Computer Algebra
Independent Integration Tests

Summer 2024

1-Algebraic-functions/1.1-Binomial/1.1.2-Quadratic-binomial/37-1.1.2.9

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May 18, 2024   Compiled on May 18, 2024 at 5:48pm

Contents

CHAPTER 1

Introduction

This report gives the result of running the computer algebra independent integration test.The download section in on the main webpage contains links to download the problems in plain text format used for all CAS systems. The number of integrals in this report is [**57**]. This is test number [37].

1.1 Listing of CAS systems tested

The following are the CAS systems tested:

1. Mathematica 14 (January 9, 2024) on windows 10 pro.
2. Rubi 4.17.3 (Sept 25, 2023) on Mathematica 14 on windows 10m pro.
3. Maple 2024 (March 1, 2024) on windows 10 pro.
4. Maxima 5.47 (June 1, 2023) using Lisp SBCL 2.4.0 on Linux Manjaro 23.1.2 KDE via sagemath 10.3.
5. FriCAS 1.3.10 built with sbcl 2.3.11 (January 10, 2024) on Linux Manjaro 23.1.2 KDE via sagemath 10.3.
6. Giac/Xcas 1.9.0-99 on Linux via sagemath 10.3.
7. Sympy 1.12 using Python 3.11.6 (Nov 14 2023, 09:36:21) [GCC 13.2.1 20230801] on Linux Manjaro 23.1.2 KDE.
8. Mupad using Matlab 2021a with Symbolic Math Toolbox Version 8.7 on windows 10.
9. Reduce CSL rev 6687 (January 9, 2024) on Linux Manjaro 23.1.2 KDE.

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.

Reduce was called directly.

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 (57)	0.00 (0)
Mathematica	100.00 (57)	0.00 (0)
Maple	91.23 (52)	8.77 (5)
Fricas	91.23 (52)	8.77 (5)
Reduce	15.79 (9)	84.21 (48)
Giac	14.04 (8)	85.96 (49)
Maxima	12.28 (7)	87.72 (50)
Mupad	8.77 (5)	91.23 (52)
Sympy	8.77 (5)	91.23 (52)

Table 1.1: Percentage solved for each CAS

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

grade	description
A	Integral was solved and antiderivative is optimal in quality and leaf size.
B	Integral was solved and antiderivative is optimal in quality but leaf size is larger than twice the optimal antiderivatives leaf size.
C	Integral was solved and antiderivative is non-optimal in quality. This can be due to one or more of the following reasons 1. antiderivative contains a hypergeometric function and the optimal antiderivative does not. 2. antiderivative contains a special function and the optimal antiderivative does not. 3. antiderivative contains the imaginary unit and the optimal antiderivative does not.
F	Integral was not solved. Either the integral was returned unevaluated within the time limit, or it timed out, or CAS hanged or crashed or an exception was raised.

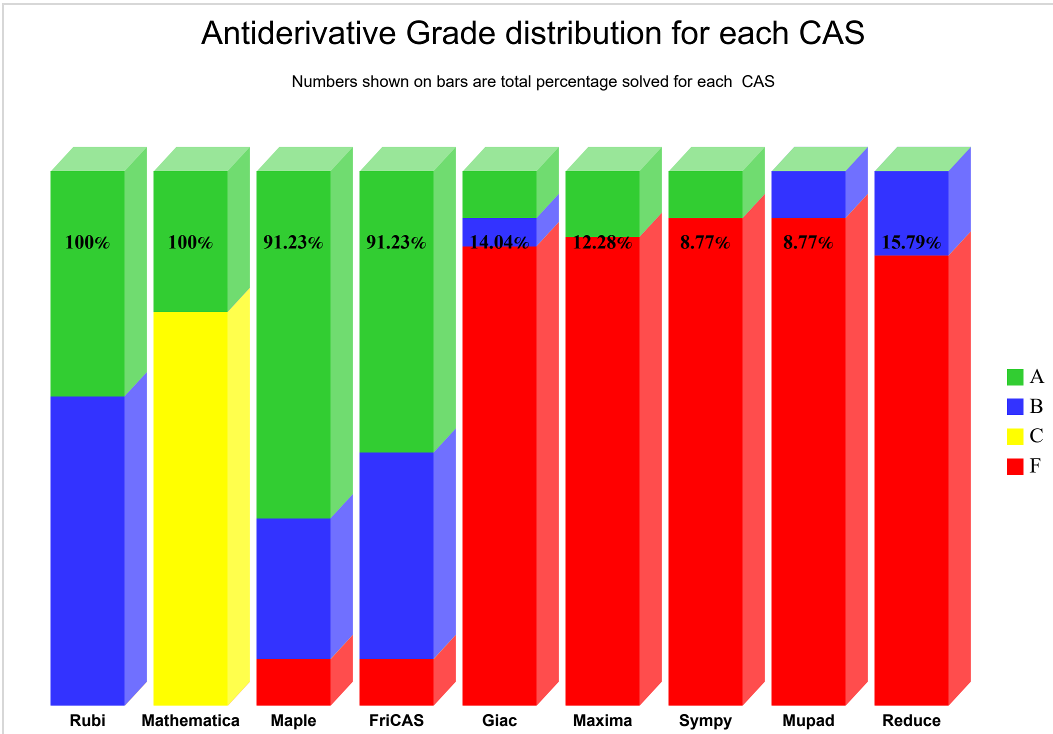
Table 1.2: Description of grading applied to integration result

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

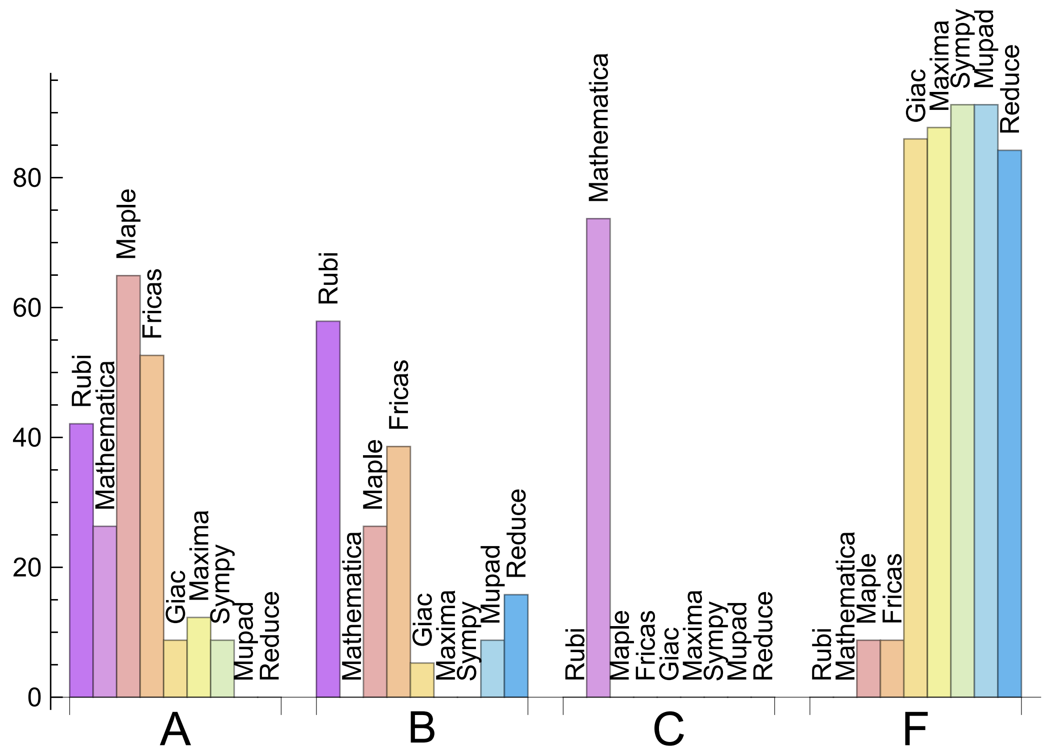
System	% A grade	% B grade	% C grade	% F grade
Maple	64.912	26.316	0.000	8.772
Fricas	52.632	38.596	0.000	8.772
Rubi	42.105	57.895	0.000	0.000
Mathematica	26.316	0.000	73.684	0.000
Maxima	12.281	0.000	0.000	87.719
Giac	8.772	5.263	0.000	85.965
Sympy	8.772	0.000	0.000	91.228
Mupad	0.000	8.772	0.000	91.228
Reduce	0.000	15.789	0.000	84.211

Table 1.3: Antiderivative Grade distribution of each CAS

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



The figure below compares the grades of the CAS systems.



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

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

The third is due to an exception generated, indicated as **F(-2)**. This most likely indicates an interface problem between sagemath and the CAS (applicable only to FriCAS, Maxima and Giac) or it could be an indication of an internal error in the CAS itself. This type of error requires more investigation to determine the cause.

System	Number failed	Percentage normal failure	Percentage timeout failure	Percentage exception failure
Rubi	0	0.00	0.00	0.00
Mathematica	0	0.00	0.00	0.00
Fricas	5	80.00	20.00	0.00
Maple	5	100.00	0.00	0.00
Reduce	48	100.00	0.00	0.00
Giac	49	97.96	0.00	2.04
Maxima	50	100.00	0.00	0.00
Mupad	52	0.00	100.00	0.00
Sympy	52	76.92	23.08	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	0.08
Giac	0.15
Sympy	0.22
Fricas	0.57
Reduce	0.64
Mupad	0.90
Rubi	1.64
Mathematica	7.37
Maple	7.44

Table 1.5: Time performance for each CAS

System	Mean size	Normalized mean	Median size	Normalized median
Mupad	31.40	1.36	20.00	0.87
Maxima	114.43	1.15	28.00	1.14
Sympy	173.40	1.07	29.00	1.00
Giac	309.62	1.95	106.00	0.99
Reduce	351.56	2.11	43.00	1.12
Mathematica	499.93	1.04	370.00	0.95
Maple	738.21	1.51	714.50	1.67
Rubi	918.81	1.98	975.00	2.10
Fricas	1028.81	2.35	820.00	1.72

Table 1.6: Leaf size performance for each CAS

1.4 Performance based on number of rules Rubi used

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

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

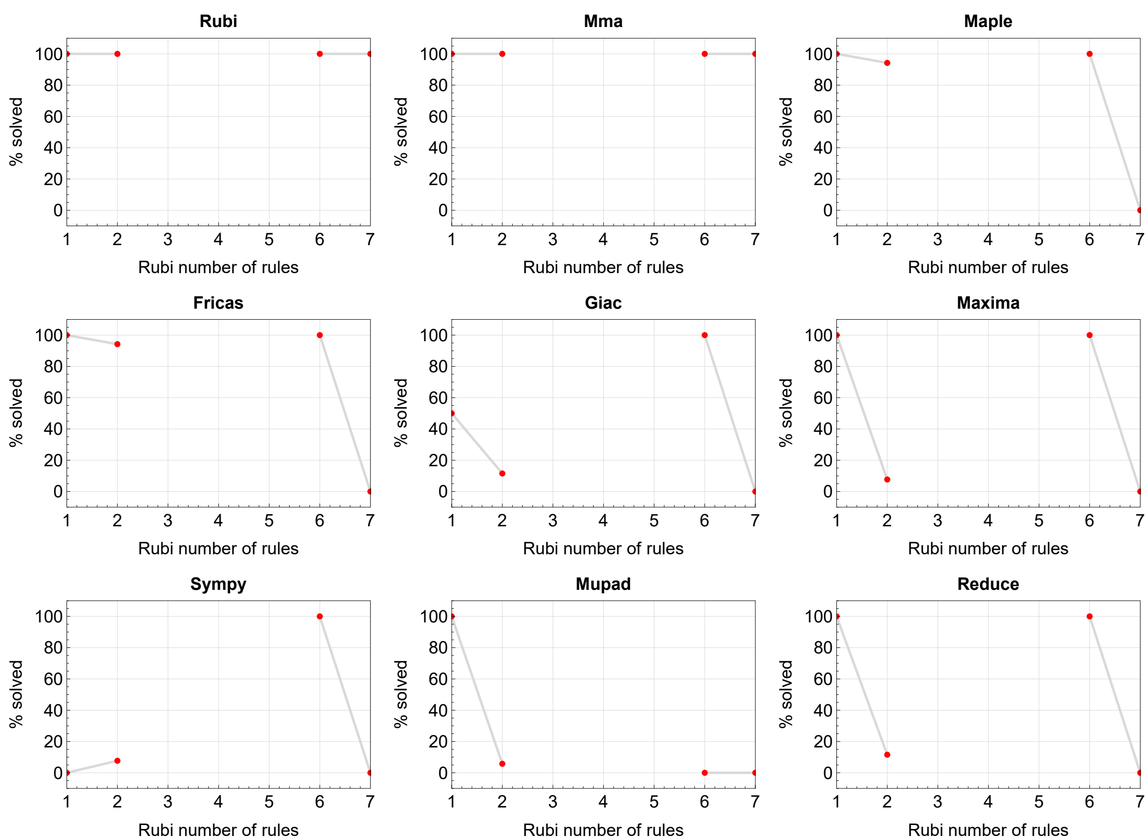


Figure 1.1: Solving statistics per number of Rubi rules used

1.5 Performance based on number of steps Rubi used

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

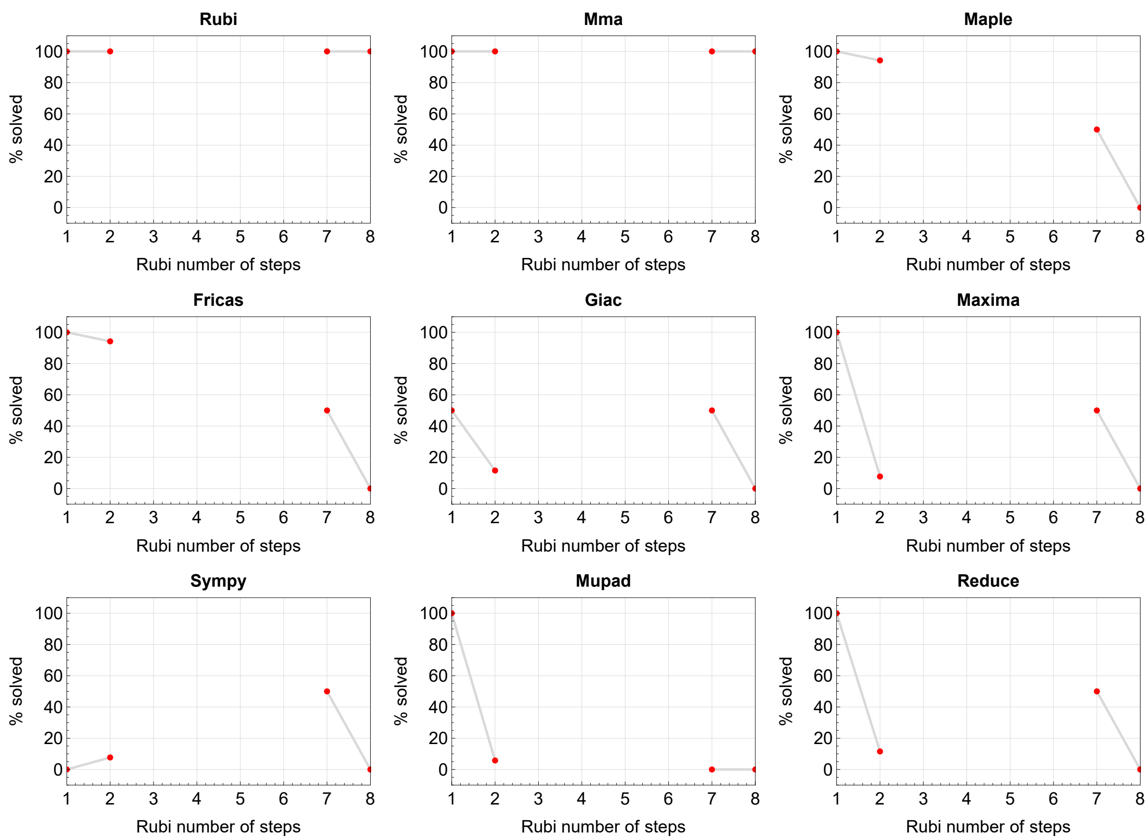


Figure 1.2: Solving statistics per number of Rubi steps used

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

1.6 Solved integrals histogram based on leaf size of result

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

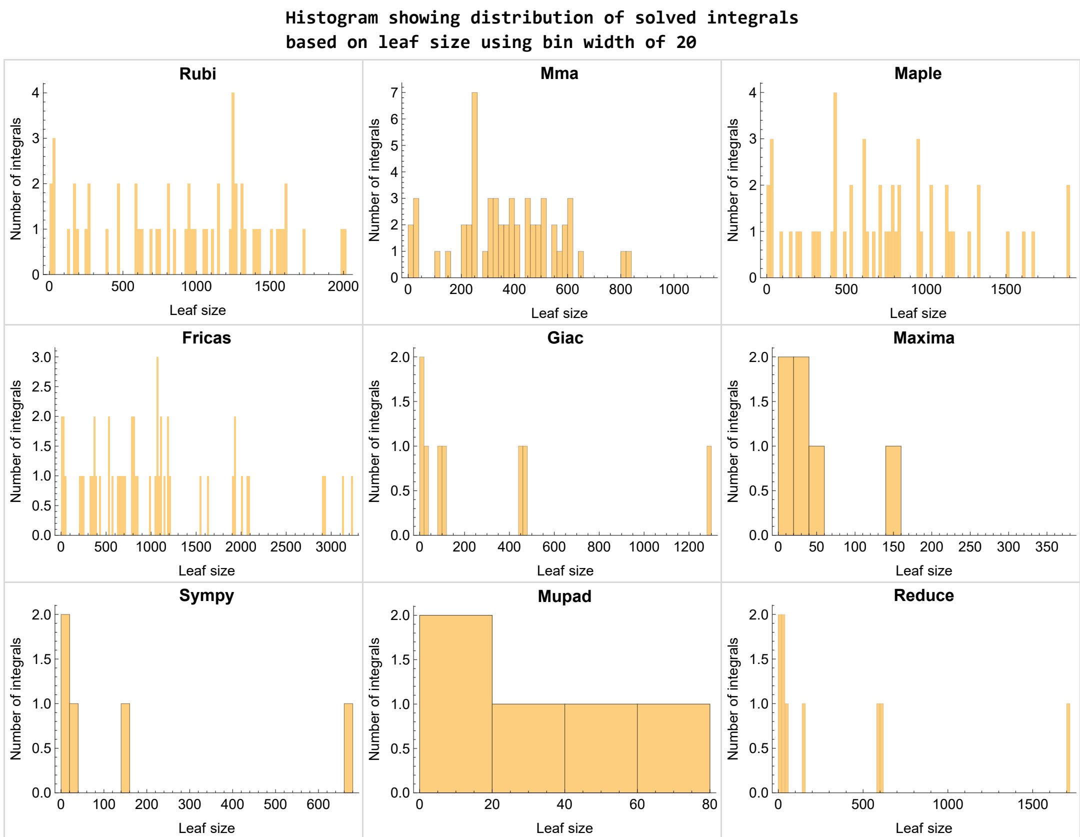


Figure 1.3: Solved integrals based on leaf size distribution

1.7 Solved integrals histogram based on CPU time used

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

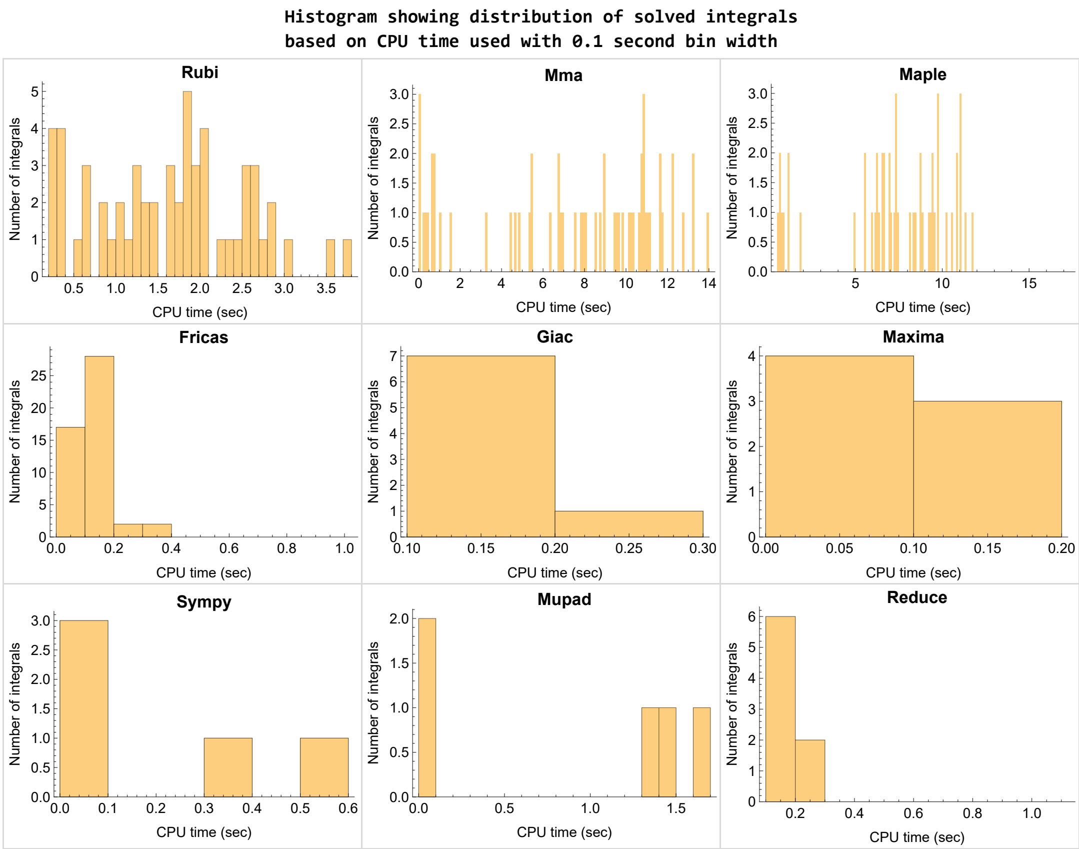


Figure 1.4: Solved integrals histogram based on CPU time used

1.8 Leaf size vs. CPU time used

The following shows 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. This should also be taken into account when looking at the timing of these three CAS systems. Direct calls not using sagemath would result in faster timings, but current implementation uses sagemath as this makes testing much easier to do.

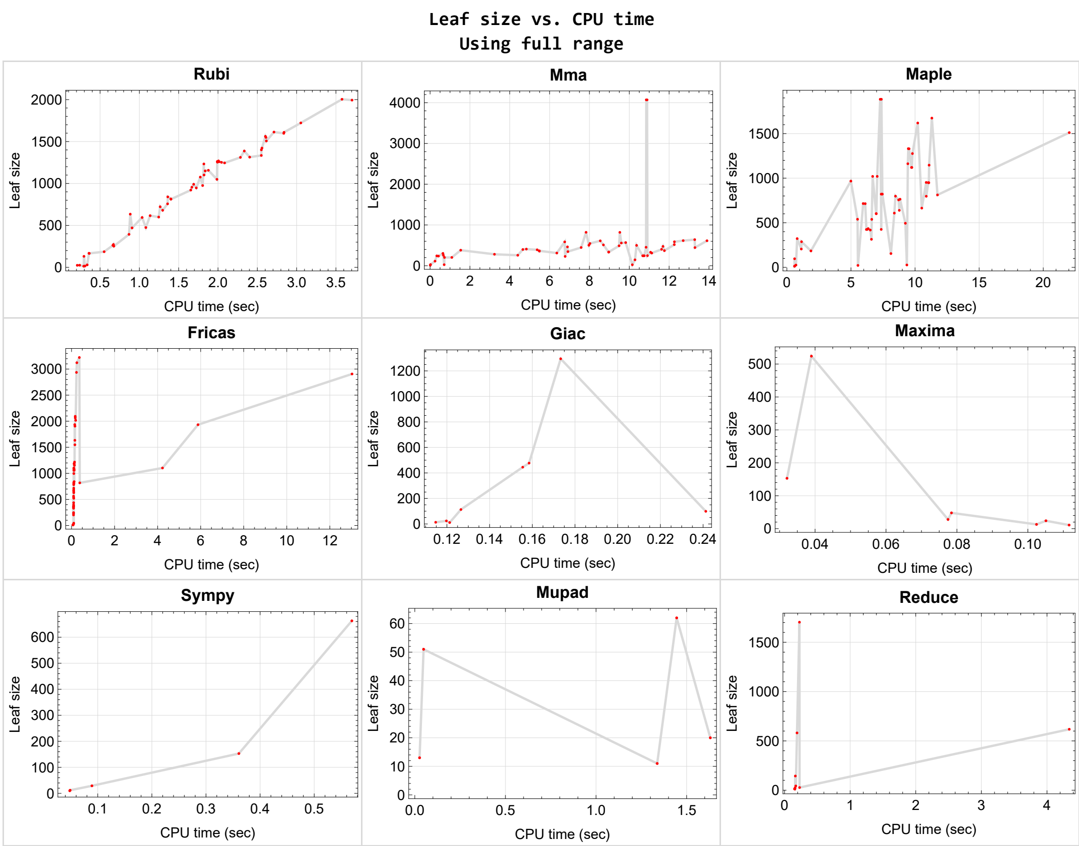


Figure 1.5: Leaf size vs. CPU time. Full range

1.9 list of integrals with no known antiderivative

{}

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

Rubi {}

Mathematica {}

Maple {}

Maxima {}

Fricas {}

Sympy {}

Giac {}

Reduce {}

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 $\{9, 53, 54, 55, 56\}$

Maple {}

Maxima Verification phase not currently implemented.

Fricas Verification phase not currently implemented.

Sympy Verification phase not currently implemented.

Giac Verification phase not currently implemented.

Reduce Verification phase not currently implemented.

Mupad Verification phase not currently implemented.

1.12 Timing

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

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

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

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

1.13 Verification

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

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

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

1.14 Important notes about some of the results

Important note about Maxima results

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

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

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

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

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

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

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

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

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

Important note about FriCAS result

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

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

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

Important note about finding leaf size of antiderivative

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

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

```
def tree_size(expr):
    r"""
    Return the tree size of this expression.
    """
    if expr not in SR:
        # deal with lists, tuples, vectors
        return 1 + sum(tree_size(a) for a in expr)
    expr = SR(expr)
    x, aa = expr.operator(), expr.operands()
    if x is None:
        return 1
    else:
        return 1 + sum(tree_size(a) for a in aa)
```

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

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

  except Exception as ee:
        leafCount =1
```

Important note about Mupad results

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

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

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

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

Which gives `sin(x)^2/2`

1.15 Current tree layout of integration tests

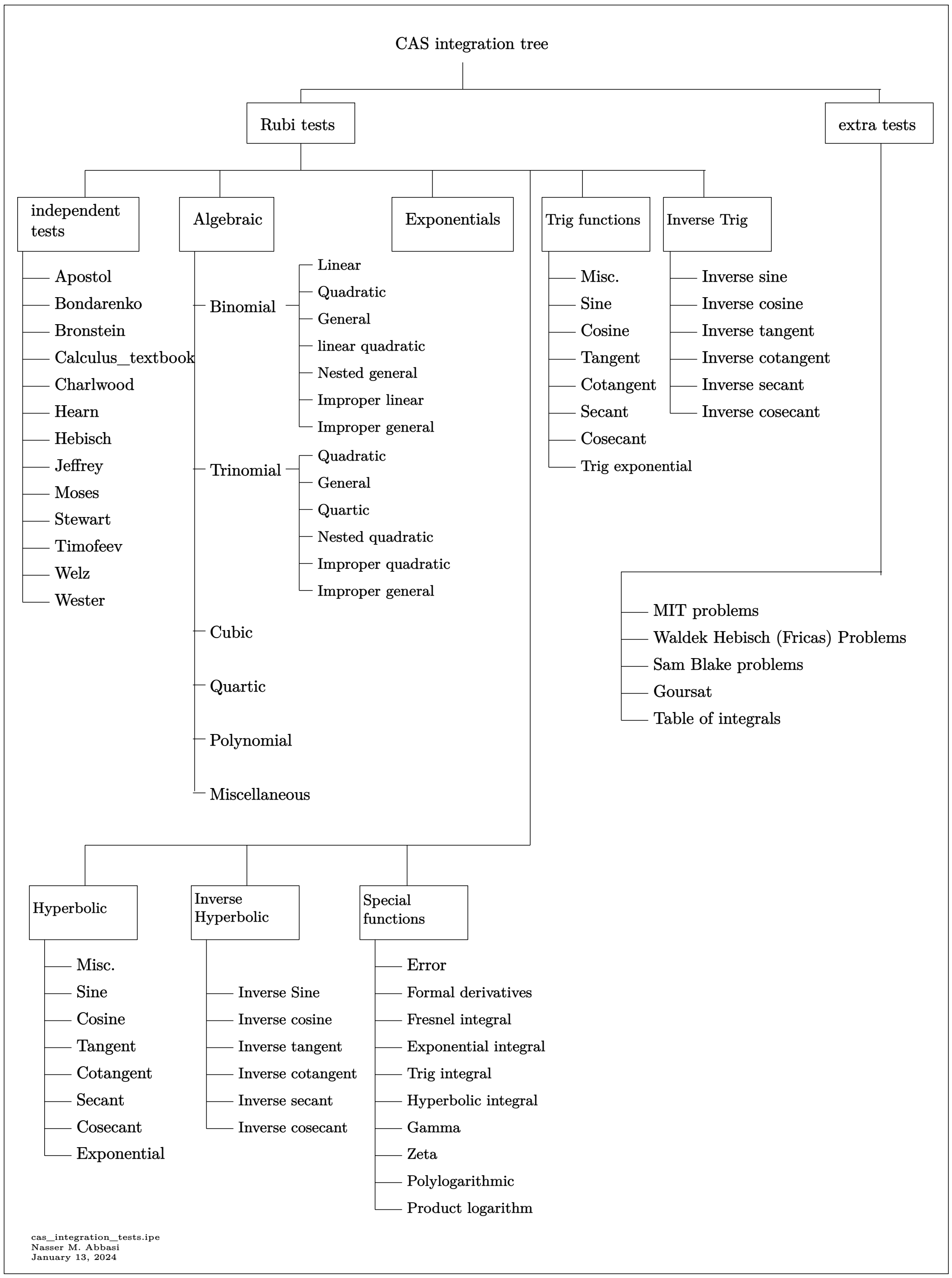
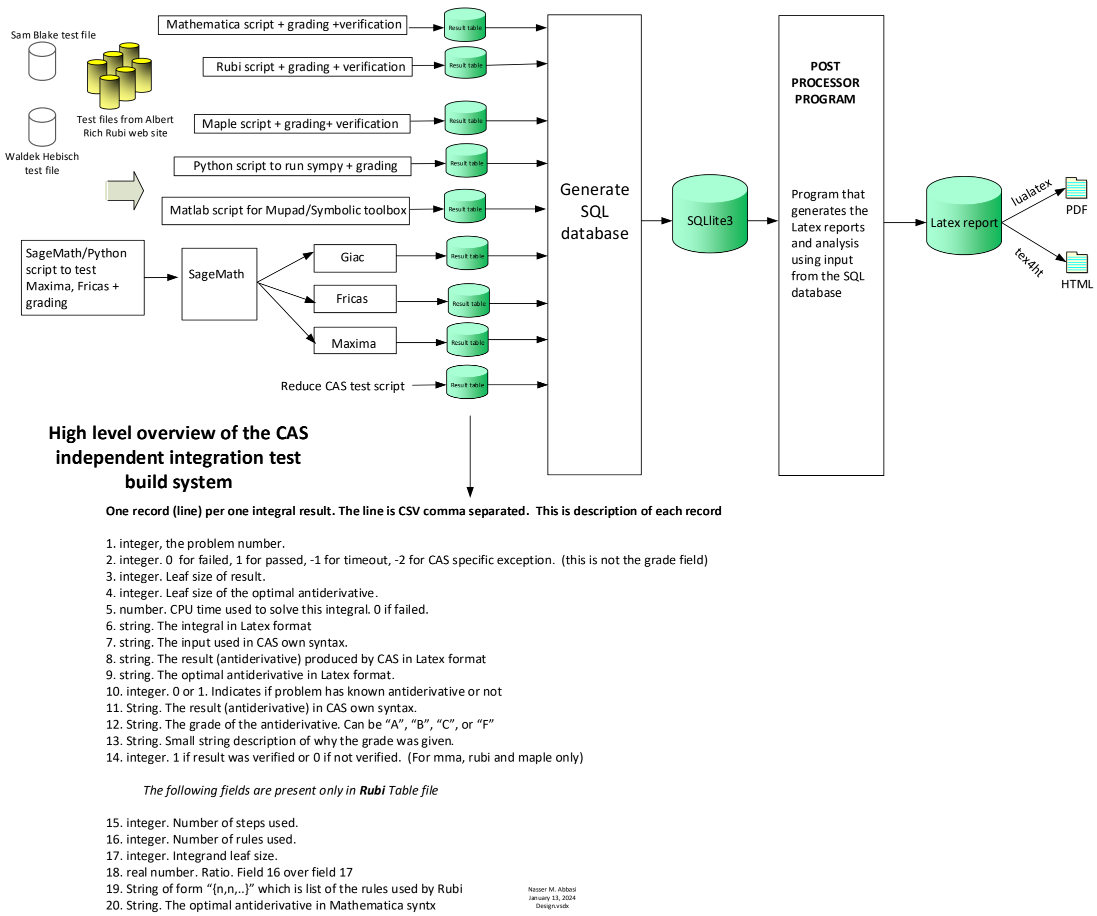


Figure 1.6: CAS integration tests tree

1.16 Design of the test system

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



CHAPTER 2

DETAILED SUMMARY TABLES OF RESULTS

2.1 List of integrals sorted by grade for each CAS

Rubi

A grade { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 21, 24, 25, 31, 32, 37, 39, 53, 54, 55, 56, 57 }

B grade { 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 26, 27, 28, 29, 30, 33, 34, 35, 36, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52 }

C grade { }

F normal fail { }

F(-1) timedout fail { }

F(-2) exception fail { }

Mma

A grade { 1, 2, 3, 4, 5, 6, 7, 8, 21, 22, 53, 54, 55, 56, 57 }

B grade { }

C grade { 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52 }

F normal fail { }

F(-1) timedout fail { }

F(-2) exception fail { }

Maple

A grade { 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 31, 32, 37, 38, 39, 40, 41, 44, 45, 47, 49, 50, 51, 57 }

B grade { 14, 15, 16, 19, 29, 30, 33, 34, 35, 36, 42, 43, 46, 48, 52 }

C grade { }

F normal fail { 9, 53, 54, 55, 56 }

F(-1) timedout fail { }

F(-2) exception fail { }

Fricas

A grade { 1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 16, 17, 18, 21, 22, 23, 24, 25, 26, 27, 31, 32, 33, 37, 38, 39, 40, 43, 44, 57 }

B grade { 7, 8, 14, 15, 19, 20, 28, 29, 30, 34, 35, 36, 41, 42, 45, 46, 47, 48, 49, 50, 51, 52 }

C grade { }

F normal fail { 53, 54, 55, 56 }

F(-1) timedout fail { 9 }

F(-2) exception fail { }

Maxima

A grade { 1, 2, 3, 4, 5, 21, 57 }

B grade { }

C grade { }

F normal fail { 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 }

F(-1) timedout fail { }

F(-2) exception fail { }

Giac

A grade { 1, 2, 3, 4, 5 }

B grade { 7, 8, 57 }

C grade { }

F normal fail { 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 }

F(-1) timedout fail { }

F(-2) exception fail { 6 }

Mupad

A grade { }

B grade { 1, 2, 3, 21, 57 }

C grade { }

F normal fail { }

F(-1) timedout fail { 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 }

F(-2) exception fail { }

Sympy

A grade { 1, 2, 3, 4, 5 }

B grade { }

C grade { }

F normal fail { 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50 }

F(-1) timedout fail { 20, 30, 35, 36, 47, 51, 52, 53, 54, 55, 56, 57 }

F(-2) exception fail { }

Reduce

A grade { }

B grade { 1, 2, 3, 4, 5, 6, 7, 21, 57 }

C grade { }

F normal fail { 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 }

F(-1) timedout fail { }

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	Reduce	Mupad
grade	N/A	A	A	A	A	A	A	A	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	15	15	15	14	13	13	12	13	13	13
N.S.	1	1.00	1.00	0.93	0.87	0.87	0.80	0.87	0.87	0.87
time (sec)	N/A	0.307	0.010	0.608	0.102	0.067	0.049	0.115	0.152	0.026

Problem 2	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	A	A	A	A	A	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	13	13	13	12	11	11	10	11	11	11
N.S.	1	1.00	1.00	0.92	0.85	0.85	0.77	0.85	0.85	0.85
time (sec)	N/A	0.292	0.009	0.595	0.112	0.066	0.048	0.121	0.158	1.337

Problem 3	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	A	A	A	A	A	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	29	29	29	25	24	24	29	24	23	51
N.S.	1	1.00	1.00	0.86	0.83	0.83	1.00	0.83	0.79	1.76
time (sec)	N/A	0.336	0.022	0.707	0.105	0.086	0.089	0.120	0.161	0.048

Problem 4	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	A	A	A	A	A	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	401	634	381	322	524	818	663	445	618	0
N.S.	1	1.58	0.95	0.80	1.31	2.04	1.65	1.11	1.54	0.00
time (sec)	N/A	0.884	1.538	0.803	0.039	0.382	0.570	0.156	4.339	0.000

Problem 5	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	A	A	A	A	A	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	134	131	112	96	153	232	153	113	144	0
N.S.	1	0.98	0.84	0.72	1.14	1.73	1.14	0.84	1.07	0.00
time (sec)	N/A	0.295	0.248	0.602	0.032	0.093	0.361	0.127	0.165	0.000

Problem 6	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	A	F	A	F	F(-2)	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	204	262	203	184	0	1103	0	0	581	0
N.S.	1	1.28	1.00	0.90	0.00	5.41	0.00	0.00	2.85	0.00
time (sec)	N/A	0.663	0.722	1.877	0.000	4.225	0.000	0.000	0.190	0.000

Problem 7	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	A	F	B	F	B	B	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	208	272	203	205	0	1933	0	477	1704	0
N.S.	1	1.31	0.98	0.99	0.00	9.29	0.00	2.29	8.19	0.00
time (sec)	N/A	0.670	1.092	1.126	0.000	5.874	0.000	0.158	0.227	0.000

Problem 8	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	A	F	B	F	B	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	269	393	247	287	0	2906	0	1295	33	0
N.S.	1	1.46	0.92	1.07	0.00	10.80	0.00	4.81	0.12	0.00
time (sec)	N/A	0.868	10.913	1.143	0.000	13.030	0.000	0.173	200.021	0.000

Problem 9	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	C	F	F	F(-1)	F	F	F	F(-1)
verified	N/A	Yes	No	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	455	594	331	0	0	0	0	0	141	0
N.S.	1	1.31	0.73	0.00	0.00	0.00	0.00	0.00	0.31	0.00
time (sec)	N/A	1.035	11.070	0.000	0.000	0.000	0.000	0.000	0.276	0.000

Problem 10	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	582	1049	391	664	0	522	0	0	903	0
N.S.	1	1.80	0.67	1.14	0.00	0.90	0.00	0.00	1.55	0.00
time (sec)	N/A	1.987	5.377	10.525	0.000	0.103	0.000	0.000	0.898	0.000

Problem 11	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	410	812	281	425	0	331	0	0	524	0
N.S.	1	1.98	0.69	1.04	0.00	0.81	0.00	0.00	1.28	0.00
time (sec)	N/A	1.402	3.232	7.361	0.000	0.094	0.000	0.000	0.555	0.000

Problem 12	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	293	470	228	314	0	203	0	0	280	0
N.S.	1	1.60	0.78	1.07	0.00	0.69	0.00	0.00	0.96	0.00
time (sec)	N/A	0.907	6.780	6.599	0.000	0.092	0.000	0.000	0.426	0.000

Problem 13	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	266	680	244	425	0	373	0	0	487	0
N.S.	1	2.56	0.92	1.60	0.00	1.40	0.00	0.00	1.83	0.00
time (sec)	N/A	1.296	10.674	6.276	0.000	0.098	0.000	0.000	0.628	0.000

Problem 14	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	337	757	370	639	0	841	0	0	0	0
N.S.	1	2.25	1.10	1.90	0.00	2.50	0.00	0.00	0.00	0.00
time (sec)	N/A	1.359	11.764	8.772	0.000	0.121	0.000	0.000	1.393	0.000

Problem 15	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	475	975	474	952	0	1548	0	0	0	0
N.S.	1	2.05	1.00	2.00	0.00	3.26	0.00	0.00	0.00	0.00
time (sec)	N/A	1.804	11.693	10.870	0.000	0.156	0.000	0.000	1.896	0.000

Problem 16	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	430	947	346	812	0	684	0	0	0	0
N.S.	1	2.20	0.80	1.89	0.00	1.59	0.00	0.00	0.00	0.00
time (sec)	N/A	1.724	6.920	11.751	0.000	0.100	0.000	0.000	1.568	0.000

Problem 17	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	295	616	257	494	0	396	0	0	1225	0
N.S.	1	2.09	0.87	1.67	0.00	1.34	0.00	0.00	4.15	0.00
time (sec)	N/A	1.137	4.402	9.246	0.000	0.095	0.000	0.000	0.969	0.000

Problem 18	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	266	840	245	424	0	437	0	0	650	0
N.S.	1	3.16	0.92	1.59	0.00	1.64	0.00	0.00	2.44	0.00
time (sec)	N/A	1.361	10.753	6.205	0.000	0.098	0.000	0.000	0.644	0.000

Problem 19	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	308	722	310	608	0	802	0	0	1473	0
N.S.	1	2.34	1.01	1.97	0.00	2.60	0.00	0.00	4.78	0.00
time (sec)	N/A	1.264	11.128	8.385	0.000	0.110	0.000	0.000	0.920	0.000

Problem 20	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	B	F(-1)	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	439	921	518	797	0	1634	0	0	0	0
N.S.	1	2.10	1.18	1.82	0.00	3.72	0.00	0.00	0.00	0.00
time (sec)	N/A	1.654	12.261	10.876	0.000	0.155	0.000	0.000	1.504	0.000

Problem 21	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	A	A	A	F	F	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	24	24	24	21	28	20	0	0	27	20
N.S.	1	1.00	1.00	0.88	1.17	0.83	0.00	0.00	1.12	0.83
time (sec)	N/A	0.210	10.154	5.545	0.077	0.086	0.000	0.000	0.230	1.631

Problem 22	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	A	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	220	474	145	154	0	247	0	0	344	0
N.S.	1	2.15	0.66	0.70	0.00	1.12	0.00	0.00	1.56	0.00
time (sec)	N/A	1.082	10.287	8.118	0.000	0.094	0.000	0.000	0.462	0.000

Problem 23	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	279	599	244	434	0	367	0	0	495	0
N.S.	1	2.15	0.87	1.56	0.00	1.32	0.00	0.00	1.77	0.00
time (sec)	N/A	1.246	10.716	6.346	0.000	0.092	0.000	0.000	0.659	0.000

Problem 24	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	1097	2004	4070	1885	0	1102	0	0	0	0
N.S.	1	1.83	3.71	1.72	0.00	1.00	0.00	0.00	0.00	0.00
time (sec)	N/A	3.577	10.854	7.374	0.000	0.107	0.000	0.000	1.264	0.000

Problem 25	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	814	1562	545	967	0	783	0	0	1128	0
N.S.	1	1.92	0.67	1.19	0.00	0.96	0.00	0.00	1.39	0.00
time (sec)	N/A	2.603	8.026	4.993	0.000	0.101	0.000	0.000	0.896	0.000

Problem 26	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	604	1254	408	602	0	563	0	0	774	0
N.S.	1	2.08	0.68	1.00	0.00	0.93	0.00	0.00	1.28	0.00
time (sec)	N/A	1.993	4.834	6.980	0.000	0.094	0.000	0.000	0.728	0.000

Problem 27	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	426	955	366	714	0	629	0	0	1297	0
N.S.	1	2.24	0.86	1.68	0.00	1.48	0.00	0.00	3.04	0.00
time (sec)	N/A	1.668	5.486	6.111	0.000	0.104	0.000	0.000	1.266	0.000

Problem 28	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	456	1252	463	821	0	1061	0	0	0	0
N.S.	1	2.75	1.02	1.80	0.00	2.33	0.00	0.00	0.00	0.00
time (sec)	N/A	2.045	6.897	7.362	0.000	0.122	0.000	0.000	2.112	0.000

Problem 29	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	567	1387	585	1162	0	1905	0	0	0	0
N.S.	1	2.45	1.03	2.05	0.00	3.36	0.00	0.00	0.00	0.00
time (sec)	N/A	2.334	6.759	9.439	0.000	0.159	0.000	0.000	4.291	0.000

Problem 30	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F(-1)	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	780	1613	820	1619	0	3122	0	0	0	0
N.S.	1	2.07	1.05	2.08	0.00	4.00	0.00	0.00	0.00	0.00
time (sec)	N/A	2.712	7.830	10.210	0.000	0.247	0.000	0.000	5.685	0.000

Problem 31	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	1098	1994	4070	1885	0	1097	0	0	0	0
N.S.	1	1.82	3.71	1.72	0.00	1.00	0.00	0.00	0.00	0.00
time (sec)	N/A	3.705	10.894	7.282	0.000	0.108	0.000	0.000	1.308	0.000

Problem 32	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	841	1598	568	1020	0	822	0	0	1182	0
N.S.	1	1.90	0.68	1.21	0.00	0.98	0.00	0.00	1.41	0.00
time (sec)	N/A	2.836	9.820	6.692	0.000	0.102	0.000	0.000	1.154	0.000

Problem 33	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	624	1401	502	1330	0	997	0	0	0	0
N.S.	1	2.25	0.80	2.13	0.00	1.60	0.00	0.00	0.00	0.00
time (sec)	N/A	2.552	7.973	9.533	0.000	0.107	0.000	0.000	2.020	0.000

Problem 34	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	554	1314	511	1120	0	1077	0	0	0	0
N.S.	1	2.37	0.92	2.02	0.00	1.94	0.00	0.00	0.00	0.00
time (sec)	N/A	2.403	8.702	9.720	0.000	0.115	0.000	0.000	3.270	0.000

Problem 35	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F(-1)	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	642	1549	611	1276	0	1935	0	0	0	0
N.S.	1	2.41	0.95	1.99	0.00	3.01	0.00	0.00	0.00	0.00
time (sec)	N/A	2.610	8.544	9.796	0.000	0.149	0.000	0.000	18.450	0.000

Problem 36	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F(-1)	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	806	1722	819	1674	0	2936	0	0	0	0
N.S.	1	2.14	1.02	2.08	0.00	3.64	0.00	0.00	0.00	0.00
time (sec)	N/A	3.053	9.527	11.312	0.000	0.230	0.000	0.000	33.587	0.000

Problem 37	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	841	1610	557	1020	0	798	0	0	1128	0
N.S.	1	1.91	0.66	1.21	0.00	0.95	0.00	0.00	1.34	0.00
time (sec)	N/A	2.840	9.602	7.049	0.000	0.100	0.000	0.000	1.078	0.000

Problem 38	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	600	1259	398	602	0	536	0	0	720	0
N.S.	1	2.10	0.66	1.00	0.00	0.89	0.00	0.00	1.20	0.00
time (sec)	N/A	2.015	4.658	6.964	0.000	0.096	0.000	0.000	0.710	0.000

Problem 39	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	428	816	311	418	0	349	0	0	435	0
N.S.	1	1.91	0.73	0.98	0.00	0.82	0.00	0.00	1.02	0.00
time (sec)	N/A	1.400	6.363	6.510	0.000	0.090	0.000	0.000	0.550	0.000

Problem 40	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	383	1076	334	539	0	645	0	0	869	0
N.S.	1	2.81	0.87	1.41	0.00	1.68	0.00	0.00	2.27	0.00
time (sec)	N/A	1.775	8.963	5.513	0.000	0.102	0.000	0.000	0.876	0.000

Problem 41	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	431	1150	453	756	0	1064	0	0	0	0
N.S.	1	2.67	1.05	1.75	0.00	2.47	0.00	0.00	0.00	0.00
time (sec)	N/A	1.837	10.843	8.717	0.000	0.126	0.000	0.000	1.657	0.000

Problem 42	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	563	1311	588	1146	0	2064	0	0	0	0
N.S.	1	2.33	1.04	2.04	0.00	3.67	0.00	0.00	0.00	0.00
time (sec)	N/A	2.285	12.267	11.098	0.000	0.172	0.000	0.000	2.773	0.000

Problem 43	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	621	1422	499	1331	0	1057	0	0	0	0
N.S.	1	2.29	0.80	2.14	0.00	1.70	0.00	0.00	0.00	0.00
time (sec)	N/A	2.559	10.367	9.474	0.000	0.109	0.000	0.000	1.908	0.000

Problem 44	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	A	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	428	990	358	715	0	670	0	0	0	0
N.S.	1	2.31	0.84	1.67	0.00	1.57	0.00	0.00	0.00	0.00
time (sec)	N/A	1.691	5.485	5.953	0.000	0.097	0.000	0.000	1.251	0.000

Problem 45	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	383	1233	336	538	0	716	0	0	1022	0
N.S.	1	3.22	0.88	1.40	0.00	1.87	0.00	0.00	2.67	0.00
time (sec)	N/A	1.820	8.973	6.621	0.000	0.102	0.000	0.000	0.940	0.000

Problem 46	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	405	1101	402	798	0	1185	0	0	0	0
N.S.	1	2.72	0.99	1.97	0.00	2.93	0.00	0.00	0.00	0.00
time (sec)	N/A	1.822	11.624	8.474	0.000	0.117	0.000	0.000	1.337	0.000

Problem 47	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	B	F(-1)	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	531	1245	640	949	0	2094	0	0	0	0
N.S.	1	2.34	1.21	1.79	0.00	3.94	0.00	0.00	0.00	0.00
time (sec)	N/A	2.084	13.286	11.076	0.000	0.170	0.000	0.000	1.786	0.000

Problem 48	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	545	1334	489	1120	0	1191	0	0	0	0
N.S.	1	2.45	0.90	2.06	0.00	2.19	0.00	0.00	0.00	0.00
time (sec)	N/A	2.551	9.488	9.753	0.000	0.127	0.000	0.000	3.608	0.000

Problem 49	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	449	1269	447	821	0	1154	0	0	0	0
N.S.	1	2.83	1.00	1.83	0.00	2.57	0.00	0.00	0.00	0.00
time (sec)	N/A	2.006	7.584	7.451	0.000	0.136	0.000	0.000	2.718	0.000

Problem 50	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	B	F	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	428	1157	445	764	0	1217	0	0	0	0
N.S.	1	2.70	1.04	1.79	0.00	2.84	0.00	0.00	0.00	0.00
time (sec)	N/A	1.878	13.298	8.829	0.000	0.140	0.000	0.000	2.029	0.000

Problem 51	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	A	F	B	F(-1)	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	525	1262	613	950	0	2017	0	0	0	0
N.S.	1	2.40	1.17	1.81	0.00	3.84	0.00	0.00	0.00	0.00
time (sec)	N/A	1.991	13.901	11.032	0.000	0.192	0.000	0.000	2.087	0.000

Problem 52	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	B	C	B	F	B	F(-1)	F	F	F(-1)
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	695	1507	616	1511	0	3222	0	0	0	0
N.S.	1	2.17	0.89	2.17	0.00	4.64	0.00	0.00	0.00	0.00
time (sec)	N/A	2.615	12.707	22.032	0.000	0.363	0.000	0.000	3.685	0.000

Problem 53	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	F	F	F	F(-1)	F	F	F(-1)
verified	N/A	Yes	No	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	174	186	256	0	0	0	0	0	0	0
N.S.	1	1.07	1.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.552	0.669	0.000	0.000	0.000	0.000	0.000	0.223	0.000

Problem 54	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	F	F	F	F(-1)	F	F	F(-1)
verified	N/A	Yes	No	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	152	167	236	0	0	0	0	0	26	0
N.S.	1	1.10	1.55	0.00	0.00	0.00	0.00	0.00	0.17	0.00
time (sec)	N/A	0.359	0.421	0.000	0.000	0.000	0.000	0.000	200.021	0.000

Problem 55	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	F	F	F	F(-1)	F	F	F(-1)
verified	N/A	Yes	No	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	166	166	242	0	0	0	0	0	0	0
N.S.	1	1.00	1.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
time (sec)	N/A	0.363	0.337	0.000	0.000	0.000	0.000	0.000	0.286	0.000

Problem 56	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	F	F	F	F(-1)	F	F	F(-1)
verified	N/A	Yes	No	N/A	TBD	TBD	TBD	TBD	TBD	TBD
size	237	252	302	0	0	0	0	0	31	0
N.S.	1	1.06	1.27	0.00	0.00	0.00	0.00	0.00	0.13	0.00
time (sec)	N/A	0.675	0.644	0.000	0.000	0.000	0.000	0.000	200.023	0.000

Problem 57	Optimal	Rubi	MMA	Maple	Maxima	Fricas	Sympy	Giac	Reduce	Mupad
grade	N/A	A	A	A	A	A	F(-1)	B	B	B
verified	N/A	Yes	Yes	Yes	TBD	TBD	TBD	TBD	TBD	TBD
size	25	25	25	26	48	45	0	99	43	62
N.S.	1	1.00	1.00	1.04	1.92	1.80	0.00	3.96	1.72	2.48
time (sec)	N/A	0.240	0.707	9.362	0.078	0.102	0.000	0.241	0.172	1.445

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 [54] had the largest ratio of [.2916670000000000010]

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	2	2	1.00	26	0.077
2	A	2	2	1.00	24	0.083
3	A	2	2	1.00	30	0.067
4	A	2	2	1.58	33	0.061
5	A	7	6	0.98	24	0.250
6	A	2	2	1.28	33	0.061
7	A	2	2	1.31	33	0.061
8	A	2	2	1.46	33	0.061
9	A	2	2	1.31	38	0.053
10	A	2	2	1.80	35	0.057
11	A	2	2	1.98	35	0.057
12	A	2	2	1.60	35	0.057
13	B	2	2	2.56	35	0.057
14	B	2	2	2.25	35	0.057
15	B	2	2	2.05	35	0.057
16	B	2	2	2.20	35	0.057
17	B	2	2	2.09	35	0.057
18	B	2	2	3.16	35	0.057
19	B	2	2	2.34	35	0.057
20	B	2	2	2.10	35	0.057
21	A	1	1	1.00	40	0.025

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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
22	B	2	2	2.15	40	0.050
23	B	2	2	2.15	36	0.056
24	A	2	2	1.83	40	0.050
25	A	2	2	1.92	40	0.050
26	B	2	2	2.08	40	0.050
27	B	2	2	2.24	40	0.050
28	B	2	2	2.75	40	0.050
29	B	2	2	2.45	40	0.050
30	B	2	2	2.07	40	0.050
31	A	2	2	1.82	40	0.050
32	A	2	2	1.90	40	0.050
33	B	2	2	2.25	40	0.050
34	B	2	2	2.37	40	0.050
35	B	2	2	2.41	40	0.050
36	B	2	2	2.14	40	0.050
37	A	2	2	1.91	40	0.050
38	B	2	2	2.10	40	0.050
39	A	2	2	1.91	40	0.050
40	B	2	2	2.81	40	0.050
41	B	2	2	2.67	40	0.050
42	B	2	2	2.33	40	0.050
43	B	2	2	2.29	40	0.050
44	B	2	2	2.31	40	0.050
45	B	2	2	3.22	40	0.050
46	B	2	2	2.72	40	0.050
47	B	2	2	2.34	40	0.050
48	B	2	2	2.45	40	0.050
49	B	2	2	2.83	40	0.050
50	B	2	2	2.70	40	0.050
51	B	2	2	2.40	40	0.050
52	B	2	2	2.17	40	0.050
53	A	2	2	1.07	31	0.065

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	$\frac{\text{number of rules}}{\text{integrand leaf size}}$
54	A	8	7	1.10	24	0.292
55	A	7	7	1.00	26	0.269
56	A	2	2	1.06	29	0.069
57	A	1	1	1.00	65	0.015

CHAPTER 3

Listing of integrals

3.1 $\int \frac{9+x+3x^2+x^3}{(1+x^2)(3+x^2)} \, dx$

Optimal result

Integrand size = 26, antiderivative size = 15

$$\int \frac{9+x+3x^2+x^3}{(1+x^2)(3+x^2)} \, dx = 3\arctan(x) + \frac{1}{2}\log\left(3+x^2\right)$$

output
```
3*arctan(x)+1/2*ln(x^2+3)
```

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00

$$\int \frac{9+x+3x^2+x^3}{(1+x^2)(3+x^2)} \, dx = 3\arctan(x) + \frac{1}{2}\log\left(3+x^2\right)$$

input
```
Integrate[(9 + x + 3*x^2 + x^3)/((1 + x^2)*(3 + x^2)),x]
```

output
```
3*ArcTan[x] + Log[3 + x^2]/2
```

Rubi [A] (verified)

Time = 0.31 (sec) , antiderivative size = 15, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.077, Rules used = {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.

$$\int \frac{x^3+3x^2+x+9}{(x^2+1)(x^2+3)}dx$$

$$\Big\downarrow \text{7276}$$

$$\int \left(\frac{x}{x^2+3}+\frac{3}{x^2+1}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$3\arctan(x)+\frac{1}{2}\log\left(x^2+3\right)$$

input
```
Int[(9 + x + 3*x^2 + x^3)/((1 + x^2)*(3 + x^2)),x]
```

output
```
3*ArcTan[x] + Log[3 + x^2]/2
```

Defintions of rubi rules used

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

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]
```

Maple [A] (verified)

Time = 0.61 (sec) , antiderivative size = 14, normalized size of antiderivative = 0.93

method	result	size
default	$3\arctan\left(x\right)+\frac{\ln\left(x^{2}+3\right)}{2}$	14
risch	$3\arctan\left(x\right)+\frac{\ln\left(x^{2}+3\right)}{2}$	14
parallelrisch	$\frac{3i\ln\left(x+i\right)}{2}-\frac{3i\ln\left(x-i\right)}{2}+\frac{\ln\left(x^{2}+3\right)}{2}$	26

input
```
int((x^3+3*x^2+x+9)/(x^2+1)/(x^2+3),x,method=_RETURNVERBOSE)
```

output
```
3*arctan(x)+1/2*ln(x^2+3)
```

Fricas [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \frac{9+x+3x^2+x^3}{(1+x^2)(3+x^2)}\,dx = 3\arctan\left(x\right)+\frac{1}{2}\log\left(x^2+3\right)$$

input
```
integrate((x^3+3*x^2+x+9)/(x^2+1)/(x^2+3),x, algorithm="fricas")
```

output
```
3*arctan(x) + 1/2*log(x^2 + 3)
```

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.80

$$\int \frac{9+x+3x^2+x^3}{(1+x^2)(3+x^2)}\,dx = \frac{\log\left(x^2+3\right)}{2}+3\operatorname{atan}\left(x\right)$$

input
```
integrate((x**3+3*x**2+x+9)/(x**2+1)/(x**2+3),x)
```

output
```
log(x**2 + 3)/2 + 3*atan(x)
```

Maxima [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \frac{9+x+3x^2+x^3}{(1+x^2)(3+x^2)}\,dx = 3\,\arctan\left(x\right) + \frac{1}{2}\,\log\left(x^2+3\right)$$

input
```
integrate((x^3+3*x^2+x+9)/(x^2+1)/(x^2+3),x, algorithm="maxima")
```

output
```
3*arctan(x) + 1/2*log(x^2 + 3)
```

Giac [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \frac{9+x+3x^2+x^3}{(1+x^2)(3+x^2)}\,dx = 3\,\arctan\left(x\right) + \frac{1}{2}\,\log\left(x^2+3\right)$$

input
```
integrate((x^3+3*x^2+x+9)/(x^2+1)/(x^2+3),x, algorithm="giac")
```

output
```
3*arctan(x) + 1/2*log(x^2 + 3)
```

Mupad [B] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \frac{9+x+3x^2+x^3}{(1+x^2)(3+x^2)}\,dx = \frac{\ln\left(x^2+3\right)}{2} + 3\,\mathrm{atan}(x)$$

input
```
int((x + 3*x^2 + x^3 + 9)/((x^2 + 1)*(x^2 + 3)),x)
```

output
```
log(x^2 + 3)/2 + 3*atan(x)
```

Reduce [B] (verification not implemented)

Time = 0.15 (sec) , antiderivative size = 13, normalized size of antiderivative = 0.87

$$\int \frac{9+x+3x^2+x^3}{(1+x^2)(3+x^2)}\,dx = 3atan(x) + \frac{\log(x^2+3)}{2}$$

input
```
int((x^3+3*x^2+x+9)/(x^2+1)/(x^2+3),x)
```

output
```
(6*atan(x) + log(x**2 + 3))/2
```

3.2 $\int \frac{3+x+x^2+x^3}{(1+x^2)(3+x^2)}\,dx$

Optimal result

Integrand size = 24, antiderivative size = 13

$$\int \frac{3+x+x^2+x^3}{(1+x^2)(3+x^2)}\,dx = \arctan(x)+\frac{1}{2}\log\left(3+x^2\right)$$

output
```
arctan(x)+1/2*ln(x^2+3)
```

Mathematica [A] (verified)

Time = 0.01 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00

$$\int \frac{3+x+x^2+x^3}{(1+x^2)(3+x^2)}\,dx = \arctan(x)+\frac{1}{2}\log\left(3+x^2\right)$$

input
```
Integrate[(3 + x + x^2 + x^3)/((1 + x^2)*(3 + x^2)),x]
```

output
```
ArcTan[x] + Log[3 + x^2]/2
```

Rubi [A] (verified)

Time = 0.29 (sec) , antiderivative size = 13, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.083, Rules used = {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.

$$\int \frac{x^3+x^2+x+3}{(x^2+1)(x^2+3)}dx$$

$$\Big\downarrow \text{7276}$$

$$\int \left(\frac{x}{x^2+3}+\frac{1}{x^2+1}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\arctan(x)+\frac{1}{2}\log\left(x^2+3\right)$$

input
```
Int[(3 + x + x^2 + x^3)/((1 + x^2)*(3 + x^2)),x]
```

output
```
ArcTan[x] + Log[3 + x^2]/2
```

Defintions of rubi rules used

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

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]
```

Maple [A] (verified)

Time = 0.60 (sec) , antiderivative size = 12, normalized size of antiderivative = 0.92

method	result	size
default	$\arctan(x)+\frac{\ln(x^2+3)}{2}$	12
risch	$\arctan(x)+\frac{\ln(x^2+3)}{2}$	12
parallelrisch	$\frac{i\ln(x+i)}{2}-\frac{i\ln(x-i)}{2}+\frac{\ln(x^2+3)}{2}$	26

input
```
int((x^3+x^2+x+3)/(x^2+1)/(x^2+3),x,method=_RETURNVERBOSE)
```

output
```
arctan(x)+1/2*ln(x^2+3)
```

Fricas [A] (verification not implemented)

Time = 0.07 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{3+x+x^2+x^3}{(1+x^2)(3+x^2)}\,dx = \arctan(x)+\frac{1}{2}\log(x^2+3)$$

input
```
integrate((x^3+x^2+x+3)/(x^2+1)/(x^2+3),x, algorithm="fricas")
```

output
```
arctan(x) + 1/2*log(x^2 + 3)
```

Sympy [A] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 10, normalized size of antiderivative = 0.77

$$\int \frac{3+x+x^2+x^3}{(1+x^2)(3+x^2)}\,dx = \frac{\log(x^2+3)}{2}+\operatorname{atan}(x)$$

input
```
integrate((x**3+x**2+x+3)/(x**2+1)/(x**2+3),x)
```

output
```
log(x**2 + 3)/2 + atan(x)
```

Maxima [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{3+x+x^2+x^3}{(1+x^2)(3+x^2)}\,dx = \arctan(x) + \frac{1}{2}\log\left(x^2+3\right)$$

input
```
integrate((x^3+x^2+x+3)/(x^2+1)/(x^2+3),x, algorithm="maxima")
```

output
```
arctan(x) + 1/2*log(x^2 + 3)
```

Giac [A] (verification not implemented)

Time = 0.12 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{3+x+x^2+x^3}{(1+x^2)(3+x^2)}\,dx = \arctan(x) + \frac{1}{2}\log\left(x^2+3\right)$$

input
```
integrate((x^3+x^2+x+3)/(x^2+1)/(x^2+3),x, algorithm="giac")
```

output
```
arctan(x) + 1/2*log(x^2 + 3)
```

Mupad [B] (verification not implemented)

Time = 1.34 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{3+x+x^2+x^3}{(1+x^2)(3+x^2)}\,dx = \frac{\ln\left(x^2+3\right)}{2} + \mathrm{atan}(x)$$

input
```
int((x + x^2 + x^3 + 3)/((x^2 + 1)*(x^2 + 3)),x)
```

output
```
log(x^2 + 3)/2 + atan(x)
```

Reduce [B] (verification not implemented)

Time = 0.16 (sec) , antiderivative size = 11, normalized size of antiderivative = 0.85

$$\int \frac{3+x+x^2+x^3}{(1+x^2)(3+x^2)}\,dx = atan(x) + \frac{\log(x^2+3)}{2}$$

input
```
int((x^3+x^2+x+3)/(x^2+1)/(x^2+3),x)
```

output
```
(2*atan(x) + log(x**2 + 3))/2
```

3.3 $\int \frac{-4+6x-x^2+3x^3}{(1+x^2)(2+x^2)}\,dx$

Optimal result

Integrand size = 30, antiderivative size = 29

$$\int \frac{-4+6x-x^2+3x^3}{(1+x^2)(2+x^2)}\,dx = -3\arctan(x)+\sqrt{2}\arctan\left(\frac{x}{\sqrt{2}}\right)+\frac{3}{2}\log\left(1+x^2\right)$$

output
```
-3*arctan(x)+2^(1/2)*arctan(1/2*x*2^(1/2))+3/2*ln(x^2+1)
```

Mathematica [A] (verified)

Time = 0.02 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.00

$$\int \frac{-4+6x-x^2+3x^3}{(1+x^2)(2+x^2)}\,dx = -3\arctan(x)+\sqrt{2}\arctan\left(\frac{x}{\sqrt{2}}\right)+\frac{3}{2}\log\left(1+x^2\right)$$

input
```
Integrate[(-4 + 6*x - x^2 + 3*x^3)/((1 + x^2)*(2 + x^2)),x]
```

output
```
-3*ArcTan[x] + Sqrt[2]*ArcTan[x/Sqrt[2]] + (3*Log[1 + x^2])/2
```

Rubi [A] (verified)

Time = 0.34 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.00, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.067$, Rules used = {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.

$$\int \frac{3x^3-x^2+6x-4}{(x^2+1)(x^2+2)}\,dx$$

$$\Big\downarrow \text{ 7276}$$

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

$$\Big\downarrow \text{ 2009}$$

$$-3\arctan(x)+\sqrt{2}\arctan\left(\frac{x}{\sqrt{2}}\right)+\frac{3}{2}\log\left(x^2+1\right)$$

input
```
Int[(-4 + 6*x - x^2 + 3*x^3)/((1 + x^2)*(2 + x^2)),x]
```

output
```
-3*ArcTan[x] + Sqrt[2]*ArcTan[x/Sqrt[2]] + (3*Log[1 + x^2])/2
```

Defintions of rubi rules used

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

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]
```

Maple [A] (verified)

Time = 0.71 (sec) , antiderivative size = 25, normalized size of antiderivative = 0.86

method	result	size
default	$-3\arctan(x)+\sqrt{2}\,\arctan\left(\frac{\sqrt{2}\,x}{2}\right)+\frac{3\ln(x^2+1)}{2}$	25
risch	$-3\arctan(x)+\sqrt{2}\,\arctan\left(\frac{\sqrt{2}\,x}{2}\right)+\frac{3\ln(x^2+1)}{2}$	25

input
```
int((3*x^3-x^2+6*x-4)/(x^2+1)/(x^2+2),x,method=_RETURNVERBOSE)
```

output
```
-3*arctan(x)+2^(1/2)*arctan(1/2*2^(1/2)*x)+3/2*ln(x^2+1)
```

Fricas [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.83

$$\int \frac{-4+6x-x^2+3x^3}{(1+x^2)(2+x^2)}\,dx=\sqrt{2}\arctan\left(\frac{1}{2}\sqrt{2}x\right)-3\arctan(x)+\frac{3}{2}\log\left(x^2+1\right)$$

input
```
integrate((3*x^3-x^2+6*x-4)/(x^2+1)/(x^2+2),x, algorithm="fricas")
```

output
```
sqrt(2)*arctan(1/2*sqrt(2)*x) - 3*arctan(x) + 3/2*log(x^2 + 1)
```

Sympy [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 29, normalized size of antiderivative = 1.00

$$\int \frac{-4+6x-x^2+3x^3}{(1+x^2)(2+x^2)}\,dx=\frac{3\log(x^2+1)}{2}-3\operatorname{atan}(x)+\sqrt{2}\operatorname{atan}\left(\frac{\sqrt{2}x}{2}\right)$$

input
```
integrate((3*x**3-x**2+6*x-4)/(x**2+1)/(x**2+2),x)
```

output
```
3*log(x**2 + 1)/2 - 3*atan(x) + sqrt(2)*atan(sqrt(2)*x/2)
```

Maxima [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.83

$$\int \frac{-4+6x-x^2+3x^3}{(1+x^2)(2+x^2)}\,dx = \sqrt{2}\arctan\left(\frac{1}{2}\sqrt{2}x\right) - 3\arctan(x) + \frac{3}{2}\log\left(x^2+1\right)$$

input
```
integrate((3*x^3-x^2+6*x-4)/(x^2+1)/(x^2+2),x, algorithm="maxima")
```

output
```
sqrt(2)*arctan(1/2*sqrt(2)*x) - 3*arctan(x) + 3/2*log(x^2 + 1)
```

Giac [A] (verification not implemented)

Time = 0.12 (sec) , antiderivative size = 24, normalized size of antiderivative = 0.83

$$\int \frac{-4+6x-x^2+3x^3}{(1+x^2)(2+x^2)}\,dx = \sqrt{2}\arctan\left(\frac{1}{2}\sqrt{2}x\right) - 3\arctan(x) + \frac{3}{2}\log\left(x^2+1\right)$$

input
```
integrate((3*x^3-x^2+6*x-4)/(x^2+1)/(x^2+2),x, algorithm="giac")
```

output
```
sqrt(2)*arctan(1/2*sqrt(2)*x) - 3*arctan(x) + 3/2*log(x^2 + 1)
```

Mupad [B] (verification not implemented)

Time = 0.05 (sec) , antiderivative size = 51, normalized size of antiderivative = 1.76

$$\int \frac{-4+6x-x^2+3x^3}{(1+x^2)(2+x^2)}\,dx = -\sqrt{2}\,\mathrm{atan}\left(\frac{24\sqrt{2}}{24\,x-64} + \frac{32\sqrt{2}\,x}{24\,x-64}\right) + \ln(x-\mathrm{i})\left(\frac{3}{2}+\frac{3}{2}\mathrm{i}\right) + \ln(x+1\mathrm{i})\left(\frac{3}{2}-\frac{3}{2}\mathrm{i}\right)$$

input
```
int((6*x - x^2 + 3*x^3 - 4)/((x^2 + 1)*(x^2 + 2)),x)
```

output
```
log(x - 1i)*(3/2 + 3i/2) + log(x + 1i)*(3/2 - 3i/2) - 2^(1/2)*atan((24*2^(
1/2))/(24*x - 64) + (32*2^(1/2)*x)/(24*x - 64))
```

Reduce [B] (verification not implemented)

Time = 0.16 (sec) , antiderivative size = 23, normalized size of antiderivative = 0.79

$$\int \frac{-4+6x-x^2+3x^3}{(1+x^2)(2+x^2)}\,dx = \sqrt{2}\,atan\left(\frac{x}{\sqrt{2}}\right)-3atan(x)+\frac{3\log(x^2+1)}{2}$$

input
```
int((3*x^3-x^2+6*x-4)/(x^2+1)/(x^2+2),x)
```

output
```
(2*sqrt(2)*atan(x/sqrt(2)) - 6*atan(x) + 3*log(x**2 + 1))/2
```

3.4 $\int \sqrt{a+bx^2}\left(c+fx^2\right)^2\left(A+Bx^2+Cx^4\right)\,dx$

Optimal result

Integrand size = 33, antiderivative size = 401

$$\int \sqrt{a+bx^2}\left(c+fx^2\right)^2\left(A+Bx^2+Cx^4\right)\,dx=\frac{1}{256}\Bigg(128Ac^2+\frac{a(7a^3Cf^2-32b^3c(Bc+2Af)-10a^2bf(2cC+Bf)+16ab^2(c^2C+2Bcf+Af^2))}{b^4}\Bigg)x\sqrt{a+bx^2}-\frac{(7a^3Cf^2-32b^3c(Bc+2Af)-10a^2bf(2cC+Bf)+16ab^2(c^2C+2Bcf+Af^2))\,x(a+bx^2)^{3/2}}{128b^4}+\frac{(7a^2Cf^2-10abf(2cC+Bf)+16b^2(c^2C+2Bcf+Af^2))\,x^3(a+bx^2)^{3/2}}{96b^3}-\frac{f(7aCf-10b(2cC+Bf))x^5(a+bx^2)^{3/2}}{80b^2}+\frac{Cf^2x^7(a+bx^2)^{3/2}}{10b}+\frac{a(128Ab^4c^2+a(7a^3Cf^2-32b^3c(Bc+2Af)-10a^2bf(2cC+Bf)+16ab^2(c^2C+2Bcf+Af^2)))\,\mathrm{arc}}{256b^{9/2}}$$

output
```
1/256*(128*A*c^2+a*(7*a^3*C*f^2-32*b^3*c*(2*A*f+B*c)-10*a^2*b*f*(B*f+2*C*c
)+16*a*b^2*(A*f^2+2*B*c*f+C*c^2))/b^4)*x*(b*x^2+a)^(1/2)-1/128*(7*a^3*C*f^
2-32*b^3*c*(2*A*f+B*c)-10*a^2*b*f*(B*f+2*C*c)+16*a*b^2*(A*f^2+2*B*c*f+C*c^
2))*x*(b*x^2+a)^(3/2)/b^4+1/96*(7*a^2*C*f^2-10*a*b*f*(B*f+2*C*c)+16*b^2*(A
*f^2+2*B*c*f+C*c^2))*x^3*(b*x^2+a)^(3/2)/b^3-1/80*f*(7*a*C*f-10*b*(B*f+2*C
*c))*x^5*(b*x^2+a)^(3/2)/b^2+1/10*C*f^2*x^7*(b*x^2+a)^(3/2)/b+1/256*a*(128
*A*b^4*c^2+a*(7*a^3*C*f^2-32*b^3*c*(2*A*f+B*c)-10*a^2*b*f*(B*f+2*C*c)+16*a
*b^2*(A*f^2+2*B*c*f+C*c^2)))*arctanh(b^(1/2)*x/(b*x^2+a)^(1/2))/b^(9/2)
```

