-c*d-e))+ln(c*e*x+c*d)*ln((c*e*x-e)/(-c*d-e))))+1/2/(c*d-e)*(1/2*(ln(c*x+1)-ln(1/2*c*x+1/2))*ln(-1/2*c*x+1/2)-1/2*dilog(1/2*c*x+1/2)-1/4*ln(c*x+1)^2)-1/2/(c*d+e)*(-1/2*dilog(1/2*c*x+1/2)-1/2*ln(c*x-1)*ln(1/2*c*x+1/2)+1/4*ln(c*x-1)^2))+2*a*b*c^2*(-1/(c*e*x+c*d)/e*arctanh(c*x)+1/e*(1/(2*c*d-2*e)*ln(c*x+1)-1/(2*c*d+2*e)*ln(c*x-1)-e/(c*d+e)/(c*d-e)*ln(c*e*x+c*d)))`

3.13.5 Fricas [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^2} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^2}{(ex + d)^2} dx$$

input `integrate((a+b*arctanh(c*x))^2/(e*x+d)^2,x, algorithm="fricas")`

output `integral((b^2*arctanh(c*x)^2 + 2*a*b*arctanh(c*x) + a^2)/(e^2*x^2 + 2*d*e*x + d^2), x)`

3.13.6 Sympy [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^2} dx = \int \frac{(a + b \operatorname{atanh}(cx))^2}{(d + ex)^2} dx$$

input `integrate((a+b*atanh(c*x))**2/(e*x+d)**2,x)`

output `Integral((a + b*atanh(c*x))**2/(d + e*x)**2, x)`

3.13.7 Maxima [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^2} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^2}{(ex + d)^2} dx$$

input `integrate((a+b*arctanh(c*x))^2/(e*x+d)^2,x, algorithm="maxima")`

output `(c*(log(c*x + 1)/(c*d*e - e^2) - log(c*x - 1)/(c*d*e + e^2) - 2*log(e*x + d)/(c^2*d^2 - e^2)) - 2*arctanh(c*x)/(e^2*x + d*e))*a*b - 1/4*b^2*(log(-c*x + 1)^2/(e^2*x + d*e) + integrate(-((c*e*x - e)*log(c*x + 1)^2 + 2*(c*e*x + c*d - (c*e*x - e)*log(c*x + 1))*log(-c*x + 1))/(c*e^3*x^3 - d^2*e + (2*c*d*e^2 - e^3)*x^2 + (c*d^2*e - 2*d*e^2)*x), x)) - a^2/(e^2*x + d*e)`

3.13.8 Giac [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^2} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^2}{(ex + d)^2} dx$$

input `integrate((a+b*arctanh(c*x))^2/(e*x+d)^2,x, algorithm="giac")`

output `integrate((b*arctanh(c*x) + a)^2/(e*x + d)^2, x)`

3.13.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^2} dx = \int \frac{(a + b \operatorname{atanh}(cx))^2}{(d + ex)^2} dx$$

input `int((a + b*atanh(c*x))^2/(d + e*x)^2,x)`

output `int((a + b*atanh(c*x))^2/(d + e*x)^2, x)`

3.14 $\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^3} dx$

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3.14.1 Optimal result

Integrand size = 18, antiderivative size = 480

$$\begin{aligned}
 \int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^3} dx = & \frac{bc(a + b \operatorname{arctanh}(cx))}{(c^2 d^2 - e^2)(d + ex)} - \frac{(a + b \operatorname{arctanh}(cx))^2}{2e(d + ex)^2} \\
 & + \frac{bc^2(a + b \operatorname{arctanh}(cx)) \log\left(\frac{2}{1 - cx}\right)}{2e(cd + e)^2} \\
 & + \frac{b^2 c^2 \log(1 - cx)}{2(cd - e)(cd + e)^2} - \frac{bc^2(a + b \operatorname{arctanh}(cx)) \log\left(\frac{2}{1 + cx}\right)}{2(cd - e)^2 e} \\
 & + \frac{2bc^3 d(a + b \operatorname{arctanh}(cx)) \log\left(\frac{2}{1 + cx}\right)}{(cd - e)^2 (cd + e)^2} \\
 & - \frac{b^2 c^2 \log(1 + cx)}{2(cd - e)^2 (cd + e)} + \frac{b^2 c^2 e \log(d + ex)}{(cd - e)^2 (cd + e)^2} \\
 & - \frac{2bc^3 d(a + b \operatorname{arctanh}(cx)) \log\left(\frac{2c(d + ex)}{(cd + e)(1 + cx)}\right)}{(cd - e)^2 (cd + e)^2} \\
 & + \frac{b^2 c^2 \operatorname{PolyLog}\left(2, 1 - \frac{2}{1 - cx}\right)}{4e(cd + e)^2} + \frac{b^2 c^2 \operatorname{PolyLog}\left(2, 1 - \frac{2}{1 + cx}\right)}{4(cd - e)^2 e} \\
 & - \frac{b^2 c^3 d \operatorname{PolyLog}\left(2, 1 - \frac{2}{1 + cx}\right)}{(cd - e)^2 (cd + e)^2} \\
 & + \frac{b^2 c^3 d \operatorname{PolyLog}\left(2, 1 - \frac{2c(d + ex)}{(cd + e)(1 + cx)}\right)}{(cd - e)^2 (cd + e)^2}
 \end{aligned}$$

output $b*c*(a+b*\operatorname{arctanh}(c*x))/(c^2*d^2-e^2)/(e*x+d)-1/2*(a+b*\operatorname{arctanh}(c*x))^2/e/(e*x+d)^2+1/2*b*c^2*(a+b*\operatorname{arctanh}(c*x))*\ln(2/(-c*x+1))/e/(c*d+e)^2+1/2*b^2*c^2*\ln(-c*x+1)/(c*d-e)/(c*d+e)^2-1/2*b*c^2*(a+b*\operatorname{arctanh}(c*x))*\ln(2/(c*x+1))/(c*d-e)^2/e+2*b*c^3*d*(a+b*\operatorname{arctanh}(c*x))*\ln(2/(c*x+1))/(c^2*d^2-e^2)^2-1/2*b^2*c^2*\ln(c*x+1)/(c*d-e)^2/(c*d+e)+b^2*c^2*e*\ln(e*x+d)/(c^2*d^2-e^2)^2-2*b*c^3*d*(a+b*\operatorname{arctanh}(c*x))*\ln(2*c*(e*x+d)/(c*d+e)/(c*x+1))/(c^2*d^2-e^2)^2+1/4*b^2*c^2*\operatorname{polylog}(2,1-2/(-c*x+1))/e/(c*d+e)^2+1/4*b^2*c^2*\operatorname{polylog}(2,1-2/(c*x+1))/(c*d-e)^2/e-b^2*c^3*d*\operatorname{polylog}(2,1-2/(c*x+1))/(c^2*d^2-e^2)^2+b^2*c^3*d*\operatorname{polylog}(2,1-2*c*(e*x+d)/(c*d+e)/(c*x+1))/(c^2*d^2-e^2)^2$

3.14.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 4.77 (sec) , antiderivative size = 470, normalized size of antiderivative = 0.98

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^3} dx$$

$$= -\frac{a^2}{2e(d + ex)^2} - \frac{abc^2 \left(\frac{2 \operatorname{arctanh}(cx)}{(cd + cex)^2} + \frac{\log(1 - cx)}{(cd + e)^2} + \frac{-\log(1 + cx) + \frac{2e(-c^2d^2 + e^2 + 2c^2d(d + ex) \log(c(d + ex)))}{c(cd + e)^2(d + ex)}}{(-cd + e)^2} \right)}{2e}$$

$$+ \frac{b^2c^2 \left(-\frac{2e^{-\operatorname{arctanh}(\frac{cd}{e})} \operatorname{arctanh}(cx)^2}{\sqrt{1 - \frac{c^2d^2}{e^2}}e} - \frac{e(-1 + c^2x^2) \operatorname{arctanh}(cx)^2}{c^2(d + ex)^2} + \frac{2x \operatorname{arctanh}(cx)(-e + cd \operatorname{arctanh}(cx))}{cd(d + ex)} + \frac{2e(-e \operatorname{arctanh}(cx) + cd \operatorname{arctanh}(cx)^2)}{cd(d + ex)} \right)}{2e}$$

input `Integrate[(a + b*ArcTanh[c*x])^2/(d + e*x)^3,x]`

output
$$-1/2*a^2/(e*(d + e*x)^2) - (a*b*c^2*((2*ArcTanh[c*x])/(c*d + c*e*x)^2 + \text{Log}[1 - c*x]/(c*d + e)^2 + (-\text{Log}[1 + c*x] + (2*e*(-(c^2*d^2) + e^2 + 2*c^2*d*(d + e*x)*\text{Log}[c*(d + e*x)])))/(c*(c*d + e)^2*(d + e*x)))/(-(c*d) + e)^2)/(2*e) + (b^2*c^2*((-2*ArcTanh[c*x]^2)/(\text{Sqrt}[1 - (c^2*d^2)/e^2]*e*E^{ArcTanh[(c*d)/e]} - (e*(-1 + c^2*x^2)*ArcTanh[c*x]^2)/(c^2*(d + e*x)^2) + (2*x*ArcTanh[c*x]*(-e + c*d*ArcTanh[c*x]))/(c*d*(d + e*x)) + (2*e*(-(e*ArcTanh[c*x]) + c*d*\text{Log}[(c*(d + e*x))/\text{Sqrt}[1 - c^2*x^2]]))/(c^3*d^3 - c*d*e^2) + (2*c*d*(I*Pi*\text{Log}[1 + E^{(2*ArcTanh[c*x])}] - 2*ArcTanh[c*x]*\text{Log}[1 - E^{(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])}] - I*Pi*(ArcTanh[c*x] - \text{Log}[1 - c^2*x^2]/2) - 2*ArcTanh[(c*d)/e]*(ArcTanh[c*x] + \text{Log}[1 - E^{(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])}] - \text{Log}[I*\text{Sinh}[ArcTanh[(c*d)/e] + ArcTanh[c*x]]]) + \text{PolyLog}[2, E^{(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])}]]))/(c^2*d^2 - e^2))/(2*(c*d - e)*(c*d + e))$$

3.14.3 Rubi [A] (verified)

Time = 0.82 (sec) , antiderivative size = 450, normalized size of antiderivative = 0.94, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {6480, 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.

$$\int \frac{(a + \text{barctanh}(cx))^2}{(d + ex)^3} dx$$

↓ 6480

$$\frac{bc \int \left(\frac{(a + \text{barctanh}(cx))^2 c^2}{2(cd+e)^2(1-cx)} + \frac{(a + \text{barctanh}(cx))^2 c^2}{2(cd-e)^2(cx+1)} - \frac{2de^2(a + \text{barctanh}(cx))^2 c^2}{(cd-e)^2(cd+e)^2(d+ex)} - \frac{e^2(a + \text{barctanh}(cx))^2}{(cd-e)(cd+e)(d+ex)^2} \right) dx}{\frac{e(a + \text{barctanh}(cx))^2}{2e(d + ex)^2}}$$

↓ 2009

$$\frac{bc \left(\frac{e(a + \text{barctanh}(cx))}{(c^2 d^2 - e^2)(d + ex)} + \frac{2c^2 de \log\left(\frac{2}{cx+1}\right)(a + \text{barctanh}(cx))}{(cd-e)^2(cd+e)^2} - \frac{2c^2 de(a + \text{barctanh}(cx)) \log\left(\frac{2c(d+ex)}{(cx+1)(cd+e)}\right)}{(cd-e)^2(cd+e)^2} + \frac{c \log\left(\frac{2}{1-cx}\right)(a + \text{barctanh}(cx))}{2(cd+e)^2} \right)}{\frac{(a + \text{barctanh}(cx))^2}{2e(d + ex)^2}}$$

input $\text{Int}[(a + b*ArcTanh[c*x])^2/(d + e*x)^3, x]$

3.14. $\int \frac{(a + \text{barctanh}(cx))^2}{(d + ex)^3} dx$

```
output -1/2*(a + b*ArcTanh[c*x])^2/(e*(d + e*x)^2) + (b*c*((e*(a + b*ArcTanh[c*x]
)))/((c^2*d^2 - e^2)*(d + e*x)) + (c*(a + b*ArcTanh[c*x])*Log[2/(1 - c*x)])
)/(2*(c*d + e)^2) + (b*c*e*Log[1 - c*x])/(2*(c*d - e)*(c*d + e)^2) - (c*(a
+ b*ArcTanh[c*x])*Log[2/(1 + c*x)])/(2*(c*d - e)^2) + (2*c^2*d*e*(a + b*Ar
cTanh[c*x])*Log[2/(1 + c*x)])/((c*d - e)^2*(c*d + e)^2) - (b*c*e*Log[1 + c
*x])/(2*(c*d - e)^2*(c*d + e)) + (b*c*e^2*Log[d + e*x])/((c*d - e)^2*(c*d
+ e)^2) - (2*c^2*d*e*(a + b*ArcTanh[c*x])*Log[(2*c*(d + e*x))/((c*d + e)*(
1 + c*x))])/((c*d - e)^2*(c*d + e)^2) + (b*c*PolyLog[2, 1 - 2/(1 - c*x)])/
(4*(c*d + e)^2) + (b*c*PolyLog[2, 1 - 2/(1 + c*x)])/(4*(c*d - e)^2) - (b*c
^2*d*e*PolyLog[2, 1 - 2/(1 + c*x)])/((c*d - e)^2*(c*d + e)^2) + (b*c^2*d*e
*PolyLog[2, 1 - (2*c*(d + e*x))/((c*d + e)*(1 + c*x))])/((c*d - e)^2*(c*d
+ e)^2))/e
```

3.14.3.1 Defintions of rubi rules used

```
rule 2009 Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]
```

```
rule 6480 Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^p_)*((d_) + (e_.)*(x_))^(q_.), x_S
ymbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])^p/(e*(q + 1))), x] -
Simp[b*c*(p/(e*(q + 1))) Int[ExpandIntegrand[(a + b*ArcTanh[c*x])^(p - 1
), (d + e*x)^(q + 1)/(1 - c^2*x^2), x], x], x] /; FreeQ[{a, b, c, d, e}, x]
&& IGtQ[p, 1] && IntegerQ[q] && NeQ[q, -1]
```

3.14.4 Maple [A] (verified)

Time = 1.72 (sec) , antiderivative size = 592, normalized size of antiderivative = 1.23

$$3.14. \int \frac{(a+b\operatorname{arctanh}(cx))^2}{(d+ex)^3} dx$$

method	result
derivativedivides	$-\frac{a^2 c^3}{2(ecx+cd)^2 e} + b^2 c^3 \left(-\frac{\operatorname{arctanh}(cx)^2}{2(ecx+cd)^2 e} + \frac{\operatorname{arctanh}(cx) \ln(cx+1)}{2(cd-e)^2} - \frac{\operatorname{arctanh}(cx) \ln(cx-1)}{2(cd+e)^2} + \frac{\operatorname{arctanh}(cx)e}{(cd+e)(cd-e)(ecx+cd)} - \frac{2 \operatorname{arctanh}(cx)ecd}{(cd+e)^2(cd-e)} \right)$
default	$-\frac{a^2 c^3}{2(ecx+cd)^2 e} + b^2 c^3 \left(-\frac{\operatorname{arctanh}(cx)^2}{2(ecx+cd)^2 e} + \frac{\operatorname{arctanh}(cx) \ln(cx+1)}{2(cd-e)^2} - \frac{\operatorname{arctanh}(cx) \ln(cx-1)}{2(cd+e)^2} + \frac{\operatorname{arctanh}(cx)e}{(cd+e)(cd-e)(ecx+cd)} - \frac{2 \operatorname{arctanh}(cx)ecd}{(cd+e)^2(cd-e)} \right)$
parts	$-\frac{a^2}{2(ex+d)^2 e} + b^2 \left(-\frac{c^3 \operatorname{arctanh}(cx)^2}{2(ecx+cd)^2 e} + c^3 \left(\frac{\operatorname{arctanh}(cx) \ln(cx+1)}{2(cd-e)^2} - \frac{\operatorname{arctanh}(cx) \ln(cx-1)}{2(cd+e)^2} + \frac{\operatorname{arctanh}(cx)e}{(cd+e)(cd-e)(ecx+cd)} - \frac{2 \operatorname{arctanh}(cx)ecd}{(cd+e)^2(cd-e)} \right) \right)$

input `int((a+b*arctanh(c*x))^2/(e*x+d)^3,x,method=_RETURNVERBOSE)`

output `1/c*(-1/2*a^2*c^3/(c*e*x+c*d)^2/e+b^2*c^3*(-1/2/(c*e*x+c*d)^2/e*arctanh(c*x)^2+1/e*(1/2*arctanh(c*x)/(c*d-e)^2*ln(c*x+1)-1/2*arctanh(c*x)/(c*d+e)^2*ln(c*x-1)+arctanh(c*x)*e/(c*d+e)/(c*d-e)/(c*e*x+c*d)-2*arctanh(c*x)*e*c*d/(c*d+e)^2/(c*d-e)^2*ln(c*e*x+c*d)-1/2/(c*d+e)^2*(-1/2*dilog(1/2*c*x+1/2)-1/2*ln(c*x-1)*ln(1/2*c*x+1/2)+1/4*ln(c*x-1)^2)+1/2/(c*d-e)^2*(1/2*(ln(c*x+1)-ln(1/2*c*x+1/2))*ln(-1/2*c*x+1/2)-1/2*dilog(1/2*c*x+1/2)-1/4*ln(c*x+1)^2)+e/(c*d+e)/(c*d-e)*(-1/(2*c*d-2*e)*ln(c*x+1)+1/(2*c*d+2*e)*ln(c*x-1)+e/(c*d+e)/(c*d-e)*ln(c*e*x+c*d))-2*c*d/(c*d+e)^2/(c*d-e)^2*(-1/2*e*(dilog((c*e*x+e)/(-c*d+e))+ln(c*e*x+c*d)*ln((c*e*x+e)/(-c*d+e)))+1/2*e*(dilog((c*e*x-e)/(-c*d-e))+ln(c*e*x+c*d)*ln((c*e*x-e)/(-c*d-e))))+2*a*b*c^3*(-1/2/(c*e*x+c*d)^2/e*arctanh(c*x)+1/2/e*(1/2/(c*d-e)^2*ln(c*x+1)-1/2/(c*d+e)^2*ln(c*x-1)+e/(c*d+e)/(c*d-e)/(c*e*x+c*d)-2*e*c*d/(c*d+e)^2/(c*d-e)^2*ln(c*e*x+c*d))))`

3.14. $\int \frac{(a+b\operatorname{arctanh}(cx))^2}{(d+ex)^3} dx$

3.14.5 Fricas [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^3} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^2}{(ex + d)^3} dx$$

input `integrate((a+b*arctanh(c*x))^2/(e*x+d)^3,x, algorithm="fricas")`

output `integral((b^2*arctanh(c*x)^2 + 2*a*b*arctanh(c*x) + a^2)/(e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x + d^3), x)`

3.14.6 Sympy [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^3} dx = \int \frac{(a + b \operatorname{atanh}(cx))^2}{(d + ex)^3} dx$$

input `integrate((a+b*atanh(c*x))**2/(e*x+d)**3,x)`

output `Integral((a + b*atanh(c*x))**2/(d + e*x)**3, x)`

3.14.7 Maxima [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^3} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^2}{(ex + d)^3} dx$$

input `integrate((a+b*arctanh(c*x))^2/(e*x+d)^3,x, algorithm="maxima")`

output `-1/2*((4*c^2*d*log(e*x + d)/(c^4*d^4 - 2*c^2*d^2*e^2 + e^4) - c*log(c*x + 1)/(c^2*d^2*e - 2*c*d*e^2 + e^3) + c*log(c*x - 1)/(c^2*d^2*e + 2*c*d*e^2 + e^3) - 2/(c^2*d^3 - d*e^2 + (c^2*d^2*e - e^3)*x))*c + 2*arctanh(c*x)/(e^3*x^2 + 2*d*e^2*x + d^2*e))*a*b - 1/8*b^2*(log(-c*x + 1)^2/(e^3*x^2 + 2*d*e^2*x + d^2*e) + 2*integrate(-((c*e*x - e)*log(c*x + 1)^2 + (c*e*x + c*d - 2*(c*e*x - e)*log(c*x + 1))*log(-c*x + 1))/(c*e^4*x^4 - d^3*e + (3*c*d*e^3 - e^4)*x^3 + 3*(c*d^2*e^2 - d*e^3)*x^2 + (c*d^3*e - 3*d^2*e^2)*x), x)) - 1/2*a^2/(e^3*x^2 + 2*d*e^2*x + d^2*e)`

3.14.8 Giac [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^3} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^2}{(ex + d)^3} dx$$

input `integrate((a+b*arctanh(c*x))^2/(e*x+d)^3,x, algorithm="giac")`

output `integrate((b*arctanh(c*x) + a)^2/(e*x + d)^3, x)`

3.14.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(a + b \operatorname{arctanh}(cx))^2}{(d + ex)^3} dx = \int \frac{(a + b \operatorname{atanh}(cx))^2}{(d + ex)^3} dx$$

input `int((a + b*atanh(c*x))^2/(d + e*x)^3,x)`

output `int((a + b*atanh(c*x))^2/(d + e*x)^3, x)`

3.15 $\int (d + ex)^3 (a + \operatorname{barctanh}(cx))^3 dx$

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3.15.1 Optimal result

Integrand size = 18, antiderivative size = 614

$$\begin{aligned}
 & \int (d + ex)^3 (a + \operatorname{barctanh}(cx))^3 dx \\
 &= \frac{3ab^2de^2x}{c^2} + \frac{b^3e^3x}{4c^3} - \frac{b^3e^3\operatorname{arctanh}(cx)}{4c^4} + \frac{3b^3de^2x\operatorname{arctanh}(cx)}{c^2} \\
 &+ \frac{b^2e^3x^2(a + \operatorname{barctanh}(cx))}{4c^2} - \frac{3bde^2(a + \operatorname{barctanh}(cx))^2}{2c^3} \\
 &+ \frac{be^3(a + \operatorname{barctanh}(cx))^2}{4c^4} + \frac{3be(6c^2d^2 + e^2)(a + \operatorname{barctanh}(cx))^2}{4c^4} \\
 &+ \frac{3be(6c^2d^2 + e^2)x(a + \operatorname{barctanh}(cx))^2}{4c^3} + \frac{3bde^2x^2(a + \operatorname{barctanh}(cx))^2}{2c} \\
 &+ \frac{be^3x^3(a + \operatorname{barctanh}(cx))^2}{4c} + \frac{d(c^2d^2 + e^2)(a + \operatorname{barctanh}(cx))^3}{c^3} \\
 &- \frac{(c^4d^4 + 6c^2d^2e^2 + e^4)(a + \operatorname{barctanh}(cx))^3}{4c^4e} + \frac{(d + ex)^4(a + \operatorname{barctanh}(cx))^3}{4e} \\
 &- \frac{b^2e^3(a + \operatorname{barctanh}(cx)) \log\left(\frac{2}{1-cx}\right)}{2c^4} - \frac{3b^2e(6c^2d^2 + e^2)(a + \operatorname{barctanh}(cx)) \log\left(\frac{2}{1-cx}\right)}{2c^4} \\
 &- \frac{3bd(c^2d^2 + e^2)(a + \operatorname{barctanh}(cx))^2 \log\left(\frac{2}{1-cx}\right)}{c^3} + \frac{3b^3de^2 \log(1 - c^2x^2)}{2c^3} \\
 &- \frac{b^3e^3 \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{4c^4} - \frac{3b^3e(6c^2d^2 + e^2) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{4c^4} \\
 &- \frac{3b^2d(c^2d^2 + e^2)(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{c^3} \\
 &+ \frac{3b^3d(c^2d^2 + e^2) \operatorname{PolyLog}\left(3, 1 - \frac{2}{1-cx}\right)}{2c^3}
 \end{aligned}$$

output

```

3*a*b^2*d*e^2*x/c^2+1/4*b^3*e^3*x/c^3-1/4*b^3*e^3*arctanh(c*x)/c^4+3*b^3*d
*e^2*x*arctanh(c*x)/c^2+1/4*b^2*e^3*x^2*(a+b*arctanh(c*x))/c^2-3/2*b*d*e^2
*(a+b*arctanh(c*x))^2/c^3+1/4*b*e^3*(a+b*arctanh(c*x))^2/c^4+3/4*b*e*(6*c^
2*d^2+e^2)*(a+b*arctanh(c*x))^2/c^4+3/4*b*e*(6*c^2*d^2+e^2)*x*(a+b*arctanh
(c*x))^2/c^3+3/2*b*d*e^2*x^2*(a+b*arctanh(c*x))^2/c+1/4*b*e^3*x^3*(a+b*arc
tanh(c*x))^2/c+d*(c^2*d^2+e^2)*(a+b*arctanh(c*x))^3/c^3-1/4*(c^4*d^4+6*c^2
*d^2*e^2+e^4)*(a+b*arctanh(c*x))^3/c^4/e+1/4*(e*x+d)^4*(a+b*arctanh(c*x))^
3/e-1/2*b^2*e^3*(a+b*arctanh(c*x))*ln(2/(-c*x+1))/c^4-3/2*b^2*e*(6*c^2*d^2
+e^2)*(a+b*arctanh(c*x))*ln(2/(-c*x+1))/c^4-3*b*d*(c^2*d^2+e^2)*(a+b*arcta
nh(c*x))^2*ln(2/(-c*x+1))/c^3+3/2*b^3*d*e^2*ln(-c^2*x^2+1)/c^3-1/4*b^3*e^3
*polylog(2,1-2/(-c*x+1))/c^4-3/4*b^3*e*(6*c^2*d^2+e^2)*polylog(2,1-2/(-c*x
+1))/c^4-3*b^2*d*(c^2*d^2+e^2)*(a+b*arctanh(c*x))*polylog(2,1-2/(-c*x+1))/
c^3+3/2*b^3*d*(c^2*d^2+e^2)*polylog(3,1-2/(-c*x+1))/c^3

```

3.15.2 Mathematica [A] (verified)

Time = 1.30 (sec) , antiderivative size = 830, normalized size of antiderivative = 1.35

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^3 dx$$

$$= \frac{2a^2c(4ac^3d^3 + 3be(6c^2d^2 + e^2))x + 12a^2c^3de(acd + be)x^2 + 2a^2c^3e^2(4acd + be)x^3 + 2a^3c^4e^3x^4 + 6a^2bc^4x^5}{5}$$

input `Integrate[(d + e*x)^3*(a + b*ArcTanh[c*x])^3,x]`

```
output (2*a^2*c*(4*a*c^3*d^3 + 3*b*e*(6*c^2*d^2 + e^2))*x + 12*a^2*c^3*d*e*(a*c*d
+ b*e)*x^2 + 2*a^2*c^3*e^2*(4*a*c*d + b*e)*x^3 + 2*a^3*c^4*e^3*x^4 + 6*a^
2*b*c^4*x*(4*d^3 + 6*d^2*e*x + 4*d*e^2*x^2 + e^3*x^3)*ArcTanh[c*x] + 3*a^2
*b*(4*c^3*d^3 + 6*c^2*d^2*e + 4*c*d*e^2 + e^3)*Log[1 - c*x] + 3*a^2*b*(4*c
^3*d^3 - 6*c^2*d^2*e + 4*c*d*e^2 - e^3)*Log[1 + c*x] + 36*a*b^2*c^2*d^2*e*
(2*c*x*ArcTanh[c*x] + (-1 + c^2*x^2)*ArcTanh[c*x]^2 + Log[1 - c^2*x^2]) +
2*a*b^2*e^3*(-1 + c^2*x^2 + 2*c*x*(3 + c^2*x^2)*ArcTanh[c*x] + 3*(-1 + c^4
*x^4)*ArcTanh[c*x]^2 + 4*Log[1 - c^2*x^2]) - 12*b^3*c^2*d^2*e*(ArcTanh[c*x
]*((3 - 3*c*x)*ArcTanh[c*x] + (1 - c^2*x^2)*ArcTanh[c*x]^2 + 6*Log[1 + E^(
-2*ArcTanh[c*x]])) - 3*PolyLog[2, -E^(-2*ArcTanh[c*x])]) + 24*a*b^2*c*d*e^
2*(c*x + (-1 + c^3*x^3)*ArcTanh[c*x]^2 + ArcTanh[c*x]*(-1 + c^2*x^2 - 2*Lo
g[1 + E^(-2*ArcTanh[c*x])]) + PolyLog[2, -E^(-2*ArcTanh[c*x])]) + 24*a*b^2
*c^3*d^3*(ArcTanh[c*x]*((-1 + c*x)*ArcTanh[c*x] - 2*Log[1 + E^(-2*ArcTanh[
c*x])]) + PolyLog[2, -E^(-2*ArcTanh[c*x])]) + 2*b^3*e^3*(c*x + (-4 + 3*c*x
+ c^3*x^3)*ArcTanh[c*x]^2 + (-1 + c^4*x^4)*ArcTanh[c*x]^3 + ArcTanh[c*x]*
(-1 + c^2*x^2 - 8*Log[1 + E^(-2*ArcTanh[c*x])]) + 4*PolyLog[2, -E^(-2*ArcT
anh[c*x])]) + 8*b^3*c^3*d^3*(ArcTanh[c*x]^2*((-1 + c*x)*ArcTanh[c*x] - 3*L
og[1 + E^(-2*ArcTanh[c*x])]) + 3*ArcTanh[c*x]*PolyLog[2, -E^(-2*ArcTanh[c*
x])]) + (3*PolyLog[3, -E^(-2*ArcTanh[c*x])])/2) + 4*b^3*c*d*e^2*(6*c*x*ArcT
anh[c*x] - 3*ArcTanh[c*x]^2 + 3*c^2*x^2*ArcTanh[c*x]^2 - 2*ArcTanh[c*x]...
```

3.15.3 Rubi [A] (verified)

Time = 1.46 (sec) , antiderivative size = 608, normalized size of antiderivative = 0.99, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {6480, 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.

$$\begin{aligned}
 & \int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^3 dx \\
 & \quad \downarrow \text{6480} \\
 & \frac{(d + ex)^4 (a + b \operatorname{arctanh}(cx))^3}{4e} - \\
 3bc \int & \left(-\frac{x^2 (a + b \operatorname{arctanh}(cx))^2 e^4}{c^2} - \frac{4dx (a + b \operatorname{arctanh}(cx))^2 e^3}{c^2} - \frac{(6c^2 d^2 + e^2) (a + b \operatorname{arctanh}(cx))^2 e^2}{c^4} + \frac{(c^4 d^4 + 6c^2 e^2 d^2 + 4c^2 e (c^2 d^2 + e^2))}{c^4 (1 - c^2 x^2)} \right) dx \\
 & \quad \downarrow \text{2009}
 \end{aligned}$$

3.15. $\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^3 dx$

$$3bc \left(-\frac{e^{4(a+\operatorname{barctanh}(cx))^2}}{3c^5} + \frac{2be^4 \log\left(\frac{2}{1-cx}\right)(a+\operatorname{barctanh}(cx))}{3c^5} + \frac{2de^3(a+\operatorname{barctanh}(cx))^2}{c^4} - \frac{be^4x^2(a+\operatorname{barctanh}(cx))}{3c^3} - \frac{2de^3x^2}{3c^3} \right) - \frac{(d+ex)^4(a+\operatorname{barctanh}(cx))^3}{4e}$$

input `Int[(d + e*x)^3*(a + b*ArcTanh[c*x])^3, x]`

output

```
((d + e*x)^4*(a + b*ArcTanh[c*x])^3)/(4*e) - (3*b*c*((-4*a*b*d*e^3*x)/c^3 - (b^2*e^4*x)/(3*c^4) + (b^2*e^4*ArcTanh[c*x])/(3*c^5) - (4*b^2*d*e^3*x*ArcTanh[c*x])/c^3 - (b*e^4*x^2*(a + b*ArcTanh[c*x]))/(3*c^3) + (2*d*e^3*(a + b*ArcTanh[c*x])^2)/c^4 - (e^4*(a + b*ArcTanh[c*x])^2)/(3*c^5) - (e^2*(6*c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])^2)/c^5 - (e^2*(6*c^2*d^2 + e^2)*x*(a + b*ArcTanh[c*x])^2)/c^4 - (2*d*e^3*x^2*(a + b*ArcTanh[c*x])^2)/c^2 - (e^4*x^3*(a + b*ArcTanh[c*x])^2)/(3*c^2) - (4*d*e*(c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])^3)/(3*b*c^4) + ((c^4*d^4 + 6*c^2*d^2*e^2 + e^4)*(a + b*ArcTanh[c*x])^3)/(3*b*c^5) + (2*b*e^4*(a + b*ArcTanh[c*x])*Log[2/(1 - c*x)])/(3*c^5) + (2*b*e^2*(6*c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])*Log[2/(1 - c*x)])/c^5 + (4*d*e*(c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])^2*Log[2/(1 - c*x)]/c^4 - (2*b^2*d*e^3*Log[1 - c^2*x^2])/c^4 + (b^2*e^4*PolyLog[2, 1 - 2/(1 - c*x)])/(3*c^5) + (b^2*e^2*(6*c^2*d^2 + e^2)*PolyLog[2, 1 - 2/(1 - c*x)]/c^5 + (4*b*d*e*(c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - 2/(1 - c*x)]/c^4 - (2*b^2*d*e*(c^2*d^2 + e^2)*PolyLog[3, 1 - 2/(1 - c*x)]/c^4))/(4*e)
```

3.15.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6480 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.))^(p_)*((d_) + (e_.)*(x_))^(q_.), x_Symbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])^p/(e*(q + 1))), x] - Simp[b*c*(p/(e*(q + 1))) Int[ExpandIntegrand[(a + b*ArcTanh[c*x])^(p - 1), (d + e*x)^(q + 1)/(1 - c^2*x^2), x], x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 1] && IntegerQ[q] && NeQ[q, -1]`

3.15.4 Maple [C] (warning: unable to verify)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 37.83 (sec) , antiderivative size = 5093, normalized size of antiderivative = 8.29

method	result	size
parts	Expression too large to display	5093
derivativedivides	Expression too large to display	5124
default	Expression too large to display	5124

```
input int((e*x+d)^3*(a+b*arctanh(c*x))^3,x,method=_RETURNVERBOSE)
```

```
output result too large to display
```

3.15.5 Fricas [F]

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^3 dx = \int (ex + d)^3 (b \operatorname{arctanh}(cx) + a)^3 dx$$

```
input integrate((e*x+d)^3*(a+b*arctanh(c*x))^3,x, algorithm="fricas")
```

```
output integral(a^3*e^3*x^3 + 3*a^3*d*e^2*x^2 + 3*a^3*d^2*e*x + a^3*d^3 + (b^3*e^
3*x^3 + 3*b^3*d*e^2*x^2 + 3*b^3*d^2*e*x + b^3*d^3)*arctanh(c*x)^3 + 3*(a*b
^2*e^3*x^3 + 3*a*b^2*d*e^2*x^2 + 3*a*b^2*d^2*e*x + a*b^2*d^3)*arctanh(c*x)
^2 + 3*(a^2*b*e^3*x^3 + 3*a^2*b*d*e^2*x^2 + 3*a^2*b*d^2*e*x + a^2*b*d^3)*a
rctanh(c*x), x)
```

3.15.6 Sympy [F]

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^3 dx = \int (a + b \operatorname{atanh}(cx))^3 (d + ex)^3 dx$$

```
input integrate((e*x+d)**3*(a+b*atanh(c*x))**3,x)
```

```
output Integral((a + b*atanh(c*x))**3*(d + e*x)**3, x)
```

3.15.7 Maxima [F]

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^3 dx = \int (ex + d)^3 (b \operatorname{arctanh}(cx) + a)^3 dx$$

input `integrate((e*x+d)^3*(a+b*arctanh(c*x))^3,x, algorithm="maxima")`

output `1/4*a^3*e^3*x^4 + a^3*d*e^2*x^3 + 3/2*a^3*d^2*e*x^2 + 9/4*(2*x^2*arctanh(c*x) + c*(2*x/c^2 - log(c*x + 1)/c^3 + log(c*x - 1)/c^3))*a^2*b*d^2*e + 3/2*(2*x^3*arctanh(c*x) + c*(x^2/c^2 + log(c^2*x^2 - 1)/c^4))*a^2*b*d*e^2 + 1/8*(6*x^4*arctanh(c*x) + c*(2*(c^2*x^3 + 3*x)/c^4 - 3*log(c*x + 1)/c^5 + 3*log(c*x - 1)/c^5))*a^2*b*e^3 + a^3*d^3*x + 3/2*(2*c*x*arctanh(c*x) + log(-c^2*x^2 + 1))*a^2*b*d^3/c - 1/32*((b^3*c^4*e^3*x^4 + 4*b^3*c^4*d*e^2*x^3 + 6*b^3*c^4*d^2*e*x^2 + 4*b^3*c^4*d^3*x - (4*c^3*d^3 + 6*c^2*d^2*e + 4*c*d*e^2 + e^3)*b^3)*log(-c*x + 1)^3 - (6*a*b^2*c^4*e^3*x^4 + 2*(12*a*b^2*c^4*d*e^2 + b^3*c^3*e^3)*x^3 + 12*(3*a*b^2*c^4*d^2*e + b^3*c^3*d*e^2)*x^2 + 6*(4*a*b^2*c^4*d^3 + (6*c^3*d^2*e + c*e^3)*b^3)*x + 3*(b^3*c^4*e^3*x^4 + 4*b^3*c^4*d*e^2*x^3 + 6*b^3*c^4*d^2*e*x^2 + 4*b^3*c^4*d^3*x + (4*c^3*d^3 - 6*c^2*d^2*e + 4*c*d*e^2 - e^3)*b^3)*log(c*x + 1))*log(-c*x + 1)^2/c^4 - integrate(-1/16*(2*(b^3*c^4*e^3*x^4 - b^3*c^3*d^3 + (3*c^4*d*e^2 - c^3*e^3)*b^3*x^3 + 3*(c^4*d^2*e - c^3*d*e^2)*b^3*x^2 + (c^4*d^3 - 3*c^3*d^2*e)*b^3*x)*log(c*x + 1)^3 + 12*(a*b^2*c^4*e^3*x^4 - a*b^2*c^3*d^3 + (3*c^4*d*e^2 - c^3*e^3)*a*b^2*x^3 + 3*(c^4*d^2*e - c^3*d*e^2)*a*b^2*x^2 + (c^4*d^3 - 3*c^3*d^2*e)*a*b^2*x)*log(c*x + 1)^2 - (6*a*b^2*c^4*e^3*x^4 + 2*(12*a*b^2*c^4*d*e^2 + b^3*c^3*e^3)*x^3 + 12*(3*a*b^2*c^4*d^2*e + b^3*c^3*d*e^2)*x^2 + 6*(b^3*c^4*e^3*x^4 - b^3*c^3*d^3 + (3*c^4*d*e^2 - c^3*e^3)*b^3*x^3 + 3*(c^4*d^2*e - c^3*d*e^2)*b^3*x^2 + (c^4*d^3 - 3*c^3*d^2*e)*b^3*x)*log(c*x + 1...)`

3.15.8 Giac [F]

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^3 dx = \int (ex + d)^3 (b \operatorname{arctanh}(cx) + a)^3 dx$$

input `integrate((e*x+d)^3*(a+b*arctanh(c*x))^3,x, algorithm="giac")`

output `integrate((e*x + d)^3*(b*arctanh(c*x) + a)^3, x)`

3.15.9 Mupad [F(-1)]

Timed out.

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx))^3 dx = \int (a + b \operatorname{atanh}(cx))^3 (d + ex)^3 dx$$

input `int((a + b*atanh(c*x))^3*(d + e*x)^3,x)`output `int((a + b*atanh(c*x))^3*(d + e*x)^3, x)`

3.16 $\int (d + ex)^2 (a + \operatorname{barctanh}(cx))^3 dx$

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3.16.1 Optimal result

Integrand size = 18, antiderivative size = 387

$$\begin{aligned}
 & \int (d + ex)^2 (a + \operatorname{barctanh}(cx))^3 dx \\
 &= \frac{ab^2e^2x}{c^2} + \frac{b^3e^2x\operatorname{arctanh}(cx)}{c^2} + \frac{3bde(a + \operatorname{barctanh}(cx))^2}{c^2} - \frac{be^2(a + \operatorname{barctanh}(cx))^2}{2c^3} \\
 &+ \frac{3bdex(a + \operatorname{barctanh}(cx))^2}{c} + \frac{be^2x^2(a + \operatorname{barctanh}(cx))^2}{2c} \\
 &+ \frac{(3c^2d^2 + e^2)(a + \operatorname{barctanh}(cx))^3}{3c^3} - \frac{d\left(d^2 + \frac{3e^2}{c^2}\right)(a + \operatorname{barctanh}(cx))^3}{3e} \\
 &+ \frac{(d + ex)^3(a + \operatorname{barctanh}(cx))^3}{3e} - \frac{6b^2de(a + \operatorname{barctanh}(cx))\log\left(\frac{2}{1-cx}\right)}{c^2} \\
 &- \frac{b(3c^2d^2 + e^2)(a + \operatorname{barctanh}(cx))^2\log\left(\frac{2}{1-cx}\right)}{c^3} + \frac{b^3e^2\log(1 - c^2x^2)}{2c^3} \\
 &- \frac{3b^3de\operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{c^2} - \frac{b^2(3c^2d^2 + e^2)(a + \operatorname{barctanh}(cx))\operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{c^3} \\
 &+ \frac{b^3(3c^2d^2 + e^2)\operatorname{PolyLog}\left(3, 1 - \frac{2}{1-cx}\right)}{2c^3}
 \end{aligned}$$

output $a*b^2*e^{2*x}/c^2+b^3*e^{2*x}*arctanh(c*x)/c^2+3*b*d*e*(a+b*arctanh(c*x))^2/c^2-1/2*b*e^{2*(a+b*arctanh(c*x))^2/c^3+3*b*d*e*x*(a+b*arctanh(c*x))^2/c+1/2*b*e^{2*x^2*(a+b*arctanh(c*x))^2/c+1/3*(3*c^2*d^2+e^2)*(a+b*arctanh(c*x))^3/c^3-1/3*d*(d^2+3*e^2/c^2)*(a+b*arctanh(c*x))^3/e+1/3*(e*x+d)^3*(a+b*arctanh(c*x))^3/e-6*b^2*d*e*(a+b*arctanh(c*x))*ln(2/(-c*x+1))/c^2-b*(3*c^2*d^2+e^2)*(a+b*arctanh(c*x))^2*ln(2/(-c*x+1))/c^3+1/2*b^3*e^{2*ln(-c^2*x^2+1)/c^3-3*b^3*d*e*polylog(2,1-2/(-c*x+1))/c^2-b^2*(3*c^2*d^2+e^2)*(a+b*arctanh(c*x))*polylog(2,1-2/(-c*x+1))/c^3+1/2*b^3*(3*c^2*d^2+e^2)*polylog(3,1-2/(-c*x+1))/c^3}$

3.16.2 Mathematica [A] (verified)

Time = 0.80 (sec) , antiderivative size = 591, normalized size of antiderivative = 1.53

$$\int (d + ex)^2(a + b \operatorname{arctanh}(cx))^3 dx$$

$$= \frac{6a^2c^2d(acd + 3be)x + 3a^2c^2e(2acd + be)x^2 + 2a^3c^3e^2x^3 + 6a^2bc^3x(3d^2 + 3dex + e^2x^2) \operatorname{arctanh}(cx) + 3a^2c^2d^2(3d^2 + 3dex + e^2x^2) \operatorname{arctanh}(cx)^2 + 3a^2c^2e^2(3d^2 + 3dex + e^2x^2) \operatorname{arctanh}(cx)^3}{6c^3}$$

input `Integrate[(d + e*x)^2*(a + b*ArcTanh[c*x])^3,x]`

output $(6*a^2*c^2*d*(a*c*d + 3*b*e)*x + 3*a^2*c^2*e*(2*a*c*d + b*e)*x^2 + 2*a^3*c^3*e^2*x^3 + 6*a^2*b*c^3*x*(3*d^2 + 3*d*e*x + e^2*x^2)*ArcTanh[c*x] + 3*a^2*b*(3*c^2*d^2 + 3*c*d*e + e^2)*Log[1 - c*x] + 3*a^2*b*(3*c^2*d^2 - 3*c*d*e + e^2)*Log[1 + c*x] + 18*a*b^2*c*d*e*(2*c*x*ArcTanh[c*x] + (-1 + c^2*x^2)*ArcTanh[c*x]^2 + Log[1 - c^2*x^2]) - 6*b^3*c*d*e*(ArcTanh[c*x]*((3 - 3*c*x)*ArcTanh[c*x] + (1 - c^2*x^2)*ArcTanh[c*x]^2 + 6*Log[1 + E^(-2*ArcTanh[c*x])]) - 3*PolyLog[2, -E^(-2*ArcTanh[c*x])]) + 6*a*b^2*e^2*(c*x + (-1 + c^3*x^3)*ArcTanh[c*x]^2 + ArcTanh[c*x]*(-1 + c^2*x^2 - 2*Log[1 + E^(-2*ArcTanh[c*x])]) + PolyLog[2, -E^(-2*ArcTanh[c*x])]) + 18*a*b^2*c^2*d^2*(ArcTanh[c*x]*((-1 + c*x)*ArcTanh[c*x] - 2*Log[1 + E^(-2*ArcTanh[c*x])]) + PolyLog[2, -E^(-2*ArcTanh[c*x])]) + 6*b^3*c^2*d^2*(ArcTanh[c*x]^2*((-1 + c*x)*ArcTanh[c*x] - 3*Log[1 + E^(-2*ArcTanh[c*x])]) + 3*ArcTanh[c*x]*PolyLog[2, -E^(-2*ArcTanh[c*x])]) + (3*PolyLog[3, -E^(-2*ArcTanh[c*x])])/2 + b^3*e^2*(6*c*x*ArcTanh[c*x] - 3*ArcTanh[c*x]^2 + 3*c^2*x^2*ArcTanh[c*x]^2 - 2*ArcTanh[c*x]^3 + 2*c^3*x^3*ArcTanh[c*x]^3 - 6*ArcTanh[c*x]^2*Log[1 + E^(-2*ArcTanh[c*x])]) + 3*Log[1 - c^2*x^2] + 6*ArcTanh[c*x]*PolyLog[2, -E^(-2*ArcTanh[c*x])]) + 3*PolyLog[3, -E^(-2*ArcTanh[c*x])])/(6*c^3)$

3.16.3 Rubi [A] (verified)

Time = 1.04 (sec) , antiderivative size = 403, normalized size of antiderivative = 1.04, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {6480, 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.

$$\int (d + ex)^2 (a + \operatorname{barctanh}(cx))^3 dx$$

↓ 6480

$$\frac{(d + ex)^3 (a + \operatorname{barctanh}(cx))^3}{3e} - bc \int \left(-\frac{x(a + \operatorname{barctanh}(cx))^2 e^3}{c^2} - \frac{3d(a + \operatorname{barctanh}(cx))^2 e^2}{c^2} + \frac{(d(c^2 d^2 + 3e^2) + e(3c^2 d^2 + e^2)x)(a + \operatorname{barctanh}(cx))^2}{c^2(1 - c^2 x^2)} \right) dx$$

↓ 2009

$$\frac{(d + ex)^3 (a + \operatorname{barctanh}(cx))^3}{3e} - bc \left(\frac{e^3 (a + \operatorname{barctanh}(cx))^2}{2c^4} - \frac{3de^2 (a + \operatorname{barctanh}(cx))^2}{c^3} + \frac{6bde^2 \log\left(\frac{2}{1 - cx}\right) (a + \operatorname{barctanh}(cx))}{c^3} - \frac{3de^2 x (a + \operatorname{barctanh}(cx))^2}{c^2} - \frac{e^3 x^2 (a + \operatorname{barctanh}(cx))^2}{2c^4} \right)$$

input `Int[(d + e*x)^2*(a + b*ArcTanh[c*x])^3,x]`

output `((d + e*x)^3*(a + b*ArcTanh[c*x])^3)/(3*e) - (b*c*(-((a*b*e^3*x)/c^3) - (b^2*e^3*x*ArcTanh[c*x])/c^3 - (3*d*e^2*(a + b*ArcTanh[c*x])^2)/c^3 + (e^3*(a + b*ArcTanh[c*x])^2)/(2*c^4) - (3*d*e^2*x*(a + b*ArcTanh[c*x])^2)/c^2 - (e^3*x^2*(a + b*ArcTanh[c*x])^2)/(2*c^4) - (e*(3*c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])^3)/(3*b*c^4) + (d*(c^2*d^2 + 3*e^2)*(a + b*ArcTanh[c*x])^3)/(3*b*c^3) + (6*b*d*e^2*(a + b*ArcTanh[c*x])*Log[2/(1 - c*x)])/c^3 + (e*(3*c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])^2*Log[2/(1 - c*x)])/c^4 - (b^2*e^3*Log[1 - c^2*x^2])/(2*c^4) + (3*b^2*d*e^2*PolyLog[2, 1 - 2/(1 - c*x)])/c^3 + (b*e*(3*c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - 2/(1 - c*x)])/c^4 - (b^2*e*(3*c^2*d^2 + e^2)*PolyLog[3, 1 - 2/(1 - c*x)]/(2*c^4))/e`

3.16.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6480 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_)*((d_) + (e_.)*(x_))^(q_.), x_Symbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])^p/(e*(q + 1))), x] - Simp[b*c*(p/(e*(q + 1))) Int[ExpandIntegrand[(a + b*ArcTanh[c*x])^(p - 1), (d + e*x)^(q + 1)/(1 - c^2*x^2), x], x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 1] && IntegerQ[q] && NeQ[q, -1]`

3.16.4 Maple [C] (warning: unable to verify)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 15.45 (sec) , antiderivative size = 3848, normalized size of antiderivative = 9.94

method	result	size
parts	Expression too large to display	3848
derivativedivides	Expression too large to display	3873
default	Expression too large to display	3873

input `int((e*x+d)^2*(a+b*arctanh(c*x))^3,x,method=_RETURNVERBOSE)`


```

output 1/3*a^3*(e*x+d)^3/e+b^3/c*(1/3*c*e^2*arctanh(c*x)^3*x^3+c*e*arctanh(c*x)^3
*x^2*d+arctanh(c*x)^3*c*x*d^2+1/3*c/e*arctanh(c*x)^3*d^3-1/c^2/e*(-1/3*e^3
*arctanh(c*x)^3+1/2*e^3*arctanh(c*x)^2-3/4*I*e^2*c*csgn(I*(c*x+1)^2/(c^2*x
^2-1))^3*Pi*d*arctanh(c*x)^2-3/4*I*e^2*c*csgn(I*(c*x+1)^2/(c^2*x^2-1))/(1-(
c*x+1)^2/(c^2*x^2-1)))^3*Pi*d*arctanh(c*x)^2-3/2*I*e^2*c*csgn(I/(1-(c*x+1)
^2/(c^2*x^2-1)))^2*Pi*d*arctanh(c*x)^2+3/2*I*e^2*c*csgn(I/(1-(c*x+1)^2/(c^
2*x^2-1)))^3*Pi*d*arctanh(c*x)^2-1/4*I*Pi*e^3*csgn(I/(1-(c*x+1)^2/(c^2*x^2
-1)))*csgn(I*(c*x+1)^2/(c^2*x^2-1))*csgn(I*(c*x+1)^2/(c^2*x^2-1)/(1-(c*x+1)
)^2/(c^2*x^2-1)))*arctanh(c*x)^2+1/4*I*c^3*csgn(I*(c*x+1)^2/(c^2*x^2-1))*c
sgn(I*(c*x+1)^2/(c^2*x^2-1)/(1-(c*x+1)^2/(c^2*x^2-1)))^2*Pi*d^3*arctanh(c*
x)^2+3/2*I*c^2*csgn(I/(1-(c*x+1)^2/(c^2*x^2-1)))^3*e*Pi*d^2*arctanh(c*x)^2
-3/2*I*c^2*csgn(I/(1-(c*x+1)^2/(c^2*x^2-1)))^2*e*Pi*d^2*arctanh(c*x)^2-1/4
*I*Pi*c^3*d^3*csgn(I*(c*x+1)/(-c^2*x^2+1)^(1/2))^2*csgn(I*(c*x+1)^2/(c^2*x
^2-1))*arctanh(c*x)^2+3/4*I*c^2*csgn(I*(c*x+1)^2/(c^2*x^2-1)/(1-(c*x+1)^2/
(c^2*x^2-1)))^3*e*Pi*d^2*arctanh(c*x)^2+3/4*I*c^2*csgn(I*(c*x+1)^2/(c^2*x^
2-1))^3*e*Pi*d^2*arctanh(c*x)^2-1/4*I*c^3*csgn(I/(1-(c*x+1)^2/(c^2*x^2-1))
)*csgn(I*(c*x+1)^2/(c^2*x^2-1)/(1-(c*x+1)^2/(c^2*x^2-1)))^2*Pi*d^3*arctanh
(c*x)^2-1/2*I*c^3*csgn(I*(c*x+1)/(-c^2*x^2+1)^(1/2))*csgn(I*(c*x+1)^2/(c^2
*x^2-1))^2*Pi*d^3*arctanh(c*x)^2+3*c^2*ln(2)*e*d^2*arctanh(c*x)^2+3*polylo
g(2,-(c*x+1)^2/(-c^2*x^2+1))*c^2*d^2*e*arctanh(c*x)+6*c*d*e^2*arctanh(c...

```

3.16.5 Fracas [F]

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx))^3 dx = \int (ex + d)^2 (b \operatorname{arctanh}(cx) + a)^3 dx$$

```

input integrate((e*x+d)^2*(a+b*arctanh(c*x))^3,x, algorithm="fracas")

```

```

output integral(a^3*e^2*x^2 + 2*a^3*d*e*x + a^3*d^2 + (b^3*e^2*x^2 + 2*b^3*d*e*x
+ b^3*d^2)*arctanh(c*x)^3 + 3*(a*b^2*e^2*x^2 + 2*a*b^2*d*e*x + a*b^2*d^2)*
arctanh(c*x)^2 + 3*(a^2*b*e^2*x^2 + 2*a^2*b*d*e*x + a^2*b*d^2)*arctanh(c*x
), x)

```

3.16.6 Sympy [F]

$$\int (d + ex)^2 (a + \operatorname{barctanh}(cx))^3 dx = \int (a + b \operatorname{atanh}(cx))^3 (d + ex)^2 dx$$

input `integrate((e*x+d)**2*(a+b*atanh(c*x))**3,x)`

output `Integral((a + b*atanh(c*x))**3*(d + e*x)**2, x)`

3.16.7 Maxima [F]

$$\int (d + ex)^2 (a + \operatorname{barctanh}(cx))^3 dx = \int (ex + d)^2 (b \operatorname{artanh}(cx) + a)^3 dx$$

input `integrate((e*x+d)^2*(a+b*arctanh(c*x))^3,x, algorithm="maxima")`

output `1/3*a^3*e^2*x^3 + a^3*d*e*x^2 + 3/2*(2*x^2*arctanh(c*x) + c*(2*x/c^2 - log(c*x + 1)/c^3 + log(c*x - 1)/c^3))*a^2*b*d*e + 1/2*(2*x^3*arctanh(c*x) + c*(x^2/c^2 + log(c^2*x^2 - 1)/c^4))*a^2*b*e^2 + a^3*d^2*x + 3/2*(2*c*x*arctanh(c*x) + log(-c^2*x^2 + 1))*a^2*b*d^2/c - 1/24*((b^3*c^3*e^2*x^3 + 3*b^3*c^3*d*e*x^2 + 3*b^3*c^3*d^2*x - (3*c^2*d^2 + 3*c*d*e + e^2)*b^3)*log(-c*x + 1)^3 - 3*(2*a*b^2*c^3*e^2*x^3 + (6*a*b^2*c^3*d*e + b^3*c^2*e^2)*x^2 + 6*(a*b^2*c^3*d^2 + b^3*c^2*d*e)*x + (b^3*c^3*e^2*x^3 + 3*b^3*c^3*d*e*x^2 + 3*b^3*c^3*d^2*x + (3*c^2*d^2 - 3*c*d*e + e^2)*b^3)*log(c*x + 1))*log(-c*x + 1)^2)/c^3 - integrate(-1/8*((b^3*c^3*e^2*x^3 - b^3*c^2*d^2 + (2*c^3*d*e - c^2*e^2)*b^3*x^2 + (c^3*d^2 - 2*c^2*d*e)*b^3*x)*log(c*x + 1)^3 + 6*(a*b^2*c^3*e^2*x^3 - a*b^2*c^2*d^2 + (2*c^3*d*e - c^2*e^2)*a*b^2*x^2 + (c^3*d^2 - 2*c^2*d*e)*a*b^2*x)*log(c*x + 1)^2 - (4*a*b^2*c^3*e^2*x^3 + 2*(6*a*b^2*c^3*d*e + b^3*c^2*e^2)*x^2 + 3*(b^3*c^3*e^2*x^3 - b^3*c^2*d^2 + (2*c^3*d*e - c^2*e^2)*b^3*x^2 + (c^3*d^2 - 2*c^2*d*e)*b^3*x)*log(c*x + 1)^2 + 12*(a*b^2*c^3*d^2 + b^3*c^2*d*e)*x - 2*(6*a*b^2*c^2*d^2 - (3*c^2*d^2 - 3*c*d*e + e^2)*b^3 - (6*a*b^2*c^3*e^2 + b^3*c^3*e^2)*x^3 - 3*(b^3*c^3*d*e + 2*(2*c^3*d*e - c^2*e^2)*a*b^2)*x^2 - 3*(b^3*c^3*d^2 + 2*(c^3*d^2 - 2*c^2*d*e)*a*b^2)*x)*log(c*x + 1))/c^3*x - c^2), x)`

3.16.8 Giac [F]

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx))^3 dx = \int (ex + d)^2 (b \operatorname{artanh}(cx) + a)^3 dx$$

input `integrate((e*x+d)^2*(a+b*arctanh(c*x))^3,x, algorithm="giac")`

output `integrate((e*x + d)^2*(b*arctanh(c*x) + a)^3, x)`

3.16.9 Mupad [F(-1)]

Timed out.

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx))^3 dx = \int (a + b \operatorname{atanh}(cx))^3 (d + ex)^2 dx$$

input `int((a + b*atanh(c*x))^3*(d + e*x)^2,x)`

output `int((a + b*atanh(c*x))^3*(d + e*x)^2, x)`

3.17 $\int (d + ex)(a + \operatorname{barctanh}(cx))^3 dx$

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3.17.1 Optimal result

Integrand size = 16, antiderivative size = 244

$$\begin{aligned}
 \int (d + ex)(a + \operatorname{barctanh}(cx))^3 dx = & \frac{3be(a + \operatorname{barctanh}(cx))^2}{2c^2} + \frac{3bex(a + \operatorname{barctanh}(cx))^2}{2c} \\
 & + \frac{d(a + \operatorname{barctanh}(cx))^3}{c} \\
 & - \frac{\left(d^2 + \frac{e^2}{c^2}\right)(a + \operatorname{barctanh}(cx))^3}{2e} \\
 & + \frac{(d + ex)^2(a + \operatorname{barctanh}(cx))^3}{2e} \\
 & - \frac{3b^2e(a + \operatorname{barctanh}(cx)) \log\left(\frac{2}{1-cx}\right)}{c^2} \\
 & - \frac{3bd(a + \operatorname{barctanh}(cx))^2 \log\left(\frac{2}{1-cx}\right)}{c} \\
 & - \frac{3b^3e \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{2c^2} \\
 & - \frac{3b^2d(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{c} \\
 & + \frac{3b^3d \operatorname{PolyLog}\left(3, 1 - \frac{2}{1-cx}\right)}{2c}
 \end{aligned}$$

output $\frac{3}{2}b^2e^2(a+b\operatorname{arctanh}(cx))^2/c^2 + \frac{3}{2}b^2e^2x(a+b\operatorname{arctanh}(cx))^2/c + d(a+b\operatorname{arctanh}(cx))^3/c - \frac{1}{2}(d^2+e^2/c^2)(a+b\operatorname{arctanh}(cx))^3/e + \frac{1}{2}(e^2x+d)^2(a+b\operatorname{arctanh}(cx))^3/e - 3b^2e^2(a+b\operatorname{arctanh}(cx))\ln(2/(-cx+1))/c^2 - 3b^2d(a+b\operatorname{arctanh}(cx))^2\ln(2/(-cx+1))/c - 3/2b^3e^2\operatorname{polylog}(2, 1-2/(-cx+1))/c^2 - 3b^2d(a+b\operatorname{arctanh}(cx))\operatorname{polylog}(2, 1-2/(-cx+1))/c + 3/2b^3d\operatorname{polylog}(3, 1-2/(-cx+1))/c$

3.17.2 Mathematica [A] (verified)

Time = 0.72 (sec) , antiderivative size = 331, normalized size of antiderivative = 1.36

$$\int (d+ex)(a+b\operatorname{arctanh}(cx))^3 dx$$

$$= \frac{2a^2c(2acd+3be)x + 2a^3c^2ex^2 + 6a^2bc^2x(2d+ex)\operatorname{arctanh}(cx) + 3a^2b(2cd+e)\log(1-cx) + 3a^2b(2cd -$$

input `Integrate[(d + e*x)*(a + b*ArcTanh[c*x])^3,x]`

output $(2a^2c(2ac*d + 3b^2e)x + 2a^3c^2e^2x^2 + 6a^2b^2c^2x(2d + e)\operatorname{ArcTanh}[c*x] + 3a^2b^2(2c*d + e)\operatorname{Log}[1 - c*x] + 3a^2b^2(2c*d - e)\operatorname{Log}[1 + c*x] + 6a^2b^2e^2(2c*x\operatorname{ArcTanh}[c*x] + (-1 + c^2x^2)\operatorname{ArcTanh}[c*x]^2 + \operatorname{Log}[1 - c^2x^2]) - 2b^3e^2(\operatorname{ArcTanh}[c*x]*((3 - 3c*x)\operatorname{ArcTanh}[c*x] + (1 - c^2x^2)\operatorname{ArcTanh}[c*x]^2 + 6\operatorname{Log}[1 + E^{-2\operatorname{ArcTanh}[c*x]})]) - 3\operatorname{PolyLog}[2, -E^{-2\operatorname{ArcTanh}[c*x]})] + 12a^2b^2c*d(\operatorname{ArcTanh}[c*x]*((-1 + c*x)\operatorname{ArcTanh}[c*x] - 2\operatorname{Log}[1 + E^{-2\operatorname{ArcTanh}[c*x]})]) + \operatorname{PolyLog}[2, -E^{-2\operatorname{ArcTanh}[c*x]})] + 4b^3c*d(\operatorname{ArcTanh}[c*x]^2*(-1 + c*x)\operatorname{ArcTanh}[c*x] - 3\operatorname{Log}[1 + E^{-2\operatorname{ArcTanh}[c*x]})]) + 3\operatorname{ArcTanh}[c*x]*\operatorname{PolyLog}[2, -E^{-2\operatorname{ArcTanh}[c*x]})] + (3\operatorname{PolyLog}[3, -E^{-2\operatorname{ArcTanh}[c*x]})])/2)/(4c^2)$

3.17.3 Rubi [A] (verified)

Time = 0.80 (sec) , antiderivative size = 259, normalized size of antiderivative = 1.06, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.125$, Rules used = {6480, 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.

3.17. $\int (d+ex)(a+b\operatorname{arctanh}(cx))^3 dx$

$$\begin{aligned}
 & \int (d + ex)(a + \operatorname{barctanh}(cx))^3 dx \\
 & \quad \downarrow \text{6480} \\
 & \frac{(d + ex)^2(a + \operatorname{barctanh}(cx))^3}{2e} - \frac{3bc \int \left(\frac{(d^2c^2 + 2dexc^2 + e^2)(a + \operatorname{barctanh}(cx))^2}{c^2(1 - c^2x^2)} - \frac{e^2(a + \operatorname{barctanh}(cx))^2}{c^2} \right) dx}{2e} \\
 & \quad \downarrow \text{2009} \\
 & \frac{(d + ex)^2(a + \operatorname{barctanh}(cx))^3}{2e} - \\
 & \frac{3bc \left(-\frac{e^2(a + \operatorname{barctanh}(cx))^2}{c^3} + \frac{2be^2 \log\left(\frac{2}{1 - cx}\right)(a + \operatorname{barctanh}(cx))}{c^3} + \frac{2bde \operatorname{PolyLog}\left(2, 1 - \frac{2}{1 - cx}\right)(a + \operatorname{barctanh}(cx))}{c^2} - \frac{2de(a + \operatorname{barctanh}(cx))}{3bc^2} \right)}{2e}
 \end{aligned}$$

input `Int[(d + e*x)*(a + b*ArcTanh[c*x])^3,x]`

output `((d + e*x)^2*(a + b*ArcTanh[c*x])^3)/(2*e) - (3*b*c*(-((e^2*(a + b*ArcTanh[c*x])^2)/c^3) - (e^2*x*(a + b*ArcTanh[c*x])^2)/c^2 - (2*d*e*(a + b*ArcTanh[c*x])^3)/(3*b*c^2) + ((c^2*d^2 + e^2)*(a + b*ArcTanh[c*x])^3)/(3*b*c^3) + (2*b*e^2*(a + b*ArcTanh[c*x])*Log[2/(1 - c*x)])/c^3 + (2*d*e*(a + b*ArcTanh[c*x])^2*Log[2/(1 - c*x)])/c^2 + (b^2*e^2*PolyLog[2, 1 - 2/(1 - c*x)])/c^3 + (2*b*d*e*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - 2/(1 - c*x)])/c^2 - (b^2*d*e*PolyLog[3, 1 - 2/(1 - c*x)]/c^2)/(2*e)`

3.17.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6480 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.)^p*((d_) + (e_.)*(x_))^(q_.), x_Symbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])^p/(e*(q + 1))), x] - Simp[b*c*(p/(e*(q + 1))) Int[ExpandIntegrand[(a + b*ArcTanh[c*x])^(p - 1), (d + e*x)^(q + 1)/(1 - c^2*x^2), x], x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 1] && IntegerQ[q] && NeQ[q, -1]`

3.17.4 Maple [C] (warning: unable to verify)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 3.43 (sec) , antiderivative size = 6324, normalized size of antiderivative = 25.92

method	result	size
parts	Expression too large to display	6324
derivativedivides	Expression too large to display	6333
default	Expression too large to display	6333

input `int((e*x+d)*(a+b*arctanh(c*x))^3,x,method=_RETURNVERBOSE)`

output `result too large to display`

3.17.5 Fricas [F]

$$\int (d + ex)(a + b \operatorname{arctanh}(cx))^3 dx = \int (ex + d)(b \operatorname{artanh}(cx) + a)^3 dx$$

input `integrate((e*x+d)*(a+b*arctanh(c*x))^3,x, algorithm="fricas")`

output `integral(a^3*e*x + a^3*d + (b^3*e*x + b^3*d)*arctanh(c*x)^3 + 3*(a*b^2*e*x + a*b^2*d)*arctanh(c*x)^2 + 3*(a^2*b*e*x + a^2*b*d)*arctanh(c*x), x)`

3.17.6 Sympy [F]

$$\int (d + ex)(a + b \operatorname{arctanh}(cx))^3 dx = \int (a + b \operatorname{atanh}(cx))^3 (d + ex) dx$$

input `integrate((e*x+d)*(a+b*atanh(c*x))**3,x)`

output `Integral((a + b*atanh(c*x))**3*(d + e*x), x)`

3.17.7 Maxima [F]

$$\int (d + ex)(a + b \operatorname{arctanh}(cx))^3 dx = \int (ex + d)(b \operatorname{artanh}(cx) + a)^3 dx$$

input `integrate((e*x+d)*(a+b*arctanh(c*x))^3,x, algorithm="maxima")`

output `1/2*a^3*e*x^2 + 3/4*(2*x^2*arctanh(c*x) + c*(2*x/c^2 - log(c*x + 1)/c^3 + log(c*x - 1)/c^3))*a^2*b*e + a^3*d*x + 3/2*(2*c*x*arctanh(c*x) + log(-c^2*x^2 + 1))*a^2*b*d/c - 1/16*((b^3*c^2*e*x^2 + 2*b^3*c^2*d*x - (2*c*d + e)*b^3)*log(-c*x + 1)^3 - 3*(2*a*b^2*c^2*e*x^2 + 2*(2*a*b^2*c^2*d + b^3*c*e)*x + (b^3*c^2*e*x^2 + 2*b^3*c^2*d*x + (2*c*d - e)*b^3)*log(c*x + 1))*log(-c*x + 1)^2)/c^2 - integrate(-1/8*((b^3*c^2*e*x^2 - b^3*c*d + (c^2*d - c*e)*b^3*x)*log(c*x + 1)^3 + 6*(a*b^2*c^2*e*x^2 - a*b^2*c*d + (c^2*d - c*e)*a*b^2*x)*log(c*x + 1)^2 - 3*(2*a*b^2*c^2*e*x^2 + (b^3*c^2*e*x^2 - b^3*c*d + (c^2*d - c*e)*b^3*x)*log(c*x + 1)^2 + 2*(2*a*b^2*c^2*d + b^3*c*e)*x - (4*a*b^2*c*d - (2*c*d - e)*b^3 - (4*a*b^2*c^2*e + b^3*c^2*e)*x^2 - 2*(b^3*c^2*d + 2*(c^2*d - c*e)*a*b^2)*x)*log(c*x + 1))*log(-c*x + 1))/(c^2*x - c), x)`

3.17.8 Giac [F]

$$\int (d + ex)(a + b \operatorname{arctanh}(cx))^3 dx = \int (ex + d)(b \operatorname{artanh}(cx) + a)^3 dx$$

input `integrate((e*x+d)*(a+b*arctanh(c*x))^3,x, algorithm="giac")`

output `integrate((e*x + d)*(b*arctanh(c*x) + a)^3, x)`

3.17.9 Mupad [F(-1)]

Timed out.

$$\int (d + ex)(a + b \operatorname{arctanh}(cx))^3 dx = \int (a + b \operatorname{atanh}(cx))^3 (d + ex) dx$$

input `int((a + b*atanh(c*x))^3*(d + e*x),x)`

output `int((a + b*atanh(c*x))^3*(d + e*x), x)`

3.18 $\int \frac{(a+b\operatorname{arctanh}(cx))^3}{d+ex} dx$

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3.18.1 Optimal result

Integrand size = 18, antiderivative size = 272

$$\int \frac{(a + b\operatorname{arctanh}(cx))^3}{d + ex} dx = -\frac{(a + b\operatorname{arctanh}(cx))^3 \log\left(\frac{2}{1+cx}\right)}{e} + \frac{(a + b\operatorname{arctanh}(cx))^3 \log\left(\frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{e} + \frac{3b(a + b\operatorname{arctanh}(cx))^2 \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{2e} - \frac{3b(a + b\operatorname{arctanh}(cx))^2 \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{2e} + \frac{3b^2(a + b\operatorname{arctanh}(cx)) \operatorname{PolyLog}\left(3, 1 - \frac{2}{1+cx}\right)}{2e} - \frac{3b^2(a + b\operatorname{arctanh}(cx)) \operatorname{PolyLog}\left(3, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{2e} + \frac{3b^3 \operatorname{PolyLog}\left(4, 1 - \frac{2}{1+cx}\right)}{4e} - \frac{3b^3 \operatorname{PolyLog}\left(4, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{4e}$$

output

```
-(a+b*arctanh(c*x))^3*ln(2/(c*x+1))/e+(a+b*arctanh(c*x))^3*ln(2*c*(e*x+d)/(c*d+e)/(c*x+1))/e+3/2*b*(a+b*arctanh(c*x))^2*polylog(2,1-2/(c*x+1))/e-3/2*b*(a+b*arctanh(c*x))^2*polylog(2,1-2*c*(e*x+d)/(c*d+e)/(c*x+1))/e+3/2*b^2*(a+b*arctanh(c*x))*polylog(3,1-2/(c*x+1))/e-3/2*b^2*(a+b*arctanh(c*x))*polylog(3,1-2*c*(e*x+d)/(c*d+e)/(c*x+1))/e+3/4*b^3*polylog(4,1-2/(c*x+1))/e-3/4*b^3*polylog(4,1-2*c*(e*x+d)/(c*d+e)/(c*x+1))/e
```

3.18.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 28.17 (sec) , antiderivative size = 2160, normalized size of antiderivative = 7.94

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{d + ex} dx = \text{Result too large to show}$$

input `Integrate[(a + b*ArcTanh[c*x])^3/(d + e*x),x]`

output `(a^3*Log[d + e*x])/e - ((3*I)*a^2*b*(I*ArcTanh[c*x]*(-Log[1/Sqrt[1 - c^2*x^2]] + Log[I*Sinh[ArcTanh[(c*d)/e] + ArcTanh[c*x]]]) + ((-I)*(I*ArcTanh[(c*d)/e] + I*ArcTanh[c*x])^2 - (I/4)*(Pi - (2*I)*ArcTanh[c*x])^2 + 2*(I*ArcTanh[(c*d)/e] + I*ArcTanh[c*x])*Log[1 - E^((2*I)*(I*ArcTanh[(c*d)/e] + I*ArcTanh[c*x]))] + (Pi - (2*I)*ArcTanh[c*x])*Log[1 - E^(I*(Pi - (2*I)*ArcTanh[c*x]))] - (Pi - (2*I)*ArcTanh[c*x])*Log[2*Sin[(Pi - (2*I)*ArcTanh[c*x])/2]] - 2*(I*ArcTanh[(c*d)/e] + I*ArcTanh[c*x])*Log[(2*I)*Sinh[ArcTanh[(c*d)/e] + ArcTanh[c*x]]) - I*PolyLog[2, E^((2*I)*(I*ArcTanh[(c*d)/e] + I*ArcTanh[c*x]))] - I*PolyLog[2, E^(I*(Pi - (2*I)*ArcTanh[c*x]))]/2))/e + (a*b^2*(-8*c*d*ArcTanh[c*x]^3 + 4*e*ArcTanh[c*x]^3 - (4*Sqrt[1 - (c^2*d^2)/e^2]*e*ArcTanh[c*x]^3)/E^ArcTanh[(c*d)/e] - 6*c*d*ArcTanh[c*x]^2*Log[1 + E^(-2*ArcTanh[c*x])] - 6*c*d*ArcTanh[c*x]^2*Log[1 - (Sqrt[c*d + e]*E^ArcTanh[c*x])/Sqrt[-(c*d) + e]] - 6*c*d*ArcTanh[c*x]^2*Log[1 + (Sqrt[c*d + e]*E^ArcTanh[c*x])/Sqrt[-(c*d) + e]] - (6*I)*c*d*Pi*ArcTanh[c*x]*Log[(1 + E^(2*ArcTanh[c*x]))/(2*E^ArcTanh[c*x])] + 6*c*d*ArcTanh[c*x]^2*Log[1 - E^(ArcTanh[(c*d)/e] + ArcTanh[c*x])] + 6*c*d*ArcTanh[c*x]^2*Log[1 + E^(ArcTanh[(c*d)/e] + ArcTanh[c*x])] + 6*c*d*ArcTanh[c*x]^2*Log[1 - E^(2*(ArcTanh[(c*d)/e] + ArcTanh[c*x]))] + 12*c*d*ArcTanh[(c*d)/e]*ArcTanh[c*x]*Log[(I/2)*E^(-ArcTanh[(c*d)/e] - ArcTanh[c*x])*(-1 + E^(2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])))] + 6*c*d*ArcTanh[c*x]^2*Log[(e*(-1 + E^(2*ArcTanh[c*x])) + c*d*(1 + E^...`

3.18.3 Rubi [A] (verified)

Time = 0.36 (sec) , antiderivative size = 272, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.056$, Rules used = {6476}

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.

3.18. $\int \frac{(a+b\operatorname{arctanh}(cx))^3}{d+ex} dx$

$$\begin{aligned}
& \int \frac{(a + \operatorname{barctanh}(cx))^3}{d + ex} dx \\
& \quad \downarrow \text{6476} \\
& -\frac{3b^2(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(3, 1 - \frac{2c(d+ex)}{(cd+e)(cx+1)}\right)}{2e} + \\
& \quad \frac{3b^2 \operatorname{PolyLog}\left(3, 1 - \frac{2}{cx+1}\right) (a + \operatorname{barctanh}(cx))}{2e} - \\
& \frac{3b(a + \operatorname{barctanh}(cx))^2 \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(cx+1)}\right)}{2e} + \frac{(a + \operatorname{barctanh}(cx))^3 \log\left(\frac{2c(d+ex)}{(cx+1)(cd+e)}\right)}{e} + \\
& \quad \frac{3b \operatorname{PolyLog}\left(2, 1 - \frac{2}{cx+1}\right) (a + \operatorname{barctanh}(cx))^2}{2e} - \frac{\log\left(\frac{2}{cx+1}\right) (a + \operatorname{barctanh}(cx))^3}{e} - \\
& \quad \frac{3b^3 \operatorname{PolyLog}\left(4, 1 - \frac{2c(d+ex)}{(cd+e)(cx+1)}\right)}{4e} + \frac{3b^3 \operatorname{PolyLog}\left(4, 1 - \frac{2}{cx+1}\right)}{4e}
\end{aligned}$$

input `Int[(a + b*ArcTanh[c*x])^3/(d + e*x), x]`

output `-((a + b*ArcTanh[c*x])^3*Log[2/(1 + c*x)]/e) + ((a + b*ArcTanh[c*x])^3*Log[(2*c*(d + e*x))/((c*d + e)*(1 + c*x))]/e) + (3*b*(a + b*ArcTanh[c*x])^2*PolyLog[2, 1 - 2/(1 + c*x)]/(2*e) - (3*b*(a + b*ArcTanh[c*x])^2*PolyLog[2, 1 - (2*c*(d + e*x))/((c*d + e)*(1 + c*x))]/(2*e) + (3*b^2*(a + b*ArcTanh[c*x])*PolyLog[3, 1 - 2/(1 + c*x)]/(2*e) - (3*b^2*(a + b*ArcTanh[c*x])*PolyLog[3, 1 - (2*c*(d + e*x))/((c*d + e)*(1 + c*x))]/(2*e) + (3*b^3*PolyLog[4, 1 - 2/(1 + c*x)]/(4*e) - (3*b^3*PolyLog[4, 1 - (2*c*(d + e*x))/((c*d + e)*(1 + c*x))]/(4*e)`

3.18.3.1 Defintions of rubi rules used

rule 6476 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.)^3/((d_) + (e_.)*(x_)), x_Symbol] := Simp[(-(a + b*ArcTanh[c*x])^3)*(Log[2/(1 + c*x)]/e), x] + (Simp[(a + b*ArcTanh[c*x])^3*(Log[2*c*((d + e*x))/((c*d + e)*(1 + c*x))])/e), x] + Simp[3*b*(a + b*ArcTanh[c*x])^2*(PolyLog[2, 1 - 2/(1 + c*x)]/(2*e)), x] - Simp[3*b*(a + b*ArcTanh[c*x])^2*(PolyLog[2, 1 - 2*c*((d + e*x))/((c*d + e)*(1 + c*x))]/(2*e)), x] + Simp[3*b^2*(a + b*ArcTanh[c*x])*(PolyLog[3, 1 - 2/(1 + c*x)]/(2*e)), x] - Simp[3*b^2*(a + b*ArcTanh[c*x])*(PolyLog[3, 1 - 2*c*((d + e*x))/((c*d + e)*(1 + c*x))]/(2*e)), x] + Simp[3*b^3*(PolyLog[4, 1 - 2/(1 + c*x)]/(4*e)), x] - Simp[3*b^3*(PolyLog[4, 1 - 2*c*((d + e*x))/((c*d + e)*(1 + c*x))]/(4*e)), x] /; FreeQ[{a, b, c, d, e}, x] && NeQ[c^2*d^2 - e^2, 0]`

3.18.4 Maple [C] (warning: unable to verify)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 24.21 (sec) , antiderivative size = 2160, normalized size of antiderivative = 7.94

method	result	size
derivativdivides	Expression too large to display	2160
default	Expression too large to display	2160
parts	Expression too large to display	2164

```
input int((a+b*arctanh(c*x))^3/(e*x+d),x,method=_RETURNVERBOSE)
```

```
output 1/c*(a^3*c*ln(c*e*x+c*d)/e+b^3*c*(ln(c*e*x+c*d)/e*arctanh(c*x)^3-3/e*(1/3*
arctanh(c*x)^3*ln(d*c*(1+(c*x+1)^2/(-c^2*x^2+1))+e*((c*x+1)^2/(-c^2*x^2+1)
-1))-1/6*I*Pi*csgn(I*(d*c*(1-(c*x+1)^2/(c^2*x^2-1))+e*(-(c*x+1)^2/(c^2*x^2
-1)-1))/(1-(c*x+1)^2/(c^2*x^2-1)))*(csgn(I*(d*c*(1-(c*x+1)^2/(c^2*x^2-1))+
e*(-(c*x+1)^2/(c^2*x^2-1)-1)))*csgn(I/(1-(c*x+1)^2/(c^2*x^2-1)))-csgn(I*(d
*c*(1-(c*x+1)^2/(c^2*x^2-1))+e*(-(c*x+1)^2/(c^2*x^2-1)-1))/(1-(c*x+1)^2/(c
^2*x^2-1)))*csgn(I/(1-(c*x+1)^2/(c^2*x^2-1)))-csgn(I*(d*c*(1-(c*x+1)^2/(c^
2*x^2-1))+e*(-(c*x+1)^2/(c^2*x^2-1)-1)))*csgn(I*(d*c*(1-(c*x+1)^2/(c^2*x^2
-1))+e*(-(c*x+1)^2/(c^2*x^2-1)-1))/(1-(c*x+1)^2/(c^2*x^2-1)))+csgn(I*(d*c*
(1-(c*x+1)^2/(c^2*x^2-1))+e*(-(c*x+1)^2/(c^2*x^2-1)-1))/(1-(c*x+1)^2/(c^2*
x^2-1)))^2)*arctanh(c*x)^3+1/2*arctanh(c*x)^2*polylog(2,-(c*x+1)^2/(-c^2*x
^2+1))-1/2*arctanh(c*x)*polylog(3,-(c*x+1)^2/(-c^2*x^2+1))+1/4*polylog(4,-
(c*x+1)^2/(-c^2*x^2+1))-1/3*e/(c*d+e)*arctanh(c*x)^3*ln(1-(c*d+e)*(c*x+1)^
2/(-c^2*x^2+1)/(-c*d+e))-1/2*e/(c*d+e)*arctanh(c*x)^2*polylog(2,(c*d+e)*(c
*x+1)^2/(-c^2*x^2+1)/(-c*d+e))+1/2*e/(c*d+e)*arctanh(c*x)*polylog(3,(c*d+e
)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))-1/4*e/(c*d+e)*polylog(4,(c*d+e)*(c*x+1)
^2/(-c^2*x^2+1)/(-c*d+e))-1/3*d*c/(c*d+e)*arctanh(c*x)^3*ln(1-(c*d+e)*(c*x
+1)^2/(-c^2*x^2+1)/(-c*d+e))-1/2*d*c/(c*d+e)*arctanh(c*x)^2*polylog(2,(c*d
+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))+1/2*d*c/(c*d+e)*arctanh(c*x)*polylog(
3,(c*d+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))-1/4*d*c/(c*d+e)*polylog(4,(c...
```

3.18.5 Fricas [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{d + ex} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^3}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x))^3/(e*x+d),x, algorithm="fricas")`

output `integral((b^3*arctanh(c*x)^3 + 3*a*b^2*arctanh(c*x)^2 + 3*a^2*b*arctanh(c*x) + a^3)/(e*x + d), x)`

3.18.6 Sympy [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{d + ex} dx = \int \frac{(a + b \operatorname{atanh}(cx))^3}{d + ex} dx$$

input `integrate((a+b*atanh(c*x))**3/(e*x+d),x)`

output `Integral((a + b*atanh(c*x))**3/(d + e*x), x)`

3.18.7 Maxima [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{d + ex} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^3}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x))^3/(e*x+d),x, algorithm="maxima")`

output `a^3*log(e*x + d)/e + integrate(1/8*b^3*(log(c*x + 1) - log(-c*x + 1))^3/(e*x + d) + 3/4*a*b^2*(log(c*x + 1) - log(-c*x + 1))^2/(e*x + d) + 3/2*a^2*b*(log(c*x + 1) - log(-c*x + 1))/(e*x + d), x)`

3.18.8 Giac [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{d + ex} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^3}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x))^3/(e*x+d),x, algorithm="giac")`

output `integrate((b*arctanh(c*x) + a)^3/(e*x + d), x)`

3.18.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{d + ex} dx = \int \frac{(a + b \operatorname{atanh}(cx))^3}{d + ex} dx$$

input `int((a + b*atanh(c*x))^3/(d + e*x),x)`

output `int((a + b*atanh(c*x))^3/(d + e*x), x)`

$$3.19 \quad \int \frac{(a+b\operatorname{arctanh}(cx))^3}{(d+ex)^2} dx$$

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3.19.1 Optimal result

Integrand size = 18, antiderivative size = 517

$$\begin{aligned}
 \int \frac{(a + \operatorname{barctanh}(cx))^3}{(d + ex)^2} dx = & -\frac{(a + \operatorname{barctanh}(cx))^3}{e(d + ex)} + \frac{3bc(a + \operatorname{barctanh}(cx))^2 \log\left(\frac{2}{1-cx}\right)}{2e(cd + e)} \\
 & - \frac{3bc(a + \operatorname{barctanh}(cx))^2 \log\left(\frac{2}{1+cx}\right)}{2(cd - e)e} \\
 & + \frac{3bc(a + \operatorname{barctanh}(cx))^2 \log\left(\frac{2}{1+cx}\right)}{c^2d^2 - e^2} \\
 & - \frac{3bc(a + \operatorname{barctanh}(cx))^2 \log\left(\frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{c^2d^2 - e^2} \\
 & + \frac{3b^2c(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{2e(cd + e)} \\
 & + \frac{3b^2c(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{2(cd - e)e} \\
 & - \frac{3b^2c(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{c^2d^2 - e^2} \\
 & + \frac{3b^2c(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{c^2d^2 - e^2} \\
 & - \frac{3b^3c \operatorname{PolyLog}\left(3, 1 - \frac{2}{1-cx}\right)}{4e(cd + e)} + \frac{3b^3c \operatorname{PolyLog}\left(3, 1 - \frac{2}{1+cx}\right)}{4(cd - e)e} \\
 & - \frac{3b^3c \operatorname{PolyLog}\left(3, 1 - \frac{2}{1+cx}\right)}{2(c^2d^2 - e^2)} \\
 & + \frac{3b^3c \operatorname{PolyLog}\left(3, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{2(c^2d^2 - e^2)}
 \end{aligned}$$

output

```

-(a+b*arctanh(c*x))^3/e/(e*x+d)+3/2*b*c*(a+b*arctanh(c*x))^2*ln(2/(-c*x+1))
)/e/(c*d+e)-3/2*b*c*(a+b*arctanh(c*x))^2*ln(2/(c*x+1))/(c*d-e)/e+3*b*c*(a
+b*arctanh(c*x))^2*ln(2/(c*x+1))/(c^2*d^2-e^2)-3*b*c*(a+b*arctanh(c*x))^2*ln
(2*c*(e*x+d)/(c*d+e)/(c*x+1))/(c^2*d^2-e^2)+3/2*b^2*c*(a+b*arctanh(c*x))*
polylog(2,1-2/(-c*x+1))/e/(c*d+e)+3/2*b^2*c*(a+b*arctanh(c*x))*polylog(2,1
-2/(c*x+1))/(c*d-e)/e-3*b^2*c*(a+b*arctanh(c*x))*polylog(2,1-2/(c*x+1))/(c
^2*d^2-e^2)+3*b^2*c*(a+b*arctanh(c*x))*polylog(2,1-2*c*(e*x+d)/(c*d+e)/(c*
x+1))/(c^2*d^2-e^2)-3/4*b^3*c*polylog(3,1-2/(-c*x+1))/e/(c*d+e)+3/4*b^3*c*
polylog(3,1-2/(c*x+1))/(c*d-e)/e-3/2*b^3*c*polylog(3,1-2/(c*x+1))/(c^2*d^2
-e^2)+3/2*b^3*c*polylog(3,1-2*c*(e*x+d)/(c*d+e)/(c*x+1))/(c^2*d^2-e^2)

```


3.19.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 12.14 (sec) , antiderivative size = 1107, normalized size of antiderivative = 2.14

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^2} dx = \text{Too large to display}$$

input `Integrate[(a + b*ArcTanh[c*x])^3/(d + e*x)^2,x]`

output `-(a^3/(e*(d + e*x))) - (3*a^2*b*ArcTanh[c*x])/(e*(d + e*x)) - (3*a^2*b*c*Log[1 - c*x])/(2*e*(c*d + e)) + (3*a^2*b*c*Log[1 + c*x])/(2*c*d*e - 2*e^2) - (3*a^2*b*c*Log[d + e*x])/(c^2*d^2 - e^2) + (3*a*b^2*(-(ArcTanh[c*x]^2/(Sqrt[1 - (c^2*d^2)/e^2])*E^ArcTanh[(c*d)/e])) + (x*ArcTanh[c*x]^2)/(d + e*x) + (c*d*(I*Pi*Log[1 + E^(2*ArcTanh[c*x])] - 2*ArcTanh[c*x]*Log[1 - E^(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])]) - I*Pi*(ArcTanh[c*x] - Log[1 - c^2*x^2]/2) - 2*ArcTanh[(c*d)/e]*(ArcTanh[c*x] + Log[1 - E^(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])]) - Log[I*Sinh[ArcTanh[(c*d)/e] + ArcTanh[c*x]]]) + PolyLog[2, E^(-2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])]))/(c^2*d^2 - e^2))/d + (b^3*((x*ArcTanh[c*x]^3)/(d + e*x) + (3*(6*c*d*ArcTanh[c*x]^3 - 2*e*ArcTanh[c*x]^3 + (4*Sqrt[1 - (c^2*d^2)/e^2])*e*ArcTanh[c*x]^3)/E^ArcTanh[(c*d)/e] + (6*I)*c*d*Pi*ArcTanh[c*x]*Log[(E^(-ArcTanh[c*x]) + E^ArcTanh[c*x])/2] + 6*c*d*ArcTanh[c*x]^2*Log[1 - (Sqrt[c*d + e]*E^ArcTanh[c*x])/Sqrt[-(c*d) + e]]) + 6*c*d*ArcTanh[c*x]^2*Log[1 + (Sqrt[c*d + e]*E^ArcTanh[c*x])/Sqrt[-(c*d) + e]]) - 6*c*d*ArcTanh[c*x]^2*Log[1 - E^(ArcTanh[(c*d)/e] + ArcTanh[c*x])]) - 6*c*d*ArcTanh[c*x]^2*Log[1 + E^(ArcTanh[(c*d)/e] + ArcTanh[c*x])]) - 6*c*d*ArcTanh[c*x]^2*Log[1 - E^(2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])]) - 12*c*d*ArcTanh[(c*d)/e]*ArcTanh[c*x]*Log[(I/2)*E^(-ArcTanh[(c*d)/e] - ArcTanh[c*x])*(-1 + E^(2*(ArcTanh[(c*d)/e] + ArcTanh[c*x])])]) - 6*c*d*ArcTanh[c*x]^2*Log[(e*(-1 + E^(2*ArcTanh[c*x])) + c*d*(1 + E^(2*ArcTanh[c*x])))]/(2...`

3.19.3 Rubi [A] (verified)

Time = 0.88 (sec) , antiderivative size = 487, normalized size of antiderivative = 0.94, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {6480, 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.

3.19. $\int \frac{(a+b\operatorname{arctanh}(cx))^3}{(d+ex)^2} dx$

$$\begin{aligned}
 & \int \frac{(a + \operatorname{barctanh}(cx))^3}{(d + ex)^2} dx \\
 & \quad \downarrow \text{6480} \\
 & \frac{3bc \int \left(\frac{c(a + \operatorname{barctanh}(cx))^2}{2(cd+e)(1-cx)} + \frac{c(a + \operatorname{barctanh}(cx))^2}{2(cd-e)(cx+1)} - \frac{e^2(a + \operatorname{barctanh}(cx))^2}{(cd-e)(cd+e)(d+ex)} \right) dx}{e} - \frac{(a + \operatorname{barctanh}(cx))^3}{e(d + ex)} \\
 & \quad \downarrow \text{2009} \\
 & \frac{3bc \left(-\frac{be \operatorname{PolyLog}\left(2, 1 - \frac{2}{cx+1}\right)(a + \operatorname{barctanh}(cx))}{c^2 d^2 - e^2} + \frac{be(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(cx+1)}\right)}{c^2 d^2 - e^2} + \frac{e \log\left(\frac{2}{cx+1}\right)(a + \operatorname{barctanh}(cx))}{c^2 d^2 - e^2} \right)}{e} \\
 & \quad \frac{(a + \operatorname{barctanh}(cx))^3}{e(d + ex)}
 \end{aligned}$$

input `Int[(a + b*ArcTanh[c*x])^3/(d + e*x)^2,x]`

output

```

-((a + b*ArcTanh[c*x])^3/(e*(d + e*x))) + (3*b*c*((a + b*ArcTanh[c*x])^2*
Log[2/(1 - c*x)]/(2*(c*d + e)) - ((a + b*ArcTanh[c*x])^2*Log[2/(1 + c*x)]
)/(2*(c*d - e)) + (e*(a + b*ArcTanh[c*x])^2*Log[2/(1 + c*x)]/(c^2*d^2 - e
^2) - (e*(a + b*ArcTanh[c*x])^2*Log[(2*c*(d + e*x))/((c*d + e)*(1 + c*x))]
)/(c^2*d^2 - e^2) + (b*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - 2/(1 - c*x)]/(
2*(c*d + e)) + (b*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - 2/(1 + c*x)]/(2*(c*
d - e)) - (b*e*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - 2/(1 + c*x)]/(c^2*d^2
- e^2) + (b*e*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - (2*c*(d + e*x))/((c*d +
e)*(1 + c*x))]/(c^2*d^2 - e^2) - (b^2*PolyLog[3, 1 - 2/(1 - c*x)]/(4*(c*
d + e)) + (b^2*PolyLog[3, 1 - 2/(1 + c*x)]/(4*(c*d - e)) - (b^2*e*PolyLog
[3, 1 - 2/(1 + c*x)]/(2*(c^2*d^2 - e^2)) + (b^2*e*PolyLog[3, 1 - (2*c*(d
+ e*x))/((c*d + e)*(1 + c*x))]/(2*(c^2*d^2 - e^2)))))/e

```

3.19.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6480 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_)*((d_) + (e_.)*(x_))^(q_.), x_Symbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])^p/(e*(q + 1))), x] - Simp[b*c*(p/(e*(q + 1))) Int[ExpandIntegrand[(a + b*ArcTanh[c*x])^(p - 1), (d + e*x)^(q + 1)/(1 - c^2*x^2), x], x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 1] && IntegerQ[q] && NeQ[q, -1]`

3.19.4 Maple [C] (warning: unable to verify)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 6.14 (sec) , antiderivative size = 3154, normalized size of antiderivative = 6.10

method	result	size
derivativedivides	Expression too large to display	3154
default	Expression too large to display	3154
parts	Expression too large to display	3162

input `int((a+b*arctanh(c*x))^3/(e*x+d)^2,x,method=_RETURNVERBOSE)`

output `1/c*(-a^3*c^2/(c*e*x+c*d)/e+b^3*c^2*(-1/(c*e*x+c*d)/e*arctanh(c*x)^3+3/e*(-1/2*I/(c*d+e)/(c*d-e)*Pi*e*arctanh(c*x)^2-1/(c*d+e)/(c*d-e)*arctanh(c*x)^2*ln(2)*e+1/(c*d+e)/(c*d-e)*ln(d*c*(1+(c*x+1)^2/(-c^2*x^2+1))+e*((c*x+1)^2/(-c^2*x^2+1)-1))*e*arctanh(c*x)^2-e^2/(c*d+e)^2/(c*d-e)*arctanh(c*x)^2*ln(1-(c*d+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))-e^2/(c*d+e)^2/(c*d-e)*arctanh(c*x)*polylog(2,(c*d+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))-arctanh(c*x)^2*e/(c*d+e)/(c*d-e)*ln(c*e*x+c*d)+1/3/(c*d-e)*arctanh(c*x)^3+1/4*I/(c*d+e)/(c*d-e)*Pi*c*d*csgn(I/(1-(c*x+1)^2/(c^2*x^2-1)))*csgn(I*(c*x+1)^2/(c^2*x^2-1))*csgn(I*(c*x+1)^2/(c^2*x^2-1)/(1-(c*x+1)^2/(c^2*x^2-1)))*arctanh(c*x)^2+1/2*e/(c*d+e)^2/(c*d-e)*d*c*polylog(3,(c*d+e)*(c*x+1)^2/(-c^2*x^2+1)/(-c*d+e))+1/4*I/(c*d+e)/(c*d-e)*Pi*e*csgn(I*(c*x+1)^2/(c^2*x^2-1))*csgn(I*(c*x+1)^2/(c^2*x^2-1)/(1-(c*x+1)^2/(c^2*x^2-1)))^2*arctanh(c*x)^2-1/4*I/(c*d+e)/(c*d-e)*Pi*e*csgn(I/(1-(c*x+1)^2/(c^2*x^2-1)))*csgn(I*(c*x+1)^2/(c^2*x^2-1)/(1-(c*x+1)^2/(c^2*x^2-1)))^2*arctanh(c*x)^2-1/4*I/(c*d+e)/(c*d-e)*Pi*e*csgn(I*(c*x+1)/(-c^2*x^2+1)^(1/2))^2*csgn(I*(c*x+1)^2/(c^2*x^2-1))*arctanh(c*x)^2-1/4*I/(c*d+e)/(c*d-e)*Pi*c*d*csgn(I*(c*x+1)^2/(c^2*x^2-1))^3*arctanh(c*x)^2-1/4*I/(c*d+e)/(c*d-e)*Pi*c*d*csgn(I*(c*x+1)^2/(c^2*x^2-1)/(1-(c*x+1)^2/(c^2*x^2-1)))^3*arctanh(c*x)^2-1/2*I/(c*d+e)/(c*d-e)*Pi*e*csgn(I*(c*x+1)/(-c^2*x^2+1)^(1/2))*csgn(I*(c*x+1)^2/(c^2*x^2-1))^2*arctanh(c*x)^2+1/2*I/(c*d+e)/(c*d-e)*Pi*csgn(I*(d*c*(1-(c*x+1)^2/(c^2*x^2-1))+e*(-(c*x+1)...`

3.19.5 Fricas [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^2} dx = \int \frac{(b \operatorname{arctanh}(cx) + a)^3}{(ex + d)^2} dx$$

input `integrate((a+b*arctanh(c*x))^3/(e*x+d)^2,x, algorithm="fricas")`

output `integral((b^3*arctanh(c*x)^3 + 3*a*b^2*arctanh(c*x)^2 + 3*a^2*b*arctanh(c*x) + a^3)/(e^2*x^2 + 2*d*e*x + d^2), x)`

3.19.6 Sympy [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^2} dx = \int \frac{(a + b \operatorname{atanh}(cx))^3}{(d + ex)^2} dx$$

input `integrate((a+b*atanh(c*x))**3/(e*x+d)**2,x)`

output `Integral((a + b*atanh(c*x))**3/(d + e*x)**2, x)`

3.19.7 Maxima [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^2} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^3}{(ex + d)^2} dx$$

input `integrate((a+b*arctanh(c*x))^3/(e*x+d)^2,x, algorithm="maxima")`

output `3/2*(c*(log(c*x + 1)/(c*d*e - e^2) - log(c*x - 1)/(c*d*e + e^2) - 2*log(e*x + d)/(c^2*d^2 - e^2)) - 2*arctanh(c*x)/(e^2*x + d*e))*a^2*b - a^3/(e^2*x + d*e) - 1/8*(((c^2*d*e - c*e^2)*b^3*x - (c*d*e - e^2)*b^3)*log(-c*x + 1)^3 + 3*(2*(c^2*d^2 - e^2)*a*b^2 - ((c^2*d*e + c*e^2)*b^3*x + (c*d*e + e^2)*b^3)*log(c*x + 1))*log(-c*x + 1)^2)/(c^2*d^3*e - d*e^3 + (c^2*d^2*e^2 - e^4)*x) - integrate(1/8*(((c^2*d*e - c*e^2)*b^3*x - (c*d*e - e^2)*b^3)*log(c*x + 1)^3 + 6*(((c^2*d*e - c*e^2)*a*b^2*x - (c*d*e - e^2)*a*b^2)*log(c*x + 1)^2 + 3*(4*(c^2*d*e - c*e^2)*a*b^2*x + 4*(c^2*d^2 - c*d*e)*a*b^2 - ((c^2*d*e - c*e^2)*b^3*x - (c*d*e - e^2)*b^3)*log(c*x + 1)^2 - 2*(b^3*c^2*e^2*x^2 + b^3*c*d*e - 2*(c*d*e - e^2)*a*b^2 + (2*(c^2*d*e - c*e^2)*a*b^2 + (c^2*d*e + c*e^2)*b^3)*x)*log(c*x + 1))*log(-c*x + 1))/(c*d^3*e - d^2*e^2 - (c^2*d*e^3 - c*e^4)*x^3 - (2*c^2*d^2*e^2 - 3*c*d*e^3 + e^4)*x^2 - (c^2*d^3*e - 3*c*d^2*e^2 + 2*d*e^3)*x), x)`

3.19.8 Giac [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^2} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^3}{(ex + d)^2} dx$$

input `integrate((a+b*arctanh(c*x))^3/(e*x+d)^2,x, algorithm="giac")`

output `integrate((b*arctanh(c*x) + a)^3/(e*x + d)^2, x)`

3.19.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^2} dx = \int \frac{(a + b \operatorname{atanh}(cx))^3}{(d + ex)^2} dx$$

input `int((a + b*atanh(c*x))^3/(d + e*x)^2,x)`

output `int((a + b*atanh(c*x))^3/(d + e*x)^2, x)`

$$3.20 \quad \int \frac{(a+b\operatorname{arctanh}(cx))^3}{(d+ex)^3} dx$$

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3.20.1 Optimal result

Integrand size = 18, antiderivative size = 953

$$\begin{aligned}
 \int \frac{(a + \operatorname{barctanh}(cx))^3}{(d + ex)^3} dx = & \frac{3bc(a + \operatorname{barctanh}(cx))^2}{2(c^2d^2 - e^2)(d + ex)} - \frac{(a + \operatorname{barctanh}(cx))^3}{2e(d + ex)^2} \\
 & - \frac{3b^2c^2(a + \operatorname{barctanh}(cx)) \log\left(\frac{2}{1-cx}\right)}{2(cd - e)(cd + e)^2} \\
 & + \frac{3bc^2(a + \operatorname{barctanh}(cx))^2 \log\left(\frac{2}{1-cx}\right)}{4e(cd + e)^2} \\
 & - \frac{3b^2c^2e(a + \operatorname{barctanh}(cx)) \log\left(\frac{2}{1+cx}\right)}{(cd - e)^2(cd + e)^2} \\
 & + \frac{3b^2c^2(a + \operatorname{barctanh}(cx)) \log\left(\frac{2}{1+cx}\right)}{2(cd - e)^2(cd + e)} \\
 & - \frac{3bc^2(a + \operatorname{barctanh}(cx))^2 \log\left(\frac{2}{1+cx}\right)}{4(cd - e)^2e} \\
 & + \frac{3bc^3d(a + \operatorname{barctanh}(cx))^2 \log\left(\frac{2}{1+cx}\right)}{(cd - e)^2(cd + e)^2} \\
 & + \frac{3b^2c^2e(a + \operatorname{barctanh}(cx)) \log\left(\frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{(cd - e)^2(cd + e)^2} \\
 & - \frac{3bc^3d(a + \operatorname{barctanh}(cx))^2 \log\left(\frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{(cd - e)^2(cd + e)^2} \\
 & - \frac{3b^3c^2 \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{4(cd - e)(cd + e)^2} \\
 & + \frac{3b^2c^2(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right)}{4e(cd + e)^2} \\
 & + \frac{3b^3c^2e \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{2(cd - e)^2(cd + e)^2} - \frac{3b^3c^2 \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{4(cd - e)^2(cd + e)} \\
 & + \frac{3b^2c^2(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{4(cd - e)^2e} \\
 & - \frac{3b^2c^3d(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+cx}\right)}{(cd - e)^2(cd + e)^2} \\
 & - \frac{3b^3c^2e \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{2(cd - e)^2(cd + e)^2} \\
 & + \frac{3b^2c^3d(a + \operatorname{barctanh}(cx)) \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{(cd - e)^2(cd + e)^2} \\
 & - \frac{3b^3c^2 \operatorname{PolyLog}\left(3, 1 - \frac{2}{1-cx}\right)}{8e(cd + e)^2} + \frac{3b^3c^2 \operatorname{PolyLog}\left(3, 1 - \frac{2}{1+cx}\right)}{8(cd - e)^2e} \\
 & - \frac{3b^3c^3d \operatorname{PolyLog}\left(3, 1 - \frac{2}{1+cx}\right)}{2(cd - e)^2(cd + e)^2} \\
 & - \frac{3b^3c^3d \operatorname{PolyLog}\left(3, 1 - \frac{2c(d+ex)}{(cd+e)(1+cx)}\right)}{2(cd - e)^2(cd + e)^2}
 \end{aligned}$$

3.20. $\int \frac{(a + \operatorname{barctanh}(cx))^3}{(d + ex)^3} dx$

output

```

3/2*b*c*(a+b*arctanh(c*x))^2/(c^2*d^2-e^2)/(e*x+d)-1/2*(a+b*arctanh(c*x))^
3/e/(e*x+d)^2-3/2*b^2*c^2*(a+b*arctanh(c*x))*ln(2/(-c*x+1))/(c*d-e)/(c*d+e
)^2+3/4*b*c^2*(a+b*arctanh(c*x))^2*ln(2/(-c*x+1))/e/(c*d+e)^2+3/2*b^2*c^2*
(a+b*arctanh(c*x))*ln(2/(c*x+1))/(c*d-e)^2/(c*d+e)-3*b^2*c^2*e*(a+b*arctan
h(c*x))*ln(2/(c*x+1))/(c^2*d^2-e^2)^2-3/4*b*c^2*(a+b*arctanh(c*x))^2*ln(2/
(c*x+1))/(c*d-e)^2/e+3*b*c^3*d*(a+b*arctanh(c*x))^2*ln(2/(c*x+1))/(c^2*d^2
-e^2)^2+3*b^2*c^2*e*(a+b*arctanh(c*x))*ln(2*c*(e*x+d)/(c*d+e)/(c*x+1))/(c^
2*d^2-e^2)^2-3*b*c^3*d*(a+b*arctanh(c*x))^2*ln(2*c*(e*x+d)/(c*d+e)/(c*x+1
))/(c^2*d^2-e^2)^2-3/4*b^3*c^2*polylog(2,1-2/(-c*x+1))/(c*d-e)/(c*d+e)^2+3/
4*b^2*c^2*(a+b*arctanh(c*x))*polylog(2,1-2/(-c*x+1))/e/(c*d+e)^2-3/4*b^3*c
^2*polylog(2,1-2/(c*x+1))/(c*d-e)^2/(c*d+e)+3/2*b^3*c^2*e*polylog(2,1-2/(c
*x+1))/(c^2*d^2-e^2)^2+3/4*b^2*c^2*(a+b*arctanh(c*x))*polylog(2,1-2/(c*x+1
))/(c*d-e)^2/e-3*b^2*c^3*d*(a+b*arctanh(c*x))*polylog(2,1-2/(c*x+1))/(c^2*
d^2-e^2)^2-3/2*b^3*c^2*e*polylog(2,1-2*c*(e*x+d)/(c*d+e)/(c*x+1))/(c^2*d^2
-e^2)^2+3*b^2*c^3*d*(a+b*arctanh(c*x))*polylog(2,1-2*c*(e*x+d)/(c*d+e)/(c*
x+1))/(c^2*d^2-e^2)^2-3/8*b^3*c^2*polylog(3,1-2/(-c*x+1))/e/(c*d+e)^2+3/8*
b^3*c^2*polylog(3,1-2/(c*x+1))/(c*d-e)^2/e-3/2*b^3*c^3*d*polylog(3,1-2/(c*
x+1))/(c^2*d^2-e^2)^2+3/2*b^3*c^3*d*polylog(3,1-2*c*(e*x+d)/(c*d+e)/(c*x+1
))/(c^2*d^2-e^2)^2

```

3.20.2 Mathematica [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^3} dx = \int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^3} dx$$

input `Integrate[(a + b*ArcTanh[c*x])^3/(d + e*x)^3,x]`

output `Integrate[(a + b*ArcTanh[c*x])^3/(d + e*x)^3, x]`

3.20.3 Rubi [A] (verified)

Time = 1.43 (sec) , antiderivative size = 896, normalized size of antiderivative = 0.94, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {6480, 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.

3.20. $\int \frac{(a+b\operatorname{arctanh}(cx))^3}{(d+ex)^3} dx$

$$\int \frac{(a + \operatorname{barctanh}(cx))^3}{(d + ex)^3} dx$$

↓ 6480

$$\frac{3bc \int \left(\frac{c^2(a + \operatorname{barctanh}(cx))^2}{2(cd+e)^2(1-cx)} + \frac{c^2(a + \operatorname{barctanh}(cx))^2}{2(cd-e)^2(cx+1)} - \frac{2c^2de^2(a + \operatorname{barctanh}(cx))^2}{(cd-e)^2(cd+e)^2(d+ex)} - \frac{e^2(a + \operatorname{barctanh}(cx))^2}{(cd-e)(cd+e)(d+ex)^2} \right) dx}{\frac{2e}{(a + \operatorname{barctanh}(cx))^3} \frac{2e(d + ex)^2}}{2e(d + ex)^2}}$$

↓ 2009

$$\frac{3bc \left(-\frac{ce \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-cx}\right) b^2}{2(cd-e)(cd+e)^2} - \frac{ce \operatorname{PolyLog}\left(2, 1 - \frac{2}{cx+1}\right) b^2}{2(cd-e)^2(cd+e)} + \frac{ce^2 \operatorname{PolyLog}\left(2, 1 - \frac{2}{cx+1}\right) b^2}{(cd-e)^2(cd+e)^2} - \frac{ce^2 \operatorname{PolyLog}\left(2, 1 - \frac{2c(d+ex)}{(cd+e)(cx+1)}\right) b^2}{(cd-e)^2(cd+e)^2} - \frac{c \operatorname{PolyLog}\left(3, 1 - \frac{2}{1-cx}\right) b^2}{(cd-e)(cd+e)(d+ex)^2} \right)}{(a + \operatorname{barctanh}(cx))^3 \frac{2e(d + ex)^2}}$$

input `Int[(a + b*ArcTanh[c*x])^3/(d + e*x)^3,x]`

output

```

-1/2*(a + b*ArcTanh[c*x])^3/(e*(d + e*x)^2) + (3*b*c*((e*(a + b*ArcTanh[c*x])^2)/((c^2*d^2 - e^2)*(d + e*x)) - (b*c*e*(a + b*ArcTanh[c*x])*Log[2/(1 - c*x)])/((c*d - e)*(c*d + e)^2) + (c*(a + b*ArcTanh[c*x])^2*Log[2/(1 - c*x)])/(2*(c*d + e)^2) - (2*b*c*e^2*(a + b*ArcTanh[c*x])*Log[2/(1 + c*x)])/((c*d - e)^2*(c*d + e)^2) + (b*c*e*(a + b*ArcTanh[c*x])*Log[2/(1 + c*x)])/((c*d - e)^2*(c*d + e)) - (c*(a + b*ArcTanh[c*x])^2*Log[2/(1 + c*x)])/(2*(c*d - e)^2) + (2*c^2*d*e*(a + b*ArcTanh[c*x])^2*Log[2/(1 + c*x)])/((c*d - e)^2*(c*d + e)^2) + (2*b*c*e^2*(a + b*ArcTanh[c*x])*Log[(2*c*(d + e*x))/((c*d + e)*(1 + c*x))])/((c*d - e)^2*(c*d + e)^2) - (2*c^2*d*e*(a + b*ArcTanh[c*x])^2*Log[(2*c*(d + e*x))/((c*d + e)*(1 + c*x))])/((c*d - e)^2*(c*d + e)^2) - (b^2*c*e*PolyLog[2, 1 - 2/(1 - c*x)])/(2*(c*d - e)*(c*d + e)^2) + (b*c*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - 2/(1 - c*x)])/(2*(c*d + e)^2) + (b^2*c*e^2*PolyLog[2, 1 - 2/(1 + c*x)])/((c*d - e)^2*(c*d + e)^2) - (b^2*c*e*PolyLog[2, 1 - 2/(1 + c*x)])/(2*(c*d - e)^2*(c*d + e)) + (b*c*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - 2/(1 + c*x)])/(2*(c*d - e)^2) - (2*b*c^2*d*e*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - 2/(1 + c*x)])/((c*d - e)^2*(c*d + e)^2) - (b^2*c*e^2*PolyLog[2, 1 - (2*c*(d + e*x))/((c*d + e)*(1 + c*x))])/((c*d - e)^2*(c*d + e)^2) + (2*b*c^2*d*e*(a + b*ArcTanh[c*x])*PolyLog[2, 1 - (2*c*(d + e*x))/((c*d + e)*(1 + c*x))])/((c*d - e)^2*(c*d + e)^2) - (b^2*c*PolyLog[3, 1 - 2/(1 - c*x)])/(4*(c*d + e)^2) + (b^2*c*PolyLog[3, 1 - 2/(1 + c*x)])/(4*(c*d + e)^2)
    
```

3.20. $\int \frac{(a + \operatorname{barctanh}(cx))^3}{(d + ex)^3} dx$

3.20.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6480 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_)*((d_) + (e_.)*(x_))^(q_.), x_Symbol] := Simp[(d + e*x)^(q + 1)*((a + b*ArcTanh[c*x])^p/(e*(q + 1))), x] - Simp[b*c*(p/(e*(q + 1))) Int[ExpandIntegrand[(a + b*ArcTanh[c*x])^(p - 1), (d + e*x)^(q + 1)/(1 - c^2*x^2), x], x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 1] && IntegerQ[q] && NeQ[q, -1]`

3.20.4 Maple [C] (warning: unable to verify)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 14.39 (sec) , antiderivative size = 51695, normalized size of antiderivative = 54.24

method	result	size
derivativedivides	Expression too large to display	51695
default	Expression too large to display	51695
parts	Expression too large to display	51703

input `int((a+b*arctanh(c*x))^3/(e*x+d)^3,x,method=_RETURNVERBOSE)`

output `result too large to display`

3.20.5 Fricas [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^3} dx = \int \frac{(b \operatorname{arctanh}(cx) + a)^3}{(ex + d)^3} dx$$

input `integrate((a+b*arctanh(c*x))^3/(e*x+d)^3,x, algorithm="fricas")`

output `integral((b^3*arctanh(c*x)^3 + 3*a*b^2*arctanh(c*x)^2 + 3*a^2*b*arctanh(c*x) + a^3)/(e^3*x^3 + 3*d*e^2*x^2 + 3*d^2*e*x + d^3), x)`

3.20.6 Sympy [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^3} dx = \int \frac{(a + b \operatorname{atanh}(cx))^3}{(d + ex)^3} dx$$

input `integrate((a+b*atanh(c*x))**3/(e*x+d)**3,x)`

output `Integral((a + b*atanh(c*x))**3/(d + e*x)**3, x)`

3.20.7 Maxima [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^3} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^3}{(ex + d)^3} dx$$

input `integrate((a+b*arctanh(c*x))^3/(e*x+d)^3,x, algorithm="maxima")`

output `-3/4*((4*c^2*d*log(e*x + d)/(c^4*d^4 - 2*c^2*d^2*e^2 + e^4) - c*log(c*x + 1)/(c^2*d^2*e - 2*c*d*e^2 + e^3) + c*log(c*x - 1)/(c^2*d^2*e + 2*c*d*e^2 + e^3) - 2/(c^2*d^3 - d*e^2 + (c^2*d^2*e - e^3)*x))*c + 2*arctanh(c*x)/(e^3*x^2 + 2*d*e^2*x + d^2*e))*a^2*b - 1/2*a^3/(e^3*x^2 + 2*d*e^2*x + d^2*e) - 1/16*(((c^4*d^2*e^2 - 2*c^3*d*e^3 + c^2*e^4)*b^3*x^2 + 2*(c^4*d^3*e - 2*c^3*d^2*e^2 + c^2*d*e^3)*b^3*x - (2*c^3*d^3*e - 3*c^2*d^2*e^2 + e^4)*b^3)*log(-c*x + 1)^3 - 3*(2*(c^3*d^2*e^2 - c*e^4)*b^3*x - 2*(c^4*d^4 - 2*c^2*d^2*e^2 + e^4)*a*b^2 + 2*(c^3*d^3*e - c*d*e^3)*b^3 + ((c^4*d^2*e^2 + 2*c^3*d*e^3 + c^2*e^4)*b^3*x^2 + 2*(c^4*d^3*e + 2*c^3*d^2*e^2 + c^2*d*e^3)*b^3*x + (2*c^3*d^3*e + 3*c^2*d^2*e^2 - e^4)*b^3)*log(c*x + 1))*log(-c*x + 1)^2)/(c^4*d^6*e - 2*c^2*d^4*e^3 + d^2*e^5 + (c^4*d^4*e^3 - 2*c^2*d^2*e^5 + e^7)*x^2 + 2*(c^4*d^5*e^2 - 2*c^2*d^3*e^4 + d*e^6)*x) - integrate(1/8*(((c^4*d^3*e - c^3*d^2*e^2 - c^2*d*e^3 + c*e^4)*b^3*x - (c^3*d^3*e - c^2*d^2*e^2 - c*d*e^3 + e^4)*b^3)*log(c*x + 1)^3 + 6*(((c^4*d^3*e - c^3*d^2*e^2 - c^2*d*e^3 + c*e^4)*a*b^2*x - (c^3*d^3*e - c^2*d^2*e^2 - c*d*e^3 + e^4)*a*b^2)*log(c*x + 1)^2 - 3*(2*(c^3*d^3*e - c^2*d^2*e^2 - 2*(c^4*d^4 - c^3*d^3*e - c^2*d^2*e^2 + c*d*e^3)*a*b^2 + 2*(c^3*d^3*e - c^2*d^2*e^2)*b^3 + ((c^4*d^3*e - c^3*d^2*e^2 - c^2*d*e^3 + c*e^4)*b^3*x - (c^3*d^3*e - c^2*d^2*e^2 - c*d*e^3 + e^4)*b^3)*log(c*x + 1)^2 - 2*((c^4*d^3*e - c^3*d^2*e^2 - c^2*d*e^3 + c*e^4)*a*b^2 - 2*(c^3*d^2*e^2 - c^2*d*e^3)*b^3)*x + ((c^4*d^3*e + ...`

3.20.8 Giac [F]

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^3} dx = \int \frac{(b \operatorname{artanh}(cx) + a)^3}{(ex + d)^3} dx$$

input `integrate((a+b*arctanh(c*x))^3/(e*x+d)^3,x, algorithm="giac")`

output `integrate((b*arctanh(c*x) + a)^3/(e*x + d)^3, x)`

3.20.9 Mupad [F(-1)]

Timed out.

$$\int \frac{(a + b \operatorname{arctanh}(cx))^3}{(d + ex)^3} dx = \int \frac{(a + b \operatorname{atanh}(cx))^3}{(d + ex)^3} dx$$

input `int((a + b*atanh(c*x))^3/(d + e*x)^3,x)`

output `int((a + b*atanh(c*x))^3/(d + e*x)^3, x)`

3.21 $\int \frac{a+b\operatorname{arctanh}(cx)}{1+2cx} dx$

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3.21.1 Optimal result

Integrand size = 17, antiderivative size = 67

$$\int \frac{a + b\operatorname{arctanh}(cx)}{1 + 2cx} dx = \frac{(a - b\operatorname{arctanh}(\frac{1}{2})) \log(-\frac{1+2cx}{2d})}{2c} - \frac{b \operatorname{PolyLog}(2, -1 - 2cx)}{4c} + \frac{b \operatorname{PolyLog}(2, \frac{1}{3}(1 + 2cx))}{4c}$$

output `1/2*(a-b*arctanh(1/2))*ln(1/2*(-2*c*x-1)/d)/c-1/4*b*polylog(2,-2*c*x-1)/c+1/4*b*polylog(2,2/3*c*x+1/3)/c`

3.21.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 0.21 (sec) , antiderivative size = 240, normalized size of antiderivative = 3.58

$$\int \frac{a + b\operatorname{arctanh}(cx)}{1 + 2cx} dx = \frac{a \log(1 + 2cx) + b\operatorname{arctanh}(cx) (\frac{1}{2} \log(1 - c^2x^2) + \log(i \sinh(\operatorname{arctanh}(\frac{1}{2}) + \operatorname{arctanh}(cx)))) - \frac{1}{2}ib(-\frac{1}{4}i(\pi$$

input `Integrate[(a + b*ArcTanh[c*x])/(1 + 2*c*x),x]`

output $(a*\text{Log}[1 + 2*c*x] + b*\text{ArcTanh}[c*x]*(\text{Log}[1 - c^2*x^2]/2 + \text{Log}[I*\text{Sinh}[\text{ArcTanh}[1/2] + \text{ArcTanh}[c*x]]]) - (I/2)*b*((-1/4*I)*(Pi - (2*I)*\text{ArcTanh}[c*x])^2 + I*(\text{ArcTanh}[1/2] + \text{ArcTanh}[c*x])^2 + (Pi - (2*I)*\text{ArcTanh}[c*x])*\text{Log}[1 + E^(2*\text{ArcTanh}[c*x])] + (2*I)*(\text{ArcTanh}[1/2] + \text{ArcTanh}[c*x])*\text{Log}[1 - E^(-2*(\text{ArcTanh}[1/2] + \text{ArcTanh}[c*x]))]) - (Pi - (2*I)*\text{ArcTanh}[c*x])*\text{Log}[2/\text{Sqrt}[1 - c^2*x^2]] - (2*I)*(\text{ArcTanh}[1/2] + \text{ArcTanh}[c*x])*\text{Log}[(2*I)*\text{Sinh}[\text{ArcTanh}[1/2] + \text{ArcTanh}[c*x]]] - I*\text{PolyLog}[2, -E^(2*\text{ArcTanh}[c*x])] - I*\text{PolyLog}[2, E^(-2*(\text{ArcTanh}[1/2] + \text{ArcTanh}[c*x]))])/(2*c)$

3.21.3 Rubi [A] (verified)

Time = 0.43 (sec) , antiderivative size = 109, normalized size of antiderivative = 1.63, number of steps used = 5, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.235$, Rules used = {6472, 2849, 2752, 2897}

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.

$$\begin{aligned}
 & \int \frac{a + \text{barctanh}(cx)}{2cx + 1} dx \\
 & \quad \downarrow \text{6472} \\
 & \frac{1}{2}b \int \frac{\log\left(\frac{2}{cx+1}\right)}{1 - c^2x^2} dx - \frac{1}{2}b \int \frac{\log\left(\frac{2(2cx+1)}{3(cx+1)}\right)}{1 - c^2x^2} dx - \frac{\log\left(\frac{2}{cx+1}\right)(a + \text{barctanh}(cx))}{2c} + \\
 & \quad \frac{\log\left(\frac{2(2cx+1)}{3(cx+1)}\right)(a + \text{barctanh}(cx))}{2c} \\
 & \quad \downarrow \text{2849} \\
 & -\frac{1}{2}b \int \frac{\log\left(\frac{2(2cx+1)}{3(cx+1)}\right)}{1 - c^2x^2} dx + \frac{b \int \frac{\log\left(\frac{2}{cx+1}\right)}{1 - \frac{2}{cx+1}} d\frac{1}{cx+1}}{2c} - \frac{\log\left(\frac{2}{cx+1}\right)(a + \text{barctanh}(cx))}{2c} + \\
 & \quad \frac{\log\left(\frac{2(2cx+1)}{3(cx+1)}\right)(a + \text{barctanh}(cx))}{2c} \\
 & \quad \downarrow \text{2752} \\
 & -\frac{1}{2}b \int \frac{\log\left(\frac{2(2cx+1)}{3(cx+1)}\right)}{1 - c^2x^2} dx - \frac{\log\left(\frac{2}{cx+1}\right)(a + \text{barctanh}(cx))}{2c} + \frac{\log\left(\frac{2(2cx+1)}{3(cx+1)}\right)(a + \text{barctanh}(cx))}{2c} + \\
 & \quad \frac{b \text{PolyLog}\left(2, 1 - \frac{2}{cx+1}\right)}{4c} \\
 & \quad \downarrow \text{2897}
 \end{aligned}$$

3.21. $\int \frac{a + \text{barctanh}(cx)}{1 + 2cx} dx$

$$-\frac{\log\left(\frac{2}{cx+1}\right)(a + \operatorname{barctanh}(cx))}{2c} + \frac{\log\left(\frac{2(2cx+1)}{3(cx+1)}\right)(a + \operatorname{barctanh}(cx))}{2c} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{cx+1}\right)}{4c} - \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2(2cx+1)}{3(cx+1)}\right)}{4c}$$

input `Int[(a + b*ArcTanh[c*x])/(1 + 2*c*x), x]`

output `-1/2*((a + b*ArcTanh[c*x])*Log[2/(1 + c*x)])/c + ((a + b*ArcTanh[c*x])*Log[(2*(1 + 2*c*x))/(3*(1 + c*x))])/(2*c) + (b*PolyLog[2, 1 - 2/(1 + c*x)])/(4*c) - (b*PolyLog[2, 1 - (2*(1 + 2*c*x))/(3*(1 + c*x))])/(4*c)`

3.21.3.1 Defintions of rubi rules used

rule 2752 `Int[Log[(c_.)*(x_)]/((d_) + (e_.)*(x_)), x_Symbol] := Simp[(-e^(-1))*PolyLog[2, 1 - c*x], x] /; FreeQ[{c, d, e}, x] && EqQ[e + c*d, 0]`

rule 2849 `Int[Log[(c_.)/((d_) + (e_.)*(x_))]/((f_) + (g_.)*(x_)^2), x_Symbol] := Simp[-e/g Subst[Int[Log[2*d*x]/(1 - 2*d*x), x], x, 1/(d + e*x)], x] /; FreeQ[{c, d, e, f, g}, x] && EqQ[c, 2*d] && EqQ[e^2*f + d^2*g, 0]`

rule 2897 `Int[Log[u_]*(Pq_)^(m_.), x_Symbol] := With[{C = FullSimplify[Pq^m*((1 - u)/D[u, x])]}, Simp[C*PolyLog[2, 1 - u], x] /; FreeQ[C, x] /; IntegerQ[m] && PolyQ[Pq, x] && RationalFunctionQ[u, x] && LeQ[RationalFunctionExponents[u, x][[2]], Expon[Pq, x]]`

rule 6472 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))/((d_) + (e_.)*(x_)), x_Symbol] := Simp[(-a + b*ArcTanh[c*x])*(Log[2/(1 + c*x)]/e), x] + (Simp[(a + b*ArcTanh[c*x])*(Log[2*c*((d + e*x)/((c*d + e)*(1 + c*x))])]/e), x] + Simp[b*(c/e) Int[Log[2/(1 + c*x)]/(1 - c^2*x^2), x], x] - Simp[b*(c/e) Int[Log[2*c*((d + e*x)/((c*d + e)*(1 + c*x)))]/(1 - c^2*x^2), x], x] /; FreeQ[{a, b, c, d, e}, x] && NeQ[c^2*d^2 - e^2, 0]`

3.21.4 Maple [A] (verified)

Time = 2.92 (sec) , antiderivative size = 92, normalized size of antiderivative = 1.37

method	result
derivativedivides	$\frac{\frac{a \ln(2cx+1)}{2} + b \left(\frac{\ln(2cx+1) \operatorname{arctanh}(cx)}{2} + \frac{(\ln(2cx+1) - \ln(\frac{2cx}{3} + \frac{1}{3})) \ln(\frac{2}{3} - \frac{2cx}{3})}{4} - \frac{\operatorname{dilog}(\frac{2cx}{3} + \frac{1}{3})}{4} - \frac{\operatorname{dilog}(2cx+2)}{4} - \frac{\ln(2cx+1) \ln(2cx+2)}{4} \right)}{c}$
default	$\frac{\frac{a \ln(2cx+1)}{2} + b \left(\frac{\ln(2cx+1) \operatorname{arctanh}(cx)}{2} + \frac{(\ln(2cx+1) - \ln(\frac{2cx}{3} + \frac{1}{3})) \ln(\frac{2}{3} - \frac{2cx}{3})}{4} - \frac{\operatorname{dilog}(\frac{2cx}{3} + \frac{1}{3})}{4} - \frac{\operatorname{dilog}(2cx+2)}{4} - \frac{\ln(2cx+1) \ln(2cx+2)}{4} \right)}{c}$
parts	$\frac{a \ln(2cx+1)}{2c} + \frac{b \left(\frac{\ln(2cx+1) \operatorname{arctanh}(cx)}{2} + \frac{(\ln(2cx+1) - \ln(\frac{2cx}{3} + \frac{1}{3})) \ln(\frac{2}{3} - \frac{2cx}{3})}{4} - \frac{\operatorname{dilog}(\frac{2cx}{3} + \frac{1}{3})}{4} - \frac{\operatorname{dilog}(2cx+2)}{4} - \frac{\ln(2cx+1) \ln(2cx+2)}{4} \right)}{c}$
risch	$-\frac{b \ln(\frac{2cx}{3} + \frac{1}{3}) \ln(-cx+1)}{4c} + \frac{b \ln(\frac{2cx}{3} + \frac{1}{3}) \ln(\frac{2}{3} - \frac{2cx}{3})}{4c} + \frac{b \operatorname{dilog}(\frac{2}{3} - \frac{2cx}{3})}{4c} + \frac{a \ln(-2cx-1)}{2c} + \frac{b \ln(-2cx-1) \ln(cx+2)}{4c}$

input `int((a+b*arctanh(c*x))/(2*c*x+1),x,method=_RETURNVERBOSE)`

output
$$\frac{1}{c} * \left(\frac{1}{2} * a * \ln(2 * c * x + 1) + b * \left(\frac{1}{2} * \ln(2 * c * x + 1) * \operatorname{arctanh}(c * x) + \frac{1}{4} * (\ln(2 * c * x + 1) - \ln(\frac{2}{3} * c * x + \frac{1}{3})) * \ln(\frac{2}{3} - \frac{2 * c * x}{3}) - \frac{1}{4} * \operatorname{dilog}(\frac{2}{3} * c * x + \frac{1}{3}) - \frac{1}{4} * \operatorname{dilog}(2 * c * x + 2) - \frac{1}{4} * \ln(2 * c * x + 1) * \ln(2 * c * x + 2) \right) \right)$$

3.21.5 Fracas [F]

$$\int \frac{a + b \operatorname{arctanh}(cx)}{1 + 2cx} dx = \int \frac{b \operatorname{arctanh}(cx) + a}{2cx + 1} dx$$

input `integrate((a+b*arctanh(c*x))/(2*c*x+1),x, algorithm="fracas")`

output `integral((b*arctanh(c*x) + a)/(2*c*x + 1), x)`

3.21.6 Sympy [F]

$$\int \frac{a + b \operatorname{arctanh}(cx)}{1 + 2cx} dx = \int \frac{a + b \operatorname{atanh}(cx)}{2cx + 1} dx$$

input `integrate((a+b*atanh(c*x))/(2*c*x+1),x)`

output `Integral((a + b*atanh(c*x))/(2*c*x + 1), x)`

3.21.7 Maxima [F]

$$\int \frac{a + b \operatorname{arctanh}(cx)}{1 + 2cx} dx = \int \frac{b \operatorname{artanh}(cx) + a}{2cx + 1} dx$$

input `integrate((a+b*arctanh(c*x))/(2*c*x+1),x, algorithm="maxima")`

output `1/2*b*integrate((log(c*x + 1) - log(-c*x + 1))/(2*c*x + 1), x) + 1/2*a*log(2*c*x + 1)/c`

3.21.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(cx)}{1 + 2cx} dx = \int \frac{b \operatorname{artanh}(cx) + a}{2cx + 1} dx$$

input `integrate((a+b*arctanh(c*x))/(2*c*x+1),x, algorithm="giac")`

output `integrate((b*arctanh(c*x) + a)/(2*c*x + 1), x)`

3.21.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(cx)}{1 + 2cx} dx = \int \frac{a + b \operatorname{atanh}(cx)}{2cx + 1} dx$$

input `int((a + b*atanh(c*x))/(2*c*x + 1),x)`output `int((a + b*atanh(c*x))/(2*c*x + 1), x)`

3.22 $\int \frac{\operatorname{arctanh}(x)}{1-\sqrt{2}x} dx$

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3.22.1 Optimal result

Integrand size = 15, antiderivative size = 88

$$\int \frac{\operatorname{arctanh}(x)}{1-\sqrt{2}x} dx = -\frac{\operatorname{arctanh}\left(\frac{1}{\sqrt{2}}\right) \log(1-\sqrt{2}x)}{\sqrt{2}} - \frac{\operatorname{PolyLog}\left(2, -\frac{\sqrt{2}-2x}{2-\sqrt{2}}\right)}{2\sqrt{2}} + \frac{\operatorname{PolyLog}\left(2, \frac{\sqrt{2}-2x}{2+\sqrt{2}}\right)}{2\sqrt{2}}$$

output

```
-1/2*arctanh(1/2*2^(1/2))*ln(1-x*2^(1/2))*2^(1/2)-1/4*polylog(2, (2*x-2^(1/2))/(2-2^(1/2)))*2^(1/2)+1/4*polylog(2, (-2*x+2^(1/2))/(2+2^(1/2)))*2^(1/2)
```

3.22.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 0.08 (sec) , antiderivative size = 272, normalized size of antiderivative = 3.09

$$\int \frac{\operatorname{arctanh}(x)}{1-\sqrt{2}x} dx = \frac{\pi^2 - 4\operatorname{arctanh}\left(\frac{1}{\sqrt{2}}\right)^2 - 4i\pi\operatorname{arctanh}(x) + 8\operatorname{arctanh}\left(\frac{1}{\sqrt{2}}\right)\operatorname{arctanh}(x) - 8\operatorname{arctanh}(x)^2 + 8\operatorname{arctanh}\left(\frac{1}{\sqrt{2}}\right)\log(1-\sqrt{2}x)}{2\sqrt{2}}$$

input `Integrate[ArcTanh[x]/(1 - Sqrt[2]*x),x]`

output $(\text{Pi}^2 - 4*\text{ArcTanh}[1/\text{Sqrt}[2]]^2 - (4*I)*\text{Pi}*\text{ArcTanh}[x] + 8*\text{ArcTanh}[1/\text{Sqrt}[2]]*\text{ArcTanh}[x] - 8*\text{ArcTanh}[x]^2 + 8*\text{ArcTanh}[1/\text{Sqrt}[2]]*\text{Log}[1 - \text{E}^{(2*\text{ArcTanh}[1/\text{Sqrt}[2]] - 2*\text{ArcTanh}[x])}] - 8*\text{ArcTanh}[x]*\text{Log}[1 - \text{E}^{(2*\text{ArcTanh}[1/\text{Sqrt}[2]] - 2*\text{ArcTanh}[x])}] + (4*I)*\text{Pi}*\text{Log}[1 + \text{E}^{(2*\text{ArcTanh}[x])}] + 8*\text{ArcTanh}[x]*\text{Log}[1 + \text{E}^{(2*\text{ArcTanh}[x])}] - (4*I)*\text{Pi}*\text{Log}[2/\text{Sqrt}[1 - x^2]] - 8*\text{ArcTanh}[x]*\text{Log}[2/\text{Sqrt}[1 - x^2]] - 4*\text{ArcTanh}[x]*\text{Log}[1 - x^2] - 8*\text{ArcTanh}[x]*\text{Log}[(-I)*\text{Sinh}[\text{ArcTanh}[1/\text{Sqrt}[2]] - \text{ArcTanh}[x]]] - 8*\text{ArcTanh}[1/\text{Sqrt}[2]]*\text{Log}[(-2*I)*\text{Sinh}[\text{ArcTanh}[1/\text{Sqrt}[2]] - \text{ArcTanh}[x]]] + 8*\text{ArcTanh}[x]*\text{Log}[(-2*I)*\text{Sinh}[\text{ArcTanh}[1/\text{Sqrt}[2]] - \text{ArcTanh}[x]]] + 4*\text{PolyLog}[2, \text{E}^{(2*\text{ArcTanh}[1/\text{Sqrt}[2]] - 2*\text{ArcTanh}[x])}] + 4*\text{PolyLog}[2, -\text{E}^{(2*\text{ArcTanh}[x])}])/(8*\text{Sqrt}[2])$

3.22.3 Rubi [A] (verified)

Time = 0.41 (sec) , antiderivative size = 108, normalized size of antiderivative = 1.23, number of steps used = 5, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.267$, Rules used = {6472, 2849, 2752, 2897}

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.

$$\int \frac{\operatorname{arctanh}(x)}{1 - \sqrt{2}x} dx$$

↓ 6472

$$-\frac{\int \frac{\log\left(\frac{2}{x+1}\right) dx}{\sqrt{2}} + \frac{\int \frac{\log\left(-\frac{2(1+\sqrt{2})(1-\sqrt{2}x)}{x+1}\right) dx}{\sqrt{2}} + \frac{\operatorname{arctanh}(x) \log\left(\frac{2}{x+1}\right)}{\sqrt{2}} - \frac{\operatorname{arctanh}(x) \log\left(-\frac{2(1+\sqrt{2})(1-\sqrt{2}x)}{x+1}\right)}{\sqrt{2}}}{\sqrt{2}}$$

↓ 2849

$$\frac{\int \frac{\log\left(-\frac{2(1+\sqrt{2})(1-\sqrt{2}x)}{x+1}\right) dx}{\sqrt{2}} - \frac{\int \frac{\log\left(\frac{2}{x+1}\right) d\frac{1}{x+1}}{\sqrt{2}} + \frac{\operatorname{arctanh}(x) \log\left(\frac{2}{x+1}\right)}{\sqrt{2}} - \frac{\operatorname{arctanh}(x) \log\left(-\frac{2(1+\sqrt{2})(1-\sqrt{2}x)}{x+1}\right)}{\sqrt{2}}}{\sqrt{2}}$$

3.22. $\int \frac{\operatorname{arctanh}(x)}{1 - \sqrt{2}x} dx$

$$\begin{aligned}
 & \int \frac{\log\left(-\frac{2(1+\sqrt{2})(1-\sqrt{2}x)}{x+1}\right)}{1-x^2} dx + \frac{\operatorname{arctanh}(x) \log\left(\frac{2}{x+1}\right)}{\sqrt{2}} - \frac{\operatorname{arctanh}(x) \log\left(-\frac{2(1+\sqrt{2})(1-\sqrt{2}x)}{x+1}\right)}{\sqrt{2}} - \\
 & \frac{\operatorname{PolyLog}\left(2, 1 - \frac{2}{x+1}\right)}{2\sqrt{2}} \\
 & \quad \downarrow \text{2752} \\
 & \frac{\operatorname{arctanh}(x) \log\left(\frac{2}{x+1}\right)}{\sqrt{2}} - \frac{\operatorname{arctanh}(x) \log\left(-\frac{2(1+\sqrt{2})(1-\sqrt{2}x)}{x+1}\right)}{\sqrt{2}} - \frac{\operatorname{PolyLog}\left(2, 1 - \frac{2}{x+1}\right)}{2\sqrt{2}} + \\
 & \frac{\operatorname{PolyLog}\left(2, \frac{2(1+\sqrt{2})(1-\sqrt{2}x)}{x+1} + 1\right)}{2\sqrt{2}} \\
 & \quad \downarrow \text{2897}
 \end{aligned}$$

input `Int[ArcTanh[x]/(1 - Sqrt[2]*x), x]`

output `(ArcTanh[x]*Log[2/(1 + x)]/Sqrt[2] - (ArcTanh[x]*Log[(-2*(1 + Sqrt[2])*(1 - Sqrt[2]*x))/(1 + x)]/Sqrt[2] - PolyLog[2, 1 - 2/(1 + x)]/(2*Sqrt[2]) + PolyLog[2, 1 + (2*(1 + Sqrt[2])*(1 - Sqrt[2]*x))/(1 + x)]/(2*Sqrt[2]))`

3.2.2.3.1 Defintions of rubi rules used

rule 2752 `Int[Log[(c_.)*(x_)]/((d_) + (e_.)*(x_)), x_Symbol] := Simp[(-e^(-1))*PolyLog[2, 1 - c*x], x] /; FreeQ[{c, d, e}, x] && EqQ[e + c*d, 0]`

rule 2849 `Int[Log[(c_.)/((d_) + (e_.)*(x_))]/((f_) + (g_.)*(x_)^2), x_Symbol] := Simp[-e/g Subst[Int[Log[2*d*x]/(1 - 2*d*x), x], x, 1/(d + e*x)], x] /; FreeQ[{c, d, e, f, g}, x] && EqQ[c, 2*d] && EqQ[e^2*f + d^2*g, 0]`

rule 2897 `Int[Log[u_]*(Pq_)^(m_.), x_Symbol] := With[{C = FullSimplify[Pq^m*((1 - u)/D[u, x])]}, Simp[C*PolyLog[2, 1 - u], x] /; FreeQ[C, x] /; IntegerQ[m] && PolyQ[Pq, x] && RationalFunctionQ[u, x] && LeQ[RationalFunctionExponents[u, x][[2]], Expon[Pq, x]]`

```
rule 6472 Int[((a_.) + ArcTanh[(c_.)*(x_.)]*(b_.))/((d_.) + (e_.)*(x_.)), x_Symbol] := S
imp[(-a + b*ArcTanh[c*x])*(Log[2/(1 + c*x)]/e), x] + (Simp[(a + b*ArcTanh
[c*x])*(Log[2*c*((d + e*x)/((c*d + e)*(1 + c*x)))]/e), x] + Simp[b*(c/e)
Int[Log[2/(1 + c*x)]/(1 - c^2*x^2), x], x] - Simp[b*(c/e) Int[Log[2*c*((d
+ e*x)/((c*d + e)*(1 + c*x)))]/(1 - c^2*x^2), x], x) /; FreeQ[{a, b, c, d
, e}, x] && NeQ[c^2*d^2 - e^2, 0]
```

3.22.4 Maple [A] (verified)

Time = 1.47 (sec) , antiderivative size = 127, normalized size of antiderivative = 1.44

method	result
default	$-\frac{\ln(x\sqrt{2}-1)\sqrt{2}\operatorname{arctanh}(x)}{2} - \frac{\sqrt{2}\ln(x\sqrt{2}-1)\ln\left(\frac{\sqrt{2}-x\sqrt{2}}{\sqrt{2}-1}\right)}{4} + \frac{\sqrt{2}\ln(x\sqrt{2}-1)\ln\left(\frac{\sqrt{2}+x\sqrt{2}}{1+\sqrt{2}}\right)}{4} - \frac{\sqrt{2}\operatorname{dilog}\left(\frac{\sqrt{2}-x\sqrt{2}}{\sqrt{2}-1}\right)}{4} + \frac{\sqrt{2}\operatorname{dilog}\left(\frac{\sqrt{2}+x\sqrt{2}}{1+\sqrt{2}}\right)}{4}$
parts	$-\frac{\ln(x\sqrt{2}-1)\sqrt{2}\operatorname{arctanh}(x)}{2} - \frac{\sqrt{2}\ln(x\sqrt{2}-1)\ln\left(\frac{\sqrt{2}-x\sqrt{2}}{\sqrt{2}-1}\right)}{4} + \frac{\sqrt{2}\ln(x\sqrt{2}-1)\ln\left(\frac{\sqrt{2}+x\sqrt{2}}{1+\sqrt{2}}\right)}{4} - \frac{\sqrt{2}\operatorname{dilog}\left(\frac{\sqrt{2}-x\sqrt{2}}{\sqrt{2}-1}\right)}{4} + \frac{\sqrt{2}\operatorname{dilog}\left(\frac{\sqrt{2}+x\sqrt{2}}{1+\sqrt{2}}\right)}{4}$
risch	$\frac{\sqrt{2}\ln\left(\frac{-2x+\sqrt{2}}{2+\sqrt{2}}\right)\ln\left(\frac{2+2x}{2+\sqrt{2}}\right)}{4} - \frac{\sqrt{2}\ln\left(\frac{-2x+\sqrt{2}}{2+\sqrt{2}}\right)\ln(1+x)}{4} + \frac{\sqrt{2}\operatorname{dilog}\left(\frac{2+2x}{2+\sqrt{2}}\right)}{4} - \frac{\sqrt{2}\ln\left(\frac{2x-\sqrt{2}}{2-\sqrt{2}}\right)\ln\left(\frac{2-2x}{2-\sqrt{2}}\right)}{4} + \frac{\sqrt{2}\ln\left(\frac{2x-\sqrt{2}}{2-\sqrt{2}}\right)}{4}$

```
input int(arctanh(x)/(1-x*2^(1/2)),x,method=_RETURNVERBOSE)
```

```
output -1/2*ln(x*2^(1/2)-1)*2^(1/2)*arctanh(x)-1/4*2^(1/2)*ln(x*2^(1/2)-1)*ln((2^(1/2)-x*2^(1/2))/(2^(1/2)-1))+1/4*2^(1/2)*ln(x*2^(1/2)-1)*ln((2^(1/2)+x*2^(1/2))/(1+2^(1/2)))-1/4*2^(1/2)*dilog((2^(1/2)-x*2^(1/2))/(2^(1/2)-1))+1/4*2^(1/2)*dilog((2^(1/2)+x*2^(1/2))/(1+2^(1/2)))
```

3.22.5 Fracas [F]

$$\int \frac{\operatorname{arctanh}(x)}{1-\sqrt{2}x} dx = \int -\frac{\operatorname{arctanh}(x)}{\sqrt{2}x-1} dx$$

```
input integrate(arctanh(x)/(1-x*2^(1/2)),x, algorithm="fricas")
```

```
output integral(-(sqrt(2)*x + 1)*arctanh(x)/(2*x^2 - 1), x)
```

3.22.6 Sympy [F]

$$\int \frac{\operatorname{arctanh}(x)}{1 - \sqrt{2}x} dx = - \int \frac{\operatorname{atanh}(x)}{\sqrt{2}x - 1} dx$$

input `integrate(atanh(x)/(1-x*2**(1/2)),x)`

output `-Integral(atanh(x)/(sqrt(2)*x - 1), x)`

3.22.7 Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 144 vs. $2(69) = 138$.

Time = 0.27 (sec) , antiderivative size = 144, normalized size of antiderivative = 1.64

$$\begin{aligned} \int \frac{\operatorname{arctanh}(x)}{1 - \sqrt{2}x} dx &= \frac{1}{4} \sqrt{2} (\log(x+1) - \log(x-1)) \log(\sqrt{2}x - 1) \\ &\quad - \frac{1}{2} \sqrt{2} \operatorname{artanh}(x) \log(\sqrt{2}x - 1) \\ &\quad - \frac{1}{4} \sqrt{2} \left(\log(x+1) \log\left(-\frac{\sqrt{2}x + \sqrt{2}}{\sqrt{2} + 1} + 1\right) + \operatorname{Li}_2\left(\frac{\sqrt{2}x + \sqrt{2}}{\sqrt{2} + 1}\right) \right) \\ &\quad + \frac{1}{4} \sqrt{2} \left(\log(x-1) \log\left(\frac{\sqrt{2}x - \sqrt{2}}{\sqrt{2} - 1} + 1\right) + \operatorname{Li}_2\left(-\frac{\sqrt{2}x - \sqrt{2}}{\sqrt{2} - 1}\right) \right) \end{aligned}$$

input `integrate(arctanh(x)/(1-x*2^(1/2)),x, algorithm="maxima")`

output `1/4*sqrt(2)*(log(x + 1) - log(x - 1))*log(sqrt(2)*x - 1) - 1/2*sqrt(2)*arc
tanh(x)*log(sqrt(2)*x - 1) - 1/4*sqrt(2)*(log(x + 1)*log(-(sqrt(2)*x + sqrt
t(2))/(sqrt(2) + 1) + 1) + dilog((sqrt(2)*x + sqrt(2))/(sqrt(2) + 1))) + 1
/4*sqrt(2)*(log(x - 1)*log((sqrt(2)*x - sqrt(2))/(sqrt(2) - 1) + 1) + dilo
g(-(sqrt(2)*x - sqrt(2))/(sqrt(2) - 1)))`

3.22.8 Giac [F]

$$\int \frac{\operatorname{arctanh}(x)}{1 - \sqrt{2x}} dx = \int -\frac{\operatorname{artanh}(x)}{\sqrt{2x} - 1} dx$$

input `integrate(arctanh(x)/(1-x*2^(1/2)),x, algorithm="giac")`

output `integrate(-arctanh(x)/(sqrt(2)*x - 1), x)`

3.22.9 Mupad [F(-1)]

Timed out.

$$\int \frac{\operatorname{arctanh}(x)}{1 - \sqrt{2x}} dx = -\int \frac{\operatorname{atanh}(x)}{\sqrt{2}x - 1} dx$$

input `int(-atanh(x)/(2^(1/2)*x - 1),x)`

output `-int(atanh(x)/(2^(1/2)*x - 1), x)`

3.23 $\int (d + ex)^3 (a + \operatorname{barctanh}(cx^2)) dx$

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3.23.1 Optimal result

Integrand size = 18, antiderivative size = 182

$$\int (d + ex)^3 (a + \operatorname{barctanh}(cx^2)) dx = \frac{2bde^2x}{c} + \frac{be^3x^2}{4c} + \frac{bd(cd^2 - e^2) \arctan(\sqrt{cx})}{c^{3/2}} - \frac{bd(cd^2 + e^2) \operatorname{arctanh}(\sqrt{cx})}{c^{3/2}} + \frac{(d + ex)^4 (a + \operatorname{barctanh}(cx^2))}{4e} + \frac{b(c^2d^4 + 6cd^2e^2 + e^4) \log(1 - cx^2)}{8c^2e} - \frac{b(c^2d^4 - 6cd^2e^2 + e^4) \log(1 + cx^2)}{8c^2e}$$

output

```
2*b*d*e^2*x/c+1/4*b*e^3*x^2/c+b*d*(c*d^2-e^2)*arctan(x*c^(1/2))/c^(3/2)+1/4*(e*x+d)^4*(a+b*arctanh(c*x^2))/e-b*d*(c*d^2+e^2)*arctanh(x*c^(1/2))/c^(3/2)+1/8*b*(c^2*d^4+6*c*d^2*e^2+e^4)*ln(-c*x^2+1)/c^2/e-1/8*b*(c^2*d^4-6*c*d^2*e^2+e^4)*ln(c*x^2+1)/c^2/e
```

3.23.2 Mathematica [A] (verified)

Time = 0.15 (sec) , antiderivative size = 254, normalized size of antiderivative = 1.40

$$\int (d+ex)^3 (a + b \operatorname{arctanh}(cx^2)) dx = \frac{1}{8} \left(\frac{8d(acd^2 + 2be^2)x}{c} + \frac{2e(6acd^2 + be^2)x^2}{c} + 8ade^2x^3 \right. \\ \left. + 2ae^3x^4 + \frac{8bd(cd^2 - e^2) \arctan(\sqrt{cx})}{c^{3/2}} \right. \\ \left. + 2bx(4d^3 + 6d^2ex + 4de^2x^2 + e^3x^3) \operatorname{arctanh}(cx^2) \right. \\ \left. + \frac{b(4c^{3/2}d^3 + 4\sqrt{c}de^2 + e^3) \log(1 - \sqrt{cx})}{c^2} \right. \\ \left. + \frac{b(-4c^2d^3 - 4cde^2 + \sqrt{c}e^3) \log(1 + \sqrt{cx})}{c^{5/2}} \right. \\ \left. - \frac{be^3 \log(1 + cx^2)}{c^2} + \frac{6bd^2e \log(1 - c^2x^4)}{c} \right)$$

input `Integrate[(d + e*x)^3*(a + b*ArcTanh[c*x^2]),x]`

output `((8*d*(a*c*d^2 + 2*b*e^2)*x)/c + (2*e*(6*a*c*d^2 + b*e^2)*x^2)/c + 8*a*d*e^2*x^3 + 2*a*e^3*x^4 + (8*b*d*(c*d^2 - e^2)*ArcTan[Sqrt[c]*x])/c^(3/2) + 2*b*x*(4*d^3 + 6*d^2*e*x + 4*d*e^2*x^2 + e^3*x^3)*ArcTanh[c*x^2] + (b*(4*c^(3/2)*d^3 + 4*Sqrt[c]*d*e^2 + e^3)*Log[1 - Sqrt[c]*x])/c^2 + (b*(-4*c^2*d^3 - 4*c*d*e^2 + Sqrt[c]*e^3)*Log[1 + Sqrt[c]*x])/c^(5/2) - (b*e^3*Log[1 + c*x^2])/c^2 + (6*b*d^2*e*Log[1 - c^2*x^4])/c)/8`

3.23.3 Rubi [A] (verified)

Time = 0.51 (sec) , antiderivative size = 160, normalized size of antiderivative = 0.88, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {6486, 2372, 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.

$$\int (d+ex)^3 (a + b \operatorname{arctanh}(cx^2)) dx \\ \downarrow 6486 \\ \frac{(d+ex)^4 (a + b \operatorname{arctanh}(cx^2))}{4e} - \frac{bc \int \frac{x(d+ex)^4}{1-c^2x^4} dx}{2e}$$

3.23. $\int (d+ex)^3 (a + b \operatorname{arctanh}(cx^2)) dx$

$$\begin{aligned}
 & \frac{(d+ex)^4 (a + \operatorname{barctanh}(cx^2))}{4e} - \frac{bc \int \left(\frac{(4ed^3+4e^3x^2d)x^2}{1-c^2x^4} + \frac{(d^4+6e^2x^2d^2+e^4x^4)x}{1-c^2x^4} \right) dx}{2e} \\
 & \quad \downarrow \text{2372} \\
 & \frac{(d+ex)^4 (a + \operatorname{barctanh}(cx^2))}{4e} - \\
 & \frac{bc \left(-\frac{2de \arctan(\sqrt{cx})(cd^2-e^2)}{c^{5/2}} + \frac{2de \operatorname{arctanh}(\sqrt{cx})(cd^2+e^2)}{c^{5/2}} + \frac{\operatorname{arctanh}(cx^2)(c^2d^4+e^4)}{2c^3} - \frac{3d^2e^2 \log(1-c^2x^4)}{2c^2} - \frac{4de^3x}{c^2} - \frac{e^4x^2}{2c^2} \right)}{2e}
 \end{aligned}$$

input `Int[(d + e*x)^3*(a + b*ArcTanh[c*x^2]),x]`

output `((d + e*x)^4*(a + b*ArcTanh[c*x^2]))/(4*e) - (b*c*((-4*d*e^3*x)/c^2 - (e^4*x^2)/(2*c^2) - (2*d*e*(c*d^2 - e^2)*ArcTan[Sqrt[c]*x])/c^(5/2) + (2*d*e*(c*d^2 + e^2)*ArcTanh[Sqrt[c]*x])/c^(5/2) + ((c^2*d^4 + e^4)*ArcTanh[c*x^2])/(2*c^3) - (3*d^2*e^2*Log[1 - c^2*x^4])/(2*c^2))/(2*e)`

3.23.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 2372 `Int[(Pq_)*((c_.)*(x_)^(m_.))*((a_) + (b_.)*(x_)^(n_))^(p_), x_Symbol] := Module[{q = Expon[Pq, x], j, k}, Int[Sum[((c*x)^(m + j)/c^j)*Sum[Coeff[Pq, x, j + k*(n/2)]*x^(k*(n/2)), {k, 0, 2*((q - j)/n) + 1}]*((a + b*x^n)^p), {j, 0, n/2 - 1}], x] /; FreeQ[{a, b, c, m, p}, x] && PolyQ[Pq, x] && IGtQ[n/2, 0] && !PolyQ[Pq, x^(n/2)]`

rule 6486 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)])*(b_.)*((d_.) + (e_.)*(x_)^(m_.)), x_Symbol] := Simp[(d + e*x)^(m + 1)*((a + b*ArcTanh[c*x^n])/(e*(m + 1))), x] - Simp[b*c*(n/(e*(m + 1))) Int[x^(n - 1)*((d + e*x)^(m + 1)/(1 - c^2*x^(2*n)))]], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && NeQ[m, -1]`

3.23.4 Maple [A] (verified)

Time = 2.19 (sec) , antiderivative size = 242, normalized size of antiderivative = 1.33

method	result
default	$\frac{a(ex+d)^4}{4e} + b \left(\frac{e^3 \operatorname{arctanh}(cx^2)x^4}{4} + e^2 \operatorname{arctanh}(cx^2)x^3d + \frac{3e \operatorname{arctanh}(cx^2)x^2d^2}{2} + \operatorname{arctanh}(cx^2)d^3x + \dots \right)$
parts	$\frac{a(ex+d)^4}{4e} + b \left(\frac{e^3 \operatorname{arctanh}(cx^2)x^4}{4} + e^2 \operatorname{arctanh}(cx^2)x^3d + \frac{3e \operatorname{arctanh}(cx^2)x^2d^2}{2} + \operatorname{arctanh}(cx^2)d^3x + \dots \right)$
risch	Expression too large to display

```
input int((e*x+d)^3*(a+b*arctanh(c*x^2)),x,method=_RETURNVERBOSE)
```

```
output 1/4*a*(e*x+d)^4/e+b*(1/4*e^3*arctanh(c*x^2)*x^4+e^2*arctanh(c*x^2)*x^3*d+3
/2*e*arctanh(c*x^2)*x^2*d^2+arctanh(c*x^2)*d^3*x+1/4/e*arctanh(c*x^2)*d^4-
1/2*c/e*(-e^3/c^2*(1/2*e*x^2+4*d*x)+1/2/c^2*(1/2*(-c^2*d^4-6*c*d^2*e^2-e^4
)/c*ln(c*x^2-1)-(-4*c*d^3*e-4*d*e^3)/c^(1/2)*arctanh(x*c^(1/2)))+1/2/c^2*(
1/2*(c^2*d^4-6*c*d^2*e^2+e^4)/c*ln(c*x^2+1)+(-4*c*d^3*e+4*d*e^3)/c^(1/2)*a
rctan(x*c^(1/2))))
```

3.23.5 Fricas [A] (verification not implemented)

Time = 0.32 (sec) , antiderivative size = 519, normalized size of antiderivative = 2.85

$$\int (d + ex)^3 (a + b \operatorname{arctanh}(cx^2)) dx$$

$$= \left[\frac{2ac^2e^3x^4 + 8ac^2de^2x^3 + 2(6ac^2d^2e + bce^3)x^2 + 8(bcd^3 - bde^2)\sqrt{c} \arctan(\sqrt{cx}) + 4(bcd^3 + bde^2)\sqrt{c} \operatorname{arctan}(x\sqrt{c})}{\dots} \right]$$

```
input integrate((e*x+d)^3*(a+b*arctanh(c*x^2)),x, algorithm="fricas")
```

output `[1/8*(2*a*c^2*e^3*x^4 + 8*a*c^2*d*e^2*x^3 + 2*(6*a*c^2*d^2*e + b*c*e^3)*x^2 + 8*(b*c*d^3 - b*d*e^2)*sqrt(c)*arctan(sqrt(c)*x) + 4*(b*c*d^3 + b*d*e^2)*sqrt(c)*log((c*x^2 - 2*sqrt(c)*x + 1)/(c*x^2 - 1)) + 8*(a*c^2*d^3 + 2*b*c*d*e^2)*x + (6*b*c*d^2*e - b*e^3)*log(c*x^2 + 1) + (6*b*c*d^2*e + b*e^3)*log(c*x^2 - 1) + (b*c^2*e^3*x^4 + 4*b*c^2*d*e^2*x^3 + 6*b*c^2*d^2*e*x^2 + 4*b*c^2*d^3*x)*log(-(c*x^2 + 1)/(c*x^2 - 1)))/c^2, 1/8*(2*a*c^2*e^3*x^4 + 8*a*c^2*d*e^2*x^3 + 2*(6*a*c^2*d^2*e + b*c*e^3)*x^2 + 8*(b*c*d^3 + b*d*e^2)*sqrt(-c)*arctan(sqrt(-c)*x) + 4*(b*c*d^3 - b*d*e^2)*sqrt(-c)*log((c*x^2 + 2*sqrt(-c)*x - 1)/(c*x^2 + 1)) + 8*(a*c^2*d^3 + 2*b*c*d*e^2)*x + (6*b*c*d^2*e - b*e^3)*log(c*x^2 + 1) + (6*b*c*d^2*e + b*e^3)*log(c*x^2 - 1) + (b*c^2*e^3*x^4 + 4*b*c^2*d*e^2*x^3 + 6*b*c^2*d^2*e*x^2 + 4*b*c^2*d^3*x)*log(-(c*x^2 + 1)/(c*x^2 - 1)))/c^2]`

3.23.6 Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 2786 vs. $2(168) = 336$.