Mathematica [A] (verified)

Time = 1.54 (sec) , antiderivative size = 381, normalized size of antiderivative = 0.95

$$\int \sqrt{a+bx^2}\left(c+fx^2\right)^2\left(A+Bx^2+Cx^4\right)\,dx$$
$$= \frac{\sqrt{b}x\sqrt{a+bx^2}(-105a^4Cf^2+10a^3bf(30cC+15Bf+7Cfx^2)-4a^2b^2(60c^2C+10cf(12B+5Cx^2)+f}{}$$

input
```
Integrate[Sqrt[a + b*x^2]*(c + f*x^2)^2*(A + B*x^2 + C*x^4),x]
```

output
```
(Sqrt[b]*x*Sqrt[a + b*x^2]*(-105*a^4*C*f^2 + 10*a^3*b*f*(30*c*C + 15*B*f +
 7*C*f*x^2) - 4*a^2*b^2*(60*c^2*C + 10*c*f*(12*B + 5*C*x^2) + f^2*x^2*(25*
B + 14*C*x^2)) + 80*A*b^2*(-3*a^2*f^2 + 2*a*b*f*(6*c + f*x^2) + 8*b^2*(3*c
^2 + 3*c*f*x^2 + f^2*x^4)) + 16*a*b^3*(5*B*(6*c^2 + 4*c*f*x^2 + f^2*x^4) +
 C*x^2*(10*c^2 + 10*c*f*x^2 + 3*f^2*x^4)) + 32*b^4*x^2*(5*B*(6*c^2 + 8*c*f
*x^2 + 3*f^2*x^4) + 2*C*x^2*(10*c^2 + 15*c*f*x^2 + 6*f^2*x^4))) - 15*a*(16
*A*b^2*(8*b^2*c^2 - 4*a*b*c*f + a^2*f^2) + a*(-32*b^3*B*c^2 + 7*a^3*C*f^2
- 10*a^2*b*f*(2*c*C + B*f) + 16*a*b^2*c*(c*C + 2*B*f)))*Log[-(Sqrt[b]*x) +
 Sqrt[a + b*x^2]])/(3840*b^(9/2))
```

Rubi [A] (verified)

Time = 0.88 (sec) , antiderivative size = 634, normalized size of antiderivative = 1.58, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.061, Rules used = {2256, 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.

$$\int \sqrt{a+bx^2}\left(c+fx^2\right)^2\left(A+Bx^2+Cx^4\right)dx$$

$$\Big\downarrow \ 2256$$

$$\int \left(x^4\sqrt{a+bx^2}\left(Af^2+2Bcf+c^2C\right)+cx^2\sqrt{a+bx^2}(2Af+Bc)+Ac^2\sqrt{a+bx^2}+fx^6\sqrt{a+bx^2}(Bf+2cC)\right.$$

$$\Big\downarrow \ 2009$$

$$\frac{7a^5Cf^2\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)}{256b^{9/2}}-\frac{5a^4f\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)(Bf+2cC)}{128b^{7/2}}-\frac{7a^4Cf^2x\sqrt{a+bx^2}}{256b^4}+\frac{a^3\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)\left(Af^2+2Bcf+c^2C\right)}{16b^{5/2}}+\frac{5a^3fx\sqrt{a+bx^2}(Bf+2cC)}{128b^3}+\frac{7a^3Cf^2x^3\sqrt{a+bx^2}}{384b^3}-\frac{a^2c\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)(2Af+Bc)}{8b^{3/2}}-\frac{a^2x\sqrt{a+bx^2}\left(Af^2+2Bcf+c^2C\right)}{16b^2}-\frac{5a^2fx^3\sqrt{a+bx^2}(Bf+2cC)}{192b^2}-\frac{7a^2Cf^2x^5\sqrt{a+bx^2}}{480b^2}+\frac{aAc^2\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)}{2\sqrt{b}}+\frac{1}{6}x^5\sqrt{a+bx^2}\left(Af^2+2Bcf+c^2C\right)+\frac{ax^3\sqrt{a+bx^2}\left(Af^2+2Bcf+c^2C\right)}{24b}+\frac{acx\sqrt{a+bx^2}(2Af+Bc)}{8b}+\frac{1}{4}cx^3\sqrt{a+bx^2}(2Af+Bc)+\frac{1}{2}Ac^2x\sqrt{a+bx^2}+\frac{1}{8}fx^7\sqrt{a+bx^2}(Bf+2cC)+\frac{afx^5\sqrt{a+bx^2}(Bf+2cC)}{48b}+\frac{1}{10}Cf^2x^9\sqrt{a+bx^2}+\frac{aCf^2x^7\sqrt{a+bx^2}}{80b}$$

input
```
Int[Sqrt[a + b*x^2]*(c + f*x^2)^2*(A + B*x^2 + C*x^4),x]
```

output

```
(A*c^2*x*Sqrt[a + b*x^2])/2 - (7*a^4*C*f^2*x*Sqrt[a + b*x^2])/(256*b^4) +
(a*c*(B*c + 2*A*f)*x*Sqrt[a + b*x^2])/(8*b) + (5*a^3*f*(2*c*C + B*f)*x*Sqr
t[a + b*x^2])/(128*b^3) - (a^2*(c^2*C + 2*B*c*f + A*f^2)*x*Sqrt[a + b*x^2]
)/(16*b^2) + (7*a^3*C*f^2*x^3*Sqrt[a + b*x^2])/(384*b^3) + (c*(B*c + 2*A*f
)*x^3*Sqrt[a + b*x^2])/4 - (5*a^2*f*(2*c*C + B*f)*x^3*Sqrt[a + b*x^2])/(19
2*b^2) + (a*(c^2*C + 2*B*c*f + A*f^2)*x^3*Sqrt[a + b*x^2])/(24*b) - (7*a^2
*C*f^2*x^5*Sqrt[a + b*x^2])/(480*b^2) + (a*f*(2*c*C + B*f)*x^5*Sqrt[a + b*
x^2])/(48*b) + ((c^2*C + 2*B*c*f + A*f^2)*x^5*Sqrt[a + b*x^2])/6 + (a*C*f^
2*x^7*Sqrt[a + b*x^2])/(80*b) + (f*(2*c*C + B*f)*x^7*Sqrt[a + b*x^2])/8 +
(C*f^2*x^9*Sqrt[a + b*x^2])/10 + (a*A*c^2*ArcTanh[(Sqrt[b]*x)/Sqrt[a + b*x
^2]])/(2*Sqrt[b]) + (7*a^5*C*f^2*ArcTanh[(Sqrt[b]*x)/Sqrt[a + b*x^2]])/(25
6*b^(9/2)) - (a^2*c*(B*c + 2*A*f)*ArcTanh[(Sqrt[b]*x)/Sqrt[a + b*x^2]])/(8
*b^(3/2)) - (5*a^4*f*(2*c*C + B*f)*ArcTanh[(Sqrt[b]*x)/Sqrt[a + b*x^2]])/(
128*b^(7/2)) + (a^3*(c^2*C + 2*B*c*f + A*f^2)*ArcTanh[(Sqrt[b]*x)/Sqrt[a +
 b*x^2]])/(16*b^(5/2))
```

Defintions of rubi rules used

rule 2009

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

rule 2256

```
Int[(Px_)*((d_) + (e_.)*(x_)^2)^(q_.)*((a_) + (b_.)*(x_)^2 + (c_.)*(x_)^4)^
(p_.), x_Symbol] :> Int[ExpandIntegrand[Px*(d + e*x^2)^q*(a + b*x^2 + c*x^4
)^p, x], x] /; FreeQ[{a, b, c, d, e, q}, x] && PolyQ[Px, x] && IntegerQ[p]
```

Maple [A] (verified)

Time = 0.80 (sec) , antiderivative size = 322, normalized size of antiderivative = 0.80

method	result
pseudoelliptic	$-\frac{-a\left(\frac{7a^4Cf^2}{16}-\frac{5bf(Bf+2Cc)a^3}{8}+b^2(Af^2+2Bcf+Cc^2)a^2+2b^3(-2Acf-Bc^2)a+8Ab^4c^2\right)\operatorname{arctanh}\left(\frac{\sqrt{bx^2+a}}{x\sqrt{b}}\right)+\left(2((\cdots\right.}{\cdots}$
risch	$-\frac{x(-384Cf^2b^4x^8-480Bb^4f^2x^6-48Cab^3f^2x^6-960Cb^4cfx^6-640Ab^4f^2x^4-80Bab^3f^2x^4-1280Bb^4cfx^4+56Ca^2b^2\cdots}{\cdots}$
default	$Ac^2\left(\frac{x\sqrt{bx^2+a}}{2}+\frac{a\ln\left(\sqrt{b}\,x+\sqrt{bx^2+a}\right)}{2\sqrt{b}}\right)+c(2Af+Bc)\left(\frac{x(bx^2+a)^{\frac{3}{2}}}{4b}-\frac{a\left(\frac{x\sqrt{bx^2+a}}{2}+\frac{a\ln\left(\sqrt{b}\,x+\sqrt{bx^2\cdots\right.}{2\sqrt{b}}\cdots\right.}{4b}\cdots\right.$

input
```
int((b*x^2+a)^(1/2)*(f*x^2+c)^2*(C*x^4+B*x^2+A),x,method=_RETURNVERBOSE)
```

output
```
-1/16*(-a*(7/16*a^4*C*f^2-5/8*b*f*(B*f+2*C*c)*a^3+b^2*(A*f^2+2*B*c*f+C*c^2
)*a^2+2*b^3*(-2*A*c*f-B*c^2)*a+8*A*b^4*c^2)*arctanh((b*x^2+a)^(1/2)/x/b^(1
/2))+(2*((-4/5*C*x^8-B*x^6-4/3*A*x^4)*f^2-4*(1/2*C*x^4+2/3*x^2*B+A)*x^2*c*
f-4*(1/3*C*x^4+1/2*x^2*B+A)*c^2)*b^(9/2)+(2*(-1/3*(3/10*C*x^4+1/2*x^2*B+A)
*x^2*f^2-2*(1/6*C*x^4+1/3*x^2*B+A)*c*f-(1/3*C*x^2+B)*c^2)*b^(7/2)+a*(((7/3
0*C*x^4+5/12*x^2*B+A)*f^2+2*(5/12*C*x^2+B)*c*f+C*c^2)*b^(5/2)+7/16*a*(2*((
-1/3*C*x^2-5/7*B)*f-10/7*C*c)*b^(3/2)+C*a*f*b^(1/2))*f))*a)*x*(b*x^2+a)^(1
/2))/b^(9/2)
```

Fricas [A] (verification not implemented)

Time = 0.38 (sec) , antiderivative size = 818, normalized size of antiderivative = 2.04

$$\int \sqrt{a+bx^2}\left(c+fx^2\right)^2\left(A+Bx^2+Cx^4\right)\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(1/2)*(f*x^2+c)^2*(C*x^4+B*x^2+A),x, algorithm="fricas
")
```

output
```
[1/7680*(15*(16*(C*a^3*b^2 - 2*B*a^2*b^3 + 8*A*a*b^4)*c^2 - 4*(5*C*a^4*b -
 8*B*a^3*b^2 + 16*A*a^2*b^3)*c*f + (7*C*a^5 - 10*B*a^4*b + 16*A*a^3*b^2)*f
^2)*sqrt(b)*log(-2*b*x^2 - 2*sqrt(b*x^2 + a)*sqrt(b)*x - a) + 2*(384*C*b^5
*f^2*x^9 + 48*(20*C*b^5*c*f + (C*a*b^4 + 10*B*b^5)*f^2)*x^7 + 8*(80*C*b^5*
c^2 + 20*(C*a*b^4 + 8*B*b^5)*c*f - (7*C*a^2*b^3 - 10*B*a*b^4 - 80*A*b^5)*f
^2)*x^5 + 10*(16*(C*a*b^4 + 6*B*b^5)*c^2 - 4*(5*C*a^2*b^3 - 8*B*a*b^4 - 48
*A*b^5)*c*f + (7*C*a^3*b^2 - 10*B*a^2*b^3 + 16*A*a*b^4)*f^2)*x^3 - 15*(16*
(C*a^2*b^3 - 2*B*a*b^4 - 8*A*b^5)*c^2 - 4*(5*C*a^3*b^2 - 8*B*a^2*b^3 + 16*
A*a*b^4)*c*f + (7*C*a^4*b - 10*B*a^3*b^2 + 16*A*a^2*b^3)*f^2)*x)*sqrt(b*x^
2 + a))/b^5, -1/3840*(15*(16*(C*a^3*b^2 - 2*B*a^2*b^3 + 8*A*a*b^4)*c^2 - 4
*(5*C*a^4*b - 8*B*a^3*b^2 + 16*A*a^2*b^3)*c*f + (7*C*a^5 - 10*B*a^4*b + 16
*A*a^3*b^2)*f^2)*sqrt(-b)*arctan(sqrt(-b)*x/sqrt(b*x^2 + a)) - (384*C*b^5*
f^2*x^9 + 48*(20*C*b^5*c*f + (C*a*b^4 + 10*B*b^5)*f^2)*x^7 + 8*(80*C*b^5*c
^2 + 20*(C*a*b^4 + 8*B*b^5)*c*f - (7*C*a^2*b^3 - 10*B*a*b^4 - 80*A*b^5)*f^
2)*x^5 + 10*(16*(C*a*b^4 + 6*B*b^5)*c^2 - 4*(5*C*a^2*b^3 - 8*B*a*b^4 - 48*
A*b^5)*c*f + (7*C*a^3*b^2 - 10*B*a^2*b^3 + 16*A*a*b^4)*f^2)*x^3 - 15*(16*(
C*a^2*b^3 - 2*B*a*b^4 - 8*A*b^5)*c^2 - 4*(5*C*a^3*b^2 - 8*B*a^2*b^3 + 16*A
*a*b^4)*c*f + (7*C*a^4*b - 10*B*a^3*b^2 + 16*A*a^2*b^3)*f^2)*x)*sqrt(b*x^2
 + a))/b^5]
```

Sympy [A] (verification not implemented)

Time = 0.57 (sec) , antiderivative size = 663, normalized size of antiderivative = 1.65

$$\int \sqrt{a+bx^2}\left(c+fx^2\right)^2\left(A+Bx^2+Cx^4\right)\,dx$$

$$= \begin{cases} \sqrt{a+bx^2}\left(\frac{Cf^2x^9}{10}+\frac{x^7\left(Bbf^2+\frac{Caf^2}{10}+2Cbcf\right)}{8b}+\frac{x^5\left(Abf^2+Baf^2+2Bbcf+2Cacf+Cbc^2-\frac{7a\left(Bbf^2+\frac{Caf^2}{10}+2Cbcf\right)}{8b}\right)}{6b}+\frac{x^3\left(A \cdots\right.}{\cdots} \right. \\ \sqrt{a}\left(Ac^2x+\frac{Cf^2x^9}{9}+\frac{x^7\left(Bf^2+2Ccf\right)}{7}+\frac{x^5\left(Af^2+2Bcf+Cc^2\right)}{5}+\frac{x^3\cdot\left(2Acf+Bc^2\right)}{3}\right) \end{cases}$$

input
```
integrate((b*x**2+a)**(1/2)*(f*x**2+c)**2*(C*x**4+B*x**2+A),x)
```

output
```
Piecewise((sqrt(a + b*x**2)*(C*f**2*x**9/10 + x**7*(B*b*f**2 + C*a*f**2/10
 + 2*C*b*c*f)/(8*b) + x**5*(A*b*f**2 + B*a*f**2 + 2*B*b*c*f + 2*C*a*c*f +
C*b*c**2 - 7*a*(B*b*f**2 + C*a*f**2/10 + 2*C*b*c*f)/(8*b))/(6*b) + x**3*(A
*a*f**2 + 2*A*b*c*f + 2*B*a*c*f + B*b*c**2 + C*a*c**2 - 5*a*(A*b*f**2 + B*
a*f**2 + 2*B*b*c*f + 2*C*a*c*f + C*b*c**2 - 7*a*(B*b*f**2 + C*a*f**2/10 +
2*C*b*c*f)/(8*b))/(6*b))/(4*b) + x*(2*A*a*c*f + A*b*c**2 + B*a*c**2 - 3*a*
(A*a*f**2 + 2*A*b*c*f + 2*B*a*c*f + B*b*c**2 + C*a*c**2 - 5*a*(A*b*f**2 +
B*a*f**2 + 2*B*b*c*f + 2*C*a*c*f + C*b*c**2 - 7*a*(B*b*f**2 + C*a*f**2/10
+ 2*C*b*c*f)/(8*b))/(6*b))/(4*b))/(2*b)) + (A*a*c**2 - a*(2*A*a*c*f + A*b*
c**2 + B*a*c**2 - 3*a*(A*a*f**2 + 2*A*b*c*f + 2*B*a*c*f + B*b*c**2 + C*a*c
**2 - 5*a*(A*b*f**2 + B*a*f**2 + 2*B*b*c*f + 2*C*a*c*f + C*b*c**2 - 7*a*(B
*b*f**2 + C*a*f**2/10 + 2*C*b*c*f)/(8*b))/(6*b))/(4*b))/(2*b))*Piecewise((
log(2*sqrt(b)*sqrt(a + b*x**2) + 2*b*x)/sqrt(b), Ne(a, 0)), (x*log(x)/sqrt
(b*x**2), True)), Ne(b, 0)), (sqrt(a)*(A*c**2*x + C*f**2*x**9/9 + x**7*(B*
f**2 + 2*C*c*f)/7 + x**5*(A*f**2 + 2*B*c*f + C*c**2)/5 + x**3*(2*A*c*f + B
*c**2)/3), True))
```

Maxima [A] (verification not implemented)

Time = 0.04 (sec) , antiderivative size = 524, normalized size of antiderivative = 1.31

$$\int \sqrt{a+bx^2}(c+fx^2)^2\left(A+Bx^2+Cx^4\right)\,dx$$
$$= \frac{(bx^2+a)^{\frac{3}{2}}Cf^2x^7}{10\,b} - \frac{7\,(bx^2+a)^{\frac{3}{2}}Caf^2x^5}{80\,b^2} + \frac{7\,(bx^2+a)^{\frac{3}{2}}Ca^2f^2x^3}{96\,b^3} + \frac{(2\,Ccf+Bf^2)(bx^2+a)^{\frac{3}{2}}x^5}{8\,b} + \frac{1}{2}\sqrt{bx^2+a}Ac^2x - \frac{7\,(bx^2+a)^{\frac{3}{2}}Ca^3f^2x}{128\,b^4} + \frac{7\,\sqrt{bx^2+a}Ca^4f^2x}{256\,b^4} - \frac{5\,(2\,Ccf+Bf^2)(bx^2+a)^{\frac{3}{2}}ax^3}{48\,b^2} + \frac{(Cc^2+2\,Bcf+Af^2)(bx^2+a)^{\frac{3}{2}}x^3}{6\,b} + \frac{Aac^2\,\mathrm{arsinh}\left(\frac{bx}{\sqrt{ab}}\right)}{2\,\sqrt{b}} + \frac{7\,Ca^5f^2\,\mathrm{arsinh}\left(\frac{bx}{\sqrt{ab}}\right)}{256\,b^{\frac{9}{2}}} + \frac{5\,(2\,Ccf+Bf^2)(bx^2+a)^{\frac{3}{2}}a^2x}{64\,b^3} - \frac{5\,(2\,Ccf+Bf^2)\sqrt{bx^2+a}a^3x}{128\,b^3} - \frac{(Cc^2+2\,Bcf+Af^2)(bx^2+a)^{\frac{3}{2}}ax}{8\,b^2} + \frac{(Cc^2+2\,Bcf+Af^2)\sqrt{bx^2+a}a^2x}{16\,b^2} + \frac{(Bc^2+2\,Acf)(bx^2+a)^{\frac{3}{2}}x}{4\,b} - \frac{(Bc^2+2\,Acf)\sqrt{bx^2+a}ax}{8\,b} - \frac{5\,(2\,Ccf+Bf^2)a^4\,\mathrm{arsinh}\left(\frac{bx}{\sqrt{ab}}\right)}{128\,b^{\frac{7}{2}}} + \frac{(Cc^2+2\,Bcf+Af^2)a^3\,\mathrm{arsinh}\left(\frac{bx}{\sqrt{ab}}\right)}{16\,b^{\frac{5}{2}}} - \frac{(Bc^2+2\,Acf)a^2\,\mathrm{arsinh}\left(\frac{bx}{\sqrt{ab}}\right)}{8\,b^{\frac{3}{2}}}$$

input
```
integrate((b*x^2+a)^(1/2)*(f*x^2+c)^2*(C*x^4+B*x^2+A),x, algorithm="maxima
")
```

output
```
1/10*(b*x^2 + a)^(3/2)*C*f^2*x^7/b - 7/80*(b*x^2 + a)^(3/2)*C*a*f^2*x^5/b^
2 + 7/96*(b*x^2 + a)^(3/2)*C*a^2*f^2*x^3/b^3 + 1/8*(2*C*c*f + B*f^2)*(b*x^
2 + a)^(3/2)*x^5/b + 1/2*sqrt(b*x^2 + a)*A*c^2*x - 7/128*(b*x^2 + a)^(3/2)
*C*a^3*f^2*x/b^4 + 7/256*sqrt(b*x^2 + a)*C*a^4*f^2*x/b^4 - 5/48*(2*C*c*f +
 B*f^2)*(b*x^2 + a)^(3/2)*a*x^3/b^2 + 1/6*(C*c^2 + 2*B*c*f + A*f^2)*(b*x^2
 + a)^(3/2)*x^3/b + 1/2*A*a*c^2*arcsinh(b*x/sqrt(a*b))/sqrt(b) + 7/256*C*a
^5*f^2*arcsinh(b*x/sqrt(a*b))/b^(9/2) + 5/64*(2*C*c*f + B*f^2)*(b*x^2 + a)
^(3/2)*a^2*x/b^3 - 5/128*(2*C*c*f + B*f^2)*sqrt(b*x^2 + a)*a^3*x/b^3 - 1/8
*(C*c^2 + 2*B*c*f + A*f^2)*(b*x^2 + a)^(3/2)*a*x/b^2 + 1/16*(C*c^2 + 2*B*c
*f + A*f^2)*sqrt(b*x^2 + a)*a^2*x/b^2 + 1/4*(B*c^2 + 2*A*c*f)*(b*x^2 + a)^
(3/2)*x/b - 1/8*(B*c^2 + 2*A*c*f)*sqrt(b*x^2 + a)*a*x/b - 5/128*(2*C*c*f +
 B*f^2)*a^4*arcsinh(b*x/sqrt(a*b))/b^(7/2) + 1/16*(C*c^2 + 2*B*c*f + A*f^2
)*a^3*arcsinh(b*x/sqrt(a*b))/b^(5/2) - 1/8*(B*c^2 + 2*A*c*f)*a^2*arcsinh(b
*x/sqrt(a*b))/b^(3/2)
```

Giac [A] (verification not implemented)

Time = 0.16 (sec) , antiderivative size = 445, normalized size of antiderivative = 1.11

$$\int \sqrt{a+bx^2}\left(c+fx^2\right)^2\left(A+Bx^2+Cx^4\right)\,dx$$

$$= \frac{1}{3840}\left(2\left(4\left(6\left(8\,Cf^2x^2+\frac{20\,Cb^8cf+Cab^7f^2+10\,Bb^8f^2}{b^8}\right)x^2+\frac{80\,Cb^8c^2+20\,Cab^7cf+160\,Bb^8cf-}{b}\right.\right.\right.$$

$$-\frac{(16\,Ca^3b^2c^2-32\,Ba^2b^3c^2+128\,Aab^4c^2-20\,Ca^4bcf+32\,Ba^3b^2cf-64\,Aa^2b^3cf+7\,Ca^5f^2-10\,Ba^4}{256\,b^{\frac{9}{2}}}$$

input
```
integrate((b*x^2+a)^(1/2)*(f*x^2+c)^2*(C*x^4+B*x^2+A),x, algorithm="giac")
```

output
```
1/3840*(2*(4*(6*(8*C*f^2*x^2 + (20*C*b^8*c*f + C*a*b^7*f^2 + 10*B*b^8*f^2)
/b^8)*x^2 + (80*C*b^8*c^2 + 20*C*a*b^7*c*f + 160*B*b^8*c*f - 7*C*a^2*b^6*f
^2 + 10*B*a*b^7*f^2 + 80*A*b^8*f^2)/b^8)*x^2 + 5*(16*C*a*b^7*c^2 + 96*B*b^
8*c^2 - 20*C*a^2*b^6*c*f + 32*B*a*b^7*c*f + 192*A*b^8*c*f + 7*C*a^3*b^5*f^
2 - 10*B*a^2*b^6*f^2 + 16*A*a*b^7*f^2)/b^8)*x^2 - 15*(16*C*a^2*b^6*c^2 - 3
2*B*a*b^7*c^2 - 128*A*b^8*c^2 - 20*C*a^3*b^5*c*f + 32*B*a^2*b^6*c*f - 64*A
*a*b^7*c*f + 7*C*a^4*b^4*f^2 - 10*B*a^3*b^5*f^2 + 16*A*a^2*b^6*f^2)/b^8)*s
qrt(b*x^2 + a)*x - 1/256*(16*C*a^3*b^2*c^2 - 32*B*a^2*b^3*c^2 + 128*A*a*b^
4*c^2 - 20*C*a^4*b*c*f + 32*B*a^3*b^2*c*f - 64*A*a^2*b^3*c*f + 7*C*a^5*f^2
 - 10*B*a^4*b*f^2 + 16*A*a^3*b^2*f^2)*log(abs(-sqrt(b)*x + sqrt(b*x^2 + a)
))/b^(9/2)
```

Mupad [F(-1)]

Timed out.

$$\int \sqrt{a+bx^2}\left(c+fx^2\right)^2\left(A+Bx^2+Cx^4\right)\,dx$$
$$=\int \sqrt{b\,x^2+a}\,\left(f\,x^2+c\right)^2\,\left(C\,x^4+B\,x^2+A\right)\,dx$$

input
```
int((a + b*x^2)^(1/2)*(c + f*x^2)^2*(A + B*x^2 + C*x^4),x)
```

output
```
int((a + b*x^2)^(1/2)*(c + f*x^2)^2*(A + B*x^2 + C*x^4), x)
```

Reduce [B] (verification not implemented)

Time = 4.34 (sec) , antiderivative size = 618, normalized size of antiderivative = 1.54

$$\int \sqrt{a+bx^2}\left(c+fx^2\right)^2\left(A+Bx^2+Cx^4\right)\,dx$$
$$=\frac{960\sqrt{b\,x^2+a}\,b^6c^2x^3+480\sqrt{b\,x^2+a}\,b^6f^2x^7+640\sqrt{b\,x^2+a}\,b^5c^3x^5+960\sqrt{b\,x^2+a}\,b^5c^2f\,x^7+384\sqrt{b\,x^2}}{}$$

input
```
int((b*x^2+a)^(1/2)*(f*x^2+c)^2*(C*x^4+B*x^2+A),x)
```

output
```
( - 105*sqrt(a + b*x**2)*a**4*b*c*f**2*x - 90*sqrt(a + b*x**2)*a**3*b**3*f
**2*x + 300*sqrt(a + b*x**2)*a**3*b**2*c**2*f*x + 70*sqrt(a + b*x**2)*a**3
*b**2*c*f**2*x**3 + 480*sqrt(a + b*x**2)*a**2*b**4*c*f*x + 60*sqrt(a + b*x
**2)*a**2*b**4*f**2*x**3 - 240*sqrt(a + b*x**2)*a**2*b**3*c**3*x - 200*sqr
t(a + b*x**2)*a**2*b**3*c**2*f*x**3 - 56*sqrt(a + b*x**2)*a**2*b**3*c*f**2
*x**5 + 2400*sqrt(a + b*x**2)*a*b**5*c**2*x + 2240*sqrt(a + b*x**2)*a*b**5
*c*f*x**3 + 720*sqrt(a + b*x**2)*a*b**5*f**2*x**5 + 160*sqrt(a + b*x**2)*a
*b**4*c**3*x**3 + 160*sqrt(a + b*x**2)*a*b**4*c**2*f*x**5 + 48*sqrt(a + b*
x**2)*a*b**4*c*f**2*x**7 + 960*sqrt(a + b*x**2)*b**6*c**2*x**3 + 1280*sqrt
(a + b*x**2)*b**6*c*f*x**5 + 480*sqrt(a + b*x**2)*b**6*f**2*x**7 + 640*sqr
t(a + b*x**2)*b**5*c**3*x**5 + 960*sqrt(a + b*x**2)*b**5*c**2*f*x**7 + 384
*sqrt(a + b*x**2)*b**5*c*f**2*x**9 + 105*sqrt(b)*log((sqrt(a + b*x**2) + s
qrt(b)*x)/sqrt(a))*a**5*c*f**2 + 90*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b
)*x)/sqrt(a))*a**4*b**2*f**2 - 300*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)
*x)/sqrt(a))*a**4*b*c**2*f - 480*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)*x
)/sqrt(a))*a**3*b**3*c*f + 240*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)*x)/
sqrt(a))*a**3*b**2*c**3 + 1440*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)*x)/
sqrt(a))*a**2*b**4*c**2)/(3840*b**5)
```

3.5 $\int \sqrt{a+bx^2}\left(A+Bx^2+Cx^4\right)\,dx$

Optimal result

Integrand size = 24, antiderivative size = 134

$$\int \sqrt{a+bx^2}\left(A+Bx^2+Cx^4\right)\,dx=\frac{1}{16}\left(8A-\frac{a(2bB-aC)}{b^2}\right)x\sqrt{a+bx^2}+\frac{(2bB-aC)x\left(a+bx^2\right)^{3/2}}{8b^2}+\frac{Cx^3\left(a+bx^2\right)^{3/2}}{6b}+\frac{a\left(8Ab^2-a(2bB-aC)\right)\operatorname{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)}{16b^{5/2}}$$

output
```
1/16*(8*A-a*(2*B*b-C*a)/b^2)*x*(b*x^2+a)^(1/2)+1/8*(2*B*b-C*a)*x*(b*x^2+a)
^(3/2)/b^2+1/6*C*x^3*(b*x^2+a)^(3/2)/b+1/16*a*(8*A*b^2-a*(2*B*b-C*a))*arct
anh(b^(1/2)*x/(b*x^2+a)^(1/2))/b^(5/2)
```

Mathematica [A] (verified)

Time = 0.25 (sec) , antiderivative size = 112, normalized size of antiderivative = 0.84

$$\int \sqrt{a+bx^2}\left(A+Bx^2+Cx^4\right)\,dx=\frac{x\sqrt{a+bx^2}\left(24Ab^2+6abB-3a^2C+12b^2Bx^2+2abCx^2+8b^2Cx^4\right)}{48b^2}-\frac{a\left(8Ab^2-2abB+a^2C\right)\log\left(-\sqrt{b}x+\sqrt{a+bx^2}\right)}{16b^{5/2}}$$

input
```
Integrate[Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4),x]
```

output
```
(x*Sqrt[a + b*x^2]*(24*A*b^2 + 6*a*b*B - 3*a^2*C + 12*b^2*B*x^2 + 2*a*b*C*
x^2 + 8*b^2*C*x^4))/(48*b^2) - (a*(8*A*b^2 - 2*a*b*B + a^2*C)*Log[-(Sqrt[b
]*x) + Sqrt[a + b*x^2]])/(16*b^(5/2))
```

Rubi [A] (verified)

Time = 0.30 (sec) , antiderivative size = 131, normalized size of antiderivative = 0.98, number of steps used = 7, number of rules used = 6, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.250, Rules used = {1473, 27, 299, 211, 224, 219}

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.

$$\int \sqrt{a+bx^2}\left(A+Bx^2+Cx^4\right)\,dx$$

$$\Big\downarrow \text{1473}$$

$$\frac{\int 3\sqrt{bx^2+a}\left((2bB-aC)x^2+2Ab\right)dx}{6b}+\frac{Cx^3\left(a+bx^2\right)^{3/2}}{6b}$$

$$\Big\downarrow \text{27}$$

$$\frac{\int \sqrt{bx^2+a}\left((2bB-aC)x^2+2Ab\right)dx}{2b}+\frac{Cx^3\left(a+bx^2\right)^{3/2}}{6b}$$

$$\Big\downarrow \text{299}$$

$$\frac{\frac{\left(8Ab^2-a(2bB-aC)\right)\int \sqrt{bx^2+a}dx}{4b}+\frac{x\left(a+bx^2\right)^{3/2}(2bB-aC)}{4b}}{2b}+\frac{Cx^3\left(a+bx^2\right)^{3/2}}{6b}$$

$$\Big\downarrow \text{211}$$

$$\frac{\frac{\left(8Ab^2-a(2bB-aC)\right)\left(\frac{1}{2}a\int \frac{1}{\sqrt{bx^2+a}}dx+\frac{1}{2}x\sqrt{a+bx^2}\right)}{4b}+\frac{x\left(a+bx^2\right)^{3/2}(2bB-aC)}{4b}}{2b}+\frac{Cx^3\left(a+bx^2\right)^{3/2}}{6b}$$

$$\Big\downarrow \text{224}$$

$$\frac{\frac{(8Ab^2-a(2bB-aC))\left(\frac{1}{2}a\int\frac{1}{1-\frac{bx^2}{bx^2+a}}d\frac{x}{\sqrt{bx^2+a}}+\frac{1}{2}x\sqrt{a+bx^2}\right)}{4b}+\frac{x(a+bx^2)^{3/2}(2bB-aC)}{4b}}{2b}+\frac{Cx^3(a+bx^2)^{3/2}}{6b}$$

$\Big\downarrow$ 219

$$\frac{\frac{\left(\frac{a\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)}{2\sqrt{b}}+\frac{1}{2}x\sqrt{a+bx^2}\right)(8Ab^2-a(2bB-aC))}{4b}+\frac{x(a+bx^2)^{3/2}(2bB-aC)}{4b}}{2b}+\frac{Cx^3(a+bx^2)^{3/2}}{6b}$$

input
```
Int[Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4),x]
```

output
```
(C*x^3*(a + b*x^2)^(3/2))/(6*b) + (((2*b*B - a*C)*x*(a + b*x^2)^(3/2))/(4*
b) + ((8*A*b^2 - a*(2*b*B - a*C))*((x*Sqrt[a + b*x^2])/2 + (a*ArcTanh[(Sqr
t[b]*x)/Sqrt[a + b*x^2]])/(2*Sqrt[b])))/(4*b))/(2*b)
```

Defintions of rubi rules used

rule 27
```
Int[(a_)*(Fx_), x_Symbol] :> Simp[a   Int[Fx, x], x] /; FreeQ[a, x] &&  !Ma
tchQ[Fx, (b_)*(Gx_) /; FreeQ[b, x]]
```

rule 211
```
Int[((a_) + (b_.)*(x_)^2)^(p_), x_Symbol] :> Simp[x*((a + b*x^2)^p/(2*p + 1
)), x] + Simp[2*a*(p/(2*p + 1))   Int[(a + b*x^2)^(p - 1), x], x] /; FreeQ[
{a, b}, x] && GtQ[p, 0] && (IntegerQ[4*p] || IntegerQ[6*p])
```

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] && (Gt
Q[a, 0] || LtQ[b, 0])
```

rule 224
```
Int[1/Sqrt[(a_) + (b_.)*(x_)^2], x_Symbol] :> Subst[Int[1/(1 - b*x^2), x],
x, x/Sqrt[a + b*x^2]] /; FreeQ[{a, b}, x] &&  !GtQ[a, 0]
```

rule 299
```
Int[((a_) + (b_.)*(x_)^2)^(p_)*((c_) + (d_.)*(x_)^2), x_Symbol] :> Simp[d*x
*((a + b*x^2)^(p + 1)/(b*(2*p + 3))), x] - Simp[(a*d - b*c*(2*p + 3))/(b*(2
*p + 3))   Int[(a + b*x^2)^p, x], x] /; FreeQ[{a, b, c, d}, x] && NeQ[b*c -
 a*d, 0] && NeQ[2*p + 3, 0]
```

rule 1473
```
Int[((d_) + (e_.)*(x_)^2)^(q_)*((a_) + (b_.)*(x_)^2 + (c_.)*(x_)^4)^(p_.),
x_Symbol] :> Simp[c^p*x^(4*p - 1)*((d + e*x^2)^(q + 1)/(e*(4*p + 2*q + 1)))
, x] + Simp[1/(e*(4*p + 2*q + 1))   Int[(d + e*x^2)^q*ExpandToSum[e*(4*p +
2*q + 1)*(a + b*x^2 + c*x^4)^p - d*c^p*(4*p - 1)*x^(4*p - 2) - e*c^p*(4*p +
 2*q + 1)*x^(4*p), x], x], x] /; FreeQ[{a, b, c, d, e, q}, x] && NeQ[b^2 -
4*a*c, 0] && NeQ[c*d^2 - b*d*e + a*e^2, 0] && IGtQ[p, 0] &&  !LtQ[q, -1]
```

Maple [A] (verified)

Time = 0.60 (sec) , antiderivative size = 96, normalized size of antiderivative = 0.72

method	result
pseudoelliptic	$\frac{a\left(b^{2}A-\frac{1}{4}abB+\frac{1}{8}a^{2}C\right)\operatorname{arctanh}\left(\frac{\sqrt{b\,x^{2}+a}}{x\sqrt{b}}\right)+\sqrt{b\,x^{2}+a}\,x\left(\left(\frac{1}{3}C\,x^{4}+\frac{1}{2}x^{2}B+A\right)b^{\frac{5}{2}}+\frac{a\left(\left(\frac{C\,x^{2}}{3}+B\right)b^{\frac{3}{2}}-\frac{Ca\sqrt{b}}{2}\right)}{4}\right)}{2b^{\frac{5}{2}}}$
risch	$\frac{x\left(8C\,b^{2}x^{4}+12b^{2}B\,x^{2}+2x^{2}aCb+24b^{2}A+6abB-3a^{2}C\right)\sqrt{b\,x^{2}+a}}{48b^{2}}+\frac{a\left(8b^{2}A-2abB+a^{2}C\right)\ln\left(\sqrt{b}\,x+\sqrt{b\,x^{2}+a}\right)}{16b^{\frac{5}{2}}}$
default	$A\left(\frac{x\sqrt{b\,x^{2}+a}}{2}+\frac{a\ln\left(\sqrt{b}\,x+\sqrt{b\,x^{2}+a}\right)}{2\sqrt{b}}\right)+C\left(\frac{x^{3}\left(b\,x^{2}+a\right)^{\frac{3}{2}}}{6b}-\frac{a\left(\frac{x\left(b\,x^{2}+a\right)^{\frac{3}{2}}}{4b}-\frac{a\left(\frac{x\sqrt{b\,x^{2}+a}}{2}+\frac{a\ln\left(\sqrt{b}\,x+\sqrt{b\,x^{2}+\cdots\right.}}{2\sqrt{b}}\right.}{4b}\right.}{2b}\right.$

input
```
int((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A),x,method=_RETURNVERBOSE)
```

output
```
1/2*(a*(b^2*A-1/4*a*b*B+1/8*a^2*C)*arctanh((b*x^2+a)^(1/2)/x/b^(1/2))+(b*x
^2+a)^(1/2)*x*((1/3*C*x^4+1/2*x^2*B+A)*b^(5/2)+1/4*a*((1/3*C*x^2+B)*b^(3/2
)-1/2*C*a*b^(1/2))))/b^(5/2)
```

Fricas [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 232, normalized size of antiderivative = 1.73

$$\int \sqrt{a+bx^2}\left(A+Bx^2+Cx^4\right)\,dx$$
$$=\left[\frac{3\left(Ca^3-2\,Ba^2b+8\,Aab^2\right)\sqrt{b}\log\left(-2\,bx^2-2\,\sqrt{bx^2+a}\sqrt{b}x-a\right)+2\left(8\,Cb^3x^5+2\left(Cab^2+6\,Bb^3\right)x^3\right.}{96\,b^3}\right.$$
$$-\frac{3\left(Ca^3-2\,Ba^2b+8\,Aab^2\right)\sqrt{-b}\arctan\left(\frac{\sqrt{-b}x}{\sqrt{bx^2+a}}\right)-\left(8\,Cb^3x^5+2\left(Cab^2+6\,Bb^3\right)x^3-3\left(Ca^2b-2\,Bab\right.\right.}{48\,b^3}$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A),x, algorithm="fricas")
```

output
```
[1/96*(3*(C*a^3 - 2*B*a^2*b + 8*A*a*b^2)*sqrt(b)*log(-2*b*x^2 - 2*sqrt(b*x
^2 + a)*sqrt(b)*x - a) + 2*(8*C*b^3*x^5 + 2*(C*a*b^2 + 6*B*b^3)*x^3 - 3*(C
*a^2*b - 2*B*a*b^2 - 8*A*b^3)*x)*sqrt(b*x^2 + a))/b^3, -1/48*(3*(C*a^3 - 2
*B*a^2*b + 8*A*a*b^2)*sqrt(-b)*arctan(sqrt(-b)*x/sqrt(b*x^2 + a)) - (8*C*b
^3*x^5 + 2*(C*a*b^2 + 6*B*b^3)*x^3 - 3*(C*a^2*b - 2*B*a*b^2 - 8*A*b^3)*x)*
sqrt(b*x^2 + a))/b^3]
```

Sympy [A] (verification not implemented)

Time = 0.36 (sec) , antiderivative size = 153, normalized size of antiderivative = 1.14

$$\int \sqrt{a+bx^2}\left(A+Bx^2+Cx^4\right)\,dx$$
$$=\begin{cases}\sqrt{a+bx^2}\left(\frac{Cx^5}{6}+\frac{x^3\left(Bb+\frac{Ca}{6}\right)}{4b}+\frac{x\left(Ab+Ba-\frac{3a\left(Bb+\frac{Ca}{6}\right)}{4b}\right)}{2b}\right)+\left(Aa-\frac{a\left(Ab+Ba-\frac{3a\left(Bb+\frac{Ca}{6}\right)}{4b}\right)}{2b}\right)\left(\begin{cases}\frac{\log\left(2\sqrt{b}\sqrt{a+\right.}}{\sqrt{b}} \\ \frac{x\log\left(x\right)}{\sqrt{bx^2}}\end{cases}\right. \\ \sqrt{a}\left(Ax+\frac{Bx^3}{3}+\frac{Cx^5}{5}\right)\end{cases}$$

input
```
integrate((b*x**2+a)**(1/2)*(C*x**4+B*x**2+A),x)
```

output
```
Piecewise((sqrt(a + b*x**2)*(C*x**5/6 + x**3*(B*b + C*a/6)/(4*b) + x*(A*b
+ B*a - 3*a*(B*b + C*a/6)/(4*b))/(2*b)) + (A*a - a*(A*b + B*a - 3*a*(B*b +
 C*a/6)/(4*b))/(2*b))*Piecewise((log(2*sqrt(b)*sqrt(a + b*x**2) + 2*b*x)/s
qrt(b), Ne(a, 0)), (x*log(x)/sqrt(b*x**2), True)), Ne(b, 0)), (sqrt(a)*(A*
x + B*x**3/3 + C*x**5/5), True))
```

Maxima [A] (verification not implemented)

Time = 0.03 (sec) , antiderivative size = 153, normalized size of antiderivative = 1.14

$$\int \sqrt{a+bx^2}\left(A+Bx^2+Cx^4\right)\,dx = \frac{\left(bx^2+a\right)^{\frac{3}{2}}Cx^3}{6\,b}+\frac{1}{2}\,\sqrt{bx^2+a}Ax-\frac{\left(bx^2+a\right)^{\frac{3}{2}}Cax}{8\,b^2}+\frac{\sqrt{bx^2+a}Ca^2x}{16\,b^2}+\frac{\left(bx^2+a\right)^{\frac{3}{2}}Bx}{4\,b}-\frac{\sqrt{bx^2+a}Bax}{8\,b}+\frac{Ca^3\operatorname{arsinh}\left(\frac{bx}{\sqrt{ab}}\right)}{16\,b^{\frac{5}{2}}}-\frac{Ba^2\operatorname{arsinh}\left(\frac{bx}{\sqrt{ab}}\right)}{8\,b^{\frac{3}{2}}}+\frac{Aa\operatorname{arsinh}\left(\frac{bx}{\sqrt{ab}}\right)}{2\,\sqrt{b}}$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A),x, algorithm="maxima")
```

output
```
1/6*(b*x^2 + a)^(3/2)*C*x^3/b + 1/2*sqrt(b*x^2 + a)*A*x - 1/8*(b*x^2 + a)^
(3/2)*C*a*x/b^2 + 1/16*sqrt(b*x^2 + a)*C*a^2*x/b^2 + 1/4*(b*x^2 + a)^(3/2)
*B*x/b - 1/8*sqrt(b*x^2 + a)*B*a*x/b + 1/16*C*a^3*arcsinh(b*x/sqrt(a*b))/b
^(5/2) - 1/8*B*a^2*arcsinh(b*x/sqrt(a*b))/b^(3/2) + 1/2*A*a*arcsinh(b*x/sq
rt(a*b))/sqrt(b)
```

Giac [A] (verification not implemented)

Time = 0.13 (sec) , antiderivative size = 113, normalized size of antiderivative = 0.84

$$\int \sqrt{a+bx^2}\left(A+Bx^2+Cx^4\right)\,dx$$
$$=\frac{1}{48}\left(2\left(4\,Cx^2+\frac{Cab^3+6\,Bb^4}{b^4}\right)x^2-\frac{3\left(Ca^2b^2-2\,Bab^3-8\,Ab^4\right)}{b^4}\right)\sqrt{bx^2+a}x$$
$$-\frac{\left(Ca^3-2\,Ba^2b+8\,Aab^2\right)\log\left(\left|-\sqrt{b}x+\sqrt{bx^2+a}\right|\right)}{16\,b^{\frac{5}{2}}}$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A),x, algorithm="giac")
```

output
```
1/48*(2*(4*C*x^2 + (C*a*b^3 + 6*B*b^4)/b^4)*x^2 - 3*(C*a^2*b^2 - 2*B*a*b^3
 - 8*A*b^4)/b^4)*sqrt(b*x^2 + a)*x - 1/16*(C*a^3 - 2*B*a^2*b + 8*A*a*b^2)*
log(abs(-sqrt(b)*x + sqrt(b*x^2 + a)))/b^(5/2)
```

Mupad [F(-1)]

Timed out.

$$\int \sqrt{a+bx^2}\left(A+Bx^2+Cx^4\right)\,dx=\int \sqrt{b\,x^2+a}\,\left(C\,x^4+B\,x^2+A\right)\,dx$$

input
```
int((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4),x)
```

output
```
int((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4), x)
```

Reduce [B] (verification not implemented)

Time = 0.16 (sec) , antiderivative size = 144, normalized size of antiderivative = 1.07

$$\int \sqrt{a+bx^2}\left(A+Bx^2+Cx^4\right)\,dx$$
$$=\frac{-3\sqrt{b\,x^2+a}\,a^2bcx+30\sqrt{b\,x^2+a}\,a\,b^3x+2\sqrt{b\,x^2+a}\,a\,b^2c\,x^3+12\sqrt{b\,x^2+a}\,b^4x^3+8\sqrt{b\,x^2+a}\,b^3c\,x^5+}{48b^3}$$

input
```
int((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A),x)
```

output
```
( - 3*sqrt(a + b*x**2)*a**2*b*c*x + 30*sqrt(a + b*x**2)*a*b**3*x + 2*sqrt(
a + b*x**2)*a*b**2*c*x**3 + 12*sqrt(a + b*x**2)*b**4*x**3 + 8*sqrt(a + b*x
**2)*b**3*c*x**5 + 3*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)*x)/sqrt(a))*a
**3*c + 18*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)*x)/sqrt(a))*a**2*b**2)/
(48*b**3)
```

3.6 $\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2} dx$

Optimal result

Integrand size = 33, antiderivative size = 204

$$\begin{aligned}
&\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2} \, dx \\
&= -\frac{(4bcC-4bBf-aCf)x\sqrt{a+bx^2}}{8bf^2} + \frac{Cx^3\sqrt{a+bx^2}}{4f} \\
&\quad - \frac{(a^2Cf^2+4abf(cC-Bf)-8b^2(c^2C-Bcf+Af^2))\operatorname{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)}{8b^{3/2}f^3} \\
&\quad - \frac{\sqrt{bc-af}(c^2C-Bcf+Af^2)\operatorname{arctanh}\left(\frac{\sqrt{bc-af}x}{\sqrt{c}\sqrt{a+bx^2}}\right)}{\sqrt{c}f^3}
\end{aligned}$$

output
```
-1/8*(-4*B*b*f-C*a*f+4*C*b*c)*x*(b*x^2+a)^(1/2)/b/f^2+1/4*C*x^3*(b*x^2+a)^
(1/2)/f-1/8*(a^2*C*f^2+4*a*b*f*(-B*f+C*c)-8*b^2*(A*f^2-B*c*f+C*c^2))*arcta
nh(b^(1/2)*x/(b*x^2+a)^(1/2))/b^(3/2)/f^3-(-a*f+b*c)^(1/2)*(A*f^2-B*c*f+C*
c^2)*arctanh((-a*f+b*c)^(1/2)*x/c^(1/2)/(b*x^2+a)^(1/2))/c^(1/2)/f^3
```

Mathematica [A] (verified)

Time = 0.72 (sec) , antiderivative size = 203, normalized size of antiderivative = 1.00

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2}\,dx$$
$$= \frac{\frac{fx\sqrt{a+bx^2}(aCf+b(-4cC+4Bf+2Cfx^2))}{b} - \frac{8\sqrt{-bc+af}(c^2C-Bcf+Af^2)\arctan\left(\frac{-fx\sqrt{a+bx^2}+\sqrt{b}(c+fx^2)}{\sqrt{c}\sqrt{-bc+af}}\right)}{\sqrt{c}} - \frac{(-a^2Cf^2+4abf(-cC+}{}}{8f^3}$$

input
```
Integrate[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4))/(c + f*x^2),x]
```

output
```
((f*x*Sqrt[a + b*x^2]*(a*C*f + b*(-4*c*C + 4*B*f + 2*C*f*x^2)))/b - (8*Sqr
t[-(b*c) + a*f]*(c^2*C - B*c*f + A*f^2)*ArcTan[(-(f*x*Sqrt[a + b*x^2]) + S
qrt[b]*(c + f*x^2))/(Sqrt[c]*Sqrt[-(b*c) + a*f])])/Sqrt[c] - ((-(a^2*C*f^2
) + 4*a*b*f*(-(c*C) + B*f) + 8*b^2*(c^2*C - B*c*f + A*f^2))*Log[-(Sqrt[b]*
x) + Sqrt[a + b*x^2]])/b^(3/2))/(8*f^3)
```

Rubi [A] (verified)

Time = 0.66 (sec) , antiderivative size = 262, normalized size of antiderivative = 1.28, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.061, Rules used = {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.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2}\,dx$$

$$\Big\downarrow \; 7276$$

$$\int \left(\frac{\sqrt{a+bx^2}(Af^2-Bcf+c^2C)}{f^2(c+fx^2)} - \frac{\sqrt{a+bx^2}(cC-Bf)}{f^2} + \frac{Cx^2\sqrt{a+bx^2}}{f}\right)dx$$

$$\Big\downarrow \; 2009$$

$$-\frac{a^2C\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)}{8b^{3/2}f}+\frac{\sqrt{b}\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)(Af^2-Bcf+c^2C)}{f^3}-\frac{\sqrt{bc-af}(Af^2-Bcf+c^2C)\,\text{arctanh}\left(\frac{x\sqrt{bc-af}}{\sqrt{c}\sqrt{a+bx^2}}\right)}{\sqrt{c}f^3}-\frac{a\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)(cC-Bf)}{2\sqrt{b}f^2}-\frac{x\sqrt{a+bx^2}(cC-Bf)}{2f^2}+\frac{aCx\sqrt{a+bx^2}}{8bf}+\frac{Cx^3\sqrt{a+bx^2}}{4f}$$

input
```
Int[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4))/(c + f*x^2),x]
```

output
```
(a*C*x*Sqrt[a + b*x^2])/(8*b*f) - ((c*C - B*f)*x*Sqrt[a + b*x^2])/(2*f^2)
+ (C*x^3*Sqrt[a + b*x^2])/(4*f) - (a^2*C*ArcTanh[(Sqrt[b]*x)/Sqrt[a + b*x^
2]])/(8*b^(3/2)*f) - (a*(c*C - B*f)*ArcTanh[(Sqrt[b]*x)/Sqrt[a + b*x^2]])/
(2*Sqrt[b]*f^2) + (Sqrt[b]*(c^2*C - B*c*f + A*f^2)*ArcTanh[(Sqrt[b]*x)/Sqr
t[a + b*x^2]])/f^3 - (Sqrt[b*c - a*f]*(c^2*C - B*c*f + A*f^2)*ArcTanh[(Sqr
t[b*c - a*f]*x)/(Sqrt[c]*Sqrt[a + b*x^2])])/(Sqrt[c]*f^3)
```

Defintions of rubi rules used

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

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]
```

Maple [A] (verified)

Time = 1.88 (sec) , antiderivative size = 184, normalized size of antiderivative = 0.90

method	result
pseudoelliptic	$-\frac{\frac{2(af-bc)\left(Af^2-Bcf+Cc^2\right)\arctan\left(\frac{c\sqrt{bx^2+a}}{x\sqrt{(af-bc)c}}\right)}{\sqrt{(af-bc)c}}-\frac{f\sqrt{bx^2+a}\left(2Cbfx^2+4Bbf+aCf-4Cbc\right)x}{4b}-\frac{\left(8Ab^2f^2+4Babf^2-8Bb^2cf-\ldots\right.}{\ldots}}{2f^3}$
risch	$\frac{x(2Cbfx^2+4Bbf+aCf-4Cbc)\sqrt{bx^2+a}}{8bf^2}+\frac{\frac{\left(8Ab^2f^2+4Babf^2-8Bb^2cf-a^2Cf^2-4Cabcf+8Cb^2c^2\right)\ln\left(\sqrt{b}\,x+\sqrt{bx^2+a}\right)}{f\sqrt{b}}-\ldots}{4b\ldots}$
default	$\frac{Bf\left(\frac{x\sqrt{bx^2+a}}{2}+\frac{a\ln\left(\sqrt{b}\,x+\sqrt{bx^2+a}\right)}{2\sqrt{b}}\right)+Cf\left(\frac{x\left(bx^2+a\right)^{\frac{3}{2}}}{4b}-\frac{a\left(\frac{x\sqrt{bx^2+a}}{2}+\frac{a\ln\left(\sqrt{b}\,x+\sqrt{bx^2+a}\right)}{2\sqrt{b}}\right)}{4b}\right)-Cc\left(\frac{x\sqrt{bx^2+a}}{2}+\frac{a\ln\left(\ldots\right.}{\ldots}\right.}{f^2}$

input
```
int((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c),x,method=_RETURNVERBOSE)
```

output
```
-1/2/f^3*(2*(a*f-b*c)*(A*f^2-B*c*f+C*c^2)/((a*f-b*c)*c)^(1/2)*arctan(c*(b*
x^2+a)^(1/2)/x/((a*f-b*c)*c)^(1/2))-1/4*f*(b*x^2+a)^(1/2)*(2*C*b*f*x^2+4*B
*b*f+C*a*f-4*C*b*c)/b*x-1/4*(8*A*b^2*f^2+4*B*a*b*f^2-8*B*b^2*c*f-C*a^2*f^2
-4*C*a*b*c*f+8*C*b^2*c^2)/b^(3/2)*arctanh((b*x^2+a)^(1/2)/x/b^(1/2)))
```

Fricas [A] (verification not implemented)

Time = 4.23 (sec) , antiderivative size = 1103, normalized size of antiderivative = 5.41

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c),x, algorithm="fricas")
```

output
```
[1/16*((8*C*b^2*c^2 - 4*(C*a*b + 2*B*b^2)*c*f - (C*a^2 - 4*B*a*b - 8*A*b^2
)*f^2)*sqrt(b)*log(-2*b*x^2 - 2*sqrt(b*x^2 + a)*sqrt(b)*x - a) + 4*(C*b^2*
c^2 - B*b^2*c*f + A*b^2*f^2)*sqrt((b*c - a*f)/c)*log(((8*b^2*c^2 - 8*a*b*c
*f + a^2*f^2)*x^4 + a^2*c^2 + 2*(4*a*b*c^2 - 3*a^2*c*f)*x^2 - 4*(a*c^2*x +
 (2*b*c^2 - a*c*f)*x^3)*sqrt(b*x^2 + a)*sqrt((b*c - a*f)/c))/(f^2*x^4 + 2*
c*f*x^2 + c^2)) + 2*(2*C*b^2*f^2*x^3 - (4*C*b^2*c*f - (C*a*b + 4*B*b^2)*f^
2)*x)*sqrt(b*x^2 + a))/(b^2*f^3), -1/8*((8*C*b^2*c^2 - 4*(C*a*b + 2*B*b^2)
*c*f - (C*a^2 - 4*B*a*b - 8*A*b^2)*f^2)*sqrt(-b)*arctan(sqrt(-b)*x/sqrt(b*
x^2 + a)) - 2*(C*b^2*c^2 - B*b^2*c*f + A*b^2*f^2)*sqrt((b*c - a*f)/c)*log(
((8*b^2*c^2 - 8*a*b*c*f + a^2*f^2)*x^4 + a^2*c^2 + 2*(4*a*b*c^2 - 3*a^2*c*
f)*x^2 - 4*(a*c^2*x + (2*b*c^2 - a*c*f)*x^3)*sqrt(b*x^2 + a)*sqrt((b*c - a
*f)/c))/(f^2*x^4 + 2*c*f*x^2 + c^2)) - (2*C*b^2*f^2*x^3 - (4*C*b^2*c*f - (
C*a*b + 4*B*b^2)*f^2)*x)*sqrt(b*x^2 + a))/(b^2*f^3), 1/16*(8*(C*b^2*c^2 -
B*b^2*c*f + A*b^2*f^2)*sqrt(-(b*c - a*f)/c)*arctan(1/2*((2*b*c - a*f)*x^2
+ a*c)*sqrt(b*x^2 + a)*sqrt(-(b*c - a*f)/c)/((b^2*c - a*b*f)*x^3 + (a*b*c
- a^2*f)*x)) + (8*C*b^2*c^2 - 4*(C*a*b + 2*B*b^2)*c*f - (C*a^2 - 4*B*a*b -
 8*A*b^2)*f^2)*sqrt(b)*log(-2*b*x^2 - 2*sqrt(b*x^2 + a)*sqrt(b)*x - a) + 2
*(2*C*b^2*f^2*x^3 - (4*C*b^2*c*f - (C*a*b + 4*B*b^2)*f^2)*x)*sqrt(b*x^2 +
a))/(b^2*f^3), -1/8*((8*C*b^2*c^2 - 4*(C*a*b + 2*B*b^2)*c*f - (C*a^2 - 4*B
*a*b - 8*A*b^2)*f^2)*sqrt(-b)*arctan(sqrt(-b)*x/sqrt(b*x^2 + a)) - 4*(C...
```

Sympy [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2}\,dx=\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2}\,dx$$

input
```
integrate((b*x**2+a)**(1/2)*(C*x**4+B*x**2+A)/(f*x**2+c),x)
```

output
```
Integral(sqrt(a + b*x**2)*(A + B*x**2 + C*x**4)/(c + f*x**2), x)
```

Maxima [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2}\,dx = \int \frac{(Cx^4+Bx^2+A)\sqrt{bx^2+a}}{fx^2+c}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c),x, algorithm="maxima")
```

output
```
integrate((C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(f*x^2 + c), x)
```

Giac [F(-2)]

Exception generated.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2}\,dx = \text{Exception raised: TypeError}$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c),x, algorithm="giac")
```

output
```
Exception raised: TypeError >> an error occurred running a Giac command:IN
PUT:sage2:=int(sage0,sageVARx):;OUTPUT:index.cc index_m i_lex_is_greater E
rror: Bad Argument Value
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2}\,dx = \int \frac{\sqrt{b\,x^2+a}\,\left(C\,x^4+B\,x^2+A\right)}{f\,x^2+c}\,dx$$

input
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4))/(c + f*x^2),x)
```

output
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4))/(c + f*x^2), x)
```

Reduce [B] (verification not implemented)

Time = 0.19 (sec) , antiderivative size = 581, normalized size of antiderivative = 2.85

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{c+fx^2}\,dx$$
$$= \frac{-8\sqrt{c}\,\sqrt{af-bc}\,atan\left(\frac{\sqrt{af-bc}-\sqrt{f}\,\sqrt{b\,x^2+a}-\sqrt{f}\,\sqrt{b}\,x}{\sqrt{c}\,\sqrt{b}}\right)a\,b^2f^2+8\sqrt{c}\,\sqrt{af-bc}\,atan\left(\frac{\sqrt{af-bc}-\sqrt{f}\,\sqrt{b\,x^2+a}-\sqrt{f}\,\sqrt{b}\,x}{\sqrt{c}\,\sqrt{b}}\right.}{}$$

input
```
int((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c),x)
```

output
```
( - 8*sqrt(c)*sqrt(a*f - b*c)*atan((sqrt(a*f - b*c) - sqrt(f)*sqrt(a + b*x
**2) - sqrt(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b)))*a*b**2*f**2 + 8*sqrt(c)*sqrt(
a*f - b*c)*atan((sqrt(a*f - b*c) - sqrt(f)*sqrt(a + b*x**2) - sqrt(f)*sqrt
(b)*x)/(sqrt(c)*sqrt(b)))*b**3*c*f - 8*sqrt(c)*sqrt(a*f - b*c)*atan((sqrt(
a*f - b*c) - sqrt(f)*sqrt(a + b*x**2) - sqrt(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b
)))*b**2*c**3 - 8*sqrt(c)*sqrt(a*f - b*c)*atan((sqrt(a*f - b*c) + sqrt(f)*
sqrt(a + b*x**2) + sqrt(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b)))*a*b**2*f**2 + 8*s
qrt(c)*sqrt(a*f - b*c)*atan((sqrt(a*f - b*c) + sqrt(f)*sqrt(a + b*x**2) +
sqrt(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b)))*b**3*c*f - 8*sqrt(c)*sqrt(a*f - b*c)
*atan((sqrt(a*f - b*c) + sqrt(f)*sqrt(a + b*x**2) + sqrt(f)*sqrt(b)*x)/(sq
rt(c)*sqrt(b)))*b**2*c**3 + sqrt(a + b*x**2)*a*b*c**2*f**2*x + 4*sqrt(a +
b*x**2)*b**3*c*f**2*x - 4*sqrt(a + b*x**2)*b**2*c**3*f*x + 2*sqrt(a + b*x*
*2)*b**2*c**2*f**2*x**3 - sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)*x)/sqrt(
a))*a**2*c**2*f**2 + 12*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)*x)/sqrt(a)
)*a*b**2*c*f**2 - 4*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)*x)/sqrt(a))*a*
b*c**3*f - 8*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)*x)/sqrt(a))*b**3*c**2
*f + 8*sqrt(b)*log((sqrt(a + b*x**2) + sqrt(b)*x)/sqrt(a))*b**2*c**4)/(8*b
**2*c*f**3)
```

3.7 $\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx$

Optimal result

Integrand size = 33, antiderivative size = 208

$$\begin{aligned}\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx &= \frac{Cx\sqrt{a+bx^2}}{2f^2}+\frac{(c^2C-Bcf+Af^2)\,x\sqrt{a+bx^2}}{2cf^2\,(c+fx^2)} \\ &\quad -\frac{(4bcC-2bBf-aCf)\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)}{2\sqrt{b}f^3} \\ &\quad +\frac{(2bc^2(2cC-Bf)-af(3c^2C-Bcf-Af^2))\,\text{arctanh}\left(\frac{\sqrt{bc-af}\,x}{\sqrt{c}\sqrt{a+bx^2}}\right)}{2c^{3/2}f^3\sqrt{bc-af}}\end{aligned}$$

output
```
1/2*C*x*(b*x^2+a)^(1/2)/f^2+1/2*(A*f^2-B*c*f+C*c^2)*x*(b*x^2+a)^(1/2)/c/f^
2/(f*x^2+c)-1/2*(-2*B*b*f-C*a*f+4*C*b*c)*arctanh(b^(1/2)*x/(b*x^2+a)^(1/2)
)/b^(1/2)/f^3+1/2*(2*b*c^2*(-B*f+2*C*c)-a*f*(-A*f^2-B*c*f+3*C*c^2))*arctan
h((-a*f+b*c)^(1/2)*x/c^(1/2)/(b*x^2+a)^(1/2))/c^(3/2)/f^3/(-a*f+b*c)^(1/2)
```

Mathematica [A] (verified)

Time = 1.09 (sec) , antiderivative size = 203, normalized size of antiderivative = 0.98

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx$$

$$=\frac{\frac{fx\sqrt{a+bx^2}(2c^2C-Bcf+Af^2+cCfx^2)}{c(c+fx^2)}-\frac{(2bc^2(2cC-Bf)+af(-3c^2C+Bcf+Af^2))\arctan\left(\frac{-fx\sqrt{a+bx^2}+\sqrt{b}(c+fx^2)}{\sqrt{c}\sqrt{-bc+af}}\right)}{c^{3/2}\sqrt{-bc+af}}+\frac{(4bcC-2bBf-}{}}{2f^3}$$

input
```
Integrate[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4))/(c + f*x^2)^2,x]
```

output
```
((f*x*Sqrt[a + b*x^2]*(2*c^2*C - B*c*f + A*f^2 + c*C*f*x^2))/(c*(c + f*x^2
)) - ((2*b*c^2*(2*c*C - B*f) + a*f*(-3*c^2*C + B*c*f + A*f^2))*ArcTan[(-(f
*x*Sqrt[a + b*x^2]) + Sqrt[b]*(c + f*x^2))/(Sqrt[c]*Sqrt[-(b*c) + a*f])])/
(c^(3/2)*Sqrt[-(b*c) + a*f]) + ((4*b*c*C - 2*b*B*f - a*C*f)*Log[-(Sqrt[b]*
x) + Sqrt[a + b*x^2]])/Sqrt[b])/(2*f^3)
```

Rubi [A] (verified)

Time = 0.67 (sec) , antiderivative size = 272, normalized size of antiderivative = 1.31, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.061$, Rules used = {7293, 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.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{\sqrt{a+bx^2}(Af^2-Bcf+c^2C)}{f^2(c+fx^2)^2}+\frac{\sqrt{a+bx^2}(Bf-2cC)}{f^2(c+fx^2)}+\frac{C\sqrt{a+bx^2}}{f^2}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{a\left(Af^2-Bcf+c^2C\right)\text{arctanh}\left(\frac{x\sqrt{bc-af}}{\sqrt{c}\sqrt{a+bx^2}}\right)}{2c^{3/2}f^2\sqrt{bc-af}}+\frac{x\sqrt{a+bx^2}\left(Af^2-Bcf+c^2C\right)}{2cf^2\left(c+fx^2\right)}-\frac{\sqrt{b}\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)(2cC-Bf)}{f^3}+\frac{\sqrt{bc-af}(2cC-Bf)\text{arctanh}\left(\frac{x\sqrt{bc-af}}{\sqrt{c}\sqrt{a+bx^2}}\right)}{\sqrt{c}f^3}+\frac{aC\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)}{2\sqrt{b}f^2}+\frac{Cx\sqrt{a+bx^2}}{2f^2}$$

input
```
Int[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4))/(c + f*x^2)^2,x]
```

output
```
(C*x*Sqrt[a + b*x^2])/(2*f^2) + ((c^2*C - B*c*f + A*f^2)*x*Sqrt[a + b*x^2]
)/(2*c*f^2*(c + f*x^2)) + (a*C*ArcTanh[(Sqrt[b]*x)/Sqrt[a + b*x^2]])/(2*Sq
rt[b]*f^2) - (Sqrt[b]*(2*c*C - B*f)*ArcTanh[(Sqrt[b]*x)/Sqrt[a + b*x^2]])/
f^3 + (Sqrt[b*c - a*f]*(2*c*C - B*f)*ArcTanh[(Sqrt[b*c - a*f]*x)/(Sqrt[c]*
Sqrt[a + b*x^2])])/(Sqrt[c]*f^3) + (a*(c^2*C - B*c*f + A*f^2)*ArcTanh[(Sqr
t[b*c - a*f]*x)/(Sqrt[c]*Sqrt[a + b*x^2])])/(2*c^(3/2)*f^2*Sqrt[b*c - a*f]
)
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 1.13 (sec) , antiderivative size = 205, normalized size of antiderivative = 0.99

method	result
pseudoelliptic	$\frac{2(f x^2+c)\sqrt{b}\left(-2c^3Cb+f\left(Bb+\frac{3Ca}{2}\right)c^2-\frac{Bac f^2}{2}-\frac{Aa f^3}{2}\right)\arctan\left(\frac{c\sqrt{b x^2+a}}{x\sqrt{(af-bc)c}}\right)+\left(2(f x^2+c)\left(-2Cbc+f\left(Bb+\frac{Ca}{2}\right)\right)c}{2\sqrt{b}\sqrt{(af-bc)c}\,c(f x^2+c)f^3}$
risch	Expression too large to display
default	Expression too large to display

input
```
int((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^2,x,method=_RETURNVERBOSE)
```

output
```
1/2/b^(1/2)*(2*(f*x^2+c)*b^(1/2)*(-2*c^3*C*b+f*(B*b+3/2*C*a)*c^2-1/2*B*a*c
*f^2-1/2*A*a*f^3)*arctan(c*(b*x^2+a)^(1/2)/x/((a*f-b*c)*c)^(1/2))+(2*(f*x^
2+c)*(-2*C*b*c+f*(B*b+1/2*C*a))*c*arctanh((b*x^2+a)^(1/2)/x/b^(1/2))+(b*x^
2+a)^(1/2)*b^(1/2)*(2*C*c^2-f*(-C*x^2+B)*c+A*f^2)*x*f)*((a*f-b*c)*c)^(1/2)
)/((a*f-b*c)*c)^(1/2)/c/(f*x^2+c)/f^3
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 460 vs. $2(180) = 360$.

Time = 5.87 (sec) , antiderivative size = 1933, normalized size of antiderivative = 9.29

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^2,x, algorithm="fricas
")
```

output
```
[-1/8*(2*(4*C*b^2*c^5 - (5*C*a*b + 2*B*b^2)*c^4*f + (C*a^2 + 2*B*a*b)*c^3*
f^2 + (4*C*b^2*c^4*f - (5*C*a*b + 2*B*b^2)*c^3*f^2 + (C*a^2 + 2*B*a*b)*c^2
*f^3)*x^2)*sqrt(b)*log(-2*b*x^2 - 2*sqrt(b*x^2 + a)*sqrt(b)*x - a) - (4*C*
b^2*c^4 + B*a*b*c^2*f^2 + A*a*b*c*f^3 - (3*C*a*b + 2*B*b^2)*c^3*f + (4*C*b
^2*c^3*f + B*a*b*c*f^3 + A*a*b*f^4 - (3*C*a*b + 2*B*b^2)*c^2*f^2)*x^2)*sqr
t(b*c^2 - a*c*f)*log(((8*b^2*c^2 - 8*a*b*c*f + a^2*f^2)*x^4 + a^2*c^2 + 2*
(4*a*b*c^2 - 3*a^2*c*f)*x^2 + 4*((2*b*c - a*f)*x^3 + a*c*x)*sqrt(b*c^2 - a
*c*f)*sqrt(b*x^2 + a))/(f^2*x^4 + 2*c*f*x^2 + c^2)) - 4*((C*b^2*c^3*f^2 -
C*a*b*c^2*f^3)*x^3 + (2*C*b^2*c^4*f - A*a*b*c*f^4 - (2*C*a*b + B*b^2)*c^3*
f^2 + (B*a*b + A*b^2)*c^2*f^3)*x)*sqrt(b*x^2 + a))/(b^2*c^4*f^3 - a*b*c^3*
f^4 + (b^2*c^3*f^4 - a*b*c^2*f^5)*x^2), 1/8*(4*(4*C*b^2*c^5 - (5*C*a*b + 2
*B*b^2)*c^4*f + (C*a^2 + 2*B*a*b)*c^3*f^2 + (4*C*b^2*c^4*f - (5*C*a*b + 2*
B*b^2)*c^3*f^2 + (C*a^2 + 2*B*a*b)*c^2*f^3)*x^2)*sqrt(-b)*arctan(sqrt(-b)*
x/sqrt(b*x^2 + a)) + (4*C*b^2*c^4 + B*a*b*c^2*f^2 + A*a*b*c*f^3 - (3*C*a*b
 + 2*B*b^2)*c^3*f + (4*C*b^2*c^3*f + B*a*b*c*f^3 + A*a*b*f^4 - (3*C*a*b +
2*B*b^2)*c^2*f^2)*x^2)*sqrt(b*c^2 - a*c*f)*log(((8*b^2*c^2 - 8*a*b*c*f + a
^2*f^2)*x^4 + a^2*c^2 + 2*(4*a*b*c^2 - 3*a^2*c*f)*x^2 + 4*((2*b*c - a*f)*x
^3 + a*c*x)*sqrt(b*c^2 - a*c*f)*sqrt(b*x^2 + a))/(f^2*x^4 + 2*c*f*x^2 + c^
2)) + 4*((C*b^2*c^3*f^2 - C*a*b*c^2*f^3)*x^3 + (2*C*b^2*c^4*f - A*a*b*c*f^
4 - (2*C*a*b + B*b^2)*c^3*f^2 + (B*a*b + A*b^2)*c^2*f^3)*x)*sqrt(b*x^2 ...
```

Sympy [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx = \int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx$$

input
```
integrate((b*x**2+a)**(1/2)*(C*x**4+B*x**2+A)/(f*x**2+c)**2,x)
```

output
```
Integral(sqrt(a + b*x**2)*(A + B*x**2 + C*x**4)/(c + f*x**2)**2, x)
```

Maxima [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx = \int \frac{(Cx^4+Bx^2+A)\sqrt{bx^2+a}}{(fx^2+c)^2}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^2,x, algorithm="maxima
")
```

output
```
integrate((C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(f*x^2 + c)^2, x)
```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 477 vs. $2(180) = 360$.