Time = 7.28 (sec) , antiderivative size = 2786, normalized size of antiderivative = 15.31

$$\int (d + ex)^3 (a + \operatorname{barctanh}(cx^2)) dx = \text{Too large to display}$$

input `integrate((e*x+d)**3*(a+b*atanh(c*x**2)),x)`

output `Piecewise((8*a*c**2*d**3*x*sqrt(-1/c)*sqrt(1/c)/(2*c**3*(-1/c)**(3/2)*sqrt(1/c) - 2*c**3*sqrt(-1/c)*(1/c)**(3/2) + 12*c**2*sqrt(-1/c)*sqrt(1/c)) + 12*a*c**2*d**2*e*x**2*sqrt(-1/c)*sqrt(1/c)/(2*c**3*(-1/c)**(3/2)*sqrt(1/c) - 2*c**3*sqrt(-1/c)*(1/c)**(3/2) + 12*c**2*sqrt(-1/c)*sqrt(1/c)) + 8*a*c**2*d*e**2*x**3*sqrt(-1/c)*sqrt(1/c)/(2*c**3*(-1/c)**(3/2)*sqrt(1/c) - 2*c**3*sqrt(-1/c)*(1/c)**(3/2) + 12*c**2*sqrt(-1/c)*sqrt(1/c)) + 2*a*c**2*e**3*x**4*sqrt(-1/c)*sqrt(1/c)/(2*c**3*(-1/c)**(3/2)*sqrt(1/c) - 2*c**3*sqrt(-1/c)*(1/c)**(3/2) + 12*c**2*sqrt(-1/c)*sqrt(1/c)) + 8*b*c**2*d**3*x*sqrt(-1/c)*sqrt(1/c)*atanh(c*x**2)/(2*c**3*(-1/c)**(3/2)*sqrt(1/c) - 2*c**3*sqrt(-1/c)*(1/c)**(3/2) + 12*c**2*sqrt(-1/c)*sqrt(1/c)) - 2*b*c**2*d**3*(-1/c)**(3/2)*log(x + sqrt(-1/c))/(2*c**3*(-1/c)**(3/2)*sqrt(1/c) - 2*c**3*sqrt(-1/c)*(1/c)**(3/2) + 12*c**2*sqrt(-1/c)*sqrt(1/c)) + 2*b*c**2*d**3*(1/c)**(3/2)*log(x + sqrt(-1/c))/(2*c**3*(-1/c)**(3/2)*sqrt(1/c) - 2*c**3*sqrt(-1/c)*(1/c)**(3/2) + 12*c**2*sqrt(-1/c)*sqrt(1/c)) + 12*b*c**2*d**2*e*x**2*sqrt(-1/c)*sqrt(1/c)*atanh(c*x**2)/(2*c**3*(-1/c)**(3/2)*sqrt(1/c) - 2*c**3*sqrt(-1/c)*(1/c)**(3/2) + 12*c**2*sqrt(-1/c)*sqrt(1/c)) + 3*b*c**2*d**2*e*(-1/c)**(3/2)*sqrt(1/c)*log(x + sqrt(-1/c))/(2*c**3*(-1/c)**(3/2)*sqrt(1/c) - 2*c**3*sqrt(-1/c)*(1/c)**(3/2) + 12*c**2*sqrt(-1/c)*sqrt(1/c)) - 3*b*c**2*d**2*e*sqrt(-1/c)*(1/c)**(3/2)*log(x + sqrt(-1/c))/(2*c**3*(-1/c)**(3/2)*sqrt(1/c) - 2*c**3*sqrt(-1/c)*(1/c)**(3/2) + 12*c**2*sqrt(-1/c)*sqrt(1/c))...`

3.23.7 Maxima [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 240, normalized size of antiderivative = 1.32

$$\begin{aligned}
 & \int (d + ex)^3 (a + b \operatorname{arctanh}(cx^2)) dx \\
 &= \frac{1}{4} ae^3 x^4 + ade^2 x^3 + \frac{3}{2} ad^2 ex^2 \\
 &+ \frac{1}{2} \left(c \left(\frac{2 \arctan(\sqrt{cx})}{c^{\frac{3}{2}}} + \frac{\log\left(\frac{cx-\sqrt{c}}{cx+\sqrt{c}}\right)}{c^{\frac{3}{2}}} \right) + 2x \operatorname{artanh}(cx^2) \right) bd^3 \\
 &+ \frac{1}{2} \left(2x^3 \operatorname{artanh}(cx^2) + c \left(\frac{4x}{c^2} - \frac{2 \arctan(\sqrt{cx})}{c^{\frac{5}{2}}} + \frac{\log\left(\frac{cx-\sqrt{c}}{cx+\sqrt{c}}\right)}{c^{\frac{5}{2}}} \right) \right) bde^2 \\
 &+ \frac{1}{8} \left(2x^4 \operatorname{artanh}(cx^2) + c \left(\frac{2x^2}{c^2} - \frac{\log(cx^2+1)}{c^3} + \frac{\log(cx^2-1)}{c^3} \right) \right) be^3 \\
 &+ ad^3 x + \frac{3(2cx^2 \operatorname{artanh}(cx^2) + \log(-c^2x^4+1))bd^2e}{4c}
 \end{aligned}$$

input `integrate((e*x+d)^3*(a+b*arctanh(c*x^2)),x, algorithm="maxima")`

output $1/4*a*e^3*x^4 + a*d*e^2*x^3 + 3/2*a*d^2*e*x^2 + 1/2*(c*(2*\arctan(\sqrt{c})*x)/c^{(3/2)} + \log((c*x - \sqrt{c})/(c*x + \sqrt{c}))/c^{(3/2)}) + 2*x*\operatorname{arctanh}(c*x^2)*b*d^3 + 1/2*(2*x^3*\operatorname{arctanh}(c*x^2) + c*(4*x/c^2 - 2*\arctan(\sqrt{c})*x)/c^{(5/2)} + \log((c*x - \sqrt{c})/(c*x + \sqrt{c}))/c^{(5/2)})*b*d*e^2 + 1/8*(2*x^4*\operatorname{arctanh}(c*x^2) + c*(2*x^2/c^2 - \log(c*x^2 + 1)/c^3 + \log(c*x^2 - 1)/c^3))*b*e^3 + a*d^3*x + 3/4*(2*c*x^2*\operatorname{arctanh}(c*x^2) + \log(-c^2*x^4 + 1))*b*d^2*e/c$

3.23.8 Giac [A] (verification not implemented)

Time = 8.12 (sec) , antiderivative size = 227, normalized size of antiderivative = 1.25

$$\begin{aligned} & \int (d + ex)^3 (a + b \operatorname{arctanh}(cx^2)) dx \\ &= \frac{1}{4} a e^3 x^4 + a d e^2 x^3 + \frac{(6 a c d^2 e + b e^3) x^2}{4 c} \\ &+ \frac{1}{8} (b e^3 x^4 + 4 b d e^2 x^3 + 6 b d^2 e x^2 + 4 b d^3 x) \log\left(-\frac{c x^2 + 1}{c x^2 - 1}\right) + \frac{(a c d^3 + 2 b d e^2) x}{c} \\ &+ \frac{(b c d^3 - b d e^2) \arctan(\sqrt{c x})}{c^{\frac{3}{2}}} + \frac{(b c d^3 + b d e^2) \arctan\left(\frac{c x}{\sqrt{-c}}\right)}{\sqrt{-c c}} \\ &+ \frac{(6 b c d^2 e - b e^3) \log(c x^2 + 1)}{8 c^2} + \frac{(6 b c d^2 e + b e^3) \log(c x^2 - 1)}{8 c^2} \end{aligned}$$

input `integrate((e*x+d)^3*(a+b*arctanh(c*x^2)),x, algorithm="giac")`

output $1/4*a*e^3*x^4 + a*d*e^2*x^3 + 1/4*(6*a*c*d^2*e + b*e^3)*x^2/c + 1/8*(b*e^3*x^4 + 4*b*d*e^2*x^3 + 6*b*d^2*e*x^2 + 4*b*d^3*x)*\log(-(c*x^2 + 1)/(c*x^2 - 1)) + (a*c*d^3 + 2*b*d*e^2)*x/c + (b*c*d^3 - b*d*e^2)*\arctan(\sqrt{c}*x)/c^{(3/2)} + (b*c*d^3 + b*d*e^2)*\arctan(c*x/\sqrt{-c})/(\sqrt{-c}*c) + 1/8*(6*b*c*d^2*e - b*e^3)*\log(c*x^2 + 1)/c^2 + 1/8*(6*b*c*d^2*e + b*e^3)*\log(c*x^2 - 1)/c^2$

3.23.9 Mupad [B] (verification not implemented)

Time = 4.58 (sec) , antiderivative size = 823, normalized size of antiderivative = 4.52

$$\begin{aligned}
& \int (d+ex)^3 (a + \operatorname{arctanh}(cx^2)) dx = \ln(cx^2+1) \left(\frac{bd^3x}{2} + \frac{3bd^2ex^2}{4} + \frac{bde^2x^3}{2} + \frac{be^3x^4}{8} \right) \\
& - \ln(1-cx^2) \left(\frac{bd^3x}{2} + \frac{3bd^2ex^2}{4} + \frac{bde^2x^3}{2} + \frac{be^3x^4}{8} \right) + \frac{ae^3x^4}{4} \\
& - \frac{\ln(8c^5d^6 - c^2e^6 - 4de^5\sqrt{-c^5} + e^6x\sqrt{-c^5} + 8c^3d^2e^4 + 4c^4d^3e^3x - 4c^3de^5x + 4cd^3e^3\sqrt{-c^5} - 8c^4)}{8c^4} \\
& - \frac{\ln(8c^5d^6 - c^2e^6 + 4de^5\sqrt{-c^5} - e^6x\sqrt{-c^5} + 8c^3d^2e^4 + 4c^4d^3e^3x - 4c^3de^5x - 4cd^3e^3\sqrt{-c^5} + 8c^4)}{8c^4} \\
& + \frac{x(2ac^2d^3 + 4bcde^2)}{2c^2} \\
& + \frac{\ln(64c^2d^{12}(c^5)^{7/2} + 128d^8e^4(c^5)^{7/2} - 64c^{20}d^{12}x - c^{14}e^{12}x + ce^{12}(c^5)^{5/2} - 32c^{16}d^4e^8x - 128c^{18}d^4e^8)}{8c^4} \\
& + \frac{\ln(8c^{10}d^6 + c^7e^6 + 8c^8d^2e^4 - 4de^5(c^5)^{3/2} + e^6x(c^5)^{3/2} - 4c^9d^3e^3x - 4cd^3e^3(c^5)^{3/2} + 8c^3d^6x(c^5)^{3/2})}{8c^4} \\
& + \frac{x^2(6ac^2d^2e + bce^3)}{4c^2} + ade^2x^3
\end{aligned}$$

input `int((a + b*atanh(c*x^2))*(d + e*x)^3,x)`

output

$$\begin{aligned} & \log(cx^2 + 1) * ((b^3e^3x^4)/8 + (bd^3x)/2 + (3bd^2e^2x^2)/4 + (bde^2x^3)/2) - \log(1 - cx^2) * ((b^3e^3x^4)/8 + (bd^3x)/2 + (3bd^2e^2x^2)/4 \\ & + (bde^2x^3)/2) + (a^3e^3x^4)/4 - (\log(8c^5d^6 - c^2e^6 - 4de^5 * (-c^5)^{(1/2)} + e^6x * (-c^5)^{(1/2)} + 8c^3d^2e^4 + 4c^4d^3e^3x - 4c^3d^2e^5x \\ & + 4cd^3e^3 * (-c^5)^{(1/2)} - 8c^3d^6x * (-c^5)^{(1/2)} - 8cd^2e^4x * (-c^5)^{(1/2)}) * (b^2e^3 - 4b^2cd^3 * (-c^5)^{(1/2)} + 4bde^2 * (-c^5)^{(1/2)} - 6b^2cd^2e)) / (8c^4) - (\log(8c^5d^6 - c^2e^6 + 4de^5 * (-c^5)^{(1/2)} - e^6x * (-c^5)^{(1/2)} + 8c^3d^2e^4 + 4c^4d^3e^3x - 4c^3d^2e^5x \\ & - 4cd^3e^3 * (-c^5)^{(1/2)} + 8c^3d^6x * (-c^5)^{(1/2)} + 8cd^2e^4x * (-c^5)^{(1/2)}) * (b^2e^3 + 4b^2cd^3 * (-c^5)^{(1/2)} - 4bde^2 * (-c^5)^{(1/2)} - 6b^2cd^2e)) / (8c^4) + (x * (2ac^2d^3 + 4b^2cd^2e)) / (2c^2) + (\log(64c^2d^12 * (c^5)^{(7/2)} + 128d^8e^4 * (c^5)^{(7/2)} - 64c^20d^12x - c^14e^12x \\ & + ce^12 * (c^5)^{(5/2)} - 32c^16d^4e^8x - 128c^18d^8e^4x + 32c^3d^4e^8 * (c^5)^{(5/2)}) * (b^2e^3 + 4b^2cd^3 * (c^5)^{(1/2)} + 4bde^2 * (c^5)^{(1/2)} + 6b^2cd^2e)) / (8c^4) + (\log(8c^10d^6 + c^7e^6 + 8c^8d^2e^4 - 4de^5 * (c^5)^{(3/2)} + e^6x * (c^5)^{(3/2)} - 4c^9d^3e^3x - 4cd^3e^3 * (c^5)^{(3/2)} + 8c^3d^6x * (c^5)^{(3/2)} - 4c^8d^2e^5x + 8cd^2e^4x * (c^5)^{(3/2)}) * (b^2e^3 - 4b^2cd^3 * (c^5)^{(1/2)} - 4bde^2 * (c^5)^{(1/2)} + 6b^2cd^2e)) / (8c^4) + (x^2 * (b^2e^3 + 6ac^2d^2e)) / (4c^2) + ade^2x^3 \end{aligned}$$

3.24 $\int (d + ex)^2 (a + b \operatorname{arctanh}(cx^2)) dx$

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3.24.1 Optimal result

Integrand size = 18, antiderivative size = 158

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx^2)) dx = \frac{2be^2x}{3c} + \frac{b(3cd^2 - e^2) \arctan(\sqrt{cx})}{3c^{3/2}} - \frac{b(3cd^2 + e^2) \operatorname{arctanh}(\sqrt{cx})}{3c^{3/2}} + \frac{(d + ex)^3 (a + b \operatorname{arctanh}(cx^2))}{3e} + \frac{bd(cd^2 + 3e^2) \log(1 - cx^2)}{6ce} - \frac{bd(cd^2 - 3e^2) \log(1 + cx^2)}{6ce}$$

output $2/3*b*e^2*x/c+1/3*b*(3*c*d^2-e^2)*\arctan(x*c^{(1/2)})/c^{(3/2)}+1/3*(e*x+d)^3*(a+b*\operatorname{arctanh}(c*x^2))/e-1/3*b*(3*c*d^2+e^2)*\operatorname{arctanh}(x*c^{(1/2)})/c^{(3/2)}+1/6*b*d*(c*d^2+3*e^2)*\ln(-c*x^2+1)/c/e-1/6*b*d*(c*d^2-3*e^2)*\ln(c*x^2+1)/c/e$

3.24.2 Mathematica [A] (verified)

Time = 0.12 (sec) , antiderivative size = 170, normalized size of antiderivative = 1.08

$$\int (d+ex)^2 (a + b \operatorname{arctanh}(cx^2)) dx = \frac{1}{6} \left(6ad^2x + \frac{4be^2x}{c} + 6adex^2 + 2ae^2x^3 + \frac{2b(3cd^2 - e^2) \arctan(\sqrt{cx})}{c^{3/2}} + 2bx(3d^2 + 3dex + e^2x^2) \operatorname{arctanh}(cx^2) + \frac{b(3cd^2 + e^2) \log(1 - \sqrt{cx})}{c^{3/2}} - \frac{b(3cd^2 + e^2) \log(1 + \sqrt{cx})}{c^{3/2}} + \frac{3bde \log(1 - c^2x^4)}{c} \right)$$

input `Integrate[(d + e*x)^2*(a + b*ArcTanh[c*x^2]),x]`

output `(6*a*d^2*x + (4*b*e^2*x)/c + 6*a*d*e*x^2 + 2*a*e^2*x^3 + (2*b*(3*c*d^2 - e^2)*ArcTan[Sqrt[c]*x])/c^(3/2) + 2*b*x*(3*d^2 + 3*d*e*x + e^2*x^2)*ArcTanh[c*x^2] + (b*(3*c*d^2 + e^2)*Log[1 - Sqrt[c]*x])/c^(3/2) - (b*(3*c*d^2 + e^2)*Log[1 + Sqrt[c]*x])/c^(3/2) + (3*b*d*e*Log[1 - c^2*x^4])/c)/6`

3.24.3 Rubi [A] (verified)

Time = 0.42 (sec) , antiderivative size = 140, normalized size of antiderivative = 0.89, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {6486, 2370, 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.

$$\int (d+ex)^2 (a + b \operatorname{arctanh}(cx^2)) dx$$

$$\downarrow 6486$$

$$\frac{(d+ex)^3 (a + b \operatorname{arctanh}(cx^2))}{3e} - \frac{2bc \int \frac{x(d+ex)^3}{1-c^2x^4} dx}{3e}$$

$$\downarrow 2370$$

$$\frac{(d+ex)^3 (a + b \operatorname{arctanh}(cx^2))}{3e} - \frac{2bc \int \left(\frac{(x^2e^3+3d^2e)x^2}{1-c^2x^4} + \frac{(d^3+3e^2x^2d)x}{1-c^2x^4} \right) dx}{3e}$$

$$\begin{array}{c} \downarrow \text{2009} \\ \frac{(d+ex)^3 (a + b \operatorname{arctanh}(cx^2))}{3e} - \\ \frac{2bc \left(-\frac{e \operatorname{arctan}(\sqrt{cx})(3cd^2 - e^2)}{2c^{5/2}} + \frac{e \operatorname{arctanh}(\sqrt{cx})(3cd^2 + e^2)}{2c^{5/2}} + \frac{d^3 \operatorname{arctanh}(cx^2)}{2c} - \frac{3de^2 \log(1 - c^2 x^4)}{4c^2} - \frac{e^3 x}{c^2} \right)}{3e} \end{array}$$

input `Int[(d + e*x)^2*(a + b*ArcTanh[c*x^2]),x]`

output `((d + e*x)^3*(a + b*ArcTanh[c*x^2]))/(3*e) - (2*b*c*(-((e^3*x)/c^2) - (e*(3*c*d^2 - e^2)*ArcTan[Sqrt[c]*x])/(2*c^(5/2)) + (e*(3*c*d^2 + e^2)*ArcTanh[Sqrt[c]*x])/(2*c^(5/2)) + (d^3*ArcTanh[c*x^2])/(2*c) - (3*d*e^2*Log[1 - c^2*x^4])/(4*c^2))/(3*e)`

3.24.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 2370 `Int[((Pq)*((c_.)*(x_)^(m_.)))/((a_) + (b_.)*(x_)^(n_)), x_Symbol] := With[{v = Sum[(c*x)^(m + ii)*((Coeff[Pq, x, ii] + Coeff[Pq, x, n/2 + ii]*x^(n/2)))/(c^ii*(a + b*x^n))], {ii, 0, n/2 - 1}}, Int[v, x] /; SumQ[v]] /; FreeQ[{a, b, c, m}, x] && PolyQ[Pq, x] && IGtQ[n/2, 0] && Expon[Pq, x] < n`

rule 6486 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)])*(b_.)*((d_.) + (e_.)*(x_)^(m_.)), x_Symbol] := Simp[(d + e*x)^(m + 1)*((a + b*ArcTanh[c*x^n])/(e*(m + 1))), x] - Simp[b*c*(n/(e*(m + 1))) Int[x^(n - 1)*((d + e*x)^(m + 1)/(1 - c^2*x^(2*n)))]], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && NeQ[m, -1]`

3.24.4 Maple [A] (verified)

Time = 1.69 (sec) , antiderivative size = 199, normalized size of antiderivative = 1.26

method	result
default	$\frac{a(ex+d)^3}{3e} + b \left(\frac{e^2 \operatorname{arctanh}(cx^2)x^3}{3} + e \operatorname{arctanh}(cx^2)x^2d + \operatorname{arctanh}(cx^2)xd^2 + \frac{\operatorname{arctanh}(cx^2)d^3}{3e} - \frac{2e \left(-\frac{e^3}{c} \right)}{c^2} \right)$
parts	$\frac{a(ex+d)^3}{3e} + b \left(\frac{e^2 \operatorname{arctanh}(cx^2)x^3}{3} + e \operatorname{arctanh}(cx^2)x^2d + \operatorname{arctanh}(cx^2)xd^2 + \frac{\operatorname{arctanh}(cx^2)d^3}{3e} - \frac{2e \left(-\frac{e^3}{c} \right)}{c^2} \right)$
risch	Expression too large to display

input `int((e*x+d)^2*(a+b*arctanh(c*x^2)),x,method=_RETURNVERBOSE)`

output `1/3*a*(e*x+d)^3/e+b*(1/3*e^2*arctanh(c*x^2)*x^3+e*arctanh(c*x^2)*x^2*d+arctanh(c*x^2)*x*d^2+1/3/e*arctanh(c*x^2)*d^3-2/3*c/e*(-1/c^2*e^3*x+1/2/c^2*(1/2*(-c^2*d^3-3*c*d*e^2)/c*ln(c*x^2-1)-(-3*c*d^2*e-e^3)/c^(1/2)*arctanh(x*c^(1/2)))+1/2/c^2*(1/2*(c^2*d^3-3*c*d*e^2)/c*ln(c*x^2+1)+(-3*c*d^2*e+e^3)/c^(1/2)*arctan(x*c^(1/2))))`

3.24.5 Fracas [A] (verification not implemented)

Time = 0.29 (sec) , antiderivative size = 401, normalized size of antiderivative = 2.54

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx^2)) dx$$

$$= \left[\frac{2ac^2e^2x^3 + 6ac^2dex^2 + 3bcde \log(cx^2 + 1) + 3bcde \log(cx^2 - 1) + 2(3bcd^2 - be^2)\sqrt{c} \arctan(\sqrt{c}x) + \dots}{\dots} \right]$$

input `integrate((e*x+d)^2*(a+b*arctanh(c*x^2)),x, algorithm="fricas")`

output `[1/6*(2*a*c^2*e^2*x^3 + 6*a*c^2*d*e*x^2 + 3*b*c*d*e*log(c*x^2 + 1) + 3*b*c*d*e*log(c*x^2 - 1) + 2*(3*b*c*d^2 - b*e^2)*sqrt(c)*arctan(sqrt(c)*x) + (3*b*c*d^2 + b*e^2)*sqrt(c)*log((c*x^2 - 2*sqrt(c)*x + 1)/(c*x^2 - 1)) + 2*(3*a*c^2*d^2 + 2*b*c*e^2)*x + (b*c^2*e^2*x^3 + 3*b*c^2*d*e*x^2 + 3*b*c^2*d^2*x)*log(-(c*x^2 + 1)/(c*x^2 - 1)))/c^2, 1/6*(2*a*c^2*e^2*x^3 + 6*a*c^2*d*e*x^2 + 3*b*c*d*e*log(c*x^2 + 1) + 3*b*c*d*e*log(c*x^2 - 1) + 2*(3*b*c*d^2 + b*e^2)*sqrt(-c)*arctan(sqrt(-c)*x) + (3*b*c*d^2 - b*e^2)*sqrt(-c)*log((c*x^2 + 2*sqrt(-c)*x - 1)/(c*x^2 + 1)) + 2*(3*a*c^2*d^2 + 2*b*c*e^2)*x + (b*c^2*e^2*x^3 + 3*b*c^2*d*e*x^2 + 3*b*c^2*d^2*x)*log(-(c*x^2 + 1)/(c*x^2 - 1)))/c^2]`

3.24.6 Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 3465 vs. $2(139) = 278$.

Time = 5.91 (sec) , antiderivative size = 3465, normalized size of antiderivative = 21.93

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx^2)) dx = \text{Too large to display}$$

input `integrate((e*x+d)**2*(a+b*atanh(c*x**2)),x)`

```

output Piecewise((12*a*c**2*d**2*x*sqrt(-1/c)/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) + 12*a*c**2*d**2*x*sqrt(1/c)/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) + 12*a*c**2*d*e*x**2*sqrt(-1/c)/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) + 12*a*c**2*d*e*x**2*sqrt(1/c)/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) + 4*a*c**2*e**2*x**3*sqrt(-1/c)/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) + 4*a*c**2*e**2*x**3*sqrt(1/c)/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) - 3*b*c**3*d**2*(-1/c)**(3/2)*sqrt(1/c)*log(x - sqrt(-1/c))/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) - 12*b*c**3*d**2*(-1/c)**(3/2)*sqrt(1/c)*log(x + sqrt(-1/c))/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) + 3*b*c**3*d**2*(-1/c)**(3/2)*sqrt(1/c)*log(x - sqrt(1/c))/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) + 3*b*c**3*d**2*sqrt(-1/c)*(1/c)**(3/2)*log(x - sqrt(-1/c))/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) - 12*b*c**3*d**2*sqrt(-1/c)*(1/c)**(3/2)*log(x + sqrt(-1/c))/(12*c**3*(-1/c)**(3/2) - 12*c**3*(1/c)**(3/2) + 24*c**2*sqrt(-1/c) + 24*c**2*sqrt(1/c)) - 3*b*c**3*d**2*...

```

3.24.7 Maxima [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 171, normalized size of antiderivative = 1.08

$$\begin{aligned}
 & \int (d + ex)^2 (a + \operatorname{arctanh}(cx^2)) dx \\
 &= \frac{1}{3} ae^2 x^3 + adex^2 + \frac{1}{2} \left(c \left(\frac{2 \arctan(\sqrt{cx})}{c^{\frac{3}{2}}} + \frac{\log\left(\frac{cx - \sqrt{c}}{cx + \sqrt{c}}\right)}{c^{\frac{3}{2}}} \right) + 2x \operatorname{artanh}(cx^2) \right) bd^2 \\
 &+ \frac{1}{6} \left(2x^3 \operatorname{artanh}(cx^2) + c \left(\frac{4x}{c^2} - \frac{2 \arctan(\sqrt{cx})}{c^{\frac{5}{2}}} + \frac{\log\left(\frac{cx - \sqrt{c}}{cx + \sqrt{c}}\right)}{c^{\frac{5}{2}}} \right) \right) be^2 \\
 &+ ad^2 x + \frac{(2cx^2 \operatorname{artanh}(cx^2) + \log(-c^2 x^4 + 1))bde}{2c}
 \end{aligned}$$

```

input integrate((e*x+d)^2*(a+b*arctanh(c*x^2)),x, algorithm="maxima")

```


output $1/3*a*e^2*x^3 + a*d*e*x^2 + 1/2*(c*(2*\arctan(\sqrt{c}*x)/c^{(3/2)} + \log((c*x - \sqrt{c}))/c*x + \sqrt{c}))/c^{(3/2)}) + 2*x*\operatorname{arctanh}(c*x^2)*b*d^2 + 1/6*(2*x^3*\operatorname{arctanh}(c*x^2) + c*(4*x/c^2 - 2*\arctan(\sqrt{c}*x)/c^{(5/2)} + \log((c*x - \sqrt{c}))/c*x + \sqrt{c}))/c^{(5/2)})*b*e^2 + a*d^2*x + 1/2*(2*c*x^2*\operatorname{arctanh}(c*x^2) + \log(-c^2*x^4 + 1))*b*d*e/c$

3.24.8 Giac [A] (verification not implemented)

Time = 1.33 (sec) , antiderivative size = 171, normalized size of antiderivative = 1.08

$$\int (d+ex)^2 (a + b \operatorname{arctanh}(cx^2)) dx = \frac{1}{3} a e^2 x^3 + a d e x^2 + \frac{b d e \log(cx^2 + 1)}{2c} + \frac{b d e \log(cx^2 - 1)}{2c} + \frac{1}{6} (b e^2 x^3 + 3 b d e x^2 + 3 b d^2 x) \log\left(-\frac{cx^2 + 1}{cx^2 - 1}\right) + \frac{(3 a c d^2 + 2 b e^2) x}{3c} + \frac{(3 b c d^2 - b e^2) \arctan(\sqrt{c}x)}{3c^{3/2}} + \frac{(3 b c d^2 + b e^2) \arctan\left(\frac{cx}{\sqrt{-c}}\right)}{3\sqrt{-cc}}$$

input `integrate((e*x+d)^2*(a+b*arctanh(c*x^2)),x, algorithm="giac")`

output $1/3*a*e^2*x^3 + a*d*e*x^2 + 1/2*b*d*e*\log(c*x^2 + 1)/c + 1/2*b*d*e*\log(c*x^2 - 1)/c + 1/6*(b*e^2*x^3 + 3*b*d*e*x^2 + 3*b*d^2*x)*\log(-(c*x^2 + 1)/(c*x^2 - 1)) + 1/3*(3*a*c*d^2 + 2*b*e^2)*x/c + 1/3*(3*b*c*d^2 - b*e^2)*\arctan(\sqrt{c}*x)/c^{(3/2)} + 1/3*(3*b*c*d^2 + b*e^2)*\arctan(c*x/\sqrt{-c})/(\sqrt{-c}*c)$

3.24.9 Mupad [B] (verification not implemented)

Time = 4.13 (sec) , antiderivative size = 309, normalized size of antiderivative = 1.96

$$\begin{aligned}
& \int (d + ex)^2 (a + \operatorname{barctanh}(cx^2)) dx \\
&= \ln(cx^2 + 1) \left(\frac{bd^2x}{2} + \frac{bdex^2}{2} + \frac{be^2x^3}{6} \right) - \ln(1 - cx^2) \left(\frac{bd^2x}{2} + \frac{bdex^2}{2} + \frac{be^2x^3}{6} \right) \\
&+ \frac{x(3ac^2d^2 + 2bce^2)}{3c^2} + \frac{ae^2x^3}{3} - \frac{\ln(c + x\sqrt{c^3}) (be^2\sqrt{c^3} + 3bcd^2\sqrt{c^3} - 3bc^2de)}{6c^3} \\
&+ \frac{\ln(c - x\sqrt{c^3}) (be^2\sqrt{c^3} + 3bcd^2\sqrt{c^3} + 3bc^2de)}{6c^3} \\
&+ \frac{\ln(c + x\sqrt{-c^3}) (be^2\sqrt{-c^3} + 3bc^2de - 3bcd^2\sqrt{-c^3})}{6c^3} \\
&+ \frac{\ln(c - x\sqrt{-c^3}) (3bc^2de - be^2\sqrt{-c^3} + 3bcd^2\sqrt{-c^3})}{6c^3} + ade^2x^2
\end{aligned}$$

input `int((a + b*atanh(c*x^2))*(d + e*x)^2,x)`

output

```

log(c*x^2 + 1)*((b*e^2*x^3)/6 + (b*d^2*x)/2 + (b*d*e*x^2)/2) - log(1 - c*x
^2)*((b*e^2*x^3)/6 + (b*d^2*x)/2 + (b*d*e*x^2)/2) + (x*(3*a*c^2*d^2 + 2*b*
c*e^2))/(3*c^2) + (a*e^2*x^3)/3 - (log(c + x*(c^3)^(1/2))*(b*e^2*(c^3)^(1/
2) + 3*b*c*d^2*(c^3)^(1/2) - 3*b*c^2*d*e))/(6*c^3) + (log(c - x*(c^3)^(1/2
)))*(b*e^2*(c^3)^(1/2) + 3*b*c*d^2*(c^3)^(1/2) + 3*b*c^2*d*e))/(6*c^3) + (l
og(c + x*(-c^3)^(1/2))*(b*e^2*(-c^3)^(1/2) + 3*b*c^2*d*e - 3*b*c*d^2*(-c^3
)^(1/2)))/(6*c^3) + (log(c - x*(-c^3)^(1/2))*(3*b*c^2*d*e - b*e^2*(-c^3)^(
1/2) + 3*b*c*d^2*(-c^3)^(1/2)))/(6*c^3) + a*d*e*x^2

```

3.25 $\int (d + ex) (a + b \operatorname{arctanh}(cx^2)) dx$

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3.25.1 Optimal result

Integrand size = 16, antiderivative size = 117

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^2)) dx = \frac{bd \arctan(\sqrt{cx})}{\sqrt{c}} - \frac{bd \operatorname{arctanh}(\sqrt{cx})}{\sqrt{c}} + \frac{(d + ex)^2 (a + b \operatorname{arctanh}(cx^2))}{2e} + \frac{b(cd^2 + e^2) \log(1 - cx^2)}{4ce} - \frac{b(cd^2 - e^2) \log(1 + cx^2)}{4ce}$$

output $\frac{1}{2}*(e*x+d)^2*(a+b*\operatorname{arctanh}(c*x^2))/e+1/4*b*(c*d^2+e^2)*\ln(-c*x^2+1)/c/e-1/4*b*(c*d^2-e^2)*\ln(c*x^2+1)/c/e+b*d*\operatorname{arctan}(x*c^{(1/2)})/c^{(1/2)}-b*d*\operatorname{arctanh}(x*c^{(1/2)})/c^{(1/2)}$

3.25.2 Mathematica [A] (verified)

Time = 0.05 (sec) , antiderivative size = 104, normalized size of antiderivative = 0.89

$$\begin{aligned} & \int (d + ex) (a + b \operatorname{arctanh}(cx^2)) dx \\ &= adx + \frac{1}{2} aex^2 + bdx \operatorname{arctanh}(cx^2) + \frac{1}{2} bex^2 \operatorname{arctanh}(cx^2) \\ &+ \frac{bd(2 \arctan(\sqrt{cx}) + \log(1 - \sqrt{cx}) - \log(1 + \sqrt{cx}))}{2\sqrt{c}} + \frac{be \log(1 - c^2x^4)}{4c} \end{aligned}$$

input `Integrate[(d + e*x)*(a + b*ArcTanh[c*x^2]),x]`

output `a*d*x + (a*e*x^2)/2 + b*d*x*ArcTanh[c*x^2] + (b*e*x^2*ArcTanh[c*x^2])/2 + (b*d*(2*ArcTan[Sqrt[c]*x] + Log[1 - Sqrt[c]*x] - Log[1 + Sqrt[c]*x]))/(2*Sqrt[c]) + (b*e*Log[1 - c^2*x^4])/(4*c)`

3.25.3 Rubi [A] (verified)

Time = 0.35 (sec) , antiderivative size = 103, normalized size of antiderivative = 0.88, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.188$, Rules used = {6486, 2370, 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.

$$\begin{aligned}
 & \int (d + ex) (a + b \operatorname{arctanh}(cx^2)) dx \\
 & \quad \downarrow \text{6486} \\
 & \frac{(d + ex)^2 (a + b \operatorname{arctanh}(cx^2))}{2e} - \frac{bc \int \frac{x(d+ex)^2}{1-c^2x^4} dx}{e} \\
 & \quad \downarrow \text{2370} \\
 & \frac{(d + ex)^2 (a + b \operatorname{arctanh}(cx^2))}{2e} - \frac{bc \int \left(\frac{2dex^2}{1-c^2x^4} + \frac{(d^2+e^2x^2)x}{1-c^2x^4} \right) dx}{e} \\
 & \quad \downarrow \text{2009} \\
 & \frac{(d + ex)^2 (a + b \operatorname{arctanh}(cx^2))}{2e} - \\
 & \frac{bc \left(-\frac{de \arctan(\sqrt{cx})}{c^{3/2}} + \frac{de \operatorname{arctanh}(\sqrt{cx})}{c^{3/2}} + \frac{d^2 \operatorname{arctanh}(cx^2)}{2c} - \frac{e^2 \log(1-c^2x^4)}{4c^2} \right)}{e}
 \end{aligned}$$

input `Int[(d + e*x)*(a + b*ArcTanh[c*x^2]),x]`

output `((d + e*x)^2*(a + b*ArcTanh[c*x^2]))/(2*e) - (b*c*(-((d*e*ArcTan[Sqrt[c]*x])/c^(3/2)) + (d*e*ArcTanh[Sqrt[c]*x])/c^(3/2) + (d^2*ArcTanh[c*x^2])/(2*c) - (e^2*Log[1 - c^2*x^4])/(4*c^2)))/e`

3.25.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 2370 `Int[((Pq_)*((c_)*(x_)^(m_)))/((a_) + (b_)*(x_)^(n_)), x_Symbol] := With[
{v = Sum[(c*x)^(m + ii)*((Coeff[Pq, x, ii] + Coeff[Pq, x, n/2 + ii])*x^(n/2))/
(c^ii*(a + b*x^n))}, {ii, 0, n/2 - 1}], Int[v, x] /; SumQ[v]] /; FreeQ[{
a, b, c, m}, x] && PolyQ[Pq, x] && IGtQ[n/2, 0] && Expon[Pq, x] < n`

rule 6486 `Int[((a_) + ArcTanh[(c_)*(x_)^(n_)]*(b_))*((d_) + (e_)*(x_)^(m_)), x_
Symbol] := Simp[(d + e*x)^(m + 1)*((a + b*ArcTanh[c*x^n])/(e*(m + 1))), x]
- Simp[b*c*(n/(e*(m + 1))) Int[x^(n - 1)*((d + e*x)^(m + 1)/(1 - c^2*x^(2
*n))], x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && NeQ[m, -1]`

3.25.4 Maple [A] (verified)

Time = 0.68 (sec) , antiderivative size = 92, normalized size of antiderivative = 0.79

method	result
default	$a\left(\frac{1}{2}ex^2 + dx\right) + \frac{b \operatorname{arctanh}(cx^2)x^2e}{2} + b \operatorname{arctanh}(cx^2) dx + \frac{be \ln(cx^2-1)}{4c} - \frac{bd \operatorname{arctanh}(x\sqrt{c})}{\sqrt{c}} + \frac{be \ln(cx^2+1)}{4c}$
parts	$a\left(\frac{1}{2}ex^2 + dx\right) + \frac{b \operatorname{arctanh}(cx^2)x^2e}{2} + b \operatorname{arctanh}(cx^2) dx + \frac{be \ln(cx^2-1)}{4c} - \frac{bd \operatorname{arctanh}(x\sqrt{c})}{\sqrt{c}} + \frac{be \ln(cx^2+1)}{4c}$
risch	$\frac{bx(ex+2d)\ln(cx^2+1)}{4} - \frac{be x^2 \ln(-cx^2+1)}{4} - \frac{bdx \ln(-cx^2+1)}{2} + \frac{aex^2}{2} - \frac{b \ln(1+x\sqrt{c})d}{2\sqrt{c}} + \frac{b \ln(1-x\sqrt{c})d}{2\sqrt{c}} + \frac{b \ln(1-x\sqrt{-c})d}{2c}$

input `int((e*x+d)*(a+b*arctanh(c*x^2)),x,method=_RETURNVERBOSE)`

output `a*(1/2*e*x^2+d*x)+1/2*b*arctanh(c*x^2)*x^2*e+b*arctanh(c*x^2)*d*x+1/4*b*e/
c*ln(c*x^2-1)-b*d*arctanh(x*c^(1/2))/c^(1/2)+1/4*b*e/c*ln(c*x^2+1)+b*d*arc
tan(x*c^(1/2))/c^(1/2)`

3.25.5 Fracas [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 249, normalized size of antiderivative = 2.13

$$\int (d + ex) (a + \operatorname{arctanh}(cx^2)) dx$$

$$= \left[\frac{2acex^2 + 4acdx + 4b\sqrt{cd} \arctan(\sqrt{cx}) + 2b\sqrt{cd} \log\left(\frac{cx^2 - 2\sqrt{cx} + 1}{cx^2 - 1}\right) + be \log(cx^2 + 1) + be \log(cx^2 - 1)}{4c} \right]$$

```
input integrate((e*x+d)*(a+b*arctanh(c*x^2)),x, algorithm="fricas")
```

```
output [1/4*(2*a*c*e*x^2 + 4*a*c*d*x + 4*b*sqrt(c)*d*arctan(sqrt(c)*x) + 2*b*sqrt(c)*d*log((c*x^2 - 2*sqrt(c)*x + 1)/(c*x^2 - 1)) + b*e*log(c*x^2 + 1) + b*e*log(c*x^2 - 1) + (b*c*e*x^2 + 2*b*c*d*x)*log(-(c*x^2 + 1)/(c*x^2 - 1)))/c, 1/4*(2*a*c*e*x^2 + 4*a*c*d*x + 4*b*sqrt(-c)*d*arctan(sqrt(-c)*x) - 2*b*sqrt(-c)*d*log((c*x^2 - 2*sqrt(-c)*x - 1)/(c*x^2 + 1)) + b*e*log(c*x^2 + 1) + b*e*log(c*x^2 - 1) + (b*c*e*x^2 + 2*b*c*d*x)*log(-(c*x^2 + 1)/(c*x^2 - 1)))/c]
```

3.25.6 Sympy [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1486 vs. 2(100) = 200.

Time = 4.36 (sec) , antiderivative size = 1486, normalized size of antiderivative = 12.70

$$\int (d + ex) (a + \operatorname{arctanh}(cx^2)) dx = \text{Too large to display}$$

```
input integrate((e*x+d)*(a+b*atanh(c*x**2)),x)
```

output `Piecewise((8*a*c*d*x*sqrt(-1/c)*sqrt(1/c)/(2*c**2*(-1/c)**(3/2)*sqrt(1/c) - 2*c**2*sqrt(-1/c)*(1/c)**(3/2) + 12*c*sqrt(-1/c)*sqrt(1/c)) + 4*a*c*e*x*
 *2*sqrt(-1/c)*sqrt(1/c)/(2*c**2*(-1/c)**(3/2)*sqrt(1/c) - 2*c**2*sqrt(-1/c)
 *(1/c)**(3/2) + 12*c*sqrt(-1/c)*sqrt(1/c)) + 8*b*c*d*x*sqrt(-1/c)*sqrt(1/
 c)*atanh(c*x**2)/(2*c**2*(-1/c)**(3/2)*sqrt(1/c) - 2*c**2*sqrt(-1/c)*(1/c)
 ** (3/2) + 12*c*sqrt(-1/c)*sqrt(1/c)) - 2*b*c*d*(-1/c)**(3/2)*log(x + sqrt(
 -1/c))/(2*c**2*(-1/c)**(3/2)*sqrt(1/c) - 2*c**2*sqrt(-1/c)*(1/c)**(3/2) +
 12*c*sqrt(-1/c)*sqrt(1/c)) + 2*b*c*d*(1/c)**(3/2)*log(x + sqrt(-1/c))/(2*c
 2*(-1/c)(3/2)*sqrt(1/c) - 2*c**2*sqrt(-1/c)*(1/c)**(3/2) + 12*c*sqrt(-
 1/c)*sqrt(1/c)) + 4*b*c*e*x**2*sqrt(-1/c)*sqrt(1/c)*atanh(c*x**2)/(2*c**2*
 (-1/c)**(3/2)*sqrt(1/c) - 2*c**2*sqrt(-1/c)*(1/c)**(3/2) + 12*c*sqrt(-1/c)
 *sqrt(1/c)) + b*c*e*(-1/c)**(3/2)*sqrt(1/c)*log(x + sqrt(-1/c))/(2*c**2*(-
 1/c)**(3/2)*sqrt(1/c) - 2*c**2*sqrt(-1/c)*(1/c)**(3/2) + 12*c*sqrt(-1/c)*s
 qrt(1/c)) - b*c*e*sqrt(-1/c)*(1/c)**(3/2)*log(x + sqrt(-1/c))/(2*c**2*(-1/
 c)**(3/2)*sqrt(1/c) - 2*c**2*sqrt(-1/c)*(1/c)**(3/2) + 12*c*sqrt(-1/c)*sqr
 t(1/c)) - 4*b*d*sqrt(-1/c)*log(x - sqrt(-1/c))/(2*c**2*(-1/c)**(3/2)*sqrt(
 1/c) - 2*c**2*sqrt(-1/c)*(1/c)**(3/2) + 12*c*sqrt(-1/c)*sqrt(1/c)) - 6*b*d
 *sqrt(-1/c)*log(x + sqrt(-1/c))/(2*c**2*(-1/c)**(3/2)*sqrt(1/c) - 2*c**2*s
 qrt(-1/c)*(1/c)**(3/2) + 12*c*sqrt(-1/c)*sqrt(1/c)) + 8*b*d*sqrt(-1/c)*log
 (x - sqrt(1/c))/(2*c**2*(-1/c)**(3/2)*sqrt(1/c) - 2*c**2*sqrt(-1/c)*(1/...`

3.25.7 Maxima [A] (verification not implemented)

Time = 0.28 (sec) , antiderivative size = 95, normalized size of antiderivative = 0.81

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^2)) dx$$

$$= \frac{1}{2} a e x^2 + \frac{1}{2} \left(c \left(\frac{2 \arctan(\sqrt{cx})}{c^{\frac{3}{2}}} + \frac{\log\left(\frac{cx - \sqrt{c}}{cx + \sqrt{c}}\right)}{c^{\frac{3}{2}}} \right) + 2x \operatorname{arctanh}(cx^2) \right) b d$$

$$+ a d x + \frac{(2cx^2 \operatorname{arctanh}(cx^2) + \log(-c^2x^4 + 1)) b e}{4c}$$

input `integrate((e*x+d)*(a+b*arctanh(c*x^2)),x, algorithm="maxima")`

output `1/2*a*e*x^2 + 1/2*(c*(2*arctan(sqrt(c)*x)/c^(3/2) + log((c*x - sqrt(c))/(c
 *x + sqrt(c)))/c^(3/2)) + 2*x*arctanh(c*x^2))*b*d + a*d*x + 1/4*(2*c*x^2*a
 rctanh(c*x^2) + log(-c^2*x^4 + 1))*b*e/c`

3.25.8 Giac [A] (verification not implemented)

Time = 0.50 (sec) , antiderivative size = 133, normalized size of antiderivative = 1.14

$$\int (d+ex)(a+b\operatorname{arctanh}(cx^2)) dx = \frac{1}{2}aex^2 + adx + \frac{bcd \arctan\left(x\sqrt{|c|}\right)}{|c|^{\frac{3}{2}}} + \frac{be \log\left(x^2 + \frac{1}{|c|}\right)}{4c}$$

$$+ \frac{1}{4}(bex^2 + 2bdx) \log\left(-\frac{cx^2 + 1}{cx^2 - 1}\right)$$

$$- \frac{(2bcd\sqrt{|c|} - bce) \log\left(\left|x + \frac{1}{\sqrt{|c|}}\right|\right)}{4c^2}$$

$$+ \frac{(2bcd\sqrt{|c|} + bce) \log\left(\left|x - \frac{1}{\sqrt{|c|}}\right|\right)}{4c^2}$$

input `integrate((e*x+d)*(a+b*arctanh(c*x^2)),x, algorithm="giac")`output `1/2*a*e*x^2 + a*d*x + b*c*d*arctan(x*sqrt(abs(c)))/abs(c)^(3/2) + 1/4*b*e*log(x^2 + 1/abs(c))/c + 1/4*(b*e*x^2 + 2*b*d*x)*log(-(c*x^2 + 1)/(c*x^2 - 1)) - 1/4*(2*b*c*d*sqrt(abs(c)) - b*c*e)*log(abs(x + 1/sqrt(abs(c))))/c^2 + 1/4*(2*b*c*d*sqrt(abs(c)) + b*c*e)*log(abs(x - 1/sqrt(abs(c))))/c^2`**3.25.9 Mupad [B] (verification not implemented)**

Time = 3.75 (sec) , antiderivative size = 242, normalized size of antiderivative = 2.07

$$\int (d+ex)(a+b\operatorname{arctanh}(cx^2)) dx = adx + \frac{aex^2}{2} + \frac{bdx \ln(cx^2 + 1)}{2} - \frac{bdx \ln(1 - cx^2)}{2}$$

$$+ \frac{be \ln(c + x\sqrt{c^3})}{4c} + \frac{be \ln(c - x\sqrt{c^3})}{4c}$$

$$+ \frac{bex^2 \ln(cx^2 + 1)}{4} - \frac{bex^2 \ln(1 - cx^2)}{4}$$

$$+ \frac{be \ln(c + x\sqrt{-c^3})}{4c} + \frac{be \ln(c - x\sqrt{-c^3})}{4c}$$

$$- \frac{bd \ln(c + x\sqrt{c^3}) \sqrt{c^3}}{2c^2} + \frac{bd \ln(c - x\sqrt{c^3}) \sqrt{c^3}}{2c^2}$$

$$- \frac{bd \ln(c + x\sqrt{-c^3}) \sqrt{-c^3}}{2c^2}$$

$$+ \frac{bd \ln(c - x\sqrt{-c^3}) \sqrt{-c^3}}{2c^2}$$

input `int((a + b*atanh(c*x^2))*(d + e*x),x)`

output `a*d*x + (a*e*x^2)/2 + (b*d*x*log(c*x^2 + 1))/2 - (b*d*x*log(1 - c*x^2))/2 + (b*e*log(c + x*(c^3)^(1/2)))/(4*c) + (b*e*log(c - x*(c^3)^(1/2)))/(4*c) + (b*e*x^2*log(c*x^2 + 1))/4 - (b*e*x^2*log(1 - c*x^2))/4 + (b*e*log(c + x*(-c^3)^(1/2)))/(4*c) + (b*e*log(c - x*(-c^3)^(1/2)))/(4*c) - (b*d*log(c + x*(c^3)^(1/2))*(c^3)^(1/2))/(2*c^2) + (b*d*log(c - x*(c^3)^(1/2))*(c^3)^(1/2))/(2*c^2) - (b*d*log(c + x*(-c^3)^(1/2))*(-c^3)^(1/2))/(2*c^2) + (b*d*log(c - x*(-c^3)^(1/2))*(-c^3)^(1/2))/(2*c^2)`

3.26 $\int \frac{a+b\operatorname{arctanh}(cx^2)}{d+ex} dx$

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3.26.1 Optimal result

Integrand size = 18, antiderivative size = 325

$$\int \frac{a + b\operatorname{arctanh}(cx^2)}{d + ex} dx = \frac{(a + b\operatorname{arctanh}(cx^2)) \log(d + ex)}{e} - \frac{b \log\left(\frac{e(1-\sqrt{-cx})}{\sqrt{-cd+e}}\right) \log(d + ex)}{2e}$$

$$- \frac{b \log\left(-\frac{e(1+\sqrt{-cx})}{\sqrt{-cd-e}}\right) \log(d + ex)}{2e}$$

$$+ \frac{b \log\left(\frac{e(1-\sqrt{cx})}{\sqrt{cd+e}}\right) \log(d + ex)}{2e} + \frac{b \log\left(-\frac{e(1+\sqrt{cx})}{\sqrt{cd-e}}\right) \log(d + ex)}{2e}$$

$$- \frac{b \operatorname{PolyLog}\left(2, \frac{\sqrt{-c}(d+ex)}{\sqrt{-cd-e}}\right)}{2e} + \frac{b \operatorname{PolyLog}\left(2, \frac{\sqrt{c}(d+ex)}{\sqrt{cd-e}}\right)}{2e}$$

$$- \frac{b \operatorname{PolyLog}\left(2, \frac{\sqrt{-c}(d+ex)}{\sqrt{-cd+e}}\right)}{2e} + \frac{b \operatorname{PolyLog}\left(2, \frac{\sqrt{c}(d+ex)}{\sqrt{cd+e}}\right)}{2e}$$

output

```
(a+b*arctanh(c*x^2))*ln(e*x+d)/e-1/2*b*ln(e*x+d)*ln(e*(1-x*(-c)^(1/2))/(e+d*(-c)^(1/2)))/e-1/2*b*ln(e*x+d)*ln(-e*(1+x*(-c)^(1/2))/(-e+d*(-c)^(1/2)))/e+1/2*b*ln(e*x+d)*ln(e*(1-x*c^(1/2))/(e+d*c^(1/2)))/e+1/2*b*ln(e*x+d)*ln(-e*(1+x*c^(1/2))/(-e+d*c^(1/2)))/e-1/2*b*polylog(2,(e*x+d)*(-c)^(1/2)/(-e+d*(-c)^(1/2)))/e-1/2*b*polylog(2,(e*x+d)*(-c)^(1/2)/(e+d*(-c)^(1/2)))/e+1/2*b*polylog(2,(e*x+d)*c^(1/2)/(-e+d*c^(1/2)))/e+1/2*b*polylog(2,(e*x+d)*c^(1/2)/(e+d*c^(1/2)))/e
```

3.26.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 18.29 (sec) , antiderivative size = 285, normalized size of antiderivative = 0.88

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{d + ex} dx = \frac{a \log(d + ex)}{e} + \frac{b \left(2 \operatorname{arctanh}(cx^2) \log(d + ex) - \log\left(\frac{e(i - \sqrt{cx})}{\sqrt{cd + ie}}\right) \log(d + ex) - \log\left(-\frac{e(i + \sqrt{cx})}{\sqrt{cd - ie}}\right) \log(d + ex) + \log\left(-\frac{e(1 + \sqrt{cx})}{\sqrt{cd}}\right) \log(d + ex) \right)}{e}$$

input `Integrate[(a + b*ArcTanh[c*x^2])/(d + e*x), x]`

output `(a*Log[d + e*x])/e + (b*(2*ArcTanh[c*x^2]*Log[d + e*x] - Log[(e*(1 - Sqrt[c]*x))/(Sqrt[c]*d + I*e)]*Log[d + e*x] - Log[-((e*(1 + Sqrt[c]*x))/(Sqrt[c]*d - I*e))]*Log[d + e*x] + Log[-((e*(1 + Sqrt[c]*x))/(Sqrt[c]*d - e))]*Log[d + e*x] + Log[d + e*x]*Log[(e - Sqrt[c]*e*x)/(Sqrt[c]*d + e)] + PolyLog[2, (Sqrt[c]*(d + e*x))/(Sqrt[c]*d - e)] - PolyLog[2, (Sqrt[c]*(d + e*x))/(Sqrt[c]*d - I*e)] - PolyLog[2, (Sqrt[c]*(d + e*x))/(Sqrt[c]*d + I*e)] + PolyLog[2, (Sqrt[c]*(d + e*x))/(Sqrt[c]*d + e)])/(2*e)`

3.26.3 Rubi [A] (verified)

Time = 0.80 (sec) , antiderivative size = 325, 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 = {6482, 2863, 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.

$$\begin{aligned} & \int \frac{a + b \operatorname{arctanh}(cx^2)}{d + ex} dx \\ & \quad \downarrow \text{6482} \\ & \frac{\log(d + ex) (a + b \operatorname{arctanh}(cx^2))}{e} - \frac{2bc \int \frac{x \log(d + ex)}{1 - c^2 x^4} dx}{e} \\ & \quad \downarrow \text{2863} \\ & \frac{\log(d + ex) (a + b \operatorname{arctanh}(cx^2))}{e} - \frac{2bc \int \left(\frac{cx \log(d + ex)}{2(c - c^2 x^2)} + \frac{cx \log(d + ex)}{2(c^2 x^2 + c)} \right) dx}{e} \end{aligned}$$

3.26. $\int \frac{a + b \operatorname{arctanh}(cx^2)}{d + ex} dx$

$$\frac{\log(d+ex) (a + \operatorname{arctanh}(cx^2))}{d+ex} - \frac{e}{4c} \left(\frac{\operatorname{PolyLog}\left(2, \frac{\sqrt{-c}(d+ex)}{\sqrt{-cd-e}}\right)}{4c} - \frac{\operatorname{PolyLog}\left(2, \frac{\sqrt{c}(d+ex)}{\sqrt{cd-e}}\right)}{4c} + \frac{\operatorname{PolyLog}\left(2, \frac{\sqrt{-c}(d+ex)}{\sqrt{-cd+e}}\right)}{4c} - \frac{\operatorname{PolyLog}\left(2, \frac{\sqrt{c}(d+ex)}{\sqrt{cd+e}}\right)}{4c} + \frac{\log(d+ex) \log\left(\frac{e(1-\sqrt{-cx})}{\sqrt{-cd+e}}\right)}{4c} \right)$$

input `Int[(a + b*ArcTanh[c*x^2])/(d + e*x), x]`

output `((a + b*ArcTanh[c*x^2])*Log[d + e*x])/e - (2*b*c*((Log[(e*(1 - Sqrt[-c]*x))/(Sqrt[-c]*d + e)]*Log[d + e*x])/(4*c) + (Log[-((e*(1 + Sqrt[-c]*x))/(Sqrt[-c]*d - e))]*Log[d + e*x])/(4*c) - (Log[(e*(1 - Sqrt[c]*x))/(Sqrt[c]*d + e)]*Log[d + e*x])/(4*c) - (Log[-((e*(1 + Sqrt[c]*x))/(Sqrt[c]*d - e))]*Log[d + e*x])/(4*c) + PolyLog[2, (Sqrt[-c]*(d + e*x))/(Sqrt[-c]*d - e)]/(4*c) - PolyLog[2, (Sqrt[c]*(d + e*x))/(Sqrt[c]*d - e)]/(4*c) + PolyLog[2, (Sqrt[-c]*(d + e*x))/(Sqrt[-c]*d + e)]/(4*c) - PolyLog[2, (Sqrt[c]*(d + e*x))/(Sqrt[c]*d + e)]/(4*c)))/e`

3.26.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 2863 `Int[((a_.) + Log[(c_.)*((d_) + (e_.)*(x_)^(n_.))]*(b_.))^(p_.)*((h_.)*(x_)^(m_.))*((f_.) + (g_.)*(x_)^(r_.))^(q_.), x_Symbol] := Int[ExpandIntegrand[(a + b*Log[c*(d + e*x)^n])^p, (h*x)^m*(f + g*x^r)^q, x], x] /; FreeQ[{a, b, c, d, e, f, g, h, m, n, p, q, r}, x] && IntegerQ[m] && IntegerQ[q]`

rule 6482 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)])*(b_.)/((d_.) + (e_.)*(x_)), x_Symbol] := Simp[Log[d + e*x]*((a + b*ArcTanh[c*x^n])/e), x] - Simp[b*c*(n/e) Int[x^(n-1)*(Log[d + e*x]/(1 - c^2*x^(2*n))), x], x] /; FreeQ[{a, b, c, d, e, n}, x] && IntegerQ[n]`

3.26.4 Maple [A] (verified)

Time = 1.04 (sec) , antiderivative size = 347, normalized size of antiderivative = 1.07

method	result
default	$\frac{a \ln(ex+d)}{e} + b \left(\frac{\ln(ex+d) \operatorname{arctanh}(cx^2)}{e} - \frac{e^2 \left(\frac{\ln(ex+d) \left(\ln\left(\frac{e\sqrt{c}-c(ex+d)+cd}{e\sqrt{c+cd}}\right) + \ln\left(\frac{e\sqrt{c}+c(ex+d)-cd}{e\sqrt{c-cd}}\right) \right)}{2c} \right) + \operatorname{dilog}\left(\frac{e\sqrt{c}-c(ex+d)}{e\sqrt{c+cd}}\right)}{2} \right)$
parts	$\frac{a \ln(ex+d)}{e} + b \left(\frac{\ln(ex+d) \operatorname{arctanh}(cx^2)}{e} - \frac{e^2 \left(\frac{\ln(ex+d) \left(\ln\left(\frac{e\sqrt{c}-c(ex+d)+cd}{e\sqrt{c+cd}}\right) + \ln\left(\frac{e\sqrt{c}+c(ex+d)-cd}{e\sqrt{c-cd}}\right) \right)}{2c} \right) + \operatorname{dilog}\left(\frac{e\sqrt{c}-c(ex+d)}{e\sqrt{c+cd}}\right)}{2} \right)$
risch	$\frac{a \ln(ex+d)}{e} - \frac{b \ln(ex+d) \ln(-cx^2+1)}{2e} + \frac{b \ln(ex+d) \ln\left(\frac{e\sqrt{c}-c(ex+d)+cd}{e\sqrt{c+cd}}\right)}{2e} + \frac{b \ln(ex+d) \ln\left(\frac{e\sqrt{c}+c(ex+d)-cd}{e\sqrt{c-cd}}\right)}{2e} + \frac{b \operatorname{dilog}\left(\frac{e\sqrt{c}-c(ex+d)}{e\sqrt{c+cd}}\right)}{2}$

input `int((a+b*arctanh(c*x^2))/(e*x+d),x,method=_RETURNVERBOSE)`

output

```

a*ln(e*x+d)/e+b*(ln(e*x+d)/e*arctanh(c*x^2)-2*c/e^3*(-1/2*e^2*(1/2*ln(e*x+d)*ln((e*c^(1/2)-c*(e*x+d)+c*d)/(e*c^(1/2)+c*d))+ln((e*c^(1/2)+c*(e*x+d)-c*d)/(e*c^(1/2)-c*d)))/c+1/2*(dilog((e*c^(1/2)-c*(e*x+d)+c*d)/(e*c^(1/2)+c*d))+dilog((e*c^(1/2)+c*(e*x+d)-c*d)/(e*c^(1/2)-c*d)))/c)+1/2*e^2*(1/2*ln(e*x+d)*(ln((e*(-c)^(1/2)-c*(e*x+d)+c*d)/(e*(-c)^(1/2)+c*d))+ln((e*(-c)^(1/2)+c*(e*x+d)-c*d)/(e*(-c)^(1/2)-c*d)))/c+1/2*(dilog((e*(-c)^(1/2)-c*(e*x+d)+c*d)/(e*(-c)^(1/2)+c*d))+dilog((e*(-c)^(1/2)+c*(e*x+d)-c*d)/(e*(-c)^(1/2)-c*d)))/c))
    
```

3.26.5 Fracas [F]

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{d + ex} dx = \int \frac{b \operatorname{artanh}(cx^2) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^2))/(e*x+d),x, algorithm="fricas")`

output `integral((b*arctanh(c*x^2) + a)/(e*x + d), x)`

3.26.6 Sympy [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{d + ex} dx = \text{Timed out}$$

input `integrate((a+b*atanh(c*x**2))/(e*x+d),x)`

output `Timed out`

3.26.7 Maxima [F]

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{d + ex} dx = \int \frac{b \operatorname{artanh}(cx^2) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^2))/(e*x+d),x, algorithm="maxima")`

output `1/2*b*integrate((log(c*x^2 + 1) - log(-c*x^2 + 1))/(e*x + d), x) + a*log(e*x + d)/e`

3.26.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{d + ex} dx = \int \frac{b \operatorname{artanh}(cx^2) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^2))/(e*x+d),x, algorithm="giac")`

output `integrate((b*arctanh(c*x^2) + a)/(e*x + d), x)`

3.26.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{d + ex} dx = \int \frac{a + b \operatorname{atanh}(cx^2)}{d + ex} dx$$

input `int((a + b*atanh(c*x^2))/(d + e*x),x)`

output `int((a + b*atanh(c*x^2))/(d + e*x), x)`

3.27 $\int \frac{a+b\operatorname{arctanh}(cx^2)}{(d+ex)^2} dx$

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3.27.1 Optimal result

Integrand size = 18, antiderivative size = 166

$$\int \frac{a + b\operatorname{arctanh}(cx^2)}{(d + ex)^2} dx = \frac{b\sqrt{c} \arctan(\sqrt{cx})}{cd^2 + e^2} - \frac{b\sqrt{c}\operatorname{arctanh}(\sqrt{cx})}{cd^2 - e^2} - \frac{a + b\operatorname{arctanh}(cx^2)}{e(d + ex)} + \frac{2bcde \log(d + ex)}{c^2d^4 - e^4} - \frac{bcd \log(1 - cx^2)}{2e(cd^2 - e^2)} + \frac{bcd \log(1 + cx^2)}{2e(cd^2 + e^2)}$$

output $(-a-b*\operatorname{arctanh}(c*x^2))/e/(e*x+d)+2*b*c*d*e*\ln(e*x+d)/(c^2*d^4-e^4)-1/2*b*c*d*\ln(-c*x^2+1)/e/(c*d^2-e^2)+1/2*b*c*d*\ln(c*x^2+1)/e/(c*d^2+e^2)+b*\operatorname{arctan}(x*c^{(1/2)})*c^{(1/2)}/(c*d^2+e^2)-b*\operatorname{arctanh}(x*c^{(1/2)})*c^{(1/2)}/(c*d^2-e^2)$

3.27.2 Mathematica [A] (verified)

Time = 0.26 (sec) , antiderivative size = 261, normalized size of antiderivative = 1.57

$$\int \frac{a + b\operatorname{arctanh}(cx^2)}{(d + ex)^2} dx = \frac{1}{2} \left(-\frac{2a}{e(d + ex)} + \frac{2b\sqrt{c} \arctan(\sqrt{cx})}{cd^2 + e^2} - \frac{2b\operatorname{arctanh}(cx^2)}{e(d + ex)} + \frac{b\sqrt{c}(c^{3/2}d^3 - cd^2e - e^3) \log(1 - \sqrt{cx})}{-c^2d^4e + e^5} + \frac{b\sqrt{c}(c^{3/2}d^3 + cd^2e + e^3) \log(1 + \sqrt{cx})}{-c^2d^4e + e^5} + \frac{4bcde \log(d + ex)}{c^2d^4 - e^4} + \frac{bc^2d^3 \log(1 + cx^2)}{c^2d^4e - e^5} - \frac{bcde \log(1 - c^2x^4)}{c^2d^4 - e^4} \right)$$

input `Integrate[(a + b*ArcTanh[c*x^2])/(d + e*x)^2,x]`

output
$$\begin{aligned} & ((-2*a)/(e*(d + e*x)) + (2*b*Sqrt[c]*ArcTan[Sqrt[c]*x])/(c*d^2 + e^2) - (2 \\ & *b*ArcTanh[c*x^2])/(e*(d + e*x)) + (b*Sqrt[c]*(c^{(3/2)*d^3} - c*d^2*e - e^3 \\ &)*Log[1 - Sqrt[c]*x])/(-(c^2*d^4*e) + e^5) + (b*Sqrt[c]*(c^{(3/2)*d^3} + c*d \\ & ^2*e + e^3)*Log[1 + Sqrt[c]*x])/(-(c^2*d^4*e) + e^5) + (4*b*c*d*e*Log[d + \\ & e*x))/(c^2*d^4 - e^4) + (b*c^2*d^3*Log[1 + c*x^2])/(c^2*d^4*e - e^5) - (b* \\ & c*d*e*Log[1 - c^2*x^4])/(c^2*d^4 - e^4))/2 \end{aligned}$$

3.27.3 Rubi [A] (verified)

Time = 0.54 (sec) , antiderivative size = 168, normalized size of antiderivative = 1.01, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {6486, 7276, 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.

$$\begin{aligned} & \int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^2} dx \\ & \quad \downarrow \text{6486} \\ & \frac{2bc \int \frac{x}{(d+ex)(1-c^2x^4)} dx}{e} - \frac{a + b \operatorname{arctanh}(cx^2)}{e(d + ex)} \\ & \quad \downarrow \text{7276} \\ & \frac{2bc \int \left(-\frac{de^3}{(e^4 - c^2d^4)(d+ex)} + \frac{e-cdx}{2(cd^2 - e^2)(cx^2 - 1)} + \frac{e+cdx}{2(cd^2 + e^2)(cx^2 + 1)} \right) dx}{e} - \frac{a + b \operatorname{arctanh}(cx^2)}{e(d + ex)} \\ & \quad \downarrow \text{2009} \\ & \frac{2bc \left(\frac{e \arctan(\sqrt{cx})}{2\sqrt{c}(cd^2 + e^2)} - \frac{e \operatorname{arctanh}(\sqrt{cx})}{2\sqrt{c}(cd^2 - e^2)} + \frac{de^2 \log(d+ex)}{c^2d^4 - e^4} - \frac{d \log(1-cx^2)}{4(cd^2 - e^2)} + \frac{d \log(cx^2 + 1)}{4(cd^2 + e^2)} \right)}{e} - \frac{a + b \operatorname{arctanh}(cx^2)}{e(d + ex)} \end{aligned}$$

input `Int[(a + b*ArcTanh[c*x^2])/(d + e*x)^2,x]`

```
output -((a + b*ArcTanh[c*x^2])/(e*(d + e*x))) + (2*b*c*((e*ArcTan[Sqrt[c]*x])/(2
*sqrt[c]*(c*d^2 + e^2)) - (e*ArcTanh[Sqrt[c]*x])/(2*sqrt[c]*(c*d^2 - e^2))
+ (d*e^2*Log[d + e*x])/(c^2*d^4 - e^4) - (d*Log[1 - c*x^2])/(4*(c*d^2 - e
^2)) + (d*Log[1 + c*x^2])/(4*(c*d^2 + e^2))))/e
```

3.27.3.1 Defintions of rubi rules used

```
rule 2009 Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]
```

```
rule 6486 Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)])*(b_.)*((d_.) + (e_.)*(x_)^(m_.)), x_
Symbol] := Simp[(d + e*x)^(m + 1)*((a + b*ArcTanh[c*x^n])/(e*(m + 1))), x]
- Simp[b*c*(n/(e*(m + 1))) Int[x^(n - 1)*((d + e*x)^(m + 1)/(1 - c^2*x^(2
*n))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && NeQ[m, -1]
```

```
rule 7276 Int[(u_)/((a_) + (b_.)*(x_)^(n_)), x_Symbol] := With[{v = RationalFunctionE
xpand[u/(a + b*x^n), x]}, Int[v, x] /; SumQ[v]] /; FreeQ[{a, b}, x] && IGtQ
[n, 0]
```

3.27.4 Maple [A] (verified)

Time = 1.96 (sec) , antiderivative size = 155, normalized size of antiderivative = 0.93

method	result
default	$-\frac{a}{(ex+d)e} + b \left(-\frac{\operatorname{arctanh}(cx^2)}{(ex+d)e} + \frac{2c \left(\frac{-\frac{d \ln(cx^2-1)}{2} - e \operatorname{arctanh}(x\sqrt{c})}{2cd^2-2e^2\sqrt{c}} + \frac{\frac{d \ln(cx^2+1)}{2} + e \operatorname{arctan}(x\sqrt{c})}{2cd^2+2e^2\sqrt{c}} + \frac{e^2 d \ln(ex+d)}{(cd^2-e^2)(cd^2+e^2)} \right)}{e} \right)$
parts	$-\frac{a}{(ex+d)e} + b \left(-\frac{\operatorname{arctanh}(cx^2)}{(ex+d)e} + \frac{2c \left(\frac{-\frac{d \ln(cx^2-1)}{2} - e \operatorname{arctanh}(x\sqrt{c})}{2cd^2-2e^2\sqrt{c}} + \frac{\frac{d \ln(cx^2+1)}{2} + e \operatorname{arctan}(x\sqrt{c})}{2cd^2+2e^2\sqrt{c}} + \frac{e^2 d \ln(ex+d)}{(cd^2-e^2)(cd^2+e^2)} \right)}{e} \right)$
risch	Expression too large to display

```
input int((a+b*arctanh(c*x^2))/(e*x+d)^2,x,method=_RETURNVERBOSE)
```

$$3.27. \int \frac{a+b\operatorname{arctanh}(cx^2)}{(d+ex)^2} dx$$

output
$$-a/(e*x+d)/e+b*(-1/(e*x+d)/e*\operatorname{arctanh}(c*x^2)+2*c/e*(1/(2*c*d^2-2*e^2))*(-1/2*d*\ln(c*x^2-1)-e/c^{1/2}*\operatorname{arctanh}(x*c^{1/2}))+1/(2*c*d^2+2*e^2)*(1/2*d*\ln(c*x^2+1)+e/c^{1/2}*\operatorname{arctan}(x*c^{1/2}))+e^2*d/(c*d^2-e^2)/(c*d^2+e^2)*\ln(e*x+d))$$

3.27.5 Fracas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 321 vs. $2(154) = 308$.

Time = 2.34 (sec) , antiderivative size = 634, normalized size of antiderivative = 3.82

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^2} dx$$

$$= \left[\frac{2ac^2d^4 - 2ae^4 - 2(bcd^3e - bde^3 + (bcd^2e^2 - be^4)x)\sqrt{c} \operatorname{arctan}(\sqrt{c}x) + (bcd^3e + bde^3 + (bcd^2e^2 + be^4)x)\sqrt{c} \operatorname{arctan}(\sqrt{c}x)}{2ac^2d^4 - 2ae^4 - 2(bcd^3e + bde^3 + (bcd^2e^2 + be^4)x)\sqrt{-c} \operatorname{arctan}(\sqrt{-c}x) - (bcd^3e - bde^3 + (bcd^2e^2 - be^4)x)\sqrt{-c} \operatorname{arctan}(\sqrt{-c}x)} \right]$$

input `integrate((a+b*arctanh(c*x^2))/(e*x+d)^2,x, algorithm="fracas")`

output
$$\begin{aligned} & [-1/2*(2*a*c^2*d^4 - 2*a*e^4 - 2*(b*c*d^3*e - b*d*e^3 + (b*c*d^2*e^2 - b*e^4)*x)*\sqrt{c}*\operatorname{arctan}(\sqrt{c}*x) + (b*c*d^3*e + b*d*e^3 + (b*c*d^2*e^2 + b*e^4)*x)*\sqrt{c}*\log((c*x^2 + 2*\sqrt{c}*x + 1)/(c*x^2 - 1)) - (b*c^2*d^4 - b*c*d^2*e^2 + (b*c^2*d^3*e - b*c*d*e^3)*x)*\log(c*x^2 + 1) + (b*c^2*d^4 + b*c*d^2*e^2 + (b*c^2*d^3*e + b*c*d*e^3)*x)*\log(c*x^2 - 1) - 4*(b*c*d*e^3*x + b*c*d^2*e^2)*\log(e*x + d) + (b*c^2*d^4 - b*e^4)*\log(-(c*x^2 + 1)/(c*x^2 - 1)))/(c^2*d^5*e - d*e^5 + (c^2*d^4*e^2 - e^6)*x), -1/2*(2*a*c^2*d^4 - 2*a*e^4 - 2*(b*c*d^3*e + b*d*e^3 + (b*c*d^2*e^2 + b*e^4)*x)*\sqrt{-c}*\operatorname{arctan}(\sqrt{-c}*x) - (b*c*d^3*e - b*d*e^3 + (b*c*d^2*e^2 - b*e^4)*x)*\sqrt{-c}*\log((c*x^2 + 2*\sqrt{-c}*x - 1)/(c*x^2 + 1)) - (b*c^2*d^4 - b*c*d^2*e^2 + (b*c^2*d^3*e - b*c*d*e^3)*x)*\log(c*x^2 + 1) + (b*c^2*d^4 + b*c*d^2*e^2 + (b*c^2*d^3*e + b*c*d*e^3)*x)*\log(c*x^2 - 1) - 4*(b*c*d*e^3*x + b*c*d^2*e^2)*\log(e*x + d) + (b*c^2*d^4 - b*e^4)*\log(-(c*x^2 + 1)/(c*x^2 - 1)))/(c^2*d^5*e - d*e^5 + (c^2*d^4*e^2 - e^6)*x)] \end{aligned}$$

3.27.6 Sympy [F(-1)]

Timed out.

$$\int \frac{a + \operatorname{barctanh}(cx^2)}{(d + ex)^2} dx = \text{Timed out}$$

input `integrate((a+b*atanh(c*x**2))/(e*x+d)**2,x)`

output `Timed out`

3.27.7 Maxima [A] (verification not implemented)

Time = 0.28 (sec) , antiderivative size = 172, normalized size of antiderivative = 1.04

$$\int \frac{a + \operatorname{barctanh}(cx^2)}{(d + ex)^2} dx$$

$$= \frac{1}{2} \left(\left(\frac{4de \log(ex + d)}{c^2d^4 - e^4} + \frac{d \log(cx^2 + 1)}{cd^2e + e^3} - \frac{d \log(cx^2 - 1)}{cd^2e - e^3} + \frac{2 \arctan(\sqrt{cx})}{(cd^2 + e^2)\sqrt{c}} + \frac{\log\left(\frac{cx - \sqrt{c}}{cx + \sqrt{c}}\right)}{(cd^2 - e^2)\sqrt{c}} \right) c - \frac{2 \operatorname{arctanh}(cx^2)}{e^2x + de} \right) - \frac{a}{e^2x + de}$$

input `integrate((a+b*arctanh(c*x^2))/(e*x+d)^2,x, algorithm="maxima")`

output `1/2*((4*d*e*log(e*x + d)/(c^2*d^4 - e^4) + d*log(c*x^2 + 1)/(c*d^2*e + e^3) - d*log(c*x^2 - 1)/(c*d^2*e - e^3) + 2*arctan(sqrt(c)*x)/((c*d^2 + e^2)*sqrt(c)) + log((c*x - sqrt(c))/(c*x + sqrt(c)))/((c*d^2 - e^2)*sqrt(c)))*c - 2*arctanh(c*x^2)/(e^2*x + d*e))*b - a/(e^2*x + d*e)`

3.27.8 Giac [A] (verification not implemented)

Time = 0.31 (sec) , antiderivative size = 269, normalized size of antiderivative = 1.62

$$\int \frac{a + \operatorname{barctanh}(cx^2)}{(d + ex)^2} dx$$

$$= \frac{1}{2} \left(\frac{cd \log\left(c - \frac{2cd}{ex+d} + \frac{cd^2}{(ex+d)^2} + \frac{e^2}{(ex+d)^2}\right)}{cd^2e + e^3} - \frac{cd \log\left(c - \frac{2cd}{ex+d} + \frac{cd^2}{(ex+d)^2} - \frac{e^2}{(ex+d)^2}\right)}{cd^2e - e^3} + \frac{2c \arctan\left(\frac{cd - \frac{cd^2}{ex+d} + e}{\sqrt{-ce}}\right)}{(cd^2 - e^2)\sqrt{-c}} \right) - \frac{a}{(ex + d)e}$$

3.27. $\int \frac{a + \operatorname{barctanh}(cx^2)}{(d + ex)^2} dx$

input `integrate((a+b*arctanh(c*x^2))/(e*x+d)^2,x, algorithm="giac")`

output $\frac{1}{2} * (c*d*\log(c - 2*c*d/(e*x + d) + c*d^2/(e*x + d)^2 + e^2/(e*x + d)^2)/(c*d^2*e + e^3) - c*d*\log(c - 2*c*d/(e*x + d) + c*d^2/(e*x + d)^2 - e^2/(e*x + d)^2)/(c*d^2*e - e^3) + 2*c*\arctan((c*d - c*d^2/(e*x + d) + e^2/(e*x + d))/(\sqrt{-c}*e))/((c*d^2 - e^2)*\sqrt{-c}) + 2*\sqrt{c}*\arctan((c*d - c*d^2/(e*x + d) - e^2/(e*x + d))/(\sqrt{c}*e))/(c*d^2 + e^2) - \log(-(c*x^2 + 1)/(c*x^2 - 1))/((e*x + d)*e))*b - a/((e*x + d)*e)$

3.27.9 Mupad [B] (verification not implemented)

Time = 5.28 (sec) , antiderivative size = 727, normalized size of antiderivative = 4.38

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^2} dx$$

$$\ln \left(\frac{16b^4 c^{10} x}{e} - \frac{(b\sqrt{-ce}+bcd) \left(8b^3 c^9 e - \frac{(b\sqrt{-ce}+bcd) \left(\frac{8x(4bc^{11}d^5e^2+52bc^9de^6)}{e^2} - \frac{(b\sqrt{-ce}+bcd) \left(\frac{384c^8de^6 + \frac{8x(24cd^2e+e^3)}{2} \right)}{2(cd^2e+e^3)} \right)}{2(cd^2e+e^3)} \right)}{2(cd^2e+e^3)} \right)}{2(cd^2e+e^3)} \right)$$

$$- \frac{a}{xe^2 + de} \left(\frac{(b\sqrt{-ce}-bcd) \left(8b^3 c^9 e - \frac{(b\sqrt{-ce}-bcd) \left(\frac{8x(4bc^{11}d^5e^2+52bc^9de^6)}{e^2} + \frac{(b\sqrt{-ce}-bcd) \left(\frac{384c^8de^6 + \frac{8x(24c^{10}d^4e^5+40cd^2e+e^3)}{e^2} \right)}{2(cd^2e+e^3)} \right)}{2(cd^2e+e^3)} \right)}{2(cd^2e+e^3)} \right)}{2(cd^2e+e^3)} \right)$$

3.27. $\int \frac{a+b\operatorname{arctanh}(cx^2)}{(d+ex)^2} dx$

input `int((a + b*atanh(c*x^2))/(d + e*x)^2,x)`

output
$$\begin{aligned} & (\log((16*b^4*c^{10}*x)/e - ((b*(-c)^{(1/2)}*e + b*c*d)*(8*b^3*c^9*e - ((b*(-c)^{(1/2)}*e + b*c*d)*((b*(-c)^{(1/2)}*e + b*c*d)*((8*x*(4*b*c^{11}*d^5*e^2 + 52*b*c^9*d*e^6))/e^2 - ((b*(-c)^{(1/2)}*e + b*c*d)*(384*c^8*d*e^6 + (8*x*(40*c^8*e^9 + 24*c^{10}*d^4*e^5))/e^2 + 128*c^{10}*d^5*e^2))/(2*(e^3 + c*d^2*e)) + 320*b*c^9*d^2*e^3))/(2*(e^3 + c*d^2*e)) - 64*b^2*c^{10}*d^2*e*x))/(2*(e^3 + c*d^2*e)) + (8*b^3*c^{11}*d^3*x)/e^2))/(2*(e^3 + c*d^2*e)))*(b*(-c)^{(1/2)}*e + b*c*d))/(2*(e^3 + c*d^2*e)) - a/(d*e + e^2*x) - (\log(((b*(-c)^{(1/2)}*e - b*c*d)*(8*b^3*c^9*e - ((b*(-c)^{(1/2)}*e - b*c*d)*((b*(-c)^{(1/2)}*e - b*c*d)*((8*x*(4*b*c^{11}*d^5*e^2 + 52*b*c^9*d*e^6))/e^2 + ((b*(-c)^{(1/2)}*e - b*c*d)*(384*c^8*d*e^6 + (8*x*(40*c^8*e^9 + 24*c^{10}*d^4*e^5))/e^2 + 128*c^{10}*d^5*e^2))/(2*(e^3 + c*d^2*e)) + 320*b*c^9*d^2*e^3))/(2*(e^3 + c*d^2*e)) + 64*b^2*c^{10}*d^2*e*x))/(2*(e^3 + c*d^2*e)) + (8*b^3*c^{11}*d^3*x)/e^2))/(2*(e^3 + c*d^2*e)) + (16*b^4*c^{10}*x)/e)*(b*(-c)^{(1/2)}*e - b*c*d))/(2*(e^3 + c*d^2*e)) - (b*log(c*x^2 + 1))/(2*e*(d + e*x)) - (b*c^{(1/2)}*log(c^{(1/2)}*x - 1))/(2*(e^2 + c^{(1/2)}*d*e)) + (b*c^{(1/2)}*log(c^{(1/2)}*x + 1))/(2*(e^2 - c^{(1/2)}*d*e)) + (b*log(1 - c*x^2))/(e*(2*d + 2*e*x)) - (2*b*c*d*e*log(d + e*x))/(e^4 - c^2*d^4) \end{aligned}$$

3.28 $\int \frac{a+b\operatorname{arctanh}(cx^2)}{(d+ex)^3} dx$

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3.28.1 Optimal result

Integrand size = 18, antiderivative size = 226

$$\int \frac{a + b\operatorname{arctanh}(cx^2)}{(d + ex)^3} dx = -\frac{bcde}{(c^2d^4 - e^4)(d + ex)} + \frac{bc^{3/2}d \arctan(\sqrt{cx})}{(cd^2 + e^2)^2} - \frac{bc^{3/2}d \operatorname{arctanh}(\sqrt{cx})}{(cd^2 - e^2)^2} - \frac{a + b\operatorname{arctanh}(cx^2)}{2e(d + ex)^2} + \frac{bce(3c^2d^4 + e^4) \log(d + ex)}{(c^2d^4 - e^4)^2} - \frac{bc(cd^2 + e^2) \log(1 - cx^2)}{4e(cd^2 - e^2)^2} + \frac{bc(cd^2 - e^2) \log(1 + cx^2)}{4e(cd^2 + e^2)^2}$$

output

```
-b*c*d*e/(c^2*d^4-e^4)/(e*x+d)+b*c^(3/2)*d*arctan(x*c^(1/2))/(c*d^2+e^2)^2
+1/2*(-a-b*arctanh(c*x^2))/e/(e*x+d)^2-b*c^(3/2)*d*arctanh(x*c^(1/2))/(c*d
^2-e^2)^2+b*c*e*(3*c^2*d^4+e^4)*ln(e*x+d)/(c^2*d^4-e^4)^2-1/4*b*c*(c*d^2+e
^2)*ln(-c*x^2+1)/e/(c*d^2-e^2)^2+1/4*b*c*(c*d^2-e^2)*ln(c*x^2+1)/e/(c*d^2+
e^2)^2
```


3.28.2 Mathematica [A] (verified)

Time = 0.48 (sec) , antiderivative size = 379, normalized size of antiderivative = 1.68

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^3} dx$$

$$= \frac{1}{4} \left(-\frac{2a}{e(d + ex)^2} - \frac{4bcde}{(c^2d^4 - e^4)(d + ex)} + \frac{4bc^{3/2}d \arctan(\sqrt{cx})}{(cd^2 + e^2)^2} - \frac{2b \operatorname{arctanh}(cx^2)}{e(d + ex)^2} \right.$$

$$- \frac{bc^{3/2}d(c^{5/2}d^5 - 2c^2d^4e - 4cd^2e^3 + 3\sqrt{c}de^4 - 2e^5) \log(1 - \sqrt{cx})}{e(-c^2d^4 + e^4)^2}$$

$$- \frac{bc^{3/2}d(c^{5/2}d^5 + 2c^2d^4e + 4cd^2e^3 + 3\sqrt{c}de^4 + 2e^5) \log(1 + \sqrt{cx})}{e(-c^2d^4 + e^4)^2}$$

$$+ \frac{4bce(3c^2d^4 + e^4) \log(d + ex)}{(-c^2d^4 + e^4)^2} + \frac{bc^2(c^2d^6 + 3d^2e^4) \log(1 + cx^2)}{e(-c^2d^4 + e^4)^2}$$

$$\left. - \frac{bce(3c^2d^4 + e^4) \log(1 - c^2x^4)}{(-c^2d^4 + e^4)^2} \right)$$

input `Integrate[(a + b*ArcTanh[c*x^2])/(d + e*x)^3,x]`

output `((-2*a)/(e*(d + e*x)^2) - (4*b*c*d*e)/((c^2*d^4 - e^4)*(d + e*x)) + (4*b*c^(3/2)*d*ArcTan[Sqrt[c]*x])/(c*d^2 + e^2)^2 - (2*b*ArcTanh[c*x^2])/(e*(d + e*x)^2) - (b*c^(3/2)*d*(c^(5/2)*d^5 - 2*c^2*d^4*e - 4*c*d^2*e^3 + 3*Sqrt[c]*d*e^4 - 2*e^5)*Log[1 - Sqrt[c]*x])/(e*(-(c^2*d^4) + e^4)^2) - (b*c^(3/2)*d*(c^(5/2)*d^5 + 2*c^2*d^4*e + 4*c*d^2*e^3 + 3*Sqrt[c]*d*e^4 + 2*e^5)*Log[1 + Sqrt[c]*x])/(e*(-(c^2*d^4) + e^4)^2) + (4*b*c*e*(3*c^2*d^4 + e^4)*Log[d + e*x])/(-(c^2*d^4) + e^4)^2 + (b*c^2*(c^2*d^6 + 3*d^2*e^4)*Log[1 + c*x^2])/(e*(-(c^2*d^4) + e^4)^2) - (b*c*e*(3*c^2*d^4 + e^4)*Log[1 - c^2*x^4])/(-(c^2*d^4) + e^4)^2)/4`

3.28.3 Rubi [A] (verified)

Time = 0.63 (sec) , antiderivative size = 223, 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 = {6486, 7276, 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.

3.28. $\int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^3} dx$

$$\begin{aligned}
& \int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^3} dx \\
& \quad \downarrow \text{6486} \\
& \frac{bc \int \frac{x}{(d+ex)^2(1-c^2x^4)} dx}{e} - \frac{a + b \operatorname{arctanh}(cx^2)}{2e(d + ex)^2} \\
& \quad \downarrow \text{7276} \\
& \frac{bc \int \left(-\frac{de^3}{(e^4 - c^2d^4)(d+ex)^2} + \frac{e^7 + 3c^2d^4e^3}{(c^2d^4 - e^4)^2(d+ex)} + \frac{c((cd^2 + e^2)x - 2de)}{2(cd^2 - e^2)^2(1 - cx^2)} + \frac{c(2de + (cd^2 - e^2)x)}{2(cd^2 + e^2)^2(cx^2 + 1)} \right) dx}{e} - \\
& \quad \frac{a + b \operatorname{arctanh}(cx^2)}{2e(d + ex)^2} \\
& \quad \downarrow \text{2009} \\
& \frac{bc \left(\frac{\sqrt{cde} \arctan(\sqrt{cx})}{(cd^2 + e^2)^2} - \frac{\sqrt{cde} \operatorname{arctanh}(\sqrt{cx})}{(cd^2 - e^2)^2} - \frac{de^2}{(c^2d^4 - e^4)(d+ex)} + \frac{e^2(3c^2d^4 + e^4) \log(d+ex)}{(c^2d^4 - e^4)^2} - \frac{(cd^2 + e^2) \log(1 - cx^2)}{4(cd^2 - e^2)^2} + \frac{(cd^2 - e^2) \log(1 + cx^2)}{4(cd^2 + e^2)^2} \right)}{e} - \\
& \quad \frac{a + b \operatorname{arctanh}(cx^2)}{2e(d + ex)^2}
\end{aligned}$$

input `Int[(a + b*ArcTanh[c*x^2])/(d + e*x)^3, x]`

output `-1/2*(a + b*ArcTanh[c*x^2])/(e*(d + e*x)^2) + (b*c*(-((d*e^2)/((c^2*d^4 - e^4)*(d + e*x))) + (Sqrt[c]*d*e*ArcTan[Sqrt[c]*x])/(c*d^2 + e^2)^2 - (Sqrt[c]*d*e*ArcTanh[Sqrt[c]*x])/(c*d^2 - e^2)^2 + (e^2*(3*c^2*d^4 + e^4)*Log[d + e*x])/(c^2*d^4 - e^4)^2 - ((c*d^2 + e^2)*Log[1 - c*x^2])/(4*(c*d^2 - e^2)^2) + ((c*d^2 - e^2)*Log[1 + c*x^2])/(4*(c*d^2 + e^2)^2))/e`

3.28.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6486 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)])*(b_.)*((d_.) + (e_.)*(x_)^(m_.)), x_Symbol] := Simp[(d + e*x)^(m + 1)*((a + b*ArcTanh[c*x^n])/(e*(m + 1))), x] - Simp[b*c*(n/(e*(m + 1))) Int[x^(n - 1)*((d + e*x)^(m + 1)/(1 - c^2*x^(2*n)))]], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && NeQ[m, -1]`

```
rule 7276 Int[(u_)/((a_) + (b_.)*(x_)^(n_)), x_Symbol] := With[{v = RationalFunctionE
xexpand[u/(a + b*x^n), x]}, Int[v, x] /; SumQ[v]] /; FreeQ[{a, b}, x] && IGtQ
[n, 0]
```

3.28.4 Maple [A] (verified)

Time = 2.14 (sec) , antiderivative size = 229, normalized size of antiderivative = 1.01

method	result
default	$-\frac{a}{2(ex+d)^2e} + b \left(-\frac{\operatorname{arctanh}(cx^2)}{2(ex+d)^2e} + \frac{c \left(-\frac{c \left(\frac{(cd^2+e^2)\ln(cx^2-1)}{2c} + \frac{2de \operatorname{arctanh}(x\sqrt{c})}{\sqrt{c}} \right)}{2(cd^2-e^2)^2} + \frac{c \left(\frac{(cd^2-e^2)\ln(cx^2+1)}{2c} + \frac{2de \operatorname{arctan}(x\sqrt{c})}{\sqrt{c}} \right)}{2(cd^2+e^2)^2} \right)}{e}$
parts	$-\frac{a}{2(ex+d)^2e} + b \left(-\frac{\operatorname{arctanh}(cx^2)}{2(ex+d)^2e} + \frac{c \left(-\frac{c \left(\frac{(cd^2+e^2)\ln(cx^2-1)}{2c} + \frac{2de \operatorname{arctanh}(x\sqrt{c})}{\sqrt{c}} \right)}{2(cd^2-e^2)^2} + \frac{c \left(\frac{(cd^2-e^2)\ln(cx^2+1)}{2c} + \frac{2de \operatorname{arctan}(x\sqrt{c})}{\sqrt{c}} \right)}{2(cd^2+e^2)^2} \right)}{e}$

```
input int((a+b*arctanh(c*x^2))/(e*x+d)^3,x,method=_RETURNVERBOSE)
```

```
output -1/2*a/(e*x+d)^2/e+b*(-1/2/(e*x+d)^2/e*arctanh(c*x^2)+c/e*(-1/2*c/(c*d^2-e
^2)^2*(1/2*(c*d^2+e^2)/c*ln(c*x^2-1)+2*d*e/c^(1/2)*arctanh(x*c^(1/2))))+1/2
*c/(c*d^2+e^2)^2*(1/2*(c*d^2-e^2)/c*ln(c*x^2+1)+2*d*e/c^(1/2)*arctan(x*c^(
1/2)))-e^2*d/(c*d^2-e^2)/(c*d^2+e^2)/(e*x+d)+e^2*(3*c^2*d^4+e^4)/(c*d^2-e
^2)^2/(c*d^2+e^2)^2*ln(e*x+d))
```

3.28.5 Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 815 vs. 2(212) = 424.

Time = 20.91 (sec) , antiderivative size = 1639, normalized size of antiderivative = 7.25

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^3} dx = \text{Too large to display}$$

3.28. $\int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^3} dx$

input `integrate((a+b*arctanh(c*x^2))/(e*x+d)^3,x, algorithm="fricas")`

output `[-1/4*(2*a*c^4*d^8 + 4*b*c^3*d^6*e^2 - 4*a*c^2*d^4*e^4 - 4*b*c*d^2*e^6 + 2*a*e^8 - 4*(b*c^3*d^7*e + 2*b*c^2*d^5*e^3 + b*c*d^3*e^5 + (b*c^3*d^5*e^3 + 2*b*c^2*d^3*e^5 + b*c*d*e^7)*x^2 + 2*(b*c^3*d^6*e^2 + 2*b*c^2*d^4*e^4 + b*c*d^2*e^6)*x)*sqrt(-c)*arctan(sqrt(-c)*x) - 2*(b*c^3*d^7*e - 2*b*c^2*d^5*e^3 + b*c*d^3*e^5 + (b*c^3*d^5*e^3 - 2*b*c^2*d^3*e^5 + b*c*d*e^7)*x^2 + 2*(b*c^3*d^6*e^2 - 2*b*c^2*d^4*e^4 + b*c*d^2*e^6)*x)*sqrt(-c)*log((c*x^2 + 2*sqrt(-c)*x - 1)/(c*x^2 + 1)) + 4*(b*c^3*d^5*e^3 - b*c*d*e^7)*x - (b*c^4*d^8 - 3*b*c^3*d^6*e^2 + 3*b*c^2*d^4*e^4 - b*c*d^2*e^6 + (b*c^4*d^6*e^2 - 3*b*c^3*d^4*e^4 + 3*b*c^2*d^2*e^6 - b*c*e^8)*x^2 + 2*(b*c^4*d^7*e - 3*b*c^3*d^5*e^3 + 3*b*c^2*d^3*e^5 - b*c*d*e^7)*x)*log(c*x^2 + 1) + (b*c^4*d^8 + 3*b*c^3*d^6*e^2 + 3*b*c^2*d^4*e^4 + b*c*d^2*e^6 + (b*c^4*d^6*e^2 + 3*b*c^3*d^4*e^4 + 3*b*c^2*d^2*e^6 + b*c*e^8)*x^2 + 2*(b*c^4*d^7*e + 3*b*c^3*d^5*e^3 + 3*b*c^2*d^3*e^5 + b*c*d*e^7)*x)*log(c*x^2 - 1) - 4*(3*b*c^3*d^6*e^2 + b*c*d^2*e^6 + (3*b*c^3*d^4*e^4 + b*c*e^8)*x^2 + 2*(3*b*c^3*d^5*e^3 + b*c*d*e^7)*x)*log(e*x + d) + (b*c^4*d^8 - 2*b*c^2*d^4*e^4 + b*e^8)*log(-(c*x^2 + 1)/(c*x^2 - 1)))/(c^4*d^10*e - 2*c^2*d^6*e^5 + d^2*e^9 + (c^4*d^8*e^3 - 2*c^2*d^4*e^7 + e^11)*x^2 + 2*(c^4*d^9*e^2 - 2*c^2*d^5*e^6 + d*e^10)*x), -1/4*(2*a*c^4*d^8 + 4*b*c^3*d^6*e^2 - 4*a*c^2*d^4*e^4 - 4*b*c*d^2*e^6 + 2*a*e^8 - 4*(b*c^3*d^7*e - 2*b*c^2*d^5*e^3 + b*c*d^3*e^5 + (b*c^3*d^5*e^3 - 2*b*c^2*d^3*e^5 + b*c*d*e^7)*x^2 + 2*(b*c^3*d^6*e^2 - 2*b*c^2*d^4*e^4 + b...`

3.28.6 Sympy [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^3} dx = \text{Timed out}$$

input `integrate((a+b*atanh(c*x**2))/(e*x+d)**3,x)`

output `Timed out`

3.28.7 Maxima [A] (verification not implemented)

Time = 0.28 (sec) , antiderivative size = 311, normalized size of antiderivative = 1.38

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^3} dx$$

$$= \frac{1}{4} \left(\left(\frac{4\sqrt{cd} \arctan(\sqrt{cx})}{c^2d^4 + 2cd^2e^2 + e^4} + \frac{2\sqrt{cd} \log\left(\frac{cx - \sqrt{c}}{cx + \sqrt{c}}\right)}{c^2d^4 - 2cd^2e^2 + e^4} - \frac{4de}{c^2d^5 - de^4 + (c^2d^4e - e^5)x} + \frac{(cd^2 - e^2) \log(cx^2 + 1)}{c^2d^4e + 2cd^2e^3 + e^5} \right) \right.$$

$$\left. - \frac{a}{2(e^3x^2 + 2de^2x + d^2e)} \right)$$

input `integrate((a+b*arctanh(c*x^2))/(e*x+d)^3,x, algorithm="maxima")`

output `1/4*((4*sqrt(c)*d*arctan(sqrt(c)*x)/(c^2*d^4 + 2*c*d^2*e^2 + e^4) + 2*sqrt(c)*d*log((c*x - sqrt(c))/(c*x + sqrt(c)))/(c^2*d^4 - 2*c*d^2*e^2 + e^4) - 4*d*e/(c^2*d^5 - d*e^4 + (c^2*d^4*e - e^5)*x) + (c*d^2 - e^2)*log(c*x^2 + 1)/(c^2*d^4*e + 2*c*d^2*e^3 + e^5) - (c*d^2 + e^2)*log(c*x^2 - 1)/(c^2*d^4*e - 2*c*d^2*e^3 + e^5) + 4*(3*c^2*d^4*e + e^5)*log(e*x + d)/(c^4*d^8 - 2*c^2*d^4*e^4 + e^8))*c - 2*arctanh(c*x^2)/(e^3*x^2 + 2*d*e^2*x + d^2*e) - 1/2*a/(e^3*x^2 + 2*d*e^2*x + d^2*e)`

3.28.8 Giac [A] (verification not implemented)

Time = 24.29 (sec) , antiderivative size = 362, normalized size of antiderivative = 1.60

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^3} dx = \frac{bc^{\frac{3}{2}}d \arctan(\sqrt{cx})}{c^2d^4 + 2cd^2e^2 + e^4} + \frac{bc^2d \arctan\left(\frac{cx}{\sqrt{-c}}\right)}{(c^2d^4 - 2cd^2e^2 + e^4)\sqrt{-c}}$$

$$+ \frac{(bc^2d^2 - bce^2) \log(cx^2 + 1)}{4(c^2d^4e + 2cd^2e^3 + e^5)} - \frac{(bc^2d^2 + bce^2) \log(-cx^2 + 1)}{4(c^2d^4e - 2cd^2e^3 + e^5)}$$

$$+ \frac{(3bc^3d^4e + bce^5) \log(ex + d)}{c^4d^8 - 2c^2d^4e^4 + e^8} - \frac{b \log\left(-\frac{cx^2+1}{cx^2-1}\right)}{4(e^3x^2 + 2de^2x + d^2e)}$$

$$- \frac{ac^2d^4 + 2bcde^3x + 2bcd^2e^2 - ae^4}{2(c^2d^4e^3x^2 + 2c^2d^5e^2x + c^2d^6e - e^7x^2 - 2de^6x - d^2e^5)}$$

input `integrate((a+b*arctanh(c*x^2))/(e*x+d)^3,x, algorithm="giac")`

output $b*c^{(3/2)*d*arctan(sqrt(c)*x)/(c^2*d^4 + 2*c*d^2*e^2 + e^4) + b*c^2*d*arctan(c*x/sqrt(-c))/((c^2*d^4 - 2*c*d^2*e^2 + e^4)*sqrt(-c)) + 1/4*(b*c^2*d^2 - b*c*e^2)*log(c*x^2 + 1)/(c^2*d^4*e + 2*c*d^2*e^3 + e^5) - 1/4*(b*c^2*d^2 + b*c*e^2)*log(-c*x^2 + 1)/(c^2*d^4*e - 2*c*d^2*e^3 + e^5) + (3*b*c^3*d^4*e + b*c*e^5)*log(e*x + d)/(c^4*d^8 - 2*c^2*d^4*e^4 + e^8) - 1/4*b*log(-(c*x^2 + 1)/(c*x^2 - 1))/(e^3*x^2 + 2*d*e^2*x + d^2*e) - 1/2*(a*c^2*d^4 + 2*b*c*d*e^3*x + 2*b*c*d^2*e^2 - a*e^4)/(c^2*d^4*e^3*x^2 + 2*c^2*d^5*e^2*x + c^2*d^6*e - e^7*x^2 - 2*d*e^6*x - d^2*e^5)$

3.28.9 Mupad [B] (verification not implemented)

Time = 7.53 (sec) , antiderivative size = 2016, normalized size of antiderivative = 8.92

$$\int \frac{a + b \operatorname{arctanh}(cx^2)}{(d + ex)^3} dx = \text{Too large to display}$$

input `int((a + b*atanh(c*x^2))/(d + e*x)^3,x)`

output $((a*c^2*d^4 - a*e^4 + 2*b*c*d^2*e^2)/(2*(e^4 - c^2*d^4)) + (b*c*d*e^3*x)/(e^4 - c^2*d^4))/(d^2*e + e^3*x^2 + 2*d*e^2*x) + (log(c*d^28*(-c^3)^(13/2) + c^21*d^28*x + 100*c^7*e^28*x - 100*c^2*e^28*(-c^3)^(3/2) + 496*d^2*e^26*(-c^3)^(5/2) - 7398*d^8*e^20*(-c^3)^(7/2) + 17176*d^14*e^14*(-c^3)^(9/2) - 2703*d^20*e^8*(-c^3)^(11/2) - 20*d^26*e^2*(-c^3)^(13/2) + 496*c^8*d^2*e^26*x + 1473*c^9*d^4*e^24*x + 3692*c^10*d^6*e^22*x + 7398*c^11*d^8*e^20*x + 11868*c^12*d^10*e^18*x + 16015*c^13*d^12*e^16*x + 17176*c^14*d^14*e^14*x + 13192*c^15*d^16*e^12*x + 6984*c^16*d^18*e^10*x + 2703*c^17*d^20*e^8*x + 764*c^18*d^22*e^6*x + 78*c^19*d^24*e^4*x - 20*c^20*d^26*e^2*x + 3692*c^2*d^6*e^22*(-c^3)^(5/2) - 16015*c^2*d^12*e^16*(-c^3)^(7/2) + 6984*c^2*d^18*e^10*(-c^3)^(9/2) - 78*c^2*d^24*e^4*(-c^3)^(11/2) + 1473*c*d^4*e^24*(-c^3)^(5/2) - 11868*c*d^10*e^18*(-c^3)^(7/2) + 13192*c*d^16*e^12*(-c^3)^(9/2) - 764*c*d^22*e^6*(-c^3)^(11/2))*(b*c^2*d^2 - b*c*e^2 + 2*b*d*e*(-c^3)^(1/2)))/(4*(e^5 + 2*c*d^2*e^3 + c^2*d^4*e) - (log(c^21*d^28*x - c*d^28*(-c^3)^(13/2) + 100*c^7*e^28*x + 100*c^2*e^28*(-c^3)^(3/2) - 496*d^2*e^26*(-c^3)^(5/2) + 7398*d^8*e^20*(-c^3)^(7/2) - 17176*d^14*e^14*(-c^3)^(9/2) + 2703*d^20*e^8*(-c^3)^(11/2) + 20*d^26*e^2*(-c^3)^(13/2) + 496*c^8*d^2*e^26*x + 1473*c^9*d^4*e^24*x + 3692*c^10*d^6*e^22*x + 7398*c^11*d^8*e^20*x + 11868*c^12*d^10*e^18*x + 16015*c^13*d^12*e^16*x + 17176*c^14*d^14*e^14*x + 13192*c^15*d^16*e^12*x + 6984*c^16*d^18*e^10*x + 2703*c^17*d^20*e^8*x + 764*c^18...$

3.29 $\int (d + ex) (a + b \operatorname{arctanh}(cx^2))^2 dx$

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3.29.1 Optimal result

Integrand size = 18, antiderivative size = 1085

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^2))^2 dx = \text{Too large to display}$$

output

```

-b^2*d*arctanh(x*c^(1/2))^2/c^(1/2)+b^2*d*polylog(2,1-2/(1+x*c^(1/2)))/c^(
1/2)-1/2*b^2*e*polylog(2,1-2/(-c*x^2+1))/c+1/4*b^2*d*x*ln(-c*x^2+1)^2+1/4*
b^2*d*x*ln(c*x^2+1)^2-1/2*b^2*d*polylog(2,1+2*(1-x*(-c)^(1/2))*c^(1/2)/((-
c)^(1/2)-c^(1/2))/(1+x*c^(1/2)))/c^(1/2)-1/2*b^2*d*polylog(2,1-2*(1+x*(-c)
^(1/2))*c^(1/2)/((-c)^(1/2)+c^(1/2))/(1+x*c^(1/2)))/c^(1/2)+a^2*d*x+b^2*d*
polylog(2,1-2/(1-x*c^(1/2)))/c^(1/2)-b^2*d*arctan(x*c^(1/2))*ln(-c*x^2+1)/
c^(1/2)+b^2*d*arctanh(x*c^(1/2))*ln(-c*x^2+1)/c^(1/2)+b^2*d*arctan(x*c^(1/
2))*ln(c*x^2+1)/c^(1/2)-b^2*d*arctanh(x*c^(1/2))*ln(c*x^2+1)/c^(1/2)+b^2*d
*arctan(x*c^(1/2))*ln((1+I)*(1-x*c^(1/2))/(1-I*x*c^(1/2)))/c^(1/2)+b^2*d*a
rctanh(x*c^(1/2))*ln(-2*(1-x*(-c)^(1/2))*c^(1/2)/((-c)^(1/2)-c^(1/2))/(1+x
*c^(1/2)))/c^(1/2)+b^2*d*arctanh(x*c^(1/2))*ln(2*(1+x*(-c)^(1/2))*c^(1/2)/
((-c)^(1/2)+c^(1/2))/(1+x*c^(1/2)))/c^(1/2)+b^2*d*arctan(x*c^(1/2))*ln((1-
I)*(1+x*c^(1/2))/(1-I*x*c^(1/2)))/c^(1/2)+I*b^2*d*polylog(2,1-2/(1-I*x*c^(
1/2)))/c^(1/2)+I*b^2*d*polylog(2,1-2/(1+I*x*c^(1/2)))/c^(1/2)-b*e*(a+b*arc
tanh(c*x^2))*ln(2/(-c*x^2+1))/c-a*b*d*x*ln(-c*x^2+1)+a*b*d*x*ln(c*x^2+1)+I
*b^2*d*arctan(x*c^(1/2))^2/c^(1/2)-1/2*I*b^2*d*polylog(2,1-(1+I)*(1-x*c^(1
/2))/(1-I*x*c^(1/2)))/c^(1/2)-1/2*I*b^2*d*polylog(2,1+(-1+I)*(1+x*c^(1/2)
)/(1-I*x*c^(1/2)))/c^(1/2)+1/2*e*(a+b*arctanh(c*x^2))^2/c+1/2*e*x^2*(a+b*ar
ctanh(c*x^2))^2-1/2*b^2*d*x*ln(-c*x^2+1)*ln(c*x^2+1)+2*a*b*d*arctan(x*c^(1
/2))/c^(1/2)-2*a*b*d*arctanh(x*c^(1/2))/c^(1/2)+2*b^2*d*arctanh(x*c^(1/...
    
```

3.29.2 Mathematica [A] (verified)

Time = 2.27 (sec) , antiderivative size = 684, normalized size of antiderivative = 0.63

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^2))^2 dx$$

$$= \frac{2a^2cdx^2 + a^2cex^3 + 4abcdx^2 \operatorname{arctanh}(cx^2) + 4abd\sqrt{cx^2} \left(\arctan(\sqrt{cx^2}) - \operatorname{arctanh}(\sqrt{cx^2}) \right) + b^2ex \operatorname{arctan}(\sqrt{cx^2})}{1}$$

input `Integrate[(d + e*x)*(a + b*ArcTanh[c*x^2])^2,x]`

output

```
(2*a^2*c*d*x^2 + a^2*c*e*x^3 + 4*a*b*c*d*x^2*ArcTanh[c*x^2] + 4*a*b*d*Sqrt[c*x^2]*(ArcTan[Sqrt[c*x^2]] - ArcTanh[Sqrt[c*x^2]]) + b^2*e*x*ArcTanh[c*x^2]*((-1 + c*x^2)*ArcTanh[c*x^2] - 2*Log[1 + E^(-2*ArcTanh[c*x^2])]) + a*b*e*x*(2*c*x^2*ArcTanh[c*x^2] + Log[1 - c^2*x^4]) + b^2*e*x*PolyLog[2, -E^(-2*ArcTanh[c*x^2])] - b^2*d*Sqrt[c*x^2]*((2*I)*ArcTan[Sqrt[c*x^2]]^2 - 4*ArcTan[Sqrt[c*x^2]]*ArcTanh[c*x^2] - 2*Sqrt[c*x^2]*ArcTanh[c*x^2]^2 - 2*ArcTan[Sqrt[c*x^2]]*Log[1 + E^((4*I)*ArcTan[Sqrt[c*x^2]])] - 2*ArcTanh[c*x^2]*Log[1 - Sqrt[c*x^2]] + Log[2]*Log[1 - Sqrt[c*x^2]] - Log[1 - Sqrt[c*x^2]]^2/2 + Log[1 - Sqrt[c*x^2]]*Log[(1/2 + I/2)*(-I + Sqrt[c*x^2])] + 2*ArcTanh[c*x^2]*Log[1 + Sqrt[c*x^2]] - Log[2]*Log[1 + Sqrt[c*x^2]] - Log[((1 + I) - (1 - I)*Sqrt[c*x^2])/2]*Log[1 + Sqrt[c*x^2]] - Log[(-1/2 - I/2)*(I + Sqrt[c*x^2])]*Log[1 + Sqrt[c*x^2]] + Log[1 + Sqrt[c*x^2]]^2/2 + Log[1 - Sqrt[c*x^2]]*Log[((1 + I) + (1 - I)*Sqrt[c*x^2])/2] + (I/2)*PolyLog[2, -E^((4*I)*ArcTan[Sqrt[c*x^2]])] - PolyLog[2, (1 - Sqrt[c*x^2])/2] + PolyLog[2, (-1/2 - I/2)*(-1 + Sqrt[c*x^2])] + PolyLog[2, (-1/2 + I/2)*(-1 + Sqrt[c*x^2])] + PolyLog[2, (1 + Sqrt[c*x^2])/2] - PolyLog[2, (1/2 - I/2)*(1 + Sqrt[c*x^2])] - PolyLog[2, (1/2 + I/2)*(1 + Sqrt[c*x^2])])/(2*c*x)
```

3.29.3 Rubi [A] (verified)

Time = 2.10 (sec) , antiderivative size = 1085, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.111$, Rules used = {6488, 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.

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^2))^2 dx$$

$$\begin{aligned}
& \int (d(a + b \operatorname{arctanh}(cx^2))^2 + ex(a + b \operatorname{arctanh}(cx^2))^2) dx \\
& \quad \downarrow \text{6488} \\
& \quad \downarrow \text{2009} \\
& dx a^2 + \frac{2bd \operatorname{arctan}(\sqrt{cx}) a}{\sqrt{c}} - \frac{2bd \operatorname{arctanh}(\sqrt{cx}) a}{\sqrt{c}} - bdx \log(1 - cx^2) a + bdx \log(cx^2 + 1) a + \\
& \frac{ib^2 d \operatorname{arctan}(\sqrt{cx})^2}{\sqrt{c}} - \frac{b^2 d \operatorname{arctanh}(\sqrt{cx})^2}{\sqrt{c}} + \frac{1}{2} ex^2 (a + b \operatorname{arctanh}(cx^2))^2 + \frac{e(a + b \operatorname{arctanh}(cx^2))^2}{2c} + \\
& \frac{1}{4} b^2 dx \log^2(1 - cx^2) + \frac{1}{4} b^2 dx \log^2(cx^2 + 1) + \frac{2b^2 d \operatorname{arctanh}(\sqrt{cx}) \log\left(\frac{2}{1 - \sqrt{cx}}\right)}{\sqrt{c}} - \\
& \frac{2b^2 d \operatorname{arctan}(\sqrt{cx}) \log\left(\frac{2}{1 - i\sqrt{cx}}\right)}{\sqrt{c}} + \frac{b^2 d \operatorname{arctan}(\sqrt{cx}) \log\left(\frac{(1+i)(1-\sqrt{cx})}{1 - i\sqrt{cx}}\right)}{\sqrt{c}} + \\
& \frac{2b^2 d \operatorname{arctan}(\sqrt{cx}) \log\left(\frac{2}{i\sqrt{cx}+1}\right)}{\sqrt{c}} - \frac{2b^2 d \operatorname{arctanh}(\sqrt{cx}) \log\left(\frac{2}{\sqrt{cx}+1}\right)}{\sqrt{c}} + \\
& \frac{b^2 d \operatorname{arctanh}(\sqrt{cx}) \log\left(-\frac{2\sqrt{c}(1-\sqrt{-cx})}{(\sqrt{-c}-\sqrt{c})(\sqrt{cx}+1)}\right)}{\sqrt{c}} + \frac{b^2 d \operatorname{arctanh}(\sqrt{cx}) \log\left(\frac{2\sqrt{c}(\sqrt{-cx}+1)}{(\sqrt{-c}+\sqrt{c})(\sqrt{cx}+1)}\right)}{\sqrt{c}} + \\
& \frac{b^2 d \operatorname{arctan}(\sqrt{cx}) \log\left(\frac{(1-i)(\sqrt{cx}+1)}{1 - i\sqrt{cx}}\right)}{\sqrt{c}} - \frac{be(a + b \operatorname{arctanh}(cx^2)) \log\left(\frac{2}{1 - cx^2}\right)}{c} - \\
& \frac{b^2 d \operatorname{arctan}(\sqrt{cx}) \log(1 - cx^2)}{\sqrt{c}} + \frac{b^2 d \operatorname{arctanh}(\sqrt{cx}) \log(1 - cx^2)}{\sqrt{c}} + \\
& \frac{b^2 d \operatorname{arctan}(\sqrt{cx}) \log(cx^2 + 1)}{\sqrt{c}} - \frac{b^2 d \operatorname{arctanh}(\sqrt{cx}) \log(cx^2 + 1)}{\sqrt{c}} - \\
& \frac{1}{2} b^2 dx \log(1 - cx^2) \log(cx^2 + 1) + \frac{b^2 d \operatorname{PolyLog}\left(2, 1 - \frac{2}{1 - \sqrt{cx}}\right)}{\sqrt{c}} + \frac{ib^2 d \operatorname{PolyLog}\left(2, 1 - \frac{2}{1 - i\sqrt{cx}}\right)}{\sqrt{c}} - \\
& \frac{ib^2 d \operatorname{PolyLog}\left(2, 1 - \frac{(1+i)(1-\sqrt{cx})}{1 - i\sqrt{cx}}\right)}{2\sqrt{c}} + \frac{ib^2 d \operatorname{PolyLog}\left(2, 1 - \frac{2}{i\sqrt{cx}+1}\right)}{\sqrt{c}} + \frac{b^2 d \operatorname{PolyLog}\left(2, 1 - \frac{2}{\sqrt{cx}+1}\right)}{\sqrt{c}} - \\
& \frac{b^2 d \operatorname{PolyLog}\left(2, \frac{2\sqrt{c}(1-\sqrt{-cx})}{(\sqrt{-c}-\sqrt{c})(\sqrt{cx}+1)} + 1\right)}{2\sqrt{c}} - \frac{b^2 d \operatorname{PolyLog}\left(2, 1 - \frac{2\sqrt{c}(\sqrt{-cx}+1)}{(\sqrt{-c}+\sqrt{c})(\sqrt{cx}+1)}\right)}{2\sqrt{c}} - \\
& \frac{ib^2 d \operatorname{PolyLog}\left(2, 1 - \frac{(1-i)(\sqrt{cx}+1)}{1 - i\sqrt{cx}}\right)}{2\sqrt{c}} - \frac{b^2 e \operatorname{PolyLog}\left(2, 1 - \frac{2}{1 - cx^2}\right)}{2c}
\end{aligned}$$

input `Int[(d + e*x)*(a + b*ArcTanh[c*x^2])^2,x]`

```
output a^2*d*x + (2*a*b*d*ArcTan[Sqrt[c]*x])/Sqrt[c] + (I*b^2*d*ArcTan[Sqrt[c]*x]
^2)/Sqrt[c] - (2*a*b*d*ArcTanh[Sqrt[c]*x])/Sqrt[c] - (b^2*d*ArcTanh[Sqrt[c]
]*x)^2)/Sqrt[c] + (e*(a + b*ArcTanh[c*x^2])^2)/(2*c) + (e*x^2*(a + b*ArcTa
nh[c*x^2])^2)/2 + (2*b^2*d*ArcTanh[Sqrt[c]*x]*Log[2/(1 - Sqrt[c]*x)])/Sqrt
[c] - (2*b^2*d*ArcTan[Sqrt[c]*x]*Log[2/(1 - I*Sqrt[c]*x)])/Sqrt[c] + (b^2*
d*ArcTan[Sqrt[c]*x]*Log[((1 + I)*(1 - Sqrt[c]*x))/(1 - I*Sqrt[c]*x)])/Sqrt
[c] + (2*b^2*d*ArcTan[Sqrt[c]*x]*Log[2/(1 + I*Sqrt[c]*x)])/Sqrt[c] - (2*b^
2*d*ArcTanh[Sqrt[c]*x]*Log[2/(1 + Sqrt[c]*x)])/Sqrt[c] + (b^2*d*ArcTanh[Sq
rt[c]*x]*Log[(-2*Sqrt[c]*(1 - Sqrt[-c]*x))/((Sqrt[-c] - Sqrt[c])*(1 + Sqrt
[c]*x))])/Sqrt[c] + (b^2*d*ArcTanh[Sqrt[c]*x]*Log[(2*Sqrt[c]*(1 + Sqrt[-c]
*x))/((Sqrt[-c] + Sqrt[c])*(1 + Sqrt[c]*x))])/Sqrt[c] + (b^2*d*ArcTan[Sqrt
[c]*x]*Log[((1 - I)*(1 + Sqrt[c]*x))/(1 - I*Sqrt[c]*x)])/Sqrt[c] - (b*e*(a
+ b*ArcTanh[c*x^2])*Log[2/(1 - c*x^2)])/c - a*b*d*x*Log[1 - c*x^2] - (b^2
*d*ArcTan[Sqrt[c]*x]*Log[1 - c*x^2])/Sqrt[c] + (b^2*d*ArcTanh[Sqrt[c]*x]*L
og[1 - c*x^2])/Sqrt[c] + (b^2*d*x*Log[1 - c*x^2]^2)/4 + a*b*d*x*Log[1 + c*
x^2] + (b^2*d*ArcTan[Sqrt[c]*x]*Log[1 + c*x^2])/Sqrt[c] - (b^2*d*ArcTanh[S
qrt[c]*x]*Log[1 + c*x^2])/Sqrt[c] - (b^2*d*x*Log[1 - c*x^2]*Log[1 + c*x^2]
)/2 + (b^2*d*x*Log[1 + c*x^2]^2)/4 + (b^2*d*PolyLog[2, 1 - 2/(1 - Sqrt[c]*
x)])/Sqrt[c] + (I*b^2*d*PolyLog[2, 1 - 2/(1 - I*Sqrt[c]*x)])/Sqrt[c] - ((I
/2)*b^2*d*PolyLog[2, 1 - ((1 + I)*(1 - Sqrt[c]*x))/(1 - I*Sqrt[c]*x)])/...
```

3.29.3.1 Defintions of rubi rules used

```
rule 2009 Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]
```

```
rule 6488 Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*((d_.) + (e_.)*(x_)^(m_.)
, x_Symbol] := Int[ExpandIntegrand[(a + b*ArcTanh[c*x^n])^p, (d + e*x)^m, x
], x] /; FreeQ[{a, b, c, d, e, n}, x] && IGtQ[p, 1] && IGtQ[m, 0]
```

3.29.4 Maple [F]

$$\int (ex + d) (a + b \operatorname{arctanh}(cx^2))^2 dx$$

```
input int((e*x+d)*(a+b*arctanh(c*x^2))^2,x)
```

```
output int((e*x+d)*(a+b*arctanh(c*x^2))^2,x)
```

3.29.5 Fracas [F]

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^2))^2 dx = \int (ex + d)(b \operatorname{arctanh}(cx^2) + a)^2 dx$$

input `integrate((e*x+d)*(a+b*arctanh(c*x^2))^2,x, algorithm="fricas")`

output `integral(a^2*e*x + a^2*d + (b^2*e*x + b^2*d)*arctanh(c*x^2)^2 + 2*(a*b*e*x + a*b*d)*arctanh(c*x^2), x)`

3.29.6 Sympy [F]

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^2))^2 dx = \int (a + b \operatorname{atanh}(cx^2))^2 (d + ex) dx$$

input `integrate((e*x+d)*(a+b*atanh(c*x**2))**2,x)`

output `Integral((a + b*atanh(c*x**2))**2*(d + e*x), x)`

3.29.7 Maxima [F]

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^2))^2 dx = \int (ex + d)(b \operatorname{arctanh}(cx^2) + a)^2 dx$$

input `integrate((e*x+d)*(a+b*arctanh(c*x^2))^2,x, algorithm="maxima")`

output `1/2*a^2*e*x^2 + (c*(2*arctan(sqrt(c)*x)/c^(3/2) + log((c*x - sqrt(c))/(c*x + sqrt(c)))/c^(3/2)) + 2*x*arctanh(c*x^2))*a*b*d + a^2*d*x + 1/2*(2*c*x^2*arctanh(c*x^2) + log(-c^2*x^4 + 1))*a*b*e/c + 1/8*(b^2*e*x^2 + 2*b^2*d*x)*log(-c*x^2 + 1)^2 - integrate(-1/4*((b^2*c*e*x^3 + b^2*c*d*x^2 - b^2*e*x - b^2*d)*log(c*x^2 + 1)^2 - 2*(b^2*c*e*x^3 + 2*b^2*c*d*x^2 + (b^2*c*e*x^3 + b^2*c*d*x^2 - b^2*e*x - b^2*d)*log(c*x^2 + 1))*log(-c*x^2 + 1))/(c*x^2 - 1), x)`

3.29.8 Giac [F]

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^2))^2 dx = \int (ex + d)(b \operatorname{artanh}(cx^2) + a)^2 dx$$

input `integrate((e*x+d)*(a+b*arctanh(c*x^2))^2,x, algorithm="giac")`

output `integrate((e*x + d)*(b*arctanh(c*x^2) + a)^2, x)`

3.29.9 Mupad [F(-1)]

Timed out.

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^2))^2 dx = \int (a + b \operatorname{atanh}(cx^2))^2 (d + ex) dx$$

input `int((a + b*atanh(c*x^2))^2*(d + e*x),x)`

output `int((a + b*atanh(c*x^2))^2*(d + e*x), x)`

$$3.30 \quad \int \frac{(a+b\operatorname{arctanh}(cx^2))^2}{d+ex} dx$$

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3.30.1 Optimal result

Integrand size = 20, antiderivative size = 20

$$\int \frac{(a + \operatorname{arctanh}(cx^2))^2}{d + ex} dx = \operatorname{Int}\left(\frac{(a + \operatorname{arctanh}(cx^2))^2}{d + ex}, x\right)$$

output `Unintegrable((a+b*arctanh(c*x^2))^2/(e*x+d),x)`

3.30.2 Mathematica [N/A]

Not integrable

Time = 51.47 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a + \operatorname{arctanh}(cx^2))^2}{d + ex} dx = \int \frac{(a + \operatorname{arctanh}(cx^2))^2}{d + ex} dx$$

input `Integrate[(a + b*ArcTanh[c*x^2])^2/(d + e*x),x]`

output `Integrate[(a + b*ArcTanh[c*x^2])^2/(d + e*x), x]`

$$3.30. \quad \int \frac{(a+b\operatorname{arctanh}(cx^2))^2}{d+ex} dx$$

3.30.3 Rubi [N/A]

Not integrable

Time = 0.22 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {6490}

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.

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{d + ex} dx$$

↓ 6490

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{d + ex} dx$$

input `Int[(a + b*ArcTanh[c*x^2])^2/(d + e*x), x]`

output `$Aborted`

3.30.3.1 Defintions of rubi rules used

rule 6490 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)])*(b_.))^(p_.)*((d_.) + (e_.)*(x_)^(m_.), x_Symbol] :> Unintegrable[(d + e*x)^m*(a + b*ArcTanh[c*x^n])^p, x] /; FreeQ[{a, b, c, d, e, m, n, p}, x]`

3.30.4 Maple [N/A] (verified)

Not integrable

Time = 0.55 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{ex + d} dx$$

input `int((a+b*arctanh(c*x^2))^2/(e*x+d), x)`

output `int((a+b*arctanh(c*x^2))^2/(e*x+d), x)`

3.30. $\int \frac{(a+b \operatorname{arctanh}(cx^2))^2}{d+ex} dx$

3.30.5 Fricas [N/A]

Not integrable

Time = 0.26 (sec) , antiderivative size = 36, normalized size of antiderivative = 1.80

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{d + ex} dx = \int \frac{(b \operatorname{artanh}(cx^2) + a)^2}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^2))^2/(e*x+d),x, algorithm="fricas")`output `integral((b^2*arctanh(c*x^2)^2 + 2*a*b*arctanh(c*x^2) + a^2)/(e*x + d), x)`**3.30.6 Sympy [F(-1)]**

Timed out.

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{d + ex} dx = \text{Timed out}$$

input `integrate((a+b*atanh(c*x**2))**2/(e*x+d),x)`output `Timed out`**3.30.7 Maxima [N/A]**

Not integrable

Time = 0.35 (sec) , antiderivative size = 81, normalized size of antiderivative = 4.05

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{d + ex} dx = \int \frac{(b \operatorname{artanh}(cx^2) + a)^2}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^2))^2/(e*x+d),x, algorithm="maxima")`output `a^2*log(e*x + d)/e + integrate(1/4*b^2*(log(c*x^2 + 1) - log(-c*x^2 + 1))^2/(e*x + d) + a*b*(log(c*x^2 + 1) - log(-c*x^2 + 1))/(e*x + d), x)`

3.30. $\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{d + ex} dx$

3.30.8 Giac [N/A]

Not integrable

Time = 0.32 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{d + ex} dx = \int \frac{(b \operatorname{artanh}(cx^2) + a)^2}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^2))^2/(e*x+d),x, algorithm="giac")`output `integrate((b*arctanh(c*x^2) + a)^2/(e*x + d), x)`**3.30.9 Mupad [N/A]**

Not integrable

Time = 3.47 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{d + ex} dx = \int \frac{(a + b \operatorname{atanh}(cx^2))^2}{d + ex} dx$$

input `int((a + b*atanh(c*x^2))^2/(d + e*x),x)`output `int((a + b*atanh(c*x^2))^2/(d + e*x), x)`

$$3.31 \quad \int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx$$

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3.31.9	Mupad [N/A]	243

3.31.1 Optimal result

Integrand size = 20, antiderivative size = 20

$$\int \frac{(a + \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx = \operatorname{Int}\left(\frac{(a + \operatorname{arctanh}(cx^2))^2}{(d + ex)^2}, x\right)$$

output `Unintegrable((a+b*arctanh(c*x^2))^2/(e*x+d)^2,x)`

3.31.2 Mathematica [N/A]

Not integrable

Time = 85.40 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a + \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx = \int \frac{(a + \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx$$

input `Integrate[(a + b*ArcTanh[c*x^2])^2/(d + e*x)^2,x]`

output `Integrate[(a + b*ArcTanh[c*x^2])^2/(d + e*x)^2, x]`

$$3.31. \quad \int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx$$

3.31.3 Rubi [N/A]

Not integrable

Time = 0.21 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 0, $\frac{\text{number of rules}}{\text{integrand size}} = 0.000$, Rules used = {6490}

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.

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx$$

↓ 6490

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx$$

input `Int[(a + b*ArcTanh[c*x^2])^2/(d + e*x)^2,x]`

output `$Aborted`

3.31.3.1 Defintions of rubi rules used

rule 6490 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)])*(b_.))^p_.*((d_.) + (e_.)*(x_))^(m_.), x_Symbol] :> Unintegrable[(d + e*x)^m*(a + b*ArcTanh[c*x^n])^p, x] /; FreeQ[{a, b, c, d, e, m, n, p}, x]`

3.31.4 Maple [N/A] (verified)

Not integrable

Time = 0.59 (sec) , antiderivative size = 20, normalized size of antiderivative = 1.00

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(ex + d)^2} dx$$

input `int((a+b*arctanh(c*x^2))^2/(e*x+d)^2,x)`

output `int((a+b*arctanh(c*x^2))^2/(e*x+d)^2,x)`

3.31. $\int \frac{(a+b\operatorname{arctanh}(cx^2))^2}{(d+ex)^2} dx$

3.31.5 Fricas [N/A]

Not integrable

Time = 0.26 (sec) , antiderivative size = 47, normalized size of antiderivative = 2.35

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx = \int \frac{(b \operatorname{artanh}(cx^2) + a)^2}{(ex + d)^2} dx$$

input `integrate((a+b*arctanh(c*x^2))^2/(e*x+d)^2,x, algorithm="fricas")`

output `integral((b^2*arctanh(c*x^2)^2 + 2*a*b*arctanh(c*x^2) + a^2)/(e^2*x^2 + 2*d*e*x + d^2), x)`

3.31.6 Sympy [F(-1)]

Timed out.

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx = \text{Timed out}$$

input `integrate((a+b*atanh(c*x**2))**2/(e*x+d)**2,x)`

output `Timed out`

3.31.7 Maxima [N/A]

Not integrable

Time = 1.38 (sec) , antiderivative size = 323, normalized size of antiderivative = 16.15

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx = \int \frac{(b \operatorname{artanh}(cx^2) + a)^2}{(ex + d)^2} dx$$

input `integrate((a+b*arctanh(c*x^2))^2/(e*x+d)^2,x, algorithm="maxima")`

3.31. $\int \frac{(a+b \operatorname{arctanh}(cx^2))^2}{(d+ex)^2} dx$

output $((4*d*e*log(e*x + d)/(c^2*d^4 - e^4) + d*log(c*x^2 + 1)/(c*d^2*e + e^3) - d*log(c*x^2 - 1)/(c*d^2*e - e^3) + 2*arctan(sqrt(c)*x)/((c*d^2 + e^2)*sqrt(c)) + log((c*x - sqrt(c))/(c*x + sqrt(c)))/((c*d^2 - e^2)*sqrt(c)))*c - 2*arctanh(c*x^2)/(e^2*x + d*e)*a*b - 1/4*b^2*(log(-c*x^2 + 1)^2/(e^2*x + d*e) + integrate(-(c*e*x^2 - e)*log(c*x^2 + 1)^2 + 2*(2*c*e*x^2 + 2*c*d*x - (c*e*x^2 - e)*log(c*x^2 + 1))*log(-c*x^2 + 1))/(c*e^3*x^4 + 2*c*d*e^2*x^3 - 2*d*e^2*x - d^2*e + (c*d^2*e - e^3)*x^2), x) - a^2/(e^2*x + d*e)$

3.31.8 Giac [N/A]

Not integrable

Time = 0.54 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx = \int \frac{(b \operatorname{artanh}(cx^2) + a)^2}{(ex + d)^2} dx$$

input `integrate((a+b*arctanh(c*x^2))^2/(e*x+d)^2,x, algorithm="giac")`

output `integrate((b*arctanh(c*x^2) + a)^2/(e*x + d)^2, x)`

3.31.9 Mupad [N/A]

Not integrable

Time = 3.56 (sec) , antiderivative size = 22, normalized size of antiderivative = 1.10

$$\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx = \int \frac{(a + b \operatorname{atanh}(cx^2))^2}{(d + ex)^2} dx$$

input `int((a + b*atanh(c*x^2))^2/(d + e*x)^2,x)`

output `int((a + b*atanh(c*x^2))^2/(d + e*x)^2, x)`

3.31. $\int \frac{(a + b \operatorname{arctanh}(cx^2))^2}{(d + ex)^2} dx$

3.32 $\int (d + ex)^2 (a + \operatorname{barctanh}(cx^3)) dx$

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3.32.1 Optimal result

Integrand size = 18, antiderivative size = 336

$$\begin{aligned}
 \int (d + ex)^2 (a + \operatorname{barctanh}(cx^3)) dx = & -\frac{\sqrt{3}bde \arctan\left(\frac{1}{\sqrt{3}} - \frac{2\sqrt[3]{cx}}{\sqrt{3}}\right)}{2c^{2/3}} \\
 & + \frac{\sqrt{3}bde \arctan\left(\frac{1}{\sqrt{3}} + \frac{2\sqrt[3]{cx}}{\sqrt{3}}\right)}{2c^{2/3}} \\
 & + \frac{\sqrt{3}bd^2 \arctan\left(\frac{1+2c^{2/3}x^2}{\sqrt{3}}\right)}{2\sqrt[3]{c}} - \frac{bde \operatorname{arctanh}(\sqrt[3]{cx})}{c^{2/3}} \\
 & + \frac{(d + ex)^3 (a + \operatorname{barctanh}(cx^3))}{3e} \\
 & + \frac{bd^2 \log(1 - c^{2/3}x^2)}{2\sqrt[3]{c}} + \frac{bde \log(1 - \sqrt[3]{cx} + c^{2/3}x^2)}{4c^{2/3}} \\
 & - \frac{bde \log(1 + \sqrt[3]{cx} + c^{2/3}x^2)}{4c^{2/3}} \\
 & + \frac{b(cd^3 + e^3) \log(1 - cx^3)}{6ce} - \frac{b(cd^3 - e^3) \log(1 + cx^3)}{6ce} \\
 & - \frac{bd^2 \log(1 + c^{2/3}x^2 + c^{4/3}x^4)}{4\sqrt[3]{c}}
 \end{aligned}$$

output
$$-b*d*e*\operatorname{arctanh}(c^{(1/3)}*x)/c^{(2/3)}+1/3*(e*x+d)^3*(a+b*\operatorname{arctanh}(c*x^3))/e+1/2*b*d^2*\ln(1-c^{(2/3)}*x^2)/c^{(1/3)}+1/4*b*d*e*\ln(1-c^{(1/3)}*x+c^{(2/3)}*x^2)/c^{(2/3)}-1/4*b*d*e*\ln(1+c^{(1/3)}*x+c^{(2/3)}*x^2)/c^{(2/3)}+1/6*b*(c*d^3+e^3)*\ln(-c*x^3+1)/c/e-1/6*b*(c*d^3-e^3)*\ln(c*x^3+1)/c/e-1/4*b*d^2*\ln(1+c^{(2/3)}*x^2+c^{(4/3)}*x^4)/c^{(1/3)}+1/2*b*d*e*\operatorname{arctan}(-1/3*3^{(1/2)}+2/3*c^{(1/3)}*x*3^{(1/2)})*3^{(1/2)}/c^{(2/3)}+1/2*b*d*e*\operatorname{arctan}(1/3*3^{(1/2)}+2/3*c^{(1/3)}*x*3^{(1/2)})*3^{(1/2)}/c^{(2/3)}+1/2*b*d^2*\operatorname{arctan}(1/3*(1+2*c^{(2/3)}*x^2)*3^{(1/2)})*3^{(1/2)}/c^{(1/3)}$$

3.32.2 Mathematica [A] (verified)

Time = 0.16 (sec) , antiderivative size = 299, normalized size of antiderivative = 0.89

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx^3)) dx$$

$$= \frac{12acd^2x + 12acdex^2 + 4ace^2x^3 + 6\sqrt{3}b\sqrt[3]{cd}(\sqrt[3]{cd} + e) \operatorname{arctan}\left(\frac{-1+2\sqrt[3]{Cx}}{\sqrt{3}}\right) - 6\sqrt{3}b\sqrt[3]{cd}(\sqrt[3]{cd} - e) \operatorname{arctan}}{\dots}$$

input `Integrate[(d + e*x)^2*(a + b*ArcTanh[c*x^3]),x]`

output
$$(12*a*c*d^2*x + 12*a*c*d*e*x^2 + 4*a*c*e^2*x^3 + 6*\operatorname{Sqrt}[3]*b*c^{(1/3)}*d*(c^{(1/3)}*d + e)*\operatorname{ArcTan}[(-1 + 2*c^{(1/3)}*x)/\operatorname{Sqrt}[3]] - 6*\operatorname{Sqrt}[3]*b*c^{(1/3)}*d*(c^{(1/3)}*d - e)*\operatorname{ArcTan}[(1 + 2*c^{(1/3)}*x)/\operatorname{Sqrt}[3]] + 4*b*c*x*(3*d^2 + 3*d*e*x + e^2*x^2)*\operatorname{ArcTanh}[c*x^3] + 6*b*c^{(1/3)}*d*(c^{(1/3)}*d + e)*\operatorname{Log}[1 - c^{(1/3)}*x] + 6*b*c^{(1/3)}*d*(c^{(1/3)}*d - e)*\operatorname{Log}[1 + c^{(1/3)}*x] - 3*b*c^{(1/3)}*d*(c^{(1/3)}*d - e)*\operatorname{Log}[1 - c^{(1/3)}*x + c^{(2/3)}*x^2] - 3*b*c^{(1/3)}*d*(c^{(1/3)}*d + e)*\operatorname{Log}[1 + c^{(1/3)}*x + c^{(2/3)}*x^2] + 2*b*e^2*\operatorname{Log}[1 - c^2*x^6])/(12*c)$$

3.32.3 Rubi [A] (verified)

Time = 0.76 (sec) , antiderivative size = 326, normalized size of antiderivative = 0.97, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.167$, Rules used = {6486, 2370, 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.

$$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx^3)) dx$$

$$\begin{aligned}
& \downarrow 6486 \\
& \frac{(d+ex)^3 (a + \operatorname{barctanh}(cx^3))}{3e} - \frac{bc \int \frac{x^2(d+ex)^3}{1-c^2x^6} dx}{e} \\
& \downarrow 2370 \\
& \frac{(d+ex)^3 (a + \operatorname{barctanh}(cx^3))}{3e} - \frac{bc \int \left(\frac{3de^2x^4}{1-c^2x^6} + \frac{3d^2ex^3}{1-c^2x^6} + \frac{(d^3+e^3x^3)x^2}{1-c^2x^6} \right) dx}{e} \\
& \downarrow 2009 \\
& \frac{(d+ex)^3 (a + \operatorname{barctanh}(cx^3))}{3e} - \\
& bc \left(-\frac{\sqrt{3}d^2e \arctan\left(\frac{2c^{2/3}x^2+1}{\sqrt{3}}\right)}{2c^{4/3}} + \frac{\sqrt{3}de^2 \arctan\left(\frac{1}{\sqrt{3}} - \frac{2\sqrt[3]{Cx}}{\sqrt{3}}\right)}{2c^{5/3}} - \frac{\sqrt{3}de^2 \arctan\left(\frac{2\sqrt[3]{Cx}}{\sqrt{3}} + \frac{1}{\sqrt{3}}\right)}{2c^{5/3}} + \frac{de^2 \operatorname{arctanh}\left(\sqrt[3]{Cx}\right)}{c^{5/3}} + \frac{d^3 \operatorname{arctanh}\left(\sqrt[3]{Cx}\right)}{3c} \right)
\end{aligned}$$

input `Int[(d + e*x)^2*(a + b*ArcTanh[c*x^3]),x]`

output `((d + e*x)^3*(a + b*ArcTanh[c*x^3]))/(3*e) - (b*c*((Sqrt[3]*d*e^2*ArcTan[1/Sqrt[3] - (2*c^(1/3)*x)/Sqrt[3]])/(2*c^(5/3)) - (Sqrt[3]*d*e^2*ArcTan[1/Sqrt[3] + (2*c^(1/3)*x)/Sqrt[3]])/(2*c^(5/3)) - (Sqrt[3]*d^2*e*ArcTan[(1 + 2*c^(2/3)*x^2)/Sqrt[3]])/(2*c^(4/3)) + (d*e^2*ArcTanh[c^(1/3)*x])/c^(5/3) + (d^3*ArcTanh[c*x^3]))/(3*c) - (d^2*e*Log[1 - c^(2/3)*x^2])/(2*c^(4/3)) - (d*e^2*Log[1 - c^(1/3)*x + c^(2/3)*x^2])/(4*c^(5/3)) + (d*e^2*Log[1 + c^(1/3)*x + c^(2/3)*x^2])/(4*c^(5/3)) + (d^2*e*Log[1 + c^(2/3)*x^2 + c^(4/3)*x^4])/(4*c^(4/3)) - (e^3*Log[1 - c^2*x^6])/(6*c^2))/e`

3.32.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 2370 `Int[((Pq)*((c_.)*(x_)^(m_.)))/((a_) + (b_.)*(x_)^(n_.)), x_Symbol] := With[{v = Sum[(c*x)^(m + ii)*((Coeff[Pq, x, ii] + Coeff[Pq, x, n/2 + ii])*x^(n/2))]/(c^ii*(a + b*x^n))}, {ii, 0, n/2 - 1}], Int[v, x] /; SumQ[v] /; FreeQ[{a, b, c, m}, x] && PolyQ[Pq, x] && IGtQ[n/2, 0] && Expon[Pq, x] < n`

```
rule 6486 Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)])*(b_.))*((d_.) + (e_.)*(x_)^(m_.), x_
Symbol] :> Simp[(d + e*x)^(m + 1)*((a + b*ArcTanh[c*x^n])/(e*(m + 1))), x]
- Simp[b*c*(n/(e*(m + 1))) Int[x^(n - 1)*((d + e*x)^(m + 1)/(1 - c^2*x^(2
*n))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && NeQ[m, -1]
```

3.32.4 Maple [A] (verified)

Time = 1.38 (sec) , antiderivative size = 467, normalized size of antiderivative = 1.39

method	result
default	$\frac{a(ex+d)^3}{3e} + b \left(\frac{e^2 \operatorname{arctanh}(cx^3)x^3}{3} + e \operatorname{arctanh}(cx^3)x^2d + \operatorname{arctanh}(cx^3)xd^2 + \frac{\operatorname{arctanh}(cx^3)d^3}{3e} - \frac{-3d^2}{c} \right)$
3.32.	$\int (d + ex)^2 (a + b \operatorname{arctanh}(cx^3)) dx$

```
input int((e*x+d)^2*(a+b*arctanh(c*x^3)),x,method=_RETURNVERBOSE)
```

```
output 1/3*a*(e*x+d)^3/e+b*(1/3*e^2*arctanh(c*x^3)*x^3+e*arctanh(c*x^3)*x^2*d+arc
tanh(c*x^3)*x*d^2+1/3/e*arctanh(c*x^3)*d^3-c/e*(1/2*(-3*d^2*e*(1/3/c/(1/c)
^(2/3)*ln(x-(1/c)^(1/3))-1/6/c/(1/c)^(2/3)*ln(x^2+(1/c)^(1/3)*x+(1/c)^(2/3
))-1/3/c/(1/c)^(2/3)*3^(1/2)*arctan(1/3*3^(1/2)*(2/(1/c)^(1/3)*x+1)))-3*d*
e^2*(1/3/c/(1/c)^(1/3)*ln(x-(1/c)^(1/3))-1/6/c/(1/c)^(1/3)*ln(x^2+(1/c)^(1
/3)*x+(1/c)^(2/3))+1/3*3^(1/2)/c/(1/c)^(1/3)*arctan(1/3*3^(1/2)*(2/(1/c)^(
1/3)*x+1)))+1/3*(-c*d^3-e^3)/c*ln(c*x^3-1))/c+1/2*(-3*d^2*e*(1/3/c/(1/c)^(
2/3)*ln(x+(1/c)^(1/3))-1/6/c/(1/c)^(2/3)*ln(x^2-(1/c)^(1/3)*x+(1/c)^(2/3)
+1/3/c/(1/c)^(2/3)*3^(1/2)*arctan(1/3*3^(1/2)*(2/(1/c)^(1/3)*x-1)))-3*d*e^
2*(-1/3/c/(1/c)^(1/3)*ln(x+(1/c)^(1/3))+1/6/c/(1/c)^(1/3)*ln(x^2-(1/c)^(1/
3)*x+(1/c)^(2/3))+1/3*3^(1/2)/c/(1/c)^(1/3)*arctan(1/3*3^(1/2)*(2/(1/c)^(1
/3)*x-1)))+1/3*(c*d^3-e^3)/c*ln(c*x^3+1))/c)
```

3.32.5 Fricas [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 1.12 (sec) , antiderivative size = 9282, normalized size of antiderivative = 27.62

$$\int (d + ex)^2 (a + \operatorname{barctanh}(cx^3)) dx = \text{Too large to display}$$

```
input integrate((e*x+d)^2*(a+b*arctanh(c*x^3)),x, algorithm="fricas")
```

```
output Too large to include
```

3.32.6 Sympy [F(-1)]

Timed out.

$$\int (d + ex)^2 (a + \operatorname{barctanh}(cx^3)) dx = \text{Timed out}$$

```
input integrate((e*x+d)**2*(a+b*atanh(c*x**3)),x)
```

```
output Timed out
```

3.32.7 Maxima [A] (verification not implemented)

Time = 0.28 (sec) , antiderivative size = 295, normalized size of antiderivative = 0.88

$$\int (d+ex)^2 (a + b \operatorname{arctanh}(cx^3)) dx = \frac{1}{3} a e^2 x^3 + a d e x^2 + \frac{1}{4} \left(c \left(\frac{2\sqrt{3} \operatorname{arctan}\left(\frac{\sqrt{3}(2c^{4/3}x^2+c^{2/3})}{3c^{2/3}}\right)}{c^{4/3}} - \frac{\log\left(c^{4/3}x^4 + c^{2/3}x^2 + 1\right)}{c^{4/3}} + \frac{2\log\left(\frac{c^{2/3}x^2-1}{c^{2/3}}\right)}{c^{4/3}} \right) + 4x \operatorname{artanh}(cx^3) \right) + \frac{1}{4} \left(4x^2 \operatorname{artanh}(cx^3) + c \left(\frac{2\sqrt{3} \operatorname{arctan}\left(\frac{\sqrt{3}(2c^{2/3}x+c^{1/3})}{3c^{1/3}}\right)}{c^{5/3}} + \frac{2\sqrt{3} \operatorname{arctan}\left(\frac{\sqrt{3}(2c^{2/3}x-c^{1/3})}{3c^{1/3}}\right)}{c^{5/3}} - \frac{\log\left(c^{2/3}x^2 + c^{1/3}x + 1\right)}{c^{5/3}} \right) \right) + a d^2 x + \frac{(2cx^3 \operatorname{artanh}(cx^3) + \log(-c^2x^6 + 1)) b e^2}{6c}$$

input `integrate((e*x+d)^2*(a+b*arctanh(c*x^3)),x, algorithm="maxima")`

```
output 1/3*a*e^2*x^3 + a*d*e*x^2 + 1/4*(c*(2*sqrt(3)*arctan(1/3*sqrt(3)*(2*c^(4/3)
)*x^2 + c^(2/3))/c^(2/3))/c^(4/3) - log(c^(4/3)*x^4 + c^(2/3)*x^2 + 1)/c^(
4/3) + 2*log((c^(2/3)*x^2 - 1)/c^(2/3))/c^(4/3) + 4*x*arctanh(c*x^3))*b*d
^2 + 1/4*(4*x^2*arctanh(c*x^3) + c*(2*sqrt(3)*arctan(1/3*sqrt(3)*(2*c^(2/3)
)*x + c^(1/3))/c^(1/3))/c^(5/3) + 2*sqrt(3)*arctan(1/3*sqrt(3)*(2*c^(2/3)*
x - c^(1/3))/c^(1/3))/c^(5/3) - log(c^(2/3)*x^2 + c^(1/3)*x + 1)/c^(5/3) +
log(c^(2/3)*x^2 - c^(1/3)*x + 1)/c^(5/3) - 2*log((c^(1/3)*x + 1)/c^(1/3))
/c^(5/3) + 2*log((c^(1/3)*x - 1)/c^(1/3))/c^(5/3))*b*d*e + a*d^2*x + 1/6*
(2*c*x^3*arctanh(c*x^3) + log(-c^2*x^6 + 1))*b*e^2/c
```