Time = 0.16 (sec) , antiderivative size = 477, normalized size of antiderivative = 2.29

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx$$

$$= \frac{\sqrt{bx^2+a}Cx}{2\,f^2} + \frac{(4\,Cbc - Caf - 2\,Bbf)\log\left(\left(\sqrt{b}x - \sqrt{bx^2+a}\right)^2\right)}{4\,\sqrt{b}f^3}$$

$$- \frac{\left(4\,Cb^{\frac{3}{2}}c^3 - 3\,Ca\sqrt{b}c^2f - 2\,Bb^{\frac{3}{2}}c^2f + Ba\sqrt{b}cf^2 + Aa\sqrt{b}f^3\right)\arctan\left(\frac{\left(\sqrt{b}x-\sqrt{bx^2+a}\right)^2f+2\,bc-af}{2\,\sqrt{-b^2c^2+abcf}}\right)}{2\,\sqrt{-b^2c^2+abcf}cf^3}$$

$$+ \frac{2\left(\sqrt{b}x - \sqrt{bx^2+a}\right)^2Cb^{\frac{3}{2}}c^3 - \left(\sqrt{b}x - \sqrt{bx^2+a}\right)^2Ca\sqrt{b}c^2f - 2\left(\sqrt{b}x - \sqrt{bx^2+a}\right)^2Bb^{\frac{3}{2}}c^2f + \left(\sqrt{b}\right.}{\left(\left(\sqrt{b}x - \sqrt{bx^2+a}\right)^4f + 4\left(\sqrt{}\right.\right.}$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^2,x, algorithm="giac")
```

output
```
1/2*sqrt(b*x^2 + a)*C*x/f^2 + 1/4*(4*C*b*c - C*a*f - 2*B*b*f)*log((sqrt(b)
*x - sqrt(b*x^2 + a))^2)/(sqrt(b)*f^3) - 1/2*(4*C*b^(3/2)*c^3 - 3*C*a*sqrt
(b)*c^2*f - 2*B*b^(3/2)*c^2*f + B*a*sqrt(b)*c*f^2 + A*a*sqrt(b)*f^3)*arcta
n(1/2*((sqrt(b)*x - sqrt(b*x^2 + a))^2*f + 2*b*c - a*f)/sqrt(-b^2*c^2 + a*
b*c*f))/(sqrt(-b^2*c^2 + a*b*c*f)*c*f^3) + (2*(sqrt(b)*x - sqrt(b*x^2 + a)
)^2*C*b^(3/2)*c^3 - (sqrt(b)*x - sqrt(b*x^2 + a))^2*C*a*sqrt(b)*c^2*f - 2*
(sqrt(b)*x - sqrt(b*x^2 + a))^2*B*b^(3/2)*c^2*f + (sqrt(b)*x - sqrt(b*x^2
+ a))^2*B*a*sqrt(b)*c*f^2 + 2*(sqrt(b)*x - sqrt(b*x^2 + a))^2*A*b^(3/2)*c*
f^2 - (sqrt(b)*x - sqrt(b*x^2 + a))^2*A*a*sqrt(b)*f^3 + C*a^2*sqrt(b)*c^2*
f - B*a^2*sqrt(b)*c*f^2 + A*a^2*sqrt(b)*f^3)/(((sqrt(b)*x - sqrt(b*x^2 + a
))^4*f + 4*(sqrt(b)*x - sqrt(b*x^2 + a))^2*b*c - 2*(sqrt(b)*x - sqrt(b*x^2
 + a))^2*a*f + a^2*f)*c*f^3)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx = \int \frac{\sqrt{b\,x^2+a}\,(C\,x^4+B\,x^2+A)}{(f\,x^2+c)^2}\,dx$$

input
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4))/(c + f*x^2)^2,x)
```

output
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4))/(c + f*x^2)^2, x)
```

Reduce [B] (verification not implemented)

Time = 0.23 (sec) , antiderivative size = 1704, normalized size of antiderivative = 8.19

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^2}\,dx = \text{Too large to display}$$

input
```
int((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^2,x)
```

output
```
( - sqrt(c)*sqrt(a*f - b*c)*atan((sqrt(a*f - b*c) - sqrt(f)*sqrt(a + b*x**
2) - sqrt(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b)))*a**2*b*c*f**3 - sqrt(c)*sqrt(a*
f - b*c)*atan((sqrt(a*f - b*c) - sqrt(f)*sqrt(a + b*x**2) - sqrt(f)*sqrt(b
)*x)/(sqrt(c)*sqrt(b)))*a**2*b*f**4*x**2 - sqrt(c)*sqrt(a*f - b*c)*atan((s
qrt(a*f - b*c) - sqrt(f)*sqrt(a + b*x**2) - sqrt(f)*sqrt(b)*x)/(sqrt(c)*sq
rt(b)))*a*b**2*c**2*f**2 - sqrt(c)*sqrt(a*f - b*c)*atan((sqrt(a*f - b*c) -
 sqrt(f)*sqrt(a + b*x**2) - sqrt(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b)))*a*b**2*c
*f**3*x**2 + 3*sqrt(c)*sqrt(a*f - b*c)*atan((sqrt(a*f - b*c) - sqrt(f)*sqr
t(a + b*x**2) - sqrt(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b)))*a*b*c**4*f + 3*sqrt(
c)*sqrt(a*f - b*c)*atan((sqrt(a*f - b*c) - sqrt(f)*sqrt(a + b*x**2) - sqrt
(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b)))*a*b*c**3*f**2*x**2 + 2*sqrt(c)*sqrt(a*f
- b*c)*atan((sqrt(a*f - b*c) - sqrt(f)*sqrt(a + b*x**2) - sqrt(f)*sqrt(b)*
x)/(sqrt(c)*sqrt(b)))*b**3*c**3*f + 2*sqrt(c)*sqrt(a*f - b*c)*atan((sqrt(a
*f - b*c) - sqrt(f)*sqrt(a + b*x**2) - sqrt(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b)
))*b**3*c**2*f**2*x**2 - 4*sqrt(c)*sqrt(a*f - b*c)*atan((sqrt(a*f - b*c) -
 sqrt(f)*sqrt(a + b*x**2) - sqrt(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b)))*b**2*c**
5 - 4*sqrt(c)*sqrt(a*f - b*c)*atan((sqrt(a*f - b*c) - sqrt(f)*sqrt(a + b*x
**2) - sqrt(f)*sqrt(b)*x)/(sqrt(c)*sqrt(b)))*b**2*c**4*f*x**2 - sqrt(c)*sq
rt(a*f - b*c)*atan((sqrt(a*f - b*c) + sqrt(f)*sqrt(a + b*x**2) + sqrt(f)*s
qrt(b)*x)/(sqrt(c)*sqrt(b)))*a**2*b*c*f**3 - sqrt(c)*sqrt(a*f - b*c)*at...
```

3.8 $\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx$

Optimal result

Integrand size = 33, antiderivative size = 269

$$\begin{aligned}\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx &= \frac{(c^2C-Bcf+Af^2)\,x\sqrt{a+bx^2}}{4cf^2(c+fx^2)^2} \\ &+ \frac{(af(5c^2C-Bcf-3Af^2)-2bc(3c^2C-Bcf-Af^2))\,x\sqrt{a+bx^2}}{8c^2f^2(bc-af)(c+fx^2)} \\ &+ \frac{\sqrt{b}C\operatorname{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)}{f^3} \\ &- \frac{(8b^2c^4C-4abcf(3c^2C+Af^2)+a^2f^2(3c^2C+Bcf+3Af^2))\operatorname{arctanh}\left(\frac{\sqrt{bc-af}x}{\sqrt{c}\sqrt{a+bx^2}}\right)}{8c^{5/2}f^3(bc-af)^{3/2}}\end{aligned}$$

output
```
1/4*(A*f^2-B*c*f+C*c^2)*x*(b*x^2+a)^(1/2)/c/f^2/(f*x^2+c)^2+1/8*(a*f*(-3*A
*f^2-B*c*f+5*C*c^2)-2*b*c*(-A*f^2-B*c*f+3*C*c^2))*x*(b*x^2+a)^(1/2)/c^2/f^
2/(-a*f+b*c)/(f*x^2+c)+b^(1/2)*C*arctanh(b^(1/2)*x/(b*x^2+a)^(1/2))/f^3-1/
8*(8*b^2*c^4*C-4*a*b*c*f*(A*f^2+3*C*c^2)+a^2*f^2*(3*A*f^2+B*c*f+3*C*c^2))*
arctanh((-a*f+b*c)^(1/2)*x/c^(1/2)/(b*x^2+a)^(1/2))/c^(5/2)/f^3/(-a*f+b*c)
^(3/2)
```

Mathematica [A] (verified)

Time = 10.91 (sec) , antiderivative size = 247, normalized size of antiderivative = 0.92

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx$$
$$= \frac{\frac{fx\sqrt{a+bx^2}\left(2c(c^2C-Bcf+Af^2)-\frac{\left(2bc\left(3c^2C-Bcf-Af^2\right)+af\left(-5c^2C+Bcf+3Af^2\right)\right)\left(c+fx^2\right)}{bc-af}\right)}{c^2(c+fx^2)^2}+\frac{(8b^2c^4C-4abcf(3c^2C+Af^2)+a^2f^2(3c^2C+}{c^{5/2}(-bc+af}}{8f^3}$$

input
```
Integrate[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4))/(c + f*x^2)^3,x]
```

output
```
((f*x*Sqrt[a + b*x^2]*(2*c*(c^2*C - B*c*f + A*f^2) - ((2*b*c*(3*c^2*C - B*
c*f - A*f^2) + a*f*(-5*c^2*C + B*c*f + 3*A*f^2))*(c + f*x^2))/(b*c - a*f))
)/(c^2*(c + f*x^2)^2) + ((8*b^2*c^4*C - 4*a*b*c*f*(3*c^2*C + A*f^2) + a^2*
f^2*(3*c^2*C + B*c*f + 3*A*f^2))*ArcTan[(Sqrt[-(b*c) + a*f]*x)/(Sqrt[c]*Sq
rt[a + b*x^2])])/(c^(5/2)*(-(b*c) + a*f)^(3/2)) + 8*Sqrt[b]*C*Log[b*x + Sq
rt[b]*Sqrt[a + b*x^2]])/(8*f^3)
```

Rubi [A] (verified)

Time = 0.87 (sec) , antiderivative size = 393, normalized size of antiderivative = 1.46, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.061, Rules used = {7293, 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.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx$$
$$\Big\downarrow \; 7293$$
$$\int \left(\frac{\sqrt{a+bx^2}(Af^2-Bcf+c^2C)}{f^2\,(c+fx^2)^3}+\frac{\sqrt{a+bx^2}(Bf-2cC)}{f^2\,(c+fx^2)^2}+\frac{C\sqrt{a+bx^2}}{f^2\,(c+fx^2)}\right)dx$$
$$\Big\downarrow \; 2009$$

$$\frac{a(4bc-3af)\left(Af^2-Bcf+c^2C\right)\text{arctanh}\left(\frac{x\sqrt{bc-af}}{\sqrt{c}\sqrt{a+bx^2}}\right)}{8c^{5/2}f^2(bc-af)^{3/2}}-\frac{x\left(a+bx^2\right)^{3/2}\left(Af^2-Bcf+c^2C\right)}{4cf\left(c+fx^2\right)^2(bc-af)}+\frac{x\sqrt{a+bx^2}(4bc-3af)\left(Af^2-Bcf+c^2C\right)}{8c^2f^2\left(c+fx^2\right)(bc-af)}-\frac{a(2cC-Bf)\text{arctanh}\left(\frac{x\sqrt{bc-af}}{\sqrt{c}\sqrt{a+bx^2}}\right)}{2c^{3/2}f^2\sqrt{bc-af}}-\frac{C\sqrt{bc-af}\text{arctanh}\left(\frac{x\sqrt{bc-af}}{\sqrt{c}\sqrt{a+bx^2}}\right)}{\sqrt{c}f^3}+\frac{\sqrt{b}C\text{arctanh}\left(\frac{\sqrt{b}x}{\sqrt{a+bx^2}}\right)}{f^3}-\frac{x\sqrt{a+bx^2}(2cC-Bf)}{2cf^2\left(c+fx^2\right)}$$

input
```
Int[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4))/(c + f*x^2)^3,x]
```

output
```
-1/4*((c^2*C - B*c*f + A*f^2)*x*(a + b*x^2)^(3/2))/(c*f*(b*c - a*f)*(c + f
*x^2)^2) - ((2*c*C - B*f)*x*Sqrt[a + b*x^2])/(2*c*f^2*(c + f*x^2)) + ((4*b
*c - 3*a*f)*(c^2*C - B*c*f + A*f^2)*x*Sqrt[a + b*x^2])/(8*c^2*f^2*(b*c - a
*f)*(c + f*x^2)) + (Sqrt[b]*C*ArcTanh[(Sqrt[b]*x)/Sqrt[a + b*x^2]])/f^3 -
(C*Sqrt[b*c - a*f]*ArcTanh[(Sqrt[b*c - a*f]*x)/(Sqrt[c]*Sqrt[a + b*x^2])])
/(Sqrt[c]*f^3) - (a*(2*c*C - B*f)*ArcTanh[(Sqrt[b*c - a*f]*x)/(Sqrt[c]*Sqr
t[a + b*x^2])])/(2*c^(3/2)*f^2*Sqrt[b*c - a*f]) + (a*(4*b*c - 3*a*f)*(c^2*
C - B*c*f + A*f^2)*ArcTanh[(Sqrt[b*c - a*f]*x)/(Sqrt[c]*Sqrt[a + b*x^2])])
/(8*c^(5/2)*f^2*(b*c - a*f)^(3/2))
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 1.14 (sec) , antiderivative size = 287, normalized size of antiderivative = 1.07

method	result
pseudoelliptic	$-\frac{\frac{3\left(\frac{8b^2c^4C}{3}-4Cab\,c^3f+C\,a^2c^2f^2-\frac{4\left(Ab-\frac{Ba}{4}\right)a\,f^3c}{3}+a^2A\,f^4\right)\left(f\,x^2+c\right)^2\arctan\left(\frac{c\sqrt{b\,x^2+a}}{x\sqrt{(af-bc)c}}\right)}{8}+\sqrt{(af-bc)c}\left(\left(f\,x^2+c\right)^2C\left(\cdots\right.\right.}{\sqrt{\cdots}}$
default	Expression too large to display

input
```
int((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^3,x,method=_RETURNVERBOSE)
```

output
```
-1/((a*f-b*c)*c)^(1/2)*(3/8*(8/3*b^2*c^4*C-4*C*a*b*c^3*f+C*a^2*c^2*f^2-4/3
*(A*b-1/4*B*a)*a*f^3*c+a^2*A*f^4)*(f*x^2+c)^2*arctan(c*(b*x^2+a)^(1/2)/x/(
(a*f-b*c)*c)^(1/2))+((a*f-b*c)*c)^(1/2)*((f*x^2+c)^2*C*(b^(3/2)*c-a*f*b^(1
/2))*c^2*arctanh((b*x^2+a)^(1/2)/x/b^(1/2))-5/8*(4/5*C*b*c^4-3/5*C*f*(-2*b
*x^2+a)*c^3-4/5*(1/2*(B*b+5/2*C*a)*x^2+A*b+1/4*B*a)*f^2*c^2+(1/5*(-2*A*b+B
*a)*x^2+A*a)*f^3*c+3/5*A*a*f^4*x^2)*(b*x^2+a)^(1/2)*x*f))/(f*x^2+c)^2/(a*f
-b*c)/c^2/f^3
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 703 vs. $2(244) = 488$.

Time = 13.03 (sec) , antiderivative size = 2906, normalized size of antiderivative = 10.80

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^3,x, algorithm="fricas
")
```

output
```
[1/32*(16*(C*b^2*c^7 - 2*C*a*b*c^6*f + C*a^2*c^5*f^2 + (C*b^2*c^5*f^2 - 2*
C*a*b*c^4*f^3 + C*a^2*c^3*f^4)*x^4 + 2*(C*b^2*c^6*f - 2*C*a*b*c^5*f^2 + C*
a^2*c^4*f^3)*x^2)*sqrt(b)*log(-2*b*x^2 - 2*sqrt(b*x^2 + a)*sqrt(b)*x - a)
- (8*C*b^2*c^6 - 12*C*a*b*c^5*f + 3*C*a^2*c^4*f^2 + 3*A*a^2*c^2*f^4 + (B*a
^2 - 4*A*a*b)*c^3*f^3 + (8*C*b^2*c^4*f^2 - 12*C*a*b*c^3*f^3 + 3*C*a^2*c^2*
f^4 + 3*A*a^2*f^6 + (B*a^2 - 4*A*a*b)*c*f^5)*x^4 + 2*(8*C*b^2*c^5*f - 12*C
*a*b*c^4*f^2 + 3*C*a^2*c^3*f^3 + 3*A*a^2*c*f^5 + (B*a^2 - 4*A*a*b)*c^2*f^4
)*x^2)*sqrt(b*c^2 - a*c*f)*log(((8*b^2*c^2 - 8*a*b*c*f + a^2*f^2)*x^4 + a^
2*c^2 + 2*(4*a*b*c^2 - 3*a^2*c*f)*x^2 + 4*((2*b*c - a*f)*x^3 + a*c*x)*sqrt
(b*c^2 - a*c*f)*sqrt(b*x^2 + a))/(f^2*x^4 + 2*c*f*x^2 + c^2)) - 4*((6*C*b^
2*c^5*f^2 - 3*A*a^2*c*f^6 - (11*C*a*b + 2*B*b^2)*c^4*f^3 + (5*C*a^2 + 3*B*
a*b - 2*A*b^2)*c^3*f^4 - (B*a^2 - 5*A*a*b)*c^2*f^5)*x^3 + (4*C*b^2*c^6*f -
 7*C*a*b*c^5*f^2 - 5*A*a^2*c^2*f^5 + (3*C*a^2 - B*a*b - 4*A*b^2)*c^4*f^3 +
 (B*a^2 + 9*A*a*b)*c^3*f^4)*x)*sqrt(b*x^2 + a))/(b^2*c^7*f^3 - 2*a*b*c^6*f
^4 + a^2*c^5*f^5 + (b^2*c^5*f^5 - 2*a*b*c^4*f^6 + a^2*c^3*f^7)*x^4 + 2*(b^
2*c^6*f^4 - 2*a*b*c^5*f^5 + a^2*c^4*f^6)*x^2), -1/32*(32*(C*b^2*c^7 - 2*C*
a*b*c^6*f + C*a^2*c^5*f^2 + (C*b^2*c^5*f^2 - 2*C*a*b*c^4*f^3 + C*a^2*c^3*f
^4)*x^4 + 2*(C*b^2*c^6*f - 2*C*a*b*c^5*f^2 + C*a^2*c^4*f^3)*x^2)*sqrt(-b)*
arctan(sqrt(-b)*x/sqrt(b*x^2 + a)) + (8*C*b^2*c^6 - 12*C*a*b*c^5*f + 3*C*a
^2*c^4*f^2 + 3*A*a^2*c^2*f^4 + (B*a^2 - 4*A*a*b)*c^3*f^3 + (8*C*b^2*c^4...
```

Sympy [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx=\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx$$

input
```
integrate((b*x**2+a)**(1/2)*(C*x**4+B*x**2+A)/(f*x**2+c)**3,x)
```

output
```
Integral(sqrt(a + b*x**2)*(A + B*x**2 + C*x**4)/(c + f*x**2)**3, x)
```

Maxima [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx = \int \frac{(Cx^4+Bx^2+A)\sqrt{bx^2+a}}{(fx^2+c)^3}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^3,x, algorithm="maxima
")
```

output
```
integrate((C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(f*x^2 + c)^3, x)
```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1295 vs. $2(244) = 488$.

Time = 0.17 (sec) , antiderivative size = 1295, normalized size of antiderivative = 4.81

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^3,x, algorithm="giac")
```

output
```
1/8*(8*C*b^(5/2)*c^4 - 12*C*a*b^(3/2)*c^3*f + 3*C*a^2*sqrt(b)*c^2*f^2 + B*
a^2*sqrt(b)*c*f^3 - 4*A*a*b^(3/2)*c*f^3 + 3*A*a^2*sqrt(b)*f^4)*arctan(1/2*
((sqrt(b)*x - sqrt(b*x^2 + a))^2*f + 2*b*c - a*f)/sqrt(-b^2*c^2 + a*b*c*f)
)/((b*c^3*f^3 - a*c^2*f^4)*sqrt(-b^2*c^2 + a*b*c*f)) - 1/2*C*sqrt(b)*log((
sqrt(b)*x - sqrt(b*x^2 + a))^2)/f^3 - 1/4*(16*(sqrt(b)*x - sqrt(b*x^2 + a)
)^6*C*b^(5/2)*c^4*f - 20*(sqrt(b)*x - sqrt(b*x^2 + a))^6*C*a*b^(3/2)*c^3*f
^2 - 8*(sqrt(b)*x - sqrt(b*x^2 + a))^6*B*b^(5/2)*c^3*f^2 + 5*(sqrt(b)*x -
sqrt(b*x^2 + a))^6*C*a^2*sqrt(b)*c^2*f^3 + 8*(sqrt(b)*x - sqrt(b*x^2 + a))
^6*B*a*b^(3/2)*c^2*f^3 - (sqrt(b)*x - sqrt(b*x^2 + a))^6*B*a^2*sqrt(b)*c*f
^4 + 4*(sqrt(b)*x - sqrt(b*x^2 + a))^6*A*a*b^(3/2)*c*f^4 - 3*(sqrt(b)*x -
sqrt(b*x^2 + a))^6*A*a^2*sqrt(b)*f^5 + 48*(sqrt(b)*x - sqrt(b*x^2 + a))^4*
C*b^(7/2)*c^5 - 88*(sqrt(b)*x - sqrt(b*x^2 + a))^4*C*a*b^(5/2)*c^4*f - 16*
(sqrt(b)*x - sqrt(b*x^2 + a))^4*B*b^(7/2)*c^4*f + 58*(sqrt(b)*x - sqrt(b*x
^2 + a))^4*C*a^2*b^(3/2)*c^3*f^2 + 24*(sqrt(b)*x - sqrt(b*x^2 + a))^4*B*a*
b^(5/2)*c^3*f^2 - 16*(sqrt(b)*x - sqrt(b*x^2 + a))^4*A*b^(7/2)*c^3*f^2 - 1
5*(sqrt(b)*x - sqrt(b*x^2 + a))^4*C*a^3*sqrt(b)*c^2*f^3 - 14*(sqrt(b)*x -
sqrt(b*x^2 + a))^4*B*a^2*b^(3/2)*c^2*f^3 + 40*(sqrt(b)*x - sqrt(b*x^2 + a)
)^4*A*a*b^(5/2)*c^2*f^3 + 3*(sqrt(b)*x - sqrt(b*x^2 + a))^4*B*a^3*sqrt(b)*
c*f^4 - 30*(sqrt(b)*x - sqrt(b*x^2 + a))^4*A*a^2*b^(3/2)*c*f^4 + 9*(sqrt(b
)*x - sqrt(b*x^2 + a))^4*A*a^3*sqrt(b)*f^5 + 32*(sqrt(b)*x - sqrt(b*x^2...
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx=\int \frac{\sqrt{b\,x^2+a}\,(C\,x^4+B\,x^2+A)}{{(f\,x^2+c)}^3}\,dx$$

input
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4))/(c + f*x^2)^3,x)
```

output
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4))/(c + f*x^2)^3, x)
```

Reduce [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4)}{(c+fx^2)^3}\,dx=\int \frac{\sqrt{b\,x^2+a}\,(C\,x^4+B\,x^2+A)}{(f\,x^2+c)^3}dx$$

input
```
int((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^3,x)
```

output
```
int((b*x^2+a)^(1/2)*(C*x^4+B*x^2+A)/(f*x^2+c)^3,x)
```

3.9 $\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt[4]{a+bx^2}\,(e+fx^2)}\,dx$

Optimal result

Integrand size = 38, antiderivative size = 455

$$
\begin{aligned}
\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt[4]{a+bx^2}\,(e+fx^2)}\,dx
&= \frac{2(4a^2Df^2+6abf(De-Cf)+15b^2(De^2-f(Ce-Bf)))\,x}{15b^2f^3\sqrt[4]{a+bx^2}} \\
&\quad - \frac{2(3bDe-3bCf+2aDf)x(a+bx^2)^{3/4}}{15b^2f^2} + \frac{2Dx^3(a+bx^2)^{3/4}}{9bf} \\
&\quad - \frac{2\sqrt{a}(4a^2Df^2+6abf(De-Cf)+15b^2(De^2-f(Ce-Bf)))\sqrt[4]{1+\frac{bx^2}{a}}\,E\left(\frac{1}{2}\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)\middle|2\right)}{15b^{5/2}f^3\sqrt[4]{a+bx^2}} \\
&\quad - \frac{\sqrt[4]{a}(De^3-f(Ce^2-f(Be-Af)))\sqrt{-\frac{bx^2}{a}}\,\text{EllipticPi}\left(-\frac{\sqrt{a}\sqrt{f}}{\sqrt{-be+af}},\arcsin\left(\frac{\sqrt[4]{a+bx^2}}{\sqrt[4]{a}}\right),-1\right)}{f^{7/2}\sqrt{-be+af}\,x} \\
&\quad + \frac{\sqrt[4]{a}(De^3-f(Ce^2-f(Be-Af)))\sqrt{-\frac{bx^2}{a}}\,\text{EllipticPi}\left(\frac{\sqrt{a}\sqrt{f}}{\sqrt{-be+af}},\arcsin\left(\frac{\sqrt[4]{a+bx^2}}{\sqrt[4]{a}}\right),-1\right)}{f^{7/2}\sqrt{-be+af}\,x}
\end{aligned}
$$

output
```
2/15*(4*a^2*D*f^2+6*a*b*f*(-C*f+D*e)+15*b^2*(D*e^2-f*(-B*f+C*e)))*x/b^2/f^
3/(b*x^2+a)^(1/4)-2/15*(-3*C*b*f+2*D*a*f+3*D*b*e)*x*(b*x^2+a)^(3/4)/b^2/f^
2+2/9*D*x^3*(b*x^2+a)^(3/4)/b/f-2/15*a^(1/2)*(4*a^2*D*f^2+6*a*b*f*(-C*f+D*
e)+15*b^2*(D*e^2-f*(-B*f+C*e)))*(1+b*x^2/a)^(1/4)*EllipticE(sin(1/2*arctan
(b^(1/2)*x/a^(1/2))),2^(1/2))/b^(5/2)/f^3/(b*x^2+a)^(1/4)-a^(1/4)*(D*e^3-f
*(C*e^2-f*(-A*f+B*e)))*(-b*x^2/a)^(1/2)*EllipticPi((b*x^2+a)^(1/4)/a^(1/4)
,-a^(1/2)*f^(1/2)/(a*f-b*e)^(1/2),I)/f^(7/2)/(a*f-b*e)^(1/2)/x+a^(1/4)*(D*
e^3-f*(C*e^2-f*(-A*f+B*e)))*(-b*x^2/a)^(1/2)*EllipticPi((b*x^2+a)^(1/4)/a^
(1/4),a^(1/2)*f^(1/2)/(a*f-b*e)^(1/2),I)/f^(7/2)/(a*f-b*e)^(1/2)/x
```

Mathematica [C] (warning: unable to verify)

Result contains higher order function than in optimal. Order 6 vs. order 4 in optimal.

Time = 11.07 (sec) , antiderivative size = 331, normalized size of antiderivative = 0.73

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt[4]{a+bx^2}\,(e+fx^2)}\,dx = \frac{x\left(\frac{(4a^2Df^2+6abf(De-Cf)+15b^2(De^2+f(-Ce+Bf)))x^2\sqrt[4]{1+\frac{bx^2}{a}}\operatorname{AppellF1}\left(\frac{3}{2},\frac{1}{4},1,\frac{5}{2},-\frac{bx^2}{a},-\frac{fx^2}{e}\right)}{e}+2\left((a+bx^2)(-6aD\right.\right.}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(1/4)*(e + f*x^2)),x]
```

output
```
(x*(((4*a^2*D*f^2 + 6*a*b*f*(D*e - C*f) + 15*b^2*(D*e^2 + f*(-(C*e) + B*f)
))*x^2*(1 + (b*x^2)/a)^(1/4)*AppellF1[3/2, 1/4, 1, 5/2, -((b*x^2)/a), -((f
*x^2)/e)])/e + 2*((a + b*x^2)*(-6*a*D*f + b*(-9*D*e + 9*C*f + 5*D*f*x^2))
- (9*a*e*(4*a^2*D*e*f + 15*A*b^2*f^2 + 6*a*b*e*(D*e - C*f))*AppellF1[1/2,
1/4, 1, 3/2, -((b*x^2)/a), -((f*x^2)/e)])/((e + f*x^2)*(-6*a*e*AppellF1[1/
2, 1/4, 1, 3/2, -((b*x^2)/a), -((f*x^2)/e)] + x^2*(4*a*f*AppellF1[3/2, 1/4
, 2, 5/2, -((b*x^2)/a), -((f*x^2)/e)] + b*e*AppellF1[3/2, 5/4, 1, 5/2, -((
b*x^2)/a), -((f*x^2)/e)])))))/(45*b^2*f^2*(a + b*x^2)^(1/4))
```

Rubi [A] (verified)

Time = 1.03 (sec) , antiderivative size = 594, normalized size of antiderivative = 1.31, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.053, Rules used = {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.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt[4]{a+bx^2}\,(e+fx^2)}dx$$

$$\Big\downarrow \; 7276$$

$$\int \left(\frac{Af^3-Bef^2+Ce^2f-De^3}{f^3\sqrt[4]{a+bx^2}\,(e+fx^2)}+\frac{Bf^2-Cef+De^2}{f^3\sqrt[4]{a+bx^2}}-\frac{x^2(De-Cf)}{f^2\sqrt[4]{a+bx^2}}+\frac{Dx^4}{f\sqrt[4]{a+bx^2}}\right)dx$$

$$\Big\downarrow \; 2009$$

$$-\frac{4a^{3/2}\sqrt[4]{\frac{bx^2}{a}+1}(De-Cf)E\left(\frac{1}{2}\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)\middle|2\right)}{5b^{3/2}f^2\sqrt[4]{a+bx^2}}-\frac{8a^{5/2}D\sqrt[4]{\frac{bx^2}{a}+1}E\left(\frac{1}{2}\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)\middle|2\right)}{15b^{5/2}f\sqrt[4]{a+bx^2}}+\frac{8a^2Dx}{15b^2f\sqrt[4]{a+bx^2}}-\frac{\sqrt[4]{a}\sqrt{-\frac{bx^2}{a}}(De^3-f(Ce^2-f(Be-Af)))\,\text{EllipticPi}\left(-\frac{\sqrt{a}\sqrt{f}}{\sqrt{af-be}},\arcsin\left(\frac{\sqrt[4]{bx^2+a}}{\sqrt[4]{a}}\right),-1\right)}{f^{7/2}x\sqrt{af-be}}+\frac{\sqrt[4]{a}\sqrt{-\frac{bx^2}{a}}(De^3-f(Ce^2-f(Be-Af)))\,\text{EllipticPi}\left(\frac{\sqrt{a}\sqrt{f}}{\sqrt{af-be}},\arcsin\left(\frac{\sqrt[4]{bx^2+a}}{\sqrt[4]{a}}\right),-1\right)}{f^{7/2}x\sqrt{af-be}}-\frac{2\sqrt{a}\sqrt[4]{\frac{bx^2}{a}+1}E\left(\frac{1}{2}\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)\middle|2\right)(Bf^2-Cef+De^2)}{\sqrt{b}f^3\sqrt[4]{a+bx^2}}-\frac{4aDx(a+bx^2)^{3/4}}{15b^2f}+\frac{2x(Bf^2-Cef+De^2)}{f^3\sqrt[4]{a+bx^2}}-\frac{2x(a+bx^2)^{3/4}(De-Cf)}{5bf^2}+\frac{4ax(De-Cf)}{5bf^2\sqrt[4]{a+bx^2}}+\frac{2Dx^3(a+bx^2)^{3/4}}{9bf}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(1/4)*(e + f*x^2)),x]
```

output
```
(8*a^2*D*x)/(15*b^2*f*(a + b*x^2)^(1/4)) + (4*a*(D*e - C*f)*x)/(5*b*f^2*(a
 + b*x^2)^(1/4)) + (2*(D*e^2 - C*e*f + B*f^2)*x)/(f^3*(a + b*x^2)^(1/4)) -
 (4*a*D*x*(a + b*x^2)^(3/4))/(15*b^2*f) - (2*(D*e - C*f)*x*(a + b*x^2)^(3/
4))/(5*b*f^2) + (2*D*x^3*(a + b*x^2)^(3/4))/(9*b*f) - (8*a^(5/2)*D*(1 + (b
*x^2)/a)^(1/4)*EllipticE[ArcTan[(Sqrt[b]*x)/Sqrt[a]]/2, 2])/(15*b^(5/2)*f*
(a + b*x^2)^(1/4)) - (4*a^(3/2)*(D*e - C*f)*(1 + (b*x^2)/a)^(1/4)*Elliptic
E[ArcTan[(Sqrt[b]*x)/Sqrt[a]]/2, 2])/(5*b^(3/2)*f^2*(a + b*x^2)^(1/4)) - (
2*Sqrt[a]*(D*e^2 - C*e*f + B*f^2)*(1 + (b*x^2)/a)^(1/4)*EllipticE[ArcTan[(
Sqrt[b]*x)/Sqrt[a]]/2, 2])/(Sqrt[b]*f^3*(a + b*x^2)^(1/4)) - (a^(1/4)*(D*e
^3 - f*(C*e^2 - f*(B*e - A*f)))*Sqrt[-((b*x^2)/a)]*EllipticPi[-((Sqrt[a]*S
qrt[f])/Sqrt[-(b*e) + a*f]), ArcSin[(a + b*x^2)^(1/4)/a^(1/4)], -1])/(f^(7
/2)*Sqrt[-(b*e) + a*f]*x) + (a^(1/4)*(D*e^3 - f*(C*e^2 - f*(B*e - A*f)))*S
qrt[-((b*x^2)/a)]*EllipticPi[(Sqrt[a]*Sqrt[f])/Sqrt[-(b*e) + a*f], ArcSin[
(a + b*x^2)^(1/4)/a^(1/4)], -1])/(f^(7/2)*Sqrt[-(b*e) + a*f]*x)
```

Defintions of rubi rules used

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

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]
```

Maple [F]

$$\int \frac{Dx^6 + C\,x^4 + x^2 B + A}{\left(b\,x^2 + a\right)^{\frac{1}{4}} \left(f\,x^2 + e\right)}dx$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/4)/(f*x^2+e),x)
```

output
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/4)/(f*x^2+e),x)
```

Fricas [F(-1)]

Timed out.

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{\sqrt[4]{a + bx^2}\,(e + fx^2)}\,dx = \text{Timed out}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/4)/(f*x^2+e),x, algorithm="fr
icas")
```

output
```
Timed out
```

Sympy [F]

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{\sqrt[4]{a + bx^2}\,(e + fx^2)}\,dx = \int \frac{A + Bx^2 + Cx^4 + Dx^6}{\sqrt[4]{a + bx^2}\,(e + fx^2)}\,dx$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(1/4)/(f*x**2+e),x)
```

output
```
Integral((A + B*x**2 + C*x**4 + D*x**6)/((a + b*x**2)**(1/4)*(e + f*x**2))
, x)
```

Maxima [F]

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{\sqrt[4]{a + bx^2}\,(e + fx^2)}\,dx = \int \frac{Dx^6 + Cx^4 + Bx^2 + A}{(bx^2 + a)^{\frac{1}{4}}(fx^2 + e)}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/4)/(f*x^2+e),x, algorithm="ma
xima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(1/4)*(f*x^2 + e)), x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt[4]{a+bx^2}\,(e+fx^2)}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{1}{4}}(fx^2+e)}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/4)/(f*x^2+e),x, algorithm="gi
ac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(1/4)*(f*x^2 + e)), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt[4]{a+bx^2}\,(e+fx^2)}\,dx=\int \frac{A+B\,x^2+C\,x^4+x^6\,D}{(b\,x^2+a)^{1/4}\,(f\,x^2+e)}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(1/4)*(e + f*x^2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(1/4)*(e + f*x^2)), x)
```

Reduce [F]

$$\begin{aligned}\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt[4]{a+bx^2}\,(e+fx^2)}\,dx=&\left(\int \frac{x^6}{(b\,x^2+a)^{\frac{1}{4}}\,e+(b\,x^2+a)^{\frac{1}{4}}\,f\,x^2}dx\right)d\\&+\left(\int \frac{x^4}{(b\,x^2+a)^{\frac{1}{4}}\,e+(b\,x^2+a)^{\frac{1}{4}}\,f\,x^2}dx\right)c\\&+\left(\int \frac{x^2}{(b\,x^2+a)^{\frac{1}{4}}\,e+(b\,x^2+a)^{\frac{1}{4}}\,f\,x^2}dx\right)b\\&+\left(\int \frac{1}{(b\,x^2+a)^{\frac{1}{4}}\,e+(b\,x^2+a)^{\frac{1}{4}}\,f\,x^2}dx\right)a\end{aligned}$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/4)/(f*x^2+e),x)
```

output
```
int(x**6/((a + b*x**2)**(1/4)*e + (a + b*x**2)**(1/4)*f*x**2),x)*d + int(x
**4/((a + b*x**2)**(1/4)*e + (a + b*x**2)**(1/4)*f*x**2),x)*c + int(x**2/(
(a + b*x**2)**(1/4)*e + (a + b*x**2)**(1/4)*f*x**2),x)*b + int(1/((a + b*x
**2)**(1/4)*e + (a + b*x**2)**(1/4)*f*x**2),x)*a
```

3.10 $\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 582

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx =$$

$$-\frac{(48a^3Cd^3-8a^2bd^2(9cC+7Bd)+b^3c(6c^2C-21Bcd-140Ad^2)+ab^2d(12c^2C+91Bcd+70Ad^2))\,x\sqrt{c}}{105b^3d^2\sqrt{a+bx^2}}$$

$$+\frac{(24a^2Cd^2-abd(33cC+28Bd)+b^2(3c^2C+42Bcd+35Ad^2))\,x\sqrt{a+bx^2}\sqrt{c+dx^2}}{105b^3d}$$

$$+\frac{(8bcC+7bBd-6aCd)x^3\sqrt{a+bx^2}\sqrt{c+dx^2}}{35b^2}+\frac{Cdx^5\sqrt{a+bx^2}\sqrt{c+dx^2}}{7b}$$

$$+\frac{\sqrt{a}(48a^3Cd^3-8a^2bd^2(9cC+7Bd)+b^3c(6c^2C-21Bcd-140Ad^2)+ab^2d(12c^2C+91Bcd+70Ad^2))\,\sqrt{}}{105b^{7/2}d^2\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

$$+\frac{\sqrt{a}(105Ab^3cd-24a^3Cd^2+a^2bd(33cC+28Bd)-ab^2(3c^2C+42Bcd+35Ad^2))\,\sqrt{c+dx^2}\,\text{EllipticF}\left(\text{arc}\right.}{105b^{7/2}d\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
-1/105*(48*a^3*C*d^3-8*a^2*b*d^2*(7*B*d+9*C*c)+b^3*c*(-140*A*d^2-21*B*c*d+
6*C*c^2)+a*b^2*d*(70*A*d^2+91*B*c*d+12*C*c^2))*x*(d*x^2+c)^(1/2)/b^3/d^2/(
b*x^2+a)^(1/2)+1/105*(24*a^2*C*d^2-a*b*d*(28*B*d+33*C*c)+b^2*(35*A*d^2+42*
B*c*d+3*C*c^2))*x*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b^3/d+1/35*(7*B*b*d-6*C*
a*d+8*C*b*c)*x^3*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b^2+1/7*C*d*x^5*(b*x^2+a)
^(1/2)*(d*x^2+c)^(1/2)/b+1/105*a^(1/2)*(48*a^3*C*d^3-8*a^2*b*d^2*(7*B*d+9*
C*c)+b^3*c*(-140*A*d^2-21*B*c*d+6*C*c^2)+a*b^2*d*(70*A*d^2+91*B*c*d+12*C*c
^2))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)^(1/2),(1-a*d/
b/c)^(1/2))/b^(7/2)/d^2/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)+1/
105*a^(1/2)*(105*A*b^3*c*d-24*a^3*C*d^2+a^2*b*d*(28*B*d+33*C*c)-a*b^2*(35*
A*d^2+42*B*c*d+3*C*c^2))*(d*x^2+c)^(1/2)*InverseJacobiAM(arctan(b^(1/2)*x/
a^(1/2)),(1-a*d/b/c)^(1/2))/b^(7/2)/d/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^
2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 5.38 (sec) , antiderivative size = 391, normalized size of antiderivative = 0.67

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)(c+dx^2)(24a^2Cd^2-abd(33cC+28Bd+18Cdx^2$$

input
```
Integrate[((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4))/Sqrt[a + b*x^2],x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(c + d*x^2)*(24*a^2*C*d^2 - a*b*d*(33*c*C + 28*
B*d + 18*C*d*x^2) + b^2*(3*c^2*C + 6*c*d*(7*B + 4*C*x^2) + d^2*(35*A + 21*
B*x^2 + 15*C*x^4))) + I*c*(48*a^3*C*d^3 - 8*a^2*b*d^2*(9*c*C + 7*B*d) + b^
3*c*(6*c^2*C - 21*B*c*d - 140*A*d^2) + a*b^2*d*(12*c^2*C + 91*B*c*d + 70*A
*d^2))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/
a]*x], (a*d)/(b*c)] - I*c*(-(b*c) + a*d)*(24*a^2*C*d^2 - a*b*d*(15*c*C + 2
8*B*d) + b^2*(-6*c^2*C + 21*B*c*d + 35*A*d^2))*Sqrt[1 + (b*x^2)/a]*Sqrt[1
+ (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)])/(105*b^3*Sqrt
[b/a]*d^2*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [A] (verified)

Time = 1.99 (sec) , antiderivative size = 1049, normalized size of antiderivative = 1.80, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.057$, Rules used = {7293, 2009}

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

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A(c+dx^2)^{3/2}}{\sqrt{a+bx^2}}+\frac{Bx^2(c+dx^2)^{3/2}}{\sqrt{a+bx^2}}+\frac{Cx^4(c+dx^2)^{3/2}}{\sqrt{a+bx^2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{Cd\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{7b}+\frac{Bd\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5b}+\frac{2C(4bc-3ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{35b^2}+\frac{Ad\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3b}+\frac{2B(3bc-2ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15b^2}+\frac{C\left(b^2c^2-11abdc+8a^2d^2\right)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{35b^3d}+\frac{2Ad(2bc-ad)\sqrt{bx^2+a}x}{3b^2\sqrt{dx^2+c}}-\frac{2C(bc-2ad)\left(b^2c^2+4abdc-4a^2d^2\right)\sqrt{bx^2+a}x}{35b^4d\sqrt{dx^2+c}}+\frac{B\left(3b^2c^2-13abdc+8a^2d^2\right)\sqrt{bx^2+a}x}{15b^3\sqrt{dx^2+c}}-\frac{2A\sqrt{c}\sqrt{d}(2bc-ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2\sqrt{c}C(bc-2ad)\left(b^2c^2+4abdc-4a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{35b^4d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{B\sqrt{c}\left(3b^2c^2-13abdc+8a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^3\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2Bc^{3/2}(3bc-2ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15b^2\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ac^{3/2}(3bc-ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3ab\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}C\left(b^2c^2-11abdc+8a^2d^2\right)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{35b^3d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4))/Sqrt[a + b*x^2],x]
```

output

```
(2*A*d*(2*b*c - a*d)*x*Sqrt[a + b*x^2])/(3*b^2*Sqrt[c + d*x^2]) - (2*C*(b*
c - 2*a*d)*(b^2*c^2 + 4*a*b*c*d - 4*a^2*d^2)*x*Sqrt[a + b*x^2])/(35*b^4*d*
Sqrt[c + d*x^2]) + (B*(3*b^2*c^2 - 13*a*b*c*d + 8*a^2*d^2)*x*Sqrt[a + b*x^
2])/(15*b^3*Sqrt[c + d*x^2]) + (A*d*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*
b) + (2*B*(3*b*c - 2*a*d)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(15*b^2) + (C
*(b^2*c^2 - 11*a*b*c*d + 8*a^2*d^2)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(35
*b^3*d) + (B*d*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(5*b) + (2*C*(4*b*c -
3*a*d)*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(35*b^2) + (C*d*x^5*Sqrt[a + b
*x^2]*Sqrt[c + d*x^2])/(7*b) - (2*A*Sqrt[c]*Sqrt[d]*(2*b*c - a*d)*Sqrt[a +
 b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^2*Sq
rt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (2*Sqrt[c]*C*(b*c -
 2*a*d)*(b^2*c^2 + 4*a*b*c*d - 4*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan
[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(35*b^4*d^(3/2)*Sqrt[(c*(a + b*x^
2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (B*Sqrt[c]*(3*b^2*c^2 - 13*a*b*c*d
 + 8*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (
b*c)/(a*d)])/(15*b^3*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c
+ d*x^2]) - (2*B*c^(3/2)*(3*b*c - 2*a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[
(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*b^2*Sqrt[d]*Sqrt[(c*(a + b*x^2
))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*c^(3/2)*(3*b*c - a*d)*Sqrt[a + b
*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*a*b*S...
```

Defintions of rubi rules used

rule 2009

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

rule 7293

```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 10.52 (sec) , antiderivative size = 664, normalized size of antiderivative = 1.14

method	result
elliptic	$\frac{\sqrt{(b x^2+a)(x^2 d+c)}\left(\frac{C d x^5 \sqrt{b d x^4+a d x^2+x^2 b c+a c}}{7b}+\frac{\left(B d^2+2Ccd-\frac{Cd(6ad+6bc)}{7b}\right)x^3\sqrt{b d x^4+a d x^2+x^2 b c+a c}}{5bd}+\frac{\left(d^2 A+2cdB+C c^2-\frac{5acd}{7b} \cdots\right.}{\cdots}\right.}{\cdots}$
risch	Expression too large to display
default	Expression too large to display

input
```
int((d*x^2+c)^(3/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x,method=_RETURNVERBOS
E)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/7*C/b*d*x^5
*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/5*(B*d^2+2*C*c*d-1/7*C/b*d*(6*a*d+6
*b*c))/b/d*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(d^2*A+2*c*d*B+C*c^
2-5/7*a/b*c*d*C-1/5*(B*d^2+2*C*c*d-1/7*C/b*d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b
*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(A*c^2-1/3*(d^2*A+2*c*d*B+C
*c^2-5/7*a/b*c*d*C-1/5*(B*d^2+2*C*c*d-1/7*C/b*d*(6*a*d+6*b*c))/b/d*(4*a*d+
4*b*c))/b/d*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4
+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1
/2))-(2*A*d*c+B*c^2-3/5*(B*d^2+2*C*c*d-1/7*C/b*d*(6*a*d+6*b*c))/b/d*a*c-1/
3*(d^2*A+2*c*d*B+C*c^2-5/7*a/b*c*d*C-1/5*(B*d^2+2*C*c*d-1/7*C/b*d*(6*a*d+6
*b*c))/b/d*(4*a*d+4*b*c))/b/d*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1
/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(
-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*
c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 522, normalized size of antiderivative = 0.90

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx = \frac{(6\,Cb^3c^4+3\,(4\,Cab^2-7\,Bb^3)c^3d-(72\,Ca^2b-91\,Bab^2+140\,Ab^3)}{}$$

input
```
integrate((d*x^2+c)^(3/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorithm="fr
icas")
```

output
```
1/105*((6*C*b^3*c^4 + 3*(4*C*a*b^2 - 7*B*b^3)*c^3*d - (72*C*a^2*b - 91*B*a
*b^2 + 140*A*b^3)*c^2*d^2 + 2*(24*C*a^3 - 28*B*a^2*b + 35*A*a*b^2)*c*d^3)*
sqrt(b*d)*x*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (6*C*
b^3*c^4 + 3*(4*C*a*b^2 - 7*B*b^3)*c^3*d - (72*C*a^2*b - (91*B + 3*C)*a*b^2
 + 140*A*b^3)*c^2*d^2 + (48*C*a^3 - (56*B + 33*C)*a^2*b + 14*(5*A + 3*B)*a
*b^2 - 105*A*b^3)*c*d^3 + (24*C*a^3 - 28*B*a^2*b + 35*A*a*b^2)*d^4)*sqrt(b
*d)*x*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) + (15*C*b^3*d
^4*x^6 - 6*C*b^3*c^3*d - 3*(4*C*a*b^2 - 7*B*b^3)*c^2*d^2 + (72*C*a^2*b - 9
1*B*a*b^2 + 140*A*b^3)*c*d^3 - 2*(24*C*a^3 - 28*B*a^2*b + 35*A*a*b^2)*d^4
+ 3*(8*C*b^3*c*d^3 - (6*C*a*b^2 - 7*B*b^3)*d^4)*x^4 + (3*C*b^3*c^2*d^2 - 3
*(11*C*a*b^2 - 14*B*b^3)*c*d^3 + (24*C*a^2*b - 28*B*a*b^2 + 35*A*b^3)*d^4)
*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/(b^4*d^3*x)
```

Sympy [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx = \int \frac{(c+dx^2)^{\frac{3}{2}}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx$$

input
```
integrate((d*x**2+c)**(3/2)*(C*x**4+B*x**2+A)/(b*x**2+a)**(1/2),x)
```

output
```
Integral((c + d*x**2)**(3/2)*(A + B*x**2 + C*x**4)/sqrt(a + b*x**2), x)
```

Maxima [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx = \int \frac{(Cx^4+Bx^2+A)(dx^2+c)^{\frac{3}{2}}}{\sqrt{bx^2+a}}\,dx$$

input
```
integrate((d*x^2+c)^(3/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)*(d*x^2 + c)^(3/2)/sqrt(b*x^2 + a), x)
```

Giac [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx = \int \frac{(Cx^4+Bx^2+A)(dx^2+c)^{\frac{3}{2}}}{\sqrt{bx^2+a}}\,dx$$

input
```
integrate((d*x^2+c)^(3/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)*(d*x^2 + c)^(3/2)/sqrt(b*x^2 + a), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx = \int \frac{(d\,x^2+c)^{3/2}\,(C\,x^4+B\,x^2+A)}{\sqrt{b\,x^2+a}}\,dx$$

input
```
int(((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4))/(a + b*x^2)^(1/2),x)
```

output
```
int(((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4))/(a + b*x^2)^(1/2), x)
```

Reduce [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx = \text{Too large to display}$$

input
```
int((d*x^2+c)^(3/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x)
```

output
```
(24*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*c*d**2*x + 7*sqrt(c + d*x**2)*s
qrt(a + b*x**2)*a*b**2*d**2*x - 33*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c
**2*d*x - 18*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c*d**2*x**3 + 42*sqrt(c
 + d*x**2)*sqrt(a + b*x**2)*b**3*c*d*x + 21*sqrt(c + d*x**2)*sqrt(a + b*x*
*2)*b**3*d**2*x**3 + 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*c**3*x + 24*
sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*c**2*d*x**3 + 15*sqrt(c + d*x**2)*s
qrt(a + b*x**2)*b**2*c*d**2*x**5 - 48*int((sqrt(c + d*x**2)*sqrt(a + b*x**
2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**3*c*d**3 - 14*int((s
qrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x*
*4),x)*a**2*b**2*d**3 + 72*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a
*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2*b*c**2*d**2 + 49*int((sqrt(c
+ d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)
*a*b**3*c*d**2 - 12*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*
d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**2*c**3*d + 21*int((sqrt(c + d*x**2)*
sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*b**4*c**2
*d - 6*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*
x**2 + b*d*x**4),x)*b**3*c**4 - 24*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))
/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**3*c**2*d**2 - 7*int((sqrt(c
+ d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2
*b**2*c*d**2 + 33*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x*...
```

3.11 $\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 410

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx = \frac{\left(5bBc-3acC-\frac{2bc^2C}{d}+15Abd-10aBd+\frac{8a^2Cd}{b}\right)x\sqrt{c+dx^2}}{15bd\sqrt{a+bx^2}} + \frac{(bcC+5bBd-4aCd)x\sqrt{a+bx^2}\sqrt{c+dx^2}}{15b^2d} + \frac{Cx^3\sqrt{a+bx^2}\sqrt{c+dx^2}}{5b} - \frac{\sqrt{a}(8a^2Cd^2-abd(3cC+10Bd)-b^2(2c^2C-5Bcd-15Ad^2))\sqrt{c+dx^2}\,E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{15b^{5/2}d^2\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}} + \frac{\sqrt{a}(15Ab^2d+4a^2Cd-ab(cC+5Bd))\sqrt{c+dx^2}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right),1-\frac{ad}{bc}\right)}{15b^{5/2}d\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
1/15*(5*b*B*c-3*a*c*C-2*b*c^2*C/d+15*A*b*d-10*a*B*d+8*a^2*C*d/b)*x*(d*x^2+
c)^(1/2)/b/d/(b*x^2+a)^(1/2)+1/15*(5*B*b*d-4*C*a*d+C*b*c)*x*(b*x^2+a)^(1/2
)*(d*x^2+c)^(1/2)/b^2/d+1/5*C*x^3*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b-1/15*a
^(1/2)*(8*a^2*C*d^2-a*b*d*(10*B*d+3*C*c)-b^2*(-15*A*d^2-5*B*c*d+2*C*c^2))*
(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)^(1/2),(1-a*d/b/c)^
(1/2))/b^(5/2)/d^2/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)+1/15*a^
(1/2)*(15*A*b^2*d+4*a^2*C*d-a*b*(5*B*d+C*c))*(d*x^2+c)^(1/2)*InverseJacobi
AM(arctan(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/b^(5/2)/d/(b*x^2+a)^(1/2)/
(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 3.23 (sec) , antiderivative size = 281, normalized size of antiderivative = 0.69

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx$$
$$= \frac{-\sqrt{\frac{b}{a}}dx(a+bx^2)\left(c+dx^2\right)\left(4aCd-b(cC+5Bd+3Cdx^2)\right)-ic(8a^2Cd^2-abd(3cC+10Bd)+b^2(-2c}{}$$

input
```
Integrate[(Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4))/Sqrt[a + b*x^2],x]
```

output
```
(-(Sqrt[b/a]*d*x*(a + b*x^2)*(c + d*x^2)*(4*a*C*d - b*(c*C + 5*B*d + 3*C*d
*x^2))) - I*c*(8*a^2*C*d^2 - a*b*d*(3*c*C + 10*B*d) + b^2*(-2*c^2*C + 5*B*
c*d + 15*A*d^2))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSi
nh[Sqrt[b/a]*x], (a*d)/(b*c)] + I*c*(-(b*c) + a*d)*(2*b*c*C - 5*b*B*d + 4*
a*C*d)*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/
a]*x], (a*d)/(b*c)])/(15*a^2*(b/a)^(5/2)*d^2*Sqrt[a + b*x^2]*Sqrt[c + d*x^
2])
```

Rubi [A] (verified)

Time = 1.40 (sec) , antiderivative size = 812, normalized size of antiderivative = 1.98, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.057, Rules used = {7293, 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.

$$\int \frac{\sqrt{c+dx^2}\left(A+Bx^2+Cx^4\right)}{\sqrt{a+bx^2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A\sqrt{c+dx^2}}{\sqrt{a+bx^2}}+\frac{Bx^2\sqrt{c+dx^2}}{\sqrt{a+bx^2}}+\frac{Cx^4\sqrt{c+dx^2}}{\sqrt{a+bx^2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{C\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5b}+\frac{B\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3b}+\frac{C(bc-4ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15b^2d}+\frac{Ad\sqrt{bx^2+a}x}{b\sqrt{dx^2+c}}+\frac{B(bc-2ad)\sqrt{bx^2+a}x}{3b^2\sqrt{dx^2+c}}-\frac{C\left(2b^2c^2+3abdc-8a^2d^2\right)\sqrt{bx^2+a}x}{15b^3d\sqrt{dx^2+c}}-\frac{B\sqrt{c}(bc-2ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^2\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}C\left(2b^2c^2+3abdc-8a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^3d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{A\sqrt{c}\sqrt{d}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}C(bc-4ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15b^2d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ac^{3/2}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Bc^{3/2}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3b\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4))/Sqrt[a + b*x^2],x]
```

output
```
(A*d*x*Sqrt[a + b*x^2])/(b*Sqrt[c + d*x^2]) + (B*(b*c - 2*a*d)*x*Sqrt[a +
b*x^2])/(3*b^2*Sqrt[c + d*x^2]) - (C*(2*b^2*c^2 + 3*a*b*c*d - 8*a^2*d^2)*x
*Sqrt[a + b*x^2])/(15*b^3*d*Sqrt[c + d*x^2]) + (B*x*Sqrt[a + b*x^2]*Sqrt[c
 + d*x^2])/(3*b) + (C*(b*c - 4*a*d)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(15
*b^2*d) + (C*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(5*b) - (A*Sqrt[c]*Sqrt[
d]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)]
)/(b*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (B*Sqrt[c]*(
b*c - 2*a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b
*c)/(a*d)])/(3*b^2*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c +
d*x^2]) + (Sqrt[c]*C*(2*b^2*c^2 + 3*a*b*c*d - 8*a^2*d^2)*Sqrt[a + b*x^2]*E
llipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*b^3*d^(3/2)*Sq
rt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*c^(3/2)*Sqrt[a +
 b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*Sqrt[d
]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (B*c^(3/2)*Sqrt
[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b*
Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (c^(3/2)*
C*(b*c - 4*a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 -
 (b*c)/(a*d)])/(15*b^2*d^(3/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[
c + d*x^2])
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 7.36 (sec) , antiderivative size = 425, normalized size of antiderivative = 1.04

method	result
elliptic	$\frac{\sqrt{(b x^2+a)(x^2 d+c)}\left(\frac{C x^3\sqrt{bd x^4+ad x^2+x^2 bc+ac}}{5b}+\frac{\left(Bd+Cc-\frac{C(4ad+4bc)}{5b}\right)x\sqrt{bd x^4+ad x^2+x^2 bc+ac}}{3bd}+\frac{\left(Ac-\frac{\left(Bd+Cc-\frac{C(4ad+4bc)}{5b}\right)a\cdots}{3bd}\right.}{\sqrt{-\cdots}}\right.}{\cdots}$
risch	$\frac{x(3Cbd x^2+5Bbd-4Cad+Cbc)\sqrt{b x^2+a}\,\sqrt{x^2 d+c}}{15b^2 d}+\frac{\left(-\frac{\left(15A b^2 d^2-10Bab d^2+5b^2 Bcd+8a^2 C d^2-3Cabcd-2C b^2 c^2\right)c\sqrt{1+\frac{b x^2}{a}}\sqrt{1+\frac{d x \cdots}{c}}}{\sqrt{-\frac{b}{a}}\sqrt{bd x^4+ad x\cdots}}\right.}{\cdots}$
default	$\frac{\sqrt{x^2 d+c}\sqrt{b x^2+a}\left(3C\sqrt{-\frac{b}{a}}\,b^2 d^3 x^7+5B\sqrt{-\frac{b}{a}}\,b^2 d^3 x^5-C\sqrt{-\frac{b}{a}}\,ab d^3 x^5+4C\sqrt{-\frac{b}{a}}\,b^2 c d^2 x^5+5B\sqrt{-\frac{b}{a}}\,ab d^3 x^3+5B\sqrt{-\frac{b}{a}}\,b^2 c d^2 x^3\cdots\right.}{\cdots}$

input
```
int((d*x^2+c)^(1/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x,method=_RETURNVERBOS
E)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/5*C/b*x^3*(
b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(B*d+C*c-1/5*C/b*(4*a*d+4*b*c))/b/d
*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(A*c-1/3*(B*d+C*c-1/5*C/b*(4*a*d+4*
b*c))/b/d*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a
*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2
))-(A*d+B*c-3/5*a/b*c*C-1/3*(B*d+C*c-1/5*C/b*(4*a*d+4*b*c))/b/d*(2*a*d+2*b
*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b
*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-El
lipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 331, normalized size of antiderivative = 0.81

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx$$

$$=\frac{(2\,Cb^2c^3+(3\,Cab-5\,Bb^2)c^2d-(8\,Ca^2-10\,Bab+15\,Ab^2)cd^2)\sqrt{bd}x\sqrt{-\frac{c}{d}}E(\arcsin\left(\frac{\sqrt{-\frac{c}{d}}}{x}\right)\mid\frac{ad}{bc})-(2\cdots}{\cdots}$$

input
```
integrate((d*x^2+c)^(1/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorithm="fr
icas")
```

output
```
1/15*((2*C*b^2*c^3 + (3*C*a*b - 5*B*b^2)*c^2*d - (8*C*a^2 - 10*B*a*b + 15*
A*b^2)*c*d^2)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/
(b*c)) - (2*C*b^2*c^3 + (3*C*a*b - 5*B*b^2)*c^2*d - (8*C*a^2 - (10*B + C)*
a*b + 15*A*b^2)*c*d^2 - (4*C*a^2 - 5*B*a*b + 15*A*b^2)*d^3)*sqrt(b*d)*x*sq
rt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) + (3*C*b^2*d^3*x^4 -
2*C*b^2*c^2*d - (3*C*a*b - 5*B*b^2)*c*d^2 + (8*C*a^2 - 10*B*a*b + 15*A*b^2
)*d^3 + (C*b^2*c*d^2 - (4*C*a*b - 5*B*b^2)*d^3)*x^2)*sqrt(b*x^2 + a)*sqrt(
d*x^2 + c))/(b^3*d^3*x)
```

Sympy [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx = \int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx$$

input
```
integrate((d*x**2+c)**(1/2)*(C*x**4+B*x**2+A)/(b*x**2+a)**(1/2),x)
```

output
```
Integral(sqrt(c + d*x**2)*(A + B*x**2 + C*x**4)/sqrt(a + b*x**2), x)
```

Maxima [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx = \int \frac{(Cx^4+Bx^2+A)\sqrt{dx^2+c}}{\sqrt{bx^2+a}}\,dx$$

input
```
integrate((d*x^2+c)^(1/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)*sqrt(d*x^2 + c)/sqrt(b*x^2 + a), x)
```

Giac [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx=\int \frac{(Cx^4+Bx^2+A)\sqrt{dx^2+c}}{\sqrt{bx^2+a}}\,dx$$

input
```
integrate((d*x^2+c)^(1/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)*sqrt(d*x^2 + c)/sqrt(b*x^2 + a), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx=\int \frac{\sqrt{d\,x^2+c}\,(C\,x^4+B\,x^2+A)}{\sqrt{b\,x^2+a}}\,dx$$

input
```
int(((c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4))/(a + b*x^2)^(1/2),x)
```

output
```
int(((c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4))/(a + b*x^2)^(1/2), x)
```

Reduce [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{\sqrt{a+bx^2}}\,dx$$
$$=\frac{-4\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,acdx+5\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,b^2dx+\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,b\,c^2x+3\sqrt{d\,x^2+c}\,\sqrt{b\cdots}}{\cdots}$$

input
```
int((d*x^2+c)^(1/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x)
```

output

```
( - 4*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*c*d*x + 5*sqrt(c + d*x**2)*sqrt(
a + b*x**2)*b**2*d*x + sqrt(c + d*x**2)*sqrt(a + b*x**2)*b*c**2*x + 3*sqrt
(c + d*x**2)*sqrt(a + b*x**2)*b*c*d*x**3 + 8*int((sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2*c*d**2 + 5*
int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 +
b*d*x**4),x)*a*b**2*d**2 - 3*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/
(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b*c**2*d + 5*int((sqrt(c + d*x
**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*b**3
*c*d - 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*
c*x**2 + b*d*x**4),x)*b**2*c**3 + 4*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)
)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2*c**2*d + 10*int((sqrt(c +
 d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**
2*c*d - int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x**2 + b*c*x**2
 + b*d*x**4),x)*a*b*c**3)/(15*b**2*d)
```

3.12 $\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 293

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx = -\frac{(2bcC-3bBd+2aCd)x\sqrt{c+dx^2}}{3bd^2\sqrt{a+bx^2}}+\frac{Cx\sqrt{a+bx^2}\sqrt{c+dx^2}}{3bd} + \frac{\sqrt{a}(2bcC-3bBd+2aCd)\sqrt{c+dx^2}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{3b^{3/2}d^2\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}} - \frac{\sqrt{a}(acC-3Abd)\sqrt{c+dx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right),1-\frac{ad}{bc}\right)}{3b^{3/2}cd\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output

```
-1/3*(-3*B*b*d+2*C*a*d+2*C*b*c)*x*(d*x^2+c)^(1/2)/b/d^2/(b*x^2+a)^(1/2)+1/
3*C*x*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b/d+1/3*a^(1/2)*(-3*B*b*d+2*C*a*d+2*
C*b*c)*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)^(1/2),(1-a*
d/b/c)^(1/2))/b^(3/2)/d^2/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)-
1/3*a^(1/2)*(-3*A*b*d+C*a*c)*(d*x^2+c)^(1/2)*InverseJacobiAM(arctan(b^(1/2
)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/b^(3/2)/c/d/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c
/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 6.78 (sec) , antiderivative size = 228, normalized size of antiderivative = 0.78

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx = \frac{\sqrt{\frac{b}{a}}Cdx(a+bx^2)\left(c+dx^2\right)+ic(2bcC-3bBd+2aCd)\sqrt{1+\frac{bx^2}{a}}\sqrt{1+\frac{dx^2}{c}}E\left(i\text{arcsinh}\left(\sqrt{\frac{b}{a}}x\right)|\frac{ad}{bc}\right)-i(}{3b\sqrt{\frac{b}{a}}d^2\sqrt{a+bx^2}\sqrt{c+}}$$

input
```
Integrate[(A + B*x^2 + C*x^4)/(Sqrt[a + b*x^2]*Sqrt[c + d*x^2]),x]
```

output
```
(Sqrt[b/a]*C*d*x*(a + b*x^2)*(c + d*x^2) + I*c*(2*b*c*C - 3*b*B*d + 2*a*C*
d)*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x
], (a*d)/(b*c)] - I*(a*c*C*d + b*(2*c^2*C - 3*B*c*d + 3*A*d^2))*Sqrt[1 + (
b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c
)])/(3*b*Sqrt[b/a]*d^2*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [A] (verified)

Time = 0.91 (sec) , antiderivative size = 470, normalized size of antiderivative = 1.60, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.057$, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A}{\sqrt{a+bx^2}\sqrt{c+dx^2}}+\frac{Bx^2}{\sqrt{a+bx^2}\sqrt{c+dx^2}}+\frac{Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{A\sqrt{c}\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}\sqrt{c+dx^2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{2\sqrt{c}C\sqrt{a+bx^2}(ad+bc)E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^2d^{3/2}\sqrt{c+dx^2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{B\sqrt{c}\sqrt{a+bx^2}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b\sqrt{d}\sqrt{c+dx^2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{c^{3/2}C\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3bd^{3/2}\sqrt{c+dx^2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{2Cx\sqrt{a+bx^2}(ad+bc)}{3b^2d\sqrt{c+dx^2}}+\frac{Bx\sqrt{a+bx^2}}{b\sqrt{c+dx^2}}+\frac{Cx\sqrt{a+bx^2}\sqrt{c+dx^2}}{3bd}$$

input
```
Int[(A + B*x^2 + C*x^4)/(Sqrt[a + b*x^2]*Sqrt[c + d*x^2]),x]
```

output
```
(B*x*Sqrt[a + b*x^2])/(b*Sqrt[c + d*x^2]) - (2*C*(b*c + a*d)*x*Sqrt[a + b*
x^2])/(3*b^2*d*Sqrt[c + d*x^2]) + (C*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3
*b*d) - (B*Sqrt[c]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]],
1 - (b*c)/(a*d)])/(b*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c
+ d*x^2]) + (2*Sqrt[c]*C*(b*c + a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqr
t[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^2*d^(3/2)*Sqrt[(c*(a + b*x^2))/(a
*(c + d*x^2))]*Sqrt[c + d*x^2]) - (c^(3/2)*C*Sqrt[a + b*x^2]*EllipticF[Arc
Tan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b*d^(3/2)*Sqrt[(c*(a + b*x^
2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*Sqrt[c]*Sqrt[a + b*x^2]*Ellipti
cF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*Sqrt[d]*Sqrt[(c*(a +
b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2])
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 6.60 (sec) , antiderivative size = 314, normalized size of antiderivative = 1.07

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(\frac{Cx\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{3bd}+\frac{\left(A-\frac{acC}{3bd}\right)\sqrt{1+\frac{b\,x^2}{a}}\,\sqrt{1+\frac{d\,x^2}{c}}\,\mathrm{EllipticF}\left(x\sqrt{-\frac{b}{a}},\sqrt{-1+\frac{ad+bc}{cb}}\right)}{\sqrt{-\frac{b}{a}}\,\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}-\frac{\left(B-\frac{C(2ad+2bc)}{3bd}\right)c\sqrt{}}{}\right.}{\sqrt{b\,x^2+a}\,\sqrt{x^2d+c}}$
risch	$\frac{Cx\sqrt{b\,x^2+a}\,\sqrt{x^2d+c}}{3bd}+\frac{\left(-\frac{(3Bbd-2Cad-2Cbc)c\sqrt{1+\frac{b\,x^2}{a}}\,\sqrt{1+\frac{d\,x^2}{c}}\,\left(\mathrm{EllipticF}\left(x\sqrt{-\frac{b}{a}},\sqrt{-1+\frac{ad+bc}{cb}}\right)-\mathrm{EllipticE}\left(x\sqrt{-\frac{b}{a}},\sqrt{-1+\frac{ad+bc}{cb}}\right)\right.}{\sqrt{-\frac{b}{a}}\,\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}\,d}\right.}{}$
default	$\frac{\left(C\sqrt{-\frac{b}{a}}\,b\,d^2x^5+C\sqrt{-\frac{b}{a}}\,a\,d^2x^3+C\sqrt{-\frac{b}{a}}\,bcd\,x^3+3A\sqrt{\frac{b\,x^2+a}{a}}\,\sqrt{\frac{x^2d+c}{c}}\,\mathrm{EllipticF}\left(x\sqrt{-\frac{b}{a}},\sqrt{\frac{ad}{bc}}\right)b\,d^2-3B\sqrt{\frac{b\,x^2+a}{a}}\,\sqrt{\frac{x^2d+c}{c}}\,\mathrm{Elli}\right.}{}$

input

```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2),x,method=_RETURNVERBOS
E)
```

output

```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/3*C/b/d*x*(
b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(A-1/3*a/b*c/d*C)/(-b/a)^(1/2)*(1+b*x^2
/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(
x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(B-1/3*C/b/d*(2*a*d+2*b*c))*c/(-b
/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c
)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*
(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 203, normalized size of antiderivative = 0.69

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx$$
$$=\frac{(2\,Cbc^3+(2\,Ca-3\,Bb)c^2d)\sqrt{bd}x\sqrt{-\frac{c}{d}}E(\arcsin\left(\frac{\sqrt{-\frac{c}{d}}}{x}\right)\mid\frac{ad}{bc})-(2\,Cbc^3+Cacd^2-3\,Abd^3+(2\,Ca-3}{3\,b^2}$$

input

```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2),x, algorithm="fr
icas")
```

output
```
1/3*((2*C*b*c^3 + (2*C*a - 3*B*b)*c^2*d)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_e
(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (2*C*b*c^3 + C*a*c*d^2 - 3*A*b*d^3 + (
2*C*a - 3*B*b)*c^2*d)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/
x), a*d/(b*c)) + (C*b*c*d^2*x^2 - 2*C*b*c^2*d - (2*C*a - 3*B*b)*c*d^2)*sqr
t(b*x^2 + a)*sqrt(d*x^2 + c))/(b^2*c*d^3*x)
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx=\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx$$

input
```
integrate((C*x**4+B*x**2+A)/(b*x**2+a)**(1/2)/(d*x**2+c)**(1/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4)/(sqrt(a + b*x**2)*sqrt(c + d*x**2)), x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx=\int \frac{Cx^4+Bx^2+A}{\sqrt{bx^2+a}\sqrt{dx^2+c}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*sqrt(d*x^2 + c)), x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx=\int \frac{Cx^4+Bx^2+A}{\sqrt{bx^2+a}\sqrt{dx^2+c}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*sqrt(d*x^2 + c)), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx=\int \frac{C\,x^4+B\,x^2+A}{\sqrt{b\,x^2+a}\,\sqrt{d\,x^2+c}}\,dx$$

input
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(1/2)*(c + d*x^2)^(1/2)),x)
```

output
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(1/2)*(c + d*x^2)^(1/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx$$
$$=\frac{\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,cx-2\left(\int \frac{\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,x^2}{bd\,x^4+ad\,x^2+bc\,x^2+ac}dx\right)acd+3\left(\int \frac{\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,x^2}{bd\,x^4+ad\,x^2+bc\,x^2+ac}dx\right)b^2d-2\left(\int \frac{\sqrt{d\,x^2+c}}{bd\,x^4+ad\,x}\right.}{3bd}$$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2),x)
```

output

```
(sqrt(c + d*x**2)*sqrt(a + b*x**2)*c*x - 2*int((sqrt(c + d*x**2)*sqrt(a +
b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*c*d + 3*int((sqr
t(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4
),x)*b**2*d - 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x*
*2 + b*c*x**2 + b*d*x**4),x)*b*c**2 + 3*int((sqrt(c + d*x**2)*sqrt(a + b*x
**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b*d - int((sqrt(c + d*x*
*2)*sqrt(a + b*x**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*c**2)/(3
*b*d)
```

3.13 $\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 266

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \frac{Cx\sqrt{a+bx^2}}{bd\sqrt{c+dx^2}} + \frac{(acCd-b(2c^2C-Bcd+Ad^2))\sqrt{a+bx^2}\,E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b\sqrt{c}d^{3/2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}} + \frac{\sqrt{c}(acC+Abd-aBd)\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{ad^{3/2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
C*x*(b*x^2+a)^(1/2)/b/d/(d*x^2+c)^(1/2)+(a*c*C*d-b*(A*d^2-B*c*d+2*C*c^2))*
(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^
(1/2))/b/c^(1/2)/d^(3/2)/(-a*d+b*c)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2
+c)^(1/2)+c^(1/2)*(A*b*d-B*a*d+C*a*c)*(b*x^2+a)^(1/2)*InverseJacobiAM(arct
an(d^(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/a/d^(3/2)/(-a*d+b*c)/(c*(b*x^2+a)
/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 10.67 (sec) , antiderivative size = 244, normalized size of antiderivative = 0.92

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}d(c^2C-Bcd+Ad^2)\,x(a+bx^2)-ic(acCd+b(-2c^2C+Bcd-Ad^2))}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4)/(Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)),x]
```

output
```
(Sqrt[b/a]*d*(c^2*C - B*c*d + A*d^2)*x*(a + b*x^2) - I*c*(a*c*C*d + b*(-2*
c^2*C + B*c*d - A*d^2))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[
I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] + I*c*(-(b*c) + a*d)*(2*c*C - B*d)*Sq
rt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a
*d)/(b*c)])/(Sqrt[b/a]*c*d^2*(-(b*c) + a*d)*Sqrt[a + b*x^2]*Sqrt[c + d*x^2
])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 680 vs. 2(266) = 532.