3.32.8 Giac [A] (verification not implemented)

Time = 12.80 (sec) , antiderivative size = 346, normalized size of antiderivative = 1.03

$$\begin{aligned}
& \int (d + ex)^2 (a + \operatorname{barctanh}(cx^3)) dx \\
&= \frac{1}{3} ae^2 x^3 + adex^2 + ad^2 x + \frac{1}{6} (be^2 x^3 + 3bdex^2 + 3bd^2 x) \log\left(-\frac{cx^3 + 1}{cx^3 - 1}\right) \\
&\quad - \frac{\sqrt{3} \left(bcd^2 |c|^{\frac{2}{3}} - bcde |c|^{\frac{1}{3}} \right) \arctan\left(\frac{1}{3} \sqrt{3} \left(2x + \frac{1}{|c|^{\frac{1}{3}}} \right) |c|^{\frac{1}{3}} \right)}{2c^2} \\
&\quad + \frac{\sqrt{3} \left(bcd^2 |c|^{\frac{2}{3}} + bcde |c|^{\frac{1}{3}} \right) \arctan\left(\frac{1}{3} \sqrt{3} \left(2x - \frac{1}{|c|^{\frac{1}{3}}} \right) |c|^{\frac{1}{3}} \right)}{2c^2} \\
&\quad - \frac{\left(3bcd^2 |c|^{\frac{2}{3}} + 3bcde |c|^{\frac{1}{3}} - 2bce^2 \right) \log\left(x^2 + \frac{x}{|c|^{\frac{1}{3}}} + \frac{1}{|c|^{\frac{2}{3}}}\right)}{12c^2} \\
&\quad - \frac{\left(3bcd^2 |c|^{\frac{2}{3}} - 3bcde |c|^{\frac{1}{3}} - 2bce^2 \right) \log\left(x^2 - \frac{x}{|c|^{\frac{1}{3}}} + \frac{1}{|c|^{\frac{2}{3}}}\right)}{12c^2} \\
&\quad + \frac{\left(3bcd^2 |c|^{\frac{2}{3}} - 3bcde |c|^{\frac{1}{3}} + bce^2 \right) \log\left(\left|x + \frac{1}{|c|^{\frac{1}{3}}}\right|\right)}{6c^2} \\
&\quad + \frac{\left(3bcd^2 |c|^{\frac{2}{3}} + 3bcde |c|^{\frac{1}{3}} + bce^2 \right) \log\left(\left|x - \frac{1}{|c|^{\frac{1}{3}}}\right|\right)}{6c^2}
\end{aligned}$$

```
input integrate((e*x+d)^2*(a+b*arctanh(c*x^3)),x, algorithm="giac")
```

```
output 1/3*a*e^2*x^3 + a*d*e*x^2 + a*d^2*x + 1/6*(b*e^2*x^3 + 3*b*d*e*x^2 + 3*b*d
^2*x)*log(-(c*x^3 + 1)/(c*x^3 - 1)) - 1/2*sqrt(3)*(b*c*d^2*abs(c)^(2/3) -
b*c*d*e*abs(c)^(1/3))*arctan(1/3*sqrt(3)*(2*x + 1/abs(c)^(1/3))*abs(c)^(1/
3))/c^2 + 1/2*sqrt(3)*(b*c*d^2*abs(c)^(2/3) + b*c*d*e*abs(c)^(1/3))*arctan
(1/3*sqrt(3)*(2*x - 1/abs(c)^(1/3))*abs(c)^(1/3))/c^2 - 1/12*(3*b*c*d^2*ab
s(c)^(2/3) + 3*b*c*d*e*abs(c)^(1/3) - 2*b*c*e^2)*log(x^2 + x/abs(c)^(1/3)
+ 1/abs(c)^(2/3))/c^2 - 1/12*(3*b*c*d^2*abs(c)^(2/3) - 3*b*c*d*e*abs(c)^(1
/3) - 2*b*c*e^2)*log(x^2 - x/abs(c)^(1/3) + 1/abs(c)^(2/3))/c^2 + 1/6*(3*b
*c*d^2*abs(c)^(2/3) - 3*b*c*d*e*abs(c)^(1/3) + b*c*e^2)*log(abs(x + 1/abs(
c)^(1/3)))/c^2 + 1/6*(3*b*c*d^2*abs(c)^(2/3) + 3*b*c*d*e*abs(c)^(1/3) + b*
c*e^2)*log(abs(x - 1/abs(c)^(1/3)))/c^2
```

3.32.9 Mupad [B] (verification not implemented)

Time = 4.14 (sec) , antiderivative size = 1081, normalized size of antiderivative = 3.22

$$\int (d + ex)^2 (a + \operatorname{arctanh}(cx^3)) dx = \left(\sum_{k=1}^3 \ln(x(162b^5c^9d^8e^2 + 6b^5c^7d^2e^8) + \operatorname{root}(216c^3z^3 - 108bc^2e^2z^2 - 162b^2c^2d^3ez + 18b^2ce^4z - 27b^3c^2d^6 - b^3e^6, z, k)) (x(486b^4c^{10}d^8 - 90b^4c^8d^2e^6) + 243b^5c^9d^9e + 9b^5c^7d^3e^7) \operatorname{root}(216c^3z^3 - 108bc^2e^2z^2 - 162b^2c^2d^3ez + 18b^2ce^4z - 27b^3c^2d^6 - b^3e^6, z, k)) \right) + \left(\sum_{k=1}^3 \ln(x(162b^5c^9d^8e^2 + 6b^5c^7d^2e^8) + \operatorname{root}(216c^3z^3 - 108bc^2e^2z^2 + 162b^2c^2d^3ez + 18b^2ce^4z - 27b^3c^2d^6 - b^3e^6, z, k)) (x(486b^4c^{10}d^8 - 90b^4c^8d^2e^6) + 243b^5c^9d^9e + 9b^5c^7d^3e^7) \operatorname{root}(216c^3z^3 - 108bc^2e^2z^2 + 162b^2c^2d^3ez + 18b^2ce^4z - 27b^3c^2d^6 - b^3e^6, z, k)) \right) + \ln(cx^3 + 1) \left(\frac{bd^2x}{2} + \frac{bde^2x^2}{2} + \frac{be^2x^3}{6} \right) - \ln(1 - cx^3) \left(\frac{bd^2x}{2} + \frac{bde^2x^2}{2} + \frac{be^2x^3}{6} \right) + \frac{ae^2x^3}{3} + ad^2x + a dex^2$$

input `int((a + b*atanh(c*x^3))*(d + e*x)^2,x)`

output `symsum(log(x*(6*b^5*c^7*d^2*e^8 + 162*b^5*c^9*d^8*e^2) + root(216*c^3*z^3 - 108*b*c^2*e^2*z^2 - 162*b^2*c^2*d^3*e*z + 18*b^2*c*e^4*z - 27*b^3*c^2*d^6 - b^3*e^6, z, k))*(x*(486*b^4*c^10*d^8 - 90*b^4*c^8*d^2*e^6) + root(216*c^3*z^3 - 108*b*c^2*e^2*z^2 - 162*b^2*c^2*d^3*e*z + 18*b^2*c*e^4*z - 27*b^3*c^2*d^6 - b^3*e^6, z, k))*(root(216*c^3*z^3 - 108*b*c^2*e^2*z^2 - 162*b^2*c^2*d^3*e*z + 18*b^2*c*e^4*z - 27*b^3*c^2*d^6 - b^3*e^6, z, k))*(3888*b^2*c^10*d^3*e - 3888*root(216*c^3*z^3 - 108*b*c^2*e^2*z^2 - 162*b^2*c^2*d^3*e*z + 18*b^2*c*e^4*z - 27*b^3*c^2*d^6 - b^3*e^6, z, k))*b*c^11*d^2*x + 648*b^2*c^10*d^2*e^2*x) - 972*b^3*c^9*d^3*e^3 + 324*b^3*c^9*d^2*e^4*x)) + 243*b^5*c^9*d^9*e + 9*b^5*c^7*d^3*e^7)*root(216*c^3*z^3 - 108*b*c^2*e^2*z^2 - 162*b^2*c^2*d^3*e*z + 18*b^2*c*e^4*z - 27*b^3*c^2*d^6 - b^3*e^6, z, k), k, 1, 3) + symsum(log(x*(6*b^5*c^7*d^2*e^8 + 162*b^5*c^9*d^8*e^2) + root(216*c^3*z^3 - 108*b*c^2*e^2*z^2 + 162*b^2*c^2*d^3*e*z + 18*b^2*c*e^4*z - 27*b^3*c^2*d^6 - b^3*e^6, z, k))*(x*(486*b^4*c^10*d^8 - 90*b^4*c^8*d^2*e^6) + root(216*c^3*z^3 - 108*b*c^2*e^2*z^2 + 162*b^2*c^2*d^3*e*z + 18*b^2*c*e^4*z - 27*b^3*c^2*d^6 - b^3*e^6, z, k))*(root(216*c^3*z^3 - 108*b*c^2*e^2*z^2 + 162*b^2*c^2*d^3*e*z + 18*b^2*c*e^4*z - 27*b^3*c^2*d^6 - b^3*e^6, z, k))*(3888*b^2*c^10*d^3*e - 3888*root(216*c^3*z^3 - 108*b*c^2*e^2*z^2 + 162*b^2*c^2*d^3*e*z + 18*b^2*c*e^4*z - 27*b^3*c^2*d^6 - b^3*e^6, z, k))*b*c^11*d^2*x + 648*b^2*c^10*d^2*e^2*x) - 972*b^3*c^9*d^3*e^3 + 324*b^3*c^9*d^2*e^4*x)...`

3.33 $\int (d + ex) (a + \operatorname{barctanh}(cx^3)) dx$

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3.33.1 Optimal result

Integrand size = 16, antiderivative size = 285

$$\begin{aligned}
 \int (d + ex) (a + \operatorname{barctanh}(cx^3)) dx = & -\frac{\sqrt{3}be \arctan\left(\frac{1}{\sqrt{3}} - \frac{2\sqrt[3]{cx}}{\sqrt{3}}\right)}{4c^{2/3}} \\
 & + \frac{\sqrt{3}be \arctan\left(\frac{1}{\sqrt{3}} + \frac{2\sqrt[3]{cx}}{\sqrt{3}}\right)}{4c^{2/3}} \\
 & + \frac{\sqrt{3}bd \arctan\left(\frac{1+2c^{2/3}x^2}{\sqrt{3}}\right)}{2\sqrt[3]{c}} - \frac{b \operatorname{arctanh}(\sqrt[3]{cx})}{2c^{2/3}} \\
 & - \frac{bd^2 \operatorname{arctanh}(cx^3)}{2e} + \frac{(d + ex)^2 (a + \operatorname{barctanh}(cx^3))}{2e} \\
 & + \frac{bd \log(1 - c^{2/3}x^2)}{2\sqrt[3]{c}} + \frac{be \log(1 - \sqrt[3]{cx} + c^{2/3}x^2)}{8c^{2/3}} \\
 & - \frac{be \log(1 + \sqrt[3]{cx} + c^{2/3}x^2)}{8c^{2/3}} \\
 & - \frac{bd \log(1 + c^{2/3}x^2 + c^{4/3}x^4)}{4\sqrt[3]{c}}
 \end{aligned}$$

output
$$\begin{aligned} & -1/2*b*e*\operatorname{arctanh}(c^{(1/3)}*x)/c^{(2/3)}-1/2*b*d^2*\operatorname{arctanh}(c*x^3)/e+1/2*(e*x+d) \\ & ^2*(a+b*\operatorname{arctanh}(c*x^3))/e+1/2*b*d*\ln(1-c^{(2/3)}*x^2)/c^{(1/3)}+1/8*b*e*\ln(1-c \\ & ^{(1/3)}*x+c^{(2/3)}*x^2)/c^{(2/3)}-1/8*b*e*\ln(1+c^{(1/3)}*x+c^{(2/3)}*x^2)/c^{(2/3)}- \\ & 1/4*b*d*\ln(1+c^{(2/3)}*x^2+c^{(4/3)}*x^4)/c^{(1/3)}+1/4*b*e*\operatorname{arctan}(-1/3*3^{(1/2)}+ \\ & 2/3*c^{(1/3)}*x*3^{(1/2)})*3^{(1/2)}/c^{(2/3)}+1/4*b*e*\operatorname{arctan}(1/3*3^{(1/2)}+2/3*c^{(1 \\ & /3)}*x*3^{(1/2)})*3^{(1/2)}/c^{(2/3)}+1/2*b*d*\operatorname{arctan}(1/3*(1+2*c^{(2/3)}*x^2)*3^{(1/2 \\ &)})*3^{(1/2)}/c^{(1/3)} \end{aligned}$$

3.33.2 Mathematica [A] (verified)

Time = 0.08 (sec) , antiderivative size = 333, normalized size of antiderivative = 1.17

$$\begin{aligned} \int (d + ex) (a + b \operatorname{arctanh}(cx^3)) dx &= adx + \frac{1}{2} aex^2 + \frac{\sqrt{3}be \operatorname{arctan}\left(\frac{-1+2\sqrt[3]{Cx}}{\sqrt{3}}\right)}{4c^{2/3}} \\ &+ \frac{\sqrt{3}be \operatorname{arctan}\left(\frac{1+2\sqrt[3]{Cx}}{\sqrt{3}}\right)}{4c^{2/3}} + bdx \operatorname{arctanh}(cx^3) + \frac{1}{2} bex^2 \operatorname{arctanh}(cx^3) + \frac{be \log(1 - \sqrt[3]{cx})}{4c^{2/3}} \\ &- \frac{be \log(1 + \sqrt[3]{cx})}{4c^{2/3}} + \frac{be \log(1 - \sqrt[3]{cx} + c^{2/3}x^2)}{8c^{2/3}} - \frac{be \log(1 + \sqrt[3]{cx} + c^{2/3}x^2)}{8c^{2/3}} \\ &- \frac{bd\left(-2\sqrt{3} \operatorname{arctan}\left(\frac{-1+2\sqrt[3]{Cx}}{\sqrt{3}}\right) + 2\sqrt{3} \operatorname{arctan}\left(\frac{1+2\sqrt[3]{Cx}}{\sqrt{3}}\right) - 2\log(1 - \sqrt[3]{cx}) - 2\log(1 + \sqrt[3]{cx}) + \log(1\right)}{4\sqrt[3]{c}} \end{aligned}$$

input `Integrate[(d + e*x)*(a + b*ArcTanh[c*x^3]),x]`

output
$$\begin{aligned} & a*d*x + (a*e*x^2)/2 + (\operatorname{Sqrt}[3]*b*e*\operatorname{ArcTan}[(-1 + 2*c^{(1/3)}*x)/\operatorname{Sqrt}[3]])/(4* \\ & c^{(2/3)}) + (\operatorname{Sqrt}[3]*b*e*\operatorname{ArcTan}[(1 + 2*c^{(1/3)}*x)/\operatorname{Sqrt}[3]])/(4*c^{(2/3)}) + b \\ & *d*x*\operatorname{ArcTanh}[c*x^3] + (b*e*x^2*\operatorname{ArcTanh}[c*x^3])/2 + (b*e*\operatorname{Log}[1 - c^{(1/3)}*x] \\ &)/(4*c^{(2/3)}) - (b*e*\operatorname{Log}[1 + c^{(1/3)}*x])/(4*c^{(2/3)}) + (b*e*\operatorname{Log}[1 - c^{(1/3} \\ &)*x + c^{(2/3)}*x^2])/(8*c^{(2/3)}) - (b*e*\operatorname{Log}[1 + c^{(1/3)}*x + c^{(2/3)}*x^2])/(\\ & 8*c^{(2/3)}) - (b*d*(-2*\operatorname{Sqrt}[3]*\operatorname{ArcTan}[(-1 + 2*c^{(1/3)}*x)/\operatorname{Sqrt}[3]] + 2*\operatorname{Sqrt}[\\ & 3]*\operatorname{ArcTan}[(1 + 2*c^{(1/3)}*x)/\operatorname{Sqrt}[3]] - 2*\operatorname{Log}[1 - c^{(1/3)}*x] - 2*\operatorname{Log}[1 + c^{ \\ & (1/3)}*x] + \operatorname{Log}[1 - c^{(1/3)}*x + c^{(2/3)}*x^2] + \operatorname{Log}[1 + c^{(1/3)}*x + c^{(2/3)}* \\ & x^2]))/(4*c^{(1/3)}) \end{aligned}$$

3.33.3 Rubi [A] (verified)

Time = 0.70 (sec) , antiderivative size = 297, normalized size of antiderivative = 1.04, number of steps used = 3, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.188$, Rules used = {6486, 2370, 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.

$$\begin{aligned}
 & \int (d + ex) (a + \operatorname{barctanh}(cx^3)) dx \\
 & \quad \downarrow 6486 \\
 & \frac{(d + ex)^2 (a + \operatorname{barctanh}(cx^3))}{2e} - \frac{3bc \int \frac{x^2(d+ex)^2}{1-c^2x^6} dx}{2e} \\
 & \quad \downarrow 2370 \\
 & \frac{(d + ex)^2 (a + \operatorname{barctanh}(cx^3))}{2e} - \frac{3bc \int \left(\frac{e^2 x^4}{1-c^2x^6} + \frac{2dex^3}{1-c^2x^6} + \frac{d^2 x^2}{1-c^2x^6} \right) dx}{2e} \\
 & \quad \downarrow 2009 \\
 & \frac{(d + ex)^2 (a + \operatorname{barctanh}(cx^3))}{2e} - \\
 & 3bc \left(-\frac{de \arctan\left(\frac{2c^{2/3}x^2+1}{\sqrt{3}}\right)}{\sqrt{3}c^{4/3}} + \frac{e^2 \arctan\left(\frac{1}{\sqrt{3}} - \frac{2\sqrt[3]{Cx}}{\sqrt{3}}\right)}{2\sqrt{3}c^{5/3}} - \frac{e^2 \arctan\left(\frac{2\sqrt[3]{Cx}}{\sqrt{3}} + \frac{1}{\sqrt{3}}\right)}{2\sqrt{3}c^{5/3}} + \frac{e^2 \operatorname{arctanh}\left(\sqrt[3]{Cx}\right)}{3c^{5/3}} + \frac{d^2 \operatorname{arctanh}(cx^3)}{3c} - \frac{de}{2e} \right)
 \end{aligned}$$

input `Int[(d + e*x)*(a + b*ArcTanh[c*x^3]),x]`

output `((d + e*x)^2*(a + b*ArcTanh[c*x^3]))/(2*e) - (3*b*c*((e^2*ArcTan[1/Sqrt[3] - (2*c^(1/3)*x)/Sqrt[3]])/(2*Sqrt[3]*c^(5/3)) - (e^2*ArcTan[1/Sqrt[3] + (2*c^(1/3)*x)/Sqrt[3]])/(2*Sqrt[3]*c^(5/3)) - (d*e*ArcTan[(1 + 2*c^(2/3)*x^2)/Sqrt[3]])/(Sqrt[3]*c^(4/3)) + (e^2*ArcTanh[c^(1/3)*x])/(3*c^(5/3)) + (d^2*ArcTanh[c*x^3])/(3*c) - (d*e*Log[1 - c^(2/3)*x^2])/(3*c^(4/3)) - (e^2*Log[1 - c^(1/3)*x + c^(2/3)*x^2])/(12*c^(5/3)) + (e^2*Log[1 + c^(1/3)*x + c^(2/3)*x^2])/(12*c^(5/3)) + (d*e*Log[1 + c^(2/3)*x^2 + c^(4/3)*x^4])/(6*c^(4/3)))/(2*e)`

3.33.3.1 Defintions of rubi rules used

```
rule 2009 Int[u_, x_Symbol] :> Simp[IntSum[u, x], x] /; SumQ[u]
```

```
rule 2370 Int[((Pq_)*((c_)*(x_)^(m_)))/((a_) + (b_)*(x_)^(n_)), x_Symbol] :> With[
{v = Sum[(c*x)^(m + ii)*((Coeff[Pq, x, ii] + Coeff[Pq, x, n/2 + ii])*x^(n/2)
)/(c^ii*(a + b*x^n))], {ii, 0, n/2 - 1}}, Int[v, x] /; SumQ[v]] /; FreeQ[{
a, b, c, m}, x] && PolyQ[Pq, x] && IGtQ[n/2, 0] && Expon[Pq, x] < n
```

```
rule 6486 Int[((a_) + ArcTanh[(c_)*(x_)^(n_)]*(b_))*((d_) + (e_)*(x_)^(m_)), x_
Symbol] :> Simp[(d + e*x)^(m + 1)*((a + b*ArcTanh[c*x^n])/(e*(m + 1))), x]
- Simp[b*c*(n/(e*(m + 1))) Int[x^(n - 1)*((d + e*x)^(m + 1)/(1 - c^2*x^(2
*n))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && NeQ[m, -1]
```

3.33.4 Maple [A] (verified)

Time = 0.26 (sec) , antiderivative size = 363, normalized size of antiderivative = 1.27

method	result
default	$a\left(\frac{1}{2}ex^2 + dx\right) + \frac{b \operatorname{arctanh}(cx^3)x^2e}{2} + b \operatorname{arctanh}(cx^3) dx + \frac{bd \ln\left(x - \left(\frac{1}{c}\right)^{\frac{1}{3}}\right)}{2c\left(\frac{1}{c}\right)^{\frac{2}{3}}} - \frac{bd \ln\left(x^2 + \left(\frac{1}{c}\right)^{\frac{1}{3}}x + \left(\frac{1}{c}\right)^{\frac{2}{3}}\right)}{4c\left(\frac{1}{c}\right)^{\frac{2}{3}}} - \dots$
parts	$a\left(\frac{1}{2}ex^2 + dx\right) + \frac{b \operatorname{arctanh}(cx^3)x^2e}{2} + b \operatorname{arctanh}(cx^3) dx + \frac{bd \ln\left(x - \left(\frac{1}{c}\right)^{\frac{1}{3}}\right)}{2c\left(\frac{1}{c}\right)^{\frac{2}{3}}} - \frac{bd \ln\left(x^2 + \left(\frac{1}{c}\right)^{\frac{1}{3}}x + \left(\frac{1}{c}\right)^{\frac{2}{3}}\right)}{4c\left(\frac{1}{c}\right)^{\frac{2}{3}}} - \dots$
risch	$\frac{b\left(\frac{1}{2}ex^2 + dx\right) \ln(cx^3 + 1)}{2} + \frac{aex^2}{2} + adx - \frac{bdx \ln(-cx^3 + 1)}{2} + \frac{bd \ln\left(x - \left(\frac{1}{c}\right)^{\frac{1}{3}}\right)}{2c\left(\frac{1}{c}\right)^{\frac{2}{3}}} - \frac{bd \ln\left(x^2 + \left(\frac{1}{c}\right)^{\frac{1}{3}}x + \left(\frac{1}{c}\right)^{\frac{2}{3}}\right)}{4c\left(\frac{1}{c}\right)^{\frac{2}{3}}} - \dots$

```
input int((e*x+d)*(a+b*arctanh(c*x^3)),x,method=_RETURNVERBOSE)
```

output `a*(1/2*e*x^2+d*x)+1/2*b*arctanh(c*x^3)*x^2*e+b*arctanh(c*x^3)*d*x+1/2*b*d/c/(1/c)^(2/3)*ln(x-(1/c)^(1/3))-1/4*b*d/c/(1/c)^(2/3)*ln(x^2+(1/c)^(1/3)*x+(1/c)^(2/3))-1/2*b*d/c/(1/c)^(2/3)*3^(1/2)*arctan(1/3*3^(1/2)*(2/(1/c)^(1/3)*x+1))+1/4*b*e/c/(1/c)^(1/3)*ln(x-(1/c)^(1/3))-1/8*b*e/c/(1/c)^(1/3)*ln(x^2+(1/c)^(1/3)*x+(1/c)^(2/3))+1/4*b*e*3^(1/2)/c/(1/c)^(1/3)*arctan(1/3*3^(1/2)*(2/(1/c)^(1/3)*x+1))+1/2*b*d/c/(1/c)^(2/3)*ln(x+(1/c)^(1/3))-1/4*b*d/c/(1/c)^(2/3)*ln(x^2-(1/c)^(1/3)*x+(1/c)^(2/3))+1/2*b*d/c/(1/c)^(2/3)*3^(1/2)*arctan(1/3*3^(1/2)*(2/(1/c)^(1/3)*x-1))-1/4*b*e/c/(1/c)^(1/3)*ln(x+(1/c)^(1/3))+1/8*b*e/c/(1/c)^(1/3)*ln(x^2-(1/c)^(1/3)*x+(1/c)^(2/3))+1/4*b*e*3^(1/2)/c/(1/c)^(1/3)*arctan(1/3*3^(1/2)*(2/(1/c)^(1/3)*x-1))`

3.33.5 Fracas [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 0.98 (sec) , antiderivative size = 3928, normalized size of antiderivative = 13.78

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^3)) dx = \text{Too large to display}$$

input `integrate((e*x+d)*(a+b*arctanh(c*x^3)),x, algorithm="fracas")`

output $\frac{1}{2}ax^2 + adx + \frac{1}{8}(4\sqrt[2]{\frac{1}{2}})^{\frac{2}{3}}b^2de^{(-\sqrt{3})} + 1 / (((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}c) - (1/2)^{\frac{1}{3}}((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}(I\sqrt{3} + 1) \log(2 * (4\sqrt[2]{\frac{1}{2}})^{\frac{2}{3}}b^2de^{(-\sqrt{3})} + 1) / (((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}c) - (1/2)^{\frac{1}{3}}((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}(I\sqrt{3} + 1) * bcd^2 + 4b^2de^2 + 1/4 * (4\sqrt[2]{\frac{1}{2}})^{\frac{2}{3}}b^2de^{(-\sqrt{3})} + 1) / (((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}c) - (1/2)^{\frac{1}{3}}(((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}(I\sqrt{3} + 1))^2 * ce + (8b^2cd^3 + b^2e^3) * x) - 1/16 * (4\sqrt[2]{\frac{1}{2}})^{\frac{2}{3}}b^2de^{(-\sqrt{3})} + 1) / (((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}c) - (1/2)^{\frac{1}{3}}((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}(I\sqrt{3} + 1) - 2\sqrt{3/2} * \sqrt{1/2} * \sqrt{-(32b^2de + (4\sqrt[2]{\frac{1}{2}})^{\frac{2}{3}}b^2de^{(-\sqrt{3})} + 1) / (((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}c) - (1/2)^{\frac{1}{3}}(((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}(I\sqrt{3} + 1))^2 * c) / c) * \log(-(4\sqrt[2]{\frac{1}{2}})^{\frac{2}{3}}b^2de^{(-\sqrt{3})} + 1) / (((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}c) - (1/2)^{\frac{1}{3}}((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}(I\sqrt{3} + 1) * bcd^2 - 2b^2de^2 - 1/8 * (4\sqrt[2]{\frac{1}{2}})^{\frac{2}{3}}b^2de^{(-\sqrt{3})} + 1) / (((8cd^3 + e^3)b^3/c^2 + (8cd^3 - e^3)b^3/c^2)^{\frac{1}{3}}c) - (1/2)^{\frac{1}{3}}((8cd^3 + e^3)b^3/c^2 + (...$

3.33.6 Sympy [F(-1)]

Timed out.

$$\int (d + ex) (a + \operatorname{barctanh}(cx^3)) dx = \text{Timed out}$$

input `integrate((e*x+d)*(a+b*atanh(c*x**3)),x)`

output `Timed out`

3.33.7 Maxima [A] (verification not implemented)

Time = 0.27 (sec) , antiderivative size = 248, normalized size of antiderivative = 0.87

$$\int (d + ex) (a + b \operatorname{arctanh}(cx^3)) dx = \frac{1}{2} aex^2 + \frac{1}{4} \left(c \left(\frac{2\sqrt{3} \arctan\left(\frac{\sqrt{3}(2c^{4/3}x^2 + c^{2/3})}{3c^{2/3}}\right)}{c^{4/3}} - \frac{\log\left(c^{4/3}x^4 + c^{2/3}x^2 + 1\right)}{c^{4/3}} + \frac{2 \log\left(\frac{c^{2/3}x^2 - 1}{c^{2/3}}\right)}{c^{4/3}} \right) + 4x \operatorname{artanh}(cx^3) \right) + \frac{1}{8} \left(4x^2 \operatorname{artanh}(cx^3) + c \left(\frac{2\sqrt{3} \arctan\left(\frac{\sqrt{3}(2c^{2/3}x + c^{1/3})}{3c^{1/3}}\right)}{c^{5/3}} + \frac{2\sqrt{3} \arctan\left(\frac{\sqrt{3}(2c^{2/3}x - c^{1/3})}{3c^{1/3}}\right)}{c^{5/3}} - \frac{\log\left(c^{2/3}x^2 + c^{1/3}x + 1\right)}{c^{5/3}} \right) \right) + adx$$

input `integrate((e*x+d)*(a+b*arctanh(c*x^3)),x, algorithm="maxima")`

output

```
1/2*a*e*x^2 + 1/4*(c*(2*sqrt(3)*arctan(1/3*sqrt(3)*(2*c^(4/3)*x^2 + c^(2/3)))/c^(2/3))/c^(4/3) - log(c^(4/3)*x^4 + c^(2/3)*x^2 + 1)/c^(4/3) + 2*log((c^(2/3)*x^2 - 1)/c^(2/3))/c^(4/3)) + 4*x*arctanh(c*x^3))*b*d + 1/8*(4*x^2*arctanh(c*x^3) + c*(2*sqrt(3)*arctan(1/3*sqrt(3)*(2*c^(2/3)*x + c^(1/3)))/c^(1/3))/c^(5/3) + 2*sqrt(3)*arctan(1/3*sqrt(3)*(2*c^(2/3)*x - c^(1/3)))/c^(1/3))/c^(5/3) - log(c^(2/3)*x^2 + c^(1/3)*x + 1)/c^(5/3) + log(c^(2/3)*x^2 - c^(1/3)*x + 1)/c^(5/3) - 2*log((c^(1/3)*x + 1)/c^(1/3))/c^(5/3) + 2*log((c^(1/3)*x - 1)/c^(1/3))/c^(5/3))*b*e + a*d*x
```

3.33.8 Giac [A] (verification not implemented)

Time = 1.03 (sec) , antiderivative size = 267, normalized size of antiderivative = 0.94

$$\begin{aligned}
& \int (d + ex) (a + \operatorname{barctanh}(cx^3)) dx \\
&= \frac{1}{2} aex^2 + adx + \frac{1}{4} (bex^2 + 2bdx) \log\left(-\frac{cx^3 + 1}{cx^3 - 1}\right) \\
&\quad - \frac{(2\sqrt{3}bcd|c|^{\frac{1}{3}} - \sqrt{3}bce) \arctan\left(\frac{1}{3}\sqrt{3}\left(2x + \frac{1}{|c|^{\frac{1}{3}}}\right)|c|^{\frac{1}{3}}\right)}{4|c|^{\frac{5}{3}}} \\
&\quad + \frac{(2\sqrt{3}bcd|c|^{\frac{1}{3}} + \sqrt{3}bce) \arctan\left(\frac{1}{3}\sqrt{3}\left(2x - \frac{1}{|c|^{\frac{1}{3}}}\right)|c|^{\frac{1}{3}}\right)}{4|c|^{\frac{5}{3}}} \\
&\quad - \frac{(2bcd|c|^{\frac{1}{3}} + bce) \log\left(x^2 + \frac{x}{|c|^{\frac{1}{3}}} + \frac{1}{|c|^{\frac{2}{3}}}\right)}{8|c|^{\frac{5}{3}}} - \frac{(2bcd|c|^{\frac{1}{3}} - bce) \log\left(x^2 - \frac{x}{|c|^{\frac{1}{3}}} + \frac{1}{|c|^{\frac{2}{3}}}\right)}{8|c|^{\frac{5}{3}}} \\
&\quad + \frac{(2bcd|c|^{\frac{1}{3}} - bce) \log\left(\left|x + \frac{1}{|c|^{\frac{1}{3}}}\right|\right)}{4|c|^{\frac{5}{3}}} + \frac{(2bcd|c|^{\frac{1}{3}} + bce) \log\left(\left|x - \frac{1}{|c|^{\frac{1}{3}}}\right|\right)}{4|c|^{\frac{5}{3}}}
\end{aligned}$$

input `integrate((e*x+d)*(a+b*arctanh(c*x^3)),x, algorithm="giac")`

```

output 1/2*a*e*x^2 + a*d*x + 1/4*(b*e*x^2 + 2*b*d*x)*log(-(c*x^3 + 1)/(c*x^3 - 1)
) - 1/4*(2*sqrt(3)*b*c*d*abs(c)^(1/3) - sqrt(3)*b*c*e)*arctan(1/3*sqrt(3)*
(2*x + 1/abs(c)^(1/3))*abs(c)^(1/3))/abs(c)^(5/3) + 1/4*(2*sqrt(3)*b*c*d*a
bs(c)^(1/3) + sqrt(3)*b*c*e)*arctan(1/3*sqrt(3)*(2*x - 1/abs(c)^(1/3))*abs
(c)^(1/3))/abs(c)^(5/3) - 1/8*(2*b*c*d*abs(c)^(1/3) + b*c*e)*log(x^2 + x/a
bs(c)^(1/3) + 1/abs(c)^(2/3))/abs(c)^(5/3) - 1/8*(2*b*c*d*abs(c)^(1/3) - b
*c*e)*log(x^2 - x/abs(c)^(1/3) + 1/abs(c)^(2/3))/abs(c)^(5/3) + 1/4*(2*b*c
*d*abs(c)^(1/3) - b*c*e)*log(abs(x + 1/abs(c)^(1/3)))/abs(c)^(5/3) + 1/4*(
2*b*c*d*abs(c)^(1/3) + b*c*e)*log(abs(x - 1/abs(c)^(1/3)))/abs(c)^(5/3)

```

3.33.9 Mupad [B] (verification not implemented)

Time = 3.63 (sec) , antiderivative size = 621, normalized size of antiderivative = 2.18

$$\begin{aligned}
& \int (d + ex) (a + \operatorname{arctanh}(cx^3)) dx \\
&= \left(\sum_{k=1}^3 \ln \left(-\operatorname{root}(64c^2z^3 + 24b^2cdez - 8b^3cd^3 + b^3e^3, z, k) \left(\operatorname{root}(64c^2z^3 + 24b^2cdez - 8b^3cd^3 + b^3e^3, z, k) \right. \right. \right. \\
&\quad \left. \left. \left. + \frac{243b^5c^9d^4e}{2} + \frac{243b^5c^9d^3e^2x}{4} \right) \operatorname{root}(64c^2z^3 + 24b^2cdez - 8b^3cd^3 + b^3e^3, z, k) \right) \right) \\
&\quad + \left(\sum_{k=1}^3 \ln \left(-\operatorname{root}(64c^2z^3 - 24b^2cdez - 8b^3cd^3 - b^3e^3, z, k) \left(\operatorname{root}(64c^2z^3 - 24b^2cdez - 8b^3cd^3 - b^3e^3, z, k) \right. \right. \right. \\
&\quad \left. \left. \left. + \frac{243b^5c^9d^4e}{2} + \frac{243b^5c^9d^3e^2x}{4} \right) \operatorname{root}(64c^2z^3 - 24b^2cdez - 8b^3cd^3 - b^3e^3, z, k) \right) \right) \\
&\quad + \ln(cx^3 + 1) \left(\frac{bex^2}{4} + \frac{bdx}{2} \right) - \ln(1 - cx^3) \left(\frac{bex^2}{4} + \frac{bdx}{2} \right) + adx + \frac{aex^2}{2}
\end{aligned}$$

input `int((a + b*atanh(c*x^3))*(d + e*x),x)`

```

output symsum(log((243*b^5*c^9*d^4*e)/2 - root(64*c^2*z^3 + 24*b^2*c*d*e*z - 8*b^3*c*d^3 +
3*c*d^3 + b^3*e^3, z, k)*(root(64*c^2*z^3 + 24*b^2*c*d*e*z - 8*b^3*c*d^3 +
b^3*e^3, z, k)*(root(64*c^2*z^3 + 24*b^2*c*d*e*z - 8*b^3*c*d^3 + b^3*e^3,
z, k)*(486*b^2*c^10*e^2*x - 1944*b^2*c^10*d*e + 3888*root(64*c^2*z^3 + 24
*b^2*c*d*e*z - 8*b^3*c*d^3 + b^3*e^3, z, k)*b*c^11*d*x) - (243*b^3*c^9*e^3
)/2) - 486*b^4*c^10*d^4*x) + (243*b^5*c^9*d^3*e^2*x)/4)*root(64*c^2*z^3 +
24*b^2*c*d*e*z - 8*b^3*c*d^3 + b^3*e^3, z, k), k, 1, 3) + symsum(log((243*
b^5*c^9*d^4*e)/2 - root(64*c^2*z^3 - 24*b^2*c*d*e*z - 8*b^3*c*d^3 - b^3*e^
3, z, k)*(root(64*c^2*z^3 - 24*b^2*c*d*e*z - 8*b^3*c*d^3 - b^3*e^3, z, k)*
(root(64*c^2*z^3 - 24*b^2*c*d*e*z - 8*b^3*c*d^3 - b^3*e^3, z, k)*(486*b^2*
c^10*e^2*x - 1944*b^2*c^10*d*e + 3888*root(64*c^2*z^3 - 24*b^2*c*d*e*z - 8
*b^3*c*d^3 - b^3*e^3, z, k)*b*c^11*d*x) - (243*b^3*c^9*e^3)/2) - 486*b^4*c
^10*d^4*x) + (243*b^5*c^9*d^3*e^2*x)/4)*root(64*c^2*z^3 - 24*b^2*c*d*e*z -
8*b^3*c*d^3 - b^3*e^3, z, k), k, 1, 3) + log(c*x^3 + 1)*((b*d*x)/2 + (b*e
*x^2)/4) - log(1 - c*x^3)*((b*d*x)/2 + (b*e*x^2)/4) + a*d*x + (a*e*x^2)/2

```

3.34 $\int \frac{a+b\operatorname{arctanh}(cx^3)}{d+ex} dx$

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3.34.1 Optimal result

Integrand size = 18, antiderivative size = 523

$$\begin{aligned}
 \int \frac{a + \operatorname{barctanh}(cx^3)}{d + ex} dx &= \frac{(a + \operatorname{barctanh}(cx^3)) \log(d + ex)}{e} + \frac{b \log\left(\frac{e(1 - \sqrt[3]{Cx})}{\sqrt[3]{Cd+e}}\right) \log(d + ex)}{2e} \\
 &\quad - \frac{b \log\left(-\frac{e(1 + \sqrt[3]{Cx})}{\sqrt[3]{Cd-e}}\right) \log(d + ex)}{2e} \\
 &\quad + \frac{b \log\left(-\frac{e(\sqrt[3]{-1} + \sqrt[3]{Cx})}{\sqrt[3]{Cd - \sqrt[3]{-1}e}}\right) \log(d + ex)}{2e} \\
 &\quad - \frac{b \log\left(-\frac{e((-1)^{2/3} + \sqrt[3]{Cx})}{\sqrt[3]{Cd - (-1)^{2/3}e}}\right) \log(d + ex)}{2e} \\
 &\quad + \frac{b \log\left(\frac{(-1)^{2/3}e(1 + \sqrt[3]{-1}\sqrt[3]{Cx})}{\sqrt[3]{Cd + (-1)^{2/3}e}}\right) \log(d + ex)}{2e} \\
 &\quad - \frac{b \log\left(\frac{\sqrt[3]{-1}e(1 + (-1)^{2/3}\sqrt[3]{Cx})}{\sqrt[3]{Cd + \sqrt[3]{-1}e}}\right) \log(d + ex)}{2e} \\
 &\quad - \frac{b \operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{Cd-e}}\right)}{2e} + \frac{b \operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{Cd+e}}\right)}{2e} \\
 &\quad + \frac{b \operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{Cd - \sqrt[3]{-1}e}}\right)}{2e} - \frac{b \operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{Cd + \sqrt[3]{-1}e}}\right)}{2e} \\
 &\quad - \frac{b \operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{Cd - (-1)^{2/3}e}}\right)}{2e} + \frac{b \operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{Cd + (-1)^{2/3}e}}\right)}{2e}
 \end{aligned}$$

output $(a+b*\operatorname{arctanh}(c*x^3))*\ln(e*x+d)/e+1/2*b*\ln(e*(1-c^(1/3)*x)/(c^(1/3)*d+e))*\ln(e*x+d)/e-1/2*b*\ln(-e*(1+c^(1/3)*x)/(c^(1/3)*d-e))*\ln(e*x+d)/e+1/2*b*\ln(-e*((-1)^(1/3)+c^(1/3)*x)/(c^(1/3)*d-(-1)^(1/3)*e))*\ln(e*x+d)/e-1/2*b*\ln(-e*((-1)^(2/3)+c^(1/3)*x)/(c^(1/3)*d-(-1)^(2/3)*e))*\ln(e*x+d)/e+1/2*b*\ln((-1)^(2/3)*e*(1+(-1)^(1/3)*c^(1/3)*x)/(c^(1/3)*d+(-1)^(2/3)*e))*\ln(e*x+d)/e-1/2*b*\ln((-1)^(1/3)*e*(1+(-1)^(2/3)*c^(1/3)*x)/(c^(1/3)*d+(-1)^(1/3)*e))*\ln(e*x+d)/e-1/2*b*\operatorname{polylog}(2,c^(1/3)*(e*x+d)/(c^(1/3)*d-e))/e+1/2*b*\operatorname{polylog}(2,c^(1/3)*(e*x+d)/(c^(1/3)*d+e))/e+1/2*b*\operatorname{polylog}(2,c^(1/3)*(e*x+d)/(c^(1/3)*d-(-1)^(1/3)*e))/e-1/2*b*\operatorname{polylog}(2,c^(1/3)*(e*x+d)/(c^(1/3)*d+(-1)^(1/3)*e))/e-1/2*b*\operatorname{polylog}(2,c^(1/3)*(e*x+d)/(c^(1/3)*d-(-1)^(2/3)*e))/e+1/2*b*\operatorname{polylog}(2,c^(1/3)*(e*x+d)/(c^(1/3)*d+(-1)^(2/3)*e))/e$

3.34.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 11.97 (sec) , antiderivative size = 515, normalized size of antiderivative = 0.98

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{d + ex} dx = \frac{a \log(d + ex)}{e} + \frac{b \left(2 \operatorname{arctanh}(cx^3) \log(d + ex) - \log \left(\frac{e \left(1 - i\sqrt{3} - 2\sqrt[3]{Cx} \right)}{2\sqrt[3]{Cd + e - i\sqrt{3}e}} \right) \log(d + ex) + \log \left(\frac{e \left(-i + \sqrt{3} - 2i\sqrt[3]{Cx} \right)}{2i\sqrt[3]{Cd + (-i + \sqrt{3})e}} \right) \log(d + ex) \right)}{e}$$

input `Integrate[(a + b*ArcTanh[c*x^3])/(d + e*x),x]`

output $(a*\operatorname{Log}[d + e*x])/e + (b*(2*\operatorname{ArcTanh}[c*x^3]*\operatorname{Log}[d + e*x] - \operatorname{Log}[(e*(1 - I*\operatorname{Sqrt}[3] - 2*c^(1/3)*x))/(2*c^(1/3)*d + e - I*\operatorname{Sqrt}[3]*e)]*\operatorname{Log}[d + e*x] + \operatorname{Log}[(e*(-I + \operatorname{Sqrt}[3] - (2*I)*c^(1/3)*x))/((2*I)*c^(1/3)*d + (-I + \operatorname{Sqrt}[3])*e)]*\operatorname{Log}[d + e*x] + \operatorname{Log}[(e*(I + \operatorname{Sqrt}[3] + (2*I)*c^(1/3)*x))/((-2*I)*c^(1/3)*d + (I + \operatorname{Sqrt}[3])*e)]*\operatorname{Log}[d + e*x] - \operatorname{Log}[-(e*(1 + c^(1/3)*x))/(c^(1/3)*d - e)])*\operatorname{Log}[d + e*x] - \operatorname{Log}[-(e*(-1 - I*\operatorname{Sqrt}[3] + 2*c^(1/3)*x))/(2*c^(1/3)*d + e + I*\operatorname{Sqrt}[3]*e)])*\operatorname{Log}[d + e*x] + \operatorname{Log}[d + e*x]*\operatorname{Log}[(e - c^(1/3)*e*x)/(c^(1/3)*d + e)] - \operatorname{PolyLog}[2, (c^(1/3)*(d + e*x))/(c^(1/3)*d - e)] + \operatorname{PolyLog}[2, (c^(1/3)*(d + e*x))/(c^(1/3)*d + e)] + \operatorname{PolyLog}[2, (2*c^(1/3)*(d + e*x))/(2*c^(1/3)*d - e - I*\operatorname{Sqrt}[3]*e)] - \operatorname{PolyLog}[2, (2*c^(1/3)*(d + e*x))/(2*c^(1/3)*d + e - I*\operatorname{Sqrt}[3]*e)] + \operatorname{PolyLog}[2, (2*c^(1/3)*(d + e*x))/(2*c^(1/3)*d - e + I*\operatorname{Sqrt}[3]*e)] - \operatorname{PolyLog}[2, (2*c^(1/3)*(d + e*x))/(2*c^(1/3)*d + e + I*\operatorname{Sqrt}[3]*e)]))/e$

3.34. $\int \frac{a+b\operatorname{arctanh}(cx^3)}{d+ex} dx$

3.34.3 Rubi [A] (verified)

Time = 1.14 (sec) , antiderivative size = 519, 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 = {6482, 2863, 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.

$$\begin{aligned}
 & \int \frac{a + \operatorname{barctanh}(cx^3)}{d + ex} dx \\
 & \quad \downarrow \text{6482} \\
 & \frac{\log(d + ex) (a + \operatorname{barctanh}(cx^3))}{e} - \frac{3bc \int \frac{x^2 \log(d+ex)}{1-c^2x^6} dx}{e} \\
 & \quad \downarrow \text{2863} \\
 & \frac{\log(d + ex) (a + \operatorname{barctanh}(cx^3))}{e} - \frac{3bc \int \left(\frac{c \log(d+ex)x^2}{2(c-c^2x^3)} + \frac{c \log(d+ex)x^2}{2(c^2x^3+c)} \right) dx}{e} \\
 & \quad \downarrow \text{2009} \\
 & \frac{\log(d + ex) (a + \operatorname{barctanh}(cx^3))}{e} - \\
 & 3bc \left(\frac{\operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{Cd-e}}\right)}{6c} - \frac{\operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{Cd+e}}\right)}{6c} - \frac{\operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{Cd-\sqrt[3]{-1e}}}\right)}{6c} + \frac{\operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{Cd+\sqrt[3]{-1e}}}\right)}{6c} + \frac{\operatorname{PolyLog}\left(2, \frac{\sqrt[3]{C(d+ex)}}{\sqrt[3]{-1e}}\right)}{6c} \right)
 \end{aligned}$$

input `Int[(a + b*ArcTanh[c*x^3])/(d + e*x), x]`

output
$$\begin{aligned} & ((a + b \operatorname{ArcTanh}[c x^3]) \operatorname{Log}[d + e x]) / e - (3 b c (-1/6 (\operatorname{Log}[(e (1 - c^{1/3} x)) / (c^{1/3} d + e)] \operatorname{Log}[d + e x]) / c + (\operatorname{Log}[-(e (1 + c^{1/3} x)) / (c^{1/3} d - e)]) \operatorname{Log}[d + e x]) / (6 c) - (\operatorname{Log}[-(e ((-1)^{1/3} + c^{1/3} x)) / (c^{1/3} d - (-1)^{1/3} e)]) \operatorname{Log}[d + e x]) / (6 c) + (\operatorname{Log}[-(e ((-1)^{2/3} + c^{1/3} x)) / (c^{1/3} d - (-1)^{2/3} e)]) \operatorname{Log}[d + e x]) / (6 c) - (\operatorname{Log}[((-1)^{2/3} e (1 + (-1)^{1/3} c^{1/3} x)) / (c^{1/3} d + (-1)^{2/3} e)]) \operatorname{Log}[d + e x]) / (6 c) + (\operatorname{Log}[((-1)^{1/3} e (1 + (-1)^{2/3} c^{1/3} x)) / (c^{1/3} d + (-1)^{1/3} e)]) \operatorname{Log}[d + e x]) / (6 c) + \operatorname{PolyLog}[2, (c^{1/3} (d + e x)) / (c^{1/3} d - e)] / (6 c) - \operatorname{PolyLog}[2, (c^{1/3} (d + e x)) / (c^{1/3} d + e)] / (6 c) - \operatorname{PolyLog}[2, (c^{1/3} (d + e x)) / (c^{1/3} d - (-1)^{1/3} e)] / (6 c) + \operatorname{PolyLog}[2, (c^{1/3} (d + e x)) / (c^{1/3} d + (-1)^{1/3} e)] / (6 c) + \operatorname{PolyLog}[2, (c^{1/3} (d + e x)) / (c^{1/3} d - (-1)^{2/3} e)] / (6 c) - \operatorname{PolyLog}[2, (c^{1/3} (d + e x)) / (c^{1/3} d + (-1)^{2/3} e)] / (6 c)) / e \end{aligned}$$

3.34.3.1 Defintions of rubi rules used

rule 2009 $\operatorname{Int}[u_, x_Symbol] \rightarrow \operatorname{Simp}[\operatorname{IntSum}[u, x], x] /; \operatorname{SumQ}[u]$

rule 2863 $\operatorname{Int}[(a_.) + \operatorname{Log}[(c_.) * ((d_.) + (e_.) * (x_.))^{(n_.)}] * (b_.)^{(p_.)} * ((h_.) * (x_.))^{(m_.)} * ((f_.) + (g_.) * (x_.)^{(r_.)})^{(q_.)}, x_Symbol] \rightarrow \operatorname{Int}[\operatorname{ExpandIntegrand}[(a + b \operatorname{Log}[c * (d + e x)^n])^p, (h x)^m * (f + g x^r)^q, x], x] /; \operatorname{FreeQ}[\{a, b, c, d, e, f, g, h, m, n, p, q, r\}, x] \ \&\& \operatorname{IntegerQ}[m] \ \&\& \operatorname{IntegerQ}[q]$

rule 6482 $\operatorname{Int}[(a_.) + \operatorname{ArcTanh}[(c_.) * (x_.)^{(n_.)}] * (b_.) / ((d_.) + (e_.) * (x_.)), x_Symbol] \rightarrow \operatorname{Simp}[\operatorname{Log}[d + e x] * ((a + b \operatorname{ArcTanh}[c x^n]) / e), x] - \operatorname{Simp}[b c * (n / e) \operatorname{Int}[x^{(n-1)} * (\operatorname{Log}[d + e x] / (1 - c^2 x^{(2n)}))], x], x] /; \operatorname{FreeQ}[\{a, b, c, d, e, n\}, x] \ \&\& \operatorname{IntegerQ}[n]$

3.34.4 Maple [C] (verified)

Result contains higher order function than in optimal. Order 9 vs. order 4.

Time = 1.13 (sec) , antiderivative size = 182, normalized size of antiderivative = 0.35

method	result
default	$\frac{a \ln(ex+d)}{e} + \frac{b \ln(ex+d) \operatorname{arctanh}(cx^3)}{e} - \frac{b \left(\sum_{-R1=\operatorname{RootOf}(cZ^3-3Z^2cd+3cd^2-Z-cd^3+e^3)} \left(\ln(ex+d) \ln\left(\frac{-ex+R1-d}{-R1}\right) + \operatorname{dilog}\left(\frac{-ex+R1-d}{-R1}\right) \right) \right)}{2e}$
parts	$\frac{a \ln(ex+d)}{e} + \frac{b \ln(ex+d) \operatorname{arctanh}(cx^3)}{e} - \frac{b \left(\sum_{-R1=\operatorname{RootOf}(cZ^3-3Z^2cd+3cd^2-Z-cd^3+e^3)} \left(\ln(ex+d) \ln\left(\frac{-ex+R1-d}{-R1}\right) + \operatorname{dilog}\left(\frac{-ex+R1-d}{-R1}\right) \right) \right)}{2e}$
risch	$\frac{a \ln(ex+d)}{e} - \frac{b \ln(ex+d) \ln(-cx^3+1)}{2e} + \frac{b \left(\sum_{-R1=\operatorname{RootOf}(cZ^3-3Z^2cd+3cd^2-Z-cd^3-e^3)} \left(\ln(ex+d) \ln\left(\frac{-ex+R1-d}{-R1}\right) + \operatorname{dilog}\left(\frac{-ex+R1-d}{-R1}\right) \right) \right)}{2e}$

input `int((a+b*arctanh(c*x^3))/(e*x+d),x,method=_RETURNVERBOSE)`

output `a*ln(e*x+d)/e+b*ln(e*x+d)/e*arctanh(c*x^3)-1/2*b/e*sum(ln(e*x+d)*ln((-e*x+_R1-d)/_R1)+dilog((-e*x+_R1-d)/_R1),_R1=RootOf(_Z^3*c-3*_Z^2*c*d+3*_Z*c*d^2-c*d^3+e^3))+1/2*b/e*sum(ln(e*x+d)*ln((-e*x+_R1-d)/_R1)+dilog((-e*x+_R1-d)/_R1),_R1=RootOf(_Z^3*c-3*_Z^2*c*d+3*_Z*c*d^2-c*d^3-e^3))`

3.34.5 Fracas [F]

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{d + ex} dx = \int \frac{b \operatorname{arctanh}(cx^3) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^3))/(e*x+d),x, algorithm="fracas")`

output `integral((b*arctanh(c*x^3) + a)/(e*x + d), x)`

3.34.6 Sympy [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{d + ex} dx = \text{Timed out}$$

input `integrate((a+b*atanh(c*x**3))/(e*x+d),x)`output `Timed out`**3.34.7 Maxima [F]**

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{d + ex} dx = \int \frac{b \operatorname{artanh}(cx^3) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^3))/(e*x+d),x, algorithm="maxima")`output `1/2*b*integrate((log(c*x^3 + 1) - log(-c*x^3 + 1))/(e*x + d), x) + a*log(e*x + d)/e`**3.34.8 Giac [F]**

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{d + ex} dx = \int \frac{b \operatorname{artanh}(cx^3) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^3))/(e*x+d),x, algorithm="giac")`output `integrate((b*arctanh(c*x^3) + a)/(e*x + d), x)`

3.34.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{d + ex} dx = \int \frac{a + b \operatorname{atanh}(cx^3)}{d + ex} dx$$

input `int((a + b*atanh(c*x^3))/(d + e*x), x)`output `int((a + b*atanh(c*x^3))/(d + e*x), x)`

3.35 $\int \frac{a+b\operatorname{arctanh}(cx^3)}{(d+ex)^2} dx$

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3.35.1 Optimal result

Integrand size = 18, antiderivative size = 414

$$\int \frac{a + b\operatorname{arctanh}(cx^3)}{(d + ex)^2} dx = -\frac{\sqrt{3}b\sqrt[3]{c} \arctan\left(\frac{1-2\sqrt[3]{cx}}{\sqrt{3}}\right)}{2(c^{2/3}d^2 + \sqrt[3]{c}de + e^2)} - \frac{\sqrt{3}b\sqrt[3]{c}(\sqrt[3]{cd} + e) \arctan\left(\frac{1+2\sqrt[3]{cx}}{\sqrt{3}}\right)}{2(cd^3 + e^3)} - \frac{a + b\operatorname{arctanh}(cx^3)}{e(d + ex)} + \frac{b\sqrt[3]{c}(\sqrt[3]{cd} - e) \log(1 - \sqrt[3]{cx})}{2(cd^3 + e^3)} + \frac{b\sqrt[3]{c}(\sqrt[3]{cd} + e) \log(1 + \sqrt[3]{cx})}{2(cd^3 - e^3)} - \frac{3bcd^2e^2 \log(d + ex)}{c^2d^6 - e^6} - \frac{b\sqrt[3]{c}(\sqrt[3]{cd} + e) \log(1 - \sqrt[3]{cx} + c^{2/3}x^2)}{4(cd^3 - e^3)} - \frac{b\sqrt[3]{c}(\sqrt[3]{cd} - e) \log(1 + \sqrt[3]{cx} + c^{2/3}x^2)}{4(cd^3 + e^3)} - \frac{bcd^2 \log(1 - cx^3)}{2e(cd^3 + e^3)} + \frac{bcd^2 \log(1 + cx^3)}{2e(cd^3 - e^3)}$$

output $(-a-b*\operatorname{arctanh}(c*x^3))/e/(e*x+d)+1/2*b*c^{(1/3)}*(c^{(1/3)*d-e}*\ln(1-c^{(1/3)*x})/(c*d^3+e^3)+1/2*b*c^{(1/3)}*(c^{(1/3)*d+e}*\ln(1+c^{(1/3)*x})/(c*d^3-e^3)-3*b*c*d^2*e^2*\ln(e*x+d)/(c^2*d^6-e^6)-1/4*b*c^{(1/3)}*(c^{(1/3)*d+e}*\ln(1-c^{(1/3)*x+c^{(2/3)*x^2}})/(c*d^3-e^3)-1/4*b*c^{(1/3)}*(c^{(1/3)*d-e}*\ln(1+c^{(1/3)*x+c^{(2/3)*x^2}})/(c*d^3+e^3)-1/2*b*c*d^2*\ln(-c*x^3+1)/e/(c*d^3+e^3)+1/2*b*c*d^2*\ln(c*x^3+1)/e/(c*d^3-e^3)-1/2*b*c^{(1/3)}*\operatorname{arctan}(1/3*(1-2*c^{(1/3)*x})*3^{(1/2)})*3^{(1/2)}/(c^{(2/3)*d^2+c^{(1/3)*d*e+e^2})-1/2*b*c^{(1/3)}*(c^{(1/3)*d+e}*\operatorname{arctan}(1/3*(1+2*c^{(1/3)*x})*3^{(1/2)})*3^{(1/2)})/(c*d^3+e^3)$

3.35.2 Mathematica [A] (verified)

Time = 0.37 (sec) , antiderivative size = 534, normalized size of antiderivative = 1.29

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{(d + ex)^2} dx$$

$$= \frac{1}{4} \left(-\frac{4a}{e(d + ex)} + \frac{2\sqrt{3}b\sqrt[3]{c} \operatorname{arctan}\left(\frac{-1+2\sqrt[3]{cx}}{\sqrt{3}}\right)}{c^{2/3}d^2 + \sqrt[3]{cde} + e^2} - \frac{2\sqrt{3}b\sqrt[3]{c}(\sqrt[3]{cd} + e) \operatorname{arctan}\left(\frac{1+2\sqrt[3]{cx}}{\sqrt{3}}\right)}{cd^3 + e^3} \right.$$

$$- \frac{4b \operatorname{arctanh}(cx^3)}{e(d + ex)} + \frac{2b\sqrt[3]{c}(c^{5/3}d^5 - c^{4/3}d^4e + cd^3e^2 + \sqrt[3]{cde}^4 - e^5) \log(1 - \sqrt[3]{cx})}{-c^2d^6e + e^7}$$

$$- \frac{2b\sqrt[3]{c}(c^{5/3}d^5 + c^{4/3}d^4e + cd^3e^2 + \sqrt[3]{cde}^4 + e^5) \log(1 + \sqrt[3]{cx})}{-c^2d^6e + e^7} - \frac{12bcd^2e^2 \log(d + ex)}{c^2d^6 - e^6}$$

$$+ \frac{b\sqrt[3]{c}(2c^{5/3}d^5 - c^{4/3}d^4e - cd^3e^2 - \sqrt[3]{cde}^4 - e^5) \log(1 - \sqrt[3]{cx} + c^{2/3}x^2)}{c^2d^6e - e^7}$$

$$+ \frac{b\sqrt[3]{c}(2c^{5/3}d^5 + c^{4/3}d^4e - cd^3e^2 - \sqrt[3]{cde}^4 + e^5) \log(1 + \sqrt[3]{cx} + c^{2/3}x^2)}{-c^2d^6e + e^7}$$

$$\left. + \frac{2bcd^2e^2 \log(1 - c^2x^6)}{c^2d^6 - e^6} \right)$$

input `Integrate[(a + b*ArcTanh[c*x^3])/(d + e*x)^2,x]`

output $((-4*a)/(e*(d + e*x)) + (2*sqrt[3]*b*c^(1/3)*ArcTan[(-1 + 2*c^(1/3)*x)/sqrt[3]])/(c^(2/3)*d^2 + c^(1/3)*d*e + e^2) - (2*sqrt[3]*b*c^(1/3)*(c^(1/3)*d + e)*ArcTan[(1 + 2*c^(1/3)*x)/sqrt[3]])/(c*d^3 + e^3) - (4*b*ArcTanh[c*x^3])/(e*(d + e*x)) + (2*b*c^(1/3)*(c^(5/3)*d^5 - c^(4/3)*d^4*e + c*d^3*e^2 + c^(1/3)*d*e^4 - e^5)*Log[1 - c^(1/3)*x]/(-(c^2*d^6*e) + e^7) - (2*b*c^(1/3)*(c^(5/3)*d^5 + c^(4/3)*d^4*e + c*d^3*e^2 + c^(1/3)*d*e^4 + e^5)*Log[1 + c^(1/3)*x]/(-(c^2*d^6*e) + e^7) - (12*b*c*d^2*e^2*Log[d + e*x])/(c^2*d^6 - e^6) + (b*c^(1/3)*(2*c^(5/3)*d^5 - c^(4/3)*d^4*e - c*d^3*e^2 - c^(1/3)*d*e^4 - e^5)*Log[1 - c^(1/3)*x + c^(2/3)*x^2])/(c^2*d^6*e - e^7) + (b*c^(1/3)*(2*c^(5/3)*d^5 + c^(4/3)*d^4*e - c*d^3*e^2 - c^(1/3)*d*e^4 + e^5)*Log[1 + c^(1/3)*x + c^(2/3)*x^2])/(-(c^2*d^6*e) + e^7) + (2*b*c*d^2*e^2*Log[1 - c^2*x^6])/(c^2*d^6 - e^6))/4$

3.35.3 Rubi [A] (verified)

Time = 0.98 (sec) , antiderivative size = 410, 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 = {6486, 7276, 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.

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{(d + ex)^2} dx$$

↓ 6486

$$\frac{3bc \int \frac{x^2}{(d+ex)(1-c^2x^6)} dx}{e} - \frac{a + b \operatorname{arctanh}(cx^3)}{e(d + ex)}$$

↓ 7276

$$\frac{3bc \int \left(\frac{d^2 e^4}{(e^3 - cd^3)(cd^3 + e^3)(d + ex)} + \frac{-xe^2 + de - cd^2 x^2}{2(cd^3 + e^3)(cx^3 - 1)} + \frac{-xe^2 + de + cd^2 x^2}{2(cd^3 - e^3)(cx^3 + 1)} \right) dx}{e} - \frac{a + b \operatorname{arctanh}(cx^3)}{e(d + ex)}$$

↓ 2009

$$\frac{3bc \left(-\frac{e \arctan\left(\frac{2\sqrt[3]{Cx+1}}{\sqrt{3}}\right) \left(\sqrt[3]{Cd+e}\right)}{2\sqrt{3}c^{2/3}(cd^3+e^3)} - \frac{e \arctan\left(\frac{1-2\sqrt[3]{Cx}}{\sqrt{3}}\right)}{2\sqrt{3}c^{2/3}\left(c^{2/3}d^2+\sqrt[3]{Cde+e^2}\right)} - \frac{e\left(\sqrt[3]{Cd+e}\right) \log\left(c^{2/3}x^2-\sqrt[3]{Cx+1}\right)}{12c^{2/3}(cd^3-e^3)} - \frac{e\left(\sqrt[3]{Cd-e}\right) \log\left(c^{2/3}x^2+\sqrt[3]{Cx+1}\right)}{12c^{2/3}(cd^3+e^3)} \right)}{e} - \frac{a + b \operatorname{arctanh}(cx^3)}{e(d + ex)}$$

3.35. $\int \frac{a+b \operatorname{arctanh}(cx^3)}{(d+ex)^2} dx$

input `Int[(a + b*ArcTanh[c*x^3])/(d + e*x)^2,x]`

output `-(a + b*ArcTanh[c*x^3])/(e*(d + e*x)) + (3*b*c*(-1/2*(e*ArcTan[(1 - 2*c^(1/3)*x)/Sqrt[3]])/(Sqrt[3]*c^(2/3)*(c^(2/3)*d^2 + c^(1/3)*d*e + e^2)) - (e*(c^(1/3)*d + e)*ArcTan[(1 + 2*c^(1/3)*x)/Sqrt[3]])/(2*Sqrt[3]*c^(2/3)*(c*d^3 + e^3)) + ((c^(1/3)*d - e)*e*Log[1 - c^(1/3)*x])/(6*c^(2/3)*(c*d^3 + e^3)) + (e*(c^(1/3)*d + e)*Log[1 + c^(1/3)*x])/(6*c^(2/3)*(c*d^3 - e^3)) - (d^2*e^3*Log[d + e*x])/(c^2*d^6 - e^6) - (e*(c^(1/3)*d + e)*Log[1 - c^(1/3)*x + c^(2/3)*x^2])/(12*c^(2/3)*(c*d^3 - e^3)) - ((c^(1/3)*d - e)*e*Log[1 + c^(1/3)*x + c^(2/3)*x^2])/(12*c^(2/3)*(c*d^3 + e^3)) - (d^2*Log[1 - c*x^3])/(6*(c*d^3 + e^3)) + (d^2*Log[1 + c*x^3])/(6*(c*d^3 - e^3)))/e`

3.35.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6486 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)])*(b_.)*((d_.) + (e_.)*(x_)^(m_.)), x_Symbol] := Simp[(d + e*x)^(m + 1)*((a + b*ArcTanh[c*x^n])/(e*(m + 1))), x] - Simp[b*c*(n/(e*(m + 1))) Int[x^(n - 1)*((d + e*x)^(m + 1)/(1 - c^2*x^(2*n))), x], x] /; FreeQ[{a, b, c, d, e, m, n}, x] && NeQ[m, -1]`

rule 7276 `Int[(u_)/((a_) + (b_.)*(x_)^(n_)), x_Symbol] := With[{v = RationalFunctionExpand[u/(a + b*x^n), x]}, Int[v, x] /; SumQ[v]] /; FreeQ[{a, b}, x] && IGtQ[n, 0]`

3.35.4 Maple [A] (verified)

Time = 1.48 (sec) , antiderivative size = 461, normalized size of antiderivative = 1.11

3.35. $\int \frac{a+b\operatorname{arctanh}(cx^3)}{(d+ex)^2} dx$

method	result
default	$-\frac{a}{(ex+d)e} + b - \frac{\operatorname{arctanh}(cx^3)}{(ex+d)e} + 3c - \frac{d^2 e^3 \ln(ex+d)}{(cd^3+e^3)(cd^3-e^3)} + \left[\frac{\ln\left(x - \left(\frac{1}{c}\right)^{\frac{1}{3}}\right)}{3c\left(\frac{1}{c}\right)^{\frac{2}{3}}} - \frac{\ln\left(x^2 + \left(\frac{1}{c}\right)^{\frac{1}{3}}x + \left(\frac{1}{c}\right)^{\frac{2}{3}}\right)}{6c\left(\frac{1}{c}\right)^{\frac{2}{3}}} - \frac{\sqrt{3} \operatorname{arctan}\left(\frac{\sqrt{3}\left(\frac{1}{c}\right)^{\frac{1}{3}}}{\frac{1}{c} - \left(\frac{1}{c}\right)^{\frac{2}{3}}}\right)}{3c\left(\frac{1}{c}\right)^{\frac{2}{3}}}\right]$
3.35.	$\int \frac{a+b\operatorname{arctanh}(cx^3)}{(d+ex)^2} dx$

input `int((a+b*arctanh(c*x^3))/(e*x+d)^2,x,method=_RETURNVERBOSE)`

output
$$-a/(e*x+d)/e+b*(-1/(e*x+d)/e*arctanh(c*x^3)+3*c/e*(-d^2*e^3/(c*d^3+e^3)/(c*d^3-e^3)*\ln(e*x+d)+(d*e*(1/3/c/(1/c)^{(2/3)}*\ln(x-(1/c)^{(1/3)})-1/6/c/(1/c)^{(2/3)}*\ln(x^2+(1/c)^{(1/3)*x+(1/c)^{(2/3)})-1/3/c/(1/c)^{(2/3)}*3^{(1/2)}*arctan(1/3*3^{(1/2)}*(2/(1/c)^{(1/3)*x+1}))-e^2*(1/3/c/(1/c)^{(1/3)}*\ln(x-(1/c)^{(1/3)})-1/6/c/(1/c)^{(1/3)}*\ln(x^2+(1/c)^{(1/3)*x+(1/c)^{(2/3)})+1/3*3^{(1/2)}/c/(1/c)^{(1/3)}*arctan(1/3*3^{(1/2)}*(2/(1/c)^{(1/3)*x+1}))-1/3*d^2*\ln(c*x^3-1))/(2*c*d^3+2*e^3)+(d*e*(1/3/c/(1/c)^{(2/3)}*\ln(x+(1/c)^{(1/3)})-1/6/c/(1/c)^{(2/3)}*\ln(x^2-(1/c)^{(1/3)*x+(1/c)^{(2/3)})+1/3/c/(1/c)^{(2/3)}*3^{(1/2)}*arctan(1/3*3^{(1/2)}*(2/(1/c)^{(1/3)*x-1}))-e^2*(-1/3/c/(1/c)^{(1/3)}*\ln(x+(1/c)^{(1/3)})+1/6/c/(1/c)^{(1/3)}*\ln(x^2-(1/c)^{(1/3)*x+(1/c)^{(2/3)})+1/3*3^{(1/2)}/c/(1/c)^{(1/3)}*arctan(1/3*3^{(1/2)}*(2/(1/c)^{(1/3)*x-1}))+1/3*d^2*\ln(c*x^3+1))/(2*c*d^3-2*e^3))$$

3.35.5 Fricas [C] (verification not implemented)

Result contains complex when optimal does not.

Time = 135.62 (sec) , antiderivative size = 12984, normalized size of antiderivative = 31.36

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{(d + ex)^2} dx = \text{Too large to display}$$

input `integrate((a+b*arctanh(c*x^3))/(e*x+d)^2,x, algorithm="fricas")`

output Too large to include

3.35.6 Sympy [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{(d + ex)^2} dx = \text{Timed out}$$

input `integrate((a+b*atanh(c*x**3))/(e*x+d)**2,x)`

output Timed out

3.35. $\int \frac{a+b \operatorname{arctanh}(cx^3)}{(d+ex)^2} dx$

3.35.7 Maxima [A] (verification not implemented)

Time = 0.26 (sec) , antiderivative size = 394, normalized size of antiderivative = 0.95

$$\int \frac{a + b \operatorname{arctanh}(cx^3)}{(d + ex)^2} dx =$$

$$-\frac{1}{4} \left(\left(\frac{12d^2e^2 \log(ex + d)}{c^2d^6 - e^6} + \frac{2\sqrt{3}(cde + c^{\frac{2}{3}}e^2) \arctan\left(\frac{\sqrt{3}(2c^{\frac{2}{3}}x + c^{\frac{1}{3}})}{3c^{\frac{1}{3}}}\right)}{(c^2d^3e + ce^4)c^{\frac{1}{3}}} \right) - \frac{2\sqrt{3}(cde - c^{\frac{2}{3}}e^2) \arctan\left(\frac{\sqrt{3}(2c^{\frac{2}{3}}x + c^{\frac{1}{3}})}{3c^{\frac{1}{3}}}\right)}{(c^2d^3e - ce^4)c^{\frac{1}{3}}} \right) - \frac{a}{e^2x + de}$$

input `integrate((a+b*arctanh(c*x^3))/(e*x+d)^2,x, algorithm="maxima")`

output

```
-1/4*((12*d^2*e^2*log(e*x + d)/(c^2*d^6 - e^6) + 2*sqrt(3)*(c*d*e + c^(2/3)*e^2)*arctan(1/3*sqrt(3)*(2*c^(2/3)*x + c^(1/3))/c^(1/3))/((c^2*d^3*e + c*e^4)*c^(1/3)) - 2*sqrt(3)*(c*d*e - c^(2/3)*e^2)*arctan(1/3*sqrt(3)*(2*c^(2/3)*x - c^(1/3))/c^(1/3))/((c^2*d^3*e - c*e^4)*c^(1/3)) + (2*c*d^2 + c^(2/3)*d*e - c^(1/3)*e^2)*log(c^(2/3)*x^2 + c^(1/3)*x + 1)/(c^2*d^3*e + c*e^4) - (2*c*d^2 - c^(2/3)*d*e - c^(1/3)*e^2)*log(c^(2/3)*x^2 - c^(1/3)*x + 1)/(c^2*d^3*e - c*e^4) - 2*(c*d^2 + c^(2/3)*d*e + c^(1/3)*e^2)*log((c^(1/3)*x + 1)/c^(1/3))/(c^2*d^3*e - c*e^4) + 2*(c*d^2 - c^(2/3)*d*e + c^(1/3)*e^2)*log((c^(1/3)*x - 1)/c^(1/3))/(c^2*d^3*e + c*e^4))*c + 4*arctanh(c*x^3)/(e^2*x + d*e))*b - a/(e^2*x + d*e)
```

3.35.8 Giac [A] (verification not implemented)

Time = 16.62 (sec) , antiderivative size = 554, normalized size of antiderivative = 1.34

$$\begin{aligned}
& \int \frac{a + b \operatorname{arctanh}(cx^3)}{(d+ex)^2} dx \\
&= -\frac{3bcd^2e^2 \log(ex+d)}{c^2d^6 - e^6} - \frac{bcd^2 \log(|cx^3 - 1|)}{2(cd^3e + e^4)} + \frac{bcd^2 \log(|-cx^3 - 1|)}{2(cd^3e - e^4)} \\
&\quad - \frac{\sqrt{3}bc|c|^{\frac{2}{3}} \arctan\left(\frac{1}{3}\sqrt{3}c^{\frac{1}{3}}\left(2x + \frac{1}{c^{\frac{1}{3}}}\right)\right)}{2\left(c^2d^2 - cde|c|^{\frac{2}{3}} + e^2|c|^{\frac{4}{3}}\right)} - \frac{\sqrt{3}bc \arctan\left(\frac{\sqrt{3}\left(2x + (-\frac{1}{c})^{\frac{1}{3}}\right)}{3(-\frac{1}{c})^{\frac{1}{3}}}\right)}{2\left(cde + (-c^2)^{\frac{2}{3}}d^2 - (-c^2)^{\frac{1}{3}}e^2\right)} \\
&\quad + \frac{\left(bc^3d^3e^3(-\frac{1}{c})^{\frac{1}{3}} - bc^3d^4e^2 - bc^2e^6(-\frac{1}{c})^{\frac{1}{3}} + bc^2de^5\right)(-\frac{1}{c})^{\frac{1}{3}} \log\left(\left|x - (-\frac{1}{c})^{\frac{1}{3}}\right|\right)}{2(c^3d^6e^2 - 2c^2d^3e^5 + ce^8)} \\
&\quad + \frac{\left((-c^2)^{\frac{1}{3}}bcd - (-c^2)^{\frac{2}{3}}be\right) \log\left(x^2 + x(-\frac{1}{c})^{\frac{1}{3}} + (-\frac{1}{c})^{\frac{2}{3}}\right)}{4(c^2d^3 - ce^3)} \\
&\quad - \frac{\left(bcd|c|^{\frac{2}{3}} - be|c|^{\frac{4}{3}}\right) \log\left(x^2 + \frac{x}{c^{\frac{1}{3}}} + \frac{1}{c^{\frac{2}{3}}}\right)}{4(c^2d^3 + ce^3)} - \frac{b \log\left(-\frac{cx^3+1}{cx^3-1}\right)}{2(e^2x + de)} \\
&\quad + \frac{\left(bc^3d^4e^2 - bc^{\frac{8}{3}}d^3e^3 + bc^2de^5 - bc^{\frac{5}{3}}e^6\right) \log\left(\left|x - \frac{1}{c^{\frac{1}{3}}}\right|\right)}{2(c^3d^6e^2 + 2c^2d^3e^5 + ce^8)c^{\frac{1}{3}}} - \frac{a}{e^2x + de}
\end{aligned}$$

input `integrate((a+b*arctanh(c*x^3))/(e*x+d)^2,x, algorithm="giac")`

```

output -3*b*c*d^2*e^2*log(e*x + d)/(c^2*d^6 - e^6) - 1/2*b*c*d^2*log(abs(c*x^3 -
1))/(c*d^3*e + e^4) + 1/2*b*c*d^2*log(abs(-c*x^3 - 1))/(c*d^3*e - e^4) - 1
/2*sqrt(3)*b*c*abs(c)^(2/3)*arctan(1/3*sqrt(3)*c^(1/3)*(2*x + 1/c^(1/3)))/
(c^2*d^2 - c*d*e*abs(c)^(2/3) + e^2*abs(c)^(4/3)) - 1/2*sqrt(3)*b*c*arctan
(1/3*sqrt(3)*(2*x + (-1/c)^(1/3))/(-1/c)^(1/3))/(c*d*e + (-c^2)^(2/3)*d^2
- (-c^2)^(1/3)*e^2) + 1/2*(b*c^3*d^3*e^3*(-1/c)^(1/3) - b*c^3*d^4*e^2 - b*
c^2*e^6*(-1/c)^(1/3) + b*c^2*d*e^5)*(-1/c)^(1/3)*log(abs(x - (-1/c)^(1/3))
)/(c^3*d^6*e^2 - 2*c^2*d^3*e^5 + c*e^8) + 1/4*((-c^2)^(1/3)*b*c*d - (-c^2)
^(2/3)*b*e)*log(x^2 + x*(-1/c)^(1/3) + (-1/c)^(2/3))/(c^2*d^3 - c*e^3) - 1
/4*(b*c*d*abs(c)^(2/3) - b*e*abs(c)^(4/3))*log(x^2 + x/c^(1/3) + 1/c^(2/3)
)/(c^2*d^3 + c*e^3) - 1/2*b*log(-(c*x^3 + 1)/(c*x^3 - 1))/(e^2*x + d*e) +
1/2*(b*c^3*d^4*e^2 - b*c^(8/3)*d^3*e^3 + b*c^2*d*e^5 - b*c^(5/3)*e^6)*log(
abs(x - 1/c^(1/3)))/((c^3*d^6*e^2 + 2*c^2*d^3*e^5 + c*e^8)*c^(1/3)) - a/(e
^2*x + d*e)

```

3.35.9 Mupad [B] (verification not implemented)

Time = 3.91 (sec) , antiderivative size = 2638, normalized size of antiderivative = 6.37

$$\int \frac{a + \operatorname{barctanh}(cx^3)}{(d + ex)^2} dx = \text{Too large to display}$$

input `int((a + b*atanh(c*x^3))/(d + e*x)^2,x)`

```
output symsum(log(-(729*b^6*c^14*d*e^2 + 54432*root(8*c*d^3*e^3*z^3 - 8*e^6*z^3 -
12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e*z - b^3*c, z, k)^6*c^12*e^15*x + 729*b^6
*c^14*e^3*x + 31104*root(8*c*d^3*e^3*z^3 - 8*e^6*z^3 - 12*b*c*d^2*e^2*z^2
+ 6*b^2*c*d*e*z - b^3*c, z, k)^6*c^14*d^7*e^8 + 243*root(8*c*d^3*e^3*z^3 -
8*e^6*z^3 - 12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e*z - b^3*c, z, k)*b^5*c^15*d^
5 + 62208*root(8*c*d^3*e^3*z^3 - 8*e^6*z^3 - 12*b*c*d^2*e^2*z^2 + 6*b^2*c*
d*e*z - b^3*c, z, k)^6*c^12*d*e^14 - 5832*root(8*c*d^3*e^3*z^3 - 8*e^6*z^3
- 12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e*z - b^3*c, z, k)^2*b^4*c^14*d^3*e^4 -
1944*root(8*c*d^3*e^3*z^3 - 8*e^6*z^3 - 12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e*z
- b^3*c, z, k)^3*b^3*c^15*d^7*e^2 + 15552*root(8*c*d^3*e^3*z^3 - 8*e^6*z^
3 - 12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e*z - b^3*c, z, k)^4*b^2*c^14*d^5*e^6 +
10692*root(8*c*d^3*e^3*z^3 - 8*e^6*z^3 - 12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e
*z - b^3*c, z, k)^3*b^3*c^13*d*e^8 + 101088*root(8*c*d^3*e^3*z^3 - 8*e^6*z
^3 - 12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e*z - b^3*c, z, k)^5*b*c^13*d^3*e^10 +
3888*root(8*c*d^3*e^3*z^3 - 8*e^6*z^3 - 12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e*
z - b^3*c, z, k)^5*b*c^15*d^9*e^4 + 12636*root(8*c*d^3*e^3*z^3 - 8*e^6*z^3
- 12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e*z - b^3*c, z, k)^3*b^3*c^13*e^9*x + 38
880*root(8*c*d^3*e^3*z^3 - 8*e^6*z^3 - 12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e*z
- b^3*c, z, k)^6*c^14*d^6*e^9*x + 116640*root(8*c*d^3*e^3*z^3 - 8*e^6*z^3
- 12*b*c*d^2*e^2*z^2 + 6*b^2*c*d*e*z - b^3*c, z, k)^5*b*c^13*d^2*e^11*x...
```


3.36 $\int \frac{x^3(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} dx$

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3.36.1 Optimal result

Integrand size = 26, antiderivative size = 195

$$\int \frac{x^3(a + b\operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = -\frac{11b\sqrt{x}}{6c^7} - \frac{5bx^{3/2}}{18c^5} - \frac{bx^{5/2}}{15c^3} + \frac{11b\operatorname{arctanh}(c\sqrt{x})}{6c^8}$$

$$- \frac{x(a + b\operatorname{arctanh}(c\sqrt{x}))}{c^6} - \frac{x^2(a + b\operatorname{arctanh}(c\sqrt{x}))}{2c^4}$$

$$- \frac{x^3(a + b\operatorname{arctanh}(c\sqrt{x}))}{3c^2} - \frac{(a + b\operatorname{arctanh}(c\sqrt{x}))^2}{bc^8}$$

$$+ \frac{2(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2}{1-c\sqrt{x}}\right)}{c^8}$$

$$+ \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-c\sqrt{x}}\right)}{c^8}$$

output
$$-5/18*b*x^(3/2)/c^5-1/15*b*x^(5/2)/c^3+11/6*b*\operatorname{arctanh}(c*x^(1/2))/c^8-x*(a+b*\operatorname{arctanh}(c*x^(1/2)))/c^6-1/2*x^2*(a+b*\operatorname{arctanh}(c*x^(1/2)))/c^4-1/3*x^3*(a+b*\operatorname{arctanh}(c*x^(1/2)))/c^2-(a+b*\operatorname{arctanh}(c*x^(1/2)))^2/b/c^8+2*(a+b*\operatorname{arctanh}(c*x^(1/2)))*\ln(2/(1-c*x^(1/2)))/c^8+b*\operatorname{polylog}(2,1-2/(1-c*x^(1/2)))/c^8-11/6*b*x^(1/2)/c^7$$

3.36.2 Mathematica [A] (verified)

Time = 0.52 (sec) , antiderivative size = 160, normalized size of antiderivative = 0.82

$$\int \frac{x^3(a + \operatorname{barctanh}(c\sqrt{x}))}{1 - c^2x} dx = \frac{165bc\sqrt{x} + 90ac^2x + 25bc^3x^{3/2} + 45ac^4x^2 + 6bc^5x^{5/2} + 30ac^6x^3 - 90\operatorname{barctanh}(c\sqrt{x})^2 + 15\operatorname{barctanh}(c\sqrt{x})}{c^8}$$

input `Integrate[(x^3*(a + b*ArcTanh[c*Sqrt[x]]))/(1 - c^2*x), x]`

output `-1/90*(165*b*c*Sqrt[x] + 90*a*c^2*x + 25*b*c^3*x^(3/2) + 45*a*c^4*x^2 + 6*b*c^5*x^(5/2) + 30*a*c^6*x^3 - 90*b*ArcTanh[c*Sqrt[x]]^2 + 15*b*ArcTanh[c*Sqrt[x]]*(-11 + 6*c^2*x + 3*c^4*x^2 + 2*c^6*x^3 - 12*Log[1 + E^(-2*ArcTanh[c*Sqrt[x]])]) + 90*a*Log[1 - c^2*x] + 90*b*PolyLog[2, -E^(-2*ArcTanh[c*Sqrt[x]])])/c^8`

3.36.3 Rubi [A] (verified)

Time = 1.83 (sec) , antiderivative size = 300, normalized size of antiderivative = 1.54, number of steps used = 18, number of rules used = 17, $\frac{\text{number of rules}}{\text{integrand size}} = 0.654$, Rules used = {7267, 6542, 6452, 254, 2009, 6542, 6452, 254, 2009, 6542, 6452, 262, 219, 6546, 6470, 2849, 2752}

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.

$$\begin{aligned} & \int \frac{x^3(a + \operatorname{barctanh}(c\sqrt{x}))}{1 - c^2x} dx \\ & \quad \downarrow 7267 \\ & 2 \int \frac{x^{7/2}(a + \operatorname{barctanh}(c\sqrt{x}))}{1 - c^2x} d\sqrt{x} \\ & \quad \downarrow 6542 \\ & 2 \left(\frac{\int \frac{x^{5/2}(a + \operatorname{barctanh}(c\sqrt{x}))}{1 - c^2x} d\sqrt{x}}{c^2} - \frac{\int x^{5/2}(a + \operatorname{barctanh}(c\sqrt{x})) d\sqrt{x}}{c^2} \right) \\ & \quad \downarrow 6452 \end{aligned}$$

3.36. $\int \frac{x^3(a + \operatorname{barctanh}(c\sqrt{x}))}{1 - c^2x} dx$

$$2 \left(\frac{\int \frac{x^{5/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{6}x^3(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{6}bc \int \frac{x^3}{1-c^2x} d\sqrt{x}}{c^2} \right)$$

↓ 254

$$2 \left(\frac{\int \frac{x^{5/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{6}x^3(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{6}bc \int \left(-\frac{x^2}{c^2} - \frac{x}{c^4} + \frac{1}{c^6(1-c^2x)} - \frac{1}{c^6} \right) d\sqrt{x}}{c^2} \right)$$

↓ 2009

$$2 \left(\frac{\int \frac{x^{5/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{6}x^3(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{6}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^7} - \frac{\sqrt{x}}{c^6} - \frac{x^{3/2}}{3c^4} - \frac{x^{5/2}}{5c^2} \right)}{c^2} \right)$$

↓ 6542

$$2 \left(\frac{\int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{c^2} d\sqrt{x}}{c^2} - \frac{\frac{1}{6}x^3(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{6}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^7} - \frac{\sqrt{x}}{c^6} - \frac{x^{3/2}}{3c^4} - \frac{x^{5/2}}{5c^2} \right)}{c^2} \right)$$

↓ 6452

$$2 \left(\frac{\int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \int \frac{x^2}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{6}x^3(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{6}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^7} - \frac{\sqrt{x}}{c^6} - \frac{x^{3/2}}{3c^4} - \frac{x^{5/2}}{5c^2} \right)}{c^2} \right)$$

↓ 254

$$2 \left(\frac{\int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \int \left(-\frac{x}{c^2} + \frac{1}{c^4(1-c^2x)} - \frac{1}{c^4} \right) d\sqrt{x}}{c^2} - \frac{\frac{1}{6}x^3(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{6}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^7} - \frac{\sqrt{x}}{c^6} - \frac{x^{3/2}}{3c^4} - \frac{x^{5/2}}{5c^2} \right)}{c^2} \right)$$

↓ 2009

3.36. $\int \frac{x^3(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} dx$

$$2 \left(\frac{\int \frac{x^{3/2}(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{c^2}}{c^2} - \frac{\frac{1}{6}x^3(a+b\operatorname{arctanh}(c\sqrt{x}))}{c^2} \right)$$

↓ 6542

$$2 \left(\frac{\frac{\int \frac{\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\int \sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x})) d\sqrt{x}}{c^2} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{c^2}}{c^2} - \frac{\frac{1}{6}x^3(a+b\operatorname{arctanh}(c\sqrt{x}))}{c^2}}{c^2} \right)$$

↓ 6452

$$2 \left(\frac{\frac{\int \frac{\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \int \frac{x}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{c^2}}{c^2} \right)$$

↓ 262

$$2 \left(\frac{\frac{\int \frac{\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\int \frac{1}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\sqrt{x}}{c^2} \right)}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{c^2}}{c^2} \right)$$

↓ 219

$$2 \left(\frac{\frac{\int \frac{\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{c^2}}{c^2} \right)$$

↓ 6546

3.36. $\int \frac{x^3(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} dx$

$$2 \left(\frac{\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{1-c\sqrt{x}} d\sqrt{x} - \frac{(a+b\operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x}))}{c^2} \right)$$

↓ 6470

$$2 \left(\frac{\frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)(a+b\operatorname{arctanh}(c\sqrt{x}))}{c} - b \int \frac{\log\left(\frac{2}{1-c^2x}\right)}{1-c^2x} d\sqrt{x} - \frac{(a+b\operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} \right)$$

↓ 2849

$$2 \left(\frac{b \int \frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)}{1-\frac{2}{1-c\sqrt{x}}} d\frac{1}{1-c\sqrt{x}} + \frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)(a+b\operatorname{arctanh}(c\sqrt{x}))}{c} - \frac{(a+b\operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} \right)$$

↓ 2752

$$2 \left(\frac{\frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)(a+b\operatorname{arctanh}(c\sqrt{x}))}{c} + \frac{b \operatorname{PolyLog}\left(2, 1-\frac{2}{1-c\sqrt{x}}\right)}{2c} - \frac{(a+b\operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} \right)$$

input `Int[(x^3*(a + b*ArcTanh[c*sqrt[x]])/(1 - c^2*x), x]`

output $2 * (- ((x^3 * (a + b * \text{ArcTanh}[c * \text{Sqrt}[x]])) / 6 - (b * c * (- (\text{Sqrt}[x] / c^6) - x^{(3/2)} / (3 * c^4) - x^{(5/2)} / (5 * c^2) + \text{ArcTanh}[c * \text{Sqrt}[x]] / c^7)) / 6) / c^2 + (- ((x^2 * (a + b * \text{ArcTanh}[c * \text{Sqrt}[x]])) / 4 - (b * c * (- (\text{Sqrt}[x] / c^4) - x^{(3/2)} / (3 * c^2) + \text{ArcTanh}[c * \text{Sqrt}[x]] / c^5)) / 4) / c^2 + (- ((x * (a + b * \text{ArcTanh}[c * \text{Sqrt}[x]])) / 2 - (b * c * (- (\text{Sqrt}[x] / c^2) + \text{ArcTanh}[c * \text{Sqrt}[x]] / c^3)) / 2) / c^2 + (- 1 / 2 * (a + b * \text{ArcTanh}[c * \text{Sqrt}[x]])^2 / (b * c^2) + (((a + b * \text{ArcTanh}[c * \text{Sqrt}[x]]) * \text{Log}[2 / (1 - c * \text{Sqrt}[x])])) / c + (b * \text{PolyLog}[2, 1 - 2 / (1 - c * \text{Sqrt}[x])]) / (2 * c)) / c) / c^2 / c^2 / c^2)$

3.36.3.1 Defintions of rubi rules used

rule 219 $\text{Int}[(a + (b \cdot x)^2)^{-1}, x_Symbol] \rightarrow \text{Simp}[(1 / (\text{Rt}[a, 2] * \text{Rt}[-b, 2])) * \text{ArcTanh}[\text{Rt}[-b, 2] * (x / \text{Rt}[a, 2])], x] /;$ FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])

rule 254 $\text{Int}[(x^m) / ((a + (b \cdot x)^2)), x_Symbol] \rightarrow \text{Int}[\text{PolynomialDivide}[x^m, a + b * x^2, x], x] /;$ FreeQ[{a, b}, x] && IGtQ[m, 3]

rule 262 $\text{Int}[(c \cdot x)^m * ((a + (b \cdot x)^2)^p), x_Symbol] \rightarrow \text{Simp}[c * (c * x)^{(m-1)} * ((a + b * x^2)^{(p+1)} / (b * (m + 2 * p + 1))), x] - \text{Simp}[a * c^2 * ((m-1) / (b * (m + 2 * p + 1))) \text{Int}[(c * x)^{(m-2)} * (a + b * x^2)^p, x], x] /;$ FreeQ[{a, b, c, p}, x] && GtQ[m, 2 - 1] && NeQ[m + 2 * p + 1, 0] && IntBinomialQ[a, b, c, 2, m, p, x]

rule 2009 $\text{Int}[u, x_Symbol] \rightarrow \text{Simp}[\text{IntSum}[u, x], x] /;$ SumQ[u]

rule 2752 $\text{Int}[\text{Log}[(c \cdot x) / ((d + (e \cdot x))], x_Symbol] \rightarrow \text{Simp}[(-e^{-1}) * \text{PolyLog}[2, 1 - c * x], x] /;$ FreeQ[{c, d, e}, x] && EqQ[e + c * d, 0]

rule 2849 $\text{Int}[\text{Log}[(c \cdot x) / ((d + (e \cdot x)))] / ((f + (g \cdot x)^2)), x_Symbol] \rightarrow \text{Simp}[-e/g \text{Subst}[\text{Int}[\text{Log}[2 * d * x] / (1 - 2 * d * x), x], x, 1 / (d + e * x)], x] /;$ FreeQ[{c, d, e, f, g}, x] && EqQ[c, 2 * d] && EqQ[e^2 * f + d^2 * g, 0]

$$3.36. \int \frac{x^3 (a + b \arctanh(c\sqrt{x}))}{1 - c^2 x} dx$$

rule 6452 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)*((a + b*ArcTanh[c*x^n])^p/(m + 1)), x] - Simp[b*c*n*(p/(m + 1)) Int[x^(m + n)*((a + b*ArcTanh[c*x^n])^(p - 1)/(1 - c^2*x^(2*n))), x], x] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1] && IntegerQ[m])) && NeQ[m, -1]`

rule 6470 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.))^(p_.)/((d_) + (e_.)*(x_)), x_Symbol] :> Simp[(-(a + b*ArcTanh[c*x])^p)*(Log[2/(1 + e*(x/d))]/e), x] + Simp[b*c*(p/e) Int[(a + b*ArcTanh[c*x])^(p - 1)*(Log[2/(1 + e*(x/d))]/(1 - c^2*x^2)), x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 0] && EqQ[c^2*d^2 - e^2, 0]`

rule 6542 `Int[(((a_.) + ArcTanh[(c_.)*(x_)])*(b_.))^(p_.)*((f_.)*(x_)^(m_))/((d_) + (e_.)*(x_)^2), x_Symbol] :> Simp[f^2/e Int[(f*x)^(m - 2)*(a + b*ArcTanh[c*x])^p, x], x] - Simp[d*(f^2/e) Int[(f*x)^(m - 2)*((a + b*ArcTanh[c*x])^p/(d + e*x^2)), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && GtQ[p, 0] && GtQ[m, 1]`

rule 6546 `Int[(((a_.) + ArcTanh[(c_.)*(x_)])*(b_.))^(p_.)*(x_)/((d_) + (e_.)*(x_)^2), x_Symbol] :> Simp[(a + b*ArcTanh[c*x])^(p + 1)/(b*e*(p + 1)), x] + Simp[1/(c*d) Int[(a + b*ArcTanh[c*x])^p/(1 - c*x), x], x] /; FreeQ[{a, b, c, d, e}, x] && EqQ[c^2*d + e, 0] && IGtQ[p, 0]`

rule 7267 `Int[u_, x_Symbol] :> With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Simp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2])], x] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]]`

3.36.4 Maple [A] (verified)

Time = 3.49 (sec) , antiderivative size = 247, normalized size of antiderivative = 1.27

method	result
parts	$-\frac{ax^3}{3c^2} - \frac{ax^2}{2c^4} - \frac{ax}{c^6} - \frac{a \ln(c^2x-1)}{c^8} - \frac{2b \left(\frac{c^6x^3 \operatorname{arctanh}(c\sqrt{x})}{6} + \frac{c^4x^2 \operatorname{arctanh}(c\sqrt{x})}{4} + \frac{c^2x \operatorname{arctanh}(c\sqrt{x})}{2} + \operatorname{arctanh}(c\sqrt{x}) \right)}{2}$
derivativedivides	$2 \left(a \left(\frac{c^6x^3}{6} + \frac{c^4x^2}{4} + \frac{c^2x}{2} + \frac{\ln(c\sqrt{x}-1)}{2} + \frac{\ln(1+c\sqrt{x})}{2} \right) + b \left(\frac{c^6x^3 \operatorname{arctanh}(c\sqrt{x})}{6} + \frac{c^4x^2 \operatorname{arctanh}(c\sqrt{x})}{4} + \frac{c^2x \operatorname{arctanh}(c\sqrt{x})}{2} + \operatorname{arctanh}(c\sqrt{x}) \right) \right)$
default	$2 \left(a \left(\frac{c^6x^3}{6} + \frac{c^4x^2}{4} + \frac{c^2x}{2} + \frac{\ln(c\sqrt{x}-1)}{2} + \frac{\ln(1+c\sqrt{x})}{2} \right) + b \left(\frac{c^6x^3 \operatorname{arctanh}(c\sqrt{x})}{6} + \frac{c^4x^2 \operatorname{arctanh}(c\sqrt{x})}{4} + \frac{c^2x \operatorname{arctanh}(c\sqrt{x})}{2} + \operatorname{arctanh}(c\sqrt{x}) \right) \right)$

input `int(x^3*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x,method=_RETURNVERBOSE)`

output
$$-1/3*a/c^2*x^3-1/2*a/c^4*x^2-a/c^6*x-a/c^8*\ln(c^2*x-1)-2*b/c^8*(1/6*c^6*x^3*\operatorname{arctanh}(c*x^(1/2))+1/4*c^4*x^2*\operatorname{arctanh}(c*x^(1/2))+1/2*c^2*x*\operatorname{arctanh}(c*x^(1/2))+1/2*\operatorname{arctanh}(c*x^(1/2))*\ln(c*x^(1/2)-1)+1/2*\operatorname{arctanh}(c*x^(1/2))*\ln(1+c*x^(1/2))+1/8*\ln(c*x^(1/2)-1)^2-1/2*\operatorname{dilog}(1/2*c*x^(1/2)+1/2)-1/4*\ln(c*x^(1/2)-1)*\ln(1/2*c*x^(1/2)+1/2)-1/8*\ln(1+c*x^(1/2))^2+1/4*(\ln(1+c*x^(1/2))-1)*\ln(1/2*c*x^(1/2)+1/2)+1/30*c^5*x^(5/2)+5/36*c^3*x^(3/2)+11/12*c*x^(1/2)+11/24*\ln(c*x^(1/2)-1)-11/24*\ln(1+c*x^(1/2)))$$

3.36.5 Fracas [F]

$$\int \frac{x^3(a + b\operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = \int -\frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x^3}{c^2x - 1} dx$$

input `integrate(x^3*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="fricas")`

output `integral(-(b*x^3*arctanh(c*sqrt(x)) + a*x^3)/(c^2*x - 1), x)`

3.36.6 Sympy [F]

$$\int \frac{x^3(a + \operatorname{barctanh}(c\sqrt{x}))}{1 - c^2x} dx = - \int \frac{ax^3}{c^2x - 1} dx - \int \frac{bx^3 \operatorname{atanh}(c\sqrt{x})}{c^2x - 1} dx$$

input `integrate(x**3*(a+b*atanh(c*x**(1/2)))/(-c**2*x+1),x)`

output `-Integral(a*x**3/(c**2*x - 1), x) - Integral(b*x**3*atanh(c*sqrt(x))/(c**2*x - 1), x)`

3.36.7 Maxima [A] (verification not implemented)

Time = 0.36 (sec) , antiderivative size = 246, normalized size of antiderivative = 1.26

$$\int \frac{x^3(a + \operatorname{barctanh}(c\sqrt{x}))}{1 - c^2x} dx = -\frac{1}{6}a \left(\frac{2c^4x^3 + 3c^2x^2 + 6x}{c^6} + \frac{6 \log(c^2x - 1)}{c^8} \right) - \frac{(\log(c\sqrt{x} + 1) \log(-\frac{1}{2}c\sqrt{x} + \frac{1}{2}) + \operatorname{Li}_2(\frac{1}{2}c\sqrt{x} + \frac{1}{2}))b}{c^8} + \frac{11b \log(c\sqrt{x} + 1)}{12c^8} - \frac{11b \log(c\sqrt{x} - 1)}{12c^8} - \frac{12bc^5x^{\frac{5}{2}} + 50bc^3x^{\frac{3}{2}} + 45b \log(c\sqrt{x} + 1)^2 - 45b \log(-c\sqrt{x} + 1)^2 + 330bc\sqrt{x} + 15(2bc^6x^3 + 3bc^4x^2 - 180c^8)}{180c^8}$$

input `integrate(x^3*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="maxima")`

output `-1/6*a*((2*c^4*x^3 + 3*c^2*x^2 + 6*x)/c^6 + 6*log(c^2*x - 1)/c^8) - (log(c*sqrt(x) + 1)*log(-1/2*c*sqrt(x) + 1/2) + dilog(1/2*c*sqrt(x) + 1/2))*b/c^8 + 11/12*b*log(c*sqrt(x) + 1)/c^8 - 11/12*b*log(c*sqrt(x) - 1)/c^8 - 1/180*(12*b*c^5*x^(5/2) + 50*b*c^3*x^(3/2) + 45*b*log(c*sqrt(x) + 1)^2 - 45*b*log(-c*sqrt(x) + 1)^2 + 330*b*c*sqrt(x) + 15*(2*b*c^6*x^3 + 3*b*c^4*x^2 + 6*b*c^2*x)*log(c*sqrt(x) + 1) - 15*(2*b*c^6*x^3 + 3*b*c^4*x^2 + 6*b*c^2*x + 6*b*log(c*sqrt(x) + 1))*log(-c*sqrt(x) + 1))/c^8`

3.36. $\int \frac{x^3(a + \operatorname{barctanh}(c\sqrt{x}))}{1 - c^2x} dx$

3.36.8 Giac [F]

$$\int \frac{x^3(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = \int -\frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x^3}{c^2x - 1} dx$$

input `integrate(x^3*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="giac")`

output `integrate(-(b*arctanh(c*sqrt(x)) + a)*x^3/(c^2*x - 1), x)`

3.36.9 Mupad [F(-1)]

Timed out.

$$\int \frac{x^3(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = \int -\frac{x^3(a + b \operatorname{atanh}(c\sqrt{x}))}{c^2x - 1} dx$$

input `int(-(x^3*(a + b*atanh(c*x^(1/2))))/(c^2*x - 1),x)`

output `int(-(x^3*(a + b*atanh(c*x^(1/2))))/(c^2*x - 1), x)`

$$3.37 \quad \int \frac{x^2 (a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2 x} dx$$

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3.37.1 Optimal result

Integrand size = 26, antiderivative size = 160

$$\int \frac{x^2 (a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2 x} dx = -\frac{3b\sqrt{x}}{2c^5} - \frac{bx^{3/2}}{6c^3} + \frac{3b \operatorname{arctanh}(c\sqrt{x})}{2c^6} - \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{c^4} - \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{2c^2} - \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{bc^6} + \frac{2(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2}{1 - c\sqrt{x}}\right)}{c^6} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{1 - c\sqrt{x}}\right)}{c^6}$$

output

```
-1/6*b*x^(3/2)/c^3+3/2*b*arctanh(c*x^(1/2))/c^6-x*(a+b*arctanh(c*x^(1/2)))/c^4-1/2*x^2*(a+b*arctanh(c*x^(1/2)))/c^2-(a+b*arctanh(c*x^(1/2)))^2/b/c^6+2*(a+b*arctanh(c*x^(1/2)))*ln(2/(1-c*x^(1/2)))/c^6+b*polylog(2,1-2/(1-c*x^(1/2)))/c^6-3/2*b*x^(1/2)/c^5
```

3.37.2 Mathematica [A] (verified)

Time = 0.39 (sec) , antiderivative size = 130, normalized size of antiderivative = 0.81

$$\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = \frac{9bc\sqrt{x} + 6ac^2x + bc^3x^{3/2} + 3ac^4x^2 - 6b \operatorname{arctanh}(c\sqrt{x})^2 + 3b \operatorname{arctanh}(c\sqrt{x}) \left(-3 + 2c^2x + c^4x^2 - 4 \log\right)}{6c^6}$$

input `Integrate[(x^2*(a + b*ArcTanh[c*Sqrt[x]]))/(1 - c^2*x),x]`

output `-1/6*(9*b*c*Sqrt[x] + 6*a*c^2*x + b*c^3*x^(3/2) + 3*a*c^4*x^2 - 6*b*ArcTanh[c*Sqrt[x]]^2 + 3*b*ArcTanh[c*Sqrt[x]]*(-3 + 2*c^2*x + c^4*x^2 - 4*Log[1 + E^(-2*ArcTanh[c*Sqrt[x]])]) + 6*a*Log[1 - c^2*x] + 6*b*PolyLog[2, -E^(-2*ArcTanh[c*Sqrt[x]])])/c^6`

3.37.3 Rubi [A] (verified)

Time = 1.28 (sec) , antiderivative size = 217, normalized size of antiderivative = 1.36, number of steps used = 14, number of rules used = 13, $\frac{\text{number of rules}}{\text{integrand size}} = 0.500$, Rules used = {7267, 6542, 6452, 254, 2009, 6542, 6452, 262, 219, 6546, 6470, 2849, 2752}

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.

$$\begin{aligned} & \int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx \\ & \quad \downarrow \text{7267} \\ & 2 \int \frac{x^{5/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} d\sqrt{x} \\ & \quad \downarrow \text{6542} \\ & 2 \left(\frac{\int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} d\sqrt{x}}{c^2} - \frac{\int x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x})) d\sqrt{x}}{c^2} \right) \\ & \quad \downarrow \text{6452} \end{aligned}$$

3.37. $\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx$

$$2 \left(\frac{\int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \int \frac{x^2}{1-c^2x} d\sqrt{x}}{c^2} \right)$$

↓ 254

$$2 \left(\frac{\int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \int \left(-\frac{x}{c^2} + \frac{1}{c^4(1-c^2x)} - \frac{1}{c^4} \right) d\sqrt{x}}{c^2} \right)$$

↓ 2009

$$2 \left(\frac{\int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{c^2} \right)$$

↓ 6542

$$2 \left(\frac{\frac{\int \frac{\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\int \frac{\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{c^2} d\sqrt{x}}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} \right)}{c^2}}{c^2} \right)$$

↓ 6452

$$2 \left(\frac{\frac{\int \frac{\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \int \frac{x}{1-c^2x} d\sqrt{x}}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} \right)}{c^2}}{c^2} \right)$$

↓ 262

$$2 \left(\frac{\frac{\int \frac{\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\int \frac{1}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\sqrt{x}}{c^2} \right)}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\operatorname{arctanh}(c\sqrt{x}) \right)}{c^2}}{c^2} \right)$$

↓ 219

3.37. $\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} dx$

$$2 \left(\frac{\int \frac{\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} \right)$$

↓ 6546

$$2 \left(\frac{\frac{\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{1-c\sqrt{x}} d\sqrt{x} - \frac{(a+b\operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} \right)$$

↓ 6470

$$2 \left(\frac{\frac{\frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)(a+b\operatorname{arctanh}(c\sqrt{x}))}{c} - b \int \frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)}{1-c^2x} d\sqrt{x} - \frac{(a+b\operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} \right)$$

↓ 2849

$$2 \left(\frac{\frac{b \int \frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)}{1-c\sqrt{x}} d\frac{1}{1-c\sqrt{x}} + \frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)(a+b\operatorname{arctanh}(c\sqrt{x}))}{c} - \frac{(a+b\operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} \right)$$

↓ 2752

$$2 \left(\frac{\frac{\frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)(a+b\operatorname{arctanh}(c\sqrt{x}))}{c} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-c\sqrt{x}}\right)}{2c} - \frac{(a+b\operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2}}{c^2} - \frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} - \frac{\frac{1}{4}x^2(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2}\right)}{c^2}}{c^2} \right)$$

input `Int[(x^2*(a + b*ArcTanh[c*sqrt[x]]))/(1 - c^2*x), x]`

3.37. $\int \frac{x^2(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} dx$

output $2 * (- ((x^2 * (a + b * \text{ArcTanh}[c * \text{Sqrt}[x]])) / 4 - (b * c * (- (\text{Sqrt}[x] / c^4) - x^{(3/2)} / (3 * c^2) + \text{ArcTanh}[c * \text{Sqrt}[x]] / c^5)) / 4) / c^2) + (- ((x * (a + b * \text{ArcTanh}[c * \text{Sqrt}[x]]))) / 2 - (b * c * (- (\text{Sqrt}[x] / c^2) + \text{ArcTanh}[c * \text{Sqrt}[x]] / c^3)) / 2) / c^2) + (- 1 / 2 * (a + b * \text{ArcTanh}[c * \text{Sqrt}[x]])^2 / (b * c^2) + (((a + b * \text{ArcTanh}[c * \text{Sqrt}[x]]) * \text{Log}[2 / (1 - c * \text{Sqrt}[x])])) / c + (b * \text{PolyLog}[2, 1 - 2 / (1 - c * \text{Sqrt}[x])]) / (2 * c)) / c^2) / c^2$

3.37.3.1 Defintions of rubi rules used

rule 219 $\text{Int}[(a + (b \cdot x)^2)^{-1}, x_Symbol] \rightarrow \text{Simp}[(1 / (\text{Rt}[a, 2] * \text{Rt}[-b, 2])) * \text{ArcTanh}[\text{Rt}[-b, 2] * (x / \text{Rt}[a, 2])], x] /;$ $\text{FreeQ}\{a, b, x\} \ \&\& \ \text{NegQ}[a/b] \ \&\& \ (\text{GtQ}[a, 0] \ || \ \text{LtQ}[b, 0])$

rule 254 $\text{Int}[(x)^m / ((a + (b \cdot x)^2)), x_Symbol] \rightarrow \text{Int}[\text{PolynomialDivide}[x^m, a + b * x^2, x], x] /;$ $\text{FreeQ}\{a, b, x\} \ \&\& \ \text{IGtQ}[m, 3]$

rule 262 $\text{Int}[(c \cdot x)^m * ((a + (b \cdot x)^2)^p), x_Symbol] \rightarrow \text{Simp}[c * (c * x)^{m-1} * ((a + b * x^2)^{p+1} / (b * (m + 2 * p + 1))), x] - \text{Simp}[a * c^2 * (m - 1) / (b * (m + 2 * p + 1)) \ \text{Int}[(c * x)^{m-2} * (a + b * x^2)^p, x], x] /;$ $\text{FreeQ}\{a, b, c, p, x\} \ \&\& \ \text{GtQ}[m, 2 - 1] \ \&\& \ \text{NeQ}[m + 2 * p + 1, 0] \ \&\& \ \text{IntBinomialQ}[a, b, c, 2, m, p, x]$

rule 2009 $\text{Int}[u, x_Symbol] \rightarrow \text{Simp}[\text{IntSum}[u, x], x] /;$ $\text{SumQ}[u]$

rule 2752 $\text{Int}[\text{Log}[(c \cdot x) / ((d + (e \cdot x))^2)], x_Symbol] \rightarrow \text{Simp}[(-e^{-1}) * \text{PolyLog}[2, 1 - c * x], x] /;$ $\text{FreeQ}\{c, d, e, x\} \ \&\& \ \text{EqQ}[e + c * d, 0]$

rule 2849 $\text{Int}[\text{Log}[(c \cdot x) / ((d + (e \cdot x))^2)] / ((f + (g \cdot x)^2)), x_Symbol] \rightarrow \text{Simp}[-e/g \ \text{Subst}[\text{Int}[\text{Log}[2 * d * x] / (1 - 2 * d * x), x], x, 1 / (d + e * x)], x] /;$ $\text{FreeQ}\{c, d, e, f, g, x\} \ \&\& \ \text{EqQ}[c, 2 * d] \ \&\& \ \text{EqQ}[e^2 * f + d^2 * g, 0]$

rule 6452 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*(x_)^(m_.), x_Symbol] :> Simp[x^(m + 1)*((a + b*ArcTanh[c*x^n])^p/(m + 1)), x] - Simp[b*c*n*(p/(m + 1)) Int[x^(m + n)*((a + b*ArcTanh[c*x^n])^(p - 1)/(1 - c^2*x^(2*n))), x], x] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1] && IntegerQ[m])) && NeQ[m, -1]`

rule 6470 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)/((d_) + (e_.)*(x_)), x_Symbol] :> Simp[(-(a + b*ArcTanh[c*x])^p)*(Log[2/(1 + e*(x/d))]/e), x] + Simp[b*c*(p/e) Int[(a + b*ArcTanh[c*x])^(p - 1)*(Log[2/(1 + e*(x/d))]/(1 - c^2*x^2)), x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 0] && EqQ[c^2*d^2 - e^2, 0]`

rule 6542 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)*((f_.)*(x_)^(m_))/((d_) + (e_.)*(x_)^2), x_Symbol] :> Simp[f^2/e Int[(f*x)^(m - 2)*(a + b*ArcTanh[c*x])^p, x], x] - Simp[d*(f^2/e) Int[(f*x)^(m - 2)*((a + b*ArcTanh[c*x])^p/(d + e*x^2)), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && GtQ[p, 0] && GtQ[m, 1]`

rule 6546 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)*(x_)/((d_) + (e_.)*(x_)^2), x_Symbol] :> Simp[(a + b*ArcTanh[c*x])^(p + 1)/(b*e*(p + 1)), x] + Simp[1/(c*d) Int[(a + b*ArcTanh[c*x])^p/(1 - c*x), x], x] /; FreeQ[{a, b, c, d, e}, x] && EqQ[c^2*d + e, 0] && IGtQ[p, 0]`

rule 7267 `Int[u_, x_Symbol] :> With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Simp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2])], x] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]]`

3.37. $\int \frac{x^2(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} dx$

3.37.4 Maple [A] (verified)

Time = 0.94 (sec) , antiderivative size = 216, normalized size of antiderivative = 1.35

method	result
parts	$-\frac{ax^2}{2c^2} - \frac{ax}{c^4} - \frac{a \ln(c^2x-1)}{c^6} - \frac{2b \left(\frac{c^4x^2 \operatorname{arctanh}(c\sqrt{x})}{4} + \frac{c^2x \operatorname{arctanh}(c\sqrt{x})}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}-1)}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}+1)}{2} \right)}{c^6}$
derivativedivides	$-\frac{2 \left(a \left(\frac{c^4x^2}{4} + \frac{c^2x}{2} + \frac{\ln(c\sqrt{x}-1)}{2} + \frac{\ln(1+c\sqrt{x})}{2} \right) + b \left(\frac{c^4x^2 \operatorname{arctanh}(c\sqrt{x})}{4} + \frac{c^2x \operatorname{arctanh}(c\sqrt{x})}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}-1)}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}+1)}{2} \right) \right)}{c^6}$
default	$-\frac{2 \left(a \left(\frac{c^4x^2}{4} + \frac{c^2x}{2} + \frac{\ln(c\sqrt{x}-1)}{2} + \frac{\ln(1+c\sqrt{x})}{2} \right) + b \left(\frac{c^4x^2 \operatorname{arctanh}(c\sqrt{x})}{4} + \frac{c^2x \operatorname{arctanh}(c\sqrt{x})}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}-1)}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}+1)}{2} \right) \right)}{c^6}$

input `int(x^2*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x,method=_RETURNVERBOSE)`

output `-1/2*a/c^2*x^2-a/c^4*x-a/c^6*ln(c^2*x-1)-2*b/c^6*(1/4*c^4*x^2*arctanh(c*x^(1/2))+1/2*c^2*x*arctanh(c*x^(1/2))+1/2*arctanh(c*x^(1/2))*ln(c*x^(1/2)-1)+1/2*arctanh(c*x^(1/2))*ln(1+c*x^(1/2))+1/8*ln(c*x^(1/2)-1)^2-1/2*dilog(1/2*c*x^(1/2)+1/2)-1/4*ln(c*x^(1/2)-1)*ln(1/2*c*x^(1/2)+1/2)-1/8*ln(1+c*x^(1/2))^2+1/4*(ln(1+c*x^(1/2))-ln(1/2*c*x^(1/2)+1/2))*ln(-1/2*c*x^(1/2)+1/2)+1/12*c^3*x^(3/2)+3/4*c*x^(1/2)+3/8*ln(c*x^(1/2)-1)-3/8*ln(1+c*x^(1/2))`

3.37.5 Fracas [F]

$$\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = \int -\frac{(b \operatorname{arctanh}(c\sqrt{x}) + a)x^2}{c^2x - 1} dx$$

input `integrate(x^2*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="fricas")`

output `integral(-(b*x^2*arctanh(c*sqrt(x)) + a*x^2)/(c^2*x - 1), x)`

3.37. $\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx$

3.37.6 Sympy [F]

$$\int \frac{x^2(a + \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = - \int \frac{ax^2}{c^2x - 1} dx - \int \frac{bx^2 \operatorname{atanh}(c\sqrt{x})}{c^2x - 1} dx$$

input `integrate(x**2*(a+b*atanh(c*x**(1/2)))/(-c**2*x+1),x)`

output `-Integral(a*x**2/(c**2*x - 1), x) - Integral(b*x**2*atanh(c*sqrt(x))/(c**2*x - 1), x)`

3.37.7 Maxima [A] (verification not implemented)

Time = 0.36 (sec) , antiderivative size = 208, normalized size of antiderivative = 1.30

$$\int \frac{x^2(a + \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = -\frac{1}{2}a \left(\frac{c^2x^2 + 2x}{c^4} + \frac{2 \log(c^2x - 1)}{c^6} \right) - \frac{(\log(c\sqrt{x} + 1) \log(-\frac{1}{2}c\sqrt{x} + \frac{1}{2}) + \operatorname{Li}_2(\frac{1}{2}c\sqrt{x} + \frac{1}{2}))b}{c^6} + \frac{3b \log(c\sqrt{x} + 1)}{4c^6} - \frac{3b \log(c\sqrt{x} - 1)}{4c^6} - \frac{2bc^3x^{\frac{3}{2}} + 3b \log(c\sqrt{x} + 1)^2 - 3b \log(-c\sqrt{x} + 1)^2 + 18bc\sqrt{x} + 3(bc^4x^2 + 2bc^2x) \log(c\sqrt{x} + 1) - 3}{12c^6}$$

input `integrate(x^2*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="maxima")`

output `-1/2*a*((c^2*x^2 + 2*x)/c^4 + 2*log(c^2*x - 1)/c^6) - (log(c*sqrt(x) + 1)*log(-1/2*c*sqrt(x) + 1/2) + dilog(1/2*c*sqrt(x) + 1/2))*b/c^6 + 3/4*b*log(c*sqrt(x) + 1)/c^6 - 3/4*b*log(c*sqrt(x) - 1)/c^6 - 1/12*(2*b*c^3*x^(3/2) + 3*b*log(c*sqrt(x) + 1)^2 - 3*b*log(-c*sqrt(x) + 1)^2 + 18*b*c*sqrt(x) + 3*(b*c^4*x^2 + 2*b*c^2*x)*log(c*sqrt(x) + 1) - 3*(b*c^4*x^2 + 2*b*c^2*x + 2*b*log(c*sqrt(x) + 1))*log(-c*sqrt(x) + 1))/c^6`

3.37. $\int \frac{x^2(a + \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx$

3.37.8 Giac [F]

$$\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = \int -\frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x^2}{c^2x - 1} dx$$

input `integrate(x^2*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="giac")`

output `integrate(-(b*arctanh(c*sqrt(x)) + a)*x^2/(c^2*x - 1), x)`

3.37.9 Mupad [F(-1)]

Timed out.

$$\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = \int -\frac{x^2(a + b \operatorname{atanh}(c\sqrt{x}))}{c^2x - 1} dx$$

input `int(-(x^2*(a + b*atanh(c*x^(1/2))))/(c^2*x - 1),x)`

output `int(-(x^2*(a + b*atanh(c*x^(1/2))))/(c^2*x - 1), x)`

3.38 $\int \frac{x(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} dx$

3.38.1	Optimal result	299
3.38.2	Mathematica [A] (verified)	300
3.38.3	Rubi [A] (verified)	300
3.38.4	Maple [A] (verified)	303
3.38.5	Fricas [F]	304
3.38.6	Sympy [F]	304
3.38.7	Maxima [A] (verification not implemented)	305
3.38.8	Giac [F]	305
3.38.9	Mupad [F(-1)]	306

3.38.1 Optimal result

Integrand size = 24, antiderivative size = 120

$$\int \frac{x(a + \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = -\frac{b\sqrt{x}}{c^3} + \frac{\operatorname{arctanh}(c\sqrt{x})}{c^4} - \frac{x(a + \operatorname{arctanh}(c\sqrt{x}))}{c^2} - \frac{(a + \operatorname{arctanh}(c\sqrt{x}))^2}{bc^4} + \frac{2(a + \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2}{1-c\sqrt{x}}\right)}{c^4} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-c\sqrt{x}}\right)}{c^4}$$

output

```
b*arctanh(c*x^(1/2))/c^4-x*(a+b*arctanh(c*x^(1/2)))/c^2-(a+b*arctanh(c*x^(1/2)))^2/b/c^4+2*(a+b*arctanh(c*x^(1/2)))*ln(2/(1-c*x^(1/2)))/c^4+b*polylog(2,1-2/(1-c*x^(1/2)))/c^4-b*x^(1/2)/c^3
```

3.38.2 Mathematica [A] (verified)

Time = 0.25 (sec) , antiderivative size = 96, normalized size of antiderivative = 0.80

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = \frac{bc\sqrt{x} + ac^2x - b \operatorname{arctanh}(c\sqrt{x})^2 + b \operatorname{arctanh}(c\sqrt{x}) \left(-1 + c^2x - 2 \log\left(1 + e^{-2 \operatorname{arctanh}(c\sqrt{x})}\right)\right) + a \log(1 - c^2x)}{c^4}$$

input `Integrate[(x*(a + b*ArcTanh[c*Sqrt[x]]))/(1 - c^2*x),x]`

output `-((b*c*Sqrt[x] + a*c^2*x - b*ArcTanh[c*Sqrt[x]]^2 + b*ArcTanh[c*Sqrt[x]]*(-1 + c^2*x - 2*Log[1 + E^(-2*ArcTanh[c*Sqrt[x]])])) + a*Log[1 - c^2*x] + b*PolyLog[2, -E^(-2*ArcTanh[c*Sqrt[x]])])/c^4)`

3.38.3 Rubi [A] (verified)

Time = 0.80 (sec) , antiderivative size = 146, normalized size of antiderivative = 1.22, number of steps used = 10, number of rules used = 9, $\frac{\text{number of rules}}{\text{integrand size}} = 0.375$, Rules used = {7267, 6542, 6452, 262, 219, 6546, 6470, 2849, 2752}

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.

$$\begin{aligned} & \int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx \\ & \quad \downarrow \text{7267} \\ & 2 \int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} d\sqrt{x} \\ & \quad \downarrow \text{6542} \\ & 2 \left(\frac{\int \frac{\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} d\sqrt{x}}{c^2} - \frac{\int \sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x})) d\sqrt{x}}{c^2} \right) \\ & \quad \downarrow \text{6452} \\ & 2 \left(\frac{\int \frac{\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \int \frac{x}{1 - c^2x} d\sqrt{x}}{c^2} \right) \end{aligned}$$

3.38. $\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx$

↓ 262

$$2 \left(\frac{\int \frac{\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\int \frac{1}{1-c^2x} d\sqrt{x} - \frac{\sqrt{x}}{c^2} \right)}{c^2} \right)$$

↓ 219

$$2 \left(\frac{\int \frac{\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{c^2} \right)$$

↓ 6546

$$2 \left(\frac{\frac{\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{1-c\sqrt{x}} d\sqrt{x}}{c} - \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2}}{c^2} - \frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{c^2} \right)$$

↓ 6470

$$2 \left(\frac{\frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)(a + b \operatorname{arctanh}(c\sqrt{x}))}{c} - b \int \frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)}{1-c^2x} d\sqrt{x}}{c} - \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2} - \frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{c^2} \right)$$

↓ 2849

$$2 \left(\frac{\frac{b \int \frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)}{1-\frac{2}{1-c\sqrt{x}}} d\frac{1}{1-c\sqrt{x}}}{c} + \frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)(a + b \operatorname{arctanh}(c\sqrt{x}))}{c}}{c^2} - \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2} - \frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{c^2} \right)$$

↓ 2752

$$2 \left(\frac{\frac{\log\left(\frac{2}{1-c\sqrt{x}}\right)(a + b \operatorname{arctanh}(c\sqrt{x}))}{c} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-c\sqrt{x}}\right)}{2c}}{c^2} - \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2} - \frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{c^2} \right)$$

input `Int[(x*(a + b*ArcTanh[c*Sqrt[x]]))/(1 - c^2*x),x]`

output `2*(-(((x*(a + b*ArcTanh[c*Sqrt[x]]))/2 - (b*c*(-(Sqrt[x]/c^2) + ArcTanh[c*Sqrt[x]]/c^3))/2)/c^2) + (-1/2*(a + b*ArcTanh[c*Sqrt[x]])^2/(b*c^2) + ((a + b*ArcTanh[c*Sqrt[x]])*Log[2/(1 - c*Sqrt[x])])/c + (b*PolyLog[2, 1 - 2/(1 - c*Sqrt[x])])/(2*c))/c)/c^2)`

3.38.3.1 Defintions of rubi rules used

rule 219 `Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])`

rule 262 `Int[((c_.)*(x_)^(m_))*((a_) + (b_.)*(x_)^2)^(p_), x_Symbol] := Simp[c*(c*x)^(m - 1)*((a + b*x^2)^(p + 1)/(b*(m + 2*p + 1))), x] - Simp[a*c^2*(m - 1)/(b*(m + 2*p + 1)) Int[(c*x)^(m - 2)*(a + b*x^2)^p, x], x] /; FreeQ[{a, b, c, p}, x] && GtQ[m, 2 - 1] && NeQ[m + 2*p + 1, 0] && IntBinomialQ[a, b, c, 2, m, p, x]`

rule 2752 `Int[Log[(c_.)*(x_)]/((d_) + (e_.)*(x_)), x_Symbol] := Simp[(-e^(-1))*PolyLog[2, 1 - c*x], x] /; FreeQ[{c, d, e}, x] && EqQ[e + c*d, 0]`

rule 2849 `Int[Log[(c_.)/((d_) + (e_.)*(x_))]/((f_) + (g_.)*(x_)^2), x_Symbol] := Simp[-e/g Subst[Int[Log[2*d*x]/(1 - 2*d*x), x], x, 1/(d + e*x)], x] /; FreeQ[{c, d, e, f, g}, x] && EqQ[c, 2*d] && EqQ[e^2*f + d^2*g, 0]`

rule 6452 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*(x_)^(m_.), x_Symbol] := Simp[x^(m + 1)*((a + b*ArcTanh[c*x^n])^p/(m + 1)), x] - Simp[b*c*n*(p/(m + 1)) Int[x^(m + n)*((a + b*ArcTanh[c*x^n])^(p - 1)/(1 - c^2*x^(2*n))), x], x] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1] && IntegerQ[m])) && NeQ[m, -1]`

```
rule 6470 Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)/((d_) + (e_.)*(x_)), x_Symbol
] := Simp[(- (a + b*ArcTanh[c*x])^p)*(Log[2/(1 + e*(x/d))]/e), x] + Simp[b*c
*(p/e) Int[(a + b*ArcTanh[c*x])^(p - 1)*(Log[2/(1 + e*(x/d))]/(1 - c^2*x^
2)), x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 0] && EqQ[c^2*d^2 - e^2
, 0]
```

```
rule 6542 Int((((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)*((f_.)*(x_))^(m_))/((d_) + (
e_.)*(x_)^2), x_Symbol] := Simp[f^2/e Int[(f*x)^(m - 2)*(a + b*ArcTanh[c*
x])^p, x], x] - Simp[d*(f^2/e) Int[(f*x)^(m - 2)*((a + b*ArcTanh[c*x])^p/
(d + e*x^2)), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && GtQ[p, 0] && GtQ[m,
1]
```

```
rule 6546 Int((((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)*(x_))/((d_) + (e_.)*(x_)^2),
x_Symbol] := Simp[(a + b*ArcTanh[c*x])^(p + 1)/(b*e*(p + 1)), x] + Simp[1/
(c*d) Int[(a + b*ArcTanh[c*x])^p/(1 - c*x), x], x] /; FreeQ[{a, b, c, d,
e}, x] && EqQ[c^2*d + e, 0] && IGtQ[p, 0]
```

```
rule 7267 Int[u_, x_Symbol] := With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Si
mp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2]])], x
] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]
```

3.38.4 Maple [A] (verified)

Time = 0.98 (sec) , antiderivative size = 185, normalized size of antiderivative = 1.54

method	result
parts	$-\frac{ax}{c^2} - \frac{a \ln(c^2x-1)}{c^4} - \frac{2b \left(\frac{c^2x \operatorname{arctanh}(c\sqrt{x})}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}-1)}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(1+c\sqrt{x})}{2} + \frac{c\sqrt{x}}{2} + \frac{\ln(c\sqrt{x}-1)}{4} \right)}{c^4}$
derivativedivides	$-\frac{2 \left(a \left(\frac{c^2x}{2} + \frac{\ln(c\sqrt{x}-1)}{2} + \frac{\ln(1+c\sqrt{x})}{2} \right) + b \left(\frac{c^2x \operatorname{arctanh}(c\sqrt{x})}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}-1)}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(1+c\sqrt{x})}{2} + \frac{c\sqrt{x}}{2} + \frac{\ln(c\sqrt{x}-1)}{4} \right) \right)}{c^4}$
default	$-\frac{2 \left(a \left(\frac{c^2x}{2} + \frac{\ln(c\sqrt{x}-1)}{2} + \frac{\ln(1+c\sqrt{x})}{2} \right) + b \left(\frac{c^2x \operatorname{arctanh}(c\sqrt{x})}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}-1)}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(1+c\sqrt{x})}{2} + \frac{c\sqrt{x}}{2} + \frac{\ln(c\sqrt{x}-1)}{4} \right) \right)}{c^4}$

```
input int(x*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x,method=_RETURNVERBOSE)
```

$$3.38. \int \frac{x(a+b\operatorname{arctanh}(c\sqrt{x}))}{1-c^2x} dx$$

output `-a/c^2*x-a/c^4*ln(c^2*x-1)-2*b/c^4*(1/2*c^2*x*arctanh(c*x^(1/2))+1/2*arctanh(c*x^(1/2))*ln(c*x^(1/2)-1)+1/2*arctanh(c*x^(1/2))*ln(1+c*x^(1/2))+1/2*c*x^(1/2)+1/4*ln(c*x^(1/2)-1)-1/4*ln(1+c*x^(1/2))+1/8*ln(c*x^(1/2)-1)^2-1/2*dilog(1/2*c*x^(1/2)+1/2)-1/4*ln(c*x^(1/2)-1)*ln(1/2*c*x^(1/2)+1/2)+1/4*(ln(1+c*x^(1/2))-ln(1/2*c*x^(1/2)+1/2))*ln(-1/2*c*x^(1/2)+1/2)-1/8*ln(1+c*x^(1/2))^2)`

3.38.5 Fricas [F]

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = \int -\frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x}{c^2x - 1} dx$$

input `integrate(x*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="fricas")`

output `integral(-(b*x*arctanh(c*sqrt(x)) + a*x)/(c^2*x - 1), x)`

3.38.6 Sympy [F]

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = -\int \frac{ax}{c^2x - 1} dx - \int \frac{bx \operatorname{atanh}(c\sqrt{x})}{c^2x - 1} dx$$

input `integrate(x*(a+b*atanh(c*x**(1/2)))/(-c**2*x+1),x)`

output `-Integral(a*x/(c**2*x - 1), x) - Integral(b*x*atanh(c*sqrt(x))/(c**2*x - 1), x)`

3.38.7 Maxima [A] (verification not implemented)

Time = 0.35 (sec) , antiderivative size = 166, normalized size of antiderivative = 1.38

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx$$

$$= -a \left(\frac{x}{c^2} + \frac{\log(c^2x - 1)}{c^4} \right) - \frac{(\log(c\sqrt{x} + 1) \log(-\frac{1}{2}c\sqrt{x} + \frac{1}{2}) + \operatorname{Li}_2(\frac{1}{2}c\sqrt{x} + \frac{1}{2}))b}{c^4}$$

$$+ \frac{b \log(c\sqrt{x} + 1)}{2c^4} - \frac{b \log(c\sqrt{x} - 1)}{2c^4}$$

$$- \frac{2bc^2x \log(c\sqrt{x} + 1) + b \log(c\sqrt{x} + 1)^2 - b \log(-c\sqrt{x} + 1)^2 + 4bc\sqrt{x} - 2(bc^2x + b \log(c\sqrt{x} + 1)) \log(c\sqrt{x} + 1)}{4c^4}$$

input `integrate(x*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="maxima")`output `-a*(x/c^2 + log(c^2*x - 1)/c^4) - (log(c*sqrt(x) + 1)*log(-1/2*c*sqrt(x) + 1/2) + dilog(1/2*c*sqrt(x) + 1/2))*b/c^4 + 1/2*b*log(c*sqrt(x) + 1)/c^4 - 1/2*b*log(c*sqrt(x) - 1)/c^4 - 1/4*(2*b*c^2*x*log(c*sqrt(x) + 1) + b*log(c*sqrt(x) + 1)^2 - b*log(-c*sqrt(x) + 1)^2 + 4*b*c*sqrt(x) - 2*(b*c^2*x + b*log(c*sqrt(x) + 1))*log(-c*sqrt(x) + 1))/c^4`**3.38.8 Giac [F]**

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2x} dx = \int -\frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x}{c^2x - 1} dx$$

input `integrate(x*(a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="giac")`output `integrate(-(b*arctanh(c*sqrt(x)) + a)*x/(c^2*x - 1), x)`

3.38.9 Mupad [F(-1)]

Timed out.

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2 x} dx = \int -\frac{x(a + b \operatorname{atanh}(c\sqrt{x}))}{c^2 x - 1} dx$$

input `int(-(x*(a + b*atanh(c*x^(1/2))))/(c^2*x - 1),x)`output `int(-(x*(a + b*atanh(c*x^(1/2))))/(c^2*x - 1), x)`

3.39 $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{1-c^2x} dx$

3.39.1	Optimal result	307
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3.39.1 Optimal result

Integrand size = 23, antiderivative size = 78

$$\int \frac{a + \operatorname{arctanh}(c\sqrt{x})}{1 - c^2x} dx = -\frac{(a + \operatorname{arctanh}(c\sqrt{x}))^2}{bc^2} + \frac{2(a + \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2}{1-c\sqrt{x}}\right)}{c^2} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{1-c\sqrt{x}}\right)}{c^2}$$

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

3.39.2 Mathematica [A] (verified)

Time = 0.15 (sec) , antiderivative size = 75, normalized size of antiderivative = 0.96

$$\int \frac{a + \operatorname{arctanh}(c\sqrt{x})}{1 - c^2x} dx = -\frac{a \log(1 - c^2x)}{c^2} - \frac{b\left(-\operatorname{arctanh}(c\sqrt{x})\left(\operatorname{arctanh}(c\sqrt{x}) + 2 \log\left(1 + e^{-2\operatorname{arctanh}(c\sqrt{x})}\right)\right) + \operatorname{PolyLog}\left(2, -e^{-2\operatorname{arctanh}(c\sqrt{x})}\right)\right)}{c^2}$$

input `Integrate[(a + b*ArcTanh[c*Sqrt[x]])/(1 - c^2*x), x]`

output $-\left(\frac{a \operatorname{Log}[1 - c^2 x]}{c^2} - (b(-\operatorname{ArcTanh}[c \sqrt{x}])(\operatorname{ArcTanh}[c \sqrt{x}] + 2 \operatorname{Log}[1 + E^{(-2 \operatorname{ArcTanh}[c \sqrt{x}])}]]) + \operatorname{PolyLog}[2, -E^{(-2 \operatorname{ArcTanh}[c \sqrt{x}])}])\right)/c^2$

3.39.3 Rubi [A] (verified)

Time = 0.45 (sec) , antiderivative size = 89, normalized size of antiderivative = 1.14, number of steps used = 6, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.217$, Rules used = {6484, 6546, 6470, 2849, 2752}

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.

$$\begin{aligned} & \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{1 - c^2 x} dx \\ & \quad \downarrow 6484 \\ & 2 \int \frac{\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{1 - c^2 x} d\sqrt{x} \\ & \quad \downarrow 6546 \\ & 2 \left(\frac{\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{1 - c\sqrt{x}} d\sqrt{x}}{c} - \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2} \right) \\ & \quad \downarrow 6470 \\ & 2 \left(\frac{\frac{\log\left(\frac{2}{1 - c\sqrt{x}}\right)(a + b \operatorname{arctanh}(c\sqrt{x}))}{c} - b \int \frac{\log\left(\frac{2}{1 - c\sqrt{x}}\right)}{1 - c^2 x} d\sqrt{x}}{c} - \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2} \right) \\ & \quad \downarrow 2849 \\ & 2 \left(\frac{b \int \frac{\log\left(\frac{2}{1 - c\sqrt{x}}\right)}{1 - c\sqrt{x}} d\frac{1}{1 - c\sqrt{x}} + \frac{\log\left(\frac{2}{1 - c\sqrt{x}}\right)(a + b \operatorname{arctanh}(c\sqrt{x}))}{c}}{c} - \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2} \right) \\ & \quad \downarrow 2752 \\ & 2 \left(\frac{\frac{\log\left(\frac{2}{1 - c\sqrt{x}}\right)(a + b \operatorname{arctanh}(c\sqrt{x}))}{c} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{1 - c\sqrt{x}}\right)}{2c}}{c} - \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2bc^2} \right) \end{aligned}$$

3.39. $\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{1 - c^2 x} dx$

input `Int[(a + b*ArcTanh[c*Sqrt[x]])/(1 - c^2*x),x]`

output `2*(-1/2*(a + b*ArcTanh[c*Sqrt[x]])^2/(b*c^2) + (((a + b*ArcTanh[c*Sqrt[x]])*Log[2/(1 - c*Sqrt[x])])/c + (b*PolyLog[2, 1 - 2/(1 - c*Sqrt[x])]))/(2*c)) /c`

3.39.3.1 Defintions of rubi rules used

rule 2752 `Int[Log[(c_.)*(x_)]/((d_) + (e_.)*(x_)), x_Symbol] := Simp[(-e^(-1))*PolyLog[2, 1 - c*x], x] /; FreeQ[{c, d, e}, x] && EqQ[e + c*d, 0]`

rule 2849 `Int[Log[(c_.)/((d_) + (e_.)*(x_))]/((f_) + (g_.)*(x_)^2), x_Symbol] := Simp[-e/g Subst[Int[Log[2*d*x]/(1 - 2*d*x), x], x, 1/(d + e*x)], x] /; FreeQ[{c, d, e, f, g}, x] && EqQ[c, 2*d] && EqQ[e^2*f + d^2*g, 0]`

rule 6470 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)/((d_) + (e_.)*(x_)), x_Symbol] := Simp[(-(a + b*ArcTanh[c*x])^p)*(Log[2/(1 + e*(x/d))]/e), x] + Simp[b*c*(p/e) Int[(a + b*ArcTanh[c*x])^(p - 1)*(Log[2/(1 + e*(x/d))]/(1 - c^2*x^2)), x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 0] && EqQ[c^2*d^2 - e^2, 0]`

rule 6484 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)]*(b_.))/((d_) + (e_.)*(x_)), x_Symbol] := With[{k = Denominator[n]}, Simp[k Subst[Int[x^(k - 1)*((a + b*ArcTanh[c*x^(k*n)])/(d + e*x^k)), x], x, x^(1/k)], x] /; FreeQ[{a, b, c, d, e}, x] && FractionQ[n]`

rule 6546 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)*(x_)/((d_) + (e_.)*(x_)^2), x_Symbol] := Simp[(a + b*ArcTanh[c*x])^(p + 1)/(b*e*(p + 1)), x] + Simp[1/(c*d) Int[(a + b*ArcTanh[c*x])^p/(1 - c*x), x], x] /; FreeQ[{a, b, c, d, e}, x] && EqQ[c^2*d + e, 0] && IGtQ[p, 0]`

3.39.4 Maple [A] (verified)

Time = 0.92 (sec) , antiderivative size = 140, normalized size of antiderivative = 1.79

method	result
parts	$-\frac{a \ln(c^2 x - 1)}{c^2} - \frac{2b \left(\frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}-1)}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)^2}{8} - \frac{\operatorname{dilog}\left(\frac{c\sqrt{x}}{2} + \frac{1}{2}\right)}{2} - \frac{\ln(c\sqrt{x}-1) \ln\left(\frac{c\sqrt{x}}{2} + \frac{1}{2}\right)}{4} \right)}{c^2}$
derivativedivides	$-\frac{2 \left(a \left(\frac{\ln(c\sqrt{x}-1)}{2} + \frac{\ln(1+c\sqrt{x})}{2} \right) + b \left(\frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}-1)}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)^2}{8} - \frac{\operatorname{dilog}\left(\frac{c\sqrt{x}}{2} + \frac{1}{2}\right)}{2} - \frac{\ln(c\sqrt{x}-1) \ln\left(\frac{c\sqrt{x}}{2} + \frac{1}{2}\right)}{4} \right) \right)}{c^2}$
default	$-\frac{2 \left(a \left(\frac{\ln(c\sqrt{x}-1)}{2} + \frac{\ln(1+c\sqrt{x})}{2} \right) + b \left(\frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x}-1)}{2} + \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)^2}{8} - \frac{\operatorname{dilog}\left(\frac{c\sqrt{x}}{2} + \frac{1}{2}\right)}{2} - \frac{\ln(c\sqrt{x}-1) \ln\left(\frac{c\sqrt{x}}{2} + \frac{1}{2}\right)}{4} \right) \right)}{c^2}$

input `int((a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x,method=_RETURNVERBOSE)`

output `-a*ln(c^2*x-1)/c^2-2*b/c^2*(1/2*arctanh(c*x^(1/2))*ln(c*x^(1/2)-1)+1/2*arctanh(c*x^(1/2))*ln(1+c*x^(1/2))+1/8*ln(c*x^(1/2)-1)^2-1/2*dilog(1/2*c*x^(1/2)+1/2)-1/4*ln(c*x^(1/2)-1)*ln(1/2*c*x^(1/2)+1/2)+1/4*(ln(1+c*x^(1/2))-ln(1/2*c*x^(1/2)+1/2))*ln(-1/2*c*x^(1/2)+1/2)-1/8*ln(1+c*x^(1/2))^2)`

3.39.5 Fricas [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{1 - c^2 x} dx = \int -\frac{b \operatorname{arctanh}(c\sqrt{x}) + a}{c^2 x - 1} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="fricas")`

output `integral(-(b*arctanh(c*sqrt(x)) + a)/(c^2*x - 1), x)`

3.39.6 Sympy [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{1 - c^2x} dx = - \int \frac{a}{c^2x - 1} dx - \int \frac{b \operatorname{atanh}(c\sqrt{x})}{c^2x - 1} dx$$

input `integrate((a+b*atanh(c*x**(1/2)))/(-c**2*x+1),x)`

output `-Integral(a/(c**2*x - 1), x) - Integral(b*atanh(c*sqrt(x))/(c**2*x - 1), x)`

3.39.7 Maxima [A] (verification not implemented)

Time = 0.39 (sec) , antiderivative size = 101, normalized size of antiderivative = 1.29

$$\begin{aligned} & \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{1 - c^2x} dx \\ &= - \frac{(\log(c\sqrt{x} + 1) \log(-\frac{1}{2}c\sqrt{x} + \frac{1}{2}) + \operatorname{Li}_2(\frac{1}{2}c\sqrt{x} + \frac{1}{2}))b}{c^2} - \frac{a \log(c^2x - 1)}{c^2} \\ & \quad - \frac{b \log(c\sqrt{x} + 1)^2 - 2b \log(c\sqrt{x} + 1) \log(-c\sqrt{x} + 1) - b \log(-c\sqrt{x} + 1)^2}{4c^2} \end{aligned}$$

input `integrate((a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="maxima")`

output `-(log(c*sqrt(x) + 1)*log(-1/2*c*sqrt(x) + 1/2) + dilog(1/2*c*sqrt(x) + 1/2)))*b/c^2 - a*log(c^2*x - 1)/c^2 - 1/4*(b*log(c*sqrt(x) + 1)^2 - 2*b*log(c*sqrt(x) + 1)*log(-c*sqrt(x) + 1) - b*log(-c*sqrt(x) + 1)^2)/c^2`

3.39.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{1 - c^2x} dx = \int - \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{c^2x - 1} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/(-c^2*x+1),x, algorithm="giac")`

output `integrate(-(b*arctanh(c*sqrt(x)) + a)/(c^2*x - 1), x)`

3.39. $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{1-c^2x} dx$

3.39.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{1 - c^2 x} dx = \int -\frac{a + b \operatorname{atanh}(c\sqrt{x})}{c^2 x - 1} dx$$

input `int(-(a + b*atanh(c*x^(1/2)))/(c^2*x - 1),x)`output `int(-(a + b*atanh(c*x^(1/2)))/(c^2*x - 1), x)`

3.40 $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x(1-c^2x)} dx$

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3.40.1 Optimal result

Integrand size = 26, antiderivative size = 69

$$\int \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{x(1-c^2x)} dx = \frac{(a + b\operatorname{arctanh}(c\sqrt{x}))^2}{b} + 2(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(2 - \frac{2}{1 + c\sqrt{x}}\right) - b \operatorname{PolyLog}\left(2, -1 + \frac{2}{1 + c\sqrt{x}}\right)$$

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

3.40.2 Mathematica [A] (verified)

Time = 0.21 (sec) , antiderivative size = 74, normalized size of antiderivative = 1.07

$$\int \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{x(1-c^2x)} dx = -b\operatorname{arctanh}(c\sqrt{x})^2 + 2b\operatorname{arctanh}(c\sqrt{x}) \log\left(1 - e^{2\operatorname{arctanh}(c\sqrt{x})}\right) + a(\log(x) - \log(1 - c^2x)) + b \operatorname{PolyLog}\left(2, e^{2\operatorname{arctanh}(c\sqrt{x})}\right)$$

input `Integrate[(a + b*ArcTanh[c*Sqrt[x]])/(x*(1 - c^2*x)),x]`

output $-(b \operatorname{ArcTanh}[c \sqrt{x}]^2) + 2b \operatorname{ArcTanh}[c \sqrt{x}] \operatorname{Log}[1 - E^{(2 \operatorname{ArcTanh}[c \sqrt{x}])}] + a(\operatorname{Log}[x] - \operatorname{Log}[1 - c^2 x]) + b \operatorname{PolyLog}[2, E^{(2 \operatorname{ArcTanh}[c \sqrt{x}])}]$

3.40.3 Rubi [A] (verified)

Time = 0.56 (sec) , antiderivative size = 75, normalized size of antiderivative = 1.09, number of steps used = 6, number of rules used = 5, $\frac{\text{number of rules}}{\text{integrand size}} = 0.192$, Rules used = {7267, 2026, 6550, 6494, 2897}

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.

$$\begin{aligned} & \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(1 - c^2 x)} dx \\ & \quad \downarrow 7267 \\ & 2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{\sqrt{x} - c^2 x^{3/2}} d\sqrt{x} \\ & \quad \downarrow 2026 \\ & 2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{\sqrt{x}(1 - c^2 x)} d\sqrt{x} \\ & \quad \downarrow 6550 \\ & 2 \left(\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{(\sqrt{x}c + 1)\sqrt{x}} d\sqrt{x} + \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2b} \right) \\ & \quad \downarrow 6494 \\ & 2 \left(-bc \int \frac{\log\left(2 - \frac{2}{\sqrt{x}c + 1}\right)}{1 - c^2 x} d\sqrt{x} + \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2b} + \log\left(2 - \frac{2}{c\sqrt{x} + 1}\right) (a + b \operatorname{arctanh}(c\sqrt{x})) \right) \\ & \quad \downarrow 2897 \\ & 2 \left(\frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2b} + \log\left(2 - \frac{2}{c\sqrt{x} + 1}\right) (a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2} b \operatorname{PolyLog}\left(2, \frac{2}{\sqrt{x}c + 1} - 1\right) \right) \end{aligned}$$

input $\operatorname{Int}[(a + b \operatorname{ArcTanh}[c \sqrt{x}]) / (x(1 - c^2 x)), x]$

3.40. $\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(1 - c^2 x)} dx$

output $2*((a + b*\text{ArcTanh}[c*\text{Sqrt}[x]])^2/(2*b) + (a + b*\text{ArcTanh}[c*\text{Sqrt}[x]])*\text{Log}[2 - 2/(1 + c*\text{Sqrt}[x])] - (b*\text{PolyLog}[2, -1 + 2/(1 + c*\text{Sqrt}[x])]))/2$

3.40.3.1 Defintions of rubi rules used

rule 2026 $\text{Int}[(\text{Fx}_.)*(\text{Px}_.)^{(p_.)}, x_Symbol] \rightarrow \text{With}[\{r = \text{Expon}[\text{Px}, x, \text{Min}]\}, \text{Int}[x^{(p*r)}*\text{ExpandToSum}[\text{Px}/x^r, x]^p*\text{Fx}, x] /; \text{IGtQ}[r, 0]] /; \text{PolyQ}[\text{Px}, x] \&\& \text{IntegerQ}[p] \&\& \text{!MonomialQ}[\text{Px}, x] \&\& (\text{ILtQ}[p, 0] \parallel \text{!PolyQ}[u, x])$

rule 2897 $\text{Int}[\text{Log}[u_]*\text{Pq}_.]^{(m_.)}, x_Symbol] \rightarrow \text{With}[\{C = \text{FullSimplify}[\text{Pq}^m*((1 - u)/\text{D}[u, x])]\}, \text{Simp}[C*\text{PolyLog}[2, 1 - u], x] /; \text{FreeQ}[C, x] /; \text{IntegerQ}[m] \&\& \text{PolyQ}[\text{Pq}, x] \&\& \text{RationalFunctionQ}[u, x] \&\& \text{LeQ}[\text{RationalFunctionExponents}[u, x][[2]], \text{Expon}[\text{Pq}, x]]$

rule 6494 $\text{Int}[(a_. + \text{ArcTanh}[(c_.)*(x_.)]*(b_.))^{(p_.)}/((x_.)*((d_.) + (e_.)*(x_.))), x_Symbol] \rightarrow \text{Simp}[(a + b*\text{ArcTanh}[c*x])^p*(\text{Log}[2 - 2/(1 + e*(x/d))]/d), x] - \text{Simp}[b*c*(p/d) \text{Int}[(a + b*\text{ArcTanh}[c*x])^{(p - 1)}*(\text{Log}[2 - 2/(1 + e*(x/d))]/(1 - c^2*x^2)), x], x] /; \text{FreeQ}[\{a, b, c, d, e\}, x] \&\& \text{IGtQ}[p, 0] \&\& \text{EqQ}[c^2*d^2 - e^2, 0]$

rule 6550 $\text{Int}[(a_. + \text{ArcTanh}[(c_.)*(x_.)]*(b_.))^{(p_.)}/((x_.)*((d_.) + (e_.)*(x_.)^2)), x_Symbol] \rightarrow \text{Simp}[(a + b*\text{ArcTanh}[c*x])^{(p + 1)}/(b*d*(p + 1)), x] + \text{Simp}[1/d \text{Int}[(a + b*\text{ArcTanh}[c*x])^p/(x*(1 + c*x)), x], x] /; \text{FreeQ}[\{a, b, c, d, e\}, x] \&\& \text{EqQ}[c^2*d + e, 0] \&\& \text{GtQ}[p, 0]$

rule 7267 $\text{Int}[u_, x_Symbol] \rightarrow \text{With}[\{lst = \text{SubstForFractionalPowerOfLinear}[u, x]\}, \text{Simp}[lst[[2]]*lst[[4]] \text{Subst}[\text{Int}[lst[[1]], x], x, lst[[3]]^{(1/lst[[2]])}], x] /; \text{!FalseQ}[lst] \&\& \text{SubstForFractionalPowerQ}[u, lst[[3]], x]]$

3.40.4 Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 179 vs. 2(61) = 122.

Time = 1.05 (sec) , antiderivative size = 180, normalized size of antiderivative = 2.61

method	result
parts	$-a(\ln(c^2x - 1) - \ln(x)) - b\left(\operatorname{arctanh}(c\sqrt{x}) \ln(1 + c\sqrt{x}) + \operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x} - 1)\right)$
derivativedivides	$-2a\left(-\ln(c\sqrt{x}) + \frac{\ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)}{2}\right) - 2b\left(-\ln(c\sqrt{x}) \operatorname{arctanh}(c\sqrt{x}) + \frac{\operatorname{arctanh}(c\sqrt{x})}{2}\right)$
default	$-2a\left(-\ln(c\sqrt{x}) + \frac{\ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)}{2}\right) - 2b\left(-\ln(c\sqrt{x}) \operatorname{arctanh}(c\sqrt{x}) + \frac{\operatorname{arctanh}(c\sqrt{x})}{2}\right)$

input `int((a+b*arctanh(c*x^(1/2)))/x/(-c^2*x+1),x,method=_RETURNVERBOSE)`

output `-a*(ln(c^2*x-1)-ln(x))-b*(arctanh(c*x^(1/2))*ln(1+c*x^(1/2))+arctanh(c*x^(1/2))*ln(c*x^(1/2)-1)-2*ln(c*x^(1/2))*arctanh(c*x^(1/2))+dilog(1+c*x^(1/2))+ln(c*x^(1/2))*ln(1+c*x^(1/2))+dilog(c*x^(1/2))+1/4*ln(c*x^(1/2)-1)^2-dilog(1/2*c*x^(1/2)+1/2)-1/2*ln(c*x^(1/2)-1)*ln(1/2*c*x^(1/2)+1/2)+1/2*(ln(1+c*x^(1/2))-ln(1/2*c*x^(1/2)+1/2))*ln(-1/2*c*x^(1/2)+1/2)-1/4*ln(1+c*x^(1/2))^2)`

3.40.5 Fracas [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(1 - c^2x)} dx = \int -\frac{b \operatorname{arctanh}(c\sqrt{x}) + a}{(c^2x - 1)x} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x/(-c^2*x+1),x, algorithm="fricas")`

output `integral(-(b*arctanh(c*sqrt(x)) + a)/(c^2*x^2 - x), x)`

3.40.6 Sympy [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(1-c^2x)} dx = - \int \frac{a}{c^2x^2 - x} dx - \int \frac{b \operatorname{atanh}(c\sqrt{x})}{c^2x^2 - x} dx$$

input `integrate((a+b*atanh(c*x**(1/2)))/x/(-c**2*x+1),x)`

output `-Integral(a/(c**2*x**2 - x), x) - Integral(b*atanh(c*sqrt(x))/(c**2*x**2 - x), x)`

3.40.7 Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 159 vs. $2(60) = 120$.