Time = 1.30 (sec) , antiderivative size = 680, normalized size of antiderivative = 2.56, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.057, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A}{\sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}}+\frac{Bx^2}{\sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}}+\frac{Cx^4}{\sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{Ab\sqrt{c}\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}\sqrt{c+dx^2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{A\sqrt{d}\sqrt{a+bx^2}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{\sqrt{c}\sqrt{c+dx^2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{B\sqrt{c}\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{\sqrt{d}\sqrt{c+dx^2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{B\sqrt{c}\sqrt{a+bx^2}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{\sqrt{d}\sqrt{c+dx^2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{c^{3/2}C\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{d^{3/2}\sqrt{c+dx^2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{\sqrt{c}C\sqrt{a+bx^2}(2bc-ad)E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{bd^{3/2}\sqrt{c+dx^2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{cCx\sqrt{a+bx^2}}{d\sqrt{c+dx^2}(bc-ad)}+\frac{Cx\sqrt{a+bx^2}(2bc-ad)}{bd\sqrt{c+dx^2}(bc-ad)}$$

input

```
Int[(A + B*x^2 + C*x^4)/(Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)),x]
```

output

```
-((c*C*x*Sqrt[a + b*x^2])/(d*(b*c - a*d)*Sqrt[c + d*x^2])) + (C*(2*b*c - a
*d)*x*Sqrt[a + b*x^2])/(b*d*(b*c - a*d)*Sqrt[c + d*x^2]) + (B*Sqrt[c]*Sqrt
[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(Sqrt
[d]*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (
A*Sqrt[d]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)
/(a*d)])/(Sqrt[c]*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c
 + d*x^2]) - (Sqrt[c]*C*(2*b*c - a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sq
rt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(b*d^(3/2)*(b*c - a*d)*Sqrt[(c*(a + b
*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (c^(3/2)*C*Sqrt[a + b*x^2]*Elli
pticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(d^(3/2)*(b*c - a*d)*
Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*b*Sqrt[c]*Sqrt
[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*Sq
rt[d]*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) -
 (B*Sqrt[c]*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*
c)/(a*d)])/(Sqrt[d]*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt
[c + d*x^2])
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 6.28 (sec) , antiderivative size = 425, normalized size of antiderivative = 1.60

method	result
elliptic	$\frac{\sqrt{(b x^2+a)(x^2 d+c)}\left(\frac{(bd x^2+ad)x(d^2 A-cdB+C c^2)}{c d^2(ad-bc)\sqrt{(x^2+\frac{c}{d})(bd x^2+ad)}}+\frac{\left(\frac{Bd-Cc}{d^2}+\frac{d^2 A-cdB+C c^2}{d^2 c}-\frac{a(d^2 A-cdB+C c^2)}{dc(ad-bc)}\right)\sqrt{1+\frac{b x^2}{a}}\sqrt{1+\frac{d x^2}{c}}\ \text{EllipticF}}{\sqrt{-\frac{b}{a}}\sqrt{bd x^4+ad x^2+x^2 bc+ac}}\right.}{\sqrt{b x^2}}$
default	$\frac{\left(A\sqrt{-\frac{b}{a}}\, b d^3 x^3-B\sqrt{-\frac{b}{a}}\, bc d^2 x^3+C\sqrt{-\frac{b}{a}}\, b c^2 d x^3-A\sqrt{\frac{b x^2+a}{a}}\sqrt{\frac{x^2 d+c}{c}}\ \text{EllipticE}\left(x\sqrt{-\frac{b}{a}},\sqrt{\frac{ad}{bc}}\right) bc d^2+B\sqrt{\frac{b x^2+a}{a}}\sqrt{\frac{x^2 d+c}{c}}\ \text{El}\right.}{}$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x,method=_RETURNVERBOS
E)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*((b*d*x^2+a*d)
/c/d^2/(a*d-b*c)*x*(A*d^2-B*c*d+C*c^2)/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+((B
*d-C*c)/d^2+(A*d^2-B*c*d+C*c^2)/d^2/c-a/d/c/(a*d-b*c)*(A*d^2-B*c*d+C*c^2))
/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2
+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(C/d-(A*d^2
-B*c*d+C*c^2)/d/(a*d-b*c)*b/c)*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c
)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-
1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))
))
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 373, normalized size of antiderivative = 1.40

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx =$$

$$-\frac{((2\,Cbc^3d + Abcd^3 - (Ca+Bb)c^2d^2)x^3 + (2\,Cbc^4 + Abc^2d^2 - (Ca+Bb)c^3d)x)\sqrt{bd}\sqrt{-\frac{c}{d}}E(\arcsin\left(\frac{\sqrt{-}}{x}\right.}{}$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x, algorithm="fr
icas")
```

output
```
-(((2*C*b*c^3*d + A*b*c*d^3 - (C*a + B*b)*c^2*d^2)*x^3 + (2*C*b*c^4 + A*b*
c^2*d^2 - (C*a + B*b)*c^3*d)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqr
t(-c/d)/x), a*d/(b*c)) - ((2*C*b*c^3*d - (C*a + B*b)*c^2*d^2 + (C*a + A*b)
*c*d^3 - (B*a - A*b)*d^4)*x^3 + (2*C*b*c^4 - (C*a + B*b)*c^3*d + (C*a + A*
b)*c^2*d^2 - (B*a - A*b)*c*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f(arcsin(
sqrt(-c/d)/x), a*d/(b*c)) - (2*C*b*c^3*d + A*b*c*d^3 - (C*a + B*b)*c^2*d^2
 + (C*b*c^2*d^2 - C*a*c*d^3)*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/((b^2*c
^2*d^4 - a*b*c*d^5)*x^3 + (b^2*c^3*d^3 - a*b*c^2*d^4)*x)
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((C*x**4+B*x**2+A)/(b*x**2+a)**(1/2)/(d*x**2+c)**(3/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4)/(sqrt(a + b*x**2)*(c + d*x**2)**(3/2)), x)
```

Maxima [F]

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{3/2}}\,dx = \int \frac{Cx^4 + Bx^2 + A}{\sqrt{bx^2 + a}(dx^2 + c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(3/2)), x)
```

Giac [F]

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{3/2}}\,dx = \int \frac{Cx^4 + Bx^2 + A}{\sqrt{bx^2 + a}(dx^2 + c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(3/2)), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{3/2}}\,dx = \int \frac{C\,x^4 + B\,x^2 + A}{\sqrt{b\,x^2 + a}\,(d\,x^2 + c)^{3/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(1/2)*(c + d*x^2)^(3/2)),x)
```

output
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(1/2)*(c + d*x^2)^(3/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \frac{\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,x-\left(\int \frac{\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,x^4}{b\,d^2x^6+a\,d^2x^4+2bcd\,x^4+2acd\,x^2+b\,c^2x^2+a\,c^2}dx\right)bcd-\left(\right.}{}$$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x)
```

output
```
(sqrt(c + d*x**2)*sqrt(a + b*x**2)*x - int((sqrt(c + d*x**2)*sqrt(a + b*x*
*2)*x**4)/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**
4 + b*d**2*x**6),x)*b*c*d - int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(
a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*
x**6),x)*b*d**2*x**2 + 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c
**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**
6),x)*c**3 + 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*
c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*c**2
*d*x**2 + int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c**2 + 2*a*c*d*x**2 +
 a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a*c**2 + int((
sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 +
b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a*c*d*x**2)/(2*c*(c + d*x**2)
)
```

3.14 $\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}(c+dx^2)^{5/2}}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 337

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx = -\frac{(c^2C-Bcd+Ad^2)\,x\sqrt{a+bx^2}}{3cd(bc-ad)\,(c+dx^2)^{3/2}}$$
$$+\frac{(bc(2c^2C+Bcd-4Ad^2)-ad(4c^2C-Bcd-2Ad^2))\,\sqrt{a+bx^2}\,E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3c^{3/2}d^{3/2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$
$$+\frac{(3Ab^2cd+3a^2cCd-ab(c^2C+2Bcd+Ad^2))\,\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a\sqrt{c}d^{3/2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
-1/3*(A*d^2-B*c*d+C*c^2)*x*(b*x^2+a)^(1/2)/c/d/(-a*d+b*c)/(d*x^2+c)^(3/2)+
1/3*(b*c*(-4*A*d^2+B*c*d+2*C*c^2)-a*d*(-2*A*d^2-B*c*d+4*C*c^2))*(b*x^2+a)^
(1/2)*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/c^(
3/2)/d^(3/2)/(-a*d+b*c)^2/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)+
1/3*(3*A*b^2*c*d+3*a^2*c*C*d-a*b*(A*d^2+2*B*c*d+C*c^2))*(b*x^2+a)^(1/2)*In
verseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/a/c^(1/2)/d^(3/
2)/(-a*d+b*c)^2/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 11.76 (sec) , antiderivative size = 370, normalized size of antiderivative = 1.10

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)\left(ad(-3c^3C-4c^2Cdx^2+2Ad^3x^2+cd^2(3A+Bx^2))+bc(c\cdots\right.}{\cdots}$$

input
```
Integrate[(A + B*x^2 + C*x^4)/(Sqrt[a + b*x^2]*(c + d*x^2)^(5/2)),x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(a*d*(-3*c^3*C - 4*c^2*C*d*x^2 + 2*A*d^3*x^2 +
c*d^2*(3*A + B*x^2)) + b*c*(c^3*C - 4*A*d^3*x^2 + c*d^2*(-5*A + B*x^2) + 2
*c^2*d*(B + C*x^2))) - I*b*c*(-(b*c*(2*c^2*C + B*c*d - 4*A*d^2)) - a*d*(-4
*c^2*C + B*c*d + 2*A*d^2))*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)*Sqrt[1 + (d*x^2
)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - I*c*(-(b*c) + a*d)*(
3*a*c*C*d + b*(-2*c^2*C - B*c*d + A*d^2))*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)*
Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)])/(3*Sqr
t[b/a]*c^2*d^2*(b*c - a*d)^2*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 757 vs. $2(337) = 674$.

Time = 1.36 (sec) , antiderivative size = 757, normalized size of antiderivative = 2.25, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.057$, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx$$

$$\Big\downarrow \; 7293$$

$$\int \left(\frac{A}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}+\frac{Bx^2}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}+\frac{Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{2A\sqrt{d}\sqrt{a+bx^2}(2bc-ad)E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3c^{3/2}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{Ab\sqrt{a+bx^2}(3bc-ad)\operatorname{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a\sqrt{c}\sqrt{d}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{Adx\sqrt{a+bx^2}}{3c\left(c+dx^2\right)^{3/2}(bc-ad)}-\frac{2bB\sqrt{c}\sqrt{a+bx^2}\operatorname{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3\sqrt{d}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{B\sqrt{a+bx^2}(ad+bc)E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3\sqrt{c}\sqrt{d}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{\sqrt{c}C\sqrt{a+bx^2}(bc-3ad)\operatorname{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{3/2}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{2\sqrt{c}C\sqrt{a+bx^2}(bc-2ad)E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3d^{3/2}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{Bx\sqrt{a+bx^2}}{3\left(c+dx^2\right)^{3/2}(bc-ad)}-\frac{cCx\sqrt{a+bx^2}}{3d\left(c+dx^2\right)^{3/2}(bc-ad)}$$

input
```
Int[(A + B*x^2 + C*x^4)/(Sqrt[a + b*x^2]*(c + d*x^2)^(5/2)),x]
```

output
```
(B*x*Sqrt[a + b*x^2])/(3*(b*c - a*d)*(c + d*x^2)^(3/2)) - (c*C*x*Sqrt[a +
b*x^2])/(3*d*(b*c - a*d)*(c + d*x^2)^(3/2)) - (A*d*x*Sqrt[a + b*x^2])/(3*c
*(b*c - a*d)*(c + d*x^2)^(3/2)) + (2*Sqrt[c]*C*(b*c - 2*a*d)*Sqrt[a + b*x^
2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*d^(3/2)*(b*
c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (2*A*S
qrt[d]*(2*b*c - a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]]
, 1 - (b*c)/(a*d)])/(3*c^(3/2)*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c +
d*x^2))]*Sqrt[c + d*x^2]) + (B*(b*c + a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTa
n[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*Sqrt[c]*Sqrt[d]*(b*c - a*d)^2
*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (2*b*B*Sqrt[c]*S
qrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3
*Sqrt[d]*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^
2]) - (Sqrt[c]*C*(b*c - 3*a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x
)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*d^(3/2)*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2)
)/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*b*(3*b*c - a*d)*Sqrt[a + b*x^2]*E
llipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*a*Sqrt[c]*Sqrt[
d]*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2])
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 638 vs. $2(314) = 628$.

Time = 8.77 (sec) , antiderivative size = 639, normalized size of antiderivative = 1.90

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(\frac{x\left(d^2A-cdB+C\,c^2\right)\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{3c\,d^3(ad-bc)\left(x^2+\frac{c}{d}\right)^2}+\frac{\left(bd\,x^2+ad\right)x\left(2Aa\,d^3-4Abc\,d^2+Bac\,d^2+Bb\,c^2d-4Ca\,c^2d+2c^3Cb\right)}{3c^2d^2(ad-bc)^2\sqrt{\left(x^2+\frac{c}{d}\right)\left(bd\,x^2+ad\right)}}+\left(\right.}{}$
default	Expression too large to display

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(5/2),x,method=_RETURNVERBOS
E)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/3/c/d^3/(a*
d-b*c)*x*(A*d^2-B*c*d+C*c^2)*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)
^2+1/3*(b*d*x^2+a*d)/c^2/d^2/(a*d-b*c)^2*x*(2*A*a*d^3-4*A*b*c*d^2+B*a*c*d^
2+B*b*c^2*d-4*C*a*c^2*d+2*C*b*c^3)/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+(C/d^2+
1/3/d^2*b*(A*d^2-B*c*d+C*c^2)/(a*d-b*c)/c+1/3/d^2/(a*d-b*c)*(2*A*a*d^3-4*A
*b*c*d^2+B*a*c*d^2+B*b*c^2*d-4*C*a*c^2*d+2*C*b*c^3)/c^2-1/3*a/d/c^2/(a*d-b
*c)^2*(2*A*a*d^3-4*A*b*c*d^2+B*a*c*d^2+B*b*c^2*d-4*C*a*c^2*d+2*C*b*c^3))/(
-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a
*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))+1/3*b/d^2*(2*
A*a*d^3-4*A*b*c*d^2+B*a*c*d^2+B*b*c^2*d-4*C*a*c^2*d+2*C*b*c^3)/(a*d-b*c)^2
/c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x
^2+a*c)^(1/2)*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-Elliptic
E(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 841 vs. $2(314) = 628$.

Time = 0.12 (sec) , antiderivative size = 841, normalized size of antiderivative = 2.50

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{5/2}}\,dx = \text{Too large to display}$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(5/2),x, algorithm="fr
icas")
```

output
```
-1/3*((2*C*b^3*c^5 + 2*A*a*b^2*c^2*d^3 - (4*C*a*b^2 - B*b^3)*c^4*d + (B*a*
b^2 - 4*A*b^3)*c^3*d^2 + (2*C*b^3*c^3*d^2 + 2*A*a*b^2*d^5 - (4*C*a*b^2 - B
*b^3)*c^2*d^3 + (B*a*b^2 - 4*A*b^3)*c*d^4)*x^4 + 2*(2*C*b^3*c^4*d + 2*A*a*
b^2*c*d^4 - (4*C*a*b^2 - B*b^3)*c^3*d^2 + (B*a*b^2 - 4*A*b^3)*c^2*d^3)*x^2
)*sqrt(a*c)*sqrt(-b/a)*elliptic_e(arcsin(x*sqrt(-b/a)), a*d/(b*c)) - (2*C*
b^3*c^5 + (C*a^2*b - 4*C*a*b^2 + B*b^3)*c^4*d - (3*C*a^3 - 2*B*a^2*b + (3*
A - B)*a*b^2 + 4*A*b^3)*c^3*d^2 + (A*a^2*b + 2*A*a*b^2)*c^2*d^3 + (2*C*b^3
*c^3*d^2 + (C*a^2*b - 4*C*a*b^2 + B*b^3)*c^2*d^3 - (3*C*a^3 - 2*B*a^2*b +
(3*A - B)*a*b^2 + 4*A*b^3)*c*d^4 + (A*a^2*b + 2*A*a*b^2)*d^5)*x^4 + 2*(2*C
*b^3*c^4*d + (C*a^2*b - 4*C*a*b^2 + B*b^3)*c^3*d^2 - (3*C*a^3 - 2*B*a^2*b
+ (3*A - B)*a*b^2 + 4*A*b^3)*c^2*d^3 + (A*a^2*b + 2*A*a*b^2)*c*d^4)*x^2)*s
qrt(a*c)*sqrt(-b/a)*elliptic_f(arcsin(x*sqrt(-b/a)), a*d/(b*c)) - ((2*C*a*
b^2*c^3*d^2 + 2*A*a^2*b*d^5 - (4*C*a^2*b - B*a*b^2)*c^2*d^3 + (B*a^2*b - 4
*A*a*b^2)*c*d^4)*x^3 + (C*a*b^2*c^4*d - 5*A*a*b^2*c^2*d^3 + 3*A*a^2*b*c*d^
4 - (3*C*a^2*b - 2*B*a*b^2)*c^3*d^2)*x)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/(
a*b^3*c^6*d^2 - 2*a^2*b^2*c^5*d^3 + a^3*b*c^4*d^4 + (a*b^3*c^4*d^4 - 2*a^2
*b^2*c^3*d^5 + a^3*b*c^2*d^6)*x^4 + 2*(a*b^3*c^5*d^3 - 2*a^2*b^2*c^4*d^4 +
 a^3*b*c^3*d^5)*x^2)
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx=\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{\frac{5}{2}}}\,dx$$

input
```
integrate((C*x**4+B*x**2+A)/(b*x**2+a)**(1/2)/(d*x**2+c)**(5/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4)/(sqrt(a + b*x**2)*(c + d*x**2)**(5/2)), x)
```

Maxima [F]

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{5/2}}\,dx = \int \frac{Cx^4 + Bx^2 + A}{\sqrt{bx^2 + a}(dx^2 + c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(5/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(5/2)), x)
```

Giac [F]

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{5/2}}\,dx = \int \frac{Cx^4 + Bx^2 + A}{\sqrt{bx^2 + a}(dx^2 + c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(5/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(5/2)), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{5/2}}\,dx = \int \frac{C\,x^4 + B\,x^2 + A}{\sqrt{b\,x^2 + a}\,(d\,x^2 + c)^{5/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(1/2)*(c + d*x^2)^(5/2)),x)
```

output
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(1/2)*(c + d*x^2)^(5/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx=\text{too large to display}$$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(5/2),x)
```

output
```
( - sqrt(c + d*x**2)*sqrt(a + b*x**2)*b*x + 2*int((sqrt(c + d*x**2)*sqrt(a
 + b*x**2)*x**4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4
 + a**2*d**4*x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b
*d**4*x**8 - b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 -
 b**2*c*d**3*x**8),x)*a**2*c**3*d**2 + 4*int((sqrt(c + d*x**2)*sqrt(a + b*
x**2)*x**4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a*
*2*d**4*x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4
*x**8 - b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2
*c*d**3*x**8),x)*a**2*c**2*d**3*x**2 + 2*int((sqrt(c + d*x**2)*sqrt(a + b*
x**2)*x**4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a*
*2*d**4*x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4
*x**8 - b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2
*c*d**3*x**8),x)*a**2*c*d**4*x**4 - int((sqrt(c + d*x**2)*sqrt(a + b*x**2)
*x**4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a**2*d*
*4*x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4*x**8
 - b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2*c*d*
*3*x**8),x)*a*b**2*c**2*d**2 - 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x*
*4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a**2*d**4*
x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4*x**8 -
b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2*c*d*...
```

3.15 $\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 475

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}\,dx=-\frac{\left(c^2C-Bcd+Ad^2\right)x\sqrt{a+bx^2}}{5cd(bc-ad)\left(c+dx^2\right)^{5/2}}$$

$$+\frac{\left(bc(2c^2C+3Bcd-8Ad^2)-ad(6c^2C-Bcd-4Ad^2)\right)x\sqrt{a+bx^2}}{15c^2d(bc-ad)^2\left(c+dx^2\right)^{3/2}}$$

$$-\frac{\left(abcd(7c^2C-7Bcd-23Ad^2)-b^2c^2(2c^2C+3Bcd-23Ad^2)+a^2d^2(3c^2C+2Bcd+8Ad^2)\right)\sqrt{a+bx^2}\,E}{15c^{5/2}d^{3/2}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

$$+\frac{b\left(15Ab^2c^2d+a^2d(9c^2C+Bcd+4Ad^2)-abc(c^2C+9Bcd+11Ad^2)\right)\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)\right.}{15ac^{3/2}d^{3/2}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
-1/5*(A*d^2-B*c*d+C*c^2)*x*(b*x^2+a)^(1/2)/c/d/(-a*d+b*c)/(d*x^2+c)^(5/2)+
1/15*(b*c*(-8*A*d^2+3*B*c*d+2*C*c^2)-a*d*(-4*A*d^2-B*c*d+6*C*c^2))*x*(b*x^
2+a)^(1/2)/c^2/d/(-a*d+b*c)^2/(d*x^2+c)^(3/2)-1/15*(a*b*c*d*(-23*A*d^2-7*B
*c*d+7*C*c^2)-b^2*c^2*(-23*A*d^2+3*B*c*d+2*C*c^2)+a^2*d^2*(8*A*d^2+2*B*c*d
+3*C*c^2))*(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(
1-b*c/a/d)^(1/2))/c^(5/2)/d^(3/2)/(-a*d+b*c)^3/(c*(b*x^2+a)/a/(d*x^2+c))^(
1/2)/(d*x^2+c)^(1/2)+1/15*b*(15*A*b^2*c^2*d+a^2*d*(4*A*d^2+B*c*d+9*C*c^2)-
a*b*c*(11*A*d^2+9*B*c*d+C*c^2))*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(
1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/a/c^(3/2)/d^(3/2)/(-a*d+b*c)^3/(c*(b*x^
2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 11.69 (sec) , antiderivative size = 474, normalized size of antiderivative = 1.00

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{7/2}}\,dx = \frac{-\sqrt{\frac{b}{a}}dx(a+bx^2)\left(3c^2(bc-ad)^2\left(c^2C-Bcd+Ad^2\right)-c(bc-ad)\left(bc(2c^2C\right.\right.}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4)/(Sqrt[a + b*x^2]*(c + d*x^2)^(7/2)),x]
```

output
```
(-(Sqrt[b/a]*d*x*(a + b*x^2)*(3*c^2*(b*c - a*d)^2*(c^2*C - B*c*d + A*d^2)
- c*(b*c - a*d)*(b*c*(2*c^2*C + 3*B*c*d - 8*A*d^2) + a*d*(-6*c^2*C + B*c*d
 + 4*A*d^2))*(c + d*x^2) - (b^2*c^2*(2*c^2*C + 3*B*c*d - 23*A*d^2) - a^2*d
^2*(3*c^2*C + 2*B*c*d + 8*A*d^2) + a*b*c*d*(-7*c^2*C + 7*B*c*d + 23*A*d^2)
)*(c + d*x^2)^2)) + I*b*c*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)^2*Sqrt[1 + (d*x^
2)/c]*((b^2*c^2*(2*c^2*C + 3*B*c*d - 23*A*d^2) - a^2*d^2*(3*c^2*C + 2*B*c*
d + 8*A*d^2) + a*b*c*d*(-7*c^2*C + 7*B*c*d + 23*A*d^2))*EllipticE[I*ArcSin
h[Sqrt[b/a]*x], (a*d)/(b*c)] - (b*c - a*d)*(b*c*(2*c^2*C + 3*B*c*d - 8*A*d
^2) + a*d*(-6*c^2*C + B*c*d + 4*A*d^2))*EllipticF[I*ArcSinh[Sqrt[b/a]*x],
(a*d)/(b*c)]))/(15*Sqrt[b/a]*c^3*d^2*(b*c - a*d)^3*Sqrt[a + b*x^2]*(c + d*
x^2)^(5/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 975 vs. 2(475) = 950.

Time = 1.80 (sec) , antiderivative size = 975, normalized size of antiderivative = 2.05, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.057$, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}+\frac{Bx^2}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}+\frac{Cx^4}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{4Ad(2bc-ad)\sqrt{bx^2+ax}}{15c^2(bc-ad)^2\left(dx^2+c\right)^{3/2}}+\frac{B(3bc+ad)\sqrt{bx^2+ax}}{15c(bc-ad)^2\left(dx^2+c\right)^{3/2}}+\frac{2C(bc-3ad)\sqrt{bx^2+ax}}{15d(bc-ad)^2\left(dx^2+c\right)^{3/2}}+\frac{B\sqrt{bx^2+ax}}{5(bc-ad)\left(dx^2+c\right)^{5/2}}-\frac{Ad\sqrt{bx^2+ax}}{5c(bc-ad)\left(dx^2+c\right)^{5/2}}-\frac{cC\sqrt{bx^2+ax}}{5d(bc-ad)\left(dx^2+c\right)^{5/2}}+\frac{C\left(2b^2c^2-7abdc-3a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15\sqrt{c}d^{3/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{B\left(3b^2c^2+7abdc-2a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15c^{3/2}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{A\sqrt{d}\left(23b^2c^2-23abdc+8a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15c^{5/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{bB(9bc-ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15\sqrt{c}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ab\left(15b^2c^2-11abdc+4a^2d^2\right)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15ac^{3/2}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{b\sqrt{c}C(bc-9ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15d^{3/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4)/(Sqrt[a + b*x^2]*(c + d*x^2)^(7/2)),x]
```

output
```
(B*x*Sqrt[a + b*x^2])/(5*(b*c - a*d)*(c + d*x^2)^(5/2)) - (c*C*x*Sqrt[a +
b*x^2])/(5*d*(b*c - a*d)*(c + d*x^2)^(5/2)) - (A*d*x*Sqrt[a + b*x^2])/(5*c
*(b*c - a*d)*(c + d*x^2)^(5/2)) + (2*C*(b*c - 3*a*d)*x*Sqrt[a + b*x^2])/(1
5*d*(b*c - a*d)^2*(c + d*x^2)^(3/2)) - (4*A*d*(2*b*c - a*d)*x*Sqrt[a + b*x
^2])/(15*c^2*(b*c - a*d)^2*(c + d*x^2)^(3/2)) + (B*(3*b*c + a*d)*x*Sqrt[a
+ b*x^2])/(15*c*(b*c - a*d)^2*(c + d*x^2)^(3/2)) + (C*(2*b^2*c^2 - 7*a*b*c
*d - 3*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 -
 (b*c)/(a*d)])/(15*Sqrt[c]*d^(3/2)*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(
c + d*x^2))]*Sqrt[c + d*x^2]) + (B*(3*b^2*c^2 + 7*a*b*c*d - 2*a^2*d^2)*Sqr
t[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*
c^(3/2)*Sqrt[d]*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c
 + d*x^2]) - (A*Sqrt[d]*(23*b^2*c^2 - 23*a*b*c*d + 8*a^2*d^2)*Sqrt[a + b*x
^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*c^(5/2)*(
b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (b*S
qrt[c]*C*(b*c - 9*a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c
]], 1 - (b*c)/(a*d)])/(15*d^(3/2)*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c
 + d*x^2))]*Sqrt[c + d*x^2]) - (b*B*(9*b*c - a*d)*Sqrt[a + b*x^2]*Elliptic
F[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*Sqrt[c]*Sqrt[d]*(b*c
- a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*b*(15
*b^2*c^2 - 11*a*b*c*d + 4*a^2*d^2)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sq...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 951 vs. $2(446) = 892$.

Time = 10.87 (sec) , antiderivative size = 952, normalized size of antiderivative = 2.00

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(\frac{x\left(d^2A-cdB+C\,c^2\right)\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{5c\,d^4(ad-bc)\left(x^2+\frac{c}{d}\right)^3}+\frac{\left(4Aa\,d^3-8Abc\,d^2+Bac\,d^2+3Bb\,c^2d-6Ca\,c^2d+2c^3Cb\right)x\sqrt{bd\,x^4+ad\,x^2+}}{15d^3(ad-bc)^2c^2\left(x^2+\frac{c}{d}\right)^2}\right.}{}$
default	Expression too large to display

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(7/2),x,method=_RETURNVERBOS
E)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/5/c/d^4/(a*
d-b*c)*x*(A*d^2-B*c*d+C*c^2)*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)
^3+1/15*(4*A*a*d^3-8*A*b*c*d^2+B*a*c*d^2+3*B*b*c^2*d-6*C*a*c^2*d+2*C*b*c^3
)/d^3/(a*d-b*c)^2/c^2*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)^2+1/
15*(b*d*x^2+a*d)/c^3/d^2/(a*d-b*c)^3*x*(8*A*a^2*d^4-23*A*a*b*c*d^3+23*A*b^
2*c^2*d^2+2*B*a^2*c*d^3-7*B*a*b*c^2*d^2-3*B*b^2*c^3*d+3*C*a^2*c^2*d^2+7*C*
a*b*c^3*d-2*C*b^2*c^4)/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+(1/15*b*(4*A*a*d^3-
8*A*b*c*d^2+B*a*c*d^2+3*B*b*c^2*d-6*C*a*c^2*d+2*C*b*c^3)/c^2/d^2/(a*d-b*c)
^2+1/15/d^2/(a*d-b*c)^2*(8*A*a^2*d^4-23*A*a*b*c*d^3+23*A*b^2*c^2*d^2+2*B*a
^2*c*d^3-7*B*a*b*c^2*d^2-3*B*b^2*c^3*d+3*C*a^2*c^2*d^2+7*C*a*b*c^3*d-2*C*b
^2*c^4)/c^3-1/15*a/d/c^3/(a*d-b*c)^3*(8*A*a^2*d^4-23*A*a*b*c*d^3+23*A*b^2*
c^2*d^2+2*B*a^2*c*d^3-7*B*a*b*c^2*d^2-3*B*b^2*c^3*d+3*C*a^2*c^2*d^2+7*C*a*
b*c^3*d-2*C*b^2*c^4))/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*
d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/
b)^(1/2))+1/15*b/d^2*(8*A*a^2*d^4-23*A*a*b*c*d^3+23*A*b^2*c^2*d^2+2*B*a^2*
c*d^3-7*B*a*b*c^2*d^2-3*B*b^2*c^3*d+3*C*a^2*c^2*d^2+7*C*a*b*c^3*d-2*C*b^2*
c^4)/(a*d-b*c)^3/c^2/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d
*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/
b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1548 vs. $2(447) = 894$.

Time = 0.16 (sec) , antiderivative size = 1548, normalized size of antiderivative = 3.26

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{7/2}}\,dx = \text{Too large to display}$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(7/2),x, algorithm="fr
icas")
```

output
```
-1/15*((2*C*b^3*c^7 - 8*A*a^2*b*c^3*d^4 - (7*C*a*b^2 - 3*B*b^3)*c^6*d - (3
*C*a^2*b - 7*B*a*b^2 + 23*A*b^3)*c^5*d^2 - (2*B*a^2*b - 23*A*a*b^2)*c^4*d^
3 + (2*C*b^3*c^4*d^3 - 8*A*a^2*b*d^7 - (7*C*a*b^2 - 3*B*b^3)*c^3*d^4 - (3*
C*a^2*b - 7*B*a*b^2 + 23*A*b^3)*c^2*d^5 - (2*B*a^2*b - 23*A*a*b^2)*c*d^6)*
x^6 + 3*(2*C*b^3*c^5*d^2 - 8*A*a^2*b*c*d^6 - (7*C*a*b^2 - 3*B*b^3)*c^4*d^3
 - (3*C*a^2*b - 7*B*a*b^2 + 23*A*b^3)*c^3*d^4 - (2*B*a^2*b - 23*A*a*b^2)*c
^2*d^5)*x^4 + 3*(2*C*b^3*c^6*d - 8*A*a^2*b*c^2*d^5 - (7*C*a*b^2 - 3*B*b^3)
*c^5*d^2 - (3*C*a^2*b - 7*B*a*b^2 + 23*A*b^3)*c^4*d^3 - (2*B*a^2*b - 23*A*
a*b^2)*c^3*d^4)*x^2)*sqrt(a*c)*sqrt(-b/a)*elliptic_e(arcsin(x*sqrt(-b/a)),
 a*d/(b*c)) - (2*C*b^3*c^7 + (C*a^2*b - 7*C*a*b^2 + 3*B*b^3)*c^6*d - (9*C*
a^3 - 3*(3*B - C)*a^2*b + (15*A - 7*B)*a*b^2 + 23*A*b^3)*c^5*d^2 - (B*a^3
- (11*A - 2*B)*a^2*b - 23*A*a*b^2)*c^4*d^3 - 4*(A*a^3 + 2*A*a^2*b)*c^3*d^4
 + (2*C*b^3*c^4*d^3 + (C*a^2*b - 7*C*a*b^2 + 3*B*b^3)*c^3*d^4 - (9*C*a^3 -
 3*(3*B - C)*a^2*b + (15*A - 7*B)*a*b^2 + 23*A*b^3)*c^2*d^5 - (B*a^3 - (11
*A - 2*B)*a^2*b - 23*A*a*b^2)*c*d^6 - 4*(A*a^3 + 2*A*a^2*b)*d^7)*x^6 + 3*(
2*C*b^3*c^5*d^2 + (C*a^2*b - 7*C*a*b^2 + 3*B*b^3)*c^4*d^3 - (9*C*a^3 - 3*(
3*B - C)*a^2*b + (15*A - 7*B)*a*b^2 + 23*A*b^3)*c^3*d^4 - (B*a^3 - (11*A -
 2*B)*a^2*b - 23*A*a*b^2)*c^2*d^5 - 4*(A*a^3 + 2*A*a^2*b)*c*d^6)*x^4 + 3*(
2*C*b^3*c^6*d + (C*a^2*b - 7*C*a*b^2 + 3*B*b^3)*c^5*d^2 - (9*C*a^3 - 3*(3*
B - C)*a^2*b + (15*A - 7*B)*a*b^2 + 23*A*b^3)*c^4*d^3 - (B*a^3 - (11*A ...
```

Sympy [F]

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{7/2}}\,dx = \int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{\frac{7}{2}}}\,dx$$

input
```
integrate((C*x**4+B*x**2+A)/(b*x**2+a)**(1/2)/(d*x**2+c)**(7/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4)/(sqrt(a + b*x**2)*(c + d*x**2)**(7/2)), x)
```

Maxima [F]

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{7/2}}\,dx = \int \frac{Cx^4 + Bx^2 + A}{\sqrt{bx^2 + a}(dx^2 + c)^{\frac{7}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(7/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(7/2)), x)
```

Giac [F]

$$\int \frac{A + Bx^2 + Cx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{7/2}}\,dx = \int \frac{Cx^4 + Bx^2 + A}{\sqrt{bx^2 + a}(dx^2 + c)^{\frac{7}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(7/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(7/2)), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{7/2}}\,dx=\int \frac{C\,x^4+B\,x^2+A}{\sqrt{b\,x^2+a}\,(d\,x^2+c)^{7/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(1/2)*(c + d*x^2)^(7/2)),x)
```

output
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(1/2)*(c + d*x^2)^(7/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{7/2}}\,dx=\text{too large to display}$$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(7/2),x)
```

output

```
( - sqrt(c + d*x**2)*sqrt(a + b*x**2)*b*x + 8*int((sqrt(c + d*x**2)*sqrt(a
 + b*x**2)*x**4)/(2*a**2*c**4*d + 8*a**2*c**3*d**2*x**2 + 12*a**2*c**2*d**
3*x**4 + 8*a**2*c*d**4*x**6 + 2*a**2*d**5*x**8 - a*b*c**5 - 2*a*b*c**4*d*x
**2 + 2*a*b*c**3*d**2*x**4 + 8*a*b*c**2*d**3*x**6 + 7*a*b*c*d**4*x**8 + 2*
a*b*d**5*x**10 - b**2*c**5*x**2 - 4*b**2*c**4*d*x**4 - 6*b**2*c**3*d**2*x*
*6 - 4*b**2*c**2*d**3*x**8 - b**2*c*d**4*x**10),x)*a**2*c**4*d**2 + 24*int
((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(2*a**2*c**4*d + 8*a**2*c**3*d**
2*x**2 + 12*a**2*c**2*d**3*x**4 + 8*a**2*c*d**4*x**6 + 2*a**2*d**5*x**8 -
a*b*c**5 - 2*a*b*c**4*d*x**2 + 2*a*b*c**3*d**2*x**4 + 8*a*b*c**2*d**3*x**6
 + 7*a*b*c*d**4*x**8 + 2*a*b*d**5*x**10 - b**2*c**5*x**2 - 4*b**2*c**4*d*x
**4 - 6*b**2*c**3*d**2*x**6 - 4*b**2*c**2*d**3*x**8 - b**2*c*d**4*x**10),x
)*a**2*c**3*d**3*x**2 + 24*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(2
*a**2*c**4*d + 8*a**2*c**3*d**2*x**2 + 12*a**2*c**2*d**3*x**4 + 8*a**2*c*d
**4*x**6 + 2*a**2*d**5*x**8 - a*b*c**5 - 2*a*b*c**4*d*x**2 + 2*a*b*c**3*d*
*2*x**4 + 8*a*b*c**2*d**3*x**6 + 7*a*b*c*d**4*x**8 + 2*a*b*d**5*x**10 - b*
*2*c**5*x**2 - 4*b**2*c**4*d*x**4 - 6*b**2*c**3*d**2*x**6 - 4*b**2*c**2*d*
*3*x**8 - b**2*c*d**4*x**10),x)*a**2*c**2*d**4*x**4 + 8*int((sqrt(c + d*x*
*2)*sqrt(a + b*x**2)*x**4)/(2*a**2*c**4*d + 8*a**2*c**3*d**2*x**2 + 12*a**
2*c**2*d**3*x**4 + 8*a**2*c*d**4*x**6 + 2*a**2*d**5*x**8 - a*b*c**5 - 2*a*
b*c**4*d*x**2 + 2*a*b*c**3*d**2*x**4 + 8*a*b*c**2*d**3*x**6 + 7*a*b*c*d...
```

3.16 $\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 430

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \frac{(24a^2Cd^2 - abd(27cC+20Bd) + b^2(3c^2C+20Bcd+15Ad^2))\,x\sqrt{c \cdots}}{15b^3d\sqrt{a+bx^2}}$$

$$+ \frac{(6bcC+5bBd-6aCd)x^3\sqrt{c+dx^2}}{15b^2\sqrt{a+bx^2}} + \frac{Cdx^5\sqrt{c+dx^2}}{5b\sqrt{a+bx^2}}$$

$$+ \frac{(15Ab^3cd - 48a^3Cd^2 + 8a^2bd(6cC+5Bd) - ab^2(3c^2C+35Bcd+30Ad^2))\sqrt{c+dx^2}\,E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1 \cdots\right.}{15\sqrt{a}b^{7/2}d\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

$$+ \frac{\sqrt{a}(24a^2Cd + 15b^2(Bc+Ad) - ab(21cC+20Bd))\sqrt{c+dx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right), 1-\frac{ad}{bc}\right)}{15b^{7/2}\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
1/15*(24*a^2*C*d^2-a*b*d*(20*B*d+27*C*c)+b^2*(15*A*d^2+20*B*c*d+3*C*c^2))*
x*(d*x^2+c)^(1/2)/b^3/d/(b*x^2+a)^(1/2)+1/15*(5*B*b*d-6*C*a*d+6*C*b*c)*x^3
*(d*x^2+c)^(1/2)/b^2/(b*x^2+a)^(1/2)+1/5*C*d*x^5*(d*x^2+c)^(1/2)/b/(b*x^2+
a)^(1/2)+1/15*(15*A*b^3*c*d-48*a^3*C*d^2+8*a^2*b*d*(5*B*d+6*C*c)-a*b^2*(30
*A*d^2+35*B*c*d+3*C*c^2))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b
*x^2/a)^(1/2),(1-a*d/b/c)^(1/2))/a^(1/2)/b^(7/2)/d/(b*x^2+a)^(1/2)/(a*(d*x
^2+c)/c/(b*x^2+a))^(1/2)+1/15*a^(1/2)*(24*a^2*C*d+15*b^2*(A*d+B*c)-a*b*(20
*B*d+21*C*c))*(d*x^2+c)^(1/2)*InverseJacobiAM(arctan(b^(1/2)*x/a^(1/2)),(1
-a*d/b/c)^(1/2))/b^(7/2)/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 6.92 (sec) , antiderivative size = 346, normalized size of antiderivative = 0.80

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}\left(\sqrt{\frac{b}{a}}dx(c+dx^2)\left(15Ab^2(bc-ad)+a(-24a^2Cd+ab(21cC+\right.\right.}{}$$

input
```
Integrate[((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4))/(a + b*x^2)^(3/2),x]
```

output
```
(Sqrt[b/a]*(Sqrt[b/a]*d*x*(c + d*x^2)*(15*A*b^2*(b*c - a*d) + a*(-24*a^2*C
*d + a*b*(21*c*C + 20*B*d - 6*C*d*x^2) + b^2*(-15*B*c + 6*c*C*x^2 + 5*B*d*
x^2 + 3*C*d*x^4))) - I*c*(-15*A*b^3*c*d + 48*a^3*C*d^2 - 8*a^2*b*d*(6*c*C
+ 5*B*d) + a*b^2*(3*c^2*C + 35*B*c*d + 30*A*d^2))*Sqrt[1 + (b*x^2)/a]*Sqrt
[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] + I*c*(-(b*
c) + a*d)*(15*A*b^2*d + 24*a^2*C*d - a*b*(3*c*C + 20*B*d))*Sqrt[1 + (b*x^2
)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/
(15*b^4*d*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 947 vs. 2(430) = 860.

Time = 1.72 (sec) , antiderivative size = 947, normalized size of antiderivative = 2.20, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.057$, Rules used = {7293, 2009}

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

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}dx$$

$$\Big\downarrow \text{ 7293}$$

$$\int \left(\frac{A(c+dx^2)^{3/2}}{(a+bx^2)^{3/2}}+\frac{Bx^2(c+dx^2)^{3/2}}{(a+bx^2)^{3/2}}+\frac{Cx^4(c+dx^2)^{3/2}}{(a+bx^2)^{3/2}}\right)dx$$

$$\Big\downarrow \text{ 2009}$$

$$-\frac{C(dx^2+c)^{3/2}x^3}{b\sqrt{bx^2+a}}+\frac{6Cd\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5b^2}-\frac{B(dx^2+c)^{3/2}x}{b\sqrt{bx^2+a}}+\frac{4Bd\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3b^2}+\frac{C(7bc-8ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{5b^3}+\frac{A(bc-ad)\sqrt{dx^2+c}x}{ab\sqrt{bx^2+a}}+\frac{Bd(7bc-8ad)\sqrt{bx^2+a}x}{3b^3\sqrt{dx^2+c}}-\frac{Ad(bc-2ad)\sqrt{bx^2+a}x}{ab^2\sqrt{dx^2+c}}+\frac{C(b^2c^2-16abdc+16a^2d^2)\sqrt{bx^2+a}x}{5b^4\sqrt{dx^2+c}}-\frac{B\sqrt{c}\sqrt{d}(7bc-8ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\sqrt{c}\sqrt{d}(bc-2ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{ab^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C(b^2c^2-16abdc+16a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{5b^4\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}C(7bc-8ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{5b^3\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Bc^{3/2}(3bc-4ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3ab^2\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ac^{3/2}\sqrt{d}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{ab\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4))/(a + b*x^2)^(3/2),x]
```

output
```
(B*d*(7*b*c - 8*a*d)*x*Sqrt[a + b*x^2])/(3*b^3*Sqrt[c + d*x^2]) - (A*d*(b*
c - 2*a*d)*x*Sqrt[a + b*x^2])/(a*b^2*Sqrt[c + d*x^2]) + (C*(b^2*c^2 - 16*a
*b*c*d + 16*a^2*d^2)*x*Sqrt[a + b*x^2])/(5*b^4*Sqrt[c + d*x^2]) + (A*(b*c
- a*d)*x*Sqrt[c + d*x^2])/(a*b*Sqrt[a + b*x^2]) + (4*B*d*x*Sqrt[a + b*x^2]
*Sqrt[c + d*x^2])/(3*b^2) + (C*(7*b*c - 8*a*d)*x*Sqrt[a + b*x^2]*Sqrt[c +
d*x^2])/(5*b^3) + (6*C*d*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(5*b^2) - (B
*x*(c + d*x^2)^(3/2))/(b*Sqrt[a + b*x^2]) - (C*x^3*(c + d*x^2)^(3/2))/(b*S
qrt[a + b*x^2]) - (B*Sqrt[c]*Sqrt[d]*(7*b*c - 8*a*d)*Sqrt[a + b*x^2]*Ellip
ticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^3*Sqrt[(c*(a + b*
x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*Sqrt[c]*Sqrt[d]*(b*c - 2*a*d)
*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/
(a*b^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (Sqrt[c]*C
*(b^2*c^2 - 16*a*b*c*d + 16*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqr
t[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(5*b^4*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a
*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*c^(3/2)*Sqrt[d]*Sqrt[a + b*x^2]*Ellip
ticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*b*Sqrt[(c*(a + b*x^
2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (c^(3/2)*C*(7*b*c - 8*a*d)*Sqrt[a
+ b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(5*b^3*S
qrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*c^(3/2)
*(3*b*c - 4*a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]],...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 811 vs. $2(395) = 790$.

Time = 11.75 (sec) , antiderivative size = 812, normalized size of antiderivative = 1.89

method	result
risch	$\frac{x\left(3Cbd\,x^{2}+5Bbd-9Cad+6Cbc\right)\sqrt{b\,x^{2}+a}\,\sqrt{x^{2}d+c}}{15b^{3}}+\frac{\left(-\frac{\left(15A\,b^{2}d^{2}-25Bab\,d^{2}+20b^{2}Bcd+33a^{2}C\,d^{2}-33Cabcd+3C\,b^{2}c^{2}\right)c\sqrt{1+\frac{b\,x^{2}}{a}}\,\sqrt{1}}{\sqrt{-\frac{b}{a}}\,\sqrt{bd\,x^{4}+c}}\right.}{}$
elliptic	$\frac{\sqrt{\left(b\,x^{2}+a\right)\left(x^{2}d+c\right)}\left(-\frac{\left(bd\,x^{2}+bc\right)\left(b^{2}dAa-A\,b^{3}c-B\,a^{2}bd+B\,b^{2}ca+C\,a^{3}d-C\,a^{2}bc\right)x}{a\,b^{4}\sqrt{\left(x^{2}+\frac{a}{b}\right)\left(bd\,x^{2}+bc\right)}}+\frac{Cd\,x^{3}\sqrt{bd\,x^{4}+ad\,x^{2}+x^{2}bc+ac}}{5b^{2}}+\frac{\left(\frac{d(Bbd-Cad+2C}{b^{2}}\right.}{}\right.}{}$
default	Expression too large to display

input
```
int((d*x^2+c)^(3/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x,method=_RETURNVERBOS
E)
```

output
```
1/15/b^3*x*(3*C*b*d*x^2+5*B*b*d-9*C*a*d+6*C*b*c)*(b*x^2+a)^(1/2)*(d*x^2+c)
^(1/2)+1/15/b^3*(-(15*A*b^2*d^2-25*B*a*b*d^2+20*B*b^2*c*d+33*C*a^2*d^2-33*
C*a*b*c*d+3*C*b^2*c^2)*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/
(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b
*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2)))+15*(A*
a^2*b^2*d^2-2*A*a*b^3*c*d+A*b^4*c^2-B*a^3*b*d^2+2*B*a^2*b^2*c*d-B*a*b^3*c^
2+C*a^4*d^2-2*C*a^3*b*c*d+C*a^2*b^2*c^2)/b*(-(b*d*x^2+b*c)/a/(a*d-b*c)*x/(
(x^2+a/b)*(b*d*x^2+b*c))^(1/2)+(1/a+b*c/(a*d-b*c)/a)/(-b/a)^(1/2)*(1+b*x^2
/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(
x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-b/(a*d-b*c)/a*c/(-b/a)^(1/2)*(1+b
*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*(Ellip
ticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1
+(a*d+b*c)/c/b)^(1/2))))-(15*A*a*b^2*d^2-30*A*b^3*c*d-15*B*a^2*b*d^2+35*B*
a*b^2*c*d-15*B*b^3*c^2+15*C*a^3*d^2-39*C*a^2*b*c*d+21*C*a*b^2*c^2)/b/(-b/a
)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^
(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2)))*((b*x^2+a)*(d*x^
2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 684, normalized size of antiderivative = 1.59

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx =$$

$$-\frac{((3\,Cab^3c^3-(48\,Ca^2b^2-35\,Bab^3+15\,Ab^4)c^2d+2\,(24\,Ca^3b-20\,Ba^2b^2+15\,Aab^3)cd^2)x^3+(3\,Ca^2b^2c^3}{}$$

input
```
integrate((d*x^2+c)^(3/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorithm="fr
icas")
```

output
```
-1/15*(((3*C*a*b^3*c^3 - (48*C*a^2*b^2 - 35*B*a*b^3 + 15*A*b^4)*c^2*d + 2*
(24*C*a^3*b - 20*B*a^2*b^2 + 15*A*a*b^3)*c*d^2)*x^3 + (3*C*a^2*b^2*c^3 - (
48*C*a^3*b - 35*B*a^2*b^2 + 15*A*a*b^3)*c^2*d + 2*(24*C*a^4 - 20*B*a^3*b +
 15*A*a^2*b^2)*c*d^2)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)
/x), a*d/(b*c)) - ((3*C*a*b^3*c^3 - (48*C*a^2*b^2 - 35*B*a*b^3 + 15*A*b^4)
*c^2*d + (48*C*a^3*b - (40*B + 21*C)*a^2*b^2 + 15*(2*A + B)*a*b^3)*c*d^2 +
 (24*C*a^3*b - 20*B*a^2*b^2 + 15*A*a*b^3)*d^3)*x^3 + (3*C*a^2*b^2*c^3 - (4
8*C*a^3*b - 35*B*a^2*b^2 + 15*A*a*b^3)*c^2*d + (48*C*a^4 - (40*B + 21*C)*a
^3*b + 15*(2*A + B)*a^2*b^2)*c*d^2 + (24*C*a^4 - 20*B*a^3*b + 15*A*a^2*b^2
)*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c))
 - (3*C*a*b^3*d^3*x^6 + 3*C*a^2*b^2*c^2*d + (6*C*a*b^3*c*d^2 - (6*C*a^2*b^
2 - 5*B*a*b^3)*d^3)*x^4 - (48*C*a^3*b - 35*B*a^2*b^2 + 15*A*a*b^3)*c*d^2 +
 2*(24*C*a^4 - 20*B*a^3*b + 15*A*a^2*b^2)*d^3 + (3*C*a*b^3*c^2*d - (27*C*a
^2*b^2 - 20*B*a*b^3)*c*d^2 + (24*C*a^3*b - 20*B*a^2*b^2 + 15*A*a*b^3)*d^3)
*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/(a*b^5*d^2*x^3 + a^2*b^4*d^2*x)
```

Sympy [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \int \frac{(c+dx^2)^{\frac{3}{2}}(A+Bx^2+Cx^4)}{(a+bx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x**2+c)**(3/2)*(C*x**4+B*x**2+A)/(b*x**2+a)**(3/2),x)
```

output
```
Integral((c + d*x**2)**(3/2)*(A + B*x**2 + C*x**4)/(a + b*x**2)**(3/2), x)
```

Maxima [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \int \frac{(Cx^4+Bx^2+A)(dx^2+c)^{\frac{3}{2}}}{(bx^2+a)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x^2+c)^(3/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)*(d*x^2 + c)^(3/2)/(b*x^2 + a)^(3/2), x)
```

Giac [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \int \frac{(Cx^4+Bx^2+A)(dx^2+c)^{\frac{3}{2}}}{(bx^2+a)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x^2+c)^(3/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)*(d*x^2 + c)^(3/2)/(b*x^2 + a)^(3/2), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \int \frac{(d\,x^2+c)^{3/2}\,(C\,x^4+B\,x^2+A)}{(b\,x^2+a)^{3/2}}\,dx$$

input
```
int(((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4))/(a + b*x^2)^(3/2),x)
```

output
```
int(((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4))/(a + b*x^2)^(3/2), x)
```

Reduce [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \text{too large to display}$$

input
```
int((d*x^2+c)^(3/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x)
```

output
```
(18*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*c**2*d*x - 12*sqrt(c + d*x**2)*
sqrt(a + b*x**2)*a**2*c*d**2*x**3 + 15*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a
*b**2*c*d*x + 10*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*d**2*x**3 - 18*s
qrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c**3*x + 12*sqrt(c + d*x**2)*sqrt(a +
 b*x**2)*a*b*c**2*d*x**3 + 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c*d**2*
x**5 + 15*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c**2*x + 48*int((sqrt(c +
 d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a
*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**4*c*d**3 - 10*int((sqrt(c + d
*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b
*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**3*b**2*d**3 - 72*int((sqrt(c +
d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*
b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**3*b*c**2*d**2 + 48*int((sqrt(c
 + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2
*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**3*b*c*d**3*x**2 + 25*int((s
qrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**
2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**2*b**3*c*d**2 - 10*int
((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*
x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**2*b**3*d**3*x**2 +
24*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*
a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**2*b**2*c**...
```

3.17 $\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}} dx$

Optimal result

Integrand size = 35, antiderivative size = 295

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}} dx = \frac{(bcC+3bBd-4aCd)x\sqrt{c+dx^2}}{3b^2d\sqrt{a+bx^2}} + \frac{Cx^3\sqrt{c+dx^2}}{3b\sqrt{a+bx^2}} + \frac{(3Ab^2d+8a^2Cd-ab(cC+6Bd))\sqrt{c+dx^2}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{3\sqrt{a}b^{5/2}d\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}} + \frac{\sqrt{a}(3bB-4aC)\sqrt{c+dx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right),1-\frac{ad}{bc}\right)}{3b^{5/2}\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
1/3*(3*B*b*d-4*C*a*d+C*b*c)*x*(d*x^2+c)^(1/2)/b^2/d/(b*x^2+a)^(1/2)+1/3*C*
x^3*(d*x^2+c)^(1/2)/b/(b*x^2+a)^(1/2)+1/3*(3*A*b^2*d+8*a^2*C*d-a*b*(6*B*d+
C*c))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)^(1/2),(1-a*d
/b/c)^(1/2))/a^(1/2)/b^(5/2)/d/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(
1/2)+1/3*a^(1/2)*(3*B*b-4*C*a)*(d*x^2+c)^(1/2)*InverseJacobiAM(arctan(b^(1
/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/b^(5/2)/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(
b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 4.40 (sec) , antiderivative size = 257, normalized size of antiderivative = 0.87

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}\left(\sqrt{\frac{b}{a}}dx(c+dx^2)\left(3Ab^2+a(-3bB+4aC+bCx^2)\right)+ic(3Ab^2d+\right.}{}$$

input
```
Integrate[(Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4))/(a + b*x^2)^(3/2),x]
```

output
```
(Sqrt[b/a]*(Sqrt[b/a]*d*x*(c + d*x^2)*(3*A*b^2 + a*(-3*b*B + 4*a*C + b*C*x
^2)) + I*c*(3*A*b^2*d + 8*a^2*C*d - a*b*(c*C + 6*B*d))*Sqrt[1 + (b*x^2)/a]
*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - I*c*
(3*A*b^2*d + 4*a^2*C*d - a*b*(c*C + 3*B*d))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (
d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(3*b^3*d*Sqrt[a
 + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 616 vs. 2(295) = 590.

Time = 1.14 (sec) , antiderivative size = 616, normalized size of antiderivative = 2.09, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.057$, Rules used = {7293, 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.

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A\sqrt{c+dx^2}}{(a+bx^2)^{3/2}}+\frac{Bx^2\sqrt{c+dx^2}}{(a+bx^2)^{3/2}}+\frac{Cx^4\sqrt{c+dx^2}}{(a+bx^2)^{3/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{A\sqrt{c+dx^2}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{\sqrt{a}\sqrt{b}\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}-\frac{\sqrt{c}C\sqrt{a+bx^2}(bc-8ad)E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^3\sqrt{d}\sqrt{c+dx^2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{2B\sqrt{c}\sqrt{d}\sqrt{a+bx^2}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b^2\sqrt{c+dx^2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{4c^{3/2}C\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3b^2\sqrt{d}\sqrt{c+dx^2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{Bc^{3/2}\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{ab\sqrt{d}\sqrt{c+dx^2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{Cx\sqrt{a+bx^2}(bc-8ad)}{3b^3\sqrt{c+dx^2}}+\frac{2Bdx\sqrt{a+bx^2}}{b^2\sqrt{c+dx^2}}+\frac{4Cx\sqrt{a+bx^2}\sqrt{c+dx^2}}{3b^2}-\frac{Bx\sqrt{c+dx^2}}{b\sqrt{a+bx^2}}-\frac{Cx^3\sqrt{c+dx^2}}{b\sqrt{a+bx^2}}$$

input
```
Int[(Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4))/(a + b*x^2)^(3/2),x]
```

output
```
(2*B*d*x*Sqrt[a + b*x^2])/(b^2*Sqrt[c + d*x^2]) + (C*(b*c - 8*a*d)*x*Sqrt[
a + b*x^2])/(3*b^3*Sqrt[c + d*x^2]) - (B*x*Sqrt[c + d*x^2])/(b*Sqrt[a + b*
x^2]) - (C*x^3*Sqrt[c + d*x^2])/(b*Sqrt[a + b*x^2]) + (4*C*x*Sqrt[a + b*x^
2]*Sqrt[c + d*x^2])/(3*b^2) + (A*Sqrt[c + d*x^2]*EllipticE[ArcTan[(Sqrt[b]
*x)/Sqrt[a]], 1 - (a*d)/(b*c)])/(Sqrt[a]*Sqrt[b]*Sqrt[a + b*x^2]*Sqrt[(a*(
c + d*x^2))/(c*(a + b*x^2))]) - (2*B*Sqrt[c]*Sqrt[d]*Sqrt[a + b*x^2]*Ellip
ticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(b^2*Sqrt[(c*(a + b*x^
2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (Sqrt[c]*C*(b*c - 8*a*d)*Sqrt[a +
b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^3*Sqr
t[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*c^(3/2)*S
qrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a
*b*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (4*c^(
3/2)*C*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a
*d)])/(3*b^2*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]
)
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 9.25 (sec) , antiderivative size = 494, normalized size of antiderivative = 1.67

method	result
elliptic	$\sqrt{(b x^2+a)(x^2 d+c)}\ \Big(\frac{(bd x^2+bc)(b^2 A-abB+a^2 C)x}{a b^3\sqrt{(x^2+\frac{a}{b})(bd x^2+bc)}}+\frac{Cx\sqrt{bd x^4+ad x^2+x^2 bc+ac}}{3b^2}+ \Big(\frac{b^2 Ad-abBd+B b^2 c+a^2 Cd-Cabc}{b^3}-\frac{(b^2 A-abB+a^2 C}{b^3 a}$
default	$\sqrt{x^2 d+c}\,\sqrt{b x^2+a}\ \Big(C\sqrt{-\frac{b}{a}}\, ab d^2 x^5+3A\sqrt{-\frac{b}{a}}\, b^2 d^2 x^3-3B\sqrt{-\frac{b}{a}}\, ab d^2 x^3+4C\sqrt{-\frac{b}{a}}\, a^2 d^2 x^3+C\sqrt{-\frac{b}{a}}\, abcd x^3+3A\sqrt{\frac{b x^2+a}{a}}\ \sqrt{\frac{x^2 d+}{c}}$
risch	$\frac{Cx\sqrt{b x^2+a}\,\sqrt{x^2 d+c}}{3b^2}+ \Bigg(-\frac{(3Bbd-5Cad+Cbc)c\sqrt{1+\frac{b x^2}{a}}\,\sqrt{1+\frac{d x^2}{c}}\,\left(\mathrm{EllipticF}\left(x\sqrt{-\frac{b}{a}},\sqrt{-1+\frac{ad+bc}{cb}}\right)-\mathrm{EllipticE}\left(x\sqrt{-\frac{b}{a}},\sqrt{-1+\frac{ad+bc}{cb}}\right)\right.}{\sqrt{-\frac{b}{a}}\,\sqrt{bd x^4+ad x^2+x^2 bc+ac}\,d}$

input
```
int((d*x^2+c)^(1/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x,method=_RETURNVERBOS
E)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*((b*d*x^2+b*c)
*(A*b^2-B*a*b+C*a^2)/a/b^3*x/((x^2+a/b)*(b*d*x^2+b*c))^(1/2)+1/3*C/b^2*x*(
b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+((A*b^2*d-B*a*b*d+B*b^2*c+C*a^2*d-C*a*b
*c)/b^3-(A*b^2-B*a*b+C*a^2)/b^3*(a*d-b*c)/a-1/b^2*c*(A*b^2-B*a*b+C*a^2)/a-
1/3*a/b^2*c*C)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a
*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2
))-(1/b^2*(B*b*d-C*a*d+C*b*c)-(A*b^2-B*a*b+C*a^2)/b^2*d/a-1/3*C/b^2*(2*a*d
+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x
^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2)
)-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 396, normalized size of antiderivative = 1.34

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx =$$

$$-\frac{((Cab^2c^2-(8\,Ca^2b-6\,Bab^2+3\,Ab^3)cd)x^3+(Ca^2bc^2-(8\,Ca^3-6\,Ba^2b+3\,Aab^2)cd)x)\sqrt{bd}\sqrt{-\frac{c}{d}}E(\mathrm{ar}}{}$$

input
```
integrate((d*x^2+c)^(1/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorithm="fr
icas")
```

output
```
-1/3*(((C*a*b^2*c^2 - (8*C*a^2*b - 6*B*a*b^2 + 3*A*b^3)*c*d)*x^3 + (C*a^2*
b*c^2 - (8*C*a^3 - 6*B*a^2*b + 3*A*a*b^2)*c*d)*x)*sqrt(b*d)*sqrt(-c/d)*ell
iptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((C*a*b^2*c^2 - (8*C*a^2*b - 6*
B*a*b^2 + 3*A*b^3)*c*d - (4*C*a^2*b - 3*B*a*b^2)*d^2)*x^3 + (C*a^2*b*c^2 -
 (8*C*a^3 - 6*B*a^2*b + 3*A*a*b^2)*c*d - (4*C*a^3 - 3*B*a^2*b)*d^2)*x)*sqr
t(b*d)*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (C*a*b^2*d
^2*x^4 + C*a^2*b*c*d - (8*C*a^3 - 6*B*a^2*b + 3*A*a*b^2)*d^2 + (C*a*b^2*c*
d - (4*C*a^2*b - 3*B*a*b^2)*d^2)*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/(a*
b^4*d^2*x^3 + a^2*b^3*d^2*x)
```

Sympy [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x**2+c)**(1/2)*(C*x**4+B*x**2+A)/(b*x**2+a)**(3/2),x)
```

output
```
Integral(sqrt(c + d*x**2)*(A + B*x**2 + C*x**4)/(a + b*x**2)**(3/2), x)
```

Maxima [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \int \frac{(Cx^4+Bx^2+A)\sqrt{dx^2+c}}{(bx^2+a)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x^2+c)^(1/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)*sqrt(d*x^2 + c)/(b*x^2 + a)^(3/2), x)
```

Giac [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \int \frac{(Cx^4+Bx^2+A)\sqrt{dx^2+c}}{(bx^2+a)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x^2+c)^(1/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)*sqrt(d*x^2 + c)/(b*x^2 + a)^(3/2), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \int \frac{\sqrt{d\,x^2+c}\,(C\,x^4+B\,x^2+A)}{(b\,x^2+a)^{3/2}}\,dx$$

input
```
int(((c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4))/(a + b*x^2)^(3/2),x)
```

output
```
int(((c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4))/(a + b*x^2)^(3/2), x)
```

Reduce [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4)}{(a+bx^2)^{3/2}}\,dx = \text{Too large to display}$$

input
```
int((d*x^2+c)^(1/2)*(C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x)
```

output
```
(3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*d*x - 3*sqrt(c + d*x**2)*sqrt(a +
 b*x**2)*a*c**2*x + 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*c*d*x**3 + 3*sqr
t(c + d*x**2)*sqrt(a + b*x**2)*b**2*c*x - 8*int((sqrt(c + d*x**2)*sqrt(a +
 b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*
c*x**4 + b**2*d*x**6),x)*a**3*c*d**2 + 3*int((sqrt(c + d*x**2)*sqrt(a + b*
x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x
**4 + b**2*d*x**6),x)*a**2*b**2*d**2 + 5*int((sqrt(c + d*x**2)*sqrt(a + b*
x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x
**4 + b**2*d*x**6),x)*a**2*b*c**2*d - 8*int((sqrt(c + d*x**2)*sqrt(a + b*x
**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x*
*4 + b**2*d*x**6),x)*a**2*b*c*d**2*x**2 - 3*int((sqrt(c + d*x**2)*sqrt(a +
 b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*
c*x**4 + b**2*d*x**6),x)*a*b**3*c*d + 3*int((sqrt(c + d*x**2)*sqrt(a + b*x
**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x*
*4 + b**2*d*x**6),x)*a*b**3*d**2*x**2 + 5*int((sqrt(c + d*x**2)*sqrt(a + b
*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*
x**4 + b**2*d*x**6),x)*a*b**2*c**2*d*x**2 - 3*int((sqrt(c + d*x**2)*sqrt(a
 + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**
2*c*x**4 + b**2*d*x**6),x)*b**4*c*d*x**2 + 3*int((sqrt(c + d*x**2)*sqrt(a
+ b*x**2))/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c...
```

3.18 $\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 266

$$
\begin{aligned}
\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx &= \frac{Cx\sqrt{c+dx^2}}{bd\sqrt{a+bx^2}} \\
&+ \frac{(Ab^2d+2a^2Cd-ab(cC+Bd))\sqrt{c+dx^2}\,E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{\sqrt{a}b^{3/2}d(bc-ad)\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}} \\
&+ \frac{\sqrt{a}(bBc-acC-Abd)\sqrt{c+dx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right),1-\frac{ad}{bc}\right)}{b^{3/2}c(bc-ad)\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}
\end{aligned}
$$

output

```
C*x*(d*x^2+c)^(1/2)/b/d/(b*x^2+a)^(1/2)+(A*b^2*d+2*a^2*C*d-a*b*(B*d+C*c))*
(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)^(1/2),(1-a*d/b/c)^
(1/2))/a^(1/2)/b^(3/2)/d/(-a*d+b*c)/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+
a))^(1/2)+a^(1/2)*(-A*b*d+B*b*c-C*a*c)*(d*x^2+c)^(1/2)*InverseJacobiAM(arc
tan(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/b^(3/2)/c/(-a*d+b*c)/(b*x^2+a)^(
1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 10.75 (sec) , antiderivative size = 245, normalized size of antiderivative = 0.92

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx = \frac{-\sqrt{\frac{b}{a}}(Ab^2+a(-bB+aC))\,dx(c+dx^2)-ic(Ab^2d+2a^2Cd-ab(cC+Bd}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*Sqrt[c + d*x^2]),x]
```

output
```
(-(Sqrt[b/a]*(A*b^2 + a*(-(b*B) + a*C))*d*x*(c + d*x^2)) - I*c*(A*b^2*d +
2*a^2*C*d - a*b*(c*C + B*d))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*Ellip
ticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] + I*(-(b*c) + a*d)*(a*c*C - A*b*
d)*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x
], (a*d)/(b*c)])/(a^2*(b/a)^(3/2)*d*(-(b*c) + a*d)*Sqrt[a + b*x^2]*Sqrt[c
+ d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 840 vs. 2(266) = 532.