Time = 0.32 (sec) , antiderivative size = 159, normalized size of antiderivative = 2.30

$$\begin{aligned} \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(1-c^2x)} dx &= -\frac{1}{4} b \log(c\sqrt{x} + 1)^2 + \frac{1}{2} b \log(c\sqrt{x} + 1) \log(-c\sqrt{x} + 1) \\ &\quad + \frac{1}{4} b \log(-c\sqrt{x} + 1)^2 \\ &\quad - \left(\log(c\sqrt{x} + 1) \log\left(-\frac{1}{2}c\sqrt{x} + \frac{1}{2}\right) + \operatorname{Li}_2\left(\frac{1}{2}c\sqrt{x} + \frac{1}{2}\right) \right) b \\ &\quad - (\log(c\sqrt{x}) \log(-c\sqrt{x} + 1) + \operatorname{Li}_2(-c\sqrt{x} + 1)) b \\ &\quad + (\log(c\sqrt{x} + 1) \log(-c\sqrt{x}) + \operatorname{Li}_2(c\sqrt{x} + 1)) b \\ &\quad - a(\log(c\sqrt{x} + 1) + \log(c\sqrt{x} - 1) - \log(x)) \end{aligned}$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x/(-c^2*x+1),x, algorithm="maxima")`

output `-1/4*b*log(c*sqrt(x) + 1)^2 + 1/2*b*log(c*sqrt(x) + 1)*log(-c*sqrt(x) + 1) + 1/4*b*log(-c*sqrt(x) + 1)^2 - (log(c*sqrt(x) + 1)*log(-1/2*c*sqrt(x) + 1/2) + dilog(1/2*c*sqrt(x) + 1/2))*b - (log(c*sqrt(x))*log(-c*sqrt(x) + 1) + dilog(-c*sqrt(x) + 1))*b + (log(c*sqrt(x) + 1)*log(-c*sqrt(x)) + dilog(c*sqrt(x) + 1))*b - a*(log(c*sqrt(x) + 1) + log(c*sqrt(x) - 1) - log(x))`

3.40.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(1 - c^2x)} dx = \int -\frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(c^2x - 1)x} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x/(-c^2*x+1),x, algorithm="giac")`

output `integrate(-(b*arctanh(c*sqrt(x)) + a)/((c^2*x - 1)*x), x)`

3.40.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(1 - c^2x)} dx = - \int \frac{a + b \operatorname{atanh}(c\sqrt{x})}{x(c^2x - 1)} dx$$

input `int(-(a + b*atanh(c*x^(1/2)))/(x*(c^2*x - 1)),x)`

output `-int((a + b*atanh(c*x^(1/2)))/(x*(c^2*x - 1)), x)`

3.41 $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x^2(1-c^2x)} dx$

3.41.1	Optimal result	319
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3.41.1 Optimal result

Integrand size = 26, antiderivative size = 117

$$\int \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{x^2(1-c^2x)} dx = -\frac{bc}{\sqrt{x}} + bc^2\operatorname{arctanh}(c\sqrt{x}) - \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{x} + \frac{c^2(a + b\operatorname{arctanh}(c\sqrt{x}))^2}{b} + 2c^2(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(2 - \frac{2}{1 + c\sqrt{x}}\right) - bc^2 \operatorname{PolyLog}\left(2, -1 + \frac{2}{1 + c\sqrt{x}}\right)$$

```
output b*c^2*arctanh(c*x^(1/2))+(-a-b*arctanh(c*x^(1/2)))/x+c^2*(a+b*arctanh(c*x^(1/2)))^2/b+2*c^2*(a+b*arctanh(c*x^(1/2)))*ln(2-2/(1+c*x^(1/2)))-b*c^2*pol
ylog(2,-1+2/(1+c*x^(1/2)))-b*c/x^(1/2)
```

3.41.2 Mathematica [A] (verified)

Time = 0.34 (sec) , antiderivative size = 118, normalized size of antiderivative = 1.01

$$\int \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{x^2(1-c^2x)} dx = -\frac{a}{x} + 2ac^2 \log(\sqrt{x}) - ac^2 \log(1-c^2x) - bc^2 \left(\frac{1}{c\sqrt{x}} - \operatorname{arctanh}(c\sqrt{x}) \left(-\frac{1-c^2x}{c^2x} + \operatorname{arctanh}(c\sqrt{x}) + 2 \log\left(1 - e^{-2\operatorname{arctanh}(c\sqrt{x})}\right) \right) + \operatorname{PolyLog}\left(2, e^{-2\operatorname{arctanh}(c\sqrt{x})}\right) \right)$$

input `Integrate[(a + b*ArcTanh[c*Sqrt[x]])/(x^2*(1 - c^2*x)),x]`

output `-(a/x) + 2*a*c^2*Log[Sqrt[x]] - a*c^2*Log[1 - c^2*x] - b*c^2*(1/(c*Sqrt[x]) - ArcTanh[c*Sqrt[x]])*(-((1 - c^2*x)/(c^2*x)) + ArcTanh[c*Sqrt[x]] + 2*Log[1 - E^(-2*ArcTanh[c*Sqrt[x]])]) + PolyLog[2, E^(-2*ArcTanh[c*Sqrt[x]])])`

3.41.3 Rubi [A] (verified)

Time = 0.86 (sec) , antiderivative size = 123, normalized size of antiderivative = 1.05, number of steps used = 10, number of rules used = 9, $\frac{\text{number of rules}}{\text{integrand size}} = 0.346$, Rules used = {7267, 2026, 6544, 6452, 264, 219, 6550, 6494, 2897}

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.

$$\begin{aligned}
 & \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(1 - c^2x)} dx \\
 & \quad \downarrow \text{7267} \\
 & 2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^{3/2} - c^2x^{5/2}} d\sqrt{x} \\
 & \quad \downarrow \text{2026} \\
 & 2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^{3/2}(1 - c^2x)} d\sqrt{x} \\
 & \quad \downarrow \text{6544} \\
 & 2 \left(c^2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{\sqrt{x}(1 - c^2x)} d\sqrt{x} + \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^{3/2}} d\sqrt{x} \right) \\
 & \quad \downarrow \text{6452} \\
 & 2 \left(c^2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{\sqrt{x}(1 - c^2x)} d\sqrt{x} + \frac{1}{2}bc \int \frac{1}{x(1 - c^2x)} d\sqrt{x} - \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{2x} \right) \\
 & \quad \downarrow \text{264} \\
 & 2 \left(c^2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{\sqrt{x}(1 - c^2x)} d\sqrt{x} + \frac{1}{2}bc \left(c^2 \int \frac{1}{1 - c^2x} d\sqrt{x} - \frac{1}{\sqrt{x}} \right) - \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{2x} \right) \\
 & \quad \downarrow \text{219}
 \end{aligned}$$

3.41. $\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(1 - c^2x)} dx$

$$2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} + \frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) \right)$$

↓ 6550

$$2 \left(c^2 \left(\int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{(\sqrt{xc}+1)\sqrt{x}} d\sqrt{x} + \frac{(a + \operatorname{barctanh}(c\sqrt{x}))^2}{2b} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} + \frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) \right)$$

↓ 6494

$$2 \left(c^2 \left(-bc \int \frac{\log \left(2 - \frac{2}{\sqrt{xc}+1} \right)}{1-c^2x} d\sqrt{x} + \frac{(a + \operatorname{barctanh}(c\sqrt{x}))^2}{2b} + \log \left(2 - \frac{2}{c\sqrt{x}+1} \right) (a + \operatorname{barctanh}(c\sqrt{x})) \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} + \frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) \right)$$

↓ 2897

$$2 \left(c^2 \left(\frac{(a + \operatorname{barctanh}(c\sqrt{x}))^2}{2b} + \log \left(2 - \frac{2}{c\sqrt{x}+1} \right) (a + \operatorname{barctanh}(c\sqrt{x})) - \frac{1}{2}b \operatorname{PolyLog} \left(2, \frac{2}{\sqrt{xc}+1} - 1 \right) \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} + \frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) \right)$$

input `Int[(a + b*ArcTanh[c*Sqrt[x]])/(x^2*(1 - c^2*x)),x]`

output `2*(-1/2*(a + b*ArcTanh[c*Sqrt[x]])/x + (b*c*(-1/Sqrt[x]) + c*ArcTanh[c*Sqrt[x]])/2 + c^2*((a + b*ArcTanh[c*Sqrt[x]])^2/(2*b) + (a + b*ArcTanh[c*Sqrt[x]])*Log[2 - 2/(1 + c*Sqrt[x])] - (b*PolyLog[2, -1 + 2/(1 + c*Sqrt[x])])/2)`

3.41.3.1 Defintions of rubi rules used

rule 219 `Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])`

rule 264 `Int[((c_.)*(x_))^(m_)*((a_) + (b_.)*(x_)^2)^(p_), x_Symbol] := Simp[(c*x)^(m+1)*((a + b*x^2)^(p+1)/(a*c*(m+1))), x] - Simp[b*(m+2*p+3)/(a*c^2*(m+1)) Int[(c*x)^(m+2)*(a + b*x^2)^p, x], x] /; FreeQ[{a, b, c, p}, x] && LtQ[m, -1] && IntBinomialQ[a, b, c, 2, m, p, x]`

rule 2026 `Int[(Fx_.)*(Px_)^(p_.), x_Symbol] := With[{r = Expon[Px, x, Min]}, Int[x^(p*r)*ExpandToSum[Px/x^r, x]^p*Fx, x] /; IGtQ[r, 0]] /; PolyQ[Px, x] && IntegerQ[p] && !MonomialQ[Px, x] && (ILtQ[p, 0] || !PolyQ[u, x])`

rule 2897 `Int[Log[u_]*(Pq_)^(m_.), x_Symbol] := With[{C = FullSimplify[Pq^m*((1 - u)/D[u, x])]}, Simp[C*PolyLog[2, 1 - u], x] /; FreeQ[C, x] /; IntegerQ[m] && PolyQ[Pq, x] && RationalFunctionQ[u, x] && LeQ[RationalFunctionExponents[u, x][[2]], Expon[Pq, x]]`

rule 6452 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*(x_)^(m_.), x_Symbol] := Simp[x^(m + 1)*((a + b*ArcTanh[c*x^n])^p/(m + 1)), x] - Simp[b*c*n*(p/(m + 1)) Int[x^(m + n)*((a + b*ArcTanh[c*x^n])^(p - 1)/(1 - c^2*x^(2*n))), x], x] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1] && IntegerQ[m])) && NeQ[m, -1]`

rule 6494 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)/((x_)*((d_) + (e_.)*(x_))), x_Symbol] := Simp[(a + b*ArcTanh[c*x])^p*(Log[2 - 2/(1 + e*(x/d))]/d), x] - Simp[b*c*(p/d) Int[(a + b*ArcTanh[c*x])^(p - 1)*(Log[2 - 2/(1 + e*(x/d))]/(1 - c^2*x^2)), x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 0] && EqQ[c^2*d^2 - e^2, 0]`

rule 6544 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)*((f_.)*(x_)^(m_))/((d_) + (e_.)*(x_)^2), x_Symbol] := Simp[1/d Int[(f*x)^m*(a + b*ArcTanh[c*x])^p, x], x] - Simp[e/(d*f^2) Int[(f*x)^(m + 2)*((a + b*ArcTanh[c*x])^p/(d + e*x^2)), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && GtQ[p, 0] && LtQ[m, -1]`

rule 6550 `Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)/((x_)*((d_) + (e_.)*(x_)^2)), x_Symbol] := Simp[(a + b*ArcTanh[c*x])^(p + 1)/(b*d*(p + 1)), x] + Simp[1/d Int[(a + b*ArcTanh[c*x])^p/(x*(1 + c*x)), x], x] /; FreeQ[{a, b, c, d, e}, x] && EqQ[c^2*d + e, 0] && GtQ[p, 0]`

rule 7267 `Int[u_, x_Symbol] := With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Simp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2])], x] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]]`

3.41.4 Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 242 vs. $2(105) = 210$.

Time = 1.09 (sec) , antiderivative size = 243, normalized size of antiderivative = 2.08

method	result
parts	$-a c^2 \ln(c^2 x - 1) - \frac{a}{x} + a c^2 \ln(x) - 2b c^2 \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{2c^2 x} - \ln(c\sqrt{x}) \operatorname{arctanh}(c\sqrt{x}) + \operatorname{arctanh}(c\sqrt{x}) \right)$
derivativedivides	$-2c^2 \left(a \left(\frac{1}{2c^2 x} - \ln(c\sqrt{x}) + \frac{\ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)}{2} \right) + b \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{2c^2 x} - \ln(c\sqrt{x}) \operatorname{arctanh}(c\sqrt{x}) + \operatorname{arctanh}(c\sqrt{x}) \right) \right)$
default	$-2c^2 \left(a \left(\frac{1}{2c^2 x} - \ln(c\sqrt{x}) + \frac{\ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)}{2} \right) + b \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{2c^2 x} - \ln(c\sqrt{x}) \operatorname{arctanh}(c\sqrt{x}) + \operatorname{arctanh}(c\sqrt{x}) \right) \right)$

input `int((a+b*arctanh(c*x^(1/2)))/x^2/(-c^2*x+1),x,method=_RETURNVERBOSE)`

output `-a*c^2*ln(c^2*x-1)-a/x+a*c^2*ln(x)-2*b*c^2*(1/2/c^2/x*arctanh(c*x^(1/2))-ln(c*x^(1/2))*arctanh(c*x^(1/2))+1/2*arctanh(c*x^(1/2))*ln(1+c*x^(1/2))+1/2*arctanh(c*x^(1/2))*ln(c*x^(1/2)-1)+1/2/c/x^(1/2)-1/4*ln(1+c*x^(1/2))+1/4*ln(c*x^(1/2)-1)+1/2*dilog(1+c*x^(1/2))+1/2*ln(c*x^(1/2))*ln(1+c*x^(1/2))+1/2*dilog(c*x^(1/2))+1/8*ln(c*x^(1/2)-1)^2-1/2*dilog(1/2*c*x^(1/2)+1/2)-1/4*ln(c*x^(1/2)-1)*ln(1/2*c*x^(1/2)+1/2)+1/4*(ln(1+c*x^(1/2))-ln(1/2*c*x^(1/2)+1/2))*ln(-1/2*c*x^(1/2)+1/2)-1/8*ln(1+c*x^(1/2))^2`

3.41.5 Fricas [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(1 - c^2 x)} dx = \int -\frac{b \operatorname{arctanh}(c\sqrt{x}) + a}{(c^2 x - 1)x^2} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^2/(-c^2*x+1),x, algorithm="fricas")`

output `integral(-(b*arctanh(c*sqrt(x)) + a)/(c^2*x^3 - x^2), x)`

3.41.6 Sympy [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(1-c^2x)} dx = - \int \frac{a}{c^2x^3 - x^2} dx - \int \frac{b \operatorname{atanh}(c\sqrt{x})}{c^2x^3 - x^2} dx$$

input `integrate((a+b*atanh(c*x**(1/2)))/x**2/(-c**2*x+1), x)`

output `-Integral(a/(c**2*x**3 - x**2), x) - Integral(b*atanh(c*sqrt(x))/(c**2*x**3 - x**2), x)`

3.41.7 Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 248 vs. $2(102) = 204$.

Time = 0.35 (sec) , antiderivative size = 248, normalized size of antiderivative = 2.12

$$\begin{aligned} \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(1-c^2x)} dx = & - \left(\log(c\sqrt{x} + 1) \log\left(-\frac{1}{2}c\sqrt{x} + \frac{1}{2}\right) + \operatorname{Li}_2\left(\frac{1}{2}c\sqrt{x} + \frac{1}{2}\right) \right) bc^2 \\ & - (\log(c\sqrt{x}) \log(-c\sqrt{x} + 1) + \operatorname{Li}_2(-c\sqrt{x} + 1)) bc^2 \\ & + (\log(c\sqrt{x} + 1) \log(-c\sqrt{x}) + \operatorname{Li}_2(c\sqrt{x} + 1)) bc^2 + \frac{1}{2} bc^2 \log(c\sqrt{x} + 1) \\ & - \frac{1}{2} bc^2 \log(c\sqrt{x} - 1) - \left(c^2 \log(c\sqrt{x} + 1) + c^2 \log(c\sqrt{x} - 1) - c^2 \log(x) + \frac{1}{x} \right) a \\ & - \frac{bc^2x \log(c\sqrt{x} + 1)^2 - bc^2x \log(-c\sqrt{x} + 1)^2 + 4bc\sqrt{x} + 2b \log(c\sqrt{x} + 1) - 2(bc^2x \log(c\sqrt{x} + 1) + b}{4x} \end{aligned}$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^2/(-c^2*x+1), x, algorithm="maxima")`

output `-(log(c*sqrt(x) + 1)*log(-1/2*c*sqrt(x) + 1/2) + dilog(1/2*c*sqrt(x) + 1/2)) * b*c^2 - (log(c*sqrt(x))*log(-c*sqrt(x) + 1) + dilog(-c*sqrt(x) + 1)) * b*c^2 + (log(c*sqrt(x) + 1)*log(-c*sqrt(x)) + dilog(c*sqrt(x) + 1)) * b*c^2 + 1/2*b*c^2*log(c*sqrt(x) + 1) - 1/2*b*c^2*log(c*sqrt(x) - 1) - (c^2*log(c*sqrt(x) + 1) + c^2*log(c*sqrt(x) - 1) - c^2*log(x) + 1/x)*a - 1/4*(b*c^2*x*log(c*sqrt(x) + 1)^2 - b*c^2*x*log(-c*sqrt(x) + 1)^2 + 4*b*c*sqrt(x) + 2*b*log(c*sqrt(x) + 1) - 2*(b*c^2*x*log(c*sqrt(x) + 1) + b)*log(-c*sqrt(x) + 1))/x`

3.41. $\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(1-c^2x)} dx$

3.41.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(1 - c^2x)} dx = \int -\frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(c^2x - 1)x^2} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^2/(-c^2*x+1),x, algorithm="giac")`

output `integrate(-(b*arctanh(c*sqrt(x)) + a)/((c^2*x - 1)*x^2), x)`

3.41.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(1 - c^2x)} dx = - \int \frac{a + b \operatorname{atanh}(c\sqrt{x})}{x^2(c^2x - 1)} dx$$

input `int(-(a + b*atanh(c*x^(1/2)))/(x^2*(c^2*x - 1)),x)`

output `-int((a + b*atanh(c*x^(1/2)))/(x^2*(c^2*x - 1)), x)`

3.42 $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x^3(1-c^2x)} dx$

3.42.1	Optimal result	326
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3.42.1 Optimal result

Integrand size = 26, antiderivative size = 157

$$\int \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{x^3(1-c^2x)} dx = -\frac{bc}{6x^{3/2}} - \frac{3bc^3}{2\sqrt{x}} + \frac{3}{2}bc^4\operatorname{arctanh}(c\sqrt{x}) - \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{2x^2} - \frac{c^2(a + b\operatorname{arctanh}(c\sqrt{x}))}{x} + \frac{c^4(a + b\operatorname{arctanh}(c\sqrt{x}))^2}{b} + 2c^4(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(2 - \frac{2}{1 + c\sqrt{x}}\right) - bc^4 \operatorname{PolyLog}\left(2, -1 + \frac{2}{1 + c\sqrt{x}}\right)$$

output

```
-1/6*b*c/x^(3/2)+3/2*b*c^4*arctanh(c*x^(1/2))+1/2*(-a-b*arctanh(c*x^(1/2))
)/x^2-c^2*(a+b*arctanh(c*x^(1/2)))/x+c^4*(a+b*arctanh(c*x^(1/2)))^2/b+2*c^
4*(a+b*arctanh(c*x^(1/2)))*ln(2-2/(1+c*x^(1/2)))-b*c^4*polylog(2,-1+2/(1+c
*x^(1/2)))-3/2*b*c^3/x^(1/2)
```

3.42.2 Mathematica [A] (verified)

Time = 0.54 (sec) , antiderivative size = 158, normalized size of antiderivative = 1.01

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(1 - c^2x)} dx = \frac{3a + bc\sqrt{x} + 6ac^2x + 9bc^3x^{3/2} - 6bc^4x^2 \operatorname{arctanh}(c\sqrt{x})^2 - 3b \operatorname{arctanh}(c\sqrt{x}) \left(-1 - 2c^2x + 3c^4x^2 + 4c^4x\right)}{6x^2} - bc^4 \operatorname{PolyLog}\left(2, e^{-2 \operatorname{arctanh}(c\sqrt{x})}\right)$$

input `Integrate[(a + b*ArcTanh[c*Sqrt[x]])/(x^3*(1 - c^2*x)),x]`

output `-1/6*(3*a + b*c*Sqrt[x] + 6*a*c^2*x + 9*b*c^3*x^(3/2) - 6*b*c^4*x^2*ArcTanh[c*Sqrt[x]]^2 - 3*b*ArcTanh[c*Sqrt[x]]*(-1 - 2*c^2*x + 3*c^4*x^2 + 4*c^4*x^2*Log[1 - E^(-2*ArcTanh[c*Sqrt[x]])]) - 6*a*c^4*x^2*Log[x] + 6*a*c^4*x^2*Log[1 - c^2*x])/x^2 - b*c^4*PolyLog[2, E^(-2*ArcTanh[c*Sqrt[x]])]`

3.42.3 Rubi [A] (verified)

Time = 1.22 (sec) , antiderivative size = 185, normalized size of antiderivative = 1.18, number of steps used = 15, number of rules used = 14, $\frac{\text{number of rules}}{\text{integrand size}} = 0.538$, Rules used = {7267, 2026, 6544, 6452, 264, 264, 219, 6544, 6452, 264, 219, 6550, 6494, 2897}

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.

$$\begin{aligned} & \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(1 - c^2x)} dx \\ & \quad \downarrow \text{7267} \\ & 2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^{5/2} - c^2x^{7/2}} d\sqrt{x} \\ & \quad \downarrow \text{2026} \\ & 2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^{5/2}(1 - c^2x)} d\sqrt{x} \\ & \quad \downarrow \text{6544} \end{aligned}$$

$$\begin{aligned}
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(1-c^2x)} d\sqrt{x} + \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{5/2}} d\sqrt{x} \right) \\
& \quad \downarrow 6452 \\
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(1-c^2x)} d\sqrt{x} + \frac{1}{4}bc \int \frac{1}{x^2(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) \\
& \quad \downarrow 264 \\
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(1-c^2x)} d\sqrt{x} + \frac{1}{4}bc \left(c^2 \int \frac{1}{x(1-c^2x)} d\sqrt{x} - \frac{1}{3x^{3/2}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) \\
& \quad \downarrow 264 \\
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(1-c^2x)} d\sqrt{x} + \frac{1}{4}bc \left(c^2 \left(c^2 \int \frac{1}{1-c^2x} d\sqrt{x} - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) \\
& \quad \downarrow 219 \\
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} + \frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) \right) \\
& \quad \downarrow 6544 \\
& 2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(1-c^2x)} d\sqrt{x} + \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}} d\sqrt{x} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} + \frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) \right) \\
& \quad \downarrow 6452 \\
& 2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(1-c^2x)} d\sqrt{x} + \frac{1}{2}bc \int \frac{1}{x(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} + \frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) \right) \\
& \quad \downarrow 264 \\
& 2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(1-c^2x)} d\sqrt{x} + \frac{1}{2}bc \left(c^2 \int \frac{1}{1-c^2x} d\sqrt{x} - \frac{1}{\sqrt{x}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} + \frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) \right) \\
& \quad \downarrow 219 \\
& 2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} + \frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} + \frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) \right)
\end{aligned}$$

$$\begin{aligned}
& \downarrow 6550 \\
& 2 \left(c^2 \left(c^2 \left(\int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{(\sqrt{xc} + 1)\sqrt{x}} d\sqrt{x} + \frac{(a + \operatorname{barctanh}(c\sqrt{x}))^2}{2b} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} + \frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) \right) \right) \right. \\
& \downarrow 6494 \\
& 2 \left(c^2 \left(c^2 \left(-bc \int \frac{\log \left(2 - \frac{2}{\sqrt{xc} + 1} \right)}{1 - c^2x} d\sqrt{x} + \frac{(a + \operatorname{barctanh}(c\sqrt{x}))^2}{2b} + \log \left(2 - \frac{2}{c\sqrt{x} + 1} \right) (a + \operatorname{barctanh}(c\sqrt{x})) \right) \right) \right. \\
& \downarrow 2897 \\
& 2 \left(c^2 \left(c^2 \left(\frac{(a + \operatorname{barctanh}(c\sqrt{x}))^2}{2b} + \log \left(2 - \frac{2}{c\sqrt{x} + 1} \right) (a + \operatorname{barctanh}(c\sqrt{x})) - \frac{1}{2}b \operatorname{PolyLog} \left(2, \frac{2}{\sqrt{xc} + 1} - 1 \right) \right) \right) \right)
\end{aligned}$$

input `Int[(a + b*ArcTanh[c*Sqrt[x]])/(x^3*(1 - c^2*x)),x]`

output `2*(-1/4*(a + b*ArcTanh[c*Sqrt[x]])/x^2 + (b*c*(-1/3*1/x^(3/2) + c^2*(-1/Sqrt[x]) + c*ArcTanh[c*Sqrt[x]]))/4 + c^2*(-1/2*(a + b*ArcTanh[c*Sqrt[x]])/x + (b*c*(-1/Sqrt[x]) + c*ArcTanh[c*Sqrt[x]]))/2 + c^2*((a + b*ArcTanh[c*Sqrt[x]])^2/(2*b) + (a + b*ArcTanh[c*Sqrt[x]])*Log[2 - 2/(1 + c*Sqrt[x])] - (b*PolyLog[2, -1 + 2/(1 + c*Sqrt[x])])/2))`

3.42.3.1 Defintions of rubi rules used

rule 219 `Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])`

rule 264 `Int[((c_.)*(x_)^(m_))*((a_) + (b_.)*(x_)^2)^(p_), x_Symbol] := Simp[(c*x)^(m + 1)*((a + b*x^2)^(p + 1)/(a*c*(m + 1))), x] - Simp[b*((m + 2*p + 3)/(a*c^2*(m + 1)) Int[(c*x)^(m + 2)*(a + b*x^2)^p, x], x] /; FreeQ[{a, b, c, p}, x] && LtQ[m, -1] && IntBinomialQ[a, b, c, 2, m, p, x]`

rule 2026 `Int[(Fx_.)*(Px_)^(p_.), x_Symbol] := With[{r = Expon[Px, x, Min]}, Int[x^(p*r)*ExpandToSum[Px/x^r, x]^p*Fx, x] /; IGtQ[r, 0]] /; PolyQ[Px, x] && IntegerQ[p] && !MonomialQ[Px, x] && (ILtQ[p, 0] || !PolyQ[u, x])`

rule 2897 `Int[Log[u_]*(Pq_)^(m_.), x_Symbol] := With[{C = FullSimplify[Pq^m*((1 - u)/D[u, x])]}, Simp[C*PolyLog[2, 1 - u], x] /; FreeQ[C, x] /; IntegerQ[m] && PolyQ[Pq, x] && RationalFunctionQ[u, x] && LeQ[RationalFunctionExponents[u, x][[2]], Expon[Pq, x]]`

rule 6452 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*(x_)^(m_.), x_Symbol] := Simp[x^(m + 1)*((a + b*ArcTanh[c*x^n])^p/(m + 1)), x] - Simp[b*c*n*(p/(m + 1)) Int[x^(m + n)*((a + b*ArcTanh[c*x^n])^(p - 1)/(1 - c^2*x^(2*n))), x], x] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1] && IntegerQ[m])) && NeQ[m, -1]`

rule 6494 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.))^(p_.)/((x_)*((d_) + (e_.)*(x_))), x_Symbol] := Simp[(a + b*ArcTanh[c*x])^p*(Log[2 - 2/(1 + e*(x/d))]/d), x] - Simp[b*c*(p/d) Int[(a + b*ArcTanh[c*x])^(p - 1)*(Log[2 - 2/(1 + e*(x/d))]/(1 - c^2*x^2)), x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 0] && EqQ[c^2*d^2 - e^2, 0]`

rule 6544 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.))^(p_.)*((f_.)*(x_)^(m_.))/((d_) + (e_.)*(x_)^2), x_Symbol] := Simp[1/d Int[(f*x)^m*(a + b*ArcTanh[c*x])^p, x], x] - Simp[e/(d*f^2) Int[(f*x)^(m + 2)*((a + b*ArcTanh[c*x])^p/(d + e*x^2)), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && GtQ[p, 0] && LtQ[m, -1]`

rule 6550 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.))^(p_.)/((x_)*((d_) + (e_.)*(x_)^2)), x_Symbol] := Simp[(a + b*ArcTanh[c*x])^(p + 1)/(b*d*(p + 1)), x] + Simp[1/d Int[(a + b*ArcTanh[c*x])^p/(x*(1 + c*x)), x], x] /; FreeQ[{a, b, c, d, e}, x] && EqQ[c^2*d + e, 0] && GtQ[p, 0]`

rule 7267 `Int[u_, x_Symbol] := With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Simp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2])], x] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]]`

3.42.4 Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 272 vs. $2(134) = 268$.

Time = 1.13 (sec) , antiderivative size = 273, normalized size of antiderivative = 1.74

method	result
parts	$-a\left(c^4 \ln(c^2x - 1) + \frac{1}{2x^2} + \frac{c^2}{x} - c^4 \ln(x)\right) - 2bc^4\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{4c^4x^2} + \frac{\operatorname{arctanh}(c\sqrt{x})}{2c^2x} - \ln(c\sqrt{x})\right)$
derivativedivides	$-2c^4\left(a\left(\frac{1}{4c^4x^2} + \frac{1}{2c^2x} - \ln(c\sqrt{x}) + \frac{\ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)}{2}\right) + b\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{4c^4x^2} + \frac{\operatorname{arctanh}(c\sqrt{x})}{2c^2x}\right)\right)$
default	$-2c^4\left(a\left(\frac{1}{4c^4x^2} + \frac{1}{2c^2x} - \ln(c\sqrt{x}) + \frac{\ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)}{2}\right) + b\left(\frac{\operatorname{arctanh}(c\sqrt{x})}{4c^4x^2} + \frac{\operatorname{arctanh}(c\sqrt{x})}{2c^2x}\right)\right)$

input `int((a+b*arctanh(c*x^(1/2)))/x^3/(-c^2*x+1),x,method=_RETURNVERBOSE)`

output
$$\begin{aligned} & -a(c^4 \ln(c^2x - 1) + 1/2/x^2 + c^2/x - c^4 \ln(x)) - 2*b*c^4*(1/4/c^4/x^2*arctanh(c*x^(1/2)) \\ & + 1/2/c^2/x*arctanh(c*x^(1/2)) - \ln(c*x^(1/2))*arctanh(c*x^(1/2)) + 1/2*arctanh(c*x^(1/2))*\ln(1+c*x^(1/2)) \\ & + 1/2*arctanh(c*x^(1/2))*\ln(c*x^(1/2) - 1) + 1/2*dilog(1+c*x^(1/2)) + 1/2*\ln(c*x^(1/2))*\ln(1+c*x^(1/2)) \\ & + 1/2*dilog(c*x^(1/2)) + 1/8*\ln(c*x^(1/2) - 1)^2 - 1/2*dilog(1/2*c*x^(1/2) + 1/2) - 1/4*\ln(c*x^(1/2) - 1) \\ & *\ln(1/2*c*x^(1/2) + 1/2) - 1/8*\ln(1+c*x^(1/2))^2 + 1/4*(\ln(1+c*x^(1/2)) - \ln(1/2*c*x^(1/2) + 1/2)) \\ & *\ln(-1/2*c*x^(1/2) + 1/2) + 1/12/c^3/x^(3/2) + 3/4/c/x^(1/2) - 3/8*\ln(1+c*x^(1/2)) + 3/8*\ln(c*x^(1/2) - 1) \end{aligned}$$

3.42.5 Fracas [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(1 - c^2x)} dx = \int -\frac{b \operatorname{arctanh}(c\sqrt{x}) + a}{(c^2x - 1)x^3} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^3/(-c^2*x+1),x, algorithm="fricas")`

output `integral(-(b*arctanh(c*sqrt(x)) + a)/(c^2*x^4 - x^3), x)`

3.42.6 Sympy [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(1-c^2x)} dx = - \int \frac{a}{c^2x^4 - x^3} dx - \int \frac{b \operatorname{atanh}(c\sqrt{x})}{c^2x^4 - x^3} dx$$

```
input integrate((a+b*atanh(c*x**(1/2)))/x**3/(-c**2*x+1),x)
```

```
output -Integral(a/(c**2*x**4 - x**3), x) - Integral(b*atanh(c*sqrt(x))/(c**2*x**4 - x**3), x)
```

3.42.7 Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 291 vs. 2(130) = 260.

Time = 0.35 (sec) , antiderivative size = 291, normalized size of antiderivative = 1.85

$$\begin{aligned} \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(1-c^2x)} dx = & - \left(\log(c\sqrt{x} + 1) \log\left(-\frac{1}{2}c\sqrt{x} + \frac{1}{2}\right) + \operatorname{Li}_2\left(\frac{1}{2}c\sqrt{x} + \frac{1}{2}\right) \right) bc^4 \\ & - (\log(c\sqrt{x}) \log(-c\sqrt{x} + 1) + \operatorname{Li}_2(-c\sqrt{x} + 1)) bc^4 \\ & + (\log(c\sqrt{x} + 1) \log(-c\sqrt{x}) + \operatorname{Li}_2(c\sqrt{x} + 1)) bc^4 \\ & + \frac{3}{4} bc^4 \log(c\sqrt{x} + 1) - \frac{3}{4} bc^4 \log(c\sqrt{x} - 1) \\ & - \frac{1}{2} \left(2c^4 \log(c\sqrt{x} + 1) + 2c^4 \log(c\sqrt{x} - 1) - 2c^4 \log(x) + \frac{2c^2x + 1}{x^2} \right) a \\ & - \frac{3bc^4x^2 \log(c\sqrt{x} + 1)^2 - 3bc^4x^2 \log(-c\sqrt{x} + 1)^2 + 18bc^3x^{\frac{3}{2}} + 2bc\sqrt{x} + 3(2bc^2x + b) \log(c\sqrt{x} + 1)}{12x^2} \end{aligned}$$

```
input integrate((a+b*arctanh(c*x^(1/2)))/x^3/(-c^2*x+1),x, algorithm="maxima")
```

```
output -(log(c*sqrt(x) + 1)*log(-1/2*c*sqrt(x) + 1/2) + dilog(1/2*c*sqrt(x) + 1/2))
)*b*c^4 - (log(c*sqrt(x))*log(-c*sqrt(x) + 1) + dilog(-c*sqrt(x) + 1))*b*c^4
+ (log(c*sqrt(x) + 1)*log(-c*sqrt(x)) + dilog(c*sqrt(x) + 1))*b*c^4 +
3/4*b*c^4*log(c*sqrt(x) + 1) - 3/4*b*c^4*log(c*sqrt(x) - 1) - 1/2*(2*c^4*log(c*sqrt(x) + 1)
+ 2*c^4*log(c*sqrt(x) - 1) - 2*c^4*log(x) + (2*c^2*x + 1)/x^2)*a - 1/12*(3*b*c^4*x^2*log(c*sqrt(x) + 1)^2
- 3*b*c^4*x^2*log(-c*sqrt(x) + 1)^2 + 18*b*c^3*x^(3/2) + 2*b*c*sqrt(x) + 3*(2*b*c^2*x + b)*log(c*sqrt(x) + 1)
- 3*(2*b*c^4*x^2*log(c*sqrt(x) + 1) + 2*b*c^2*x + b)*log(-c*sqrt(x) + 1))/x^2
```

3.42. $\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(1-c^2x)} dx$

3.42.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(1-c^2x)} dx = \int -\frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(c^2x-1)x^3} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^3/(-c^2*x+1),x, algorithm="giac")`

output `integrate(-(b*arctanh(c*sqrt(x)) + a)/((c^2*x - 1)*x^3), x)`

3.42.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(1-c^2x)} dx = -\int \frac{a + b \operatorname{atanh}(c\sqrt{x})}{x^3(c^2x-1)} dx$$

input `int(-(a + b*atanh(c*x^(1/2)))/(x^3*(c^2*x - 1)),x)`

output `-int((a + b*atanh(c*x^(1/2)))/(x^3*(c^2*x - 1)), x)`

3.43 $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x^4(1-c^2x)} dx$

3.43.1	Optimal result	334
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3.43.1 Optimal result

Integrand size = 26, antiderivative size = 192

$$\int \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{x^4(1 - c^2x)} dx = -\frac{bc}{15x^{5/2}} - \frac{5bc^3}{18x^{3/2}} - \frac{11bc^5}{6\sqrt{x}} + \frac{11}{6}bc^6\operatorname{arctanh}(c\sqrt{x})$$

$$- \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{3x^3} - \frac{c^2(a + b\operatorname{arctanh}(c\sqrt{x}))}{2x^2}$$

$$- \frac{c^4(a + b\operatorname{arctanh}(c\sqrt{x}))}{x} + \frac{c^6(a + b\operatorname{arctanh}(c\sqrt{x}))^2}{b}$$

$$+ 2c^6(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(2 - \frac{2}{1 + c\sqrt{x}}\right)$$

$$- bc^6 \operatorname{PolyLog}\left(2, -1 + \frac{2}{1 + c\sqrt{x}}\right)$$

output

```
-1/15*b*c/x^(5/2)-5/18*b*c^3/x^(3/2)+11/6*b*c^6*arctanh(c*x^(1/2))+1/3*(-a
-b*arctanh(c*x^(1/2)))/x^3-1/2*c^2*(a+b*arctanh(c*x^(1/2)))/x^2-c^4*(a+b*a
rctanh(c*x^(1/2)))/x+c^6*(a+b*arctanh(c*x^(1/2)))^2/b+2*c^6*(a+b*arctanh(c
*x^(1/2)))*ln(2-2/(1+c*x^(1/2)))-b*c^6*polylog(2,-1+2/(1+c*x^(1/2)))-11/6*
b*c^5/x^(1/2)
```

3.43.2 Mathematica [A] (verified)

Time = 0.67 (sec) , antiderivative size = 187, normalized size of antiderivative = 0.97

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^4(1-c^2x)} dx =$$

$$\frac{30a + 6bc\sqrt{x} + 45ac^2x + 25bc^3x^{3/2} + 90ac^4x^2 + 165bc^5x^{5/2} - 90bc^6x^3 \operatorname{arctanh}(c\sqrt{x})^2 - 15b \operatorname{arctanh}(c\sqrt{x})}{x^3} - bc^6 \operatorname{PolyLog}\left(2, e^{-2 \operatorname{arctanh}(c\sqrt{x})}\right)$$

input `Integrate[(a + b*ArcTanh[c*Sqrt[x]])/(x^4*(1 - c^2*x)),x]`

output `-1/90*(30*a + 6*b*c*Sqrt[x] + 45*a*c^2*x + 25*b*c^3*x^(3/2) + 90*a*c^4*x^2 + 165*b*c^5*x^(5/2) - 90*b*c^6*x^3*ArcTanh[c*Sqrt[x]]^2 - 15*b*ArcTanh[c*Sqrt[x]]*(-2 - 3*c^2*x - 6*c^4*x^2 + 11*c^6*x^3 + 12*c^6*x^3*Log[1 - E^(-2*ArcTanh[c*Sqrt[x]])]) - 90*a*c^6*x^3*Log[x] + 90*a*c^6*x^3*Log[1 - c^2*x])/x^3 - b*c^6*PolyLog[2, E^(-2*ArcTanh[c*Sqrt[x]])]`

3.43.3 Rubi [A] (verified)

Time = 1.69 (sec) , antiderivative size = 261, normalized size of antiderivative = 1.36, number of steps used = 21, number of rules used = 20, $\frac{\text{number of rules}}{\text{integrand size}} = 0.769$, Rules used = {7267, 2026, 6544, 6452, 264, 264, 264, 219, 6544, 6452, 264, 264, 219, 6544, 6452, 264, 219, 6550, 6494, 2897}

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.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^4(1-c^2x)} dx$$

$$\downarrow \text{7267}$$

$$2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^{7/2} - c^2x^{9/2}} d\sqrt{x}$$

$$\downarrow \text{2026}$$

$$2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^{7/2}(1-c^2x)} d\sqrt{x}$$

$$\downarrow \text{6544}$$

3.43. $\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^4(1-c^2x)} dx$

$$\begin{aligned}
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{5/2}(1-c^2x)} d\sqrt{x} + \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{7/2}} d\sqrt{x} \right) \\
& \quad \downarrow 6452 \\
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{5/2}(1-c^2x)} d\sqrt{x} + \frac{1}{6} bc \int \frac{1}{x^3(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{6x^3} \right) \\
& \quad \downarrow 264 \\
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{5/2}(1-c^2x)} d\sqrt{x} + \frac{1}{6} bc \left(c^2 \int \frac{1}{x^2(1-c^2x)} d\sqrt{x} - \frac{1}{5x^{5/2}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{6x^3} \right) \\
& \quad \downarrow 264 \\
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{5/2}(1-c^2x)} d\sqrt{x} + \frac{1}{6} bc \left(c^2 \left(c^2 \int \frac{1}{x(1-c^2x)} d\sqrt{x} - \frac{1}{3x^{3/2}} \right) - \frac{1}{5x^{5/2}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{6x^3} \right) \\
& \quad \downarrow 264 \\
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{5/2}(1-c^2x)} d\sqrt{x} + \frac{1}{6} bc \left(c^2 \left(c^2 \left(c^2 \int \frac{1}{1-c^2x} d\sqrt{x} - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{1}{5x^{5/2}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{6x^3} \right) \\
& \quad \downarrow 219 \\
& 2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{5/2}(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{6x^3} + \frac{1}{6} bc \left(c^2 \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{1}{5x^{5/2}} \right) \right) \\
& \quad \downarrow 6544 \\
& 2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(1-c^2x)} d\sqrt{x} + \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{5/2}} d\sqrt{x} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{6x^3} + \frac{1}{6} bc \left(c^2 \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{1}{5x^{5/2}} \right) \right) \\
& \quad \downarrow 6452 \\
& 2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(1-c^2x)} d\sqrt{x} + \frac{1}{4} bc \int \frac{1}{x^2(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{6x^3} + \frac{1}{6} bc \left(c^2 \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{1}{5x^{5/2}} \right) \right) \\
& \quad \downarrow 264 \\
& 2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(1-c^2x)} d\sqrt{x} + \frac{1}{4} bc \left(c^2 \int \frac{1}{x(1-c^2x)} d\sqrt{x} - \frac{1}{3x^{3/2}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{6x^3} + \frac{1}{6} bc \left(c^2 \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{1}{5x^{5/2}} \right) \right)
\end{aligned}$$

↓ 264

$$2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(1-c^2x)} d\sqrt{x} + \frac{1}{4}bc \left(c^2 \left(c^2 \int \frac{1}{1-c^2x} d\sqrt{x} - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right)$$

↓ 219

$$2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} + \frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right)$$

↓ 6544

$$2 \left(c^2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(1-c^2x)} d\sqrt{x} + \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}} d\sqrt{x} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} + \frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right)$$

↓ 6452

$$2 \left(c^2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(1-c^2x)} d\sqrt{x} + \frac{1}{2}bc \int \frac{1}{x(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right)$$

↓ 264

$$2 \left(c^2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(1-c^2x)} d\sqrt{x} + \frac{1}{2}bc \left(c^2 \int \frac{1}{1-c^2x} d\sqrt{x} - \frac{1}{\sqrt{x}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right)$$

↓ 219

$$2 \left(c^2 \left(c^2 \left(c^2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} + \frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right)$$

↓ 6550

$$2 \left(c^2 \left(c^2 \left(c^2 \left(\int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{(\sqrt{xc}+1)\sqrt{x}} d\sqrt{x} + \frac{(a + \operatorname{barctanh}(c\sqrt{x}))^2}{2b} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x} + \frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right)$$

↓ 6494

$$2 \left(c^2 \left(c^2 \left(c^2 \left(-bc \int \frac{\log \left(2 - \frac{2}{\sqrt{xc}+1} \right)}{1-c^2x} d\sqrt{x} + \frac{(a + \operatorname{barctanh}(c\sqrt{x}))^2}{2b} + \log \left(2 - \frac{2}{c\sqrt{x}+1} \right) (a + \operatorname{barctanh}(c\sqrt{x})) \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2} \right)$$

↓ 2897

$$2 \left(c^2 \left(c^2 \left(\frac{(a + b \operatorname{arctanh}(c\sqrt{x}))^2}{2b} + \log \left(2 - \frac{2}{c\sqrt{x} + 1} \right) (a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2} b \operatorname{PolyLog} \left(2, \frac{2}{\sqrt{xc} + 1} - 1 \right) \right) \right) \right)$$

input `Int[(a + b*ArcTanh[c*Sqrt[x]])/(x^4*(1 - c^2*x)),x]`

output `2*(-1/6*(a + b*ArcTanh[c*Sqrt[x]])/x^3 + (b*c*(-1/5*1/x^(5/2) + c^2*(-1/3*1/x^(3/2) + c^2*(-1/Sqrt[x]) + c*ArcTanh[c*Sqrt[x]])))/6 + c^2*(-1/4*(a + b*ArcTanh[c*Sqrt[x]])/x^2 + (b*c*(-1/3*1/x^(3/2) + c^2*(-1/Sqrt[x]) + c*ArcTanh[c*Sqrt[x]])))/4 + c^2*(-1/2*(a + b*ArcTanh[c*Sqrt[x]])/x + (b*c*(-1/Sqrt[x]) + c*ArcTanh[c*Sqrt[x]]))/2 + c^2*((a + b*ArcTanh[c*Sqrt[x]])^2/(2*b) + (a + b*ArcTanh[c*Sqrt[x]])*Log[2 - 2/(1 + c*Sqrt[x])] - (b*PolyLog[2, -1 + 2/(1 + c*Sqrt[x])])/2))`

3.43.3.1 Defintions of rubi rules used

rule 219 `Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])`

rule 264 `Int[((c_)*(x_)^(m_))*((a_) + (b_)*(x_)^2)^(p_), x_Symbol] := Simp[(c*x)^(m + 1)*((a + b*x^2)^(p + 1)/(a*c*(m + 1))), x] - Simp[b*((m + 2*p + 3)/(a*c^2*(m + 1)) Int[(c*x)^(m + 2)*(a + b*x^2)^p, x], x] /; FreeQ[{a, b, c, p}, x] && LtQ[m, -1] && IntBinomialQ[a, b, c, 2, m, p, x]`

rule 2026 `Int[(F_x_)*(P_x_)^(p_), x_Symbol] := With[{r = Expon[P_x, x, Min]}, Int[x^(p*r)*ExpandToSum[P_x/x^r, x]^p*F_x, x] /; IGtQ[r, 0] /; PolyQ[P_x, x] && IntegerQ[p] && !MonomialQ[P_x, x] && (ILtQ[p, 0] || !PolyQ[u, x])`

rule 2897 `Int[Log[u_]*(P_q_)^(m_), x_Symbol] := With[{C = FullSimplify[P_q^m*((1 - u)/D[u, x])]}, Simp[C*PolyLog[2, 1 - u], x] /; FreeQ[C, x] /; IntegerQ[m] && PolyQ[P_q, x] && RationalFunctionQ[u, x] && LeQ[RationalFunctionExponents[u, x][[2]], Expon[P_q, x]]`

```
rule 6452 Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*(x_)^(m_.), x_Symbol] :
> Simp[x^(m + 1)*((a + b*ArcTanh[c*x^n])^p/(m + 1)), x] - Simp[b*c*n*(p/(m
+ 1)) Int[x^(m + n)*((a + b*ArcTanh[c*x^n])^(p - 1)/(1 - c^2*x^(2*n))), x
], x] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1
] && IntegerQ[m])) && NeQ[m, -1]
```

```
rule 6494 Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)/((x_)*((d_) + (e_.)*(x_))), x
_Symbol] := Simp[(a + b*ArcTanh[c*x])^p*(Log[2 - 2/(1 + e*(x/d))]/d), x] -
Simp[b*c*(p/d) Int[(a + b*ArcTanh[c*x])^(p - 1)*(Log[2 - 2/(1 + e*(x/d))
]/(1 - c^2*x^2)), x], x] /; FreeQ[{a, b, c, d, e}, x] && IGtQ[p, 0] && EqQ[c
^2*d^2 - e^2, 0]
```

```
rule 6544 Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)*((f_.)*(x_)^(m_))/((d_) + (
e_.)*(x_)^2), x_Symbol] := Simp[1/d Int[(f*x)^m*(a + b*ArcTanh[c*x])^p, x
], x] - Simp[e/(d*f^2) Int[(f*x)^(m + 2)*((a + b*ArcTanh[c*x])^p/(d + e*x
^2)), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && GtQ[p, 0] && LtQ[m, -1]
```

```
rule 6550 Int[((a_.) + ArcTanh[(c_.)*(x_)]*(b_.))^(p_.)/((x_)*((d_) + (e_.)*(x_)^2)),
x_Symbol] := Simp[(a + b*ArcTanh[c*x])^(p + 1)/(b*d*(p + 1)), x] + Simp[1/
d Int[(a + b*ArcTanh[c*x])^p/(x*(1 + c*x)), x], x] /; FreeQ[{a, b, c, d,
e}, x] && EqQ[c^2*d + e, 0] && GtQ[p, 0]
```

```
rule 7267 Int[u_, x_Symbol] := With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Si
mp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2])]], x
] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]
```

3.43.4 Maple [A] (verified)

Time = 1.21 (sec) , antiderivative size = 303, normalized size of antiderivative = 1.58

method	result
parts	$-a \left(c^6 \ln(c^2 x - 1) + \frac{1}{3x^3} + \frac{c^2}{2x^2} + \frac{c^4}{x} - c^6 \ln(x) \right) - 2b c^6 \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{6c^6 x^3} + \frac{\operatorname{arctanh}(c\sqrt{x})}{4c^4 x^2} + \operatorname{arctanh}(c\sqrt{x}) \right)$
derivativedivides	$-2c^6 \left(a \left(\frac{1}{6c^6 x^3} + \frac{1}{4c^4 x^2} + \frac{1}{2c^2 x} - \ln(c\sqrt{x}) + \frac{\ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)}{2} \right) + b \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{6c^6 x^3} + \operatorname{arctanh}(c\sqrt{x}) \right) \right)$
default	$-2c^6 \left(a \left(\frac{1}{6c^6 x^3} + \frac{1}{4c^4 x^2} + \frac{1}{2c^2 x} - \ln(c\sqrt{x}) + \frac{\ln(1+c\sqrt{x})}{2} + \frac{\ln(c\sqrt{x}-1)}{2} \right) + b \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{6c^6 x^3} + \operatorname{arctanh}(c\sqrt{x}) \right) \right)$

input `int((a+b*arctanh(c*x^(1/2)))/x^4/(-c^2*x+1),x,method=_RETURNVERBOSE)`

output `-a*(c^6*ln(c^2*x-1)+1/3/x^3+1/2*c^2/x^2+c^4/x-c^6*ln(x))-2*b*c^6*(1/6*arctanh(c*x^(1/2))/c^6/x^3+1/4/c^4/x^2*arctanh(c*x^(1/2))+1/2/c^2/x*arctanh(c*x^(1/2))-ln(c*x^(1/2))*arctanh(c*x^(1/2))+1/2*arctanh(c*x^(1/2))*ln(1+c*x^(1/2))+1/2*arctanh(c*x^(1/2))*ln(c*x^(1/2)-1)+1/2*dilog(1+c*x^(1/2))+1/2*ln(c*x^(1/2))*ln(1+c*x^(1/2))+1/2*dilog(c*x^(1/2))+1/8*ln(c*x^(1/2)-1)^2-1/2*dilog(1/2*c*x^(1/2)+1/2)-1/4*ln(c*x^(1/2)-1)*ln(1/2*c*x^(1/2)+1/2)-1/8*ln(1+c*x^(1/2))^2+1/4*(ln(1+c*x^(1/2))-ln(1/2*c*x^(1/2)+1/2))*ln(-1/2*c*x^(1/2)+1/2)+1/30/c^5/x^(5/2)+5/36/c^3/x^(3/2)+11/12/c/x^(1/2)-11/24*ln(1+c*x^(1/2))+11/24*ln(c*x^(1/2)-1))`

3.43.5 Fricas [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^4(1 - c^2 x)} dx = \int -\frac{b \operatorname{arctanh}(c\sqrt{x}) + a}{(c^2 x - 1)x^4} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^4/(-c^2*x+1),x, algorithm="fricas")`

output `integral(-(b*arctanh(c*sqrt(x)) + a)/(c^2*x^5 - x^4), x)`

3.43.6 Sympy [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^4(1-c^2x)} dx = - \int \frac{a}{c^2x^5 - x^4} dx - \int \frac{b \operatorname{atanh}(c\sqrt{x})}{c^2x^5 - x^4} dx$$

input `integrate((a+b*atanh(c*x**(1/2)))/x**4/(-c**2*x+1),x)`

output `-Integral(a/(c**2*x**5 - x**4), x) - Integral(b*atanh(c*sqrt(x))/(c**2*x**5 - x**4), x)`

3.43.7 Maxima [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 330 vs. $2(157) = 314$.

Time = 0.35 (sec) , antiderivative size = 330, normalized size of antiderivative = 1.72

$$\begin{aligned} \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^4(1-c^2x)} dx = & - \left(\log(c\sqrt{x} + 1) \log\left(-\frac{1}{2}c\sqrt{x} + \frac{1}{2}\right) + \operatorname{Li}_2\left(\frac{1}{2}c\sqrt{x} + \frac{1}{2}\right) \right) bc^6 \\ & - (\log(c\sqrt{x}) \log(-c\sqrt{x} + 1) + \operatorname{Li}_2(-c\sqrt{x} + 1)) bc^6 \\ & + (\log(c\sqrt{x} + 1) \log(-c\sqrt{x}) + \operatorname{Li}_2(c\sqrt{x} + 1)) bc^6 \\ & + \frac{11}{12} bc^6 \log(c\sqrt{x} + 1) - \frac{11}{12} bc^6 \log(c\sqrt{x} - 1) \\ & - \frac{1}{6} \left(6c^6 \log(c\sqrt{x} + 1) + 6c^6 \log(c\sqrt{x} - 1) - 6c^6 \log(x) + \frac{6c^4x^2 + 3c^2x + 2}{x^3} \right) a \\ & - \frac{45bc^6x^3 \log(c\sqrt{x} + 1)^2 - 45bc^6x^3 \log(-c\sqrt{x} + 1)^2 + 330bc^5x^{\frac{5}{2}} + 50bc^3x^{\frac{3}{2}} + 12bc\sqrt{x} + 15(6bc^4x^2 + 180x^3)}{180x^3} \end{aligned}$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^4/(-c^2*x+1),x, algorithm="maxima")`

output `-(log(c*sqrt(x) + 1)*log(-1/2*c*sqrt(x) + 1/2) + dilog(1/2*c*sqrt(x) + 1/2))*b*c^6 - (log(c*sqrt(x))*log(-c*sqrt(x) + 1) + dilog(-c*sqrt(x) + 1))*b*c^6 + (log(c*sqrt(x) + 1)*log(-c*sqrt(x)) + dilog(c*sqrt(x) + 1))*b*c^6 + 11/12*b*c^6*log(c*sqrt(x) + 1) - 11/12*b*c^6*log(c*sqrt(x) - 1) - 1/6*(6*c^6*log(c*sqrt(x) + 1) + 6*c^6*log(c*sqrt(x) - 1) - 6*c^6*log(x) + (6*c^4*x^2 + 3*c^2*x + 2)/x^3)*a - 1/180*(45*b*c^6*x^3*log(c*sqrt(x) + 1)^2 - 45*b*c^6*x^3*log(-c*sqrt(x) + 1)^2 + 330*b*c^5*x^(5/2) + 50*b*c^3*x^(3/2) + 12*b*c*sqrt(x) + 15*(6*b*c^4*x^2 + 3*b*c^2*x + 2*b)*log(c*sqrt(x) + 1) - 15*(6*b*c^6*x^3*log(c*sqrt(x) + 1) + 6*b*c^4*x^2 + 3*b*c^2*x + 2*b)*log(-c*sqrt(x) + 1))/x^3`

3.43. $\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^4(1-c^2x)} dx$

3.43.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^4(1 - c^2x)} dx = \int -\frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(c^2x - 1)x^4} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^4/(-c^2*x+1),x, algorithm="giac")`

output `integrate(-(b*arctanh(c*sqrt(x)) + a)/((c^2*x - 1)*x^4), x)`

3.43.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^4(1 - c^2x)} dx = - \int \frac{a + b \operatorname{atanh}(c\sqrt{x})}{x^4(c^2x - 1)} dx$$

input `int(-(a + b*atanh(c*x^(1/2)))/(x^4*(c^2*x - 1)),x)`

output `-int((a + b*atanh(c*x^(1/2)))/(x^4*(c^2*x - 1)), x)`

$$3.44 \quad \int \frac{x^2 \left(a + b \operatorname{arctanh}(c\sqrt{x}) \right)}{d + ex} dx$$

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3.44.1 Optimal result

Integrand size = 23, antiderivative size = 460

$$\begin{aligned} \int \frac{x^2 (a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = & -\frac{bd\sqrt{x}}{ce^2} + \frac{b\sqrt{x}}{2c^3e} + \frac{bx^{3/2}}{6ce} + \frac{bd \operatorname{arctanh}(c\sqrt{x})}{c^2e^2} - \frac{b \operatorname{arctanh}(c\sqrt{x})}{2c^4e} \\ & - \frac{dx(a + b \operatorname{arctanh}(c\sqrt{x}))}{e^2} + \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{2e} \\ & - \frac{2d^2(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2}{1+c\sqrt{x}}\right)}{e^3} \\ & + \frac{d^2(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{e^3} \\ & + \frac{d^2(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{e^3} \\ & + \frac{bd^2 \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+c\sqrt{x}}\right)}{e^3} \\ & - \frac{bd^2 \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{2e^3} \\ & - \frac{bd^2 \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{2e^3} \end{aligned}$$

3.44. $\int \frac{x^2 (a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx$

output $1/6*b*x^{(3/2)}/c/e+b*d*\arctanh(c*x^{(1/2)})/c^2/e^2-1/2*b*\arctanh(c*x^{(1/2)})/c^4/e-d*x*(a+b*\arctanh(c*x^{(1/2)}))/e^2+1/2*x^2*(a+b*\arctanh(c*x^{(1/2)}))/e-2*d^2*(a+b*\arctanh(c*x^{(1/2)}))*\ln(2/(1+c*x^{(1/2)}))/e^3+d^2*(a+b*\arctanh(c*x^{(1/2)}))*\ln(2*c*((-d)^{(1/2)}-e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}-e^{(1/2)})/(1+c*x^{(1/2)}))/e^3+d^2*(a+b*\arctanh(c*x^{(1/2)}))*\ln(2*c*((-d)^{(1/2)}+e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}+e^{(1/2)})/(1+c*x^{(1/2)}))/e^3+b*d^2*\text{polylog}(2,1-2/(1+c*x^{(1/2)}))/e^3-1/2*b*d^2*\text{polylog}(2,1-2*c*((-d)^{(1/2)}-e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}-e^{(1/2)})/(1+c*x^{(1/2)}))/e^3-1/2*b*d^2*\text{polylog}(2,1-2*c*((-d)^{(1/2)}+e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}+e^{(1/2)})/(1+c*x^{(1/2)}))/e^3-b*d*x^{(1/2)}/c/e^2+1/2*b*x^{(1/2)}/c^3/e$

3.44.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 2.11 (sec) , antiderivative size = 558, normalized size of antiderivative = 1.21

$$\int \frac{x^2(a + b\operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx$$

$$= \frac{-6adex + 3ae^2x^2 + 6ad^2 \log(d + ex) + \frac{b \left(2ce(-3c^2d+2e)\sqrt{x}+ce^2\sqrt{x}(-1+c^2x)-6(c^2d-e)e(-1+c^2x)\operatorname{arctanh}(c\sqrt{x})+3e^2(-1+c^2x) \right)}{c^2d+e}}{c^2d+e}$$

input `Integrate[(x^2*(a + b*ArcTanh[c*Sqrt[x]]))/(d + e*x),x]`

output $(-6*a*d*e*x + 3*a*e^2*x^2 + 6*a*d^2*\text{Log}[d + e*x] + (b*(2*c*e*(-3*c^2*d + 2*e)*\text{Sqrt}[x] + c*e^2*\text{Sqrt}[x]*(-1 + c^2*x) - 6*(c^2*d - e)*e*(-1 + c^2*x)*\text{ArcTanh}[c*\text{Sqrt}[x]] + 3*e^2*(-1 + c^2*x)^2*\text{ArcTanh}[c*\text{Sqrt}[x]] - 6*c^4*d^2*(\text{ArcTanh}[c*\text{Sqrt}[x]]*(\text{ArcTanh}[c*\text{Sqrt}[x]] + 2*\text{Log}[1 + E^{(-2*\text{ArcTanh}[c*\text{Sqrt}[x]])}]) - \text{PolyLog}[2, -E^{(-2*\text{ArcTanh}[c*\text{Sqrt}[x]])}]) + 3*c^4*d^2*(2*\text{ArcTanh}[c*\text{Sqrt}[x]]^2 - (4*I)*\text{ArcSin}[\text{Sqrt}[(c^2*d)/(c^2*d + e)]]*\text{ArcTanh}[(c*e*\text{Sqrt}[x])/(\text{Sqrt}[-(c^2*d*e)])] + 2*((-I)*\text{ArcSin}[\text{Sqrt}[(c^2*d)/(c^2*d + e)]] + \text{ArcTanh}[c*\text{Sqrt}[x]])*\text{Log}[(-2*\text{Sqrt}[-(c^2*d*e)] + e*(-1 + E^{(2*\text{ArcTanh}[c*\text{Sqrt}[x]])}) + c^2*d*(1 + E^{(2*\text{ArcTanh}[c*\text{Sqrt}[x]])})]/((c^2*d + e)*E^{(2*\text{ArcTanh}[c*\text{Sqrt}[x]])})] + 2*(I*\text{ArcSin}[\text{Sqrt}[(c^2*d)/(c^2*d + e)]] + \text{ArcTanh}[c*\text{Sqrt}[x]])*\text{Log}[(2*\text{Sqrt}[-(c^2*d*e)] + e*(-1 + E^{(2*\text{ArcTanh}[c*\text{Sqrt}[x]])}) + c^2*d*(1 + E^{(2*\text{ArcTanh}[c*\text{Sqrt}[x]])})]/((c^2*d + e)*E^{(2*\text{ArcTanh}[c*\text{Sqrt}[x]])})] - \text{PolyLog}[2, -(c^2*d + e - 2*\text{Sqrt}[-(c^2*d*e)])/((c^2*d + e)*E^{(2*\text{ArcTanh}[c*\text{Sqrt}[x]])})] - \text{PolyLog}[2, -(c^2*d + e + 2*\text{Sqrt}[-(c^2*d*e)])/((c^2*d + e)*E^{(2*\text{ArcTanh}[c*\text{Sqrt}[x]])})])))/c^4/(6*e^3)$

$$3.44. \int \frac{x^2(a+b\operatorname{arctanh}(c\sqrt{x}))}{d+ex} dx$$

3.44.3 Rubi [A] (verified)

Time = 1.40 (sec) , antiderivative size = 459, normalized size of antiderivative = 1.00, number of steps used = 12, number of rules used = 11, $\frac{\text{number of rules}}{\text{integrand size}} = 0.478$, Rules used = {7267, 6542, 6452, 254, 2009, 6542, 6452, 262, 219, 6606, 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.

$$\begin{aligned}
 & \int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx \\
 & \quad \downarrow \text{7267} \\
 & 2 \int \frac{x^{5/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x} \\
 & \quad \downarrow \text{6542} \\
 & 2 \left(\frac{\int x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x})) d\sqrt{x}}{e} - \frac{d \int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x}}{e} \right) \\
 & \quad \downarrow \text{6452} \\
 & 2 \left(\frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \int \frac{x^2}{1 - c^2x} d\sqrt{x}}{e} - \frac{d \int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x}}{e} \right) \\
 & \quad \downarrow \text{254} \\
 & 2 \left(\frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \int \left(-\frac{x}{c^2} + \frac{1}{c^4(1 - c^2x)} - \frac{1}{c^4} \right) d\sqrt{x}}{e} - \frac{d \int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x}}{e} \right) \\
 & \quad \downarrow \text{2009} \\
 & 2 \left(\frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{e} - \frac{d \int \frac{x^{3/2}(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x}}{e} \right) \\
 & \quad \downarrow \text{6542}
 \end{aligned}$$

3.44. $\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx$

$$2 \left(\frac{\frac{1}{4}x^2(a + b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{e} - d \left(\frac{\int \sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))d\sqrt{x}}{e} - d \int \frac{\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{d+ex} dx \right) \right)$$

↓ 6452

$$2 \left(\frac{\frac{1}{4}x^2(a + b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{e} - d \left(\frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \int \frac{x}{1-c^2x} d\sqrt{x}}{e} - d \int \frac{\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{d+ex} dx \right) \right)$$

↓ 262

$$2 \left(\frac{\frac{1}{4}x^2(a + b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{e} - d \left(\frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\int \frac{1}{1-c^2x} d\sqrt{x}}{c^2} - \frac{\sqrt{x}}{c^2} \right)}{e} - d \int \frac{\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{d+ex} dx \right) \right)$$

↓ 219

$$2 \left(\frac{\frac{1}{4}x^2(a + b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{e} - d \left(\frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{e} - d \int \frac{\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{d+ex} dx \right) \right)$$

↓ 6606

$$2 \left(\frac{\frac{1}{4}x^2(a + b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{e} - d \left(\frac{\frac{1}{2}x(a+b\operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{e} - d \int \frac{\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{d+ex} dx \right) \right)$$

↓ 2009

$$2 \left(\frac{\frac{1}{4}x^2(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{4}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^5} - \frac{\sqrt{x}}{c^4} - \frac{x^{3/2}}{3c^2} \right)}{e} \right) - d \left(\frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{e} \right)$$

input `Int[(x^2*(a + b*ArcTanh[c*Sqrt[x]]))/(d + e*x),x]`

output `2*((x^2*(a + b*ArcTanh[c*Sqrt[x]]))/4 - (b*c*(-(Sqrt[x]/c^4) - x^(3/2)/(3*c^2) + ArcTanh[c*Sqrt[x]]/c^5))/4)/e - (d*((x*(a + b*ArcTanh[c*Sqrt[x]]))/2 - (b*c*(-(Sqrt[x]/c^2) + ArcTanh[c*Sqrt[x]]/c^3))/2)/e - (d*(-((a + b*ArcTanh[c*Sqrt[x]])*Log[2/(1 + c*Sqrt[x]]))/e) + ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x]))])/(2*e) + ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x]))])/(2*e) + (b*PolyLog[2, 1 - 2/(1 + c*Sqrt[x])])/(2*e) - (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x]))])/(4*e) - (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x]))])/(4*e)))/e)`

3.44.3.1 Defintions of rubi rules used

rule 219 `Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])`

rule 254 `Int[(x_)^(m_)/((a_) + (b_.)*(x_)^2), x_Symbol] := Int[PolynomialDivide[x^m, a + b*x^2, x], x] /; FreeQ[{a, b}, x] && IGtQ[m, 3]`

3.44. $\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx$

rule 262 `Int[((c_.)*(x_)^(m_))*((a_) + (b_.)*(x_)^2)^(p_), x_Symbol] := Simp[c*(c*x)^(m - 1)*((a + b*x^2)^(p + 1)/(b*(m + 2*p + 1))), x] - Simp[a*c^2*((m - 1)/(b*(m + 2*p + 1))) Int[(c*x)^(m - 2)*(a + b*x^2)^p, x], x] /; FreeQ[{a, b, c, p}, x] && GtQ[m, 2 - 1] && NeQ[m + 2*p + 1, 0] && IntBinomialQ[a, b, c, 2, m, p, x]`

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6452 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*(x_)^(m_.), x_Symbol] := Simp[x^(m + 1)*((a + b*ArcTanh[c*x^n])^p/(m + 1)), x] - Simp[b*c*n*(p/(m + 1)) Int[x^(m + n)*((a + b*ArcTanh[c*x^n])^(p - 1)/(1 - c^2*x^(2*n))), x], x] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1] && IntegerQ[m])) && NeQ[m, -1]`

rule 6542 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.))^(p_.)*((f_.)*(x_)^(m_))/((d_) + (e_.)*(x_)^2), x_Symbol] := Simp[f^2/e Int[(f*x)^(m - 2)*(a + b*ArcTanh[c*x])^p, x], x] - Simp[d*(f^2/e Int[(f*x)^(m - 2)*((a + b*ArcTanh[c*x])^p/(d + e*x^2)), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && GtQ[p, 0] && GtQ[m, 1]`

rule 6606 `Int[((a_.) + ArcTanh[(c_.)*(x_)])*(b_.))^(p_.)*((f_.)*(x_)^(m_.))*((d_) + (e_.)*(x_)^2)^(q_.), x_Symbol] := With[{u = ExpandIntegrand[(a + b*ArcTanh[c*x])^p, (f*x)^m*(d + e*x^2)^q, x]}, Int[u, x] /; SumQ[u] /; FreeQ[{a, b, c, d, e, f, m}, x] && IntegerQ[q] && IGtQ[p, 0] && (GtQ[q, 0] || IntegerQ[m])]`

rule 7267 `Int[u_, x_Symbol] := With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Simp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2]])], x] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]`

3.44.4 Maple [A] (verified)

Time = 2.84 (sec) , antiderivative size = 564, normalized size of antiderivative = 1.23

method	result
parts	$\frac{ax^2}{2e} - \frac{adx}{e^2} + \frac{ad^2 \ln(ex+d)}{e^3} + 2b \left(-\frac{c^6 \operatorname{arctanh}(c\sqrt{x})xd}{2e^2} + \frac{c^6 \operatorname{arctanh}(c\sqrt{x})x^2}{4e} + \frac{c^6 \operatorname{arctanh}(c\sqrt{x})d^2 \ln(c^2ex+c^2d)}{2e^3} \right) - \frac{c^2}{e}$
derivativedivides	$-\frac{ac^6dx}{e^2} + \frac{ac^6x^2}{2e} + \frac{ac^6d^2 \ln(c^2ex+c^2d)}{e^3} + 2bc^2 \left(-\frac{\operatorname{arctanh}(c\sqrt{x})c^4dx}{2e^2} + \frac{\operatorname{arctanh}(c\sqrt{x})c^4x^2}{4e} + \frac{\operatorname{arctanh}(c\sqrt{x})c^4d^2 \ln(c^2ex+c^2d)}{2e^3} \right)$
default	$-\frac{ac^6dx}{e^2} + \frac{ac^6x^2}{2e} + \frac{ac^6d^2 \ln(c^2ex+c^2d)}{e^3} + 2bc^2 \left(-\frac{\operatorname{arctanh}(c\sqrt{x})c^4dx}{2e^2} + \frac{\operatorname{arctanh}(c\sqrt{x})c^4x^2}{4e} + \frac{\operatorname{arctanh}(c\sqrt{x})c^4d^2 \ln(c^2ex+c^2d)}{2e^3} \right)$

input `int(x^2*(a+b*arctanh(c*x^(1/2)))/(e*x+d),x,method=_RETURNVERBOSE)`

output

```

1/2*a*x^2/e-a*d*x/e^2+a*d^2/e^3*ln(e*x+d)+2*b/c^6*(-1/2*c^6*arctanh(c*x^(1/2))/e^2*x*d+1/4*c^6*arctanh(c*x^(1/2))*x^2/e+1/2*c^6*arctanh(c*x^(1/2))*d^2/e^3*ln(c^2*e*x+c^2*d)-1/2*c^2*(-1/2/e^2*(1/3*e*c^3*x^(3/2)-2*c^3*d*x^(1/2)+e*c*x^(1/2)+1/2*(-2*c^2*d+e)*ln(c*x^(1/2)-1)-1/2*(-2*c^2*d+e)*ln(1+c*x^(1/2)))-c^4*d^2/e^3*(-1/2*ln(1+c*x^(1/2))*ln(c^2*e*x+c^2*d)+e*(1/2*ln(1+c*x^(1/2))*(ln((c*(-d*e)^(1/2)-e*(1+c*x^(1/2)))+e)/(c*(-d*e)^(1/2)+e))+ln((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(c*(-d*e)^(1/2)-e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(1+c*x^(1/2)))+e)/(c*(-d*e)^(1/2)+e))+dilog((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(c*(-d*e)^(1/2)-e)))/e+1/2*ln(c*x^(1/2)-1)*ln(c^2*e*x+c^2*d)-e*(1/2*ln(c*x^(1/2)-1)*(ln((c*(-d*e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+ln((c*(-d*e)^(1/2)+e*(c*x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+dilog((c*(-d*e)^(1/2)+e*(c*x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e)))
    
```

3.44. $\int \frac{x^2(a+b\operatorname{arctanh}(c\sqrt{x}))}{d+ex} dx$

3.44.5 Fricas [F]

$$\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \int \frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x^2}{ex + d} dx$$

input `integrate(x^2*(a+b*arctanh(c*x^(1/2)))/(e*x+d),x, algorithm="fricas")`

output `integral((b*x^2*arctanh(c*sqrt(x)) + a*x^2)/(e*x + d), x)`

3.44.6 Sympy [F(-1)]

Timed out.

$$\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \text{Timed out}$$

input `integrate(x**2*(a+b*atanh(c*x**(1/2)))/(e*x+d),x)`

output `Timed out`

3.44.7 Maxima [F]

$$\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \int \frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x^2}{ex + d} dx$$

input `integrate(x^2*(a+b*arctanh(c*x^(1/2)))/(e*x+d),x, algorithm="maxima")`

output `1/2*a*(2*d^2*log(e*x + d)/e^3 + (e*x^2 - 2*d*x)/e^2) + b*integrate(1/2*x^2*log(c*sqrt(x) + 1)/(e*x + d), x) - b*integrate(1/2*x^2*log(-c*sqrt(x) + 1)/(e*x + d), x)`

3.44.8 Giac [F]

$$\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \int \frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x^2}{ex + d} dx$$

input `integrate(x^2*(a+b*arctanh(c*x^(1/2)))/(e*x+d),x, algorithm="giac")`

output `integrate((b*arctanh(c*sqrt(x)) + a)*x^2/(e*x + d), x)`

3.44.9 Mupad [F(-1)]

Timed out.

$$\int \frac{x^2(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \int \frac{x^2(a + b \operatorname{atanh}(c\sqrt{x}))}{d + ex} dx$$

input `int((x^2*(a + b*atanh(c*x^(1/2))))/(d + e*x),x)`

output `int((x^2*(a + b*atanh(c*x^(1/2))))/(d + e*x), x)`

3.45 $\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx$

3.45.1	Optimal result	352
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3.45.1 Optimal result

Integrand size = 21, antiderivative size = 374

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \frac{b\sqrt{x}}{ce} - \frac{b \operatorname{arctanh}(c\sqrt{x})}{c^2e} + \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{e} + \frac{2d(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2}{1+c\sqrt{x}}\right)}{e^2} - \frac{d(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{e^2} - \frac{d(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{e^2} - \frac{bd \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+c\sqrt{x}}\right)}{e^2} + \frac{bd \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{2e^2} + \frac{bd \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{2e^2}$$

3.45. $\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx$

output
$$\begin{aligned} & -b \operatorname{arctanh}(c x^{1/2}) / c^2 / e + x (a + b \operatorname{arctanh}(c x^{1/2})) / e + 2 d (a + b \operatorname{arctanh}(c x^{1/2})) \ln(2 / (1 + c x^{1/2})) / e^2 - d (a + b \operatorname{arctanh}(c x^{1/2})) \ln(2 c ((-d)^{1/2} - e^{1/2}) x^{1/2}) / (c (-d)^{1/2} - e^{1/2}) / (1 + c x^{1/2}) / e^2 - d (a + b \operatorname{arctanh}(c x^{1/2})) \ln(2 c ((-d)^{1/2} + e^{1/2}) x^{1/2}) / (c (-d)^{1/2} + e^{1/2}) / (1 + c x^{1/2}) / e^2 - b d \operatorname{polylog}(2, 1 - 2 / (1 + c x^{1/2})) / e^2 + 1/2 b d \operatorname{polylog}(2, 1 - 2 c ((-d)^{1/2} - e^{1/2}) x^{1/2}) / (c (-d)^{1/2} - e^{1/2}) / (1 + c x^{1/2})) / e^2 + 1/2 b d \operatorname{polylog}(2, 1 - 2 c ((-d)^{1/2} + e^{1/2}) x^{1/2}) / (c (-d)^{1/2} + e^{1/2}) / (1 + c x^{1/2})) / e^2 + b x^{1/2} / c / e \end{aligned}$$