Time = 1.36 (sec) , antiderivative size = 840, normalized size of antiderivative = 3.16, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.057$, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}+\frac{Bx^2}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}+\frac{Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{B\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)c^{3/2}}{a\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{C\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)c^{3/2}}{b\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{C(bc-2ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)\sqrt{c}}{b^2\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\sqrt{d}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)\sqrt{c}}{a(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{B\sqrt{d}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)\sqrt{c}}{b(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{A\sqrt{d}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)\sqrt{c}}{a(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Abx\sqrt{dx^2+c}}{a(bc-ad)\sqrt{bx^2+a}}-\frac{Bx\sqrt{dx^2+c}}{(bc-ad)\sqrt{bx^2+a}}+\frac{aCx\sqrt{dx^2+c}}{b(bc-ad)\sqrt{bx^2+a}}-\frac{Adx\sqrt{bx^2+a}}{a(bc-ad)\sqrt{dx^2+c}}+\frac{Bdx\sqrt{bx^2+a}}{b(bc-ad)\sqrt{dx^2+c}}+\frac{C(bc-2ad)x\sqrt{bx^2+a}}{b^2(bc-ad)\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*Sqrt[c + d*x^2]),x]
```

output
```
-((A*d*x*Sqrt[a + b*x^2])/(a*(b*c - a*d)*Sqrt[c + d*x^2])) + (B*d*x*Sqrt[a
 + b*x^2])/(b*(b*c - a*d)*Sqrt[c + d*x^2]) + (C*(b*c - 2*a*d)*x*Sqrt[a + b
*x^2])/(b^2*(b*c - a*d)*Sqrt[c + d*x^2]) + (A*b*x*Sqrt[c + d*x^2])/(a*(b*c
 - a*d)*Sqrt[a + b*x^2]) - (B*x*Sqrt[c + d*x^2])/((b*c - a*d)*Sqrt[a + b*x
^2]) + (a*C*x*Sqrt[c + d*x^2])/(b*(b*c - a*d)*Sqrt[a + b*x^2]) + (A*Sqrt[c
]*Sqrt[d]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)
/(a*d)])/(a*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x
^2]) - (B*Sqrt[c]*Sqrt[d]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqr
t[c]], 1 - (b*c)/(a*d)])/(b*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2
))]*Sqrt[c + d*x^2]) - (Sqrt[c]*C*(b*c - 2*a*d)*Sqrt[a + b*x^2]*EllipticE[
ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(b^2*Sqrt[d]*(b*c - a*d)*Sq
rt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*c^(3/2)*Sqrt[a +
 b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*Sqrt[d
]*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (c^
(3/2)*C*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(
a*d)])/(b*Sqrt[d]*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c
 + d*x^2]) - (A*Sqrt[c]*Sqrt[d]*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*
x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c +
 d*x^2))]*Sqrt[c + d*x^2])
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 6.20 (sec) , antiderivative size = 424, normalized size of antiderivative = 1.59

method	result
elliptic	$\frac{\sqrt{(b x^2+a)(x^2 d+c)}\left(-\frac{\left(b d x^2+b c\right) x\left(b^2 A-a b B+a^2 C\right)}{b^2 a(a d-b c)\sqrt{\left(x^2+\frac{a}{b}\right)\left(b d x^2+b c\right)}}+\frac{\left(\frac{B b-C a}{b^2}+\frac{b^2 A-a b B+a^2 C}{b^2 a}+\frac{c\left(b^2 A-a b B+a^2 C\right)}{b a(a d-b c)}\right)\sqrt{1+\frac{b x^2}{a}}\sqrt{1+\frac{d x^2}{c}}\ \mathrm{Elliptic}}{\sqrt{-\frac{b}{a}}\sqrt{b d x^4+a d x^2+x^2 b c+a c}}\right.}{\sqrt{b x^2}}$
default	$\frac{\left(-A\sqrt{-\frac{b}{a}}\, b^2 d^2 x^3+B\sqrt{-\frac{b}{a}}\, a b d^2 x^3-C\sqrt{-\frac{b}{a}}\, a^2 d^2 x^3+A\sqrt{\frac{b x^2+a}{a}}\sqrt{\frac{x^2 d+c}{c}}\ \mathrm{EllipticF}\left(x\sqrt{-\frac{b}{a}},\sqrt{\frac{a d}{b c}}\right) a b d^2-A\sqrt{\frac{b x^2+a}{a}}\sqrt{\frac{x^2 d+c}{c}}\right.}{}$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(1/2),x,method=_RETURNVERBOS
E)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(-(b*d*x^2+b*c
)/b^2/a/(a*d-b*c)*x*(A*b^2-B*a*b+C*a^2)/((x^2+a/b)*(b*d*x^2+b*c))^(1/2)+((
B*b-C*a)/b^2+(A*b^2-B*a*b+C*a^2)/b^2/a+1/b*c/a/(a*d-b*c)*(A*b^2-B*a*b+C*a^
2))/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*
x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(C/b+(A*
b^2-B*a*b+C*a^2)/b/(a*d-b*c)*d/a)*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^
2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2)
,(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/
2))))
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 437, normalized size of antiderivative = 1.64

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx =$$

$$-\frac{((Cab^2c^3-(2\,Ca^2b-Bab^2+Ab^3)c^2d)x^3+(Ca^2bc^3-(2\,Ca^3-Ba^2b+Aab^2)c^2d)x)\sqrt{bd}\sqrt{-\frac{c}{d}}E(\arcsin}{}$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(1/2),x, algorithm="fr
icas")
```

output
```
-(((C*a*b^2*c^3 - (2*C*a^2*b - B*a*b^2 + A*b^3)*c^2*d)*x^3 + (C*a^2*b*c^3
- (2*C*a^3 - B*a^2*b + A*a*b^2)*c^2*d)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(
arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((C*a*b^2*c^3 - A*a*b^2*d^3 - (2*C*a^2*
b - B*a*b^2 + A*b^3)*c^2*d - (C*a^2*b - B*a*b^2)*c*d^2)*x^3 + (C*a^2*b*c^3
 - A*a^2*b*d^3 - (2*C*a^3 - B*a^2*b + A*a*b^2)*c^2*d - (C*a^3 - B*a^2*b)*c
*d^2)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c))
- (C*a^2*b*c^2*d - (2*C*a^3 - B*a^2*b + A*a*b^2)*c*d^2 + (C*a*b^2*c^2*d -
C*a^2*b*c*d^2)*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/((a*b^4*c^2*d^2 - a^2
*b^3*c*d^3)*x^3 + (a^2*b^3*c^2*d^2 - a^3*b^2*c*d^3)*x)
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx=\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{\frac{3}{2}}\sqrt{c+dx^2}}\,dx$$

input
```
integrate((C*x**4+B*x**2+A)/(b*x**2+a)**(3/2)/(d*x**2+c)**(1/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4)/((a + b*x**2)**(3/2)*sqrt(c + d*x**2)), x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx=\int \frac{Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}\sqrt{dx^2+c}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(1/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*sqrt(d*x^2 + c)), x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx = \int \frac{Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}\sqrt{dx^2+c}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(1/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*sqrt(d*x^2 + c)), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx = \int \frac{C\,x^4+B\,x^2+A}{(b\,x^2+a)^{3/2}\,\sqrt{d\,x^2+c}}\,dx$$

input
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(1/2)),x)
```

output
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(1/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx = \frac{\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,bx+2\left(\int \frac{\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,x^4}{b^2 d\,x^6+2abd\,x^4+b^2 c\,x^4+a^2 d\,x^2+2abc\,x^2+a^2 c}dx\right)a^2cd -}{}$$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(1/2),x)
```

output
```
(sqrt(c + d*x**2)*sqrt(a + b*x**2)*b*x + 2*int((sqrt(c + d*x**2)*sqrt(a +
b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c
*x**4 + b**2*d*x**6),x)*a**2*c*d - int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*
x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 +
b**2*d*x**6),x)*a*b**2*d + 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/
(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d
*x**6),x)*a*b*c*d*x**2 - int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**
2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**
6),x)*b**3*d*x**2 + 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a**2*c + a*
*2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a*
*3*d - int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a**2*c + a**2*d*x**2 + 2*a
*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**2*b*c + 2*int(
(sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 +
 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**2*b*d*x**2 - int((sqrt(c
+ d*x**2)*sqrt(a + b*x**2))/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d
*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a*b**2*c*x**2)/(2*a*d*(a + b*x**2))
```

3.19 $\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 308

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx = \frac{(Ab^2-a(bB-aC))x}{ab(bc-ad)\sqrt{a+bx^2}\sqrt{c+dx^2}} + \frac{(Ab^2cd+a^2cCd+ab(c^2C-2Bcd+Ad^2))\sqrt{a+bx^2}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{ab\sqrt{c}\sqrt{d}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}} + \frac{\sqrt{c}(bBc-2acC-2Abd+aBd)\sqrt{a+bx^2}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
(A*b^2-a*(B*b-C*a))*x/a/b/(-a*d+b*c)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)+(A*b^
2*c*d+a^2*c*C*d+a*b*(A*d^2-2*B*c*d+C*c^2))*(b*x^2+a)^(1/2)*EllipticE(d^(1/
2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/a/b/c^(1/2)/d^(1/2)/(-a*
d+b*c)^2/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)+c^(1/2)*(-2*A*b*d
+B*a*d+B*b*c-2*C*a*c)*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/2)*x/c^(
1/2)),(1-b*c/a/d)^(1/2))/a/d^(1/2)/(-a*d+b*c)^2/(c*(b*x^2+a)/a/(d*x^2+c))^
(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 11.13 (sec) , antiderivative size = 310, normalized size of antiderivative = 1.01

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}\left(\sqrt{\frac{b}{a}}dx(A(a^2d^2+abd^2x^2+b^2c(c+dx^2))+ac(bcCx^2-bB(c+2dx^2\right.}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)),x]
```

output
```
(Sqrt[b/a]*(Sqrt[b/a]*d*x*(A*(a^2*d^2 + a*b*d^2*x^2 + b^2*c*(c + d*x^2)) +
 a*c*(b*c*C*x^2 - b*B*(c + 2*d*x^2) + a*(2*c*C - B*d + C*d*x^2))) + I*c*(A
*b^2*c*d + a^2*c*C*d + a*b*(c^2*C - 2*B*c*d + A*d^2))*Sqrt[1 + (b*x^2)/a]*
Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] + I*c*(
-(b*c) + a*d)*(a*c*C + A*b*d - a*B*d)*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)
/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(b*c*d*(b*c - a*d)^2*
Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 722 vs. 2(308) = 616.

Time = 1.26 (sec) , antiderivative size = 722, normalized size of antiderivative = 2.34, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.057$, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx$$

$$\Big\downarrow \; 7293$$

$$\int \left(\frac{A}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}+\frac{Bx^2}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}+\frac{Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\right)dx$$

$\downarrow$ 2009

$$-\frac{2Ab\sqrt{c}\sqrt{d}\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{A\sqrt{d}\sqrt{a+bx^2}(ad+bc)E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{a\sqrt{c}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{Abx}{a\sqrt{a+bx^2}\sqrt{c+dx^2}(bc-ad)}+\frac{B\sqrt{c}\sqrt{a+bx^2}(ad+bc)\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{2B\sqrt{c}\sqrt{d}\sqrt{a+bx^2}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{2c^{3/2}C\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{\sqrt{d}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}+\frac{\sqrt{c}C\sqrt{a+bx^2}(ad+bc)E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b\sqrt{d}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}}-\frac{Bx}{\sqrt{a+bx^2}\sqrt{c+dx^2}(bc-ad)}+\frac{aCx}{b\sqrt{a+bx^2}\sqrt{c+dx^2}(bc-ad)}$$

input
```
Int[(A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)),x]
```

output
```
(A*b*x)/(a*(b*c - a*d)*Sqrt[a + b*x^2]*Sqrt[c + d*x^2]) - (B*x)/((b*c - a*
d)*Sqrt[a + b*x^2]*Sqrt[c + d*x^2]) + (a*C*x)/(b*(b*c - a*d)*Sqrt[a + b*x^
2]*Sqrt[c + d*x^2]) - (2*B*Sqrt[c]*Sqrt[d]*Sqrt[a + b*x^2]*EllipticE[ArcTa
n[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/((b*c - a*d)^2*Sqrt[(c*(a + b*x^
2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c]*C*(b*c + a*d)*Sqrt[a + b*
x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(b*Sqrt[d]*(
b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*S
qrt[d]*(b*c + a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]],
1 - (b*c)/(a*d)])/(a*Sqrt[c]*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*
x^2))]*Sqrt[c + d*x^2]) - (2*c^(3/2)*C*Sqrt[a + b*x^2]*EllipticF[ArcTan[(S
qrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(Sqrt[d]*(b*c - a*d)^2*Sqrt[(c*(a +
b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (2*A*b*Sqrt[c]*Sqrt[d]*Sqrt[a
+ b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*(b*c
- a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*Sqrt[
c]*(b*c + a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 -
(b*c)/(a*d)])/(a*Sqrt[d]*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2)
)]*Sqrt[c + d*x^2])
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 607 vs. $2(291) = 582$.

Time = 8.38 (sec) , antiderivative size = 608, normalized size of antiderivative = 1.97

method	result
elliptic	$\frac{\sqrt{(b x^2+a)(x^2 d+c)}\left(-\frac{2bd\left(-\frac{\left(Aab\,d^2+A\,b^2cd-2Babcd+a^2cCd+Cab\,c^2\right)x^3}{2bdac\left(a^2d^2-2abcd+b^2c^2\right)}-\frac{\left(A\,a^2d^2+A\,b^2c^2-B\,a^2cd-Bab\,c^2+2C\,a^2c^2\right)x}{2bdac\left(a^2d^2-2abcd+b^2c^2\right)}\right)}{\sqrt{\left(x^4+\frac{(ad+bc)x^2}{db}+\frac{ac}{db}\right)bd}}+\frac{\left(\frac{C}{bd}+\frac{Ab\ldots}{\ldots}\right.}{\ldots}\right.}{\ldots}$
default	$\frac{\left(A\sqrt{-\frac{b}{a}}\,ab\,d^3x^3+A\sqrt{-\frac{b}{a}}\,b^2c\,d^2x^3-2B\sqrt{-\frac{b}{a}}\,abc\,d^2x^3+C\sqrt{-\frac{b}{a}}\,a^2c\,d^2x^3+C\sqrt{-\frac{b}{a}}\,ab\,c^2d\,x^3-A\sqrt{\frac{b\,x^2+a}{a}}\,\sqrt{\frac{x^2d+c}{c}}\,\mathrm{EllipticF}\left(x\sqrt{\ldots}\right.\right.}{\ldots}$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x,method=_RETURNVERBOS
E)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(-2*b*d*(-1/2/
b/d*(A*a*b*d^2+A*b^2*c*d-2*B*a*b*c*d+C*a^2*c*d+C*a*b*c^2)/a/c/(a^2*d^2-2*a
*b*c*d+b^2*c^2)*x^3-1/2/b/d*(A*a^2*d^2+A*b^2*c^2-B*a^2*c*d-B*a*b*c^2+2*C*a
^2*c^2)/a/c/(a^2*d^2-2*a*b*c*d+b^2*c^2)*x)/((x^4+(a*d+b*c)/d/b*x^2+a*c/d/b
)*b*d)^(1/2)+(C/b/d+1/b/d*(A*b*d-C*a*c)/a/c-(A*a^2*d^2+A*b^2*c^2-B*a^2*c*d
-B*a*b*c^2+2*C*a^2*c^2)/a/c/(a^2*d^2-2*a*b*c*d+b^2*c^2))/(-b/a)^(1/2)*(1+b
*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*Ellipt
icF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))+(A*a*b*d^2+A*b^2*c*d-2*B*a*b*
c*d+C*a^2*c*d+C*a*b*c^2)/a/(a^2*d^2-2*a*b*c*d+b^2*c^2)/(-b/a)^(1/2)*(1+b*x
^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(Ellip
ticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1
+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 802 vs. $2(293) = 586$.

Time = 0.11 (sec) , antiderivative size = 802, normalized size of antiderivative = 2.60

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\,(c+dx^2)^{3/2}}\,dx = \text{Too large to display}$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x, algorithm="fr
icas")
```

output
```
-((C*a^2*b^2*c^3 + A*a^2*b^2*c*d^2 + (C*a*b^3*c^2*d + A*a*b^3*d^3 + (C*a^2
*b^2 - 2*B*a*b^3 + A*b^4)*c*d^2)*x^4 + (C*a^3*b - 2*B*a^2*b^2 + A*a*b^3)*c
^2*d + (C*a*b^3*c^3 + A*a^2*b^2*d^3 + (2*C*a^2*b^2 - 2*B*a*b^3 + A*b^4)*c^
2*d + (C*a^3*b - 2*B*a^2*b^2 + 2*A*a*b^3)*c*d^2)*x^2)*sqrt(a*c)*sqrt(-b/a)
*elliptic_e(arcsin(x*sqrt(-b/a)), a*d/(b*c)) - (C*a^2*b^2*c^3 + (C*a*b^3*c
^2*d + (2*C*a^3*b - (B - C)*a^2*b^2 - 2*B*a*b^3 + A*b^4)*c*d^2 - (B*a^3*b
- 2*A*a^2*b^2 - A*a*b^3)*d^3)*x^4 + (2*C*a^4 - (B - C)*a^3*b - 2*B*a^2*b^2
 + A*a*b^3)*c^2*d - (B*a^4 - 2*A*a^3*b - A*a^2*b^2)*c*d^2 + (C*a*b^3*c^3 +
 (2*C*a^3*b - (B - 2*C)*a^2*b^2 - 2*B*a*b^3 + A*b^4)*c^2*d + (2*C*a^4 - (2
*B - C)*a^3*b + 2*(A - B)*a^2*b^2 + 2*A*a*b^3)*c*d^2 - (B*a^4 - 2*A*a^3*b
- A*a^2*b^2)*d^3)*x^2)*sqrt(a*c)*sqrt(-b/a)*elliptic_f(arcsin(x*sqrt(-b/a)
), a*d/(b*c)) - ((C*a^2*b^2*c^2*d + A*a^2*b^2*d^3 + (C*a^3*b - 2*B*a^2*b^2
 + A*a*b^3)*c*d^2)*x^3 - (B*a^3*b*c*d^2 - A*a^3*b*d^3 - (2*C*a^3*b - B*a^2
*b^2 + A*a*b^3)*c^2*d)*x)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/(a^3*b^3*c^4*d
- 2*a^4*b^2*c^3*d^2 + a^5*b*c^2*d^3 + (a^2*b^4*c^3*d^2 - 2*a^3*b^3*c^2*d^3
 + a^4*b^2*c*d^4)*x^4 + (a^2*b^4*c^4*d - a^3*b^3*c^3*d^2 - a^4*b^2*c^2*d^3
 + a^5*b*c*d^4)*x^2)
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\,(c+dx^2)^{3/2}}\,dx=\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{\frac{3}{2}}\,(c+dx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((C*x**4+B*x**2+A)/(b*x**2+a)**(3/2)/(d*x**2+c)**(3/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4)/((a + b*x**2)**(3/2)*(c + d*x**2)**(3/2)),
x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\,(c+dx^2)^{3/2}}\,dx = \int \frac{Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*(d*x^2 + c)^(3/2)), x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\,(c+dx^2)^{3/2}}\,dx = \int \frac{Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*(d*x^2 + c)^(3/2)), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}\,(c+dx^2)^{3/2}}\,dx = \int \frac{C\,x^4+B\,x^2+A}{{\left(b\,x^2+a\right)}^{3/2}\,{\left(d\,x^2+c\right)}^{3/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)),x)
```

output
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)), x)
```

Reduce [F]

$$\int \frac{A + Bx^2 + Cx^4}{(a + bx^2)^{3/2} (c + dx^2)^{3/2}} \, dx = \text{Too large to display}$$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x)
```

output
```
( - sqrt(c + d*x**2)*sqrt(a + b*x**2)*c*x + int((sqrt(c + d*x**2)*sqrt(a +
 b*x**2)*x**2)/(a**2*c**2 + 2*a**2*c*d*x**2 + a**2*d**2*x**4 + 2*a*b*c**2*
x**2 + 4*a*b*c*d*x**4 + 2*a*b*d**2*x**6 + b**2*c**2*x**4 + 2*b**2*c*d*x**6
 + b**2*d**2*x**8),x)*a*b**2*c*d + int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*
x**2)/(a**2*c**2 + 2*a**2*c*d*x**2 + a**2*d**2*x**4 + 2*a*b*c**2*x**2 + 4*
a*b*c*d*x**4 + 2*a*b*d**2*x**6 + b**2*c**2*x**4 + 2*b**2*c*d*x**6 + b**2*d
**2*x**8),x)*a*b**2*d**2*x**2 + int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**
2)/(a**2*c**2 + 2*a**2*c*d*x**2 + a**2*d**2*x**4 + 2*a*b*c**2*x**2 + 4*a*b
*c*d*x**4 + 2*a*b*d**2*x**6 + b**2*c**2*x**4 + 2*b**2*c*d*x**6 + b**2*d**2
*x**8),x)*b**3*c*d*x**2 + int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*
*2*c**2 + 2*a**2*c*d*x**2 + a**2*d**2*x**4 + 2*a*b*c**2*x**2 + 4*a*b*c*d*x
**4 + 2*a*b*d**2*x**6 + b**2*c**2*x**4 + 2*b**2*c*d*x**6 + b**2*d**2*x**8)
,x)*b**3*d**2*x**4 + int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a**2*c**2 +
2*a**2*c*d*x**2 + a**2*d**2*x**4 + 2*a*b*c**2*x**2 + 4*a*b*c*d*x**4 + 2*a*
b*d**2*x**6 + b**2*c**2*x**4 + 2*b**2*c*d*x**6 + b**2*d**2*x**8),x)*a**2*b
*c*d + int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a**2*c**2 + 2*a**2*c*d*x**
2 + a**2*d**2*x**4 + 2*a*b*c**2*x**2 + 4*a*b*c*d*x**4 + 2*a*b*d**2*x**6 +
b**2*c**2*x**4 + 2*b**2*c*d*x**6 + b**2*d**2*x**8),x)*a**2*b*d**2*x**2 + i
nt((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a**2*c**2 + 2*a**2*c*d*x**2 + a**2
*d**2*x**4 + 2*a*b*c**2*x**2 + 4*a*b*c*d*x**4 + 2*a*b*d**2*x**6 + b**2*...
```

3.20 $\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx$

Optimal result

Integrand size = 35, antiderivative size = 439

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx = \frac{(Ab^2-a(bB-aC))\,x}{ab(bc-ad)\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}$$
$$+\frac{(3Ab^2cd+3a^2cCd+ab(c^2C-4Bcd+Ad^2))\,x\sqrt{a+bx^2}}{3abc(bc-ad)^2\,(c+dx^2)^{3/2}}$$
$$+\frac{(3Ab^2c^2d+a^2d(7c^2C-Bcd-2Ad^2)+abc(c^2C-7Bcd+7Ad^2))\,\sqrt{a+bx^2}\,E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3ac^{3/2}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$
$$-\frac{(3a^2cCd-3b^2c(Bc-3Ad)+ab(5c^2C-5Bcd-Ad^2))\,\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a\sqrt{c}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
(A*b^2-a*(B*b-C*a))*x/a/b/(-a*d+b*c)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2)+1/3*(
3*A*b^2*c*d+3*a^2*c*C*d+a*b*(A*d^2-4*B*c*d+C*c^2))*x*(b*x^2+a)^(1/2)/a/b/c
/(-a*d+b*c)^2/(d*x^2+c)^(3/2)+1/3*(3*A*b^2*c^2*d+a^2*d*(-2*A*d^2-B*c*d+7*C
*c^2)+a*b*c*(7*A*d^2-7*B*c*d+C*c^2))*(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c
^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/a/c^(3/2)/d^(1/2)/(-a*d+b*c)^3
/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)-1/3*(3*a^2*c*C*d-3*b^2*c*
(-3*A*d+B*c)+a*b*(-A*d^2-5*B*c*d+5*C*c^2))*(b*x^2+a)^(1/2)*InverseJacobiAM
(arctan(d^(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/a/c^(1/2)/d^(1/2)/(-a*d+b*c)
^3/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 12.26 (sec) , antiderivative size = 518, normalized size of antiderivative = 1.18

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx = \frac{\sqrt{\frac{b}{a}}\left(\sqrt{\frac{b}{a}}dx\left(-A\left(3b^3c^2(c+dx^2)^2-a^3d^3(3c+2dx^2)+ab^2cd^2x^2(8c+7d\right.\right.\right.}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(5/2)),x]
```

output
```
(Sqrt[b/a]*(Sqrt[b/a]*d*x*(-(A*(3*b^3*c^2*(c + d*x^2)^2 - a^3*d^3*(3*c + 2
*d*x^2) + a*b^2*c*d^2*x^2*(8*c + 7*d*x^2) + 2*a^2*b*d^2*(4*c^2 + 2*c*d*x^2
 - d^2*x^4))) + a*c*(a^2*d*(-3*c^2*C - 4*c*C*d*x^2 + B*d^2*x^2) + a*b*(-5*
c^3*C + B*d^3*x^4 + c*d^2*x^2*(4*B - 7*C*x^2) + 5*c^2*d*(B - 2*C*x^2)) + b
^2*c*(-(c*C*x^2*(2*c + d*x^2)) + B*(3*c^2 + 11*c*d*x^2 + 7*d^2*x^4)))) - I
*b*c*(3*A*b^2*c^2*d - a^2*d*(-7*c^2*C + B*c*d + 2*A*d^2) + a*b*c*(c^2*C -
7*B*c*d + 7*A*d^2))*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)*Sqrt[1 + (d*x^2)/c]*El
lipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - I*c*(-(b*c) + a*d)*(3*A*b^2
*c*d + 3*a^2*c*C*d + a*b*(c^2*C - 4*B*c*d + A*d^2))*Sqrt[1 + (b*x^2)/a]*(c
 + d*x^2)*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c
)]))/(3*b*c^2*d*(-(b*c) + a*d)^3*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 921 vs. 2(439) = 878.

Time = 1.65 (sec) , antiderivative size = 921, normalized size of antiderivative = 2.10, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.057, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx$$

$$\Big\downarrow \; 7293$$

$$\int \left(\frac{A}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}+\frac{Bx^2}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}+\frac{Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{Ad(3bc+ad)\sqrt{bx^2+a}x}{3ac(bc-ad)^2(dx^2+c)^{3/2}}+\frac{C(bc+3ad)\sqrt{bx^2+a}x}{3b(bc-ad)^2(dx^2+c)^{3/2}}-\frac{4Bd\sqrt{bx^2+a}x}{3(bc-ad)^2(dx^2+c)^{3/2}}+\frac{Abx}{a(bc-ad)\sqrt{bx^2+a}(dx^2+c)^{3/2}}-\frac{Bx}{(bc-ad)\sqrt{bx^2+a}(dx^2+c)^{3/2}}+\frac{aCx}{b(bc-ad)\sqrt{bx^2+a}(dx^2+c)^{3/2}}-\frac{B\sqrt{d}(7bc+ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3\sqrt{c}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}C(bc+7ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\sqrt{d}\left(3b^2c^2+7abdc-2a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3ac^{3/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Ab\sqrt{d}(9bc-ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a\sqrt{c}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C(5bc+3ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{bB\sqrt{c}(3bc+5ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(5/2)),x]
```

output
```
(A*b*x)/(a*(b*c - a*d)*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)) - (B*x)/((b*c -
a*d)*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)) + (a*C*x)/(b*(b*c - a*d)*Sqrt[a +
b*x^2]*(c + d*x^2)^(3/2)) - (4*B*d*x*Sqrt[a + b*x^2])/(3*(b*c - a*d)^2*(c
+ d*x^2)^(3/2)) + (A*d*(3*b*c + a*d)*x*Sqrt[a + b*x^2])/(3*a*c*(b*c - a*d)
^2*(c + d*x^2)^(3/2)) + (C*(b*c + 3*a*d)*x*Sqrt[a + b*x^2])/(3*b*(b*c - a*
d)^2*(c + d*x^2)^(3/2)) - (B*Sqrt[d]*(7*b*c + a*d)*Sqrt[a + b*x^2]*Ellipti
cE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*Sqrt[c]*(b*c - a*d)^3
*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c]*C*(b*c
+ 7*a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/
(a*d)])/(3*Sqrt[d]*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqr
t[c + d*x^2]) + (A*Sqrt[d]*(3*b^2*c^2 + 7*a*b*c*d - 2*a^2*d^2)*Sqrt[a + b*
x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*a*c^(3/2)
*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (A
*b*Sqrt[d]*(9*b*c - a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt
[c]], 1 - (b*c)/(a*d)])/(3*a*Sqrt[c]*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a
*(c + d*x^2))]*Sqrt[c + d*x^2]) - (Sqrt[c]*C*(5*b*c + 3*a*d)*Sqrt[a + b*x^
2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*Sqrt[d]*(b*
c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (b*B*S
qrt[c]*(3*b*c + 5*a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c
]], 1 - (b*c)/(a*d)])/(3*a*Sqrt[d]*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 10.88 (sec) , antiderivative size = 797, normalized size of antiderivative = 1.82

method	result
elliptic	$\frac{\sqrt{(b\,x^{2}+a)(x^{2}d+c)}\left(-\frac{\left(b d\,x^{2}+b c\right) x\left(b^{2} A-a b B+a^{2} C\right)}{a(a d-b c)^{3} \sqrt{\left(x^{2}+\frac{a}{b}\right)\left(b d\,x^{2}+b c\right)}}+\frac{x\left(d^{2} A-c d B+C\,c^{2}\right) \sqrt{b d\,x^{4}+a d\,x^{2}+x^{2} b c+a c}}{3 c\,d^{2}(a d-b c)^{2}\left(x^{2}+\frac{c}{d}\right)^{2}}+\frac{\left(b d\,x^{2}+a d\right) x\left(2 A a\,d^{3}-7 A b c\,d^{2}+B \cdots\right.}{3 c^{2} d(a d-b c)^{3} \sqrt{\left(x^{2} \cdots\right.}}\right.}{\cdots}$
default	Expression too large to display

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(5/2),x,method=_RETURNVERBOS
E)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(-(b*d*x^2+b*c
)/a/(a*d-b*c)^3*x*(A*b^2-B*a*b+C*a^2)/((x^2+a/b)*(b*d*x^2+b*c))^(1/2)+1/3/
c/d^2/(a*d-b*c)^2*x*(A*d^2-B*c*d+C*c^2)*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2
)/(x^2+c/d)^2+1/3*(b*d*x^2+a*d)/c^2/d/(a*d-b*c)^3*x*(2*A*a*d^3-7*A*b*c*d^2
+B*a*c*d^2+4*B*b*c^2*d-4*C*a*c^2*d-C*b*c^3)/((x^2+c/d)*(b*d*x^2+a*d))^(1/2
)+(1/(a*d-b*c)^2*(A*b^2-B*a*b+C*a^2)/a+b*c/a/(a*d-b*c)^3*(A*b^2-B*a*b+C*a^
2)+1/3*b/d*(A*d^2-B*c*d+C*c^2)/(a*d-b*c)^2/c+1/3/(a*d-b*c)^2/d*(2*A*a*d^3-
7*A*b*c*d^2+B*a*c*d^2+4*B*b*c^2*d-4*C*a*c^2*d-C*b*c^3)/c^2-1/3*a/c^2/(a*d-
b*c)^3*(2*A*a*d^3-7*A*b*c*d^2+B*a*c*d^2+4*B*b*c^2*d-4*C*a*c^2*d-C*b*c^3))/
(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+
a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(b*d*(A*b^2-
B*a*b+C*a^2)/a/(a*d-b*c)^3-1/3*b*(2*A*a*d^3-7*A*b*c*d^2+B*a*c*d^2+4*B*b*c^
2*d-4*C*a*c^2*d-C*b*c^3)/(a*d-b*c)^3/c^2)*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)
*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/
a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/
c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1634 vs. $2(411) = 822$.

Time = 0.15 (sec) , antiderivative size = 1634, normalized size of antiderivative = 3.72

$$\int \frac{A + Bx^2 + Cx^4}{(a + bx^2)^{3/2} (c + dx^2)^{5/2}} \, dx = \text{Too large to display}$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(5/2),x, algorithm="fr
icas")
```

output
```
-1/3*((C*a^2*b^3*c^5 - 2*A*a^3*b^2*c^2*d^3 + (C*a*b^4*c^3*d^2 - 2*A*a^2*b^
3*d^5 + (7*C*a^2*b^3 - 7*B*a*b^4 + 3*A*b^5)*c^2*d^3 - (B*a^2*b^3 - 7*A*a*b
^4)*c*d^4)*x^6 + (7*C*a^3*b^2 - 7*B*a^2*b^3 + 3*A*a*b^4)*c^4*d - (B*a^3*b^
2 - 7*A*a^2*b^3)*c^3*d^2 + (2*C*a*b^4*c^4*d - 2*A*a^3*b^2*d^5 + (15*C*a^2*
b^3 - 14*B*a*b^4 + 6*A*b^5)*c^3*d^2 + (7*C*a^3*b^2 - 9*B*a^2*b^3 + 17*A*a*
b^4)*c^2*d^3 - (B*a^3*b^2 - 3*A*a^2*b^3)*c*d^4)*x^4 + (C*a*b^4*c^5 - 4*A*a
^3*b^2*c*d^4 + (9*C*a^2*b^3 - 7*B*a*b^4 + 3*A*b^5)*c^4*d + (14*C*a^3*b^2 -
 15*B*a^2*b^3 + 13*A*a*b^4)*c^3*d^2 - 2*(B*a^3*b^2 - 6*A*a^2*b^3)*c^2*d^3)
*x^2)*sqrt(a*c)*sqrt(-b/a)*elliptic_e(arcsin(x*sqrt(-b/a)), a*d/(b*c)) - (
C*a^2*b^3*c^5 + (C*a*b^4*c^3*d^2 + (5*C*a^3*b^2 - (3*B - 7*C)*a^2*b^3 - 7*
B*a*b^4 + 3*A*b^5)*c^2*d^3 + (3*C*a^4*b - 5*B*a^3*b^2 + (9*A - B)*a^2*b^3
+ 7*A*a*b^4)*c*d^4 - (A*a^3*b^2 + 2*A*a^2*b^3)*d^5)*x^6 + (5*C*a^4*b - (3*
B - 7*C)*a^3*b^2 - 7*B*a^2*b^3 + 3*A*a*b^4)*c^4*d + (3*C*a^5 - 5*B*a^4*b +
 (9*A - B)*a^3*b^2 + 7*A*a^2*b^3)*c^3*d^2 - (A*a^4*b + 2*A*a^3*b^2)*c^2*d^
3 + (2*C*a*b^4*c^4*d + (10*C*a^3*b^2 - 3*(2*B - 5*C)*a^2*b^3 - 14*B*a*b^4
+ 6*A*b^5)*c^3*d^2 + (11*C*a^4*b - (13*B - 7*C)*a^3*b^2 + 9*(2*A - B)*a^2*
b^3 + 17*A*a*b^4)*c^2*d^3 + (3*C*a^5 - 5*B*a^4*b + (7*A - B)*a^3*b^2 + 3*A
*a^2*b^3)*c*d^4 - (A*a^4*b + 2*A*a^3*b^2)*d^5)*x^4 + (C*a*b^4*c^5 + (5*C*a
^3*b^2 - 3*(B - 3*C)*a^2*b^3 - 7*B*a*b^4 + 3*A*b^5)*c^4*d + (13*C*a^4*b -
(11*B - 14*C)*a^3*b^2 + 3*(3*A - 5*B)*a^2*b^3 + 13*A*a*b^4)*c^3*d^2 + (...
```

Sympy [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx=\text{Timed out}$$

input
```
integrate((C*x**4+B*x**2+A)/(b*x**2+a)**(3/2)/(d*x**2+c)**(5/2),x)
```

output
```
Timed out
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx=\int \frac{Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(5/2),x, algorithm="ma
xima")
```

output
```
integrate((C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*(d*x^2 + c)^(5/2)), x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx=\int \frac{Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(5/2),x, algorithm="gi
ac")
```

output
```
integrate((C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*(d*x^2 + c)^(5/2)), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx = \int \frac{C\,x^4+B\,x^2+A}{(b\,x^2+a)^{3/2}\,(d\,x^2+c)^{5/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(5/2)),x)
```

output
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(5/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx = \text{too large to display}$$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(5/2),x)
```

output
```
( - sqrt(c + d*x**2)*sqrt(a + b*x**2)*b*x + 2*int((sqrt(c + d*x**2)*sqrt(a
 + b*x**2)*x**4)/(a**2*c**3 + 3*a**2*c**2*d*x**2 + 3*a**2*c*d**2*x**4 + a*
*2*d**3*x**6 + 2*a*b*c**3*x**2 + 6*a*b*c**2*d*x**4 + 6*a*b*c*d**2*x**6 + 2
*a*b*d**3*x**8 + b**2*c**3*x**4 + 3*b**2*c**2*d*x**6 + 3*b**2*c*d**2*x**8
+ b**2*d**3*x**10),x)*a**2*c**3*d + 4*int((sqrt(c + d*x**2)*sqrt(a + b*x**
2)*x**4)/(a**2*c**3 + 3*a**2*c**2*d*x**2 + 3*a**2*c*d**2*x**4 + a**2*d**3*
x**6 + 2*a*b*c**3*x**2 + 6*a*b*c**2*d*x**4 + 6*a*b*c*d**2*x**6 + 2*a*b*d**
3*x**8 + b**2*c**3*x**4 + 3*b**2*c**2*d*x**6 + 3*b**2*c*d**2*x**8 + b**2*d
**3*x**10),x)*a**2*c**2*d**2*x**2 + 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**
2)*x**4)/(a**2*c**3 + 3*a**2*c**2*d*x**2 + 3*a**2*c*d**2*x**4 + a**2*d**3*
x**6 + 2*a*b*c**3*x**2 + 6*a*b*c**2*d*x**4 + 6*a*b*c*d**2*x**6 + 2*a*b*d**
3*x**8 + b**2*c**3*x**4 + 3*b**2*c**2*d*x**6 + 3*b**2*c*d**2*x**8 + b**2*d
**3*x**10),x)*a**2*c*d**3*x**4 - 3*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*
x**4)/(a**2*c**3 + 3*a**2*c**2*d*x**2 + 3*a**2*c*d**2*x**4 + a**2*d**3*x**
6 + 2*a*b*c**3*x**2 + 6*a*b*c**2*d*x**4 + 6*a*b*c*d**2*x**6 + 2*a*b*d**3*x
**8 + b**2*c**3*x**4 + 3*b**2*c**2*d*x**6 + 3*b**2*c*d**2*x**8 + b**2*d**3
*x**10),x)*a*b**2*c**2*d - 6*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/
(a**2*c**3 + 3*a**2*c**2*d*x**2 + 3*a**2*c*d**2*x**4 + a**2*d**3*x**6 + 2*
a*b*c**3*x**2 + 6*a*b*c**2*d*x**4 + 6*a*b*c*d**2*x**6 + 2*a*b*d**3*x**8 +
b**2*c**3*x**4 + 3*b**2*c**2*d*x**6 + 3*b**2*c*d**2*x**8 + b**2*d**3*x*...
```

3.21 $\int \frac{ac+2bcx^2+bdx^4}{\sqrt{a+bx^2}(c+dx^2)^{3/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 24

$$\int \frac{ac+2bcx^2+bdx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \frac{x\sqrt{a+bx^2}}{\sqrt{c+dx^2}}$$

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

Mathematica [A] (verified)

Time = 10.15 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.00

$$\int \frac{ac+2bcx^2+bdx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \frac{x\sqrt{a+bx^2}}{\sqrt{c+dx^2}}$$

input
```
Integrate[(a*c + 2*b*c*x^2 + b*d*x^4)/(Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)),
x]
```

output
```
(x*Sqrt[a + b*x^2])/Sqrt[c + d*x^2]
```

Rubi [A] (verified)

Time = 0.21 (sec) , antiderivative size = 24, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.025$, Rules used = {2023}

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.

$$\int \frac{ac+2bcx^2+bdx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx$$
$$\Big\downarrow \ 2023$$
$$\frac{x\sqrt{a+bx^2}}{\sqrt{c+dx^2}}$$

input
```
Int[(a*c + 2*b*c*x^2 + b*d*x^4)/(Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)),x]
```

output
```
(x*Sqrt[a + b*x^2])/Sqrt[c + d*x^2]
```

Defintions of rubi rules used

rule 2023
```
Int[(Pp_)*(Qq_)^(m_.)*(Rr_)^(n_.), x_Symbol] :> With[{p = Expon[Pp, x], q =
 Expon[Qq, x], r = Expon[Rr, x]}, Simp[Coeff[Pp, x, p]*x^(p - q - r + 1)*Qq
^(m + 1)*(Rr^(n + 1)/((p + m*q + n*r + 1)*Coeff[Qq, x, q]*Coeff[Rr, x, r]))
, x] /; NeQ[p + m*q + n*r + 1, 0] && EqQ[(p + m*q + n*r + 1)*Coeff[Qq, x, q
]*Coeff[Rr, x, r]*Pp, Coeff[Pp, x, p]*x^(p - q - r)*((p - q - r + 1)*Qq*Rr
+ (m + 1)*x*Rr*D[Qq, x] + (n + 1)*x*Qq*D[Rr, x])]] /; FreeQ[{m, n}, x] && P
olyQ[Pp, x] && PolyQ[Qq, x] && PolyQ[Rr, x] && NeQ[m, -1] && NeQ[n, -1]
```

Maple [A] (verified)

Time = 5.54 (sec) , antiderivative size = 21, normalized size of antiderivative = 0.88

method	result	size
gosper	$\frac{x\sqrt{b\,x^2+a}}{\sqrt{x^2d+c}}$	21
default	$\frac{x\sqrt{b\,x^2+a}}{\sqrt{x^2d+c}}$	21
orering	$\frac{x\sqrt{b\,x^2+a}}{\sqrt{x^2d+c}}$	21
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(\frac{\left(bd\,x^2+ad\right)x}{d\sqrt{\left(x^2+\frac{c}{d}\right)\left(bd\,x^2+ad\right)}}+\frac{\left(\frac{bc}{d}+\frac{ad-bc}{d}-a\right)\sqrt{1+\frac{b\,x^2}{a}}\,\sqrt{1+\frac{d\,x^2}{c}}\,\operatorname{EllipticF}\left(x\sqrt{-\frac{b}{a}},\sqrt{-1+\frac{ad+bc}{cb}}\right)}{\sqrt{-\frac{b}{a}}\,\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}\right)}{\sqrt{b\,x^2+a}\,\sqrt{x^2d+c}}$	183

input
```
int((b*d*x^4+2*b*c*x^2+a*c)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x,method=_RETU
RNVERBOSE)
```

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

Fricas [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.83

$$\int \frac{ac+2bcx^2+bdx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx=\frac{\sqrt{bx^2+a}x}{\sqrt{dx^2+c}}$$

input
```
integrate((b*d*x^4+2*b*c*x^2+a*c)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x, algor
ithm="fricas")
```

output
```
sqrt(b*x^2 + a)*x/sqrt(d*x^2 + c)
```

Sympy [F]

$$\int \frac{ac + 2bcx^2 + bdx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{3/2}}\,dx = \int \frac{ac + 2bcx^2 + bdx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*d*x**4+2*b*c*x**2+a*c)/(b*x**2+a)**(1/2)/(d*x**2+c)**(3/2),x)
```

output
```
Integral((a*c + 2*b*c*x**2 + b*d*x**4)/(sqrt(a + b*x**2)*(c + d*x**2)**(3/
2)), x)
```

Maxima [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 28, normalized size of antiderivative = 1.17

$$\int \frac{ac + 2bcx^2 + bdx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{3/2}}\,dx = \frac{bx^3 + ax}{\sqrt{bx^2 + a}\sqrt{dx^2 + c}}$$

input
```
integrate((b*d*x^4+2*b*c*x^2+a*c)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x, algor
ithm="maxima")
```

output
```
(b*x^3 + a*x)/(sqrt(b*x^2 + a)*sqrt(d*x^2 + c))
```

Giac [F]

$$\int \frac{ac + 2bcx^2 + bdx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{3/2}}\,dx = \int \frac{bdx^4 + 2\,bcx^2 + ac}{\sqrt{bx^2 + a}(dx^2 + c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*d*x^4+2*b*c*x^2+a*c)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x, algor
ithm="giac")
```

output
```
integrate((b*d*x^4 + 2*b*c*x^2 + a*c)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(3/2)),
 x)
```

Mupad [B] (verification not implemented)

Time = 1.63 (sec) , antiderivative size = 20, normalized size of antiderivative = 0.83

$$\int \frac{ac + 2bcx^2 + bdx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{3/2}}\,dx = \frac{x\sqrt{b\,x^2 + a}}{\sqrt{d\,x^2 + c}}$$

input
```
int((a*c + 2*b*c*x^2 + b*d*x^4)/((a + b*x^2)^(1/2)*(c + d*x^2)^(3/2)),x)
```

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

Reduce [B] (verification not implemented)

Time = 0.23 (sec) , antiderivative size = 27, normalized size of antiderivative = 1.12

$$\int \frac{ac + 2bcx^2 + bdx^4}{\sqrt{a + bx^2}\,(c + dx^2)^{3/2}}\,dx = \frac{\sqrt{d\,x^2 + c}\,\sqrt{b\,x^2 + a}\,x}{d\,x^2 + c}$$

input
```
int((b*d*x^4+2*b*c*x^2+a*c)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x)
```

output
```
(sqrt(c + d*x**2)*sqrt(a + b*x**2)*x)/(c + d*x**2)
```

3.22 $\int \frac{ac+2bcx^2+bdx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 220

$$\int \frac{ac+2bcx^2+bdx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx = -\frac{x}{\sqrt{a+bx^2}\sqrt{c+dx^2}} - \frac{2\sqrt{c}\sqrt{d}\sqrt{a+bx^2}\,E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}} + \frac{2bc^{3/2}\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output

```
-x/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)-2*c^(1/2)*d^(1/2)*(b*x^2+a)^(1/2)*Ellip
ticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/(-a*d+b*c)/(c*
(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)+2*b*c^(3/2)*(b*x^2+a)^(1/2)*I
nverseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/a/d^(1/2)/(-a*
d+b*c)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [A] (verified)

Time = 10.29 (sec) , antiderivative size = 145, normalized size of antiderivative = 0.66

$$\int \frac{ac+2bcx^2+bdx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx = \frac{\sqrt{-\frac{b}{a}}x\sqrt{1+\frac{dx^2}{c}}(ad+b(c+2dx^2))-2b\sqrt{1+\frac{bx^2}{a}}(c+dx^2)\,E\Big(\arcsin\Big(\sqrt{}}{\sqrt{-\frac{b}{a}}(-bc+ad)\sqrt{a+bx^2}\sqrt{c+dx^2}\sqrt{1+\frac{dx^2}{c}}}$$

input
```
Integrate[(a*c + 2*b*c*x^2 + b*d*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)
),x]
```

output
```
(Sqrt[-(b/a)]*x*Sqrt[1 + (d*x^2)/c]*(a*d + b*(c + 2*d*x^2)) - 2*b*Sqrt[1 +
 (b*x^2)/a]*(c + d*x^2)*EllipticE[ArcSin[Sqrt[-(b/a)]*x], (a*d)/(b*c)])/(S
qrt[-(b/a)]*(-(b*c) + a*d)*Sqrt[a + b*x^2]*Sqrt[c + d*x^2]*Sqrt[1 + (d*x^2
)/c])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 474 vs. 2(220) = 440.

Time = 1.08 (sec) , antiderivative size = 474, normalized size of antiderivative = 2.15, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{ac+2bcx^2+bdx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{2bcx^2}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}+\frac{ac}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}+\frac{bdx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{2bc^{3/2}\sqrt{a+bx^2}(ad+bc)\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}} - \frac{4bc^{3/2}\sqrt{d}\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}} - \frac{4bc^{3/2}\sqrt{d}\sqrt{a+bx^2}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}} + \frac{2\sqrt{c}\sqrt{d}\sqrt{a+bx^2}(ad+bc)E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{\sqrt{c+dx^2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}} - \frac{bcx}{\sqrt{a+bx^2}\sqrt{c+dx^2}(bc-ad)} + \frac{adx}{\sqrt{a+bx^2}\sqrt{c+dx^2}(bc-ad)}$$

input
```
Int[(a*c + 2*b*c*x^2 + b*d*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)),x]
```

output
```
-((b*c*x)/((b*c - a*d)*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])) + (a*d*x)/((b*c -
 a*d)*Sqrt[a + b*x^2]*Sqrt[c + d*x^2]) - (4*b*c^(3/2)*Sqrt[d]*Sqrt[a + b*x
^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/((b*c - a*d)^
2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (2*Sqrt[c]*Sqrt
[d]*(b*c + a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 -
 (b*c)/(a*d)])/((b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c
 + d*x^2]) - (4*b*c^(3/2)*Sqrt[d]*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d
]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/((b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c
 + d*x^2))]*Sqrt[c + d*x^2]) + (2*b*c^(3/2)*(b*c + a*d)*Sqrt[a + b*x^2]*El
lipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*Sqrt[d]*(b*c - a
*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2])
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 8.12 (sec) , antiderivative size = 154, normalized size of antiderivative = 0.70

method	result
default	$\frac{\left(2\sqrt{-\frac{b}{a}}\, bd\, x^{3}-2\sqrt{\frac{b\, x^{2}+a}{a}}\, \sqrt{\frac{x^{2} d+c}{c}}\, \operatorname{EllipticE}\left(x\sqrt{-\frac{b}{a}}, \sqrt{\frac{ad}{bc}}\right) bc+\sqrt{-\frac{b}{a}}\, adx+\sqrt{-\frac{b}{a}}\, bcx\right) \sqrt{x^{2} d+c}\, \sqrt{b\, x^{2}+a}}{\sqrt{-\frac{b}{a}}\, (ad-bc)(bd\, x^{4}+ad\, x^{2}+x^{2} bc+ac)}$
elliptic	$\frac{\sqrt{(b\, x^{2}+a)(x^{2} d+c)}\, \left(-\frac{2bd\left(-\frac{x^{3}}{ad-bc}-\frac{(ad+bc)x}{2(ad-bc)bd}\right)}{\sqrt{\left(x^{4}+\frac{(ad+bc)x^{2}}{db}+\frac{ac}{db}\right)bd}}+\frac{\left(1-\frac{ad+bc}{ad-bc}\right)\sqrt{1+\frac{b\, x^{2}}{a}}\, \sqrt{1+\frac{d\, x^{2}}{c}}\, \operatorname{EllipticF}\left(x\sqrt{-\frac{b}{a}}, \sqrt{-1+\frac{ad+bc}{cb}}\right)}{\sqrt{-\frac{b}{a}}\, \sqrt{bd\, x^{4}+ad\, x^{2}+x^{2} bc+ac}}+\frac{2bc\sqrt{1+\frac{b\, x^{2}}{a}}\, \sqrt{1}}{}\right.}{\sqrt{b\, x^{2}+a}\, \sqrt{x^{2} d+c}}$

input
```
int((b*d*x^4+2*b*c*x^2+a*c)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x,method=_RETU
RNVERBOSE)
```

output
```
(2*(-b/a)^(1/2)*b*d*x^3-2*((b*x^2+a)/a)^(1/2)*((d*x^2+c)/c)^(1/2)*Elliptic
E(x*(-b/a)^(1/2),(a*d/b/c)^(1/2))*b*c+(-b/a)^(1/2)*a*d*x+(-b/a)^(1/2)*b*c*
x)*(d*x^2+c)^(1/2)*(b*x^2+a)^(1/2)/(-b/a)^(1/2)/(a*d-b*c)/(b*d*x^4+a*d*x^2
+b*c*x^2+a*c)
```

Fricas [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 247, normalized size of antiderivative = 1.12

$$\int \frac{ac+2bcx^2+bdx^4}{(a+bx^2)^{3/2}\,(c+dx^2)^{3/2}}\,dx = \frac{2\,(b^2dx^4+abc+(b^2c+abd)x^2)\sqrt{ac}\sqrt{-\frac{b}{a}}E(\arcsin\left(x\sqrt{-\frac{b}{a}}\right)\mid\frac{ad}{bc})-2\,((a}{}$$

input
```
integrate((b*d*x^4+2*b*c*x^2+a*c)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x, algor
ithm="fricas")
```

output
```
(2*(b^2*d*x^4 + a*b*c + (b^2*c + a*b*d)*x^2)*sqrt(a*c)*sqrt(-b/a)*elliptic
_e(arcsin(x*sqrt(-b/a)), a*d/(b*c)) - 2*((a*b + b^2)*d*x^4 + ((a*b + b^2)*
c + (a^2 + a*b)*d)*x^2 + (a^2 + a*b)*c)*sqrt(a*c)*sqrt(-b/a)*elliptic_f(ar
csin(x*sqrt(-b/a)), a*d/(b*c)) - (2*a*b*d*x^3 + (a*b*c + a^2*d)*x)*sqrt(b*
x^2 + a)*sqrt(d*x^2 + c))/(a^2*b*c^2 - a^3*c*d + (a*b^2*c*d - a^2*b*d^2)*x
^4 + (a*b^2*c^2 - a^3*d^2)*x^2)
```

Sympy [F]

$$\int \frac{ac + 2bcx^2 + bdx^4}{(a + bx^2)^{3/2}\,(c + dx^2)^{3/2}}\,dx = \int \frac{ac + 2bcx^2 + bdx^4}{(a + bx^2)^{\frac{3}{2}}\,(c + dx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*d*x**4+2*b*c*x**2+a*c)/(b*x**2+a)**(3/2)/(d*x**2+c)**(3/2),x)
```

output
```
Integral((a*c + 2*b*c*x**2 + b*d*x**4)/((a + b*x**2)**(3/2)*(c + d*x**2)**
(3/2)), x)
```

Maxima [F]

$$\int \frac{ac + 2bcx^2 + bdx^4}{(a + bx^2)^{3/2}\,(c + dx^2)^{3/2}}\,dx = \int \frac{bdx^4 + 2\,bcx^2 + ac}{(bx^2 + a)^{\frac{3}{2}}(dx^2 + c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*d*x^4+2*b*c*x^2+a*c)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x, algor
ithm="maxima")
```

output
```
integrate((b*d*x^4 + 2*b*c*x^2 + a*c)/((b*x^2 + a)^(3/2)*(d*x^2 + c)^(3/2)
), x)
```

Giac [F]

$$\int \frac{ac + 2bcx^2 + bdx^4}{(a + bx^2)^{3/2}\,(c + dx^2)^{3/2}}\,dx = \int \frac{bdx^4 + 2\,bcx^2 + ac}{(bx^2 + a)^{\frac{3}{2}}(dx^2 + c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*d*x^4+2*b*c*x^2+a*c)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x, algor
ithm="giac")
```

output
```
integrate((b*d*x^4 + 2*b*c*x^2 + a*c)/((b*x^2 + a)^(3/2)*(d*x^2 + c)^(3/2)
), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{ac+2bcx^2+bdx^4}{(a+bx^2)^{3/2}\,(c+dx^2)^{3/2}}\,dx=\int \frac{b\,d\,x^4+2\,b\,c\,x^2+a\,c}{(b\,x^2+a)^{3/2}\,(d\,x^2+c)^{3/2}}\,dx$$

input
```
int((a*c + 2*b*c*x^2 + b*d*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)),x)
```

output
```
int((a*c + 2*b*c*x^2 + b*d*x^4)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)), x)
```

Reduce [F]

$$\int \frac{ac+2bcx^2+bdx^4}{(a+bx^2)^{3/2}\,(c+dx^2)^{3/2}}\,dx=\frac{-\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,x+2\left(\int \frac{\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}}{b\,d^2x^6+a\,d^2x^4+2bcd\,x^4+2acd\,x^2+b\,c^2x^2+a\,c^2}dx\right)a\,c}{}$$

input
```
int((b*d*x^4+2*b*c*x^2+a*c)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x)
```

output
```
( - sqrt(c + d*x**2)*sqrt(a + b*x**2)*x + 2*int((sqrt(c + d*x**2)*sqrt(a +
 b*x**2))/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**
4 + b*d**2*x**6),x)*a*c**2 + 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*
c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x*
*6),x)*a*c*d*x**2 + 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c**2 + 2*
a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*b*
c**2*x**2 + 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c**2 + 2*a*c*d*x*
*2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*b*c*d*x**4
)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4)
```

3.23 $\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}(c-dx^2)^{3/2}}\,dx$

Optimal result

Integrand size = 36, antiderivative size = 279

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}(c-dx^2)^{3/2}}\,dx=\frac{(c^2C+Bcd+Ad^2)\,x\sqrt{a+bx^2}}{cd(bc+ad)\sqrt{c-dx^2}}-\frac{(acCd+b(2c^2C+Bcd+Ad^2))\sqrt{a+bx^2}\sqrt{1-\frac{dx^2}{c}}E\left(\arcsin\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|-\frac{bc}{ad}\right)}{b\sqrt{c}d^{3/2}(bc+ad)\sqrt{1+\frac{bx^2}{a}}\sqrt{c-dx^2}}+\frac{(acC+Abd)\sqrt{1+\frac{bx^2}{a}}\sqrt{1-\frac{dx^2}{c}}\,\text{EllipticF}\left(\arcsin\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),-\frac{bc}{ad}\right)}{b\sqrt{c}d^{3/2}\sqrt{a+bx^2}\sqrt{c-dx^2}}$$

output
```
(A*d^2+B*c*d+C*c^2)*x*(b*x^2+a)^(1/2)/c/d/(a*d+b*c)/(-d*x^2+c)^(1/2)-(a*c*
C*d+b*(A*d^2+B*c*d+2*C*c^2))*(b*x^2+a)^(1/2)*(1-d*x^2/c)^(1/2)*EllipticE(d
^(1/2)*x/c^(1/2),(-b*c/a/d)^(1/2))/b/c^(1/2)/d^(3/2)/(a*d+b*c)/(1+b*x^2/a)
^(1/2)/(-d*x^2+c)^(1/2)+(A*b*d+C*a*c)*(1+b*x^2/a)^(1/2)*(1-d*x^2/c)^(1/2)*
EllipticF(d^(1/2)*x/c^(1/2),(-b*c/a/d)^(1/2))/b/c^(1/2)/d^(3/2)/(b*x^2+a)^
(1/2)/(-d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 10.72 (sec) , antiderivative size = 244, normalized size of antiderivative = 0.87

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}d(c^2C+Bcd+Ad^2)\,x(a+bx^2)-ic(acCd+b(2c^2C+Bcd+Ad^2))\sqrt{}}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4)/(Sqrt[a + b*x^2]*(c - d*x^2)^(3/2)),x]
```

output
```
(Sqrt[b/a]*d*(c^2*C + B*c*d + A*d^2)*x*(a + b*x^2) - I*c*(a*c*C*d + b*(2*c
^2*C + B*c*d + A*d^2))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 - (d*x^2)/c]*EllipticE[I
*ArcSinh[Sqrt[b/a]*x], -((a*d)/(b*c))] + I*c*(b*c + a*d)*(2*c*C + B*d)*Sqr
t[1 + (b*x^2)/a]*Sqrt[1 - (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], -((
a*d)/(b*c))])/(Sqrt[b/a]*c*d^2*(b*c + a*d)*Sqrt[a + b*x^2]*Sqrt[c - d*x^2]
)
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 599 vs. 2(279) = 558.

Time = 1.25 (sec) , antiderivative size = 599, normalized size of antiderivative = 2.15, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.056, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}\,dx$$

$$\Big\downarrow \text{ 7293}$$

$$\int \left(\frac{A}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}+\frac{Bx^2}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}+\frac{Cx^4}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}\right)dx$$

$$\Big\downarrow \text{ 2009}$$

$$\frac{A\sqrt{\frac{bx^2}{a}+1}\sqrt{1-\frac{dx^2}{c}}\,\text{EllipticF}\left(\arcsin\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),-\frac{bc}{ad}\right)}{\sqrt{c}\sqrt{d}\sqrt{a+bx^2}\sqrt{c-dx^2}}-\frac{A\sqrt{d}\sqrt{a+bx^2}\sqrt{1-\frac{dx^2}{c}}E\left(\arcsin\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|-\frac{bc}{ad}\right)}{\sqrt{c}\sqrt{\frac{bx^2}{a}+1}\sqrt{c-dx^2}(ad+bc)}+\frac{Adx\sqrt{a+bx^2}}{c\sqrt{c-dx^2}(ad+bc)}-\frac{B\sqrt{c}\sqrt{a+bx^2}\sqrt{1-\frac{dx^2}{c}}E\left(\arcsin\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|-\frac{bc}{ad}\right)}{\sqrt{d}\sqrt{\frac{bx^2}{a}+1}\sqrt{c-dx^2}(ad+bc)}+\frac{a\sqrt{c}C\sqrt{\frac{bx^2}{a}+1}\sqrt{1-\frac{dx^2}{c}}\,\text{EllipticF}\left(\arcsin\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),-\frac{bc}{ad}\right)}{bd^{3/2}\sqrt{a+bx^2}\sqrt{c-dx^2}}-\frac{\sqrt{c}C\sqrt{a+bx^2}\sqrt{1-\frac{dx^2}{c}}(ad+2bc)E\left(\arcsin\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|-\frac{bc}{ad}\right)}{bd^{3/2}\sqrt{\frac{bx^2}{a}+1}\sqrt{c-dx^2}(ad+bc)}+\frac{Bx\sqrt{a+bx^2}}{\sqrt{c-dx^2}(ad+bc)}+\frac{cCx\sqrt{a+bx^2}}{d\sqrt{c-dx^2}(ad+bc)}$$

input
```
Int[(A + B*x^2 + C*x^4)/(Sqrt[a + b*x^2]*(c - d*x^2)^(3/2)),x]
```

output
```
(B*x*Sqrt[a + b*x^2])/((b*c + a*d)*Sqrt[c - d*x^2]) + (c*C*x*Sqrt[a + b*x^
2])/(d*(b*c + a*d)*Sqrt[c - d*x^2]) + (A*d*x*Sqrt[a + b*x^2])/(c*(b*c + a*
d)*Sqrt[c - d*x^2]) - (B*Sqrt[c]*Sqrt[a + b*x^2]*Sqrt[1 - (d*x^2)/c]*Ellip
ticE[ArcSin[(Sqrt[d]*x)/Sqrt[c]], -((b*c)/(a*d))])/(Sqrt[d]*(b*c + a*d)*Sq
rt[1 + (b*x^2)/a]*Sqrt[c - d*x^2]) - (A*Sqrt[d]*Sqrt[a + b*x^2]*Sqrt[1 - (
d*x^2)/c]*EllipticE[ArcSin[(Sqrt[d]*x)/Sqrt[c]], -((b*c)/(a*d))])/(Sqrt[c]
*(b*c + a*d)*Sqrt[1 + (b*x^2)/a]*Sqrt[c - d*x^2]) - (Sqrt[c]*C*(2*b*c + a*
d)*Sqrt[a + b*x^2]*Sqrt[1 - (d*x^2)/c]*EllipticE[ArcSin[(Sqrt[d]*x)/Sqrt[c
]], -((b*c)/(a*d))])/(b*d^(3/2)*(b*c + a*d)*Sqrt[1 + (b*x^2)/a]*Sqrt[c - d
*x^2]) + (a*Sqrt[c]*C*Sqrt[1 + (b*x^2)/a]*Sqrt[1 - (d*x^2)/c]*EllipticF[Ar
cSin[(Sqrt[d]*x)/Sqrt[c]], -((b*c)/(a*d))])/(b*d^(3/2)*Sqrt[a + b*x^2]*Sqr
t[c - d*x^2]) + (A*Sqrt[1 + (b*x^2)/a]*Sqrt[1 - (d*x^2)/c]*EllipticF[ArcSi
n[(Sqrt[d]*x)/Sqrt[c]], -((b*c)/(a*d))])/(Sqrt[c]*Sqrt[d]*Sqrt[a + b*x^2]*
Sqrt[c - d*x^2])
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 6.35 (sec) , antiderivative size = 434, normalized size of antiderivative = 1.56

method	result
elliptic	$\frac{\sqrt{(-x^2d+c)(b\,x^2+a)}\left(-\frac{\left(-bd\,x^2-ad\right)x\left(d^2A+cdB+C\,c^2\right)}{c\,d^2(ad+bc)\sqrt{\left(x^2-\frac{c}{d}\right)\left(-bd\,x^2-ad\right)}}+\frac{\left(-\frac{Bd+Cc}{d^2}+\frac{d^2A+cdB+C\,c^2}{d^2c}-\frac{a\left(d^2A+cdB+C\,c^2\right)}{dc(ad+bc)}\right)\sqrt{1-\frac{d\,x^2}{c}}\,\sqrt{1+\frac{b\,x^2}{a}}\ \mathrm{E}}{\sqrt{\frac{d}{c}}\,\sqrt{-bd\,x^4-ad\,x^2+x^2bc+ac}}\right.}{\sqrt{}}$
default	$\frac{\left(A\sqrt{\frac{d}{c}}\,b^2d^2x^3+B\sqrt{\frac{d}{c}}\,b^2cd\,x^3+C\sqrt{\frac{d}{c}}\,b^2c^2x^3+A\sqrt{\frac{-x^2d+c}{c}}\,\sqrt{\frac{b\,x^2+a}{a}}\ \mathrm{EllipticF}\left(x\sqrt{\frac{d}{c}},\sqrt{-\frac{bc}{ad}}\right)ab\,d^2+A\sqrt{\frac{-x^2d+c}{c}}\,\sqrt{\frac{b\,x^2+a}{a}}\ \mathrm{Ellip}\right.}{}$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(-d*x^2+c)^(3/2),x,method=_RETURNVERBO
SE)
```

output
```
((-d*x^2+c)*(b*x^2+a))^(1/2)/(-d*x^2+c)^(1/2)/(b*x^2+a)^(1/2)*(-(-b*d*x^2-
a*d)/c/d^2/(a*d+b*c)*x*(A*d^2+B*c*d+C*c^2)/((x^2-c/d)*(-b*d*x^2-a*d))^(1/2
)+(-(B*d+C*c)/d^2+(A*d^2+B*c*d+C*c^2)/d^2/c-a/d/c/(a*d+b*c)*(A*d^2+B*c*d+C
*c^2))/(1/c*d)^(1/2)*(1-d*x^2/c)^(1/2)*(1+b*x^2/a)^(1/2)/(-b*d*x^4-a*d*x^2
+b*c*x^2+a*c)^(1/2)*EllipticF(x*(1/c*d)^(1/2),(-1-(-a*d+b*c)/a/d)^(1/2))-(
-C/d-(A*d^2+B*c*d+C*c^2)/d/(a*d+b*c)*b/c)*a/(1/c*d)^(1/2)*(1-d*x^2/c)^(1/2
)*(1+b*x^2/a)^(1/2)/(-b*d*x^4-a*d*x^2+b*c*x^2+a*c)^(1/2)/b*(EllipticF(x*(1
/c*d)^(1/2),(-1-(-a*d+b*c)/a/d)^(1/2))-EllipticE(x*(1/c*d)^(1/2),(-1-(-a*d
+b*c)/a/d)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 367, normalized size of antiderivative = 1.32

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}\,dx = \frac{((2\,Cbc^3d+Abcd^3+(Ca+Bb)c^2d^2)x^3-(2\,Cbc^4+Abc^2d^2+(Ca+Bb)c^3}{}$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(-d*x^2+c)^(3/2),x, algorithm="f
ricas")
```

output
```
(((2*C*b*c^3*d + A*b*c*d^3 + (C*a + B*b)*c^2*d^2)*x^3 - (2*C*b*c^4 + A*b*c
^2*d^2 + (C*a + B*b)*c^3*d)*x)*sqrt(-b*d)*sqrt(c/d)*elliptic_e(arcsin(sqrt
(c/d)/x), -a*d/(b*c)) - ((2*C*b*c^3*d + (C*a + B*b)*c^2*d^2 + (C*a + A*b)*
c*d^3 + (B*a - A*b)*d^4)*x^3 - (2*C*b*c^4 + (C*a + B*b)*c^3*d + (C*a + A*b
)*c^2*d^2 + (B*a - A*b)*c*d^3)*x)*sqrt(-b*d)*sqrt(c/d)*elliptic_f(arcsin(s
qrt(c/d)/x), -a*d/(b*c)) - (2*C*b*c^3*d + A*b*c*d^3 + (C*a + B*b)*c^2*d^2
- (C*b*c^2*d^2 + C*a*c*d^3)*x^2)*sqrt(b*x^2 + a)*sqrt(-d*x^2 + c))/((b^2*c
^2*d^4 + a*b*c*d^5)*x^3 - (b^2*c^3*d^3 + a*b*c^2*d^4)*x)
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}\,dx = \int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c-dx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((C*x**4+B*x**2+A)/(b*x**2+a)**(1/2)/(-d*x**2+c)**(3/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4)/(sqrt(a + b*x**2)*(c - d*x**2)**(3/2)), x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}\,dx = \int \frac{Cx^4+Bx^2+A}{\sqrt{bx^2+a}(-dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(-d*x^2+c)^(3/2),x, algorithm="m
axima")
```

output
```
integrate((C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(-d*x^2 + c)^(3/2)), x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}\,dx = \int \frac{Cx^4+Bx^2+A}{\sqrt{bx^2+a}(-dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(-d*x^2+c)^(3/2),x, algorithm="g
iac")
```

output
```
integrate((C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(-d*x^2 + c)^(3/2)), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}\,dx = \int \frac{C\,x^4+B\,x^2+A}{\sqrt{b\,x^2+a}\,(c-d\,x^2)^{3/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(1/2)*(c - d*x^2)^(3/2)),x)
```

output
```
int((A + B*x^2 + C*x^4)/((a + b*x^2)^(1/2)*(c - d*x^2)^(3/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4}{\sqrt{a+bx^2}\,(c-dx^2)^{3/2}}\,dx = \frac{\sqrt{-d\,x^2+c}\,\sqrt{b\,x^2+a}\,x+\left(\int \frac{\sqrt{-d\,x^2+c}\,\sqrt{b\,x^2+a}\,x^4}{b\,d^2x^6+a\,d^2x^4-2bcd\,x^4-2acd\,x^2+b\,c^2x^2+a\,c^2}dx\right)bcd-}{}$$

input
```
int((C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(-d*x^2+c)^(3/2),x)
```

output
```
(sqrt(c - d*x**2)*sqrt(a + b*x**2)*x + int((sqrt(c - d*x**2)*sqrt(a + b*x*
*2)*x**4)/(a*c**2 - 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 - 2*b*c*d*x**
4 + b*d**2*x**6),x)*b*c*d - int((sqrt(c - d*x**2)*sqrt(a + b*x**2)*x**4)/(
a*c**2 - 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 - 2*b*c*d*x**4 + b*d**2*
x**6),x)*b*d**2*x**2 + 2*int((sqrt(c - d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c
**2 - 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 - 2*b*c*d*x**4 + b*d**2*x**
6),x)*c**3 - 2*int((sqrt(c - d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 - 2*a*
c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 - 2*b*c*d*x**4 + b*d**2*x**6),x)*c**2
*d*x**2 + int((sqrt(c - d*x**2)*sqrt(a + b*x**2))/(a*c**2 - 2*a*c*d*x**2 +
 a*d**2*x**4 + b*c**2*x**2 - 2*b*c*d*x**4 + b*d**2*x**6),x)*a*c**2 - int((
sqrt(c - d*x**2)*sqrt(a + b*x**2))/(a*c**2 - 2*a*c*d*x**2 + a*d**2*x**4 +
b*c**2*x**2 - 2*b*c*d*x**4 + b*d**2*x**6),x)*a*c*d*x**2)/(2*c*(c - d*x**2)
)
```

3.24 $\int \sqrt{a+bx^2}(c+dx^2)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx$

Optimal result

Integrand size = 40, antiderivative size = 1097

$$\int \sqrt{a+bx^2}(c+dx^2)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx = \text{Too large to display}$$

output
```
1/3465*(128*a^5*d^5*D-8*a^4*b*d^4*(22*C*d+29*D*c)+a^3*b^2*d^3*(264*B*d^2+3
52*C*c*d+51*D*c^2)+b^5*c^2*(693*A*d^3-198*B*c*d^2+88*C*c^2*d-48*D*c^3)-a*b
^4*c*d*(-1617*A*d^3-297*B*c*d^2+77*C*c^2*d-32*D*c^3)-a^2*b^3*d^2*(462*A*d^
3+627*B*c*d^2+99*C*c^2*d-29*D*c^3))*x*(d*x^2+c)^(1/2)/b^4/d^4/(b*x^2+a)^(1
/2)-1/3465*(64*a^4*d^4*D-4*a^3*b*d^3*(22*C*d+27*D*c)+3*a^2*b^2*d^2*(44*B*d
^2+55*C*c*d+5*D*c^2)+b^4*c*(-1386*A*d^3-99*B*c*d^2+44*C*c^2*d-24*D*c^3)-a*
b^3*d*(231*A*d^3+297*B*c*d^2+33*C*c^2*d-13*D*c^3))*x*(b*x^2+a)^(1/2)*(d*x^
2+c)^(1/2)/b^4/d^3+1/3465*(48*a^3*d^3*D-a^2*b*d^2*(66*C*d+79*D*c)+a*b^2*d*
(99*B*d^2+121*C*c*d+9*D*c^2)+b^3*(693*A*d^3+792*B*c*d^2+33*C*c^2*d-18*D*c^
3))*x^3*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b^3/d^2-1/693*(8*a^2*d^2*D-a*b*d*(
11*C*d+13*D*c)-b^2*(99*B*d^2+110*C*c*d+3*D*c^2))*x^5*(b*x^2+a)^(1/2)*(d*x^
2+c)^(1/2)/b^2/d+1/99*(11*C*b*d+D*a*d+12*D*b*c)*x^7*(b*x^2+a)^(1/2)*(d*x^2
+c)^(1/2)/b+1/11*d*D*x^9*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)-1/3465*a^(1/2)*(1
28*a^5*d^5*D-8*a^4*b*d^4*(22*C*d+29*D*c)+a^3*b^2*d^3*(264*B*d^2+352*C*c*d+
51*D*c^2)+b^5*c^2*(693*A*d^3-198*B*c*d^2+88*C*c^2*d-48*D*c^3)-a*b^4*c*d*(-
1617*A*d^3-297*B*c*d^2+77*C*c^2*d-32*D*c^3)-a^2*b^3*d^2*(462*A*d^3+627*B*c
*d^2+99*C*c^2*d-29*D*c^3))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+
b*x^2/a)^(1/2),(1-a*d/b/c)^(1/2))/b^(9/2)/d^4/(b*x^2+a)^(1/2)/(a*(d*x^2+c)
/c/(b*x^2+a))^(1/2)+1/3465*a^(3/2)*(64*a^4*d^4*D-4*a^3*b*d^3*(22*C*d+27*D*
c)+3*a^2*b^2*d^2*(44*B*d^2+55*C*c*d+5*D*c^2)+b^4*c*(2079*A*d^3-99*B*c*d...
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 10.85 (sec) , antiderivative size = 4070, normalized size of antiderivative = 3.71

$$\int \sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx = \text{Result too large to show}$$

input
```
Integrate[Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6),x]
```

output
```
Sqrt[a + b*x^2]*Sqrt[c + d*x^2]*(((-44*b^4*c^3*C*d + 99*b^4*B*c^2*d^2 + 33
*a*b^3*c^2*C*d^2 + 1386*A*b^4*c*d^3 + 297*a*b^3*B*c*d^3 - 165*a^2*b^2*c*C*
d^3 + 231*a*A*b^3*d^4 - 132*a^2*b^2*B*d^4 + 88*a^3*b*C*d^4 + 24*b^4*c^4*D
- 13*a*b^3*c^3*d*D - 15*a^2*b^2*c^2*d^2*D + 108*a^3*b*c*d^3*D - 64*a^4*d^4
*D)*x)/(3465*b^4*d^3) + ((33*b^3*c^2*C*d + 792*b^3*B*c*d^2 + 121*a*b^2*c*C
*d^2 + 693*A*b^3*d^3 + 99*a*b^2*B*d^3 - 66*a^2*b*C*d^3 - 18*b^3*c^3*D + 9*
a*b^2*c^2*d*D - 79*a^2*b*c*d^2*D + 48*a^3*d^3*D)*x^3)/(3465*b^3*d^2) + ((1
10*b^2*c*C*d + 99*b^2*B*d^2 + 11*a*b*C*d^2 + 3*b^2*c^2*D + 13*a*b*c*d*D -
8*a^2*d^2*D)*x^5)/(693*b^2*d) + ((11*b*C*d + 12*b*c*D + a*d*D)*x^7)/(99*b)
 + (d*D*x^9)/11) + (Sqrt[(a + b*x^2)*(c + d*x^2)]*(((-88*I)*b^5*c^5*C*Sqrt
[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*(EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*
d)/(b*c)] - EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(Sqrt[b/a]*Sq
rt[(a + b*x^2)*(c + d*x^2)]) + ((198*I)*b^5*B*c^4*d*Sqrt[1 + (b*x^2)/a]*Sq
rt[1 + (d*x^2)/c]*(EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - Ellipt
icF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(Sqrt[b/a]*Sqrt[(a + b*x^2)*(c
+ d*x^2)]) + ((77*I)*a*b^4*c^4*C*d*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]
*(EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - EllipticF[I*ArcSinh[Sqr
t[b/a]*x], (a*d)/(b*c)]))/(Sqrt[b/a]*Sqrt[(a + b*x^2)*(c + d*x^2)]) - ((69
3*I)*A*b^5*c^3*d^2*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*(EllipticE[I*Ar
cSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a...
```

Rubi [A] (verified)

Time = 3.58 (sec) , antiderivative size = 2004, normalized size of antiderivative = 1.83, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(A\sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}+Bx^2\sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}+Cx^4\sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}+Dx^6\sqrt{a+bx^2}\left(c+dx^2\right.\right.$$

$$\Big\downarrow \text{2009}$$

$$\frac{1}{11}D\sqrt{bx^2+a}\left(dx^2+c\right)^{3/2}x^7+\frac{(3bc+ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^7}{99b}+$$
$$\frac{1}{9}C\sqrt{bx^2+a}\left(dx^2+c\right)^{3/2}x^5+\frac{C(3bc+ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{63b}+$$
$$\frac{\left(-\frac{8da^2}{b}+13ca+\frac{3bc^2}{d}\right)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{693b}+\frac{1}{7}B\sqrt{bx^2+a}\left(dx^2+c\right)^{3/2}x^3+$$
$$\frac{B(3bc+ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{35b}+\frac{C\left(-\frac{6da^2}{b}+11ca+\frac{3bc^2}{d}\right)\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{315b}-$$
$$\frac{\left(18b^3c^3-9ab^2dc^2+79a^2bd^2c-48a^3d^3\right)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{3465b^3d^2}+$$
$$\frac{Ad\left(bx^2+a\right)^{3/2}\sqrt{dx^2+c}x}{5b}+\frac{2A(3bc-ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15b}+$$
$$\frac{B\left(-\frac{4da^2}{b}+9ca+\frac{3bc^2}{d}\right)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{105b}-$$
$$\frac{C\left(4b^3c^3-3ab^2dc^2+15a^2bd^2c-8a^3d^3\right)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{315b^3d^2}+$$
$$\frac{\left(24b^4c^4-13ab^3dc^3-15a^2b^2d^2c^2+108a^3bd^3c-64a^4d^4\right)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3465b^4d^3}+$$
$$\frac{A\left(3b^2c^2+7abdc-2a^2d^2\right)\sqrt{bx^2+a}x}{15b^2\sqrt{dx^2+c}}-\frac{B(2bc-ad)\left(3b^2c^2-3abdc+8a^2d^2\right)\sqrt{bx^2+a}x}{105b^3d\sqrt{dx^2+c}}+$$
$$\frac{C\left(8b^4c^4-7ab^3dc^3-9a^2b^2d^2c^2+32a^3bd^3c-16a^4d^4\right)\sqrt{bx^2+a}x}{315b^4d^2\sqrt{dx^2+c}}-$$
$$\frac{\left(48b^5c^5-32ab^4dc^4-29a^2b^3d^2c^3-51a^3b^2d^3c^2+232a^4bd^4c-128a^5d^5\right)D\sqrt{bx^2+a}x}{3465b^5d^3\sqrt{dx^2+c}}-$$
$$\frac{A\sqrt{c}\left(3b^2c^2+7abdc-2a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^2\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+$$
$$\frac{B\sqrt{c}(2bc-ad)\left(3b^2c^2-3abdc+8a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{105b^3d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$
$$\frac{\sqrt{c}C\left(8b^4c^4-7ab^3dc^3-9a^2b^2d^2c^2+32a^3bd^3c-16a^4d^4\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{315b^4d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+$$
$$\frac{\sqrt{c}\left(48b^5c^5-32ab^4dc^4-29a^2b^3d^2c^3-51a^3b^2d^3c^2+232a^4bd^4c-128a^5d^5\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3465b^5d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$
$$\frac{Ac^{3/2}(9bc-ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15b\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$
$$\frac{Bc^{3/2}\left(3b^2c^2+9abdc-4a^2d^2\right)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{105b^2d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+$$
$$\frac{c^{3/2}C\left(4b^3c^3-3ab^2dc^2+15a^2bd^2c-8a^3d^3\right)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{315b^3d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$
$$\frac{c^{3/2}\left(24b^4c^4-13ab^3dc^3-15a^2b^2d^2c^2+108a^3bd^3c-64a^4d^4\right)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3465b^4d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6),x]
```

output
```
(A*(3*b^2*c^2 + 7*a*b*c*d - 2*a^2*d^2)*x*Sqrt[a + b*x^2])/(15*b^2*Sqrt[c +
 d*x^2]) - (B*(2*b*c - a*d)*(3*b^2*c^2 - 3*a*b*c*d + 8*a^2*d^2)*x*Sqrt[a +
 b*x^2])/(105*b^3*d*Sqrt[c + d*x^2]) + (C*(8*b^4*c^4 - 7*a*b^3*c^3*d - 9*a
^2*b^2*c^2*d^2 + 32*a^3*b*c*d^3 - 16*a^4*d^4)*x*Sqrt[a + b*x^2])/(315*b^4*
d^2*Sqrt[c + d*x^2]) - ((48*b^5*c^5 - 32*a*b^4*c^4*d - 29*a^2*b^3*c^3*d^2
- 51*a^3*b^2*c^2*d^3 + 232*a^4*b*c*d^4 - 128*a^5*d^5)*D*x*Sqrt[a + b*x^2])
/(3465*b^5*d^3*Sqrt[c + d*x^2]) + (2*A*(3*b*c - a*d)*x*Sqrt[a + b*x^2]*Sqr
t[c + d*x^2])/(15*b) + (B*(9*a*c + (3*b*c^2)/d - (4*a^2*d)/b)*x*Sqrt[a + b
*x^2]*Sqrt[c + d*x^2])/(105*b) - (C*(4*b^3*c^3 - 3*a*b^2*c^2*d + 15*a^2*b*
c*d^2 - 8*a^3*d^3)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(315*b^3*d^2) + ((24
*b^4*c^4 - 13*a*b^3*c^3*d - 15*a^2*b^2*c^2*d^2 + 108*a^3*b*c*d^3 - 64*a^4*
d^4)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3465*b^4*d^3) + (B*(3*b*c + a*d
)*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(35*b) + (C*(11*a*c + (3*b*c^2)/d -
 (6*a^2*d)/b)*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(315*b) - ((18*b^3*c^3
- 9*a*b^2*c^2*d + 79*a^2*b*c*d^2 - 48*a^3*d^3)*D*x^3*Sqrt[a + b*x^2]*Sqrt[
c + d*x^2])/(3465*b^3*d^2) + (C*(3*b*c + a*d)*x^5*Sqrt[a + b*x^2]*Sqrt[c +
 d*x^2])/(63*b) + ((13*a*c + (3*b*c^2)/d - (8*a^2*d)/b)*D*x^5*Sqrt[a + b*x
^2]*Sqrt[c + d*x^2])/(693*b) + ((3*b*c + a*d)*D*x^7*Sqrt[a + b*x^2]*Sqrt[c
 + d*x^2])/(99*b) + (A*d*x*(a + b*x^2)^(3/2)*Sqrt[c + d*x^2])/(5*b) + (B*x
^3*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2))/7 + (C*x^5*Sqrt[a + b*x^2]*(c + d...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 7.37 (sec) , antiderivative size = 1885, normalized size of antiderivative = 1.72

method	result	size
elliptic	Expression too large to display	1885
default	Expression too large to display	3732

input
```
int((b*x^2+a)^(1/2)*(d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/11*d*D*x^9*
(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/9*(b*d^2*C+D*a*d^2+2*D*b*c*d-1/11*d*
D*(10*a*d+10*b*c))/b/d*x^7*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/7*(b*B*d^
2+C*a*d^2+2*C*b*c*d+13/11*D*a*c*d+D*b*c^2-1/9*(b*d^2*C+D*a*d^2+2*D*b*c*d-1
/11*d*D*(10*a*d+10*b*c))/b/d*(8*a*d+8*b*c))/b/d*x^5*(b*d*x^4+a*d*x^2+b*c*x
^2+a*c)^(1/2)+1/5*(b*d^2*A+B*a*d^2+2*B*b*c*d+2*C*a*c*d+C*b*c^2+a*c^2*D-7/9
*(b*d^2*C+D*a*d^2+2*D*b*c*d-1/11*d*D*(10*a*d+10*b*c))/b/d*a*c-1/7*(b*B*d^2
+C*a*d^2+2*C*b*c*d+13/11*D*a*c*d+D*b*c^2-1/9*(b*d^2*C+D*a*d^2+2*D*b*c*d-1/
11*d*D*(10*a*d+10*b*c))/b/d*(8*a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*x^3*(b*d
*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(A*a*d^2+2*A*b*c*d+2*B*a*c*d+B*b*c^2+a
*c^2*C-5/7*(b*B*d^2+C*a*d^2+2*C*b*c*d+13/11*D*a*c*d+D*b*c^2-1/9*(b*d^2*C+D
*a*d^2+2*D*b*c*d-1/11*d*D*(10*a*d+10*b*c))/b/d*(8*a*d+8*b*c))/b/d*a*c-1/5*
(b*d^2*A+B*a*d^2+2*B*b*c*d+2*C*a*c*d+C*b*c^2+a*c^2*D-7/9*(b*d^2*C+D*a*d^2+
2*D*b*c*d-1/11*d*D*(10*a*d+10*b*c))/b/d*a*c-1/7*(b*B*d^2+C*a*d^2+2*C*b*c*d
+13/11*D*a*c*d+D*b*c^2-1/9*(b*d^2*C+D*a*d^2+2*D*b*c*d-1/11*d*D*(10*a*d+10*
b*c))/b/d*(8*a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/b/d*x*(b*d*
x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(a*c^2*A-1/3*(A*a*d^2+2*A*b*c*d+2*B*a*c*d+B
*b*c^2+a*c^2*C-5/7*(b*B*d^2+C*a*d^2+2*C*b*c*d+13/11*D*a*c*d+D*b*c^2-1/9*(b
*d^2*C+D*a*d^2+2*D*b*c*d-1/11*d*D*(10*a*d+10*b*c))/b/d*(8*a*d+8*b*c))/b/d*
a*c-1/5*(b*d^2*A+B*a*d^2+2*B*b*c*d+2*C*a*c*d+C*b*c^2+a*c^2*D-7/9*(b*d^2...
```

Fricas [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 1102, normalized size of antiderivative = 1.00

$$\int \sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx=\text{Too large to display}$$

input
```
integrate((b*x^2+a)^(1/2)*(d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A),x, algorit
hm="fricas")
```

output
```
1/3465*((48*D*b^5*c^6 - 8*(4*D*a*b^4 + 11*C*b^5)*c^5*d - (29*D*a^2*b^3 - 7
7*C*a*b^4 - 198*B*b^5)*c^4*d^2 - 3*(17*D*a^3*b^2 - 33*C*a^2*b^3 + 99*B*a*b
^4 + 231*A*b^5)*c^3*d^3 + (232*D*a^4*b - 352*C*a^3*b^2 + 627*B*a^2*b^3 - 1
617*A*a*b^4)*c^2*d^4 - 2*(64*D*a^5 - 88*C*a^4*b + 132*B*a^3*b^2 - 231*A*a^
2*b^3)*c*d^5)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/
(b*c)) - (48*D*b^5*c^6 - 8*(4*D*a*b^4 + 11*C*b^5)*c^5*d - (29*D*a^2*b^3 -
(77*C + 24*D)*a*b^4 - 198*B*b^5)*c^4*d^2 - (51*D*a^3*b^2 - (99*C - 13*D)*a
^2*b^3 + 11*(27*B + 4*C)*a*b^4 + 693*A*b^5)*c^3*d^3 + (232*D*a^4*b - (352*
C + 15*D)*a^3*b^2 + 33*(19*B + C)*a^2*b^3 - 33*(49*A - 3*B)*a*b^4)*c^2*d^4
 - (128*D*a^5 - 4*(44*C + 27*D)*a^4*b + 33*(8*B + 5*C)*a^3*b^2 - 33*(14*A
+ 9*B)*a^2*b^3 + 2079*A*a*b^4)*c*d^5 - (64*D*a^5 - 88*C*a^4*b + 132*B*a^3*
b^2 - 231*A*a^2*b^3)*d^6)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c
/d)/x), a*d/(b*c)) + (315*D*b^5*d^6*x^10 - 48*D*b^5*c^5*d + 35*(12*D*b^5*c
*d^5 + (D*a*b^4 + 11*C*b^5)*d^6)*x^8 + 8*(4*D*a*b^4 + 11*C*b^5)*c^4*d^2 +
(29*D*a^2*b^3 - 77*C*a*b^4 - 198*B*b^5)*c^3*d^3 + 3*(17*D*a^3*b^2 - 33*C*a
^2*b^3 + 99*B*a*b^4 + 231*A*b^5)*c^2*d^4 - (232*D*a^4*b - 352*C*a^3*b^2 +
627*B*a^2*b^3 - 1617*A*a*b^4)*c*d^5 + 2*(64*D*a^5 - 88*C*a^4*b + 132*B*a^3
*b^2 - 231*A*a^2*b^3)*d^6 + 5*(3*D*b^5*c^2*d^4 + (13*D*a*b^4 + 110*C*b^5)*
c*d^5 - (8*D*a^2*b^3 - 11*C*a*b^4 - 99*B*b^5)*d^6)*x^6 - (18*D*b^5*c^3*d^3
 - 3*(3*D*a*b^4 + 11*C*b^5)*c^2*d^4 + (79*D*a^2*b^3 - 121*C*a*b^4 - 792...
```

Sympy [F]

$$\int \sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx=\int \sqrt{a+bx^2}\left(c+dx^2\right)^{\frac{3}{2}}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx$$

input
```
integrate((b*x**2+a)**(1/2)*(d*x**2+c)**(3/2)*(D*x**6+C*x**4+B*x**2+A),x)
```

output
```
Integral(sqrt(a + b*x**2)*(c + d*x**2)**(3/2)*(A + B*x**2 + C*x**4 + D*x**
6), x)
```

Maxima [F]

$$\int \sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx=\int \left(Dx^6+Cx^4+Bx^2+A\right)\sqrt{bx^2+a}\left(dx^2+c\right)^{\frac{3}{2}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)*(d*x^2 + c)^(3/2), x
)
```

Giac [F]

$$\int \sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx=\int \left(Dx^6+Cx^4+Bx^2+A\right)\sqrt{bx^2+a}\left(dx^2+c\right)^{\frac{3}{2}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)*(d*x^2 + c)^(3/2), x
)
```

Mupad [F(-1)]

Timed out.

$$\int \sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx=\int \sqrt{b\,x^2+a}\,\left(d\,x^2+c\right)^{3/2}\,\left(A+B\,x^2+C\,x^4+x^6\,D\right)\,dx$$

input
```
int((a + b*x^2)^(1/2)*(c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D),x)
```

output
```
int((a + b*x^2)^(1/2)*(c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D), x)
```

Reduce [F]

$$\int \sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx=\text{too large to display}$$

input
```
int((b*x^2+a)^(1/2)*(d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A),x)
```

output

```
( - 64*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**4*d**4*x + 196*sqrt(c + d*x**2
)*sqrt(a + b*x**2)*a**3*b*c*d**3*x + 48*sqrt(c + d*x**2)*sqrt(a + b*x**2)*
a**3*b*d**4*x**3 + 99*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b**3*d**3*x -
 180*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b**2*c**2*d**2*x - 145*sqrt(c
+ d*x**2)*sqrt(a + b*x**2)*a**2*b**2*c*d**3*x**3 - 40*sqrt(c + d*x**2)*sqr
t(a + b*x**2)*a**2*b**2*d**4*x**5 + 1683*sqrt(c + d*x**2)*sqrt(a + b*x**2)
*a*b**4*c*d**2*x + 792*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**4*d**3*x**3
+ 20*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**3*c**3*d*x + 130*sqrt(c + d*x*
*2)*sqrt(a + b*x**2)*a*b**3*c**2*d**2*x**3 + 120*sqrt(c + d*x**2)*sqrt(a +
 b*x**2)*a*b**3*c*d**3*x**5 + 35*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**3*
d**4*x**7 + 99*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**5*c**2*d*x + 792*sqrt(
c + d*x**2)*sqrt(a + b*x**2)*b**5*c*d**2*x**3 + 495*sqrt(c + d*x**2)*sqrt(
a + b*x**2)*b**5*d**3*x**5 - 20*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*c**
4*x + 15*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*c**3*d*x**3 + 565*sqrt(c +
 d*x**2)*sqrt(a + b*x**2)*b**4*c**2*d**2*x**5 + 805*sqrt(c + d*x**2)*sqrt(
a + b*x**2)*b**4*c*d**3*x**7 + 315*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*
d**4*x**9 + 128*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x*
*2 + b*c*x**2 + b*d*x**4),x)*a**5*d**5 - 408*int((sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**4*b*c*d**4 -
198*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*...
```

3.25 $\int \sqrt{a+bx^2}\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)\, dx$

Optimal result

Integrand size = 40, antiderivative size = 814

$$\int \sqrt{a+bx^2}\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)\, dx =$$
$$-\frac{(16a^4d^4D-8a^3bd^3(3Cd+cD)+3a^2b^2d^2(5cCd+14Bd^2-2c^2D)-b^4c(24c^2Cd-42Bcd^2+105Ad^3}{315b^3d^4\sqrt{a+bx^2}}$$
$$+\frac{(8a^3d^3D-3a^2bd^2(4Cd+cD)+3ab^2d(2cCd+7Bd^2-c^2D)-b^3(12c^2Cd-21Bcd^2-105Ad^3-8c^3}{315b^3d^3}$$
$$+\frac{\left(9bcC+63bBd+9aCd+2acD-\frac{6bc^2D}{d}-\frac{6a^2dD}{b}\right)x^3\sqrt{a+bx^2}\sqrt{c+dx^2}}{315bd}$$
$$+\frac{(9bCd+bcD+adD)x^5\sqrt{a+bx^2}\sqrt{c+dx^2}}{63bd}+\frac{1}{9}Dx^7\sqrt{a+bx^2}\sqrt{c+dx^2}$$
$$+\frac{\sqrt{a}(16a^4d^4D-8a^3bd^3(3Cd+cD)+3a^2b^2d^2(5cCd+14Bd^2-2c^2D)-b^4c(24c^2Cd-42Bcd^2+105}{315b^{7/2}d^4\sqrt{a+b}}$$
$$-\frac{a^{3/2}(8a^3d^3D-3a^2bd^2(4Cd+cD)+3ab^2d(2cCd+7Bd^2-c^2D)-b^3(12c^2Cd-21Bcd^2+210Ad^3-}{315b^{7/2}d^3\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
-1/315*(16*a^4*d^4*D-8*a^3*b*d^3*(3*C*d+D*c)+3*a^2*b^2*d^2*(14*B*d^2+5*C*c
*d-2*D*c^2)-b^4*c*(105*A*d^3-42*B*c*d^2+24*C*c^2*d-16*D*c^3)+a*b^3*d*(-105
*A*d^3-42*B*c*d^2+15*C*c^2*d-8*D*c^3))*x*(d*x^2+c)^(1/2)/b^3/d^4/(b*x^2+a)
^(1/2)+1/315*(8*a^3*d^3*D-3*a^2*b*d^2*(4*C*d+D*c)+3*a*b^2*d*(7*B*d^2+2*C*c
*d-D*c^2)-b^3*(-105*A*d^3-21*B*c*d^2+12*C*c^2*d-8*D*c^3))*x*(b*x^2+a)^(1/2
)*(d*x^2+c)^(1/2)/b^3/d^3+1/315*(9*C*b*c+63*B*b*d+9*C*a*d+2*a*c*D-6*b*c^2*
D/d-6*a^2*d*D/b)*x^3*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b/d+1/63*(9*C*b*d+D*a
*d+D*b*c)*x^5*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b/d+1/9*D*x^7*(b*x^2+a)^(1/2
)*(d*x^2+c)^(1/2)+1/315*a^(1/2)*(16*a^4*d^4*D-8*a^3*b*d^3*(3*C*d+D*c)+3*a^
2*b^2*d^2*(14*B*d^2+5*C*c*d-2*D*c^2)-b^4*c*(105*A*d^3-42*B*c*d^2+24*C*c^2*
d-16*D*c^3)+a*b^3*d*(-105*A*d^3-42*B*c*d^2+15*C*c^2*d-8*D*c^3))*(d*x^2+c)^
(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)^(1/2),(1-a*d/b/c)^(1/2))/b^(
7/2)/d^4/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)-1/315*a^(3/2)*(8*
a^3*d^3*D-3*a^2*b*d^2*(4*C*d+D*c)+3*a*b^2*d*(7*B*d^2+2*C*c*d-D*c^2)-b^3*(2
10*A*d^3-21*B*c*d^2+12*C*c^2*d-8*D*c^3))*(d*x^2+c)^(1/2)*InverseJacobiAM(a
rctan(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/b^(7/2)/d^3/(b*x^2+a)^(1/2)/(a
*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 8.03 (sec) , antiderivative size = 545, normalized size of antiderivative = 0.67

$$\int \sqrt{a+bx^2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx$$

$$= \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)\left(c+dx^2\right)\left(8a^3d^3D-3a^2bd^2(4Cd+D(c+2dx^2))+ab^2d(-3c^2D+2cd(3C+Dx^2)+d^2\right.}{}$$

input
```
Integrate[Sqrt[a + b*x^2]*Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4 + D*x^6),x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(c + d*x^2)*(8*a^3*d^3*D - 3*a^2*b*d^2*(4*C*d +
 D*(c + 2*d*x^2)) + a*b^2*d*(-3*c^2*D + 2*c*d*(3*C + D*x^2) + d^2*(21*B +
9*C*x^2 + 5*D*x^4)) + b^3*(8*c^3*D - 6*c^2*d*(2*C + D*x^2) + c*d^2*(21*B +
 9*C*x^2 + 5*D*x^4) + d^3*(105*A + 63*B*x^2 + 45*C*x^4 + 35*D*x^6))) + I*c
*(16*a^4*d^4*D - 8*a^3*b*d^3*(3*C*d + c*D) + 3*a^2*b^2*d^2*(5*c*C*d + 14*B
*d^2 - 2*c^2*D) - a*b^3*d*(-15*c^2*C*d + 42*B*c*d^2 + 105*A*d^3 + 8*c^3*D)
 + b^4*c*(-24*c^2*C*d + 42*B*c*d^2 - 105*A*d^3 + 16*c^3*D))*Sqrt[1 + (b*x^
2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] -
 I*c*(-(b*c) + a*d)*(3*a*b^2*d^2*(-(c*C) + 7*B*d) + 8*a^3*d^3*D + 3*a^2*b*
d^2*(-4*C*d + c*D) + b^3*(24*c^2*C*d - 42*B*c*d^2 + 105*A*d^3 - 16*c^3*D))
*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x],
 (a*d)/(b*c)])/(315*b^3*Sqrt[b/a]*d^4*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [A] (verified)

Time = 2.60 (sec) , antiderivative size = 1562, normalized size of antiderivative = 1.92, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \sqrt{a+bx^2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx$$

$$\Big\downarrow \text{ 7293}$$

$$\int \left(A\sqrt{a+bx^2}\sqrt{c+dx^2}+Bx^2\sqrt{a+bx^2}\sqrt{c+dx^2}+Cx^4\sqrt{a+bx^2}\sqrt{c+dx^2}+Dx^6\sqrt{a+bx^2}\sqrt{c+dx^2}\right)dx$$

$$\Big\downarrow \text{ 2009}$$

$$\frac{1}{9}D\sqrt{bx^2+a}\sqrt{dx^2+c}x^7+\frac{1}{7}C\sqrt{bx^2+a}\sqrt{dx^2+c}x^5+\frac{(bc+ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{63bd}+\frac{1}{5}B\sqrt{bx^2+a}\sqrt{dx^2+c}x^3+\frac{C(bc+ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{35bd}-\frac{2(3b^2c^2-abdc+3a^2d^2)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{315b^2d^2}+\frac{1}{3}A\sqrt{bx^2+a}\sqrt{dx^2+c}x+\frac{B(bc+ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15bd}-\frac{2C(2b^2c^2-abdc+2a^2d^2)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{105b^2d^2}+\frac{(bc+ad)(8b^2c^2-11abdc+8a^2d^2)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{315b^3d^3}+\frac{A(bc+ad)\sqrt{bx^2+a}x}{3b\sqrt{dx^2+c}}-\frac{2B(b^2c^2-abdc+a^2d^2)\sqrt{bx^2+a}x}{15b^2d\sqrt{dx^2+c}}+\frac{C(bc+ad)(8b^2c^2-13abdc+8a^2d^2)\sqrt{bx^2+a}x}{105b^3d^2\sqrt{dx^2+c}}-\frac{2(8b^4c^4-4ab^3dc^3-3a^2b^2d^2c^2-4a^3bd^3c+8a^4d^4)D\sqrt{bx^2+a}x}{315b^4d^3\sqrt{dx^2+c}}-\frac{A\sqrt{c}(bc+ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2B\sqrt{c}(b^2c^2-abdc+a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^2d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C(bc+ad)(8b^2c^2-13abdc+8a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{105b^3d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2\sqrt{c}(8b^4c^4-4ab^3dc^3-3a^2b^2d^2c^2-4a^3bd^3c+8a^4d^4)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{315b^4d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Bc^{3/2}(bc+ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15bd^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2c^{3/2}C(2b^2c^2-abdc+2a^2d^2)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{105b^2d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}(bc+ad)(8b^2c^2-11abdc+8a^2d^2)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{315b^3d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2Ac^{3/2}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[Sqrt[a + b*x^2]*Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4 + D*x^6),x]
```

output
```
(A*(b*c + a*d)*x*Sqrt[a + b*x^2])/(3*b*Sqrt[c + d*x^2]) - (2*B*(b^2*c^2 -
a*b*c*d + a^2*d^2)*x*Sqrt[a + b*x^2])/(15*b^2*d*Sqrt[c + d*x^2]) + (C*(b*c
 + a*d)*(8*b^2*c^2 - 13*a*b*c*d + 8*a^2*d^2)*x*Sqrt[a + b*x^2])/(105*b^3*d
^2*Sqrt[c + d*x^2]) - (2*(8*b^4*c^4 - 4*a*b^3*c^3*d - 3*a^2*b^2*c^2*d^2 -
4*a^3*b*c*d^3 + 8*a^4*d^4)*D*x*Sqrt[a + b*x^2])/(315*b^4*d^3*Sqrt[c + d*x^
2]) + (A*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/3 + (B*(b*c + a*d)*x*Sqrt[a +
b*x^2]*Sqrt[c + d*x^2])/(15*b*d) - (2*C*(2*b^2*c^2 - a*b*c*d + 2*a^2*d^2)*
x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(105*b^2*d^2) + ((b*c + a*d)*(8*b^2*c^2
 - 11*a*b*c*d + 8*a^2*d^2)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(315*b^3*d
^3) + (B*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/5 + (C*(b*c + a*d)*x^3*Sqrt[
a + b*x^2]*Sqrt[c + d*x^2])/(35*b*d) - (2*(3*b^2*c^2 - a*b*c*d + 3*a^2*d^2
)*D*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(315*b^2*d^2) + (C*x^5*Sqrt[a + b
*x^2]*Sqrt[c + d*x^2])/7 + ((b*c + a*d)*D*x^5*Sqrt[a + b*x^2]*Sqrt[c + d*x
^2])/(63*b*d) + (D*x^7*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/9 - (A*Sqrt[c]*(b*
c + a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/
(a*d)])/(3*b*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]
) + (2*B*Sqrt[c]*(b^2*c^2 - a*b*c*d + a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[A
rcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*b^2*d^(3/2)*Sqrt[(c*(a +
 b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (Sqrt[c]*C*(b*c + a*d)*(8*b^2
*c^2 - 13*a*b*c*d + 8*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 4.99 (sec) , antiderivative size = 967, normalized size of antiderivative = 1.19

method	result
elliptic	$\frac{\sqrt{(b x^2+a)(x^2 d+c)}\left(\frac{D x^7 \sqrt{b d x^4+a d x^2+x^2 b c+a c}}{9}+\frac{\left(C b d+D a d+D b c-\frac{D(8 a d+8 b c)}{9}\right) x^5 \sqrt{b d x^4+a d x^2+x^2 b c+a c}}{7 b d}+\frac{\left(B b d+C a d+C b c+\frac{2 D c}{9}\right.}{}\right.}{}$
default	Expression too large to display

input
```
int((b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/9*D*x^7*(b*
d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/7*(C*b*d+D*a*d+D*b*c-1/9*D*(8*a*d+8*b*c
))/b/d*x^5*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/5*(B*b*d+C*a*d+C*b*c+2/9*
D*c*a-1/7*(C*b*d+D*a*d+D*b*c-1/9*D*(8*a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*x
^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(A*b*d+B*a*d+B*b*c+C*a*c-5/7*(C
*b*d+D*a*d+D*b*c-1/9*D*(8*a*d+8*b*c))/b/d*a*c-1/5*(B*b*d+C*a*d+C*b*c+2/9*D
*c*a-1/7*(C*b*d+D*a*d+D*b*c-1/9*D*(8*a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*(4
*a*d+4*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(A*a*c-1/3*(A*b*d+B
*a*d+B*b*c+C*a*c-5/7*(C*b*d+D*a*d+D*b*c-1/9*D*(8*a*d+8*b*c))/b/d*a*c-1/5*(
B*b*d+C*a*d+C*b*c+2/9*D*c*a-1/7*(C*b*d+D*a*d+D*b*c-1/9*D*(8*a*d+8*b*c))/b/
d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/b/d*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2
)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)
^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(A*a*d+A*b*c+B*a*c-3/5*(B*b*d+C*a*d+C*b*c
+2/9*D*c*a-1/7*(C*b*d+D*a*d+D*b*c-1/9*D*(8*a*d+8*b*c))/b/d*(6*a*d+6*b*c))/
b/d*a*c-1/3*(A*b*d+B*a*d+B*b*c+C*a*c-5/7*(C*b*d+D*a*d+D*b*c-1/9*D*(8*a*d+8
*b*c))/b/d*a*c-1/5*(B*b*d+C*a*d+C*b*c+2/9*D*c*a-1/7*(C*b*d+D*a*d+D*b*c-1/9
*D*(8*a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/b/d*(2*a*d+2*b*c))
*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x
^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-Ellipt
icE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 783, normalized size of antiderivative = 0.96

$$\int \sqrt{a+bx^2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A),x, algorit
hm="fricas")
```

output
```
1/315*((16*D*b^4*c^5 - 8*(D*a*b^3 + 3*C*b^4)*c^4*d - 3*(2*D*a^2*b^2 - 5*C*
a*b^3 - 14*B*b^4)*c^3*d^2 - (8*D*a^3*b - 15*C*a^2*b^2 + 42*B*a*b^3 + 105*A
*b^4)*c^2*d^3 + (16*D*a^4 - 24*C*a^3*b + 42*B*a^2*b^2 - 105*A*a*b^3)*c*d^4
)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (16
*D*b^4*c^5 - 8*(D*a*b^3 + 3*C*b^4)*c^4*d - (6*D*a^2*b^2 - (15*C + 8*D)*a*b
^3 - 42*B*b^4)*c^3*d^2 - (8*D*a^3*b - 3*(5*C - D)*a^2*b^2 + 6*(7*B + 2*C)*
a*b^3 + 105*A*b^4)*c^2*d^3 + (16*D*a^4 - 3*(8*C + D)*a^3*b + 6*(7*B + C)*a
^2*b^2 - 21*(5*A - B)*a*b^3)*c*d^4 + (8*D*a^4 - 12*C*a^3*b + 21*B*a^2*b^2
- 210*A*a*b^3)*d^5)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x)
, a*d/(b*c)) + (35*D*b^4*d^5*x^8 - 16*D*b^4*c^4*d + 5*(D*b^4*c*d^4 + (D*a*
b^3 + 9*C*b^4)*d^5)*x^6 + 8*(D*a*b^3 + 3*C*b^4)*c^3*d^2 + 3*(2*D*a^2*b^2 -
 5*C*a*b^3 - 14*B*b^4)*c^2*d^3 + (8*D*a^3*b - 15*C*a^2*b^2 + 42*B*a*b^3 +
105*A*b^4)*c*d^4 - (16*D*a^4 - 24*C*a^3*b + 42*B*a^2*b^2 - 105*A*a*b^3)*d^
5 - (6*D*b^4*c^2*d^3 - (2*D*a*b^3 + 9*C*b^4)*c*d^4 + 3*(2*D*a^2*b^2 - 3*C*
a*b^3 - 21*B*b^4)*d^5)*x^4 + (8*D*b^4*c^3*d^2 - 3*(D*a*b^3 + 4*C*b^4)*c^2*
d^3 - 3*(D*a^2*b^2 - 2*C*a*b^3 - 7*B*b^4)*c*d^4 + (8*D*a^3*b - 12*C*a^2*b^
2 + 21*B*a*b^3 + 105*A*b^4)*d^5)*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/(b^
4*d^5*x)
```

Sympy [F]

$$\int \sqrt{a+bx^2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx$$
$$=\int \sqrt{a+bx^2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx$$

input
```
integrate((b*x**2+a)**(1/2)*(d*x**2+c)**(1/2)*(D*x**6+C*x**4+B*x**2+A),x)
```

output
```
Integral(sqrt(a + b*x**2)*sqrt(c + d*x**2)*(A + B*x**2 + C*x**4 + D*x**6),
 x)
```

Maxima [F]

$$\int \sqrt{a+bx^2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx = \int (Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}\sqrt{dx^2+c}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c), x)
```

Giac [F]

$$\int \sqrt{a+bx^2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx = \int (Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}\sqrt{dx^2+c}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c), x)
```

Mupad [F(-1)]

Timed out.

$$\int \sqrt{a+bx^2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx = \int \sqrt{b\,x^2+a}\,\sqrt{d\,x^2+c}\,\left(A+B\,x^2+C\,x^4+x^6\,D\right)\,dx$$

input
```
int((a + b*x^2)^(1/2)*(c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D),x)
```

output
```
int((a + b*x^2)^(1/2)*(c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D), x)
```

Reduce [F]

$$\int \sqrt{a+bx^2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx = \text{Too large to display}$$

input
```
int((b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A),x)
```

output
```
(8*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**3*d**3*x - 15*sqrt(c + d*x**2)*sqr
t(a + b*x**2)*a**2*b*c*d**2*x - 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b
*d**3*x**3 + 126*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**3*d**2*x + 3*sqrt(
c + d*x**2)*sqrt(a + b*x**2)*a*b**2*c**2*d*x + 11*sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*a*b**2*c*d**2*x**3 + 5*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*
d**3*x**5 + 21*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*c*d*x + 63*sqrt(c +
d*x**2)*sqrt(a + b*x**2)*b**4*d**2*x**3 - 4*sqrt(c + d*x**2)*sqrt(a + b*x*
*2)*b**3*c**3*x + 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c**2*d*x**3 + 5
0*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c*d**2*x**5 + 35*sqrt(c + d*x**2)
*sqrt(a + b*x**2)*b**3*d**3*x**7 - 16*int((sqrt(c + d*x**2)*sqrt(a + b*x**
2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**4*d**4 + 32*int((sqr
t(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4
),x)*a**3*b*c*d**3 + 63*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c
+ a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2*b**3*d**3 - 9*int((sqrt(c + d*x*
*2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2*
b**2*c**2*d**2 + 147*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a
*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**4*c*d**2 - 7*int((sqrt(c + d*x**2)*
sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**3*c*
*3*d - 42*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b
*c*x**2 + b*d*x**4),x)*b**5*c**2*d + 8*int((sqrt(c + d*x**2)*sqrt(a + b...
```

3.26 $\int \frac{\sqrt{a+bx^2}\left(A+Bx^2+Cx^4+Dx^6\right)}{\sqrt{c+dx^2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 604

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx$$
$$= \frac{(8a^3d^3D-a^2bd^2(14Cd-9cD)-ab^2d(21cCd-35Bd^2-16c^2D)+b^3(56c^2Cd-70Bcd^2+105Ad^3-4}{105b^2d^4\sqrt{a+bx^2}}$$
$$-\frac{(4a^2d^2D-abd(7Cd-5cD)+b^2(28cCd-35Bd^2-24c^2D))\,x\sqrt{a+bx^2}\sqrt{c+dx^2}}{105b^2d^3}$$
$$+\frac{(7bCd-6bcD+adD)x^3\sqrt{a+bx^2}\sqrt{c+dx^2}}{35bd^2}+\frac{Dx^5\sqrt{a+bx^2}\sqrt{c+dx^2}}{7d}$$
$$-\frac{\sqrt{a}(8a^3d^3D-a^2bd^2(14Cd-9cD)-ab^2d(21cCd-35Bd^2-16c^2D)+b^3(56c^2Cd-70Bcd^2+105Ad}{105b^{5/2}d^4\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$
$$+\frac{a^{3/2}(4a^2cd^2D-abcd(7Cd-5cD)+b^2(28c^2Cd-35Bcd^2+105Ad^3-24c^3D))\,\sqrt{c+dx^2}\,\text{EllipticF}\left(a\right.}{105b^{5/2}cd^3\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
1/105*(8*a^3*d^3*D-a^2*b*d^2*(14*C*d-9*D*c)-a*b^2*d*(-35*B*d^2+21*C*c*d-16
*D*c^2)+b^3*(105*A*d^3-70*B*c*d^2+56*C*c^2*d-48*D*c^3))*x*(d*x^2+c)^(1/2)/
b^2/d^4/(b*x^2+a)^(1/2)-1/105*(4*a^2*d^2*D-a*b*d*(7*C*d-5*D*c)+b^2*(-35*B*
d^2+28*C*c*d-24*D*c^2))*x*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b^2/d^3+1/35*(7*
C*b*d+D*a*d-6*D*b*c)*x^3*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b/d^2+1/7*D*x^5*(
b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/d-1/105*a^(1/2)*(8*a^3*d^3*D-a^2*b*d^2*(14*
C*d-9*D*c)-a*b^2*d*(-35*B*d^2+21*C*c*d-16*D*c^2)+b^3*(105*A*d^3-70*B*c*d^2
+56*C*c^2*d-48*D*c^3))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^
2/a)^(1/2),(1-a*d/b/c)^(1/2))/b^(5/2)/d^4/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(
b*x^2+a))^(1/2)+1/105*a^(3/2)*(4*a^2*c*d^2*D-a*b*c*d*(7*C*d-5*D*c)+b^2*(10
5*A*d^3-35*B*c*d^2+28*C*c^2*d-24*D*c^3))*(d*x^2+c)^(1/2)*InverseJacobiAM(a
rctan(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/b^(5/2)/c/d^3/(b*x^2+a)^(1/2)/
(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 4.83 (sec) , antiderivative size = 408, normalized size of antiderivative = 0.68

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx$$
$$= \frac{-\sqrt{\frac{b}{a}}dx(a+bx^2)\left(c+dx^2\right)\left(4a^2d^2D+abd(-7Cd+5cD-3dDx^2)-b^2(24c^2D-2cd(14C+9Dx^2)+\right.}{}$$

input
```
Integrate[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/Sqrt[c + d*x^2],x]
```

output
```
(-(Sqrt[b/a]*d*x*(a + b*x^2)*(c + d*x^2)*(4*a^2*d^2*D + a*b*d*(-7*C*d + 5*
c*D - 3*d*D*x^2) - b^2*(24*c^2*D - 2*c*d*(14*C + 9*D*x^2) + d^2*(35*B + 21
*C*x^2 + 15*D*x^4)))) - I*c*(8*a^3*d^3*D + a^2*b*d^2*(-14*C*d + 9*c*D) + a
*b^2*d*(-21*c*C*d + 35*B*d^2 + 16*c^2*D) + b^3*(56*c^2*C*d - 70*B*c*d^2 +
105*A*d^3 - 48*c^3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I
*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] + I*(-(b*c) + a*d)*(4*a^2*c*d^2*D + a*
b*c*d*(-7*C*d + 8*c*D) + b^2*(-56*c^2*C*d + 70*B*c*d^2 - 105*A*d^3 + 48*c^
3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a
]*x], (a*d)/(b*c)])/(105*a^2*(b/a)^(5/2)*d^4*Sqrt[a + b*x^2]*Sqrt[c + d*x^
2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1254 vs. $2(604) = 1208$.

Time = 1.99 (sec) , antiderivative size = 1254, normalized size of antiderivative = 2.08, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx$$

$$\Big\downarrow \text{ 7293}$$

$$\int \left(\frac{A\sqrt{a+bx^2}}{\sqrt{c+dx^2}}+\frac{Bx^2\sqrt{a+bx^2}}{\sqrt{c+dx^2}}+\frac{Cx^4\sqrt{a+bx^2}}{\sqrt{c+dx^2}}+\frac{Dx^6\sqrt{a+bx^2}}{\sqrt{c+dx^2}}\right)dx$$

$$\Big\downarrow \text{ 2009}$$

$$\frac{D\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{7d}-\frac{(6bc-ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{35bd^2}+\frac{C\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5d}-\frac{C(4bc-ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15bd^2}-\frac{\left(\frac{4da^2}{b}+5ca-\frac{24bc^2}{d}\right)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{105bd^2}+\frac{B\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3d}+\frac{A\sqrt{bx^2+a}x}{\sqrt{dx^2+c}}-\frac{B(2bc-ad)\sqrt{bx^2+a}x}{3bd\sqrt{dx^2+c}}+\frac{C\left(8b^2c^2-3abdc-2a^2d^2\right)\sqrt{bx^2+a}x}{15b^2d^2\sqrt{dx^2+c}}-\frac{\left(48b^3c^3-16ab^2dc^2-9a^2bd^2c-8a^3d^3\right)D\sqrt{bx^2+a}x}{105b^3d^3\sqrt{dx^2+c}}+\frac{B\sqrt{c}(2bc-ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3bd^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C\left(8b^2c^2-3abdc-2a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^2d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}\left(48b^3c^3-16ab^2dc^2-9a^2bd^2c-8a^3d^3\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{105b^3d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{A\sqrt{c}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}C(4bc-ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15bd^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}\left(24b^2c^2-5abdc-4a^2d^2\right)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{105b^2d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\sqrt{c}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Bc^{3/2}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/Sqrt[c + d*x^2],x]
```

output
```
(A*x*Sqrt[a + b*x^2])/Sqrt[c + d*x^2] - (B*(2*b*c - a*d)*x*Sqrt[a + b*x^2]
)/(3*b*d*Sqrt[c + d*x^2]) + (C*(8*b^2*c^2 - 3*a*b*c*d - 2*a^2*d^2)*x*Sqrt[
a + b*x^2])/(15*b^2*d^2*Sqrt[c + d*x^2]) - ((48*b^3*c^3 - 16*a*b^2*c^2*d -
 9*a^2*b*c*d^2 - 8*a^3*d^3)*D*x*Sqrt[a + b*x^2])/(105*b^3*d^3*Sqrt[c + d*x
^2]) + (B*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*d) - (C*(4*b*c - a*d)*x*Sq
rt[a + b*x^2]*Sqrt[c + d*x^2])/(15*b*d^2) - ((5*a*c - (24*b*c^2)/d + (4*a^
2*d)/b)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(105*b*d^2) + (C*x^3*Sqrt[a +
 b*x^2]*Sqrt[c + d*x^2])/(5*d) - ((6*b*c - a*d)*D*x^3*Sqrt[a + b*x^2]*Sqrt
[c + d*x^2])/(35*b*d^2) + (D*x^5*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(7*d) -
(A*Sqrt[c]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c
)/(a*d)])/(Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2])
+ (B*Sqrt[c]*(2*b*c - a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sq
rt[c]], 1 - (b*c)/(a*d)])/(3*b*d^(3/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2)
)]*Sqrt[c + d*x^2]) - (Sqrt[c]*C*(8*b^2*c^2 - 3*a*b*c*d - 2*a^2*d^2)*Sqrt[
a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*b^
2*d^(5/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c
]*(48*b^3*c^3 - 16*a*b^2*c^2*d - 9*a^2*b*c*d^2 - 8*a^3*d^3)*D*Sqrt[a + b*x
^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(105*b^3*d^(7
/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (B*c^(3/2)*Sq
rt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 6.98 (sec) , antiderivative size = 602, normalized size of antiderivative = 1.00

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(\frac{D x^5\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{7d}+\frac{\left(Cb+Da-\frac{D(6ad+6bc)}{7d}\right)x^3\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{5bd}+\frac{\left(Bb+Ca-\frac{5Dac}{7d}-\frac{\left(Cb+Da-\frac{D}{\cdots}\right.}{\cdots}\right.}{\cdots}\right.}{\cdots}$
default	Expression too large to display

input
```
int((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(1/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/7*D/d*x^5*(
b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/5*(C*b+D*a-1/7*D/d*(6*a*d+6*b*c))/b/d
*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(B*b+C*a-5/7*D/d*a*c-1/5*(C*b
+D*a-1/7*D/d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*
x^2+a*c)^(1/2)+(A*a-1/3*(B*b+C*a-5/7*D/d*a*c-1/5*(C*b+D*a-1/7*D/d*(6*a*d+6
*b*c))/b/d*(4*a*d+4*b*c))/b/d*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2
/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1
+(a*d+b*c)/c/b)^(1/2))-(A*b+B*a-3/5*(C*b+D*a-1/7*D/d*(6*a*d+6*b*c))/b/d*a*
c-1/3*(B*b+C*a-5/7*D/d*a*c-1/5*(C*b+D*a-1/7*D/d*(6*a*d+6*b*c))/b/d*(4*a*d+
4*b*c))/b/d*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1
/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a
*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 563, normalized size of antiderivative = 0.93

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx$$
$$= \frac{(48\,Db^3c^5 - 8\,(2\,Dab^2 + 7\,Cb^3)c^4d - (9\,Da^2b - 21\,Cab^2 - 70\,Bb^3)c^3d^2 - (8\,Da^3 - 14\,Ca^2b + 35\,Bab^2 +}{}$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(1/2),x, algorit
hm="fricas")
```

output
```
1/105*((48*D*b^3*c^5 - 8*(2*D*a*b^2 + 7*C*b^3)*c^4*d - (9*D*a^2*b - 21*C*a
*b^2 - 70*B*b^3)*c^3*d^2 - (8*D*a^3 - 14*C*a^2*b + 35*B*a*b^2 + 105*A*b^3)
*c^2*d^3)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c
)) - (48*D*b^3*c^5 - 105*A*a*b^2*d^5 - 8*(2*D*a*b^2 + 7*C*b^3)*c^4*d - (9*
D*a^2*b - 3*(7*C + 8*D)*a*b^2 - 70*B*b^3)*c^3*d^2 - (8*D*a^3 - (14*C - 5*D
)*a^2*b + 7*(5*B + 4*C)*a*b^2 + 105*A*b^3)*c^2*d^3 - (4*D*a^3 - 7*C*a^2*b
- 35*B*a*b^2)*c*d^4)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x
), a*d/(b*c)) + (15*D*b^3*c*d^4*x^6 - 48*D*b^3*c^4*d + 8*(2*D*a*b^2 + 7*C*
b^3)*c^3*d^2 + (9*D*a^2*b - 21*C*a*b^2 - 70*B*b^3)*c^2*d^3 + (8*D*a^3 - 14
*C*a^2*b + 35*B*a*b^2 + 105*A*b^3)*c*d^4 - 3*(6*D*b^3*c^2*d^3 - (D*a*b^2 +
 7*C*b^3)*c*d^4)*x^4 + (24*D*b^3*c^3*d^2 - (5*D*a*b^2 + 28*C*b^3)*c^2*d^3
- (4*D*a^2*b - 7*C*a*b^2 - 35*B*b^3)*c*d^4)*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^
2 + c))/(b^3*c*d^5*x)
```

Sympy [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx = \int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx$$

input
```
integrate((b*x**2+a)**(1/2)*(D*x**6+C*x**4+B*x**2+A)/(d*x**2+c)**(1/2),x)
```

output
```
Integral(sqrt(a + b*x**2)*(A + B*x**2 + C*x**4 + D*x**6)/sqrt(c + d*x**2),
 x)
```

Maxima [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}}{\sqrt{dx^2+c}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(1/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/sqrt(d*x^2 + c), x)
```

Giac [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}}{\sqrt{dx^2+c}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(1/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/sqrt(d*x^2 + c), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx = \int \frac{\sqrt{b\,x^2+a}\,\left(A+B\,x^2+C\,x^4+x^6\,D\right)}{\sqrt{d\,x^2+c}}\,dx$$

input
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(1/2),x)
```

output
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(1/2), x)
```

Reduce [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx$$
$$= \frac{-4\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,a^2d^2x+2\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,abcdx+3\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,ab\,d^2x^3+35\sqrt{d\,x^2}}{}$$

input
```
int((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(1/2),x)
```

output
```
( - 4*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*d**2*x + 2*sqrt(c + d*x**2)*s
qrt(a + b*x**2)*a*b*c*d*x + 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*d**2*x
**3 + 35*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*d*x - 4*sqrt(c + d*x**2)*s
qrt(a + b*x**2)*b**2*c**2*x + 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*c*d
*x**3 + 15*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*d**2*x**5 + 8*int((sqrt(
c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),
x)*a**3*d**3 - 5*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x
**2 + b*c*x**2 + b*d*x**4),x)*a**2*b*c*d**2 + 140*int((sqrt(c + d*x**2)*sq
rt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**3*d**2
 - 5*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x*
*2 + b*d*x**4),x)*a*b**2*c**2*d - 70*int((sqrt(c + d*x**2)*sqrt(a + b*x**2
)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*b**4*c*d + 8*int((sqrt(c
 + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x
)*b**3*c**3 + 4*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x**2 +
b*c*x**2 + b*d*x**4),x)*a**3*c*d**2 + 105*int((sqrt(c + d*x**2)*sqrt(a + b
*x**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2*b**2*d**2 - 2*int((
sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),
x)*a**2*b*c**2*d - 35*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x
**2 + b*c*x**2 + b*d*x**4),x)*a*b**3*c*d + 4*int((sqrt(c + d*x**2)*sqrt(a
+ b*x**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**2*c**3)/(105*...
```

3.27 $\int \frac{\sqrt{a+bx^2}\left(A+Bx^2+Cx^4+Dx^6\right)}{\left(c+dx^2\right)^{3/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 426

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx = -\frac{(2a^2d^2D-abd(5Cd-7cD)+b^2(20cCd-15Bd^2-24c^2D))\,x\sqrt{a+bx^2}}{15b^2d^3\sqrt{c+dx^2}} + \frac{(5bCd-6bcD+adD)x^3\sqrt{a+bx^2}}{15bd^2\sqrt{c+dx^2}} + \frac{Dx^5\sqrt{a+bx^2}}{5d\sqrt{c+dx^2}} + \frac{(2a^2cd^2D-abcd(5Cd-8cD)+b^2(40c^2Cd-30Bcd^2+15Ad^3-48c^3D))\sqrt{a+bx^2}\,E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\right.}{15b^2\sqrt{c}d^{7/2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}} - \frac{\sqrt{c}(acdD+b(20cCd-15Bd^2-24c^2D))\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15bd^{7/2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
-1/15*(2*a^2*d^2*D-a*b*d*(5*C*d-7*D*c)+b^2*(-15*B*d^2+20*C*c*d-24*D*c^2))*
x*(b*x^2+a)^(1/2)/b^2/d^3/(d*x^2+c)^(1/2)+1/15*(5*C*b*d+D*a*d-6*D*b*c)*x^3
*(b*x^2+a)^(1/2)/b/d^2/(d*x^2+c)^(1/2)+1/5*D*x^5*(b*x^2+a)^(1/2)/d/(d*x^2+
c)^(1/2)+1/15*(2*a^2*c*d^2*D-a*b*c*d*(5*C*d-8*D*c)+b^2*(15*A*d^3-30*B*c*d^
2+40*C*c^2*d-48*D*c^3))*(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x
^2/c)^(1/2),(1-b*c/a/d)^(1/2))/b^2/c^(1/2)/d^(7/2)/(c*(b*x^2+a)/a/(d*x^2+c
))^(1/2)/(d*x^2+c)^(1/2)-1/15*c^(1/2)*(a*c*d*D+b*(-15*B*d^2+20*C*c*d-24*D*
c^2))*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),(1-b*c/a/d
)^(1/2))/b/d^(7/2)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 5.49 (sec) , antiderivative size = 366, normalized size of antiderivative = 0.86

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)\left(acdD(c+dx^2)+b(15Ad^3-24c^3D+c^2(20C\right.}{}$$

input
```
Integrate[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(3/2),
x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(a*c*d*D*(c + d*x^2) + b*(15*A*d^3 - 24*c^3*D +
 c^2*(20*C*d - 6*d*D*x^2) + c*d^2*(-15*B + 5*C*x^2 + 3*D*x^4))) + I*c*(2*a
^2*c*d^2*D + a*b*c*d*(-5*C*d + 8*c*D) + b^2*(40*c^2*C*d - 30*B*c*d^2 + 15*
A*d^3 - 48*c^3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*Arc
Sinh[Sqrt[b/a]*x], (a*d)/(b*c)] - I*c*(a^2*c*d^2*D + a*b*d*(-25*c*C*d + 15
*B*d^2 + 32*c^2*D) + b^2*(40*c^2*C*d - 30*B*c*d^2 + 15*A*d^3 - 48*c^3*D))*
Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x],
(a*d)/(b*c)])/(15*b*Sqrt[b/a]*c*d^4*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 955 vs. 2(426) = 852.

Time = 1.67 (sec) , antiderivative size = 955, normalized size of antiderivative = 2.24, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{\sqrt{a+bx^2}\left(A+Bx^2+Cx^4+Dx^6\right)}{\left(c+dx^2\right)^{3/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A\sqrt{a+bx^2}}{\left(c+dx^2\right)^{3/2}}+\frac{Bx^2\sqrt{a+bx^2}}{\left(c+dx^2\right)^{3/2}}+\frac{Cx^4\sqrt{a+bx^2}}{\left(c+dx^2\right)^{3/2}}+\frac{Dx^6\sqrt{a+bx^2}}{\left(c+dx^2\right)^{3/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{D\sqrt{bx^2+a}x^5}{d\sqrt{dx^2+c}}+\frac{6D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5d^2}-\frac{C\sqrt{bx^2+a}x^3}{d\sqrt{dx^2+c}}-\frac{(24bc-ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15bd^3}+\frac{4C\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3d^2}-\frac{C(8bc-ad)\sqrt{bx^2+a}x}{3bd^2\sqrt{dx^2+c}}-\frac{2\left(\frac{da^2}{b}+4ca-\frac{24bc^2}{d}\right)D\sqrt{bx^2+a}x}{15bd^2\sqrt{dx^2+c}}+\frac{B\sqrt{bx^2+a}x}{d\sqrt{dx^2+c}}+\frac{\sqrt{c}C(8bc-ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3bd^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2\sqrt{c}\left(24b^2c^2-4abdc-a^2d^2\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^2d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{\sqrt{c}\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2B\sqrt{c}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}(24bc-ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15bd^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{B\sqrt{c}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{4c^{3/2}C\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(3/2),x]
```

output
```
(B*x*Sqrt[a + b*x^2])/(d*Sqrt[c + d*x^2]) - (C*(8*b*c - a*d)*x*Sqrt[a + b*
x^2])/(3*b*d^2*Sqrt[c + d*x^2]) - (2*(4*a*c - (24*b*c^2)/d + (a^2*d)/b)*D*
x*Sqrt[a + b*x^2])/(15*b*d^2*Sqrt[c + d*x^2]) - (C*x^3*Sqrt[a + b*x^2])/(d
*Sqrt[c + d*x^2]) - (D*x^5*Sqrt[a + b*x^2])/(d*Sqrt[c + d*x^2]) + (4*C*x*S
qrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*d^2) - ((24*b*c - a*d)*D*x*Sqrt[a + b*x
^2]*Sqrt[c + d*x^2])/(15*b*d^3) + (6*D*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2]
)/(5*d^2) - (2*B*Sqrt[c]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt
[c]], 1 - (b*c)/(a*d)])/(d^(3/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqr
t[c + d*x^2]) + (A*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]],
1 - (b*c)/(a*d)])/(Sqrt[c]*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*S
qrt[c + d*x^2]) + (Sqrt[c]*C*(8*b*c - a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTa
n[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b*d^(5/2)*Sqrt[(c*(a + b*x^2)
)/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (2*Sqrt[c]*(24*b^2*c^2 - 4*a*b*c*d -
 a^2*d^2)*D*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*
c)/(a*d)])/(15*b^2*d^(7/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c +
d*x^2]) - (4*c^(3/2)*C*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c
]], 1 - (b*c)/(a*d)])/(3*d^(5/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqr
t[c + d*x^2]) + (B*Sqrt[c]*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sq
rt[c]], 1 - (b*c)/(a*d)])/(d^(3/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*S
qrt[c + d*x^2]) + (c^(3/2)*(24*b*c - a*d)*D*Sqrt[a + b*x^2]*EllipticF[A...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 6.11 (sec) , antiderivative size = 714, normalized size of antiderivative = 1.68

method	result
elliptic	$\frac{\sqrt{(b x^2+a)(x^2 d+c)}\left(\frac{(bd\,x^2+ad)(A\,d^3-Bc\,d^2+C\,c^2d-Dc^3)x}{c\,d^4\sqrt{\left(x^2+\frac{c}{d}\right)(bd\,x^2+ad)}}+\frac{Dx^3\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{5d^2}+\frac{\left(\frac{Cbd+Dad-Dbc}{d^2}-\frac{D(4ad+4bc)}{5d^2}\right)x\sqrt{bd\,x^4+\cdots}}{3bd}\cdots\right.}{\cdots}$
default	Expression too large to display

input
```
int((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(3/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*((b*d*x^2+a*d)
*(A*d^3-B*c*d^2+C*c^2*d-D*c^3)/c/d^4*x/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+1/5
/d^2*D*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(1/d^2*(C*b*d+D*a*d-D*b
*c)-1/5/d^2*D*(4*a*d+4*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+((A
*b*d^3+B*a*d^3-B*b*c*d^2-C*a*c*d^2+C*b*c^2*d+D*a*c^2*d-D*b*c^3)/d^4+(A*d^3
-B*c*d^2+C*c^2*d-D*c^3)/d^4*(a*d-b*c)/c-a/d^3*(A*d^3-B*c*d^2+C*c^2*d-D*c^3
)/c-1/3*(1/d^2*(C*b*d+D*a*d-D*b*c)-1/5/d^2*D*(4*a*d+4*b*c))/b/d*a*c)/(-b/a
)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^
(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(1/d^3*(B*b*d^2+C
*a*d^2-C*b*c*d-D*a*c*d+D*b*c^2)-(A*d^3-B*c*d^2+C*c^2*d-D*c^3)/d^3*b/c-3/5/
d^2*D*a*c-1/3*(1/d^2*(C*b*d+D*a*d-D*b*c)-1/5/d^2*D*(4*a*d+4*b*c))/b/d*(2*a
*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d
*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/
2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 629, normalized size of antiderivative = 1.48

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx =$$

$$-\frac{((48\,Db^2c^4d-15\,Ab^2cd^4-8\,(Dab+5\,Cb^2)c^3d^2-(2\,Da^2-5\,Cab-30\,Bb^2)c^2d^3)x^3+(48\,Db^2c^5-15\,A\cdots}{\cdots}$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(3/2),x, algorit
hm="fricas")
```

output
```
-1/15*(((48*D*b^2*c^4*d - 15*A*b^2*c*d^4 - 8*(D*a*b + 5*C*b^2)*c^3*d^2 - (
2*D*a^2 - 5*C*a*b - 30*B*b^2)*c^2*d^3)*x^3 + (48*D*b^2*c^5 - 15*A*b^2*c^2*
d^3 - 8*(D*a*b + 5*C*b^2)*c^4*d - (2*D*a^2 - 5*C*a*b - 30*B*b^2)*c^3*d^2)*
x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((48
*D*b^2*c^4*d + 15*B*a*b*d^5 - 8*(D*a*b + 5*C*b^2)*c^3*d^2 - (2*D*a^2 - (5*
C + 24*D)*a*b - 30*B*b^2)*c^2*d^3 - (D*a^2 + 20*C*a*b + 15*A*b^2)*c*d^4)*x
^3 + (48*D*b^2*c^5 + 15*B*a*b*c*d^4 - 8*(D*a*b + 5*C*b^2)*c^4*d - (2*D*a^2
 - (5*C + 24*D)*a*b - 30*B*b^2)*c^3*d^2 - (D*a^2 + 20*C*a*b + 15*A*b^2)*c^
2*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c))
 - (3*D*b^2*c*d^4*x^6 + 48*D*b^2*c^4*d - 15*A*b^2*c*d^4 - 8*(D*a*b + 5*C*b
^2)*c^3*d^2 - (2*D*a^2 - 5*C*a*b - 30*B*b^2)*c^2*d^3 - (6*D*b^2*c^2*d^3 -
(D*a*b + 5*C*b^2)*c*d^4)*x^4 + (24*D*b^2*c^3*d^2 - (7*D*a*b + 20*C*b^2)*c^
2*d^3 - (2*D*a^2 - 5*C*a*b - 15*B*b^2)*c*d^4)*x^2)*sqrt(b*x^2 + a)*sqrt(d*
x^2 + c))/(b^2*c*d^6*x^3 + b^2*c^2*d^5*x)
```

Sympy [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx = \int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*x**2+a)**(1/2)*(D*x**6+C*x**4+B*x**2+A)/(d*x**2+c)**(3/2),x)
```

output
```
Integral(sqrt(a + b*x**2)*(A + B*x**2 + C*x**4 + D*x**6)/(c + d*x**2)**(3/
2), x)
```

Maxima [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}}{(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(3/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(d*x^2 + c)^(3/2), x
)
```

Giac [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}}{(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(3/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(d*x^2 + c)^(3/2), x
)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx = \int \frac{\sqrt{b\,x^2+a}\,\left(A+B\,x^2+C\,x^4+x^6\,D\right)}{{\left(d\,x^2+c\right)}^{3/2}}\,dx$$

input
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(3/2),x)
```

output
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(3/2), x)
```

Reduce [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx = \text{Too large to display}$$

input
```
int((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(3/2),x)
```

output
```
( - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*c*d*x + 30*sqrt(c + d*x**2)*s
qrt(a + b*x**2)*a*b**2*d*x + 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c**2*
x + 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c*d*x**3 - 2*sqrt(c + d*x**2)*
sqrt(a + b*x**2)*b**2*c**2*x**3 + 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2
*c*d*x**5 - int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d
*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a**2*b*
c**2*d**2 - int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d
*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a**2*b*
c*d**3*x**2 - 30*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*
a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a*
b**3*c*d**2 - 30*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*
a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a*
b**3*d**3*x**2 - 7*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 +
2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*
a*b**2*c**3*d - 7*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2
*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a
*b**2*c**2*d**2*x**2 + 30*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*
c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x*
*6),x)*b**4*c**2*d + 30*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c*
*2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x...
```

3.28 $\int \frac{\sqrt{a+bx^2}\left(A+Bx^2+Cx^4+Dx^6\right)}{\left(c+dx^2\right)^{5/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 456

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \frac{(c^2Cd-Bcd^2+Ad^3-2c^3D)\,x\sqrt{a+bx^2}}{3cd^3\,(c+dx^2)^{3/2}} + \frac{Dx^5\sqrt{a+bx^2}}{3d\,(c+dx^2)^{3/2}} + \frac{(3bCd-6bcD+adD)x\sqrt{a+bx^2}}{3bd^3\sqrt{c+dx^2}} + \frac{(a^2c^2d^2D+abd(7c^2Cd-Bcd^2-2Ad^3-16c^3D)-b^2c(8c^2Cd-2Bcd^2-Ad^3-16c^3D))\sqrt{a+bx^2}\,E\big(\mathrm{ar}}{3bc^{3/2}d^{7/2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}} - \frac{(acd(3Cd-7cD)-b(4c^2Cd-Bcd^2+Ad^3-8c^3D))\sqrt{a+bx^2}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3\sqrt{c}d^{7/2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
1/3*(A*d^3-B*c*d^2+C*c^2*d-2*D*c^3)*x*(b*x^2+a)^(1/2)/c/d^3/(d*x^2+c)^(3/2
)+1/3*D*x^5*(b*x^2+a)^(1/2)/d/(d*x^2+c)^(3/2)+1/3*(3*C*b*d+D*a*d-6*D*b*c)*
x*(b*x^2+a)^(1/2)/b/d^3/(d*x^2+c)^(1/2)+1/3*(a^2*c^2*d^2*D+a*b*d*(-2*A*d^3
-B*c*d^2+7*C*c^2*d-16*D*c^3)-b^2*c*(-A*d^3-2*B*c*d^2+8*C*c^2*d-16*D*c^3))*
(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^
(1/2))/b/c^(3/2)/d^(7/2)/(-a*d+b*c)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2
+c)^(1/2)-1/3*(a*c*d*(3*C*d-7*D*c)-b*(A*d^3-B*c*d^2+4*C*c^2*d-8*D*c^3))*(b
*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))
/c^(1/2)/d^(7/2)/(-a*d+b*c)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2
)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 6.90 (sec) , antiderivative size = 463, normalized size of antiderivative = 1.02

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)\left(ad(7c^4D+2Ad^4x^2+cd^3(3A+Bx^2)-3c^3d(\right.}{}$$

input
```
Integrate[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(5/2),
x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(a*d*(7*c^4*D + 2*A*d^4*x^2 + c*d^3*(3*A + B*x^
2) - 3*c^3*d*(C - 3*D*x^2) + c^2*d^2*x^2*(-4*C + D*x^2)) - b*c*(8*c^4*D +
A*d^4*x^2 + 2*c*d^3*(A + B*x^2) + c^3*(-4*C*d + 10*d*D*x^2) + c^2*d^2*(B -
 5*C*x^2 + D*x^4))) - I*c*(a^2*c^2*d^2*D + b^2*c*(-8*c^2*C*d + 2*B*c*d^2 +
 A*d^3 + 16*c^3*D) - a*b*d*(-7*c^2*C*d + B*c*d^2 + 2*A*d^3 + 16*c^3*D))*Sq
rt[1 + (b*x^2)/a]*(c + d*x^2)*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt
[b/a]*x], (a*d)/(b*c)] + I*c*(-(b*c) + a*d)*(a*c*d*(-3*C*d + 8*c*D) - b*(-
8*c^2*C*d + 2*B*c*d^2 + A*d^3 + 16*c^3*D))*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)
*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)])/(3*Sq
rt[b/a]*c^2*d^4*(-(b*c) + a*d)*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1252 vs. 2(456) = 912.