3.45.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 1.88 (sec) , antiderivative size = 463, normalized size of antiderivative = 1.24

$$\int \frac{x(a + b \operatorname{arctanh}(c \sqrt{x}))}{d + ex} dx$$

$$= \frac{2be\sqrt{x}}{c} + 2aex + \frac{2be(-1+c^2x)\operatorname{arctanh}(c\sqrt{x})}{c^2} + 4ibd \arcsin\left(\sqrt{\frac{c^2d}{c^2d+e}}\right) \operatorname{arctanh}\left(\frac{ce\sqrt{x}}{\sqrt{-c^2de}}\right) + 4bd \operatorname{arctanh}(c\sqrt{x}) \log$$

input `Integrate[(x*(a + b*ArcTanh[c*Sqrt[x]]))/(d + e*x), x]`

output
$$\begin{aligned} & ((2*b*e*Sqrt[x])/c + 2*a*e*x + (2*b*e*(-1 + c^2*x)*ArcTanh[c*Sqrt[x]])/c^2 \\ & + (4*I)*b*d*ArcSin[Sqrt[(c^2*d)/(c^2*d + e)]]*ArcTanh[(c*e*Sqrt[x])/Sqrt[-(c^2*d*e)]] \\ & + 4*b*d*ArcTanh[c*Sqrt[x]]*Log[1 + E^(-2*ArcTanh[c*Sqrt[x]])] \\ & + (2*I)*b*d*(ArcSin[Sqrt[(c^2*d)/(c^2*d + e)]] + I*ArcTanh[c*Sqrt[x]])*Log[(-2*Sqrt[-(c^2*d*e)] + e*(-1 + E^(2*ArcTanh[c*Sqrt[x]])) + c^2*d*(1 + E^(2*ArcTanh[c*Sqrt[x]])))/((c^2*d + e)*E^(2*ArcTanh[c*Sqrt[x]]))] - 2*b*d*(I*ArcSin[Sqrt[(c^2*d)/(c^2*d + e)]] + ArcTanh[c*Sqrt[x]])*Log[(2*Sqrt[-(c^2*d*e)] + e*(-1 + E^(2*ArcTanh[c*Sqrt[x]])) + c^2*d*(1 + E^(2*ArcTanh[c*Sqrt[x]])))/((c^2*d + e)*E^(2*ArcTanh[c*Sqrt[x]]))] - 2*a*d*Log[d + e*x] - 2*b*d*PolyLog[2, -E^(-2*ArcTanh[c*Sqrt[x]])] + b*d*PolyLog[2, -(c^2*d) + e - 2*Sqrt[-(c^2*d*e)]]/((c^2*d + e)*E^(2*ArcTanh[c*Sqrt[x]])] + b*d*PolyLog[2, -(c^2*d) + e + 2*Sqrt[-(c^2*d*e)]]/((c^2*d + e)*E^(2*ArcTanh[c*Sqrt[x]]))]/(2*e^2) \end{aligned}$$

3.45.
$$\int \frac{x(a + b \operatorname{arctanh}(c \sqrt{x}))}{d + ex} dx$$

3.45.3 Rubi [A] (verified)

Time = 0.89 (sec) , antiderivative size = 387, normalized size of antiderivative = 1.03, number of steps used = 8, number of rules used = 7, $\frac{\text{number of rules}}{\text{integrand size}} = 0.333$, Rules used = {7267, 6542, 6452, 262, 219, 6606, 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.

$$\begin{aligned}
 & \int \frac{x(a + \operatorname{barctanh}(c\sqrt{x}))}{d + ex} dx \\
 & \quad \downarrow \text{7267} \\
 & 2 \int \frac{x^{3/2}(a + \operatorname{barctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x} \\
 & \quad \downarrow \text{6542} \\
 & 2 \left(\frac{\int \sqrt{x}(a + \operatorname{barctanh}(c\sqrt{x})) d\sqrt{x}}{e} - \frac{d \int \frac{\sqrt{x}(a + \operatorname{barctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x}}{e} \right) \\
 & \quad \downarrow \text{6452} \\
 & 2 \left(\frac{\frac{1}{2}x(a + \operatorname{barctanh}(c\sqrt{x})) - \frac{1}{2}bc \int \frac{x}{1 - c^2x} d\sqrt{x}}{e} - \frac{d \int \frac{\sqrt{x}(a + \operatorname{barctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x}}{e} \right) \\
 & \quad \downarrow \text{262} \\
 & 2 \left(\frac{\frac{1}{2}x(a + \operatorname{barctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\int \frac{1}{1 - c^2x} d\sqrt{x}}{c^2} - \frac{\sqrt{x}}{c^2} \right)}{e} - \frac{d \int \frac{\sqrt{x}(a + \operatorname{barctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x}}{e} \right) \\
 & \quad \downarrow \text{219} \\
 & 2 \left(\frac{\frac{1}{2}x(a + \operatorname{barctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{e} - \frac{d \int \frac{\sqrt{x}(a + \operatorname{barctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x}}{e} \right) \\
 & \quad \downarrow \text{6606} \\
 & 2 \left(\frac{\frac{1}{2}x(a + \operatorname{barctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{e} - \frac{d \int \left(\frac{a + \operatorname{barctanh}(c\sqrt{x})}{2\sqrt{e}(\sqrt{-d} + \sqrt{e}\sqrt{x})} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2\sqrt{e}(\sqrt{-d} - \sqrt{e}\sqrt{x})} \right) d\sqrt{x}}{e} \right)
 \end{aligned}$$

3.45. $\int \frac{x(a + \operatorname{barctanh}(c\sqrt{x}))}{d + ex} dx$

↓ 2009

$$2 \left(\frac{\frac{1}{2}x(a + b \operatorname{arctanh}(c\sqrt{x})) - \frac{1}{2}bc \left(\frac{\operatorname{arctanh}(c\sqrt{x})}{c^3} - \frac{\sqrt{x}}{c^2} \right)}{e} - \frac{d \left(\frac{(a + b \operatorname{arctanh}(c\sqrt{x})) \log \left(\frac{2c(\sqrt{-d} - \sqrt{e}\sqrt{x})}{(c\sqrt{x}+1)(c\sqrt{-d}-\sqrt{e})} \right)}{2e} + \frac{(a + b \operatorname{arctanh}(c\sqrt{x}))}{e} \right)}{e} \right)$$

input `Int[(x*(a + b*ArcTanh[c*Sqrt[x]])/(d + e*x),x]`

output `2*((x*(a + b*ArcTanh[c*Sqrt[x]])/2 - (b*c*(-(Sqrt[x]/c^2) + ArcTanh[c*Sqrt[x]]/c^3))/2)/e - (d*(-((a + b*ArcTanh[c*Sqrt[x]])*Log[2/(1 + c*Sqrt[x]])))/e) + ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x]))])/(2*e) + ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x]))])/(2*e) + (b*PolyLog[2, 1 - 2/(1 + c*Sqrt[x])])/(2*e) - (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x]))])/(4*e) - (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x]))])/(4*e))/e`

3.45.3.1 Defintions of rubi rules used

rule 219 `Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])`

rule 262 `Int[((c_)*(x_)^(m_))*((a_) + (b_)*(x_)^2)^(p_), x_Symbol] := Simp[c*(c*x)^(m-1)*((a + b*x^2)^(p+1)/(b*(m+2*p+1))), x] - Simp[a*c^2*(m-1)/(b*(m+2*p+1)) Int[(c*x)^(m-2)*(a + b*x^2)^p, x], x] /; FreeQ[{a, b, c, p}, x] && GtQ[m, 2-1] && NeQ[m+2*p+1, 0] && IntBinomialQ[a, b, c, 2, m, p, x]`

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

3.45. $\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx$

```
rule 6452 Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_.)]*(b_.))^(p_.)*(x_)^(m_.), x_Symbol] :
> Simp[x^(m + 1)*((a + b*ArcTanh[c*x^n])^p/(m + 1)), x] - Simp[b*c*n*(p/(m
+ 1)) Int[x^(m + n)*((a + b*ArcTanh[c*x^n])^(p - 1)/(1 - c^2*x^(2*n))), x
], x] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1
] && IntegerQ[m])) && NeQ[m, -1]
```

```
rule 6542 Int[(((a_.) + ArcTanh[(c_.)*(x_)*(b_.))^(p_.)*((f_.)*(x_)^(m_.))/((d_) + (
e_.)*(x_)^2), x_Symbol] :> Simp[f^2/e Int[(f*x)^(m - 2)*(a + b*ArcTanh[c*
x])^p, x], x] - Simp[d*(f^2/e Int[(f*x)^(m - 2)*((a + b*ArcTanh[c*x])^p/
(d + e*x^2)), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && GtQ[p, 0] && GtQ[m,
1]
```

```
rule 6606 Int[((a_.) + ArcTanh[(c_.)*(x_)*(b_.))^(p_.)*((f_.)*(x_)^(m_.))*((d_) + (e
_.)*(x_)^2)^(q_.), x_Symbol] :> With[{u = ExpandIntegrand[(a + b*ArcTanh[c*
x])^p, (f*x)^m*(d + e*x^2)^q, x]}, Int[u, x] /; SumQ[u] /; FreeQ[{a, b, c,
d, e, f, m}, x] && IntegerQ[q] && IGtQ[p, 0] && (GtQ[q, 0] || IntegerQ[m])
```

```
rule 7267 Int[u_, x_Symbol] :> With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Si
mp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2])]], x
] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]
```

3.45.4 Maple [A] (verified)

Time = 0.85 (sec) , antiderivative size = 494, normalized size of antiderivative = 1.32

$$3.45. \int \frac{x(a+b\operatorname{arctanh}(c\sqrt{x}))}{d+ex} dx$$

method	result
parts	$\frac{ax}{e} - \frac{ad \ln(ex+d)}{e^2} + \frac{2b}{e^2} \left(\frac{c^4 \operatorname{arctanh}(c\sqrt{x})}{2e} - \frac{c^4 \operatorname{arctanh}(c\sqrt{x}) d \ln(c^2 ex+c^2 d)}{2e^2} - \frac{dc^2 \left(-\frac{\ln(1+c\sqrt{x}) \ln(c^2 ex+c^2 d)}{2} + e \left(\frac{\ln(1+c\sqrt{x})}{2} - \frac{\ln(c^2 ex+c^2 d)}{2} \right) \right)}{e^2} \right)$
derivativelimit	$\frac{a c^4 x}{e} - \frac{a c^4 d \ln(c^2 ex+c^2 d)}{e^2} + 2b c^2 \left(\frac{\operatorname{arctanh}(c\sqrt{x}) c^2 x}{2e} - \frac{\operatorname{arctanh}(c\sqrt{x}) d c^2 \ln(c^2 ex+c^2 d)}{2e^2} - \frac{d c^2 \left(-\frac{\ln(1+c\sqrt{x}) \ln(c^2 ex+c^2 d)}{2} + e \left(\frac{\ln(1+c\sqrt{x})}{2} - \frac{\ln(c^2 ex+c^2 d)}{2} \right) \right)}{e^2} \right)$
default	$\frac{a c^4 x}{e} - \frac{a c^4 d \ln(c^2 ex+c^2 d)}{e^2} + 2b c^2 \left(\frac{\operatorname{arctanh}(c\sqrt{x}) c^2 x}{2e} - \frac{\operatorname{arctanh}(c\sqrt{x}) d c^2 \ln(c^2 ex+c^2 d)}{2e^2} - \frac{d c^2 \left(-\frac{\ln(1+c\sqrt{x}) \ln(c^2 ex+c^2 d)}{2} + e \left(\frac{\ln(1+c\sqrt{x})}{2} - \frac{\ln(c^2 ex+c^2 d)}{2} \right) \right)}{e^2} \right)$

input `int(x*(a+b*arctanh(c*x^(1/2)))/(e*x+d), x, method=_RETURNVERBOSE)`

output

```

a*x/e-a*d/e^2*ln(e*x+d)+2*b/c^4*(1/2*c^4*arctanh(c*x^(1/2))/e*x-1/2*c^4*ar
ctanh(c*x^(1/2))/e^2*d*ln(c^2*e*x+c^2*d)-1/2*c^2*(d*c^2/e^2*(-1/2*ln(1+c*x
^(1/2))*ln(c^2*e*x+c^2*d)+e*(1/2*ln(1+c*x^(1/2))*(ln((c*(-d*e)^(1/2)-e*(1+
c*x^(1/2))+e)/(c*(-d*e)^(1/2)+e))+ln((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(c
*(-d*e)^(1/2)-e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(1+c*x^(1/2))+e)/(c*(-d*
e)^(1/2)+e))+dilog((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(c*(-d*e)^(1/2)-e))
/e)+1/2*ln(c*x^(1/2)-1)*ln(c^2*e*x+c^2*d)-e*(1/2*ln(c*x^(1/2)-1)*(ln((c(-
d*e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+ln((c*(-d*e)^(1/2)+e*(c
x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(c*x^(1/
2)-1)-e)/(c*(-d*e)^(1/2)-e))+dilog((c*(-d*e)^(1/2)+e*(c*x^(1/2)-1)+e)/(c(-
d*e)^(1/2)+e)))/e)-1/e*(c*x^(1/2)+1/2*ln(c*x^(1/2)-1)-1/2*ln(1+c*x^(1/2)
))))
    
```

3.45. $\int \frac{x(a+b\operatorname{arctanh}(c\sqrt{x}))}{d+ex} dx$

3.45.5 Fracas [F]

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \int \frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x}{ex + d} dx$$

input `integrate(x*(a+b*arctanh(c*x^(1/2)))/(e*x+d),x, algorithm="fricas")`

output `integral((b*x*arctanh(c*sqrt(x)) + a*x)/(e*x + d), x)`

3.45.6 Sympy [F]

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \int \frac{x(a + b \operatorname{atanh}(c\sqrt{x}))}{d + ex} dx$$

input `integrate(x*(a+b*atanh(c*x**(1/2)))/(e*x+d),x)`

output `Integral(x*(a + b*atanh(c*sqrt(x)))/(d + e*x), x)`

3.45.7 Maxima [F]

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \int \frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x}{ex + d} dx$$

input `integrate(x*(a+b*arctanh(c*x^(1/2)))/(e*x+d),x, algorithm="maxima")`

output `a*(x/e - d*log(e*x + d)/e^2) + b*integrate(1/2*x*log(c*sqrt(x) + 1)/(e*x + d), x) - b*integrate(1/2*x*log(-c*sqrt(x) + 1)/(e*x + d), x)`

3.45.8 Giac [F]

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \int \frac{(b \operatorname{artanh}(c\sqrt{x}) + a)x}{ex + d} dx$$

input `integrate(x*(a+b*arctanh(c*x^(1/2)))/(e*x+d),x, algorithm="giac")`

output `integrate((b*arctanh(c*sqrt(x)) + a)*x/(e*x + d), x)`

3.45.9 Mupad [F(-1)]

Timed out.

$$\int \frac{x(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} dx = \int \frac{x(a + b \operatorname{atanh}(c\sqrt{x}))}{d + ex} dx$$

input `int((x*(a + b*atanh(c*x^(1/2))))/(d + e*x),x)`

output `int((x*(a + b*atanh(c*x^(1/2))))/(d + e*x), x)`

3.46 $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{d+ex} dx$

3.46.1	Optimal result	360
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3.46.9	Mupad [F(-1)]	365

3.46.1 Optimal result

Integrand size = 20, antiderivative size = 318

$$\int \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{d + ex} dx = -\frac{2(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2}{1+c\sqrt{x}}\right)}{e} + \frac{(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{e} + \frac{(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{e} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+c\sqrt{x}}\right)}{e} - \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{2e} - \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{2e}$$

output

```
-2*(a+b*arctanh(c*x^(1/2)))*ln(2/(1+c*x^(1/2)))/e+(a+b*arctanh(c*x^(1/2))
*ln(2*c*((-d)^(1/2)-e^(1/2)*x^(1/2))/(c*(-d)^(1/2)-e^(1/2))/(1+c*x^(1/2))
/e+(a+b*arctanh(c*x^(1/2)))*ln(2*c*((-d)^(1/2)+e^(1/2)*x^(1/2))/(c*(-d)^(1
/2)+e^(1/2))/(1+c*x^(1/2)))/e+b*polylog(2,1-2/(1+c*x^(1/2)))/e-1/2*b*polyl
og(2,1-2*c*((-d)^(1/2)-e^(1/2)*x^(1/2))/(c*(-d)^(1/2)-e^(1/2))/(1+c*x^(1/2
)))/e-1/2*b*polylog(2,1-2*c*((-d)^(1/2)+e^(1/2)*x^(1/2))/(c*(-d)^(1/2)+e^(
1/2))/(1+c*x^(1/2)))/e
```

3.46.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 1.28 (sec) , antiderivative size = 432, normalized size of antiderivative = 1.36

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{d + ex} dx = \frac{a \log(d + ex)}{e} - \frac{b \left(-2 \operatorname{arctanh}(c\sqrt{x})^2 + 4i \arcsin \left(\sqrt{\frac{c^2 d}{c^2 d + e}} \right) \operatorname{arctanh} \left(\frac{ce\sqrt{x}}{\sqrt{-c^2 de}} \right) + 2 \operatorname{arctanh}(c\sqrt{x}) \left(\operatorname{arctanh}(c\sqrt{x}) + 2 \log \right) \right)}{2e}$$

input `Integrate[(a + b*ArcTanh[c*Sqrt[x]])/(d + e*x), x]`

output `(a*Log[d + e*x])/e - (b*(-2*ArcTanh[c*Sqrt[x]]^2 + (4*I)*ArcSin[Sqrt[(c^2*d)/(c^2*d + e)]]*ArcTanh[(c*e*Sqrt[x])/Sqrt[-(c^2*d*e)]] + 2*ArcTanh[c*Sqrt[x]]*(ArcTanh[c*Sqrt[x]] + 2*Log[1 + E^(-2*ArcTanh[c*Sqrt[x]])])) - 2*((-I)*ArcSin[Sqrt[(c^2*d)/(c^2*d + e)]] + ArcTanh[c*Sqrt[x]])*Log[(-2*Sqrt[-(c^2*d*e)] + e*(-1 + E^(2*ArcTanh[c*Sqrt[x]]))) + c^2*d*(1 + E^(2*ArcTanh[c*Sqrt[x]]))]/((c^2*d + e)*E^(2*ArcTanh[c*Sqrt[x]])) - 2*(I*ArcSin[Sqrt[(c^2*d)/(c^2*d + e)]] + ArcTanh[c*Sqrt[x]])*Log[(2*Sqrt[-(c^2*d*e)] + e*(-1 + E^(2*ArcTanh[c*Sqrt[x]]))) + c^2*d*(1 + E^(2*ArcTanh[c*Sqrt[x]]))]/((c^2*d + e)*E^(2*ArcTanh[c*Sqrt[x]])) - 2*PolyLog[2, -E^(-2*ArcTanh[c*Sqrt[x]])] + PolyLog[2, -(c^2*d) + e - 2*Sqrt[-(c^2*d*e)]]/((c^2*d + e)*E^(2*ArcTanh[c*Sqrt[x]])) + PolyLog[2, -(c^2*d) + e + 2*Sqrt[-(c^2*d*e)]]/((c^2*d + e)*E^(2*ArcTanh[c*Sqrt[x]])))]/(2*e)`

3.46.3 Rubi [A] (verified)

Time = 0.58 (sec) , antiderivative size = 329, normalized size of antiderivative = 1.03, number of steps used = 4, number of rules used = 3, $\frac{\text{number of rules}}{\text{integrand size}} = 0.150$, Rules used = {6484, 6606, 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.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{d + ex} dx$$

↓ 6484

$$\begin{aligned}
& 2 \int \frac{\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{d + ex} d\sqrt{x} \\
& \quad \downarrow \text{6606} \\
& 2 \int \left(\frac{a + b \operatorname{arctanh}(c\sqrt{x})}{2\sqrt{e}(\sqrt{-d} + \sqrt{e}\sqrt{x})} - \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{2\sqrt{e}(\sqrt{-d} - \sqrt{e}\sqrt{x})} \right) d\sqrt{x} \\
& \quad \downarrow \text{2009} \\
& 2 \left(\frac{(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d} - \sqrt{e}\sqrt{x})}{(c\sqrt{x}+1)(c\sqrt{-d} - \sqrt{e})}\right)}{2e} + \frac{(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d} + \sqrt{e}\sqrt{x})}{(c\sqrt{x}+1)(c\sqrt{-d} + \sqrt{e})}\right)}{2e} - \log\left(\frac{2}{c\sqrt{x}+1}\right) \right)
\end{aligned}$$

input `Int[(a + b*ArcTanh[c*Sqrt[x]])/(d + e*x), x]`

output `2*(-(((a + b*ArcTanh[c*Sqrt[x]])*Log[2/(1 + c*Sqrt[x]])/e) + ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x])/((c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x]))])/(2*e) + ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x])/((c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x]))])/(2*e) + (b*PolyLog[2, 1 - 2/(1 + c*Sqrt[x])])/(2*e) - (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x])/((c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x]))])/(4*e) - (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x])/((c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x]))])/(4*e))`

3.46.3.1 Defintions of rubi rules used

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 6484 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(n_)])*(b_.)/((d_) + (e_.)*(x_)), x_Symbol] := With[{k = Denominator[n]}, Simp[k Subst[Int[x^(k - 1)*((a + b*ArcTanh[c*x^(k*n)])/(d + e*x^k)), x], x, x^(1/k)], x] /; FreeQ[{a, b, c, d, e}, x] && FractionQ[n]`

rule 6606 `Int[((a_.) + ArcTanh[(c_.)*(x_)^(p_.)]*(b_.))^(q_.)*((f_.)*(x_)^(m_.))*((d_) + (e_.)*(x_)^2)^(q_.), x_Symbol] := With[{u = ExpandIntegrand[(a + b*ArcTanh[c*x])^p, (f*x)^m*(d + e*x^2)^q, x]}, Int[u, x] /; SumQ[u] /; FreeQ[{a, b, c, d, e, f, m}, x] && IntegerQ[q] && IGtQ[p, 0] && (GtQ[q, 0] || IntegerQ[m])`

3.46.4 Maple [A] (verified)

Time = 0.90 (sec) , antiderivative size = 433, normalized size of antiderivative = 1.36

method	result
parts	$\frac{a \ln(ex+d)}{e} + \frac{c^2 \ln(c^2 ex+c^2 d) \operatorname{arctanh}(c\sqrt{x})}{2e} - \frac{c^2 \left(\frac{\ln(1+c\sqrt{x}) \ln(c^2 ex+c^2 d)}{2} - e \left(\frac{\ln(1+c\sqrt{x}) \left(\ln\left(\frac{c\sqrt{-de}-e(1+c\sqrt{x})+e}{c\sqrt{-de}+e} \right)}{2e} \right) \right)}{e} \right)}{e}$
derivativedivides	$\frac{a c^2 \ln(c^2 ex+c^2 d)}{e} + 2b c^2 \left(\frac{\ln(c^2 ex+c^2 d) \operatorname{arctanh}(c\sqrt{x})}{2e} - \frac{\frac{\ln(1+c\sqrt{x}) \ln(c^2 ex+c^2 d)}{2} - e \left(\frac{\ln(1+c\sqrt{x}) \left(\ln\left(\frac{c\sqrt{-de}-e(1+c\sqrt{x})+e}{c\sqrt{-de}+e} \right)}{2e} \right) \right)}{e} \right)$
default	$\frac{a c^2 \ln(c^2 ex+c^2 d)}{e} + 2b c^2 \left(\frac{\ln(c^2 ex+c^2 d) \operatorname{arctanh}(c\sqrt{x})}{2e} - \frac{\frac{\ln(1+c\sqrt{x}) \ln(c^2 ex+c^2 d)}{2} - e \left(\frac{\ln(1+c\sqrt{x}) \left(\ln\left(\frac{c\sqrt{-de}-e(1+c\sqrt{x})+e}{c\sqrt{-de}+e} \right)}{2e} \right) \right)}{e} \right)$

```
input int((a+b*arctanh(c*x^(1/2)))/(e*x+d),x,method=_RETURNVERBOSE)
```

```
output a*ln(e*x+d)/e+2*b/c^2*(1/2*c^2/e*ln(c^2*e*x+c^2*d)*arctanh(c*x^(1/2))-1/2*
c^2/e*(1/2*ln(1+c*x^(1/2))*ln(c^2*e*x+c^2*d)-e*(1/2*ln(1+c*x^(1/2))*(ln((c
*(-d*e)^(1/2)-e*(1+c*x^(1/2))+e)/(c*(-d*e)^(1/2)+e))+ln((c*(-d*e)^(1/2)+e*
(1+c*x^(1/2))-e)/(c*(-d*e)^(1/2)-e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(1+c*
x^(1/2))+e)/(c*(-d*e)^(1/2)+e))+dilog((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(
c*(-d*e)^(1/2)-e)))/e)-1/2*ln(c*x^(1/2)-1)*ln(c^2*e*x+c^2*d)+e*(1/2*ln(c*x
^(1/2)-1)*(ln((c*(-d*e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+ln((c
*(-d*e)^(1/2)+e*(c*x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e+1/2*(dilog((c*(-d*
e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+dilog((c*(-d*e)^(1/2)+e*(c
*x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e))
```

3.46.5 Fracas [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{d + ex} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/(e*x+d),x, algorithm="fricas")`

output `integral((b*arctanh(c*sqrt(x)) + a)/(e*x + d), x)`

3.46.6 Sympy [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{d + ex} dx = \int \frac{a + b \operatorname{atanh}(c\sqrt{x})}{d + ex} dx$$

input `integrate((a+b*atanh(c*x**(1/2)))/(e*x+d),x)`

output `Integral((a + b*atanh(c*sqrt(x)))/(d + e*x), x)`

3.46.7 Maxima [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{d + ex} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/(e*x+d),x, algorithm="maxima")`

output `b*integrate(1/2*log(c*sqrt(x) + 1)/(e*x + d), x) - b*integrate(1/2*log(-c*sqrt(x) + 1)/(e*x + d), x) + a*log(e*x + d)/e`

3.46.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{d + ex} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{ex + d} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/(e*x+d),x, algorithm="giac")`

output `integrate((b*arctanh(c*sqrt(x)) + a)/(e*x + d), x)`

3.46.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{d + ex} dx = \int \frac{a + b \operatorname{atanh}(c\sqrt{x})}{d + ex} dx$$

input `int((a + b*atanh(c*x^(1/2)))/(d + e*x),x)`

output `int((a + b*atanh(c*x^(1/2)))/(d + e*x), x)`

3.47 $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x(d+ex)} dx$

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3.47.1 Optimal result

Integrand size = 23, antiderivative size = 358

$$\int \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{x(d + ex)} dx = \frac{2(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2}{1+c\sqrt{x}}\right)}{d} - \frac{(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{d} - \frac{(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{d} + \frac{a \log(x)}{d} - \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+c\sqrt{x}}\right)}{d} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{2d} + \frac{b \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{2d} - \frac{b \operatorname{PolyLog}\left(2, -c\sqrt{x}\right)}{d} + \frac{b \operatorname{PolyLog}\left(2, c\sqrt{x}\right)}{d}$$

output $a*\ln(x)/d+2*(a+b*\operatorname{arctanh}(c*x^{(1/2)}))*\ln(2/(1+c*x^{(1/2)}))/d-(a+b*\operatorname{arctanh}(c*x^{(1/2)}))*\ln(2*c*((-d)^{(1/2)}-e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}-e^{(1/2)})/(1+c*x^{(1/2)}))/d-(a+b*\operatorname{arctanh}(c*x^{(1/2)}))*\ln(2*c*((-d)^{(1/2)}+e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}+e^{(1/2)})/(1+c*x^{(1/2)}))/d-b*\operatorname{polylog}(2,-c*x^{(1/2)})/d+b*\operatorname{polylog}(2,c*x^{(1/2)})/d-b*\operatorname{polylog}(2,1-2/(1+c*x^{(1/2)}))/d+1/2*b*\operatorname{polylog}(2,1-2*c*((-d)^{(1/2)}-e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}-e^{(1/2)})/(1+c*x^{(1/2)}))/d+1/2*b*\operatorname{polylog}(2,1-2*c*((-d)^{(1/2)}+e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}+e^{(1/2)})/(1+c*x^{(1/2)}))/d$

3.47.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 1.61 (sec) , antiderivative size = 445, normalized size of antiderivative = 1.24

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(d + ex)} dx$$

$$= \frac{-2b \operatorname{arctanh}(c\sqrt{x})^2 + 4ib \arcsin\left(\sqrt{\frac{c^2 d}{c^2 d + e}}\right) \operatorname{arctanh}\left(\frac{ce\sqrt{x}}{\sqrt{-c^2 de}}\right) + 2b \operatorname{arctanh}(c\sqrt{x}) \left(\operatorname{arctanh}(c\sqrt{x}) + 2 \log\left(\frac{c\sqrt{x} + \sqrt{-c^2 de}}{c\sqrt{x} - \sqrt{-c^2 de}}\right)\right)}{d}$$

input `Integrate[(a + b*ArcTanh[c*Sqrt[x]])/(x*(d + e*x)),x]`

output $(-2*b*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]]^2 + (4*I)*b*\operatorname{ArcSin}[\operatorname{Sqrt}[(c^2*d)/(c^2*d + e)]]*\operatorname{ArcTanh}[(c*e*\operatorname{Sqrt}[x])/ \operatorname{Sqrt}[-(c^2*d*e)]] + 2*b*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]]*(\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]] + 2*\operatorname{Log}[1 - E^{(-2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x])}])) + (2*I)*b*(\operatorname{ArcSin}[\operatorname{Sqrt}[(c^2*d)/(c^2*d + e)]] + I*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])*\operatorname{Log}[(-2*\operatorname{Sqrt}[-(c^2*d*e)] + e*(-1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x])})) + c^2*d*(1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x])}))]/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x])}))] - 2*b*(I*\operatorname{ArcSin}[\operatorname{Sqrt}[(c^2*d)/(c^2*d + e)]] + \operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])*\operatorname{Log}[(2*\operatorname{Sqrt}[-(c^2*d*e)] + e*(-1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x])})) + c^2*d*(1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x])}))]/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x])}))] + 2*a*\operatorname{Log}[x] - 2*a*\operatorname{Log}[d + e*x] - 2*b*\operatorname{PolyLog}[2, E^{(-2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x])}]] + b*\operatorname{PolyLog}[2, (-c^2*d + e - 2*\operatorname{Sqrt}[-(c^2*d*e)])/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x])}])] + b*\operatorname{PolyLog}[2, (-c^2*d + e + 2*\operatorname{Sqrt}[-(c^2*d*e)])/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x])}])])]/(2*d)$

3.47.3 Rubi [A] (verified)

Time = 0.81 (sec) , antiderivative size = 374, normalized size of antiderivative = 1.04, number of steps used = 5, number of rules used = 4, $\frac{\text{number of rules}}{\text{integrand size}} = 0.174$, Rules used = {7267, 2026, 6554, 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.

$$\begin{aligned}
 & \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(d + ex)} dx \\
 & \quad \downarrow 7267 \\
 & 2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{ex^{3/2} + d\sqrt{x}} d\sqrt{x} \\
 & \quad \downarrow 2026 \\
 & 2 \int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{\sqrt{x}(d + ex)} d\sqrt{x} \\
 & \quad \downarrow 6554 \\
 & 2 \int \left(\frac{a + b \operatorname{arctanh}(c\sqrt{x})}{d\sqrt{x}} - \frac{e\sqrt{x}(a + b \operatorname{arctanh}(c\sqrt{x}))}{d(d + ex)} \right) d\sqrt{x} \\
 & \quad \downarrow 2009 \\
 & 2 \left(-\frac{(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d} - \sqrt{e}\sqrt{x})}{(c\sqrt{x}+1)(c\sqrt{-d} - \sqrt{e})}\right)}{2d} - \frac{(a + b \operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d} + \sqrt{e}\sqrt{x})}{(c\sqrt{x}+1)(c\sqrt{-d} + \sqrt{e})}\right)}{2d} + \frac{\log\left(\frac{2}{c\sqrt{x}}\right)}{2d} \right)
 \end{aligned}$$

input `Int[(a + b*ArcTanh[c*Sqrt[x]])/(x*(d + e*x)),x]`

output `2*(((a + b*ArcTanh[c*Sqrt[x]])*Log[2/(1 + c*Sqrt[x])])/d - ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x]))])/d - ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x]))])/d + (a*Log[Sqrt[x]])/d - (b*PolyLog[2, 1 - 2/(1 + c*Sqrt[x])])/d + (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x]))])/d + (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x]))])/d - (b*PolyLog[2, -(c*Sqrt[x])])/d + (b*PolyLog[2, c*Sqrt[x]])/d)`

3.47. $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x(d+ex)} dx$

3.47.3.1 Defintions of rubi rules used

```
rule 2009 Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]
```

```
rule 2026 Int[(Fx_.)*(Px_)^(p_), x_Symbol] := With[{r = Expon[Px, x, Min]}, Int[x^(p*r)*ExpandToSum[Px/x^r, x]^p*Fx, x] /; IGtQ[r, 0]] /; PolyQ[Px, x] && IntegerQ[p] && !MonomialQ[Px, x] && (ILtQ[p, 0] || !PolyQ[u, x])
```

```
rule 6554 Int[(((a_.) + ArcTanh[(c_.)*(x_.)]*(b_.))*(x_)^(m_.))/((d_) + (e_.)*(x_)^2), x_Symbol] := Int[ExpandIntegrand[a + b*ArcTanh[c*x], x^m/(d + e*x^2), x], x] /; FreeQ[{a, b, c, d, e}, x] && IntegerQ[m] && !(EqQ[m, 1] && NeQ[a, 0])
```

```
rule 7267 Int[u_, x_Symbol] := With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Simp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2])], x] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]
```

3.47.4 Maple [A] (verified)

Time = 0.87 (sec) , antiderivative size = 499, normalized size of antiderivative = 1.39

method	result
parts	$-\frac{a \ln(ex+d)}{d} + \frac{a \ln(x)}{d} + b \left(-\frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c^2 ex+c^2 d)}{d} + \frac{2 \operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x})}{d} - c^2 \left(\frac{-\ln(1+c\sqrt{x}) \ln(\dots)}{\dots} \right) \right)$
derivativedivides	$\frac{2a \ln(c\sqrt{x})}{d} - \frac{a \ln(c^2 ex+c^2 d)}{d} + 2b c^2 \left(\frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x})}{d c^2} - \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c^2 ex+c^2 d)}{2d c^2} - \frac{\ln(1+c\sqrt{x})}{\dots} \right)$
default	$\frac{2a \ln(c\sqrt{x})}{d} - \frac{a \ln(c^2 ex+c^2 d)}{d} + 2b c^2 \left(\frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c\sqrt{x})}{d c^2} - \frac{\operatorname{arctanh}(c\sqrt{x}) \ln(c^2 ex+c^2 d)}{2d c^2} - \frac{\ln(1+c\sqrt{x})}{\dots} \right)$

```
input int((a+b*arctanh(c*x^(1/2)))/x/(e*x+d), x, method=_RETURNVERBOSE)
```

3.47. $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x(d+ex)} dx$

```
output -a/d*ln(e*x+d)+a/d*ln(x)+b*(-arctanh(c*x^(1/2))/d*ln(c^2*e*x+c^2*d)+2*arctanh(c*x^(1/2))/d*ln(c*x^(1/2))-c^2*(1/d/c^2*(-1/2*ln(1+c*x^(1/2))*ln(c^2*e*x+c^2*d)+e*(1/2*ln(1+c*x^(1/2))*(ln((c*(-d*e)^(1/2)-e*(1+c*x^(1/2))+e)/(c*(-d*e)^(1/2)+e))+ln((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(c*(-d*e)^(1/2)-e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(1+c*x^(1/2))+e)/(c*(-d*e)^(1/2)+e))+dilog((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(c*(-d*e)^(1/2)-e)))/e)+1/2*ln(c*x^(1/2)-1)*ln(c^2*e*x+c^2*d)-e*(1/2*ln(c*x^(1/2)-1)*(ln((c*(-d*e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+ln((c*(-d*e)^(1/2)+e*(c*x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+dilog((c*(-d*e)^(1/2)+e*(c*x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e))-2/d/c^2*(-1/2*dilog(1+c*x^(1/2))-1/2*ln(c*x^(1/2))*ln(1+c*x^(1/2))-1/2*dilog(c*x^(1/2))))
```

3.47.5 Fricas [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(d + ex)} dx = \int \frac{b \operatorname{arctanh}(c\sqrt{x}) + a}{(ex + d)x} dx$$

```
input integrate((a+b*arctanh(c*x^(1/2)))/x/(e*x+d),x, algorithm="fricas")
```

```
output integral((b*arctanh(c*sqrt(x)) + a)/(e*x^2 + d*x), x)
```

3.47.6 SymPy [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(d + ex)} dx = \text{Timed out}$$

```
input integrate((a+b*atanh(c*x**(1/2)))/x/(e*x+d),x)
```

```
output Timed out
```

3.47.7 Maxima [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(d+ex)} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(ex+d)x} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x/(e*x+d),x, algorithm="maxima")`

output `-a*(log(e*x + d)/d - log(x)/d) + b*integrate(1/2*log(c*sqrt(x) + 1)/((e*x^(3/2) + d*sqrt(x))*sqrt(x)), x) - b*integrate(1/2*log(-c*sqrt(x) + 1)/((e*x^(3/2) + d*sqrt(x))*sqrt(x)), x)`

3.47.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(d+ex)} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(ex+d)x} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x/(e*x+d),x, algorithm="giac")`

output `integrate((b*arctanh(c*sqrt(x)) + a)/((e*x + d)*x), x)`

3.47.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x(d+ex)} dx = \int \frac{a + b \operatorname{atanh}(c\sqrt{x})}{x(d+ex)} dx$$

input `int((a + b*atanh(c*x^(1/2)))/(x*(d + e*x)),x)`

output `int((a + b*atanh(c*x^(1/2)))/(x*(d + e*x)), x)`

3.48 $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x^2(d+ex)} dx$

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3.48.9	Mupad [F(-1)]	379

3.48.1 Optimal result

Integrand size = 23, antiderivative size = 413

$$\begin{aligned} \int \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{x^2(d + ex)} dx = & -\frac{bc}{d\sqrt{x}} + \frac{bc^2\operatorname{arctanh}(c\sqrt{x})}{d} - \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{dx} \\ & - \frac{2e(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2}{1+c\sqrt{x}}\right)}{d^2} \\ & + \frac{e(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{d^2} \\ & + \frac{e(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{d^2} \\ & - \frac{ae \log(x)}{d^2} + \frac{be \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+c\sqrt{x}}\right)}{d^2} \\ & - \frac{be \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{2d^2} \\ & - \frac{be \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{2d^2} \\ & + \frac{be \operatorname{PolyLog}(2, -c\sqrt{x})}{d^2} - \frac{be \operatorname{PolyLog}(2, c\sqrt{x})}{d^2} \end{aligned}$$

output $b*c^2*\operatorname{arctanh}(c*x^{(1/2)})/d+(-a-b*\operatorname{arctanh}(c*x^{(1/2)}))/d/x-a*e*\ln(x)/d^2-2*e*(a+b*\operatorname{arctanh}(c*x^{(1/2)}))*\ln(2/(1+c*x^{(1/2)}))/d^2+e*(a+b*\operatorname{arctanh}(c*x^{(1/2)}))*\ln(2*c*((-d)^{(1/2)}-e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}-e^{(1/2)})/(1+c*x^{(1/2)}))/d^2+e*(a+b*\operatorname{arctanh}(c*x^{(1/2)}))*\ln(2*c*((-d)^{(1/2)}+e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}+e^{(1/2)})/(1+c*x^{(1/2)}))/d^2+b*e*\operatorname{polylog}(2,-c*x^{(1/2)})/d^2-b*e*\operatorname{polylog}(2,c*x^{(1/2)})/d^2+b*e*\operatorname{polylog}(2,1-2/(1+c*x^{(1/2)}))/d^2-1/2*b*e*\operatorname{polylog}(2,1-2*c*((-d)^{(1/2)}-e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}-e^{(1/2)})/(1+c*x^{(1/2)}))/d^2-1/2*b*e*\operatorname{polylog}(2,1-2*c*((-d)^{(1/2)}+e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}+e^{(1/2)})/(1+c*x^{(1/2)}))/d^2-b*c/d/x^{(1/2)}$

3.48.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 2.11 (sec) , antiderivative size = 479, normalized size of antiderivative = 1.16

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(d + ex)} dx$$

$$= \frac{-2ad - 2aex \log(x) + 2aex \log(d + ex) - 2b \left(cd\sqrt{x} + \operatorname{arctanh}(c\sqrt{x}) \left(d - c^2 dx + ex \operatorname{arctanh}(c\sqrt{x}) + 2e \right) \right)}{x^2(d + ex)}$$

input `Integrate[(a + b*ArcTanh[c*Sqrt[x]])/(x^2*(d + e*x)),x]`

output $(-2*a*d - 2*a*e*x*\operatorname{Log}[x] + 2*a*e*x*\operatorname{Log}[d + e*x] - 2*b*(c*d*\operatorname{Sqrt}[x] + \operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]]*(d - c^2*d*x + e*x*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]] + 2*e*x*\operatorname{Log}[1 - E^{(-2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}]) - e*x*\operatorname{PolyLog}[2, E^{(-2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}])) + b*e*x*(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]]^2 - (4*I)*\operatorname{ArcSin}[\operatorname{Sqrt}[(c^2*d)/(c^2*d + e)]]*\operatorname{ArcTanh}[(c*e*\operatorname{Sqrt}[x])/ \operatorname{Sqrt}[-(c^2*d*e)]] + 2*((-I)*\operatorname{ArcSin}[\operatorname{Sqrt}[(c^2*d)/(c^2*d + e)]] + \operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])*\operatorname{Log}[(-2*\operatorname{Sqrt}[-(c^2*d*e)] + e*(-1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}) + c^2*d*(1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}))]/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}) + 2*(I*\operatorname{ArcSin}[\operatorname{Sqrt}[(c^2*d)/(c^2*d + e)]] + \operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])*\operatorname{Log}[(2*\operatorname{Sqrt}[-(c^2*d*e)] + e*(-1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}) + c^2*d*(1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}))]/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}) - \operatorname{PolyLog}[2, (-c^2*d + e - 2*\operatorname{Sqrt}[-(c^2*d*e)])/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])})] - \operatorname{PolyLog}[2, (-c^2*d + e + 2*\operatorname{Sqrt}[-(c^2*d*e)])/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])})]))/(2*d^2*x)$

3.48.3 Rubi [A] (verified)

Time = 1.13 (sec) , antiderivative size = 429, normalized size of antiderivative = 1.04, number of steps used = 9, number of rules used = 8, $\frac{\text{number of rules}}{\text{integrand size}} = 0.348$, Rules used = {7267, 2026, 6544, 6452, 264, 219, 6554, 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.

$$\begin{aligned}
 & \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^2(d+ex)} dx \\
 & \quad \downarrow 7267 \\
 & 2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{ex^{5/2} + dx^{3/2}} d\sqrt{x} \\
 & \quad \downarrow 2026 \\
 & 2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(d+ex)} d\sqrt{x} \\
 & \quad \downarrow 6544 \\
 & 2 \left(\frac{\int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}} d\sqrt{x}}{d} - \frac{e \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(d+ex)} d\sqrt{x}}{d} \right) \\
 & \quad \downarrow 6452 \\
 & 2 \left(\frac{\frac{1}{2}bc \int \frac{1}{x(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x}}{d} - \frac{e \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(d+ex)} d\sqrt{x}}{d} \right) \\
 & \quad \downarrow 264 \\
 & 2 \left(\frac{\frac{1}{2}bc \left(c^2 \int \frac{1}{1-c^2x} d\sqrt{x} - \frac{1}{\sqrt{x}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x}}{d} - \frac{e \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(d+ex)} d\sqrt{x}}{d} \right) \\
 & \quad \downarrow 219 \\
 & 2 \left(\frac{\frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{2x}}{d} - \frac{e \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{\sqrt{x}(d+ex)} d\sqrt{x}}{d} \right) \\
 & \quad \downarrow 6554
 \end{aligned}$$

$$2 \left(\frac{\frac{1}{2}bc \left(\operatorname{arctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{2x}}{d} - \frac{e \int \left(\frac{a+b\operatorname{arctanh}(c\sqrt{x})}{d\sqrt{x}} - \frac{e\sqrt{x}(a+b\operatorname{arctanh}(c\sqrt{x}))}{d(d+ex)} \right) d\sqrt{x}}{d} \right)$$

↓ 2009

$$2 \left(\frac{\frac{1}{2}bc \left(\operatorname{arctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{2x}}{d} - e \left(-\frac{(a+b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{x}+1)(c\sqrt{-d}-\sqrt{e})}\right)}{2d} - \frac{(a+b\operatorname{arctanh}(c\sqrt{x}))}{d} \right) \right)$$

input `Int[(a + b*ArcTanh[c*Sqrt[x]])/(x^2*(d + e*x)),x]`

output `2*((-1/2*(a + b*ArcTanh[c*Sqrt[x]])/x + (b*c*(-1/Sqrt[x] + c*ArcTanh[c*Sqrt[x]]))/2)/d - (e*((a + b*ArcTanh[c*Sqrt[x]])*Log[2/(1 + c*Sqrt[x]])/d - ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x]))/(c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x])])/(2*d) - ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x]))/(c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x])])/(2*d) + (a*Log[Sqrt[x]])/d - (b*PolyLog[2, 1 - 2/(1 + c*Sqrt[x])])/(2*d) + (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x]))/(c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x])])/(4*d) + (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x]))/(c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x])])/(4*d) - (b*PolyLog[2, -(c*Sqrt[x])])/(2*d) + (b*PolyLog[2, c*Sqrt[x]])/(2*d))/d`

3.48.3.1 Defintions of rubi rules used

rule 219 `Int[((a_) + (b_.)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])`

rule 264 `Int[((c_.)*(x_)^(m_))*((a_) + (b_.)*(x_)^2)^(p_), x_Symbol] := Simp[(c*x)^(m + 1)*((a + b*x^2)^(p + 1)/(a*c*(m + 1))), x] - Simp[b*((m + 2*p + 3)/(a*c^2*(m + 1)) Int[(c*x)^(m + 2)*(a + b*x^2)^p, x], x] /; FreeQ[{a, b, c, p}, x] && LtQ[m, -1] && IntBinomialQ[a, b, c, 2, m, p, x]`

- rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`
- rule 2026 `Int[(Fx_)*(Px_)^(p_), x_Symbol] := With[{r = Expon[Px, x, Min]}, Int[x^(p*r)*ExpandToSum[Px/x^r, x]^p*Fx, x] /; IGtQ[r, 0] /; PolyQ[Px, x] && IntegerQ[p] && !MonomialQ[Px, x] && (ILtQ[p, 0] || !PolyQ[u, x])]`
- rule 6452 `Int[((a_) + ArcTanh[(c_)*(x_)^(n_)]*(b_))^(p_)*(x_)^(m_), x_Symbol] :> Simp[x^(m + 1)*((a + b*ArcTanh[c*x^n])^p/(m + 1)), x] - Simp[b*c*n*(p/(m + 1)) Int[x^(m + n)*((a + b*ArcTanh[c*x^n])^(p - 1)/(1 - c^2*x^(2*n))), x], x] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1] && IntegerQ[m])) && NeQ[m, -1]`
- rule 6544 `Int[(((a_) + ArcTanh[(c_)*(x_)]*(b_))^(p_)*((f_)*(x_)^(m_)))/((d_) + (e_)*(x_)^2), x_Symbol] := Simp[1/d Int[(f*x)^m*(a + b*ArcTanh[c*x])^p, x], x] - Simp[e/(d*f^2) Int[(f*x)^(m + 2)*((a + b*ArcTanh[c*x])^p/(d + e*x^2)), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && GtQ[p, 0] && LtQ[m, -1]`
- rule 6554 `Int[(((a_) + ArcTanh[(c_)*(x_)]*(b_))* (x_)^(m_))/((d_) + (e_)*(x_)^2), x_Symbol] := Int[ExpandIntegrand[a + b*ArcTanh[c*x], x^m/(d + e*x^2), x], x] /; FreeQ[{a, b, c, d, e}, x] && IntegerQ[m] && !(EqQ[m, 1] && NeQ[a, 0])`
- rule 7267 `Int[u_, x_Symbol] := With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Simp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2])], x] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]]`

3.48.4 Maple [A] (verified)

Time = 0.99 (sec) , antiderivative size = 577, normalized size of antiderivative = 1.40

method	result
parts	$a \left(\frac{e \ln(ex+d)}{d^2} - \frac{1}{dx} - \frac{e \ln(x)}{d^2} \right) + 2b c^2 \left(\frac{\operatorname{arctanh}(c\sqrt{x}) e \ln(c^2 ex+c^2 d)}{2c^2 d^2} - \frac{\operatorname{arctanh}(c\sqrt{x})}{2d c^2 x} - \frac{\operatorname{arctanh}(c\sqrt{x}) e}{c^2 d^2} \right)$
derivativedivides	$2c^2 \left(-\frac{a}{2d c^2 x} - \frac{ae \ln(c\sqrt{x})}{c^2 d^2} + \frac{ae \ln(c^2 ex+c^2 d)}{2c^2 d^2} \right) + b c^2 \left(-\frac{\operatorname{arctanh}(c\sqrt{x})}{2d c^4 x} - \frac{\operatorname{arctanh}(c\sqrt{x}) e \ln(c\sqrt{x})}{d^2 c^4} + \dots \right)$
default	$2c^2 \left(-\frac{a}{2d c^2 x} - \frac{ae \ln(c\sqrt{x})}{c^2 d^2} + \frac{ae \ln(c^2 ex+c^2 d)}{2c^2 d^2} \right) + b c^2 \left(-\frac{\operatorname{arctanh}(c\sqrt{x})}{2d c^4 x} - \frac{\operatorname{arctanh}(c\sqrt{x}) e \ln(c\sqrt{x})}{d^2 c^4} + \dots \right)$

input `int((a+b*arctanh(c*x^(1/2)))/x^2/(e*x+d),x,method=_RETURNVERBOSE)`

output `a*(e/d^2*ln(e*x+d)-1/d/x-e/d^2*ln(x))+2*b*c^2*(1/2/c^2*arctanh(c*x^(1/2))*e/d^2*ln(c^2*e*x+c^2*d)-1/2*arctanh(c*x^(1/2))/d/c^2/x-1/c^2*arctanh(c*x^(1/2))*e/d^2*ln(c*x^(1/2))-1/2*c^2*(1/d/c^2*(1/c/x^(1/2)-1/2*ln(1+c*x^(1/2))+1/2*ln(c*x^(1/2)-1))-e/d^2/c^4*(-1/2*ln(1+c*x^(1/2))*ln(c^2*e*x+c^2*d)+e*(1/2*ln(1+c*x^(1/2))*(ln((c*(-d*e)^(1/2)-e*(1+c*x^(1/2))+e)/(c*(-d*e)^(1/2)+e))+ln((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(c*(-d*e)^(1/2)-e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(1+c*x^(1/2))+e)/(c*(-d*e)^(1/2)+e))+dilog((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(c*(-d*e)^(1/2)-e)))/e+1/2*ln(c*x^(1/2)-1)*ln(c^2*e*x+c^2*d)-e*(1/2*ln(c*x^(1/2)-1)*(ln((c*(-d*e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+ln((c*(-d*e)^(1/2)+e*(c*x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+dilog((c*(-d*e)^(1/2)+e*(c*x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e)+2*e/d^2/c^4*(-1/2*dilog(1+c*x^(1/2))-1/2*ln(c*x^(1/2))*ln(1+c*x^(1/2))-1/2*dilog(c*x^(1/2))))`

3.48. $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x^2(d+ex)} dx$

3.48.5 Fricas [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(d + ex)} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(ex + d)x^2} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^2/(e*x+d),x, algorithm="fricas")`

output `integral((b*arctanh(c*sqrt(x)) + a)/(e*x^3 + d*x^2), x)`

3.48.6 Sympy [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(d + ex)} dx = \text{Timed out}$$

input `integrate((a+b*atanh(c*x**(1/2)))/x**2/(e*x+d),x)`

output `Timed out`

3.48.7 Maxima [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(d + ex)} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(ex + d)x^2} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^2/(e*x+d),x, algorithm="maxima")`

output `a*(e*log(e*x + d)/d^2 - e*log(x)/d^2 - 1/(d*x)) + b*integrate(1/2*log(c*sqrt(x) + 1)/((e*x^(5/2) + d*x^(3/2))*sqrt(x)), x) - b*integrate(1/2*log(-c*sqrt(x) + 1)/((e*x^(5/2) + d*x^(3/2))*sqrt(x)), x)`

3.48.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(d + ex)} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(ex + d)x^2} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^2/(e*x+d),x, algorithm="giac")`

output `integrate((b*arctanh(c*sqrt(x)) + a)/((e*x + d)*x^2), x)`

3.48.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^2(d + ex)} dx = \int \frac{a + b \operatorname{atanh}(c\sqrt{x})}{x^2(d + ex)} dx$$

input `int((a + b*atanh(c*x^(1/2)))/(x^2*(d + e*x)),x)`

output `int((a + b*atanh(c*x^(1/2)))/(x^2*(d + e*x)), x)`

3.49 $\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x^3(d+ex)} dx$

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3.49.1 Optimal result

Integrand size = 23, antiderivative size = 506

$$\begin{aligned}
 \int \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{x^3(d + ex)} dx = & -\frac{bc}{6dx^{3/2}} - \frac{bc^3}{2d\sqrt{x}} + \frac{bce}{d^2\sqrt{x}} \\
 & + \frac{bc^4\operatorname{arctanh}(c\sqrt{x})}{2d} - \frac{bc^2e\operatorname{arctanh}(c\sqrt{x})}{d^2} \\
 & - \frac{a + b\operatorname{arctanh}(c\sqrt{x})}{2dx^2} + \frac{e(a + b\operatorname{arctanh}(c\sqrt{x}))}{d^2x} \\
 & + \frac{2e^2(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2}{1+c\sqrt{x}}\right)}{d^3} \\
 & - \frac{e^2(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{d^3} \\
 & - \frac{e^2(a + b\operatorname{arctanh}(c\sqrt{x})) \log\left(\frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{d^3} \\
 & + \frac{ae^2 \log(x)}{d^3} - \frac{be^2 \operatorname{PolyLog}\left(2, 1 - \frac{2}{1+c\sqrt{x}}\right)}{d^3} \\
 & + \frac{be^2 \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}-\sqrt{e}\sqrt{x})}{(c\sqrt{-d}-\sqrt{e})(1+c\sqrt{x})}\right)}{2d^3} \\
 & + \frac{be^2 \operatorname{PolyLog}\left(2, 1 - \frac{2c(\sqrt{-d}+\sqrt{e}\sqrt{x})}{(c\sqrt{-d}+\sqrt{e})(1+c\sqrt{x})}\right)}{2d^3} \\
 & - \frac{be^2 \operatorname{PolyLog}(2, -c\sqrt{x})}{d^3} + \frac{be^2 \operatorname{PolyLog}(2, c\sqrt{x})}{d^3}
 \end{aligned}$$

output
$$\begin{aligned} & -1/6*b*c/d/x^{(3/2)}+1/2*b*c^4*\operatorname{arctanh}(c*x^{(1/2)})/d-b*c^2*e*\operatorname{arctanh}(c*x^{(1/2)})/d^2+1/2*(-a-b*\operatorname{arctanh}(c*x^{(1/2)}))/d/x^2+e*(a+b*\operatorname{arctanh}(c*x^{(1/2)}))/d^2/x+a*e^2*\ln(x)/d^3+2*e^2*(a+b*\operatorname{arctanh}(c*x^{(1/2)}))*\ln(2/(1+c*x^{(1/2)}))/d^3-e^2*(a+b*\operatorname{arctanh}(c*x^{(1/2)}))*\ln(2*c*((-d)^{(1/2)}-e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}-e^{(1/2)}))/(1+c*x^{(1/2)})/d^3-e^2*(a+b*\operatorname{arctanh}(c*x^{(1/2)}))*\ln(2*c*((-d)^{(1/2)}+e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}+e^{(1/2)}))/(1+c*x^{(1/2)})/d^3-b*e^2*\operatorname{polylog}(2,-c*x^{(1/2)})/d^3+b*e^2*\operatorname{polylog}(2,c*x^{(1/2)})/d^3-b*e^2*\operatorname{polylog}(2,1-2/(1+c*x^{(1/2)}))/d^3+1/2*b*e^2*\operatorname{polylog}(2,1-2*c*((-d)^{(1/2)}-e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}-e^{(1/2)}))/(1+c*x^{(1/2)})/d^3+1/2*b*e^2*\operatorname{polylog}(2,1-2*c*((-d)^{(1/2)}+e^{(1/2)}*x^{(1/2)})/(c*(-d)^{(1/2)}+e^{(1/2)}))/(1+c*x^{(1/2)})/d^3-1/2*b*c^3/d/x^{(1/2)}+b*c*e/d^2/x^{(1/2)} \end{aligned}$$

3.49.2 Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 2.78 (sec) , antiderivative size = 538, normalized size of antiderivative = 1.06

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(d + ex)} dx = \frac{3ad^2 - 6adex - 6ae^2x^2 \log(x) + 6ae^2x^2 \log(d + ex) + b \left(cd\sqrt{x}(d + 3c^2dx - 6ex) - 3\operatorname{arctanh}(c\sqrt{x}) \right) (d + ex)}{d^3x^2}$$

input `Integrate[(a + b*ArcTanh[c*Sqrt[x]])/(x^3*(d + e*x)),x]`

output
$$\begin{aligned} & -1/6*(3*a*d^2 - 6*a*d*e*x - 6*a*e^2*x^2*\operatorname{Log}[x] + 6*a*e^2*x^2*\operatorname{Log}[d + e*x] \\ & + b*(c*d*\operatorname{Sqrt}[x]*(d + 3*c^2*d*x - 6*e*x) - 3*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]]*(d*(-1 + c^2*x)*(d + c^2*d*x - 2*e*x) + 2*e^2*x^2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]] + 4*e^2*x^2*\operatorname{Log}[1 - E^{(-2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}]) + 6*e^2*x^2*\operatorname{PolyLog}[2, E^{(-2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}] + 3*e^2*x^2*(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]]^2 - (4*I)*\operatorname{ArcSin}[\operatorname{Sqrt}[(c^2*d)/(c^2*d + e)]]*\operatorname{ArcTanh}[(c*e*\operatorname{Sqrt}[x])/ \operatorname{Sqrt}[-(c^2*d*e)]] + 2*((-I)*\operatorname{ArcSin}[\operatorname{Sqrt}[(c^2*d)/(c^2*d + e)]] + \operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])*\operatorname{Log}[(-2*\operatorname{Sqrt}[-(c^2*d*e)]] + e*(-1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}) + c^2*d*(1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}))/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}) + 2*(I*\operatorname{ArcSin}[\operatorname{Sqrt}[(c^2*d)/(c^2*d + e)]] + \operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])*\operatorname{Log}[(2*\operatorname{Sqrt}[-(c^2*d*e)]] + e*(-1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}) + c^2*d*(1 + E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}))/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}) - \operatorname{PolyLog}[2, -(c^2*d) + e - 2*\operatorname{Sqrt}[-(c^2*d*e)]]/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}) - \operatorname{PolyLog}[2, -(c^2*d) + e + 2*\operatorname{Sqrt}[-(c^2*d*e)]]/((c^2*d + e)*E^{(2*\operatorname{ArcTanh}[c*\operatorname{Sqrt}[x]])}))))/(d^3*x^2) \end{aligned}$$

3.49.
$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(d + ex)} dx$$

3.49.3 Rubi [A] (verified)

Time = 1.50 (sec) , antiderivative size = 498, normalized size of antiderivative = 0.98, number of steps used = 14, number of rules used = 13, $\frac{\text{number of rules}}{\text{integrand size}} = 0.565$, Rules used = {7267, 2026, 6544, 6452, 264, 264, 219, 6544, 6452, 264, 219, 6554, 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.

$$\begin{aligned}
 & \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^3(d+ex)} dx \\
 & \quad \downarrow \text{7267} \\
 & 2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{ex^{7/2} + dx^{5/2}} d\sqrt{x} \\
 & \quad \downarrow \text{2026} \\
 & 2 \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{5/2}(d+ex)} d\sqrt{x} \\
 & \quad \downarrow \text{6544} \\
 & 2 \left(\frac{\int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{5/2}} d\sqrt{x}}{d} - \frac{e \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(d+ex)} d\sqrt{x}}{d} \right) \\
 & \quad \downarrow \text{6452} \\
 & 2 \left(\frac{\frac{1}{4}bc \int \frac{1}{x^2(1-c^2x)} d\sqrt{x} - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2}}{d} - \frac{e \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(d+ex)} d\sqrt{x}}{d} \right) \\
 & \quad \downarrow \text{264} \\
 & 2 \left(\frac{\frac{1}{4}bc \left(c^2 \int \frac{1}{x(1-c^2x)} d\sqrt{x} - \frac{1}{3x^{3/2}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2}}{d} - \frac{e \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(d+ex)} d\sqrt{x}}{d} \right) \\
 & \quad \downarrow \text{264} \\
 & 2 \left(\frac{\frac{1}{4}bc \left(c^2 \left(c^2 \int \frac{1}{1-c^2x} d\sqrt{x} - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{a + \operatorname{barctanh}(c\sqrt{x})}{4x^2}}{d} - \frac{e \int \frac{a + \operatorname{barctanh}(c\sqrt{x})}{x^{3/2}(d+ex)} d\sqrt{x}}{d} \right) \\
 & \quad \downarrow \text{219}
 \end{aligned}$$

$$2 \left(\frac{\frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{4x^2}}{d} - \frac{e \int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x^{3/2}(d+ex)} d\sqrt{x}}{d} \right)$$

↓ 6544

$$2 \left(\frac{\frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{4x^2}}{d} - \frac{e \left(\frac{\int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{x^{3/2}} d\sqrt{x}}{d} - \frac{e \int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{\sqrt{x}(d+ex)} d\sqrt{x}}{d} \right)}{d} \right)$$

↓ 6452

$$2 \left(\frac{\frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{4x^2}}{d} - \frac{e \left(\frac{\frac{1}{2}bc \int \frac{1}{x(1-c^2x)} d\sqrt{x} - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{2x}}{d} - \frac{e \int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{\sqrt{x}(d+ex)} d\sqrt{x}}{d} \right)}{d} \right)$$

↓ 264

$$2 \left(\frac{\frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{4x^2}}{d} - \frac{e \left(\frac{\frac{1}{2}bc \left(c^2 \int \frac{1}{1-c^2x} d\sqrt{x} - \frac{1}{\sqrt{x}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{2x}}{d} - \frac{e \int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{\sqrt{x}(d+ex)} d\sqrt{x}}{d} \right)}{d} \right)$$

↓ 219

$$2 \left(\frac{\frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{4x^2}}{d} - \frac{e \left(\frac{\frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{2x}}{d} - \frac{e \int \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{\sqrt{x}(d+ex)} d\sqrt{x}}{d} \right)}{d} \right)$$

↓ 6554

$$2 \left(\frac{\frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{4x^2}}{d} - e \left(\frac{\frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{2x}}{d} - \dots \right) \right)$$

↓ 2009

$$2 \left(\frac{\frac{1}{4}bc \left(c^2 \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{1}{3x^{3/2}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{4x^2}}{d} - e \left(\frac{\frac{1}{2}bc \left(\operatorname{carctanh}(c\sqrt{x}) - \frac{1}{\sqrt{x}} \right) - \frac{a+b\operatorname{arctanh}(c\sqrt{x})}{2x}}{d} - \dots \right) \right)$$

input `Int[(a + b*ArcTanh[c*Sqrt[x]])/(x^3*(d + e*x)),x]`

output `2*((-1/4*(a + b*ArcTanh[c*Sqrt[x]])/x^2 + (b*c*(-1/3*1/x^(3/2) + c^2*(-1/Sqrt[x]) + c*ArcTanh[c*Sqrt[x]]))/4)/d - (e*((-1/2*(a + b*ArcTanh[c*Sqrt[x]])/x + (b*c*(-1/Sqrt[x]) + c*ArcTanh[c*Sqrt[x]]))/2)/d - (e*(((a + b*ArcTanh[c*Sqrt[x]])*Log[2/(1 + c*Sqrt[x]])/d - ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x]))])/d - ((a + b*ArcTanh[c*Sqrt[x]])*Log[(2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x]))])/d - (b*PolyLog[2, 1 - 2/(1 + c*Sqrt[x])])/(2*d) + (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] - Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] - Sqrt[e])*(1 + c*Sqrt[x]))])/d - (b*PolyLog[2, 1 - (2*c*(Sqrt[-d] + Sqrt[e]*Sqrt[x]))/((c*Sqrt[-d] + Sqrt[e])*(1 + c*Sqrt[x]))])/d - (b*PolyLog[2, -(c*Sqrt[x])])/(2*d) + (b*PolyLog[2, c*Sqrt[x])/(2*d)))/d)/d`

3.49.3.1 Defintions of rubi rules used

rule 219 `Int[((a_) + (b_)*(x_)^2)^(-1), x_Symbol] := Simp[(1/(Rt[a, 2]*Rt[-b, 2]))*ArcTanh[Rt[-b, 2]*(x/Rt[a, 2])], x] /; FreeQ[{a, b}, x] && NegQ[a/b] && (GtQ[a, 0] || LtQ[b, 0])`

rule 264 `Int[((c_)*(x_)^(m_))*((a_) + (b_)*(x_)^2)^(p_), x_Symbol] := Simp[(c*x)^(m + 1)*((a + b*x^2)^(p + 1)/(a*c*(m + 1))), x] - Simp[b*(m + 2*p + 3)/(a*c^2*(m + 1)) Int[(c*x)^(m + 2)*(a + b*x^2)^p, x], x] /; FreeQ[{a, b, c, p}, x] && LtQ[m, -1] && IntBinomialQ[a, b, c, 2, m, p, x]`

rule 2009 `Int[u_, x_Symbol] := Simp[IntSum[u, x], x] /; SumQ[u]`

rule 2026 `Int[(Fx_)*(Px_)^(p_), x_Symbol] := With[{r = Expon[Px, x, Min]}, Int[x^(p*r)*ExpandToSum[Px/x^r, x]^p*Fx, x] /; IGtQ[r, 0]] /; PolyQ[Px, x] && IntegerQ[p] && !MonomialQ[Px, x] && (ILtQ[p, 0] || !PolyQ[u, x])`

rule 6452 `Int[((a_) + ArcTanh[(c_)*(x_)^(n_)]*(b_))^(p_)*(x_)^(m_), x_Symbol] := Simp[x^(m + 1)*((a + b*ArcTanh[c*x^n])^p/(m + 1)), x] - Simp[b*c*n*(p/(m + 1)) Int[x^(m + n)*((a + b*ArcTanh[c*x^n])^(p - 1)/(1 - c^2*x^(2*n))), x], x] /; FreeQ[{a, b, c, m, n}, x] && IGtQ[p, 0] && (EqQ[p, 1] || (EqQ[n, 1] && IntegerQ[m])) && NeQ[m, -1]`

rule 6544 `Int[((a_) + ArcTanh[(c_)*(x_)*(b_)]^(p_))*((f_)*(x_)^(m_))/((d_) + (e_)*(x_)^2), x_Symbol] := Simp[1/d Int[(f*x)^m*(a + b*ArcTanh[c*x])^p, x], x] - Simp[e/(d*f^2) Int[(f*x)^(m + 2)*((a + b*ArcTanh[c*x])^p/(d + e*x^2)), x], x] /; FreeQ[{a, b, c, d, e, f}, x] && GtQ[p, 0] && LtQ[m, -1]`

rule 6554 `Int[((a_) + ArcTanh[(c_)*(x_)*(b_)]*(x_)^(m_))/((d_) + (e_)*(x_)^2), x_Symbol] := Int[ExpandIntegrand[a + b*ArcTanh[c*x], x^m/(d + e*x^2), x], x] /; FreeQ[{a, b, c, d, e}, x] && IntegerQ[m] && !(EqQ[m, 1] && NeQ[a, 0])`

rule 7267 `Int[u_, x_Symbol] := With[{lst = SubstForFractionalPowerOfLinear[u, x]}, Simp[lst[[2]]*lst[[4]] Subst[Int[lst[[1]], x], x, lst[[3]]^(1/lst[[2])], x] /; !FalseQ[lst] && SubstForFractionalPowerQ[u, lst[[3]], x]]`

3.49.4 Maple [A] (verified)

Time = 0.84 (sec) , antiderivative size = 650, normalized size of antiderivative = 1.28

method	result
parts	$a \left(-\frac{e^2 \ln(ex+d)}{d^3} - \frac{1}{2dx^2} + \frac{e^2 \ln(x)}{d^3} + \frac{e}{d^2x} \right) + 2bc^4 \left(-\frac{\operatorname{arctanh}(c\sqrt{x})e^2 \ln(c^2ex+c^2d)}{2c^4d^3} - \frac{\operatorname{arctanh}(c\sqrt{x})}{4dc^4x^2} \right)$
derivativedivides	$2c^4 \left(-\frac{a}{4dc^4x^2} + \frac{ae^2 \ln(c\sqrt{x})}{c^4d^3} + \frac{ae}{2c^4d^2x} - \frac{ae^2 \ln(c^2ex+c^2d)}{2c^4d^3} \right) + bc^2 \left(-\frac{\operatorname{arctanh}(c\sqrt{x})}{4dc^6x^2} + \frac{\operatorname{arctanh}(c\sqrt{x})e}{d^3c^6} \right)$
default	$2c^4 \left(-\frac{a}{4dc^4x^2} + \frac{ae^2 \ln(c\sqrt{x})}{c^4d^3} + \frac{ae}{2c^4d^2x} - \frac{ae^2 \ln(c^2ex+c^2d)}{2c^4d^3} \right) + bc^2 \left(-\frac{\operatorname{arctanh}(c\sqrt{x})}{4dc^6x^2} + \frac{\operatorname{arctanh}(c\sqrt{x})e}{d^3c^6} \right)$

```
input int((a+b*arctanh(c*x^(1/2)))/x^3/(e*x+d),x,method=_RETURNVERBOSE)
```

```
output a*(-e^2/d^3*ln(e*x+d)-1/2/d/x^2+e^2/d^3*ln(x)+e/d^2/x)+2*b*c^4*(-1/2/c^4*arctanh(c*x^(1/2))*e^2/d^3*ln(c^2*e*x+c^2*d)-1/4*arctanh(c*x^(1/2))/d/c^4/x^2+1/c^4*arctanh(c*x^(1/2))*e^2/d^3*ln(c*x^(1/2))+1/2/c^4*arctanh(c*x^(1/2))*e/d^2/x-1/4*c^2*(2*e^2/d^3/c^6*(-1/2*ln(1+c*x^(1/2))*ln(c^2*e*x+c^2*d)+e*(1/2*ln(1+c*x^(1/2))*(ln((c*(-d*e)^(1/2)-e*(1+c*x^(1/2))+e)/(c*(-d*e)^(1/2)+e))+ln((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(c*(-d*e)^(1/2)-e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(1+c*x^(1/2))+e)/(c*(-d*e)^(1/2)+e))+dilog((c*(-d*e)^(1/2)+e*(1+c*x^(1/2))-e)/(c*(-d*e)^(1/2)-e)))/e+1/2*ln(c*x^(1/2)-1)*ln(c^2*e*x+c^2*d)-e*(1/2*ln(c*x^(1/2)-1)*(ln((c*(-d*e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+ln((c*(-d*e)^(1/2)+e*(c*x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e+1/2*(dilog((c*(-d*e)^(1/2)-e*(c*x^(1/2)-1)-e)/(c*(-d*e)^(1/2)-e))+dilog((c*(-d*e)^(1/2)+e*(c*x^(1/2)-1)+e)/(c*(-d*e)^(1/2)+e)))/e)-4*e^2/d^3/c^6*(-1/2*dilog(1+c*x^(1/2))-1/2*ln(c*x^(1/2))*ln(1+c*x^(1/2))-1/2*dilog(c*x^(1/2)))-1/c^4/d^2*((1/2*c^2*d-e)*ln(1+c*x^(1/2))+(-1/2*c^2*d+e)*ln(c*x^(1/2)-1)-(c^2*d-2*e)/c/x^(1/2)-1/3*d/c/x^(3/2))))
```

3.49.5 Fricas [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(d + ex)} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(ex + d)x^3} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^3/(e*x+d),x, algorithm="fricas")`

output `integral((b*arctanh(c*sqrt(x)) + a)/(e*x^4 + d*x^3), x)`

3.49.6 Sympy [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(d + ex)} dx = \text{Timed out}$$

input `integrate((a+b*atanh(c*x**(1/2)))/x**3/(e*x+d),x)`

output `Timed out`

3.49.7 Maxima [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(d + ex)} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(ex + d)x^3} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^3/(e*x+d),x, algorithm="maxima")`

output `-1/2*a*(2*e^2*log(e*x + d)/d^3 - 2*e^2*log(x)/d^3 - (2*e*x - d)/(d^2*x^2)) + b*integrate(1/2*log(c*sqrt(x) + 1)/((e*x^(7/2) + d*x^(5/2))*sqrt(x)), x) - b*integrate(1/2*log(-c*sqrt(x) + 1)/((e*x^(7/2) + d*x^(5/2))*sqrt(x)), x)`

3.49.8 Giac [F]

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(d + ex)} dx = \int \frac{b \operatorname{artanh}(c\sqrt{x}) + a}{(ex + d)x^3} dx$$

input `integrate((a+b*arctanh(c*x^(1/2)))/x^3/(e*x+d),x, algorithm="giac")`

output `integrate((b*arctanh(c*sqrt(x)) + a)/((e*x + d)*x^3), x)`

3.49.9 Mupad [F(-1)]

Timed out.

$$\int \frac{a + b \operatorname{arctanh}(c\sqrt{x})}{x^3(d + ex)} dx = \int \frac{a + b \operatorname{atanh}(c\sqrt{x})}{x^3(d + ex)} dx$$

input `int((a + b*atanh(c*x^(1/2)))/(x^3*(d + e*x)),x)`

output `int((a + b*atanh(c*x^(1/2)))/(x^3*(d + e*x)), x)`

APPENDIX

4.1 Listing of Grading functions	389
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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;
    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
  end if
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(leaf_count_result)
            else:
                grade = "C"
                grade_annotation = "Result contains higher order function than in optimal. Order "+str(ExpnType_result)

    #print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)

```

```
return grade, grade_annotation
```

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 Fracas, Giac and Maxima results.
#Dec 24, 2019. Nasser: Added 'exp_integral_e' and 'sng', 'sin_integral'
#      'arctan2', 'floor', 'abs', 'log_integral'
#June 4, 2022 Made default grade_annotation "none" instead of "" due
#      issue later when reading the file.
#July 14, 2022. Added ellipticF. This is until they fix sagemath, then remove it.

from sage.all import *
from sage.symbolic.operators import add_vararg, mul_vararg

debug=False;

def tree_size(expr):
    r"""
    Return the tree size of this expression.
    """
    #print("Enter tree_size, expr is ",expr)

    if expr not in SR:
        # deal with lists, tuples, vectors
        return 1 + sum(tree_size(a) for a in expr)
    expr = SR(expr)
    x, aa = expr.operator(), expr.operands()
    if x is None:
        return 1
    else:
        return 1 + sum(tree_size(a) for a in aa)

def is_sqrt(expr):
    if expr.operator() == operator.pow: #isinstance(expr,Pow):
        if expr.operands()[1]==1/2: #expr.args[1] == Rational(1,2):
            if debug: print ("expr is sqrt")
            return True
        else:
```

```

        return False
    else:
        return False

def is_elementary_function(func):
    #debug=False
    m = func.name() in ['exp','log','ln',
        'sin','cos','tan','cot','sec','csc',
        'arcsin','arccos','arctan','arccot','arcsec','arccsc',
        'sinh','cosh','tanh','coth','sech','csch',
        'arcsinh','arccosh','arctanh','arcoth','arcsech','arccsch','sgn',
        'arctan2','floor','abs'
    ]
    if debug:
        if m:
            print ("func ", func , " is elementary_function")
        else:
            print ("func ", func , " is NOT elementary_function")

    return m

def is_special_function(func):
    #debug=False
    if debug:
        print ("type(func)=", type(func))

    m= func.name() in ['erf','erfc','erfi','fresnel_sin','fresnel_cos','Ei',
        'Ei','Li','Si','sin_integral','Ci','cos_integral','Shi','sinh_integral',
        'Chi','cosh_integral','gamma','log_gamma','psi,zeta',
        'polylog','lambert_w','elliptic_f','elliptic_e','ellipticF',
        'elliptic_pi','exp_integral_e','log_integral']

    if debug:
        print ("m=",m)
        if m:
            print ("func ", func ," is special_function")
        else:
            print ("func ", func ," is NOT special_function")

    return m

```

```

def is_hypergeometric_function(func):
    return func.name() in ['hypergeometric', 'hypergeometric_M', 'hypergeometric_U']

def is_appell_function(func):
    return func.name() in ['hypergeometric']  #[appellf1] can't find this in sagemath

def is_atom(expn):

    #debug=False
    if debug:
        print ("Enter is_atom, expn=", expn)

    if not hasattr(expn, 'parent'):
        return False

    #thanks to answer at https://ask.sagemath.org/question/49179/what-is-sagemath-equivalent-to-atomic-try:
    try:
        if expn.parent() is SR:
            return expn.operator() is None
        if expn.parent() in (ZZ, QQ, AA, QQbar):
            return expn in expn.parent() # Should always return True
        if hasattr(expn.parent(), "base_ring") and hasattr(expn.parent(), "gens"):
            return expn in expn.parent().base_ring() or expn in expn.parent().gens()

        return False

    except AttributeError as error:
        print("Exception, AttributeError in is_atom")
        print ("caught exception" , type(error).__name__ )
        return False

def expnType(expn):

    if debug:
        print (">>>>>Enter expnType, expn=", expn)
        print (">>>>>is_atom(expn)=", is_atom(expn))

    if is_atom(expn):
        return 1
    elif type(expn)==list:  #isinstance(expn,list):

```

```

    return max(map(expnType, expn)) #apply(max,map(ExpnType,expn))
elif is_sqrt(expn):
    if type(expn.operands()[0])==Rational: #type(isinstance(expn.args[0],Rational):
        return 1
    else:
        return max(2,expnType(expn.operands()[0])) #max(2,expnType(expn.args[0]))
elif expn.operator() == operator.pow: #instance(expn,Pow)
    if type(expn.operands()[1])==Integer: #instance(expn.args[1],Integer)
        return expnType(expn.operands()[0]) #expnType(expn.args[0])
    elif type(expn.operands()[1])==Rational: #instance(expn.args[1],Rational)
        if type(expn.operands()[0])==Rational: #instance(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: #instance(expn,Add) or inst
    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
```