Time = 2.04 (sec) , antiderivative size = 1252, normalized size of antiderivative = 2.75, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.050, Rules used = {7293, 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.

$$\int \frac{\sqrt{a+bx^2}\left(A+Bx^2+Cx^4+Dx^6\right)}{\left(c+dx^2\right)^{5/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A\sqrt{a+bx^2}}{\left(c+dx^2\right)^{5/2}}+\frac{Bx^2\sqrt{a+bx^2}}{\left(c+dx^2\right)^{5/2}}+\frac{Cx^4\sqrt{a+bx^2}}{\left(c+dx^2\right)^{5/2}}+\frac{Dx^6\sqrt{a+bx^2}}{\left(c+dx^2\right)^{5/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{D\sqrt{bx^2+a}x^5}{3d(dx^2+c)^{3/2}}-\frac{(6bc-5ad)D\sqrt{bx^2+a}x^3}{3d^2(bc-ad)\sqrt{dx^2+c}}-\frac{C\sqrt{bx^2+a}x^3}{3d(dx^2+c)^{3/2}}+\frac{(8bc-7ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3d^3(bc-ad)}-\frac{(16b^2c^2-16abdc+a^2d^2)D\sqrt{bx^2+a}x}{3bd^3(bc-ad)\sqrt{dx^2+c}}+\frac{C(8bc-7ad)\sqrt{bx^2+a}x}{3d^2(bc-ad)\sqrt{dx^2+c}}-\frac{C(4bc-3ad)\sqrt{bx^2+a}x}{3d^2(bc-ad)\sqrt{dx^2+c}}+\frac{A\sqrt{bx^2+a}x}{3c(dx^2+c)^{3/2}}-\frac{B\sqrt{bx^2+a}x}{3d(dx^2+c)^{3/2}}+\frac{B(2bc-ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3\sqrt{c}d^{3/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}(16b^2c^2-16abdc+a^2d^2)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3bd^{7/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C(8bc-7ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3d^{5/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A(bc-2ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3c^{3/2}\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}(8bc-7ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{7/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}C(4bc-3ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{5/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ab\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3\sqrt{c}\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{bB\sqrt{c}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{3/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(5/2),x]
```

output
```
(A*x*Sqrt[a + b*x^2])/(3*c*(c + d*x^2)^(3/2)) - (B*x*Sqrt[a + b*x^2])/(3*d
*(c + d*x^2)^(3/2)) - (C*x^3*Sqrt[a + b*x^2])/(3*d*(c + d*x^2)^(3/2)) - (D
*x^5*Sqrt[a + b*x^2])/(3*d*(c + d*x^2)^(3/2)) + (C*(8*b*c - 7*a*d)*x*Sqrt[
a + b*x^2])/(3*d^2*(b*c - a*d)*Sqrt[c + d*x^2]) - (C*(4*b*c - 3*a*d)*x*Sqr
t[a + b*x^2])/(3*d^2*(b*c - a*d)*Sqrt[c + d*x^2]) - ((16*b^2*c^2 - 16*a*b*
c*d + a^2*d^2)*D*x*Sqrt[a + b*x^2])/(3*b*d^3*(b*c - a*d)*Sqrt[c + d*x^2])
- ((6*b*c - 5*a*d)*D*x^3*Sqrt[a + b*x^2])/(3*d^2*(b*c - a*d)*Sqrt[c + d*x^
2]) + ((8*b*c - 7*a*d)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*d^3*(b*c -
a*d)) - (Sqrt[c]*C*(8*b*c - 7*a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[
d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*d^(5/2)*(b*c - a*d)*Sqrt[(c*(a + b*x^
2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*(b*c - 2*a*d)*Sqrt[a + b*x^2]*E
llipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*c^(3/2)*Sqrt[d]
*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*(
2*b*c - a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b
*c)/(a*d)])/(3*Sqrt[c]*d^(3/2)*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*
x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c]*(16*b^2*c^2 - 16*a*b*c*d + a^2*d^2)*D*S
qrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3
*b*d^(7/2)*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^
2]) - (b*B*Sqrt[c]*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]],
1 - (b*c)/(a*d)])/(3*d^(3/2)*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 7.36 (sec) , antiderivative size = 821, normalized size of antiderivative = 1.80

method	result
elliptic	$\sqrt{(b x^2+a)(x^2 d+c)}\left(\frac{\left(A d^3-B c d^2+C c^2 d-D c^3\right) x \sqrt{b d x^4+a d x^2+x^2 b c+a c}}{3 c d^5 \left(x^2+\frac{c}{d}\right)^2}+\frac{\left(b d x^2+a d\right) x \left(2 A a d^4-A b c d^3+B a c d^3-2 B b c^2 d^2-4 C a c^2 d^2+5\right.}{3 c^2 d^4 (a d-b c) \sqrt{\left(x^2+\frac{c}{d}\right)\left(b d x^2+a d\right)}}\right.$
default	Expression too large to display

input
```
int((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(5/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/3*(A*d^3-B*
c*d^2+C*c^2*d-D*c^3)/c/d^5*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)
^2+1/3*(b*d*x^2+a*d)/c^2/d^4/(a*d-b*c)*x*(2*A*a*d^4-A*b*c*d^3+B*a*c*d^3-2*
B*b*c^2*d^2-4*C*a*c^2*d^2+5*C*b*c^3*d+7*D*a*c^3*d-8*D*b*c^4)/((x^2+c/d)*(b
*d*x^2+a*d))^(1/2)+1/3*D/d^3*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+((B*b*d
^2+C*a*d^2-2*C*b*c*d-2*D*a*c*d+3*D*b*c^2)/d^4+1/3*(A*d^3-B*c*d^2+C*c^2*d-D
*c^3)/d^4*b/c+1/3/d^4*(2*A*a*d^4-A*b*c*d^3+B*a*c*d^3-2*B*b*c^2*d^2-4*C*a*c
^2*d^2+5*C*b*c^3*d+7*D*a*c^3*d-8*D*b*c^4)/c^2-1/3*a/d^3/c^2/(a*d-b*c)*(2*A
*a*d^4-A*b*c*d^3+B*a*c*d^3-2*B*b*c^2*d^2-4*C*a*c^2*d^2+5*C*b*c^3*d+7*D*a*c
^3*d-8*D*b*c^4)-1/3*D/d^3*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^
(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*
d+b*c)/c/b)^(1/2))-(1/d^3*(C*b*d+D*a*d-2*D*b*c)-1/3/d^3*b*(2*A*a*d^4-A*b*c
*d^3+B*a*c*d^3-2*B*b*c^2*d^2-4*C*a*c^2*d^2+5*C*b*c^3*d+7*D*a*c^3*d-8*D*b*c
^4)/(a*d-b*c)/c^2-1/3*D/d^3*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2
)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b
/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)
/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1061 vs. $2(421) = 842$.

Time = 0.12 (sec) , antiderivative size = 1061, normalized size of antiderivative = 2.33

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(5/2),x, algorit
hm="fricas")
```

output
```
1/3*(((16*D*b^2*c^5*d^2 - 2*A*a*b*c*d^6 - 8*(2*D*a*b + C*b^2)*c^4*d^3 + (D
*a^2 + 7*C*a*b + 2*B*b^2)*c^3*d^4 - (B*a*b - A*b^2)*c^2*d^5)*x^5 + 2*(16*D
*b^2*c^6*d - 2*A*a*b*c^2*d^5 - 8*(2*D*a*b + C*b^2)*c^5*d^2 + (D*a^2 + 7*C*
a*b + 2*B*b^2)*c^4*d^3 - (B*a*b - A*b^2)*c^3*d^4)*x^3 + (16*D*b^2*c^7 - 2*
A*a*b*c^3*d^4 - 8*(2*D*a*b + C*b^2)*c^6*d + (D*a^2 + 7*C*a*b + 2*B*b^2)*c^
5*d^2 - (B*a*b - A*b^2)*c^4*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin
(sqrt(-c/d)/x), a*d/(b*c)) - ((16*D*b^2*c^5*d^2 - A*a*b*d^7 - 8*(2*D*a*b +
 C*b^2)*c^4*d^3 + (D*a^2 + (7*C + 8*D)*a*b + 2*B*b^2)*c^3*d^4 - (7*D*a^2 +
 (B + 4*C)*a*b - A*b^2)*c^2*d^5 + (3*C*a^2 - (2*A - B)*a*b)*c*d^6)*x^5 + 2
*(16*D*b^2*c^6*d - A*a*b*c*d^6 - 8*(2*D*a*b + C*b^2)*c^5*d^2 + (D*a^2 + (7
*C + 8*D)*a*b + 2*B*b^2)*c^4*d^3 - (7*D*a^2 + (B + 4*C)*a*b - A*b^2)*c^3*d
^4 + (3*C*a^2 - (2*A - B)*a*b)*c^2*d^5)*x^3 + (16*D*b^2*c^7 - A*a*b*c^2*d^
5 - 8*(2*D*a*b + C*b^2)*c^6*d + (D*a^2 + (7*C + 8*D)*a*b + 2*B*b^2)*c^5*d^
2 - (7*D*a^2 + (B + 4*C)*a*b - A*b^2)*c^4*d^3 + (3*C*a^2 - (2*A - B)*a*b)*
c^3*d^4)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c
)) - (16*D*b^2*c^6*d - 2*A*a*b*c^2*d^5 - 8*(2*D*a*b + C*b^2)*c^5*d^2 + (D*
a^2 + 7*C*a*b + 2*B*b^2)*c^4*d^3 - (B*a*b - A*b^2)*c^3*d^4 - (D*b^2*c^3*d^
4 - D*a*b*c^2*d^5)*x^6 + (6*D*b^2*c^4*d^3 - (7*D*a*b + 3*C*b^2)*c^3*d^4 +
(D*a^2 + 3*C*a*b)*c^2*d^5)*x^4 + (24*D*b^2*c^5*d^2 - 2*B*a*b*c^2*d^5 - A*a
*b*c*d^6 - (25*D*a*b + 12*C*b^2)*c^4*d^3 + (2*D*a^2 + 11*C*a*b + 3*B*b^...
```

Sympy [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{\frac{5}{2}}}\,dx$$

input
```
integrate((b*x**2+a)**(1/2)*(D*x**6+C*x**4+B*x**2+A)/(d*x**2+c)**(5/2),x)
```

output
```
Integral(sqrt(a + b*x**2)*(A + B*x**2 + C*x**4 + D*x**6)/(c + d*x**2)**(5/
2), x)
```

Maxima [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}}{(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(5/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(d*x^2 + c)^(5/2), x
)
```

Giac [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}}{(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(5/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(d*x^2 + c)^(5/2), x
)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx=\int \frac{\sqrt{b\,x^2+a}\,(A+B\,x^2+C\,x^4+x^6\,D)}{(d\,x^2+c)^{5/2}}\,dx$$

input
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(5/2),x)
```

output
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(5/2), x)
```

Reduce [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx=\text{too large to display}$$

input
```
int((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(5/2),x)
```

output

```
(3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*c*d*x + 2*sqrt(c + d*x**2)*sqrt(
a + b*x**2)*a**2*d**2*x**3 - 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*d*
x - 9*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c**2*x - 8*sqrt(c + d*x**2)*sq
rt(a + b*x**2)*a*b*c*d*x**3 + 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*d**2
*x**5 + 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*c**2*x**3 - 2*sqrt(c + d*
x**2)*sqrt(a + b*x**2)*b**2*c*d*x**5 - 9*int((sqrt(c + d*x**2)*sqrt(a + b*
x**2)*x**4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a*
*2*d**4*x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4
*x**8 - b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2
*c*d**3*x**8),x)*a**3*b*c**3*d**3 - 18*int((sqrt(c + d*x**2)*sqrt(a + b*x*
*2)*x**4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a**2
*d**4*x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4*x
**8 - b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2*c
*d**3*x**8),x)*a**3*b*c**2*d**4*x**2 - 9*int((sqrt(c + d*x**2)*sqrt(a + b*
x**2)*x**4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a*
*2*d**4*x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4
*x**8 - b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2
*c*d**3*x**8),x)*a**3*b*c*d**5*x**4 + 36*int((sqrt(c + d*x**2)*sqrt(a + b*
x**2)*x**4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a*
*2*d**4*x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d...
```

3.29 $\int \frac{\sqrt{a+bx^2}\left(A+Bx^2+Cx^4+Dx^6\right)}{\left(c+dx^2\right)^{7/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 567

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \frac{(c^2Cd-Bcd^2+Ad^3-6c^3D)\,x\sqrt{a+bx^2}}{5cd^3\,(c+dx^2)^{5/2}}$$
$$+\frac{Dx^5\sqrt{a+bx^2}}{d\,(c+dx^2)^{5/2}}$$
$$-\frac{(bc(7c^2Cd-2Bcd^2-3Ad^3-42c^3D)-ad(6c^2Cd-Bcd^2-4Ad^3-41c^3D))\,x\sqrt{a+bx^2}}{15c^2d^3(bc-ad)\,(c+dx^2)^{3/2}}$$
$$-\frac{(abcd(13c^2Cd+2Bcd^2+13Ad^3-88c^3D)-b^2c^2(8c^2Cd+2Bcd^2+3Ad^3-48c^3D)-a^2d^2(3c^2Cd+2E}{15c^{5/2}d^{7/2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$
$$+\frac{(15a^2c^2d^2D+abd(6c^2Cd-Bcd^2-4Ad^3-41c^3D)-b^2c(4c^2Cd+Bcd^2-6Ad^3-24c^3D))\,\sqrt{a+bx^2}\,\mathrm{El}}{15c^{3/2}d^{7/2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
1/5*(A*d^3-B*c*d^2+C*c^2*d-6*D*c^3)*x*(b*x^2+a)^(1/2)/c/d^3/(d*x^2+c)^(5/2
)+D*x^5*(b*x^2+a)^(1/2)/d/(d*x^2+c)^(5/2)-1/15*(b*c*(-3*A*d^3-2*B*c*d^2+7*
C*c^2*d-42*D*c^3)-a*d*(-4*A*d^3-B*c*d^2+6*C*c^2*d-41*D*c^3))*x*(b*x^2+a)^(
1/2)/c^2/d^3/(-a*d+b*c)/(d*x^2+c)^(3/2)-1/15*(a*b*c*d*(13*A*d^3+2*B*c*d^2+
13*C*c^2*d-88*D*c^3)-b^2*c^2*(3*A*d^3+2*B*c*d^2+8*C*c^2*d-48*D*c^3)-a^2*d^
2*(8*A*d^3+2*B*c*d^2+3*C*c^2*d-38*D*c^3))*(b*x^2+a)^(1/2)*EllipticE(d^(1/2
)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/c^(5/2)/d^(7/2)/(-a*d+b*c
)^2/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)+1/15*(15*a^2*c^2*d^2*D
+a*b*d*(-4*A*d^3-B*c*d^2+6*C*c^2*d-41*D*c^3)-b^2*c*(-6*A*d^3+B*c*d^2+4*C*c
^2*d-24*D*c^3))*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),
(1-b*c/a/d)^(1/2))/c^(3/2)/d^(7/2)/(-a*d+b*c)^2/(c*(b*x^2+a)/a/(d*x^2+c))^
(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 6.76 (sec) , antiderivative size = 585, normalized size of antiderivative = 1.03

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)\left(3c^2(bc-ad)^2\left(c^2Cd-Bcd^2+Ad^3-c^3D\right)+\right.}{}$$

input
```
Integrate[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(7/2),
x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(3*c^2*(b*c - a*d)^2*(c^2*C*d - B*c*d^2 + A*d^3
 - c^3*D) + c*(b*c - a*d)*(-(a*d*(-6*c^2*C*d + B*c*d^2 + 4*A*d^3 + 11*c^3*
D)) + b*c*(-7*c^2*C*d + 2*B*c*d^2 + 3*A*d^3 + 12*c^3*D))*(c + d*x^2) + (b^
2*c^2*(8*c^2*C*d + 2*B*c*d^2 + 3*A*d^3 - 33*c^3*D) + a^2*d^2*(3*c^2*C*d +
2*B*c*d^2 + 8*A*d^3 - 23*c^3*D) + a*b*c*d*(-13*c^2*C*d - 2*B*c*d^2 - 13*A*
d^3 + 58*c^3*D))*(c + d*x^2)^2) - I*c*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)^2*Sq
rt[1 + (d*x^2)/c]*(b*(a*b*c*d*(13*c^2*C*d + 2*B*c*d^2 + 13*A*d^3 - 88*c^3*
D) - a^2*d^2*(3*c^2*C*d + 2*B*c*d^2 + 8*A*d^3 - 38*c^3*D) + b^2*c^2*(-8*c^
2*C*d - 2*B*c*d^2 - 3*A*d^3 + 48*c^3*D))*EllipticE[I*ArcSinh[Sqrt[b/a]*x],
 (a*d)/(b*c)] - (b*c - a*d)*(15*a^2*c^2*d^2*D + a*b*d*(9*c^2*C*d + B*c*d^2
 + 4*A*d^3 - 64*c^3*D) + b^2*c*(-8*c^2*C*d - 2*B*c*d^2 - 3*A*d^3 + 48*c^3*
D))*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(15*Sqrt[b/a]*c^3*d^4
*(b*c - a*d)^2*Sqrt[a + b*x^2]*(c + d*x^2)^(5/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1387 vs. $2(567) = 1134$.

Time = 2.33 (sec) , antiderivative size = 1387, normalized size of antiderivative = 2.45, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{\sqrt{a+bx^2}\left(A+Bx^2+Cx^4+Dx^6\right)}{\left(c+dx^2\right)^{7/2}} \, dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A\sqrt{a+bx^2}}{\left(c+dx^2\right)^{7/2}}+\frac{Bx^2\sqrt{a+bx^2}}{\left(c+dx^2\right)^{7/2}}+\frac{Cx^4\sqrt{a+bx^2}}{\left(c+dx^2\right)^{7/2}}+\frac{Dx^6\sqrt{a+bx^2}}{\left(c+dx^2\right)^{7/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{D\sqrt{bx^2+a}x^5}{5d\left(dx^2+c\right)^{5/2}}-\frac{(6bc-5ad)D\sqrt{bx^2+a}x^3}{15d^2(bc-ad)\left(dx^2+c\right)^{3/2}}-\frac{C\sqrt{bx^2+a}x^3}{5d\left(dx^2+c\right)^{5/2}}-\frac{\left(24b^2c^2-41abdc+15a^2d^2\right)D\sqrt{bx^2+a}x}{15d^3(bc-ad)^2\sqrt{dx^2+c}}+\frac{2\left(24b^2c^2-44abdc+19a^2d^2\right)D\sqrt{bx^2+a}x}{15d^3(bc-ad)^2\sqrt{dx^2+c}}+\frac{B(2bc-ad)\sqrt{bx^2+a}x}{15cd(bc-ad)\left(dx^2+c\right)^{3/2}}+\frac{A(3bc-4ad)\sqrt{bx^2+a}x}{15c^2(bc-ad)\left(dx^2+c\right)^{3/2}}-\frac{C(4bc-3ad)\sqrt{bx^2+a}x}{15d^2(bc-ad)\left(dx^2+c\right)^{3/2}}+\frac{A\sqrt{bx^2+a}x}{5c\left(dx^2+c\right)^{5/2}}-\frac{B\sqrt{bx^2+a}x}{5d\left(dx^2+c\right)^{5/2}}+\frac{2B\left(b^2c^2-abdc+a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15c^{3/2}d^{3/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{C\left(8b^2c^2-13abdc+3a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15\sqrt{c}d^{5/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\left(3b^2c^2-13abdc+8a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15c^{5/2}\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2\sqrt{c}\left(24b^2c^2-44abdc+19a^2d^2\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15d^{7/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{bB(bc+ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15\sqrt{c}d^{3/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}\left(24b^2c^2-41abdc+15a^2d^2\right)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15d^{7/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2b\sqrt{c}C(2bc-3ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15d^{5/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2Ab(3bc-2ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15c^{3/2}\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(7/2),x]
```

output
```
(A*x*Sqrt[a + b*x^2])/(5*c*(c + d*x^2)^(5/2)) - (B*x*Sqrt[a + b*x^2])/(5*d
*(c + d*x^2)^(5/2)) - (C*x^3*Sqrt[a + b*x^2])/(5*d*(c + d*x^2)^(5/2)) - (D
*x^5*Sqrt[a + b*x^2])/(5*d*(c + d*x^2)^(5/2)) + (A*(3*b*c - 4*a*d)*x*Sqrt[
a + b*x^2])/(15*c^2*(b*c - a*d)*(c + d*x^2)^(3/2)) - (C*(4*b*c - 3*a*d)*x*
Sqrt[a + b*x^2])/(15*d^2*(b*c - a*d)*(c + d*x^2)^(3/2)) + (B*(2*b*c - a*d)
*x*Sqrt[a + b*x^2])/(15*c*d*(b*c - a*d)*(c + d*x^2)^(3/2)) - ((6*b*c - 5*a
*d)*D*x^3*Sqrt[a + b*x^2])/(15*d^2*(b*c - a*d)*(c + d*x^2)^(3/2)) - ((24*b
^2*c^2 - 41*a*b*c*d + 15*a^2*d^2)*D*x*Sqrt[a + b*x^2])/(15*d^3*(b*c - a*d)
^2*Sqrt[c + d*x^2]) + (2*(24*b^2*c^2 - 44*a*b*c*d + 19*a^2*d^2)*D*x*Sqrt[a
 + b*x^2])/(15*d^3*(b*c - a*d)^2*Sqrt[c + d*x^2]) + (2*B*(b^2*c^2 - a*b*c*
d + a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b
*c)/(a*d)])/(15*c^(3/2)*d^(3/2)*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c +
 d*x^2))]*Sqrt[c + d*x^2]) + (C*(8*b^2*c^2 - 13*a*b*c*d + 3*a^2*d^2)*Sqrt[
a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*Sq
rt[c]*d^(5/2)*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c +
 d*x^2]) + (A*(3*b^2*c^2 - 13*a*b*c*d + 8*a^2*d^2)*Sqrt[a + b*x^2]*Ellipti
cE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*c^(5/2)*Sqrt[d]*(b*c
 - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (2*Sqrt
[c]*(24*b^2*c^2 - 44*a*b*c*d + 19*a^2*d^2)*D*Sqrt[a + b*x^2]*EllipticE[Arc
Tan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*d^(7/2)*(b*c - a*d)^2*S...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 1161 vs. 2(534) = 1068.

Time = 9.44 (sec) , antiderivative size = 1162, normalized size of antiderivative = 2.05

method	result	size
elliptic	Expression too large to display	1162
default	Expression too large to display	5928

input
```
int((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(7/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/5*(A*d^3-B*
c*d^2+C*c^2*d-D*c^3)/c/d^6*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)
^3+1/15*(4*A*a*d^4-3*A*b*c*d^3+B*a*c*d^3-2*B*b*c^2*d^2-6*C*a*c^2*d^2+7*C*b
*c^3*d+11*D*a*c^3*d-12*D*b*c^4)/c^2/d^5/(a*d-b*c)*x*(b*d*x^4+a*d*x^2+b*c*x
^2+a*c)^(1/2)/(x^2+c/d)^2+1/15*(b*d*x^2+a*d)/c^3/d^4/(a*d-b*c)^2*x*(8*A*a^
2*d^5-13*A*a*b*c*d^4+3*A*b^2*c^2*d^3+2*B*a^2*c*d^4-2*B*a*b*c^2*d^3+2*B*b^2
*c^3*d^2+3*C*a^2*c^2*d^3-13*C*a*b*c^3*d^2+8*C*b^2*c^4*d-23*D*a^2*c^3*d^2+5
8*D*a*b*c^4*d-33*D*b^2*c^5)/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+((C*b*d+D*a*d-
3*D*b*c)/d^4+1/15*b*(4*A*a*d^4-3*A*b*c*d^3+B*a*c*d^3-2*B*b*c^2*d^2-6*C*a*c
^2*d^2+7*C*b*c^3*d+11*D*a*c^3*d-12*D*b*c^4)/c^2/d^4/(a*d-b*c)+1/15/d^4/(a*
d-b*c)*(8*A*a^2*d^5-13*A*a*b*c*d^4+3*A*b^2*c^2*d^3+2*B*a^2*c*d^4-2*B*a*b*c
^2*d^3+2*B*b^2*c^3*d^2+3*C*a^2*c^2*d^3-13*C*a*b*c^3*d^2+8*C*b^2*c^4*d-23*D
*a^2*c^3*d^2+58*D*a*b*c^4*d-33*D*b^2*c^5)/c^3-1/15*a/d^3/c^3/(a*d-b*c)^2*(
8*A*a^2*d^5-13*A*a*b*c*d^4+3*A*b^2*c^2*d^3+2*B*a^2*c*d^4-2*B*a*b*c^2*d^3+2
*B*b^2*c^3*d^2+3*C*a^2*c^2*d^3-13*C*a*b*c^3*d^2+8*C*b^2*c^4*d-23*D*a^2*c^3
*d^2+58*D*a*b*c^4*d-33*D*b^2*c^5))/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2
/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1
+(a*d+b*c)/c/b)^(1/2))-(D*b/d^3-1/15/d^3*b*(8*A*a^2*d^5-13*A*a*b*c*d^4+3*A
*b^2*c^2*d^3+2*B*a^2*c*d^4-2*B*a*b*c^2*d^3+2*B*b^2*c^3*d^2+3*C*a^2*c^2*d^3
-13*C*a*b*c^3*d^2+8*C*b^2*c^4*d-23*D*a^2*c^3*d^2+58*D*a*b*c^4*d-33*D*b^...
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1905 vs. $2(533) = 1066$.

Time = 0.16 (sec) , antiderivative size = 1905, normalized size of antiderivative = 3.36

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(7/2),x, algorit
hm="fricas")
```

output
```
-1/15*(((48*D*b^3*c^6*d^3 - 8*A*a^2*b*c*d^8 - 8*(11*D*a*b^2 + C*b^3)*c^5*d
^4 + (38*D*a^2*b + 13*C*a*b^2 - 2*B*b^3)*c^4*d^5 - (3*C*a^2*b - 2*B*a*b^2
+ 3*A*b^3)*c^3*d^6 - (2*B*a^2*b - 13*A*a*b^2)*c^2*d^7)*x^7 + 3*(48*D*b^3*c
^7*d^2 - 8*A*a^2*b*c^2*d^7 - 8*(11*D*a*b^2 + C*b^3)*c^6*d^3 + (38*D*a^2*b
+ 13*C*a*b^2 - 2*B*b^3)*c^5*d^4 - (3*C*a^2*b - 2*B*a*b^2 + 3*A*b^3)*c^4*d^
5 - (2*B*a^2*b - 13*A*a*b^2)*c^3*d^6)*x^5 + 3*(48*D*b^3*c^8*d - 8*A*a^2*b*
c^3*d^6 - 8*(11*D*a*b^2 + C*b^3)*c^7*d^2 + (38*D*a^2*b + 13*C*a*b^2 - 2*B*
b^3)*c^6*d^3 - (3*C*a^2*b - 2*B*a*b^2 + 3*A*b^3)*c^5*d^4 - (2*B*a^2*b - 13
*A*a*b^2)*c^4*d^5)*x^3 + (48*D*b^3*c^9 - 8*A*a^2*b*c^4*d^5 - 8*(11*D*a*b^2
 + C*b^3)*c^8*d + (38*D*a^2*b + 13*C*a*b^2 - 2*B*b^3)*c^7*d^2 - (3*C*a^2*b
 - 2*B*a*b^2 + 3*A*b^3)*c^6*d^3 - (2*B*a^2*b - 13*A*a*b^2)*c^5*d^4)*x)*sqr
t(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((48*D*b^3
*c^6*d^3 - 4*A*a^2*b*d^9 - 8*(11*D*a*b^2 + C*b^3)*c^5*d^4 + (38*D*a^2*b +
(13*C + 24*D)*a*b^2 - 2*B*b^3)*c^4*d^5 - ((3*C + 41*D)*a^2*b - 2*(B - 2*C)
*a*b^2 + 3*A*b^3)*c^3*d^6 + (15*D*a^3 - 2*(B - 3*C)*a^2*b + (13*A - B)*a*b
^2)*c^2*d^7 - ((8*A + B)*a^2*b - 6*A*a*b^2)*c*d^8)*x^7 + 3*(48*D*b^3*c^7*d
^2 - 4*A*a^2*b*c*d^8 - 8*(11*D*a*b^2 + C*b^3)*c^6*d^3 + (38*D*a^2*b + (13*
C + 24*D)*a*b^2 - 2*B*b^3)*c^5*d^4 - ((3*C + 41*D)*a^2*b - 2*(B - 2*C)*a*b
^2 + 3*A*b^3)*c^4*d^5 + (15*D*a^3 - 2*(B - 3*C)*a^2*b + (13*A - B)*a*b^2)*
c^3*d^6 - ((8*A + B)*a^2*b - 6*A*a*b^2)*c^2*d^7)*x^5 + 3*(48*D*b^3*c^8*...
```

Sympy [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{\frac{7}{2}}}\,dx$$

input
```
integrate((b*x**2+a)**(1/2)*(D*x**6+C*x**4+B*x**2+A)/(d*x**2+c)**(7/2),x)
```

output
```
Integral(sqrt(a + b*x**2)*(A + B*x**2 + C*x**4 + D*x**6)/(c + d*x**2)**(7/
2), x)
```

Maxima [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}}{(dx^2+c)^{\frac{7}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(7/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(d*x^2 + c)^(7/2), x
)
```

Giac [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}}{(dx^2+c)^{\frac{7}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(7/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(d*x^2 + c)^(7/2), x
)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx=\int \frac{\sqrt{b\,x^2+a}\,\left(A+B\,x^2+C\,x^4+x^6\,D\right)}{{\left(d\,x^2+c\right)}^{7/2}}\,dx$$

input
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(7/2),x)
```

output
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(7/2), x)
```

Reduce [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \text{too large to display}$$

input
```
int((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(7/2),x)
```

output
```
( - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*c*d*x - 4*sqrt(c + d*x**2)*sq
rt(a + b*x**2)*a**2*d**2*x**3 - 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2
*d*x + 15*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c**2*x + 22*sqrt(c + d*x**
2)*sqrt(a + b*x**2)*a*b*c*d*x**3 + 4*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b
*d**2*x**5 - 10*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*c**2*x**3 - 2*sqrt(
c + d*x**2)*sqrt(a + b*x**2)*b**2*c*d*x**5 - 16*int((sqrt(c + d*x**2)*sqrt
(a + b*x**2)*x**4)/(2*a**2*c**4*d + 8*a**2*c**3*d**2*x**2 + 12*a**2*c**2*d
**3*x**4 + 8*a**2*c*d**4*x**6 + 2*a**2*d**5*x**8 - a*b*c**5 - 2*a*b*c**4*d
*x**2 + 2*a*b*c**3*d**2*x**4 + 8*a*b*c**2*d**3*x**6 + 7*a*b*c*d**4*x**8 +
2*a*b*d**5*x**10 - b**2*c**5*x**2 - 4*b**2*c**4*d*x**4 - 6*b**2*c**3*d**2*
x**6 - 4*b**2*c**2*d**3*x**8 - b**2*c*d**4*x**10),x)*a**4*c**3*d**4 - 48*i
nt((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(2*a**2*c**4*d + 8*a**2*c**3*d
**2*x**2 + 12*a**2*c**2*d**3*x**4 + 8*a**2*c*d**4*x**6 + 2*a**2*d**5*x**8
- a*b*c**5 - 2*a*b*c**4*d*x**2 + 2*a*b*c**3*d**2*x**4 + 8*a*b*c**2*d**3*x*
*6 + 7*a*b*c*d**4*x**8 + 2*a*b*d**5*x**10 - b**2*c**5*x**2 - 4*b**2*c**4*d
*x**4 - 6*b**2*c**3*d**2*x**6 - 4*b**2*c**2*d**3*x**8 - b**2*c*d**4*x**10)
,x)*a**4*c**2*d**5*x**2 - 48*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/
(2*a**2*c**4*d + 8*a**2*c**3*d**2*x**2 + 12*a**2*c**2*d**3*x**4 + 8*a**2*c
*d**4*x**6 + 2*a**2*d**5*x**8 - a*b*c**5 - 2*a*b*c**4*d*x**2 + 2*a*b*c**3*
d**2*x**4 + 8*a*b*c**2*d**3*x**6 + 7*a*b*c*d**4*x**8 + 2*a*b*d**5*x**10...
```

3.30 $\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 780

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \frac{(c^2Cd-Bcd^2+Ad^3+6c^3D)\,x\sqrt{a+bx^2}}{7cd^3\,(c+dx^2)^{7/2}}$$

$$-\frac{Dx^5\sqrt{a+bx^2}}{d\,(c+dx^2)^{7/2}}$$

$$-\frac{(bc(9c^2Cd-2Bcd^2-5Ad^3+54c^3D)-ad(8c^2Cd-Bcd^2-6Ad^3+55c^3D))\,x\sqrt{a+bx^2}}{35c^2d^3(bc-ad)\,(c+dx^2)^{5/2}}$$

$$+\frac{(b^2c^2(8c^2Cd+6Bcd^2+15Ad^3+48c^3D)+a^2d^2(3c^2Cd+4Bcd^2+24Ad^3+60c^3D)-abcd(15c^2Cd+6I}{105c^3d^3(bc-ad)^2\,(c+dx^2)^{3/2}}$$

$$-\frac{(a^3d^3(6c^2Cd+8Bcd^2+48Ad^3+15c^3D)-b^3c^3(8c^2Cd+6Bcd^2+15Ad^3+48c^3D)-a^2bcd^2(9c^2Cd+1}{105c^{7/2}d^{7/2}(bc-}$$

$$+\frac{b(a^2d^2(3c^2Cd+4Bcd^2+24Ad^3-45c^3D)-b^2c^2(4c^2Cd+3Bcd^2-45Ad^3+24c^3D)+abcd(9c^2Cd-9I}{105c^{5/2}d^{7/2}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+d}}$$

output
```
1/7*(A*d^3-B*c*d^2+C*c^2*d+6*D*c^3)*x*(b*x^2+a)^(1/2)/c/d^3/(d*x^2+c)^(7/2
)-D*x^5*(b*x^2+a)^(1/2)/d/(d*x^2+c)^(7/2)-1/35*(b*c*(-5*A*d^3-2*B*c*d^2+9*
C*c^2*d+54*D*c^3)-a*d*(-6*A*d^3-B*c*d^2+8*C*c^2*d+55*D*c^3))*x*(b*x^2+a)^(
1/2)/c^2/d^3/(-a*d+b*c)/(d*x^2+c)^(5/2)+1/105*(b^2*c^2*(15*A*d^3+6*B*c*d^2
+8*C*c^2*d+48*D*c^3)+a^2*d^2*(24*A*d^3+4*B*c*d^2+3*C*c^2*d+60*D*c^3)-a*b*c
*d*(43*A*d^3+6*B*c*d^2+15*C*c^2*d+104*D*c^3))*x*(b*x^2+a)^(1/2)/c^3/d^3/(-
a*d+b*c)^2/(d*x^2+c)^(3/2)-1/105*(a^3*d^3*(48*A*d^3+8*B*c*d^2+6*C*c^2*d+15
*D*c^3)-b^3*c^3*(15*A*d^3+6*B*c*d^2+8*C*c^2*d+48*D*c^3)-a^2*b*c*d^2*(128*A
*d^3+19*B*c*d^2+9*C*c^2*d+103*D*c^3)+a*b^2*c^2*d*(103*A*d^3+9*B*c*d^2+19*C
*c^2*d+128*D*c^3))*(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)
^(1/2),(1-b*c/a/d)^(1/2))/c^(7/2)/d^(7/2)/(-a*d+b*c)^3/(c*(b*x^2+a)/a/(d*x
^2+c))^(1/2)/(d*x^2+c)^(1/2)+1/105*b*(a^2*d^2*(24*A*d^3+4*B*c*d^2+3*C*c^2*
d-45*D*c^3)-b^2*c^2*(-45*A*d^3+3*B*c*d^2+4*C*c^2*d+24*D*c^3)+a*b*c*d*(-61*
A*d^3-9*B*c*d^2+9*C*c^2*d+61*D*c^3))*(b*x^2+a)^(1/2)*InverseJacobiAM(arcta
n(d^(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/c^(5/2)/d^(7/2)/(-a*d+b*c)^3/(c*(b
*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 7.83 (sec) , antiderivative size = 820, normalized size of antiderivative = 1.05

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)\left(15c^3(bc-ad)^3\left(c^2Cd-Bcd^2+Ad^3-c^3D\right)\right.}{}$$

input
```
Integrate[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(9/2),
x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(15*c^3*(b*c - a*d)^3*(c^2*C*d - B*c*d^2 + A*d^
3 - c^3*D) + 3*c^2*(b*c - a*d)^2*(-(a*d*(-8*c^2*C*d + B*c*d^2 + 6*A*d^3 +
15*c^3*D)) + b*c*(-9*c^2*C*d + 2*B*c*d^2 + 5*A*d^3 + 16*c^3*D))*(c + d*x^2
) + c*(b*c - a*d)*(b^2*c^2*(8*c^2*C*d + 6*B*c*d^2 + 15*A*d^3 - 57*c^3*D) +
 a^2*d^2*(3*c^2*C*d + 4*B*c*d^2 + 24*A*d^3 - 45*c^3*D) + a*b*c*d*(-15*c^2*
C*d - 6*B*c*d^2 - 43*A*d^3 + 106*c^3*D))*(c + d*x^2)^2 + (-(a^3*d^3*(6*c^2
*C*d + 8*B*c*d^2 + 48*A*d^3 + 15*c^3*D)) + b^3*c^3*(8*c^2*C*d + 6*B*c*d^2
+ 15*A*d^3 + 48*c^3*D) + a^2*b*c*d^2*(9*c^2*C*d + 19*B*c*d^2 + 128*A*d^3 +
 103*c^3*D) - a*b^2*c^2*d*(19*c^2*C*d + 9*B*c*d^2 + 103*A*d^3 + 128*c^3*D)
)*(c + d*x^2)^3) + I*b*c*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)^3*Sqrt[1 + (d*x^2
)/c]*((-(a^3*d^3*(6*c^2*C*d + 8*B*c*d^2 + 48*A*d^3 + 15*c^3*D)) + b^3*c^3*
(8*c^2*C*d + 6*B*c*d^2 + 15*A*d^3 + 48*c^3*D) + a^2*b*c*d^2*(9*c^2*C*d + 1
9*B*c*d^2 + 128*A*d^3 + 103*c^3*D) - a*b^2*c^2*d*(19*c^2*C*d + 9*B*c*d^2 +
 103*A*d^3 + 128*c^3*D))*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] -
(b*c - a*d)*(b^2*c^2*(8*c^2*C*d + 6*B*c*d^2 + 15*A*d^3 + 48*c^3*D) + a^2*d
^2*(3*c^2*C*d + 4*B*c*d^2 + 24*A*d^3 + 60*c^3*D) - a*b*c*d*(15*c^2*C*d + 6
*B*c*d^2 + 43*A*d^3 + 104*c^3*D))*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/
(b*c)]))/(105*Sqrt[b/a]*c^4*d^4*(b*c - a*d)^3*Sqrt[a + b*x^2]*(c + d*x^2)^
(7/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1613 vs. $2(780) = 1560$.

Time = 2.71 (sec) , antiderivative size = 1613, normalized size of antiderivative = 2.07, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{\sqrt{a+bx^2}\left(A+Bx^2+Cx^4+Dx^6\right)}{\left(c+dx^2\right)^{9/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A\sqrt{a+bx^2}}{\left(c+dx^2\right)^{9/2}}+\frac{Bx^2\sqrt{a+bx^2}}{\left(c+dx^2\right)^{9/2}}+\frac{Cx^4\sqrt{a+bx^2}}{\left(c+dx^2\right)^{9/2}}+\frac{Dx^6\sqrt{a+bx^2}}{\left(c+dx^2\right)^{9/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{D\sqrt{bx^2+a}x^5}{7d(dx^2+c)^{7/2}}-\frac{(6bc-5ad)D\sqrt{bx^2+a}x^3}{35d^2(bc-ad)(dx^2+c)^{5/2}}-\frac{C\sqrt{bx^2+a}x^3}{7d(dx^2+c)^{7/2}}+\frac{2B(3b^2c^2-3abdc+2a^2d^2)\sqrt{bx^2+a}x}{105c^2d(bc-ad)^2(dx^2+c)^{3/2}}+\frac{C(8b^2c^2-15abdc+3a^2d^2)\sqrt{bx^2+a}x}{105cd^2(bc-ad)^2(dx^2+c)^{3/2}}+\frac{A(15b^2c^2-43abdc+24a^2d^2)\sqrt{bx^2+a}x}{105c^3(bc-ad)^2(dx^2+c)^{3/2}}-\frac{(24b^2c^2-43abdc+15a^2d^2)D\sqrt{bx^2+a}x}{105d^3(bc-ad)^2(dx^2+c)^{3/2}}+\frac{B(2bc-ad)\sqrt{bx^2+a}x}{35cd(bc-ad)(dx^2+c)^{5/2}}+\frac{A(5bc-6ad)\sqrt{bx^2+a}x}{35c^2(bc-ad)(dx^2+c)^{5/2}}-\frac{C(4bc-3ad)\sqrt{bx^2+a}x}{35d^2(bc-ad)(dx^2+c)^{5/2}}+\frac{A\sqrt{bx^2+a}x}{7c(dx^2+c)^{7/2}}-\frac{B\sqrt{bx^2+a}x}{7d(dx^2+c)^{7/2}}+\frac{C(bc-2ad)(8b^2c^2-3abdc+3a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{105c^{3/2}d^{5/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{B(2bc-ad)(3b^2c^2-3abdc+8a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{105c^{5/2}d^{3/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A(15b^3c^3-103ab^2dc^2+128a^2bd^2c-48a^3d^3)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{105c^{7/2}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{(48b^3c^3-128ab^2dc^2+103a^2bd^2c-15a^3d^3)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{105\sqrt{c}d^{7/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{bB(3b^2c^2+9abdc-4a^2d^2)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{105c^{3/2}d^{3/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{bC(4b^2c^2-9abdc-3a^2d^2)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{105\sqrt{c}d^{5/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ab(45b^2c^2-61abdc+24a^2d^2)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{105c^{5/2}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{b\sqrt{c}(24b^2c^2-61abdc+45a^2d^2)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{105d^{7/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(Sqrt[a + b*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(9/2),x]
```

output
```
(A*x*Sqrt[a + b*x^2])/(7*c*(c + d*x^2)^(7/2)) - (B*x*Sqrt[a + b*x^2])/(7*d
*(c + d*x^2)^(7/2)) - (C*x^3*Sqrt[a + b*x^2])/(7*d*(c + d*x^2)^(7/2)) - (D
*x^5*Sqrt[a + b*x^2])/(7*d*(c + d*x^2)^(7/2)) + (A*(5*b*c - 6*a*d)*x*Sqrt[
a + b*x^2])/(35*c^2*(b*c - a*d)*(c + d*x^2)^(5/2)) - (C*(4*b*c - 3*a*d)*x*
Sqrt[a + b*x^2])/(35*d^2*(b*c - a*d)*(c + d*x^2)^(5/2)) + (B*(2*b*c - a*d)
*x*Sqrt[a + b*x^2])/(35*c*d*(b*c - a*d)*(c + d*x^2)^(5/2)) - ((6*b*c - 5*a
*d)*D*x^3*Sqrt[a + b*x^2])/(35*d^2*(b*c - a*d)*(c + d*x^2)^(5/2)) + (2*B*(
3*b^2*c^2 - 3*a*b*c*d + 2*a^2*d^2)*x*Sqrt[a + b*x^2])/(105*c^2*d*(b*c - a*
d)^2*(c + d*x^2)^(3/2)) + (C*(8*b^2*c^2 - 15*a*b*c*d + 3*a^2*d^2)*x*Sqrt[a
 + b*x^2])/(105*c*d^2*(b*c - a*d)^2*(c + d*x^2)^(3/2)) + (A*(15*b^2*c^2 -
43*a*b*c*d + 24*a^2*d^2)*x*Sqrt[a + b*x^2])/(105*c^3*(b*c - a*d)^2*(c + d*
x^2)^(3/2)) - ((24*b^2*c^2 - 43*a*b*c*d + 15*a^2*d^2)*D*x*Sqrt[a + b*x^2])
/(105*d^3*(b*c - a*d)^2*(c + d*x^2)^(3/2)) + (C*(b*c - 2*a*d)*(8*b^2*c^2 -
 3*a*b*c*d + 3*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[
c]], 1 - (b*c)/(a*d)])/(105*c^(3/2)*d^(5/2)*(b*c - a*d)^3*Sqrt[(c*(a + b*x
^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*(2*b*c - a*d)*(3*b^2*c^2 - 3*a
*b*c*d + 8*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]],
 1 - (b*c)/(a*d)])/(105*c^(5/2)*d^(3/2)*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))
/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*(15*b^3*c^3 - 103*a*b^2*c^2*d + 12
8*a^2*b*c*d^2 - 48*a^3*d^3)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 1618 vs. $2(741) = 1482$.

Time = 10.21 (sec) , antiderivative size = 1619, normalized size of antiderivative = 2.08

method	result	size
elliptic	Expression too large to display	1619
default	Expression too large to display	10184

input
```
int((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(9/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/7*(A*d^3-B*
c*d^2+C*c^2*d-D*c^3)/c/d^7*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)
^4+1/35*(6*A*a*d^4-5*A*b*c*d^3+B*a*c*d^3-2*B*b*c^2*d^2-8*C*a*c^2*d^2+9*C*b
*c^3*d+15*D*a*c^3*d-16*D*b*c^4)/d^6/(a*d-b*c)/c^2*x*(b*d*x^4+a*d*x^2+b*c*x
^2+a*c)^(1/2)/(x^2+c/d)^3+1/105*(24*A*a^2*d^5-43*A*a*b*c*d^4+15*A*b^2*c^2*
d^3+4*B*a^2*c*d^4-6*B*a*b*c^2*d^3+6*B*b^2*c^3*d^2+3*C*a^2*c^2*d^3-15*C*a*b
*c^3*d^2+8*C*b^2*c^4*d-45*D*a^2*c^3*d^2+106*D*a*b*c^4*d-57*D*b^2*c^5)/d^5/
(a*d-b*c)^2/c^3*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)^2+1/105*(b
*d*x^2+a*d)/c^4/d^4/(a*d-b*c)^3*x*(48*A*a^3*d^6-128*A*a^2*b*c*d^5+103*A*a*
b^2*c^2*d^4-15*A*b^3*c^3*d^3+8*B*a^3*c*d^5-19*B*a^2*b*c^2*d^4+9*B*a*b^2*c^
3*d^3-6*B*b^3*c^4*d^2+6*C*a^3*c^2*d^4-9*C*a^2*b*c^3*d^3+19*C*a*b^2*c^4*d^2
-8*C*b^3*c^5*d+15*D*a^3*c^3*d^3-103*D*a^2*b*c^4*d^2+128*D*a*b^2*c^5*d-48*D
*b^3*c^6)/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+(D*b/d^4+1/105*b*(24*A*a^2*d^5-4
3*A*a*b*c*d^4+15*A*b^2*c^2*d^3+4*B*a^2*c*d^4-6*B*a*b*c^2*d^3+6*B*b^2*c^3*d
^2+3*C*a^2*c^2*d^3-15*C*a*b*c^3*d^2+8*C*b^2*c^4*d-45*D*a^2*c^3*d^2+106*D*a
*b*c^4*d-57*D*b^2*c^5)/d^4/(a*d-b*c)^2/c^3+1/105/d^4/(a*d-b*c)^2*(48*A*a^3
*d^6-128*A*a^2*b*c*d^5+103*A*a*b^2*c^2*d^4-15*A*b^3*c^3*d^3+8*B*a^3*c*d^5-
19*B*a^2*b*c^2*d^4+9*B*a*b^2*c^3*d^3-6*B*b^3*c^4*d^2+6*C*a^3*c^2*d^4-9*C*a
^2*b*c^3*d^3+19*C*a*b^2*c^4*d^2-8*C*b^3*c^5*d+15*D*a^3*c^3*d^3-103*D*a^2*b
*c^4*d^2+128*D*a*b^2*c^5*d-48*D*b^3*c^6)/c^4-1/105*a/d^3/c^4/(a*d-b*c)^...
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 3122 vs. $2(741) = 1482$.

Time = 0.25 (sec) , antiderivative size = 3122, normalized size of antiderivative = 4.00

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(9/2),x, algorit
hm="fricas")
```

output
```
Too large to include
```

Sympy [F(-1)]

Timed out.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \text{Timed out}$$

input
```
integrate((b*x**2+a)**(1/2)*(D*x**6+C*x**4+B*x**2+A)/(d*x**2+c)**(9/2),x)
```

output
```
Timed out
```

Maxima [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}}{(dx^2+c)^{\frac{9}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(9/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(d*x^2 + c)^(9/2), x
)
```

Giac [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{bx^2+a}}{(dx^2+c)^{\frac{9}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(9/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(b*x^2 + a)/(d*x^2 + c)^(9/2), x
)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \int \frac{\sqrt{b\,x^2+a}\,(A+B\,x^2+C\,x^4+x^6\,D)}{(d\,x^2+c)^{9/2}}\,dx$$

input
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(9/2),x)
```

output
```
int(((a + b*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(9/2), x)
```

Reduce [F]

$$\int \frac{\sqrt{a+bx^2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \text{too large to display}$$

input
```
int((b*x^2+a)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(9/2),x)
```

output

```
(3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*c*d*x + 6*sqrt(c + d*x**2)*sqrt(
a + b*x**2)*a**2*d**2*x**3 - 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*d*
x - 21*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c**2*x - 44*sqrt(c + d*x**2)*
sqrt(a + b*x**2)*a*b*c*d*x**3 - 18*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*d
**2*x**5 + 14*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*c**2*x**3 + 6*sqrt(c
+ d*x**2)*sqrt(a + b*x**2)*b**2*c*d*x**5 + 72*int((sqrt(c + d*x**2)*sqrt(a
 + b*x**2)*x**4)/(3*a**2*c**5*d + 15*a**2*c**4*d**2*x**2 + 30*a**2*c**3*d*
*3*x**4 + 30*a**2*c**2*d**4*x**6 + 15*a**2*c*d**5*x**8 + 3*a**2*d**6*x**10
 - a*b*c**6 - 2*a*b*c**5*d*x**2 + 5*a*b*c**4*d**2*x**4 + 20*a*b*c**3*d**3*
x**6 + 25*a*b*c**2*d**4*x**8 + 14*a*b*c*d**5*x**10 + 3*a*b*d**6*x**12 - b*
*2*c**6*x**2 - 5*b**2*c**5*d*x**4 - 10*b**2*c**4*d**2*x**6 - 10*b**2*c**3*
d**3*x**8 - 5*b**2*c**2*d**4*x**10 - b**2*c*d**5*x**12),x)*a**4*c**4*d**4
+ 288*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(3*a**2*c**5*d + 15*a**
2*c**4*d**2*x**2 + 30*a**2*c**3*d**3*x**4 + 30*a**2*c**2*d**4*x**6 + 15*a*
*2*c*d**5*x**8 + 3*a**2*d**6*x**10 - a*b*c**6 - 2*a*b*c**5*d*x**2 + 5*a*b*
c**4*d**2*x**4 + 20*a*b*c**3*d**3*x**6 + 25*a*b*c**2*d**4*x**8 + 14*a*b*c*
d**5*x**10 + 3*a*b*d**6*x**12 - b**2*c**6*x**2 - 5*b**2*c**5*d*x**4 - 10*b
**2*c**4*d**2*x**6 - 10*b**2*c**3*d**3*x**8 - 5*b**2*c**2*d**4*x**10 - b**
2*c*d**5*x**12),x)*a**4*c**3*d**5*x**2 + 432*int((sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*x**4)/(3*a**2*c**5*d + 15*a**2*c**4*d**2*x**2 + 30*a**2*c**3*...
```

3.31 $\int (a+bx^2)^{3/2}\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)\,dx$

Optimal result

Integrand size = 40, antiderivative size = 1098

$$\int (a+bx^2)^{3/2}\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)\,dx = \text{Too large to display}$$

output
```
-1/3465*(48*a^5*d^5*D-8*a^4*b*d^4*(11*C*d+4*D*c)+a^3*b^2*d^3*(198*B*d^2+77
*C*c*d-29*D*c^2)-a*b^4*c*d*(1617*A*d^3-627*B*c*d^2+352*C*c^2*d-232*D*c^3)+
2*b^5*c^2*(231*A*d^3-132*B*c*d^2+88*C*c^2*d-64*D*c^3)+3*a^2*b^3*d^2*(-231*
A*d^3-99*B*c*d^2+33*C*c^2*d-17*D*c^3))*x*(d*x^2+c)^(1/2)/b^3/d^5/(b*x^2+a)
^(1/2)+1/3465*(24*a^4*d^4*D-a^3*b*d^3*(44*C*d+13*D*c)+3*a^2*b^2*d^2*(33*B*
d^2+11*C*c*d-5*D*c^2)+b^4*c*(231*A*d^3-132*B*c*d^2+88*C*c^2*d-64*D*c^3)-3*
a*b^3*d*(-462*A*d^3-99*B*c*d^2+55*C*c^2*d-36*D*c^3))*x*(b*x^2+a)^(1/2)*(d*
x^2+c)^(1/2)/b^3/d^4-1/3465*(18*a^3*d^3*D-3*a^2*b*d^2*(11*C*d+3*D*c)-a*b^2
*d*(792*B*d^2+121*C*c*d-79*D*c^2)+b^3*(-693*A*d^3-99*B*c*d^2+66*C*c^2*d-48
*D*c^3))*x^3*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b^2/d^3+1/693*(3*a^2*d^2*D+a*
b*d*(110*C*d+13*D*c)+b^2*(99*B*d^2+11*C*c*d-8*D*c^2))*x^5*(b*x^2+a)^(1/2)*
(d*x^2+c)^(1/2)/b/d^2+1/99*(11*C*b*d+12*D*a*d+D*b*c)*x^7*(b*x^2+a)^(1/2)*(
d*x^2+c)^(1/2)/d+1/11*b*D*x^9*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)+1/3465*a^(1/
2)*(48*a^5*d^5*D-8*a^4*b*d^4*(11*C*d+4*D*c)+a^3*b^2*d^3*(198*B*d^2+77*C*c*
d-29*D*c^2)-a*b^4*c*d*(1617*A*d^3-627*B*c*d^2+352*C*c^2*d-232*D*c^3)+2*b^5
*c^2*(231*A*d^3-132*B*c*d^2+88*C*c^2*d-64*D*c^3)+3*a^2*b^3*d^2*(-231*A*d^3
-99*B*c*d^2+33*C*c^2*d-17*D*c^3))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1
/2)/(1+b*x^2/a)^(1/2),(1-a*d/b/c)^(1/2))/b^(7/2)/d^5/(b*x^2+a)^(1/2)/(a*(d
*x^2+c)/c/(b*x^2+a))^(1/2)-1/3465*a^(3/2)*(24*a^4*d^4*D-a^3*b*d^3*(44*C*d+
13*D*c)+3*a^2*b^2*d^2*(33*B*d^2+11*C*c*d-5*D*c^2)+b^4*c*(231*A*d^3-132*...
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 10.89 (sec) , antiderivative size = 4070, normalized size of antiderivative = 3.71

$$\int (a+bx^2)^{3/2}\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)\,dx = \text{Result too large to show}$$

input
```
Integrate[(a + b*x^2)^(3/2)*Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4 + D*x^6),x]
```

output
```
Sqrt[a + b*x^2]*Sqrt[c + d*x^2]*(((88*b^4*c^3*C*d - 132*b^4*B*c^2*d^2 - 16
5*a*b^3*c^2*C*d^2 + 231*A*b^4*c*d^3 + 297*a*b^3*B*c*d^3 + 33*a^2*b^2*c*C*d
^3 + 1386*a*A*b^3*d^4 + 99*a^2*b^2*B*d^4 - 44*a^3*b*C*d^4 - 64*b^4*c^4*D +
 108*a*b^3*c^3*d*D - 15*a^2*b^2*c^2*d^2*D - 13*a^3*b*c*d^3*D + 24*a^4*d^4*
D)*x)/(3465*b^3*d^4) + ((-66*b^3*c^2*C*d + 99*b^3*B*c*d^2 + 121*a*b^2*c*C*
d^2 + 693*A*b^3*d^3 + 792*a*b^2*B*d^3 + 33*a^2*b*C*d^3 + 48*b^3*c^3*D - 79
*a*b^2*c^2*d*D + 9*a^2*b*c*d^2*D - 18*a^3*d^3*D)*x^3)/(3465*b^2*d^3) + ((1
1*b^2*c*C*d + 99*b^2*B*d^2 + 110*a*b*C*d^2 - 8*b^2*c^2*D + 13*a*b*c*d*D +
3*a^2*d^2*D)*x^5)/(693*b*d^2) + ((11*b*C*d + b*c*D + 12*a*d*D)*x^7)/(99*d)
 + (b*D*x^9)/11) - (Sqrt[(a + b*x^2)*(c + d*x^2)]*(((-176*I)*b^5*c^5*C*Sqr
t[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*(EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a
*d)/(b*c)] - EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(Sqrt[b/a]*S
qrt[(a + b*x^2)*(c + d*x^2)]) + ((264*I)*b^5*B*c^4*d*Sqrt[1 + (b*x^2)/a]*S
qrt[1 + (d*x^2)/c]*(EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - Ellip
ticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(Sqrt[b/a]*Sqrt[(a + b*x^2)*(c
 + d*x^2)]) + ((352*I)*a*b^4*c^4*C*d*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/
c]*(EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - EllipticF[I*ArcSinh[S
qrt[b/a]*x], (a*d)/(b*c)]))/(Sqrt[b/a]*Sqrt[(a + b*x^2)*(c + d*x^2)]) - ((
462*I)*A*b^5*c^3*d^2*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*(EllipticE[I*
ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - EllipticF[I*ArcSinh[Sqrt[b/a]*x], ...
```

Rubi [A] (verified)

Time = 3.70 (sec) , antiderivative size = 1994, normalized size of antiderivative = 1.82, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int (a+bx^2)^{3/2}\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(A(a+bx^2)^{3/2}\sqrt{c+dx^2}+Bx^2(a+bx^2)^{3/2}\sqrt{c+dx^2}+Cx^4(a+bx^2)^{3/2}\sqrt{c+dx^2}+Dx^6(a+bx^2)^{3/2}\sqrt{c\right.$$

$$\Big\downarrow \text{2009}$$

$$\frac{1}{11}D\left(bx^2+a\right)^{3/2}\sqrt{dx^2+c}x^7+\frac{(bc+3ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^7}{99d}+\frac{1}{9}C\left(bx^2+a\right)^{3/2}\sqrt{dx^2+c}x^5+\frac{C(bc+3ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{63d}+\frac{\left(\frac{3da^2}{b}+13ca-\frac{8bc^2}{d}\right)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{693d}+\frac{1}{7}B\left(bx^2+a\right)^{3/2}\sqrt{dx^2+c}x^3+\frac{B(bc+3ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{35d}+\frac{C\left(\frac{3da^2}{b}+11ca-\frac{6bc^2}{d}\right)\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{315d}+\frac{\left(48b^3c^3-79ab^2dc^2+9a^2bd^2c-18a^3d^3\right)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{3465b^2d^3}+\frac{Ab\sqrt{bx^2+a}\left(dx^2+c\right)^{3/2}x}{5d}-\frac{2A(bc-3ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15d}+\frac{B\left(\frac{3da^2}{b}+9ca-\frac{4bc^2}{d}\right)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{105d}+\frac{C\left(8b^3c^3-15ab^2dc^2+3a^2bd^2c-4a^3d^3\right)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{315b^2d^3}-\frac{\left(64b^4c^4-108ab^3dc^3+15a^2b^2d^2c^2+13a^3bd^3c-24a^4d^4\right)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3465b^3d^4}+\frac{A\left(\frac{3da^2}{b}+7ca-\frac{2bc^2}{d}\right)\sqrt{bx^2+a}x}{15\sqrt{dx^2+c}}+\frac{B(bc-2ad)\left(8b^2c^2-3abdc+3a^2d^2\right)\sqrt{bx^2+a}x}{105b^2d^2\sqrt{dx^2+c}}-\frac{C\left(16b^4c^4-32ab^3dc^3+9a^2b^2d^2c^2+7a^3bd^3c-8a^4d^4\right)\sqrt{bx^2+a}x}{315b^3d^3\sqrt{dx^2+c}}+\frac{\left(128b^5c^5-232ab^4dc^4+51a^2b^3d^2c^3+29a^3b^2d^3c^2+32a^4bd^4c-48a^5d^5\right)D\sqrt{bx^2+a}x}{3465b^4d^4\sqrt{dx^2+c}}+\frac{A\sqrt{c}\left(2b^2c^2-7abdc-3a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15bd^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{B\sqrt{c}(bc-2ad)\left(8b^2c^2-3abdc+3a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{105b^2d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}C\left(16b^4c^4-32ab^3dc^3+9a^2b^2d^2c^2+7a^3bd^3c-8a^4d^4\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{315b^3d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}\left(128b^5c^5-232ab^4dc^4+51a^2b^3d^2c^3+29a^3b^2d^3c^2+32a^4bd^4c-48a^5d^5\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3465b^4d^{9/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

$$\frac{Ac^{3/2}(bc-9ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Bc^{3/2}\left(4b^2c^2-9abdc-3a^2d^2\right)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{105bd^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}C\left(8b^3c^3-15ab^2dc^2+3a^2bd^2c-4a^3d^3\right)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{315b^2d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}\left(64b^4c^4-108ab^3dc^3+15a^2b^2d^2c^2+13a^3bd^3c-24a^4d^4\right)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3465b^3d^{9/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(a + b*x^2)^(3/2)*Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4 + D*x^6),x]
```

output
```
(A*(7*a*c - (2*b*c^2)/d + (3*a^2*d)/b)*x*Sqrt[a + b*x^2])/(15*Sqrt[c + d*x
^2]) + (B*(b*c - 2*a*d)*(8*b^2*c^2 - 3*a*b*c*d + 3*a^2*d^2)*x*Sqrt[a + b*x
^2])/(105*b^2*d^2*Sqrt[c + d*x^2]) - (C*(16*b^4*c^4 - 32*a*b^3*c^3*d + 9*a
^2*b^2*c^2*d^2 + 7*a^3*b*c*d^3 - 8*a^4*d^4)*x*Sqrt[a + b*x^2])/(315*b^3*d^
3*Sqrt[c + d*x^2]) + ((128*b^5*c^5 - 232*a*b^4*c^4*d + 51*a^2*b^3*c^3*d^2
+ 29*a^3*b^2*c^2*d^3 + 32*a^4*b*c*d^4 - 48*a^5*d^5)*D*x*Sqrt[a + b*x^2])/(
3465*b^4*d^4*Sqrt[c + d*x^2]) - (2*A*(b*c - 3*a*d)*x*Sqrt[a + b*x^2]*Sqrt[
c + d*x^2])/(15*d) + (B*(9*a*c - (4*b*c^2)/d + (3*a^2*d)/b)*x*Sqrt[a + b*x
^2]*Sqrt[c + d*x^2])/(105*d) + (C*(8*b^3*c^3 - 15*a*b^2*c^2*d + 3*a^2*b*c*
d^2 - 4*a^3*d^3)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(315*b^2*d^3) - ((64*b
^4*c^4 - 108*a*b^3*c^3*d + 15*a^2*b^2*c^2*d^2 + 13*a^3*b*c*d^3 - 24*a^4*d^
4)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3465*b^3*d^4) + (B*(b*c + 3*a*d)*
x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(35*d) + (C*(11*a*c - (6*b*c^2)/d + (
3*a^2*d)/b)*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(315*d) + ((48*b^3*c^3 -
79*a*b^2*c^2*d + 9*a^2*b*c*d^2 - 18*a^3*d^3)*D*x^3*Sqrt[a + b*x^2]*Sqrt[c
+ d*x^2])/(3465*b^2*d^3) + (C*(b*c + 3*a*d)*x^5*Sqrt[a + b*x^2]*Sqrt[c + d
*x^2])/(63*d) + ((13*a*c - (8*b*c^2)/d + (3*a^2*d)/b)*D*x^5*Sqrt[a + b*x^2
]*Sqrt[c + d*x^2])/(693*d) + ((b*c + 3*a*d)*D*x^7*Sqrt[a + b*x^2]*Sqrt[c +
 d*x^2])/(99*d) + (B*x^3*(a + b*x^2)^(3/2)*Sqrt[c + d*x^2])/7 + (C*x^5*(a
+ b*x^2)^(3/2)*Sqrt[c + d*x^2])/9 + (D*x^7*(a + b*x^2)^(3/2)*Sqrt[c + d...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 7.28 (sec) , antiderivative size = 1885, normalized size of antiderivative = 1.72

method	result	size
elliptic	Expression too large to display	1885
default	Expression too large to display	3732

input
```
int((b*x^2+a)^(3/2)*(d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/11*D*b*x^9*
(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/9*(C*d*b^2+2*D*a*d*b+D*b^2*c-1/11*D*
b*(10*a*d+10*b*c))/b/d*x^7*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/7*(b^2*B*
d+2*C*a*b*d+C*b^2*c+a^2*d*D+13/11*a*b*D*c-1/9*(C*d*b^2+2*D*a*d*b+D*b^2*c-1
/11*D*b*(10*a*d+10*b*c))/b/d*(8*a*d+8*b*c))/b/d*x^5*(b*d*x^4+a*d*x^2+b*c*x
^2+a*c)^(1/2)+1/5*(b^2*A*d+2*a*b*B*d+B*b^2*c+a^2*C*d+2*C*a*b*c+D*a^2*c-7/9
*(C*d*b^2+2*D*a*d*b+D*b^2*c-1/11*D*b*(10*a*d+10*b*c))/b/d*a*c-1/7*(b^2*B*d
+2*C*a*b*d+C*b^2*c+a^2*d*D+13/11*a*b*D*c-1/9*(C*d*b^2+2*D*a*d*b+D*b^2*c-1/
11*D*b*(10*a*d+10*b*c))/b/d*(8*a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*x^3*(b*d
*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(2*A*a*b*d+b^2*A*c+B*a^2*d+2*a*b*B*c+C
*a^2*c-5/7*(b^2*B*d+2*C*a*b*d+C*b^2*c+a^2*d*D+13/11*a*b*D*c-1/9*(C*d*b^2+2
*D*a*d*b+D*b^2*c-1/11*D*b*(10*a*d+10*b*c))/b/d*(8*a*d+8*b*c))/b/d*a*c-1/5*
(b^2*A*d+2*a*b*B*d+B*b^2*c+a^2*C*d+2*C*a*b*c+D*a^2*c-7/9*(C*d*b^2+2*D*a*d*
b+D*b^2*c-1/11*D*b*(10*a*d+10*b*c))/b/d*a*c-1/7*(b^2*B*d+2*C*a*b*d+C*b^2*c
+a^2*d*D+13/11*a*b*D*c-1/9*(C*d*b^2+2*D*a*d*b+D*b^2*c-1/11*D*b*(10*a*d+10*
b*c))/b/d*(8*a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/b/d*x*(b*d*
x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(a^2*A*c-1/3*(2*A*a*b*d+b^2*A*c+B*a^2*d+2*a
*b*B*c+C*a^2*c-5/7*(b^2*B*d+2*C*a*b*d+C*b^2*c+a^2*d*D+13/11*a*b*D*c-1/9*(C
*d*b^2+2*D*a*d*b+D*b^2*c-1/11*D*b*(10*a*d+10*b*c))/b/d*(8*a*d+8*b*c))/b/d*
a*c-1/5*(b^2*A*d+2*a*b*B*d+B*b^2*c+a^2*C*d+2*C*a*b*c+D*a^2*c-7/9*(C*d*b...
```

Fricas [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 1097, normalized size of antiderivative = 1.00

$$\int \left(a+bx^2\right)^{3/2} \sqrt{c+dx^2} \left(A+Bx^2+Cx^4+Dx^6\right) \, dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(3/2)*(d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A),x, algorit
hm="fricas")
```

output
```
-1/3465*((128*D*b^5*c^6 - 8*(29*D*a*b^4 + 22*C*b^5)*c^5*d + (51*D*a^2*b^3
+ 352*C*a*b^4 + 264*B*b^5)*c^4*d^2 + (29*D*a^3*b^2 - 99*C*a^2*b^3 - 627*B*
a*b^4 - 462*A*b^5)*c^3*d^3 + (32*D*a^4*b - 77*C*a^3*b^2 + 297*B*a^2*b^3 +
1617*A*a*b^4)*c^2*d^4 - (48*D*a^5 - 88*C*a^4*b + 198*B*a^3*b^2 - 693*A*a^2
*b^3)*c*d^5)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(
b*c)) - (128*D*b^5*c^6 - 8*(29*D*a*b^4 + 22*C*b^5)*c^5*d + (51*D*a^2*b^3 +
 32*(11*C + 2*D)*a*b^4 + 264*B*b^5)*c^4*d^2 + (29*D*a^3*b^2 - 9*(11*C + 12
*D)*a^2*b^3 - 11*(57*B + 8*C)*a*b^4 - 462*A*b^5)*c^3*d^3 + (32*D*a^4*b - (
77*C - 15*D)*a^3*b^2 + 33*(9*B + 5*C)*a^2*b^3 + 33*(49*A + 4*B)*a*b^4)*c^2
*d^4 - (48*D*a^5 - (88*C + 13*D)*a^4*b + 33*(6*B + C)*a^3*b^2 - 99*(7*A -
3*B)*a^2*b^3 + 231*A*a*b^4)*c*d^5 - (24*D*a^5 - 44*C*a^4*b + 99*B*a^3*b^2
- 2079*A*a^2*b^3)*d^6)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)
/x), a*d/(b*c)) - (315*D*b^5*d^6*x^10 + 128*D*b^5*c^5*d + 35*(D*b^5*c*d^5
+ (12*D*a*b^4 + 11*C*b^5)*d^6)*x^8 - 8*(29*D*a*b^4 + 22*C*b^5)*c^4*d^2 + (
51*D*a^2*b^3 + 352*C*a*b^4 + 264*B*b^5)*c^3*d^3 + (29*D*a^3*b^2 - 99*C*a^2
*b^3 - 627*B*a*b^4 - 462*A*b^5)*c^2*d^4 + (32*D*a^4*b - 77*C*a^3*b^2 + 297
*B*a^2*b^3 + 1617*A*a*b^4)*c*d^5 - (48*D*a^5 - 88*C*a^4*b + 198*B*a^3*b^2
- 693*A*a^2*b^3)*d^6 - 5*(8*D*b^5*c^2*d^4 - (13*D*a*b^4 + 11*C*b^5)*c*d^5
- (3*D*a^2*b^3 + 110*C*a*b^4 + 99*B*b^5)*d^6)*x^6 + (48*D*b^5*c^3*d^3 - (7
9*D*a*b^4 + 66*C*b^5)*c^2*d^4 + (9*D*a^2*b^3 + 121*C*a*b^4 + 99*B*b^5)*...
```

Sympy [F]

$$\int \left(a+bx^2\right)^{3/2} \sqrt{c+dx^2} \left(A+Bx^2+Cx^4+Dx^6\right) \, dx = \int \left(a+bx^2\right)^{\frac{3}{2}} \sqrt{c+dx^2} \left(A+Bx^2+Cx^4+Dx^6\right) \, dx$$

input
```
integrate((b*x**2+a)**(3/2)*(d*x**2+c)**(1/2)*(D*x**6+C*x**4+B*x**2+A),x)
```

output
```
Integral((a + b*x**2)**(3/2)*sqrt(c + d*x**2)*(A + B*x**2 + C*x**4 + D*x**
6), x)
```

Maxima [F]

$$\int \left(a+bx^2\right)^{3/2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx=\int \left(Dx^6+Cx^4+Bx^2+A\right)\left(bx^2+a\right)^{\frac{3}{2}}\sqrt{dx^2+c}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)*sqrt(d*x^2 + c), x
)
```

Giac [F]

$$\int \left(a+bx^2\right)^{3/2}\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)\,dx=\int \left(Dx^6+Cx^4+Bx^2+A\right)\left(bx^2+a\right)^{\frac{3}{2}}\sqrt{dx^2+c}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)*sqrt(d*x^2 + c), x
)
```

Mupad [F(-1)]

Timed out.

$$\int (a+bx^2)^{3/2}\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)\,dx=\int (b\,x^2+a)^{3/2}\sqrt{d\,x^2+c}\,(A+B\,x^2+C\,x^4+x^6\,D)\,dx$$

input
```
int((a + b*x^2)^(3/2)*(c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D),x)
```

output
```
int((a + b*x^2)^(3/2)*(c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D), x)
```

Reduce [F]

$$\int (a+bx^2)^{3/2}\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)\,dx=\text{too large to display}$$

input
```
int((b*x^2+a)^(3/2)*(d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A),x)
```

output

```
(8*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**4*d**4*x - 19*sqrt(c + d*x**2)*sqr
t(a + b*x**2)*a**3*b*c*d**3*x - 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**3*b
*d**4*x**3 + 495*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b**3*d**3*x + 6*sq
rt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b**2*c**2*d**2*x + 14*sqrt(c + d*x**2
)*sqrt(a + b*x**2)*a**2*b**2*c*d**3*x**3 + 5*sqrt(c + d*x**2)*sqrt(a + b*x
**2)*a**2*b**2*d**4*x**5 + 176*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**4*c*
d**2*x + 495*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**4*d**3*x**3 - 19*sqrt(
c + d*x**2)*sqrt(a + b*x**2)*a*b**3*c**3*d*x + 14*sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*a*b**3*c**2*d**2*x**3 + 205*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*
b**3*c*d**3*x**5 + 140*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**3*d**4*x**7
- 44*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**5*c**2*d*x + 33*sqrt(c + d*x**2)
*sqrt(a + b*x**2)*b**5*c*d**2*x**3 + 165*sqrt(c + d*x**2)*sqrt(a + b*x**2)
*b**5*d**3*x**5 + 8*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*c**4*x - 6*sqrt
(c + d*x**2)*sqrt(a + b*x**2)*b**4*c**3*d*x**3 + 5*sqrt(c + d*x**2)*sqrt(a
 + b*x**2)*b**4*c**2*d**2*x**5 + 140*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**
4*c*d**3*x**7 + 105*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*d**4*x**9 - 16*
int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 +
b*d*x**4),x)*a**5*d**5 + 40*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(
a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**4*b*c*d**4 + 165*int((sqrt(c +
 d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),...
```

3.32 $\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 841

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx = \frac{(8a^4d^4D - a^3bd^3(18Cd-11cD) - 9a^2b^2d^2(4cCd-7Bd^2 - \cdots}{\cdots}$$

$$-\frac{(4a^3d^3D - 3a^2bd^2(3Cd-2cD) + 3ab^2d(33cCd-42Bd^2-28c^2D) - b^3(72c^2Cd-84Bcd^2+105Ad^3 - \cdots}{315b^2d^4}$$

$$+\frac{(3a^2d^2D + abd(72Cd-61cD) - b^2(54cCd-63Bd^2-48c^2D))\,x^3\sqrt{a+bx^2}\sqrt{c+dx^2}}{315bd^3}$$

$$+\frac{(9bCd-8bcD+10adD)x^5\sqrt{a+bx^2}\sqrt{c+dx^2}}{63d^2} + \frac{bDx^7\sqrt{a+bx^2}\sqrt{c+dx^2}}{9d}$$

$$-\frac{\sqrt{a}(8a^4d^4D - a^3bd^3(18Cd-11cD) - 9a^2b^2d^2(4cCd-7Bd^2-3c^2D) + ab^3d(216c^2Cd-273Bcd^2+420\cdots}{315b^{5/2}d^5\sqrt{a+b\cdots}}$$

$$+\frac{a^{3/2}(4a^3cd^3D - 3a^2bcd^2(3Cd-2cD) - b^3c(72c^2Cd-84Bcd^2+105Ad^3-64c^3D) + 3ab^2d(33c^2Cd-42\cdots}{315b^{5/2}cd^4\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}\cdots}$$

output
```
1/315*(8*a^4*d^4*D-a^3*b*d^3*(18*C*d-11*D*c)-9*a^2*b^2*d^2*(-7*B*d^2+4*C*c
*d-3*D*c^2)+a*b^3*d*(420*A*d^3-273*B*c*d^2+216*C*c^2*d-184*D*c^3)-2*b^4*c*
(105*A*d^3-84*B*c*d^2+72*C*c^2*d-64*D*c^3))*x*(d*x^2+c)^(1/2)/b^2/d^5/(b*x
^2+a)^(1/2)-1/315*(4*a^3*d^3*D-3*a^2*b*d^2*(3*C*d-2*D*c)+3*a*b^2*d*(-42*B*
d^2+33*C*c*d-28*D*c^2)-b^3*(105*A*d^3-84*B*c*d^2+72*C*c^2*d-64*D*c^3))*x*(
b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b^2/d^4+1/315*(3*a^2*d^2*D+a*b*d*(72*C*d-61
*D*c)-b^2*(-63*B*d^2+54*C*c*d-48*D*c^2))*x^3*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/
2)/b/d^3+1/63*(9*C*b*d+10*D*a*d-8*D*b*c)*x^5*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/
2)/d^2+1/9*b*D*x^7*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/d-1/315*a^(1/2)*(8*a^4*
d^4*D-a^3*b*d^3*(18*C*d-11*D*c)-9*a^2*b^2*d^2*(-7*B*d^2+4*C*c*d-3*D*c^2)+a
*b^3*d*(420*A*d^3-273*B*c*d^2+216*C*c^2*d-184*D*c^3)-2*b^4*c*(105*A*d^3-84
*B*c*d^2+72*C*c^2*d-64*D*c^3))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)
/(1+b*x^2/a)^(1/2),(1-a*d/b/c)^(1/2))/b^(5/2)/d^5/(b*x^2+a)^(1/2)/(a*(d*x^
2+c)/c/(b*x^2+a))^(1/2)+1/315*a^(3/2)*(4*a^3*c*d^3*D-3*a^2*b*c*d^2*(3*C*d-
2*D*c)-b^3*c*(105*A*d^3-84*B*c*d^2+72*C*c^2*d-64*D*c^3)+3*a*b^2*d*(105*A*d
^3-42*B*c*d^2+33*C*c^2*d-28*D*c^3))*(d*x^2+c)^(1/2)*InverseJacobiAM(arctan
(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/b^(5/2)/c/d^4/(b*x^2+a)^(1/2)/(a*(d
*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 9.82 (sec) , antiderivative size = 568, normalized size of antiderivative = 0.68

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)(c+dx^2)(-4a^3d^3D+3a^2bd^2(3Cd-2cD+$$

input
```
Integrate[((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/Sqrt[c + d*x^2],
x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(c + d*x^2)*(-4*a^3*d^3*D + 3*a^2*b*d^2*(3*C*d
- 2*c*D + d*D*x^2) + a*b^2*d*(84*c^2*D - c*d*(99*C + 61*D*x^2) + 2*d^2*(63
*B + 36*C*x^2 + 25*D*x^4)) + b^3*(-64*c^3*D + 24*c^2*d*(3*C + 2*D*x^2) - 2
*c*d^2*(42*B + 27*C*x^2 + 20*D*x^4) + d^3*(105*A + 63*B*x^2 + 45*C*x^4 + 3
5*D*x^6))) - I*c*(8*a^4*d^4*D + a^3*b*d^3*(-18*C*d + 11*c*D) + 9*a^2*b^2*d
^2*(-4*c*C*d + 7*B*d^2 + 3*c^2*D) + a*b^3*d*(216*c^2*C*d - 273*B*c*d^2 + 4
20*A*d^3 - 184*c^3*D) + 2*b^4*c*(-72*c^2*C*d + 84*B*c*d^2 - 105*A*d^3 + 64
*c^3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[
b/a]*x], (a*d)/(b*c)] + I*(-(b*c) + a*d)*(4*a^3*c*d^3*D + 9*a^2*b*c*d^2*(-
(C*d) + c*D) + 3*a*b^2*d*(-48*c^2*C*d + 63*B*c*d^2 - 105*A*d^3 + 40*c^3*D)
 - 2*b^3*c*(-72*c^2*C*d + 84*B*c*d^2 - 105*A*d^3 + 64*c^3*D))*Sqrt[1 + (b*
x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]
)/(315*a^2*(b/a)^(5/2)*d^5*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [A] (verified)

Time = 2.84 (sec) , antiderivative size = 1598, normalized size of antiderivative = 1.90, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A(a+bx^2)^{3/2}}{\sqrt{c+dx^2}}+\frac{Bx^2(a+bx^2)^{3/2}}{\sqrt{c+dx^2}}+\frac{Cx^4(a+bx^2)^{3/2}}{\sqrt{c+dx^2}}+\frac{Dx^6(a+bx^2)^{3/2}}{\sqrt{c+dx^2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{bD\sqrt{bx^2+a}\sqrt{dx^2+c}x^7}{9d}-\frac{2(4bc-5ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{63d^2}+\frac{bC\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{7d}-$$

$$\frac{2C(3bc-4ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{35d^2}+\frac{\left(48b^2c^2-61abdc+3a^2d^2\right)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{315bd^3}+$$

$$\frac{bB\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5d}-\frac{2B(2bc-3ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15d^2}+$$

$$\frac{C\left(8b^2c^2-11abdc+a^2d^2\right)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{35bd^3}-$$

$$\frac{2\left(32b^3c^3-42ab^2dc^2+3a^2bd^2c+2a^3d^3\right)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{315b^2d^4}+\frac{Ab\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3d}-$$

$$\frac{2A(bc-2ad)\sqrt{bx^2+a}x}{3d\sqrt{dx^2+c}}-\frac{B\left(-\frac{3da^2}{b}+13ca-\frac{8bc^2}{d}\right)\sqrt{bx^2+a}x}{15d\sqrt{dx^2+c}}-$$

$$\frac{2C(2bc-ad)\left(4b^2c^2-4abdc-a^2d^2\right)\sqrt{bx^2+a}x}{35b^2d^3\sqrt{dx^2+c}}+$$

$$\frac{\left(128b^4c^4-184ab^3dc^3+27a^2b^2d^2c^2+11a^3bd^3c+8a^4d^4\right)D\sqrt{bx^2+a}x}{315b^3d^4\sqrt{dx^2+c}}+$$

$$\frac{2A\sqrt{c}(bc-2ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+$$

$$\frac{2\sqrt{c}C(2bc-ad)\left(4b^2c^2-4abdc-a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{35b^2d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$

$$\frac{B\sqrt{c}\left(8b^2c^2-13abdc+3a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15bd^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$

$$\frac{\sqrt{c}\left(128b^4c^4-184ab^3dc^3+27a^2b^2d^2c^2+11a^3bd^3c+8a^4d^4\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{315b^3d^{9/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$

$$\frac{A\sqrt{c}(bc-3ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+$$

$$\frac{2Bc^{3/2}(2bc-3ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$

$$\frac{c^{3/2}C\left(8b^2c^2-11abdc+a^2d^2\right)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{35bd^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+$$

$$\frac{2c^{3/2}\left(32b^3c^3-42ab^2dc^2+3a^2bd^2c+2a^3d^3\right)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{315b^2d^{9/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/Sqrt[c + d*x^2],x]
```

output
```
(-2*A*(b*c - 2*a*d)*x*Sqrt[a + b*x^2])/(3*d*Sqrt[c + d*x^2]) - (B*(13*a*c
- (8*b*c^2)/d - (3*a^2*d)/b)*x*Sqrt[a + b*x^2])/(15*d*Sqrt[c + d*x^2]) - (
2*C*(2*b*c - a*d)*(4*b^2*c^2 - 4*a*b*c*d - a^2*d^2)*x*Sqrt[a + b*x^2])/(35
*b^2*d^3*Sqrt[c + d*x^2]) + ((128*b^4*c^4 - 184*a*b^3*c^3*d + 27*a^2*b^2*c
^2*d^2 + 11*a^3*b*c*d^3 + 8*a^4*d^4)*D*x*Sqrt[a + b*x^2])/(315*b^3*d^4*Sqr
t[c + d*x^2]) + (A*b*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*d) - (2*B*(2*b*
c - 3*a*d)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(15*d^2) + (C*(8*b^2*c^2 - 1
1*a*b*c*d + a^2*d^2)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(35*b*d^3) - (2*(3
2*b^3*c^3 - 42*a*b^2*c^2*d + 3*a^2*b*c*d^2 + 2*a^3*d^3)*D*x*Sqrt[a + b*x^2
]*Sqrt[c + d*x^2])/(315*b^2*d^4) + (b*B*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2
])/(5*d) - (2*C*(3*b*c - 4*a*d)*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(35*d
^2) + ((48*b^2*c^2 - 61*a*b*c*d + 3*a^2*d^2)*D*x^3*Sqrt[a + b*x^2]*Sqrt[c
+ d*x^2])/(315*b*d^3) + (b*C*x^5*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(7*d) -
(2*(4*b*c - 5*a*d)*D*x^5*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(63*d^2) + (b*D*
x^7*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(9*d) + (2*A*Sqrt[c]*(b*c - 2*a*d)*Sq
rt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*
d^(3/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (2*Sqrt[c
]*C*(2*b*c - a*d)*(4*b^2*c^2 - 4*a*b*c*d - a^2*d^2)*Sqrt[a + b*x^2]*Ellipt
icE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(35*b^2*d^(7/2)*Sqrt[(c
*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (B*Sqrt[c]*(8*b^2*c^2...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 6.69 (sec) , antiderivative size = 1020, normalized size of antiderivative = 1.21

method	result	size
elliptic	Expression too large to display	1020
default	Expression too large to display	2764

input
```
int((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(1/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/9*D*b/d*x^7
*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/7*(b^2*C+2*a*b*D-1/9*D*b/d*(8*a*d+8
*b*c))/b/d*x^5*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/5*(B*b^2+2*C*a*b+D*a^
2-7/9*D*b/d*a*c-1/7*(b^2*C+2*a*b*D-1/9*D*b/d*(8*a*d+8*b*c))/b/d*(6*a*d+6*b
*c))/b/d*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(b^2*A+2*a*b*B+a^2*C-
5/7*(b^2*C+2*a*b*D-1/9*D*b/d*(8*a*d+8*b*c))/b/d*a*c-1/5*(B*b^2+2*C*a*b+D*a
^2-7/9*D*b/d*a*c-1/7*(b^2*C+2*a*b*D-1/9*D*b/d*(8*a*d+8*b*c))/b/d*(6*a*d+6*
b*c))/b/d*(4*a*d+4*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(a^2*A-
1/3*(b^2*A+2*a*b*B+a^2*C-5/7*(b^2*C+2*a*b*D-1/9*D*b/d*(8*a*d+8*b*c))/b/d*a
*c-1/5*(B*b^2+2*C*a*b+D*a^2-7/9*D*b/d*a*c-1/7*(b^2*C+2*a*b*D-1/9*D*b/d*(8*
a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/b/d*a*c)/(-b/a)^(1/2)*(1
+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*Elli
pticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(2*a*b*A+a^2*B-3/5*(B*b^2+2
*C*a*b+D*a^2-7/9*D*b/d*a*c-1/7*(b^2*C+2*a*b*D-1/9*D*b/d*(8*a*d+8*b*c))/b/d
*(6*a*d+6*b*c))/b/d*a*c-1/3*(b^2*A+2*a*b*B+a^2*C-5/7*(b^2*C+2*a*b*D-1/9*D*
b/d*(8*a*d+8*b*c))/b/d*a*c-1/5*(B*b^2+2*C*a*b+D*a^2-7/9*D*b/d*a*c-1/7*(b^2
*C+2*a*b*D-1/9*D*b/d*(8*a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/
b/d*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d
*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/
c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 822, normalized size of antiderivative = 0.98

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(1/2),x, algorit
hm="fricas")
```

output
```
-1/315*((128*D*b^4*c^6 - 8*(23*D*a*b^3 + 18*C*b^4)*c^5*d + 3*(9*D*a^2*b^2
+ 72*C*a*b^3 + 56*B*b^4)*c^4*d^2 + (11*D*a^3*b - 36*C*a^2*b^2 - 273*B*a*b^
3 - 210*A*b^4)*c^3*d^3 + (8*D*a^4 - 18*C*a^3*b + 63*B*a^2*b^2 + 420*A*a*b^
3)*c^2*d^4)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b
*c)) - (128*D*b^4*c^6 + 315*A*a^2*b^2*d^6 - 8*(23*D*a*b^3 + 18*C*b^4)*c^5*
d + (27*D*a^2*b^2 + 8*(27*C + 8*D)*a*b^3 + 168*B*b^4)*c^4*d^2 + (11*D*a^3*
b - 12*(3*C + 7*D)*a^2*b^2 - 3*(91*B + 24*C)*a*b^3 - 210*A*b^4)*c^3*d^3 +
(8*D*a^4 - 6*(3*C - D)*a^3*b + 9*(7*B + 11*C)*a^2*b^2 + 84*(5*A + B)*a*b^3
)*c^2*d^4 + (4*D*a^4 - 9*C*a^3*b - 126*B*a^2*b^2 - 105*A*a*b^3)*c*d^5)*sqr
t(b*d)*x*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (35*D*b^
4*c*d^5*x^8 + 128*D*b^4*c^5*d - 8*(23*D*a*b^3 + 18*C*b^4)*c^4*d^2 + 3*(9*D
*a^2*b^2 + 72*C*a*b^3 + 56*B*b^4)*c^3*d^3 + (11*D*a^3*b - 36*C*a^2*b^2 - 2
73*B*a*b^3 - 210*A*b^4)*c^2*d^4 + (8*D*a^4 - 18*C*a^3*b + 63*B*a^2*b^2 + 4
20*A*a*b^3)*c*d^5 - 5*(8*D*b^4*c^2*d^4 - (10*D*a*b^3 + 9*C*b^4)*c*d^5)*x^6
 + (48*D*b^4*c^3*d^3 - (61*D*a*b^3 + 54*C*b^4)*c^2*d^4 + 3*(D*a^2*b^2 + 24
*C*a*b^3 + 21*B*b^4)*c*d^5)*x^4 - (64*D*b^4*c^4*d^2 - 12*(7*D*a*b^3 + 6*C*
b^4)*c^3*d^3 + 3*(2*D*a^2*b^2 + 33*C*a*b^3 + 28*B*b^4)*c^2*d^4 + (4*D*a^3*
b - 9*C*a^2*b^2 - 126*B*a*b^3 - 105*A*b^4)*c*d^5)*x^2)*sqrt(b*x^2 + a)*sqr
t(d*x^2 + c))/(b^3*c*d^6*x)
```

Sympy [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx = \int \frac{(a+bx^2)^{\frac{3}{2}}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx$$

input
```
integrate((b*x**2+a)**(3/2)*(D*x**6+C*x**4+B*x**2+A)/(d*x**2+c)**(1/2),x)
```

output
```
Integral((a + b*x**2)**(3/2)*(A + B*x**2 + C*x**4 + D*x**6)/sqrt(c + d*x**
2), x)
```

Maxima [F]

$$\int \frac{(a+bx^2)^{3/2}\,(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)(bx^2+a)^{\frac{3}{2}}}{\sqrt{dx^2+c}}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(1/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)/sqrt(d*x^2 + c), x
)
```

Giac [F]

$$\int \frac{(a+bx^2)^{3/2}\,(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)(bx^2+a)^{\frac{3}{2}}}{\sqrt{dx^2+c}}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(1/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)/sqrt(d*x^2 + c), x
)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx=\int \frac{(b\,x^2+a)^{3/2}\,(A+B\,x^2+C\,x^4+x^6\,D)}{\sqrt{d\,x^2+c}}\,dx$$

input
```
int(((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(1/2),x)
```

output
```
int(((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(1/2), x)
```

Reduce [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{c+dx^2}}\,dx = \text{Too large to display}$$

input
```
int((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(1/2),x)
```

output
```
( - 4*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**3*d**3*x + 3*sqrt(c + d*x**2)*s
qrt(a + b*x**2)*a**2*b*c*d**2*x + 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2
*b*d**3*x**3 + 231*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**3*d**2*x - 15*sq
rt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*c**2*d*x + 11*sqrt(c + d*x**2)*sqrt
(a + b*x**2)*a*b**2*c*d**2*x**3 + 50*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b
**2*d**3*x**5 - 84*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*c*d*x + 63*sqrt(
c + d*x**2)*sqrt(a + b*x**2)*b**4*d**2*x**3 + 8*sqrt(c + d*x**2)*sqrt(a +
b*x**2)*b**3*c**3*x - 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c**2*d*x**3
 + 5*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c*d**2*x**5 + 35*sqrt(c + d*x*
*2)*sqrt(a + b*x**2)*b**3*d**3*x**7 + 8*int((sqrt(c + d*x**2)*sqrt(a + b*x
**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**4*d**4 - 7*int((sq
rt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**
4),x)*a**3*b*c*d**3 + 483*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*
c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2*b**3*d**3 - 9*int((sqrt(c + d*
x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**
2*b**2*c**2*d**2 - 483*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c +
 a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**4*c*d**2 + 32*int((sqrt(c + d*x**
2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**3
*c**3*d + 168*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2
 + b*c*x**2 + b*d*x**4),x)*b**5*c**2*d - 16*int((sqrt(c + d*x**2)*sqrt(...
```

3.33 $\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 624

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx =$$

$$-\frac{(6a^3d^3D-3a^2bd^2(7Cd-10cD)+ab^2d(189cCd-140Bd^2-228c^2D)-b^3(168c^2Cd-140Bcd^2+105A}{105b^2d^4\sqrt{c+dx^2}}$$

$$+\frac{(3a^2d^2D+3abd(14Cd-17cD)-b^2(42cCd-35Bd^2-48c^2D))\,x^3\sqrt{a+bx^2}}{105bd^3\sqrt{c+dx^2}}$$

$$+\frac{(7bCd-8bcD+8adD)x^5\sqrt{a+bx^2}}{35d^2\sqrt{c+dx^2}}+\frac{bDx^7\sqrt{a+bx^2}}{7d\sqrt{c+dx^2}}$$

$$+\frac{(6a^3cd^3D-3a^2bcd^2(7Cd-11cD)+ab^2d(336c^2Cd-245Bcd^2+105Ad^3-408c^3D)-2b^3c(168c^2Cd-}{105b^2\sqrt{c}d^{9/2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

$$-\frac{\sqrt{c}(3a^2cd^2D+3abd(49cCd-35Bd^2-60c^2D)-b^2(168c^2Cd-140Bcd^2+105Ad^3-192c^3D))\,\sqrt{a+b}}{105bd^{9/2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
-1/105*(6*a^3*d^3*D-3*a^2*b*d^2*(7*C*d-10*D*c)+a*b^2*d*(-140*B*d^2+189*C*c
*d-228*D*c^2)-b^3*(105*A*d^3-140*B*c*d^2+168*C*c^2*d-192*D*c^3))*x*(b*x^2+
a)^(1/2)/b^2/d^4/(d*x^2+c)^(1/2)+1/105*(3*a^2*d^2*D+3*a*b*d*(14*C*d-17*D*c
)-b^2*(-35*B*d^2+42*C*c*d-48*D*c^2))*x^3*(b*x^2+a)^(1/2)/b/d^3/(d*x^2+c)^(
1/2)+1/35*(7*C*b*d+8*D*a*d-8*D*b*c)*x^5*(b*x^2+a)^(1/2)/d^2/(d*x^2+c)^(1/2
)+1/7*b*D*x^7*(b*x^2+a)^(1/2)/d/(d*x^2+c)^(1/2)+1/105*(6*a^3*c*d^3*D-3*a^2
*b*c*d^2*(7*C*d-11*D*c)+a*b^2*d*(105*A*d^3-245*B*c*d^2+336*C*c^2*d-408*D*c
^3)-2*b^3*c*(105*A*d^3-140*B*c*d^2+168*C*c^2*d-192*D*c^3))*(b*x^2+a)^(1/2)
*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/b^2/c^(1
/2)/d^(9/2)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)-1/105*c^(1/2)*
(3*a^2*c*d^2*D+3*a*b*d*(-35*B*d^2+49*C*c*d-60*D*c^2)-b^2*(105*A*d^3-140*B*
c*d^2+168*C*c^2*d-192*D*c^3))*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/
2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/b/d^(9/2)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)
/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 7.97 (sec) , antiderivative size = 502, normalized size of antiderivative = 0.80

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)\left(3a^2cd^2D(c+dx^2)+3abd(35Ad^3-60c^3D\right.}{}$$

input
```
Integrate[((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(3/2
),x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(3*a^2*c*d^2*D*(c + d*x^2) + 3*a*b*d*(35*A*d^3
- 60*c^3*D + c^2*d*(49*C - 17*D*x^2) + c*d^2*(-35*B + 14*C*x^2 + 8*D*x^4))
 + b^2*c*(192*c^3*D - 24*c^2*d*(7*C - 2*D*x^2) + d^3*(-105*A + 35*B*x^2 +
21*C*x^4 + 15*D*x^6) + 2*c*d^2*(70*B - 3*(7*C*x^2 + 4*D*x^4)))) + I*c*(6*a
^3*c*d^3*D + 3*a^2*b*c*d^2*(-7*C*d + 11*c*D) + a*b^2*d*(336*c^2*C*d - 245*
B*c*d^2 + 105*A*d^3 - 408*c^3*D) + 2*b^3*c*(-168*c^2*C*d + 140*B*c*d^2 - 1
05*A*d^3 + 192*c^3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I
*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - I*c*(-(b*c) + a*d)*(3*a^2*c*d^2*D +
3*a*b*d*(-56*c*C*d + 35*B*d^2 + 72*c^2*D) + b^2*(336*c^2*C*d - 280*B*c*d^2
 + 210*A*d^3 - 384*c^3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*Ellipti
cF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)])/(105*b*Sqrt[b/a]*c*d^5*Sqrt[a + b
*x^2]*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1401 vs. $2(624) = 1248$.

Time = 2.55 (sec) , antiderivative size = 1401, normalized size of antiderivative = 2.25, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = $\{7293, 2009\}$

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.

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A(a+bx^2)^{3/2}}{(c+dx^2)^{3/2}}+\frac{Bx^2(a+bx^2)^{3/2}}{(c+dx^2)^{3/2}}+\frac{Cx^4(a+bx^2)^{3/2}}{(c+dx^2)^{3/2}}+\frac{Dx^6(a+bx^2)^{3/2}}{(c+dx^2)^{3/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{8bD\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{7d^2}-\frac{D(bx^2+a)^{3/2}x^5}{d\sqrt{dx^2+c}}-\frac{(48bc-43ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{35d^3}+\frac{6bC\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5d^2}-\frac{C(bx^2+a)^{3/2}x^3}{d\sqrt{dx^2+c}}-\frac{C(8bc-7ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{5d^3}+\frac{(64b^2c^2-60abdc+a^2d^2)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{35bd^4}+\frac{4bB\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3d^2}-\frac{B(bx^2+a)^{3/2}x}{d\sqrt{dx^2+c}}-\frac{B(8bc-7ad)\sqrt{bx^2+a}x}{3d^2\sqrt{dx^2+c}}-\frac{A(bc-ad)\sqrt{bx^2+a}x}{cd\sqrt{dx^2+c}}+\frac{A(2bc-ad)\sqrt{bx^2+a}x}{cd\sqrt{dx^2+c}}-\frac{C\left(-\frac{da^2}{b}+16ca-\frac{16bc^2}{d}\right)\sqrt{bx^2+a}x}{5d^2\sqrt{dx^2+c}}-\frac{(128b^3c^3-136ab^2dc^2+11a^2bd^2c+2a^3d^3)D\sqrt{bx^2+a}x}{35b^2d^4\sqrt{dx^2+c}}+\frac{B\sqrt{c}(8bc-7ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{A(2bc-ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{\sqrt{c}d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C(16b^2c^2-16abdc+a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{5bd^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}(128b^3c^3-136ab^2dc^2+11a^2bd^2c+2a^3d^3)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{35b^2d^{9/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}C(8bc-7ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{5d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{B\sqrt{c}(4bc-3ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}(64b^2c^2-60abdc+a^2d^2)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{35bd^{9/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ab\sqrt{c}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(3/2),x]
```

output
```
-1/3*(B*(8*b*c - 7*a*d)*x*Sqrt[a + b*x^2])/(d^2*Sqrt[c + d*x^2]) - (A*(b*c
 - a*d)*x*Sqrt[a + b*x^2])/(c*d*Sqrt[c + d*x^2]) + (A*(2*b*c - a*d)*x*Sqrt
[a + b*x^2])/(c*d*Sqrt[c + d*x^2]) - (C*(16*a*c - (16*b*c^2)/d - (a^2*d)/b
)*x*Sqrt[a + b*x^2])/(5*d^2*Sqrt[c + d*x^2]) - ((128*b^3*c^3 - 136*a*b^2*c
^2*d + 11*a^2*b*c*d^2 + 2*a^3*d^3)*D*x*Sqrt[a + b*x^2])/(35*b^2*d^4*Sqrt[c
 + d*x^2]) - (B*x*(a + b*x^2)^(3/2))/(d*Sqrt[c + d*x^2]) - (C*x^3*(a + b*x
^2)^(3/2))/(d*Sqrt[c + d*x^2]) - (D*x^5*(a + b*x^2)^(3/2))/(d*Sqrt[c + d*x
^2]) + (4*b*B*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*d^2) - (C*(8*b*c - 7*a
*d)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(5*d^3) + ((64*b^2*c^2 - 60*a*b*c*d
 + a^2*d^2)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(35*b*d^4) + (6*b*C*x^3*S
qrt[a + b*x^2]*Sqrt[c + d*x^2])/(5*d^2) - ((48*b*c - 43*a*d)*D*x^3*Sqrt[a
+ b*x^2]*Sqrt[c + d*x^2])/(35*d^3) + (8*b*D*x^5*Sqrt[a + b*x^2]*Sqrt[c + d
*x^2])/(7*d^2) + (B*Sqrt[c]*(8*b*c - 7*a*d)*Sqrt[a + b*x^2]*EllipticE[ArcT
an[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*d^(5/2)*Sqrt[(c*(a + b*x^2))
/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (A*(2*b*c - a*d)*Sqrt[a + b*x^2]*Elli
pticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(Sqrt[c]*d^(3/2)*Sqrt
[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (Sqrt[c]*C*(16*b^2*c^
2 - 16*a*b*c*d + a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqr
t[c]], 1 - (b*c)/(a*d)])/(5*b*d^(7/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))
]*Sqrt[c + d*x^2]) + (Sqrt[c]*(128*b^3*c^3 - 136*a*b^2*c^2*d + 11*a^2*b...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 1329 vs. $2(583) = 1166$.

Time = 9.53 (sec) , antiderivative size = 1330, normalized size of antiderivative = 2.13

method	result	size
elliptic	Expression too large to display	1330
default	Expression too large to display	2092

input
```
int((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(3/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*((b*d*x^2+a*d)
*(A*a*d^4-A*b*c*d^3-B*a*c*d^3+B*b*c^2*d^2+C*a*c^2*d^2-C*b*c^3*d-D*a*c^3*d+
D*b*c^4)/c/d^5*x/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+1/7*b/d^2*D*x^5*(b*d*x^4+
a*d*x^2+b*c*x^2+a*c)^(1/2)+1/5*(b/d^2*(C*b*d+2*D*a*d-D*b*c)-1/7*b/d^2*D*(6
*a*d+6*b*c))/b/d*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(1/d^3*(B*b^2
*d^2+2*C*a*b*d^2-C*b^2*c*d+D*a^2*d^2-2*D*a*b*c*d+D*b^2*c^2)-5/7*b/d^2*D*a*
c-1/5*(b/d^2*(C*b*d+2*D*a*d-D*b*c)-1/7*b/d^2*D*(6*a*d+6*b*c))/b/d*(4*a*d+4
*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+((2*A*a*b*d^4-A*b^2*c*d^3
+B*a^2*d^4-2*B*a*b*c*d^3+B*b^2*c^2*d^2-C*a^2*c*d^3+2*C*a*b*c^2*d^2-C*b^2*c
^3*d+D*a^2*c^2*d^2-2*D*a*b*c^3*d+D*b^2*c^4)/d^5+(A*a*d^4-A*b*c*d^3-B*a*c*d
^3+B*b*c^2*d^2+C*a*c^2*d^2-C*b*c^3*d-D*a*c^3*d+D*b*c^4)/d^5*(a*d-b*c)/c-a/
d^4*(A*a*d^4-A*b*c*d^3-B*a*c*d^3+B*b*c^2*d^2+C*a*c^2*d^2-C*b*c^3*d-D*a*c^3
*d+D*b*c^4)/c-1/3*(1/d^3*(B*b^2*d^2+2*C*a*b*d^2-C*b^2*c*d+D*a^2*d^2-2*D*a*
b*c*d+D*b^2*c^2)-5/7*b/d^2*D*a*c-1/5*(b/d^2*(C*b*d+2*D*a*d-D*b*c)-1/7*b/d^
2*D*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/b/d*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1
/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/
a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(1/d^4*(A*b^2*d^3+2*B*a*b*d^3-B*b^2*c*d
^2+C*a^2*d^3-2*C*a*b*c*d^2+C*b^2*c^2*d-D*a^2*c*d^2+2*D*a*b*c^2*d-D*b^2*c^3
)-(A*a*d^4-A*b*c*d^3-B*a*c*d^3+B*b*c^2*d^2+C*a*c^2*d^2-C*b*c^3*d-D*a*c^3*d
+D*b*c^4)/d^4*b/c-3/5*(b/d^2*(C*b*d+2*D*a*d-D*b*c)-1/7*b/d^2*D*(6*a*d+6...
```

Fricas [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 997, normalized size of antiderivative = 1.60

$$\int \frac{(a+bx^2)^{3/2}\,(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(3/2),x, algorit
hm="fricas")
```

output
```
1/105*(((384*D*b^3*c^5*d + 105*A*a*b^2*c*d^5 - 24*(17*D*a*b^2 + 14*C*b^3)*
c^4*d^2 + (33*D*a^2*b + 336*C*a*b^2 + 280*B*b^3)*c^3*d^3 + (6*D*a^3 - 21*C
*a^2*b - 245*B*a*b^2 - 210*A*b^3)*c^2*d^4)*x^3 + (384*D*b^3*c^6 + 105*A*a*
b^2*c^2*d^4 - 24*(17*D*a*b^2 + 14*C*b^3)*c^5*d + (33*D*a^2*b + 336*C*a*b^2
 + 280*B*b^3)*c^4*d^2 + (6*D*a^3 - 21*C*a^2*b - 245*B*a*b^2 - 210*A*b^3)*c
^3*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)
) - ((384*D*b^3*c^5*d - 24*(17*D*a*b^2 + 14*C*b^3)*c^4*d^2 + (33*D*a^2*b +
 48*(7*C + 4*D)*a*b^2 + 280*B*b^3)*c^3*d^3 + (6*D*a^3 - 3*(7*C + 60*D)*a^2
*b - 7*(35*B + 24*C)*a*b^2 - 210*A*b^3)*c^2*d^4 + (3*D*a^3 + 147*C*a^2*b +
 35*(3*A + 4*B)*a*b^2)*c*d^5 - 105*(B*a^2*b + A*a*b^2)*d^6)*x^3 + (384*D*b
^3*c^6 - 24*(17*D*a*b^2 + 14*C*b^3)*c^5*d + (33*D*a^2*b + 48*(7*C + 4*D)*a
*b^2 + 280*B*b^3)*c^4*d^2 + (6*D*a^3 - 3*(7*C + 60*D)*a^2*b - 7*(35*B + 24
*C)*a*b^2 - 210*A*b^3)*c^3*d^3 + (3*D*a^3 + 147*C*a^2*b + 35*(3*A + 4*B)*a
*b^2)*c^2*d^4 - 105*(B*a^2*b + A*a*b^2)*c*d^5)*x)*sqrt(b*d)*sqrt(-c/d)*ell
iptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) + (15*D*b^3*c*d^5*x^8 - 384*D*b^3
*c^5*d - 105*A*a*b^2*c*d^5 + 24*(17*D*a*b^2 + 14*C*b^3)*c^4*d^2 - (33*D*a^
2*b + 336*C*a*b^2 + 280*B*b^3)*c^3*d^3 - (6*D*a^3 - 21*C*a^2*b - 245*B*a*b
^2 - 210*A*b^3)*c^2*d^4 - 3*(8*D*b^3*c^2*d^4 - (8*D*a*b^2 + 7*C*b^3)*c*d^5
)*x^6 + (48*D*b^3*c^3*d^3 - 3*(17*D*a*b^2 + 14*C*b^3)*c^2*d^4 + (3*D*a^2*b
 + 42*C*a*b^2 + 35*B*b^3)*c*d^5)*x^4 - (192*D*b^3*c^4*d^2 - 12*(19*D*a*...
```

Sympy [F]

$$\int \frac{(a+bx^2)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)}{(c+dx^2)^{3/2}}\,dx=\int \frac{(a+bx^2)^{\frac{3}{2}}\left(A+Bx^2+Cx^4+Dx^6\right)}{(c+dx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*x**2+a)**(3/2)*(D*x**6+C*x**4+B*x**2+A)/(d*x**2+c)**(3/2),x)
```

output
```
Integral((a + b*x**2)**(3/2)*(A + B*x**2 + C*x**4 + D*x**6)/(c + d*x**2)**
(3/2), x)
```

Maxima [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)(bx^2+a)^{\frac{3}{2}}}{(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(3/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)/(d*x^2 + c)^(3/2),
 x)
```

Giac [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)(bx^2+a)^{\frac{3}{2}}}{(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(3/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)/(d*x^2 + c)^(3/2),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx=\int \frac{(b\,x^2+a)^{3/2}\,(A+B\,x^2+C\,x^4+x^6\,D)}{(d\,x^2+c)^{3/2}}\,dx$$

input
```
int(((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(3/2),x)
```

output
```
int(((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(3/2), x)
```

Reduce [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{3/2}}\,dx = \text{too large to display}$$

input
```
int((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(3/2),x)
```

output
```
( - 9*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**3*c*d**2*x + 315*sqrt(c + d*x**
2)*sqrt(a + b*x**2)*a**2*b**2*d**2*x + 27*sqrt(c + d*x**2)*sqrt(a + b*x**2
)*a**2*b*c**2*d*x + 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b*c*d**2*x**3
 - 105*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**3*c*d*x - 18*sqrt(c + d*x**2
)*sqrt(a + b*x**2)*a*b**2*c**3*x - 18*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*
b**2*c**2*d*x**3 + 48*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*c*d**2*x**5
 + 70*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*c*d*x**3 + 12*sqrt(c + d*x**2
)*sqrt(a + b*x**2)*b**3*c**3*x**3 - 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b*
*3*c**2*d*x**5 + 30*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c*d**2*x**7 - 3
*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d*x**2 + a*d
**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a**3*b*c**2*d**3 -
 3*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d*x**2 + a
*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a**3*b*c*d**4*x*
*2 - 315*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d*x*
*2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a**2*b**3*
c*d**3 - 315*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*
d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a**2*b
**3*d**4*x**2 - 45*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 +
2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*
a**2*b**2*c**3*d**2 - 45*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(...
```

3.34 $\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 554

$$
\begin{aligned}
\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \\
& -\frac{(bc(5c^2Cd-5Bcd^2+5Ad^3-8c^3D)-5ad(c^2Cd-Bcd^2+Ad^3-c^3D))\,x\sqrt{a+bx^2}}{15cd^4(c+dx^2)^{3/2}} \\
& +\frac{bDx^7\sqrt{a+bx^2}}{5d(c+dx^2)^{3/2}} \\
& +\frac{(3a^2d^2D+abd(20Cd-47cD)-b^2(35cCd-15Bd^2-56c^2D))\,x\sqrt{a+bx^2}}{15bd^4\sqrt{c+dx^2}} \\
& +\frac{(5bCd-8bcD+6adD)x^3\sqrt{a+bx^2}}{15d^3\sqrt{c+dx^2}} \\
& -\frac{(3a^2c^2d^2D+abd(40c^2Cd-5Bcd^2-10Ad^3-88c^3D)-2b^2c(40c^2Cd-20Bcd^2+5Ad^3-64c^3D))\sqrt{a+\cdots}}{15bc^{3/2}d^{9/2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}} \\
& +\frac{(3acd(5Cd-12cD)-b(40c^2Cd-20Bcd^2+5Ad^3-64c^3D))\sqrt{a+bx^2}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\cdots\right.}{15\sqrt{c}d^{9/2}\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}
\end{aligned}
$$

output
```
-1/15*(b*c*(5*A*d^3-5*B*c*d^2+5*C*c^2*d-8*D*c^3)-5*a*d*(A*d^3-B*c*d^2+C*c^
2*d-D*c^3))*x*(b*x^2+a)^(1/2)/c/d^4/(d*x^2+c)^(3/2)+1/5*b*D*x^7*(b*x^2+a)^
(1/2)/d/(d*x^2+c)^(3/2)+1/15*(3*a^2*d^2*D+a*b*d*(20*C*d-47*D*c)-b^2*(-15*B
*d^2+35*C*c*d-56*D*c^2))*x*(b*x^2+a)^(1/2)/b/d^4/(d*x^2+c)^(1/2)+1/15*(5*C
*b*d+6*D*a*d-8*D*b*c)*x^3*(b*x^2+a)^(1/2)/d^3/(d*x^2+c)^(1/2)-1/15*(3*a^2*
c^2*d^2*D+a*b*d*(-10*A*d^3-5*B*c*d^2+40*C*c^2*d-88*D*c^3)-2*b^2*c*(5*A*d^3
-20*B*c*d^2+40*C*c^2*d-64*D*c^3))*(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c^(1
/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/b/c^(3/2)/d^(9/2)/(c*(b*x^2+a)/a/
(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)+1/15*(3*a*c*d*(5*C*d-12*D*c)-b*(5*A*d^3-2
0*B*c*d^2+40*C*c^2*d-64*D*c^3))*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(
1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/c^(1/2)/d^(9/2)/(c*(b*x^2+a)/a/(d*x^2+c
))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 8.70 (sec) , antiderivative size = 511, normalized size of antiderivative = 0.92

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)\left(ad(36c^4D+10Ad^4x^2+5cd^3(3A+Bx^2)+\right.}{}$$

input
```
Integrate[((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(5/2
),x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(a*d*(36*c^4*D + 10*A*d^4*x^2 + 5*c*d^3*(3*A +
B*x^2) + 2*c^2*d^2*x^2*(-10*C + 3*D*x^2) + c^3*(-15*C*d + 47*d*D*x^2)) + b
*c*(-64*c^4*D + 10*A*d^4*x^2 + 40*c^3*d*(C - 2*D*x^2) - 2*c^2*d^2*(10*B -
25*C*x^2 + 4*D*x^4) + c*d^3*(5*A - 25*B*x^2 + 5*C*x^4 + 3*D*x^6))) - I*c*(
3*a^2*c^2*d^2*D + 2*b^2*c*(-40*c^2*C*d + 20*B*c*d^2 - 5*A*d^3 + 64*c^3*D)
- a*b*d*(-40*c^2*C*d + 5*B*c*d^2 + 10*A*d^3 + 88*c^3*D))*Sqrt[1 + (b*x^2)/
a]*(c + d*x^2)*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)
/(b*c)] + I*c*(3*a^2*c*d^2*(-5*C*d + 13*c*D) + 2*b^2*c*(-40*c^2*C*d + 20*B
*c*d^2 - 5*A*d^3 + 64*c^3*D) - a*b*d*(-80*c^2*C*d + 25*B*c*d^2 + 5*A*d^3 +
 152*c^3*D))*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)*Sqrt[1 + (d*x^2)/c]*EllipticF
[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)])/(15*Sqrt[b/a]*c^2*d^5*Sqrt[a + b*x^
2]*(c + d*x^2)^(3/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1314 vs. 2(554) = 1108.

Time = 2.40 (sec) , antiderivative size = 1314, normalized size of antiderivative = 2.37, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.050, Rules used = {7293, 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.

$$\int \frac{(a+bx^2)^{3/2} (A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}} \, dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A(a+bx^2)^{3/2}}{(c+dx^2)^{5/2}}+\frac{Bx^2(a+bx^2)^{3/2}}{(c+dx^2)^{5/2}}+\frac{Cx^4(a+bx^2)^{3/2}}{(c+dx^2)^{5/2}}+\frac{Dx^6(a+bx^2)^{3/2}}{(c+dx^2)^{5/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{(8bc-5ad)D\sqrt{bx^2+a}x^5}{3cd^2\sqrt{dx^2+c}}-\frac{D(bx^2+a)^{3/2}x^5}{3d(dx^2+c)^{3/2}}+\frac{(48bc-25ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{15cd^3}-\frac{C(2bc-ad)\sqrt{bx^2+a}x^3}{cd^2\sqrt{dx^2+c}}-\frac{C(bx^2+a)^{3/2}x^3}{3d(dx^2+c)^{3/2}}+\frac{C(8bc-3ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3cd^3}-\frac{4(16bc-9ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15d^4}-\frac{8C(2bc-ad)\sqrt{bx^2+a}x}{3d^3\sqrt{dx^2+c}}-\frac{B(4bc-ad)\sqrt{bx^2+a}x}{3cd^2\sqrt{dx^2+c}}+\frac{B(8bc-ad)\sqrt{bx^2+a}x}{3cd^2\sqrt{dx^2+c}}+\frac{(128b^2c^2-88abdc+3a^2d^2)D\sqrt{bx^2+a}x}{15bd^4\sqrt{dx^2+c}}-\frac{B(bx^2+a)^{3/2}x}{3d(dx^2+c)^{3/2}}-\frac{A(bc-ad)\sqrt{bx^2+a}x}{3cd(dx^2+c)^{3/2}}+\frac{8\sqrt{c}C(2bc-ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{B(8bc-ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3\sqrt{c}d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2A(bc+ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3c^{3/2}d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}(128b^2c^2-88abdc+3a^2d^2)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15bd^{9/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C(8bc-3ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{7/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{4c^{3/2}(16bc-9ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15d^{9/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Ab\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3\sqrt{c}d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{4bB\sqrt{c}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(5/2),x]
```

output
```
-1/3*(A*(b*c - a*d)*x*Sqrt[a + b*x^2])/(c*d*(c + d*x^2)^(3/2)) - (B*x*(a +
 b*x^2)^(3/2))/(3*d*(c + d*x^2)^(3/2)) - (C*x^3*(a + b*x^2)^(3/2))/(3*d*(c
 + d*x^2)^(3/2)) - (D*x^5*(a + b*x^2)^(3/2))/(3*d*(c + d*x^2)^(3/2)) - (8*
C*(2*b*c - a*d)*x*Sqrt[a + b*x^2])/(3*d^3*Sqrt[c + d*x^2]) - (B*(4*b*c - a
*d)*x*Sqrt[a + b*x^2])/(3*c*d^2*Sqrt[c + d*x^2]) + (B*(8*b*c - a*d)*x*Sqrt
[a + b*x^2])/(3*c*d^2*Sqrt[c + d*x^2]) + ((128*b^2*c^2 - 88*a*b*c*d + 3*a^
2*d^2)*D*x*Sqrt[a + b*x^2])/(15*b*d^4*Sqrt[c + d*x^2]) - (C*(2*b*c - a*d)*
x^3*Sqrt[a + b*x^2])/(c*d^2*Sqrt[c + d*x^2]) - ((8*b*c - 5*a*d)*D*x^5*Sqrt
[a + b*x^2])/(3*c*d^2*Sqrt[c + d*x^2]) + (C*(8*b*c - 3*a*d)*x*Sqrt[a + b*x
^2]*Sqrt[c + d*x^2])/(3*c*d^3) - (4*(16*b*c - 9*a*d)*D*x*Sqrt[a + b*x^2]*S
qrt[c + d*x^2])/(15*d^4) + ((48*b*c - 25*a*d)*D*x^3*Sqrt[a + b*x^2]*Sqrt[c
 + d*x^2])/(15*c*d^3) + (8*Sqrt[c]*C*(2*b*c - a*d)*Sqrt[a + b*x^2]*Ellipti
cE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*d^(7/2)*Sqrt[(c*(a +
b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (B*(8*b*c - a*d)*Sqrt[a + b*x^
2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*Sqrt[c]*d^(
5/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (2*A*(b*c +
a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d
)])/(3*c^(3/2)*d^(3/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^
2]) - (Sqrt[c]*(128*b^2*c^2 - 88*a*b*c*d + 3*a^2*d^2)*D*Sqrt[a + b*x^2]*El
lipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*b*d^(9/2)*Sq...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 1119 vs. $2(513) = 1026$.

Time = 9.72 (sec), antiderivative size = 1120, normalized size of antiderivative = 2.02

method	result	size
elliptic	Expression too large to display	1120
default	Expression too large to display	3024

input
```
int((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(5/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/3*(A*a*d^4-
A*b*c*d^3-B*a*c*d^3+B*b*c^2*d^2+C*a*c^2*d^2-C*b*c^3*d-D*a*c^3*d+D*b*c^4)/c
/d^6*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)^2+1/3*(b*d*x^2+a*d)*(
2*A*a*d^4+2*A*b*c*d^3+B*a*c*d^3-5*B*b*c^2*d^2-4*C*a*c^2*d^2+8*C*b*c^3*d+7*
D*a*c^3*d-11*D*b*c^4)/c^2/d^5*x/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+1/5*D*b/d^
3*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(b/d^3*(C*b*d+2*D*a*d-2*D*b*
c)-1/5*D*b/d^3*(4*a*d+4*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+((
A*b^2*d^3+2*B*a*b*d^3-2*B*b^2*c*d^2+C*a^2*d^3-4*C*a*b*c*d^2+3*C*b^2*c^2*d-
2*D*a^2*c*d^2+6*D*a*b*c^2*d-4*D*b^2*c^3)/d^5+1/3*(A*a*d^4-A*b*c*d^3-B*a*c*
d^3+B*b*c^2*d^2+C*a*c^2*d^2-C*b*c^3*d-D*a*c^3*d+D*b*c^4)/d^5*b/c+1/3*(2*A*
a*d^4+2*A*b*c*d^3+B*a*c*d^3-5*B*b*c^2*d^2-4*C*a*c^2*d^2+8*C*b*c^3*d+7*D*a*
c^3*d-11*D*b*c^4)/d^5*(a*d-b*c)/c^2-1/3*a/d^4*(2*A*a*d^4+2*A*b*c*d^3+B*a*c
*d^3-5*B*b*c^2*d^2-4*C*a*c^2*d^2+8*C*b*c^3*d+7*D*a*c^3*d-11*D*b*c^4)/c^2-1
/3*(b/d^3*(C*b*d+2*D*a*d-2*D*b*c)-1/5*D*b/d^3*(4*a*d+4*b*c))/b/d*a*c)/(-b/
a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)
^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(1/d^4*(B*b^2*d^
2+2*C*a*b*d^2-2*C*b^2*c*d+D*a^2*d^2-4*D*a*b*c*d+3*D*b^2*c^2)-1/3*(2*A*a*d^
4+2*A*b*c*d^3+B*a*c*d^3-5*B*b*c^2*d^2-4*C*a*c^2*d^2+8*C*b*c^3*d+7*D*a*c^3*
d-11*D*b*c^4)/d^4*b/c^2-3/5*D*b/d^3*a*c-1/3*(b/d^3*(C*b*d+2*D*a*d-2*D*b*c)
-1/5*D*b/d^3*(4*a*d+4*b*c))/b/d*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/...
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1077 vs. $2(514) = 1028$.

Time = 0.11 (sec) , antiderivative size = 1077, normalized size of antiderivative = 1.94

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(5/2),x, algorit
hm="fricas")
```

output
```
-1/15*(((128*D*b^2*c^5*d^2 - 10*A*a*b*c*d^6 - 8*(11*D*a*b + 10*C*b^2)*c^4*
d^3 + (3*D*a^2 + 40*C*a*b + 40*B*b^2)*c^3*d^4 - 5*(B*a*b + 2*A*b^2)*c^2*d^
5)*x^5 + 2*(128*D*b^2*c^6*d - 10*A*a*b*c^2*d^5 - 8*(11*D*a*b + 10*C*b^2)*c
^5*d^2 + (3*D*a^2 + 40*C*a*b + 40*B*b^2)*c^4*d^3 - 5*(B*a*b + 2*A*b^2)*c^3
*d^4)*x^3 + (128*D*b^2*c^7 - 10*A*a*b*c^3*d^4 - 8*(11*D*a*b + 10*C*b^2)*c^
6*d + (3*D*a^2 + 40*C*a*b + 40*B*b^2)*c^5*d^2 - 5*(B*a*b + 2*A*b^2)*c^4*d^
3)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (
(128*D*b^2*c^5*d^2 - 5*A*a*b*d^7 - 8*(11*D*a*b + 10*C*b^2)*c^4*d^3 + (3*D*
a^2 + 8*(5*C + 8*D)*a*b + 40*B*b^2)*c^3*d^4 - (36*D*a^2 + 5*(B + 8*C)*a*b
+ 10*A*b^2)*c^2*d^5 + 5*(3*C*a^2 - 2*(A - 2*B)*a*b)*c*d^6)*x^5 + 2*(128*D*
b^2*c^6*d - 5*A*a*b*c*d^6 - 8*(11*D*a*b + 10*C*b^2)*c^5*d^2 + (3*D*a^2 + 8
*(5*C + 8*D)*a*b + 40*B*b^2)*c^4*d^3 - (36*D*a^2 + 5*(B + 8*C)*a*b + 10*A*
b^2)*c^3*d^4 + 5*(3*C*a^2 - 2*(A - 2*B)*a*b)*c^2*d^5)*x^3 + (128*D*b^2*c^7
 - 5*A*a*b*c^2*d^5 - 8*(11*D*a*b + 10*C*b^2)*c^6*d + (3*D*a^2 + 8*(5*C + 8
*D)*a*b + 40*B*b^2)*c^5*d^2 - (36*D*a^2 + 5*(B + 8*C)*a*b + 10*A*b^2)*c^4*
d^3 + 5*(3*C*a^2 - 2*(A - 2*B)*a*b)*c^3*d^4)*x)*sqrt(b*d)*sqrt(-c/d)*ellip
tic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (3*D*b^2*c^2*d^5*x^8 + 128*D*b^2*
c^6*d - 10*A*a*b*c^2*d^5 - 8*(11*D*a*b + 10*C*b^2)*c^5*d^2 + (3*D*a^2 + 40
*C*a*b + 40*B*b^2)*c^4*d^3 - 5*(B*a*b + 2*A*b^2)*c^3*d^4 - (8*D*b^2*c^3*d^
4 - (6*D*a*b + 5*C*b^2)*c^2*d^5)*x^6 + (48*D*b^2*c^4*d^3 - (41*D*a*b + ...
```

Sympy [F]

$$\int \frac{(a+bx^2)^{3/2}\left(A+Bx^2+Cx^4+Dx^6\right)}{(c+dx^2)^{5/2}}\,dx=\int \frac{(a+bx^2)^{\frac{3}{2}}\left(A+Bx^2+Cx^4+Dx^6\right)}{(c+dx^2)^{\frac{5}{2}}}\,dx$$

input
```
integrate((b*x**2+a)**(3/2)*(D*x**6+C*x**4+B*x**2+A)/(d*x**2+c)**(5/2),x)
```

output
```
Integral((a + b*x**2)**(3/2)*(A + B*x**2 + C*x**4 + D*x**6)/(c + d*x**2)**
(5/2), x)
```

Maxima [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)(bx^2+a)^{\frac{3}{2}}}{(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(5/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)/(d*x^2 + c)^(5/2),
 x)
```

Giac [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)(bx^2+a)^{\frac{3}{2}}}{(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(5/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)/(d*x^2 + c)^(5/2),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \int \frac{(b\,x^2+a)^{3/2}\,(A+B\,x^2+C\,x^4+x^6\,D)}{(d\,x^2+c)^{5/2}}\,dx$$

input
```
int(((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(5/2),x)
```

output
```
int(((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(5/2), x)
```

Reduce [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{5/2}}\,dx = \text{too large to display}$$

input
```
int((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(5/2),x)
```

output
```
(3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*c*d*x + 2*sqrt(c + d*x**2)*sqrt(
a + b*x**2)*a**2*d**2*x**3 - 15*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*d
*x - 18*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c**2*x - 14*sqrt(c + d*x**2)
*sqrt(a + b*x**2)*a*b*c*d*x**3 + 4*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*d
**2*x**5 + 10*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*d*x**3 + 12*sqrt(c +
d*x**2)*sqrt(a + b*x**2)*b**2*c**2*x**3 - 2*sqrt(c + d*x**2)*sqrt(a + b*x*
*2)*b**2*c*d*x**5 + 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*d**2*x**7 - 1
5*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**3 + 3*a*c**2*d*x**2 +
 3*a*c*d**2*x**4 + a*d**3*x**6 + b*c**3*x**2 + 3*b*c**2*d*x**4 + 3*b*c*d**
2*x**6 + b*d**3*x**8),x)*a**2*b*c**3*d**2 - 30*int((sqrt(c + d*x**2)*sqrt(
a + b*x**2)*x**4)/(a*c**3 + 3*a*c**2*d*x**2 + 3*a*c*d**2*x**4 + a*d**3*x**
6 + b*c**3*x**2 + 3*b*c**2*d*x**4 + 3*b*c*d**2*x**6 + b*d**3*x**8),x)*a**2
*b*c**2*d**3*x**2 - 15*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**
3 + 3*a*c**2*d*x**2 + 3*a*c*d**2*x**4 + a*d**3*x**6 + b*c**3*x**2 + 3*b*c*
*2*d*x**4 + 3*b*c*d**2*x**6 + b*d**3*x**8),x)*a**2*b*c*d**4*x**4 + 15*int(
(sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**3 + 3*a*c**2*d*x**2 + 3*a*c
*d**2*x**4 + a*d**3*x**6 + b*c**3*x**2 + 3*b*c**2*d*x**4 + 3*b*c*d**2*x**6
 + b*d**3*x**8),x)*a*b**3*c**2*d**2 + 30*int((sqrt(c + d*x**2)*sqrt(a + b*
x**2)*x**4)/(a*c**3 + 3*a*c**2*d*x**2 + 3*a*c*d**2*x**4 + a*d**3*x**6 + b*
c**3*x**2 + 3*b*c**2*d*x**4 + 3*b*c*d**2*x**6 + b*d**3*x**8),x)*a*b**3*...
```

3.35 $\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 642

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = -\frac{(bc(3c^2Cd-3Bcd^2+3Ad^3-8c^3D)-3ad(c^2Cd-Bcd^2+Ad^3-c^3D))\,x\sqrt{a+bx^2}}{15cd^4(c+dx^2)^{5/2}}$$
$$+\frac{bDx^7\sqrt{a+bx^2}}{3d(c+dx^2)^{5/2}}$$
$$+\frac{(bc(12c^2Cd-7Bcd^2+2Ad^3-32c^3D)-ad(6c^2Cd-Bcd^2-4Ad^3-11c^3D))\,x\sqrt{a+bx^2}}{15c^2d^4(c+dx^2)^{3/2}}$$
$$+\frac{(3bCd-8bcD+4adD)x\sqrt{a+bx^2}}{3d^4\sqrt{c+dx^2}}$$
$$-\frac{(2b^2c^2(24c^2Cd-4Bcd^2-Ad^3-64c^3D)-3abcd(16c^2Cd-Bcd^2+Ad^3-56c^3D)+a^2d^2(3c^2Cd+2Bc}{15c^{5/2}d^{9/2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$
$$-\frac{(15a^2c^2d^2D+abd(21c^2Cd-Bcd^2-4Ad^3-76c^3D)-b^2c(24c^2Cd-4Bcd^2-Ad^3-64c^3D))\sqrt{a+bx^2}}{15c^{3/2}d^{9/2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
-1/15*(b*c*(3*A*d^3-3*B*c*d^2+3*C*c^2*d-8*D*c^3)-3*a*d*(A*d^3-B*c*d^2+C*c^
2*d-D*c^3))*x*(b*x^2+a)^(1/2)/c/d^4/(d*x^2+c)^(5/2)+1/3*b*D*x^7*(b*x^2+a)^
(1/2)/d/(d*x^2+c)^(5/2)+1/15*(b*c*(2*A*d^3-7*B*c*d^2+12*C*c^2*d-32*D*c^3)-
a*d*(-4*A*d^3-B*c*d^2+6*C*c^2*d-11*D*c^3))*x*(b*x^2+a)^(1/2)/c^2/d^4/(d*x^
2+c)^(3/2)+1/3*(3*C*b*d+4*D*a*d-8*D*b*c)*x*(b*x^2+a)^(1/2)/d^4/(d*x^2+c)^(
1/2)-1/15*(2*b^2*c^2*(-A*d^3-4*B*c*d^2+24*C*c^2*d-64*D*c^3)-3*a*b*c*d*(A*d
^3-B*c*d^2+16*C*c^2*d-56*D*c^3)+a^2*d^2*(8*A*d^3+2*B*c*d^2+3*C*c^2*d-43*D*
c^3))*(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c
/a/d)^(1/2))/c^(5/2)/d^(9/2)/(-a*d+b*c)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d
*x^2+c)^(1/2)-1/15*(15*a^2*c^2*d^2*D+a*b*d*(-4*A*d^3-B*c*d^2+21*C*c^2*d-76
*D*c^3)-b^2*c*(-A*d^3-4*B*c*d^2+24*C*c^2*d-64*D*c^3))*(b*x^2+a)^(1/2)*Inve
rseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/c^(3/2)/d^(9/2)/(
-a*d+b*c)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 8.54 (sec) , antiderivative size = 611, normalized size of antiderivative = 0.95

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \frac{-\sqrt{\frac{b}{a}}dx(a+bx^2)\left(3c^2(bc-ad)^2\left(c^2Cd-Bcd^2+Ad^3-c^3\right.\right.}{}$$

input
```
Integrate[((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(7/2
),x]
```

output
```
(-(Sqrt[b/a]*d*x*(a + b*x^2)*(3*c^2*(b*c - a*d)^2*(c^2*C*d - B*c*d^2 + A*d
^3 - c^3*D) - c*(b*c - a*d)*(b*c*(12*c^2*C*d - 7*B*c*d^2 + 2*A*d^3 - 17*c^
3*D) + a*d*(-6*c^2*C*d + B*c*d^2 + 4*A*d^3 + 11*c^3*D))*(c + d*x^2) + (a^2
*d^2*(3*c^2*C*d + 2*B*c*d^2 + 8*A*d^3 - 23*c^3*D) + 3*a*b*c*d*(-11*c^2*C*d
 + B*c*d^2 - A*d^3 + 31*c^3*D) - b^2*c^2*(-33*c^2*C*d + 8*B*c*d^2 + 2*A*d^
3 + 73*c^3*D))*(c + d*x^2)^2 - 5*b*c^3*(b*c - a*d)*D*(c + d*x^2)^3)) + I*c
*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)^2*Sqrt[1 + (d*x^2)/c]*(b*(-(a^2*d^2*(3*c^
2*C*d + 2*B*c*d^2 + 8*A*d^3 - 43*c^3*D)) - 3*a*b*c*d*(-16*c^2*C*d + B*c*d^
2 - A*d^3 + 56*c^3*D) + 2*b^2*c^2*(-24*c^2*C*d + 4*B*c*d^2 + A*d^3 + 64*c^
3*D))*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - (b*c - a*d)*(15*a^2
*c^2*d^2*D + a*b*d*(24*c^2*C*d + B*c*d^2 + 4*A*d^3 - 104*c^3*D) + 2*b^2*c*
(-24*c^2*C*d + 4*B*c*d^2 + A*d^3 + 64*c^3*D))*EllipticF[I*ArcSinh[Sqrt[b/a
]*x], (a*d)/(b*c)]))/(15*Sqrt[b/a]*c^3*d^5*(b*c - a*d)*Sqrt[a + b*x^2]*(c
+ d*x^2)^(5/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1549 vs. 2(642) = 1284.

Time = 2.61 (sec) , antiderivative size = 1549, normalized size of antiderivative = 2.41, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A(a+bx^2)^{3/2}}{(c+dx^2)^{7/2}}+\frac{Bx^2(a+bx^2)^{3/2}}{(c+dx^2)^{7/2}}+\frac{Cx^4(a+bx^2)^{3/2}}{(c+dx^2)^{7/2}}+\frac{Dx^6(a+bx^2)^{3/2}}{(c+dx^2)^{7/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$
\begin{aligned}
&-\frac{(8bc-5ad)D\sqrt{bx^2+a}x^5}{15cd^2\left(dx^2+c\right)^{3/2}}-\frac{D\left(bx^2+a\right)^{3/2}x^5}{5d\left(dx^2+c\right)^{5/2}}- \\
&\frac{\left(48b^2c^2-55abdc+10a^2d^2\right)D\sqrt{bx^2+a}x^3}{15cd^3(bc-ad)\sqrt{dx^2+c}}-\frac{C(2bc-ad)\sqrt{bx^2+a}x^3}{5cd^2\left(dx^2+c\right)^{3/2}}-\frac{C\left(bx^2+a\right)^{3/2}x^3}{5d\left(dx^2+c\right)^{5/2}}+ \\
&\frac{(16bc-15ad)(4bc-ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15cd^4(bc-ad)}+\frac{C\left(16b^2c^2-16abdc+a^2d^2\right)\sqrt{bx^2+a}x}{5cd^3(bc-ad)\sqrt{dx^2+c}}- \\
&\frac{\left(128b^2c^2-168abdc+43a^2d^2\right)D\sqrt{bx^2+a}x}{15d^4(bc-ad)\sqrt{dx^2+c}}-\frac{bC(8bc-7ad)\sqrt{bx^2+a}x}{5d^3(bc-ad)\sqrt{dx^2+c}}- \\
&\frac{B(4bc-ad)\sqrt{bx^2+a}x}{15cd^2\left(dx^2+c\right)^{3/2}}+\frac{2A(bc+2ad)\sqrt{bx^2+a}x}{15c^2d\left(dx^2+c\right)^{3/2}}-\frac{B\left(bx^2+a\right)^{3/2}x}{5d\left(dx^2+c\right)^{5/2}}- \\
&\frac{A(bc-ad)\sqrt{bx^2+a}x}{5cd\left(dx^2+c\right)^{5/2}}+\frac{A\left(2b^2c^2+3abdc-8a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15c^{5/2}d^{3/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+ \\
&\frac{B\left(8b^2c^2-3abdc-2a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15c^{3/2}d^{5/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}- \\
&\frac{C\left(16b^2c^2-16abdc+a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{5\sqrt{c}d^{7/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+ \\
&\frac{\sqrt{c}\left(128b^2c^2-168abdc+43a^2d^2\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15d^{9/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}- \\
&\frac{bB(4bc-ad)\sqrt{bx^2+a}\operatorname{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15\sqrt{c}d^{5/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}- \\
&\frac{\sqrt{c}(16bc-15ad)(4bc-ad)D\sqrt{bx^2+a}\operatorname{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15d^{9/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+ \\
&\frac{b\sqrt{c}C(8bc-7ad)\sqrt{bx^2+a}\operatorname{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{5d^{7/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}- \\
&\frac{Ab(bc-4ad)\sqrt{bx^2+a}\operatorname{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15c^{3/2}d^{3/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}
\end{aligned}
$$

input
```
Int[((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(7/2),x]
```

output
```
-1/5*(A*(b*c - a*d)*x*Sqrt[a + b*x^2])/(c*d*(c + d*x^2)^(5/2)) - (B*x*(a +
 b*x^2)^(3/2))/(5*d*(c + d*x^2)^(5/2)) - (C*x^3*(a + b*x^2)^(3/2))/(5*d*(c
 + d*x^2)^(5/2)) - (D*x^5*(a + b*x^2)^(3/2))/(5*d*(c + d*x^2)^(5/2)) - (B*
(4*b*c - a*d)*x*Sqrt[a + b*x^2])/(15*c*d^2*(c + d*x^2)^(3/2)) + (2*A*(b*c
+ 2*a*d)*x*Sqrt[a + b*x^2])/(15*c^2*d*(c + d*x^2)^(3/2)) - (C*(2*b*c - a*d
)*x^3*Sqrt[a + b*x^2])/(5*c*d^2*(c + d*x^2)^(3/2)) - ((8*b*c - 5*a*d)*D*x^
5*Sqrt[a + b*x^2])/(15*c*d^2*(c + d*x^2)^(3/2)) - (b*C*(8*b*c - 7*a*d)*x*S
qrt[a + b*x^2])/(5*d^3*(b*c - a*d)*Sqrt[c + d*x^2]) + (C*(16*b^2*c^2 - 16*
a*b*c*d + a^2*d^2)*x*Sqrt[a + b*x^2])/(5*c*d^3*(b*c - a*d)*Sqrt[c + d*x^2]
) - ((128*b^2*c^2 - 168*a*b*c*d + 43*a^2*d^2)*D*x*Sqrt[a + b*x^2])/(15*d^4
*(b*c - a*d)*Sqrt[c + d*x^2]) - ((48*b^2*c^2 - 55*a*b*c*d + 10*a^2*d^2)*D*
x^3*Sqrt[a + b*x^2])/(15*c*d^3*(b*c - a*d)*Sqrt[c + d*x^2]) + ((16*b*c - 1
5*a*d)*(4*b*c - a*d)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(15*c*d^4*(b*c -
 a*d)) + (A*(2*b^2*c^2 + 3*a*b*c*d - 8*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[
ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*c^(5/2)*d^(3/2)*(b*c -
a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*(8*b^2*c^
2 - 3*a*b*c*d - 2*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sq
rt[c]], 1 - (b*c)/(a*d)])/(15*c^(3/2)*d^(5/2)*(b*c - a*d)*Sqrt[(c*(a + b*x
^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (C*(16*b^2*c^2 - 16*a*b*c*d + a^2
*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 1275 vs. 2(601) = 1202.

Time = 9.80 (sec) , antiderivative size = 1276, normalized size of antiderivative = 1.99

method	result	size
elliptic	Expression too large to display	1276
default	Expression too large to display	5978

input
```
int((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(7/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/5*(A*a*d^4-
A*b*c*d^3-B*a*c*d^3+B*b*c^2*d^2+C*a*c^2*d^2-C*b*c^3*d-D*a*c^3*d+D*b*c^4)/c
/d^7*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)^3+1/15*(4*A*a*d^4+2*A
*b*c*d^3+B*a*c*d^3-7*B*b*c^2*d^2-6*C*a*c^2*d^2+12*C*b*c^3*d+11*D*a*c^3*d-1
7*D*b*c^4)/c^2/d^6*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)^2+1/15*
(b*d*x^2+a*d)/c^3/d^5/(a*d-b*c)*x*(8*A*a^2*d^5-3*A*a*b*c*d^4-2*A*b^2*c^2*d
^3+2*B*a^2*c*d^4+3*B*a*b*c^2*d^3-8*B*b^2*c^3*d^2+3*C*a^2*c^2*d^3-33*C*a*b*
c^3*d^2+33*C*b^2*c^4*d-23*D*a^2*c^3*d^2+93*D*a*b*c^4*d-73*D*b^2*c^5)/((x^2
+c/d)*(b*d*x^2+a*d))^(1/2)+1/3*D*b/d^4*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/
2)+((B*b^2*d^2+2*C*a*b*d^2-3*C*b^2*c*d+D*a^2*d^2-6*D*a*b*c*d+6*D*b^2*c^2)/
d^5+1/15*b*(4*A*a*d^4+2*A*b*c*d^3+B*a*c*d^3-7*B*b*c^2*d^2-6*C*a*c^2*d^2+12
*C*b*c^3*d+11*D*a*c^3*d-17*D*b*c^4)/c^2/d^5+1/15/d^5*(8*A*a^2*d^5-3*A*a*b*
c*d^4-2*A*b^2*c^2*d^3+2*B*a^2*c*d^4+3*B*a*b*c^2*d^3-8*B*b^2*c^3*d^2+3*C*a^
2*c^2*d^3-33*C*a*b*c^3*d^2+33*C*b^2*c^4*d-23*D*a^2*c^3*d^2+93*D*a*b*c^4*d-
73*D*b^2*c^5)/c^3-1/15*a/d^4/c^3/(a*d-b*c)*(8*A*a^2*d^5-3*A*a*b*c*d^4-2*A*
b^2*c^2*d^3+2*B*a^2*c*d^4+3*B*a*b*c^2*d^3-8*B*b^2*c^3*d^2+3*C*a^2*c^2*d^3-
33*C*a*b*c^3*d^2+33*C*b^2*c^4*d-23*D*a^2*c^3*d^2+93*D*a*b*c^4*d-73*D*b^2*c
^5)-1/3*D*b/d^4*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d
*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b
)^(1/2))-(b/d^4*(C*b*d+2*D*a*d-3*D*b*c)-1/15/d^4*b*(8*A*a^2*d^5-3*A*a*b...
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1935 vs. $2(597) = 1194$.

Time = 0.15 (sec) , antiderivative size = 1935, normalized size of antiderivative = 3.01

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(7/2),x, algorit
hm="fricas")
```

output
```
1/15*(((128*D*b^3*c^6*d^3 - 8*A*a^2*b*c*d^8 - 24*(7*D*a*b^2 + 2*C*b^3)*c^5
*d^4 + (43*D*a^2*b + 48*C*a*b^2 + 8*B*b^3)*c^4*d^5 - (3*C*a^2*b + 3*B*a*b^
2 - 2*A*b^3)*c^3*d^6 - (2*B*a^2*b - 3*A*a*b^2)*c^2*d^7)*x^7 + 3*(128*D*b^3
*c^7*d^2 - 8*A*a^2*b*c^2*d^7 - 24*(7*D*a*b^2 + 2*C*b^3)*c^6*d^3 + (43*D*a^
2*b + 48*C*a*b^2 + 8*B*b^3)*c^5*d^4 - (3*C*a^2*b + 3*B*a*b^2 - 2*A*b^3)*c^
4*d^5 - (2*B*a^2*b - 3*A*a*b^2)*c^3*d^6)*x^5 + 3*(128*D*b^3*c^8*d - 8*A*a^
2*b*c^3*d^6 - 24*(7*D*a*b^2 + 2*C*b^3)*c^7*d^2 + (43*D*a^2*b + 48*C*a*b^2
+ 8*B*b^3)*c^6*d^3 - (3*C*a^2*b + 3*B*a*b^2 - 2*A*b^3)*c^5*d^4 - (2*B*a^2*
b - 3*A*a*b^2)*c^4*d^5)*x^3 + (128*D*b^3*c^9 - 8*A*a^2*b*c^4*d^5 - 24*(7*D
*a*b^2 + 2*C*b^3)*c^8*d + (43*D*a^2*b + 48*C*a*b^2 + 8*B*b^3)*c^7*d^2 - (3
*C*a^2*b + 3*B*a*b^2 - 2*A*b^3)*c^6*d^3 - (2*B*a^2*b - 3*A*a*b^2)*c^5*d^4)
*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((1
28*D*b^3*c^6*d^3 - 4*A*a^2*b*d^9 - 24*(7*D*a*b^2 + 2*C*b^3)*c^5*d^4 + (43*
D*a^2*b + 16*(3*C + 4*D)*a*b^2 + 8*B*b^3)*c^4*d^5 - ((3*C + 76*D)*a^2*b +
3*(B + 8*C)*a*b^2 - 2*A*b^3)*c^3*d^6 + (15*D*a^3 - (2*B - 21*C)*a^2*b + (3
*A + 4*B)*a*b^2)*c^2*d^7 - ((8*A + B)*a^2*b - A*a*b^2)*c*d^8)*x^7 + 3*(128
*D*b^3*c^7*d^2 - 4*A*a^2*b*c*d^8 - 24*(7*D*a*b^2 + 2*C*b^3)*c^6*d^3 + (43*
D*a^2*b + 16*(3*C + 4*D)*a*b^2 + 8*B*b^3)*c^5*d^4 - ((3*C + 76*D)*a^2*b +
3*(B + 8*C)*a*b^2 - 2*A*b^3)*c^4*d^5 + (15*D*a^3 - (2*B - 21*C)*a^2*b + (3
*A + 4*B)*a*b^2)*c^3*d^6 - ((8*A + B)*a^2*b - A*a*b^2)*c^2*d^7)*x^5 + 3...
```

Sympy [F(-1)]

Timed out.

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \text{Timed out}$$

input
```
integrate((b*x**2+a)**(3/2)*(D*x**6+C*x**4+B*x**2+A)/(d*x**2+c)**(7/2),x)
```

output
```
Timed out
```

Maxima [F]

$$\int \frac{(a+bx^2)^{3/2}\,(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)(bx^2+a)^{\frac{3}{2}}}{(dx^2+c)^{\frac{7}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(7/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)/(d*x^2 + c)^(7/2),
 x)
```

Giac [F]

$$\int \frac{(a+bx^2)^{3/2}\,(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)(bx^2+a)^{\frac{3}{2}}}{(dx^2+c)^{\frac{7}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(7/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)/(d*x^2 + c)^(7/2),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(a+bx^2)^{3/2}\,(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \int \frac{(b\,x^2+a)^{3/2}\,(A+B\,x^2+C\,x^4+x^6\,D)}{(d\,x^2+c)^{7/2}}\,dx$$

input
```
int(((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(7/2),x)
```

output
```
int(((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(7/2), x)
```

Reduce [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{7/2}}\,dx = \text{too large to display}$$

input
```
int((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(7/2),x)
```

output
```
( - 9*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**3*c*d**2*x - 12*sqrt(c + d*x**2
)*sqrt(a + b*x**2)*a**3*d**3*x**3 - 9*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*
*2*b**2*d**2*x + 75*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b*c**2*d*x + 10
6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b*c*d**2*x**3 + 16*sqrt(c + d*x**
2)*sqrt(a + b*x**2)*a**2*b*d**3*x**5 - 9*sqrt(c + d*x**2)*sqrt(a + b*x**2)
*a*b**3*c*d*x - 12*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**3*d**2*x**3 - 90
*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*c**3*x - 170*sqrt(c + d*x**2)*sq
rt(a + b*x**2)*a*b**2*c**2*d*x**3 - 28*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a
*b**2*c*d**2*x**5 + 4*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*d**3*x**7 +
 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*c*d*x**3 + 60*sqrt(c + d*x**2)*s
qrt(a + b*x**2)*b**3*c**3*x**3 + 10*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3
*c**2*d*x**5 - 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c*d**2*x**7 - 48*i
nt((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(2*a**2*c**4*d + 8*a**2*c**3*d
**2*x**2 + 12*a**2*c**2*d**3*x**4 + 8*a**2*c*d**4*x**6 + 2*a**2*d**5*x**8
- a*b*c**5 - 2*a*b*c**4*d*x**2 + 2*a*b*c**3*d**2*x**4 + 8*a*b*c**2*d**3*x*
*6 + 7*a*b*c*d**4*x**8 + 2*a*b*d**5*x**10 - b**2*c**5*x**2 - 4*b**2*c**4*d
*x**4 - 6*b**2*c**3*d**2*x**6 - 4*b**2*c**2*d**3*x**8 - b**2*c*d**4*x**10)
,x)*a**5*c**3*d**5 - 144*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(2*a
**2*c**4*d + 8*a**2*c**3*d**2*x**2 + 12*a**2*c**2*d**3*x**4 + 8*a**2*c*d**
4*x**6 + 2*a**2*d**5*x**8 - a*b*c**5 - 2*a*b*c**4*d*x**2 + 2*a*b*c**3*d...
```

3.36 $\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 806

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = -\frac{(bc(c^2Cd-Bcd^2+Ad^3-8c^3D)-ad(c^2Cd-Bcd^2+Ad^3-c^3D))\,x\sqrt{a+bx^2}}{7cd^4(c+dx^2)^{7/2}}$$
$$+\frac{bDx^7\sqrt{a+bx^2}}{d(c+dx^2)^{7/2}}$$
$$+\frac{(bc(16c^2Cd-9Bcd^2+2Ad^3-128c^3D)-ad(8c^2Cd-Bcd^2-6Ad^3-15c^3D))\,x\sqrt{a+bx^2}}{35c^2d^4(c+dx^2)^{5/2}}$$
$$+\frac{(abcd(57c^2Cd-Bcd^2+15Ad^3-498c^3D)-b^2c^2(57c^2Cd-8Bcd^2-6Ad^3-456c^3D)-a^2d^2(3c^2Cd+4\cdots}{105c^3d^4(bc-ad)(c+dx^2)^{3/2}}$$
$$-\frac{(ab^2c^2d(72c^2Cd+5Bcd^2-12Ad^3-744c^3D)-a^2bcd^2(12c^2Cd-5Bcd^2-72Ad^3-369c^3D)-2b^3c^3(24\cdots}{105c^{7/2}d^{9/2}(bc-\cdots}$$
$$+\frac{b(abcd(33c^2Cd+2Bcd^2+33Ad^3-348c^3D)-b^2c^2(24c^2Cd+4Bcd^2+3Ad^3-192c^3D)-a^2d^2(3c^2Cd+\cdots}{105c^{5/2}d^{9/2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+\cdots}}$$

output
```
-1/7*(b*c*(A*d^3-B*c*d^2+C*c^2*d-8*D*c^3)-a*d*(A*d^3-B*c*d^2+C*c^2*d-D*c^3
))*x*(b*x^2+a)^(1/2)/c/d^4/(d*x^2+c)^(7/2)+b*D*x^7*(b*x^2+a)^(1/2)/d/(d*x^
2+c)^(7/2)+1/35*(b*c*(2*A*d^3-9*B*c*d^2+16*C*c^2*d-128*D*c^3)-a*d*(-6*A*d^
3-B*c*d^2+8*C*c^2*d-15*D*c^3))*x*(b*x^2+a)^(1/2)/c^2/d^4/(d*x^2+c)^(5/2)+1
/105*(a*b*c*d*(15*A*d^3-B*c*d^2+57*C*c^2*d-498*D*c^3)-b^2*c^2*(-6*A*d^3-8*
B*c*d^2+57*C*c^2*d-456*D*c^3)-a^2*d^2*(24*A*d^3+4*B*c*d^2+3*C*c^2*d-45*D*c
^3))*x*(b*x^2+a)^(1/2)/c^3/d^4/(-a*d+b*c)/(d*x^2+c)^(3/2)-1/105*(a*b^2*c^2
*d*(-12*A*d^3+5*B*c*d^2+72*C*c^2*d-744*D*c^3)-a^2*b*c*d^2*(-72*A*d^3-5*B*c
*d^2+12*C*c^2*d-369*D*c^3)-2*b^3*c^3*(3*A*d^3+4*B*c*d^2+24*C*c^2*d-192*D*c
^3)-a^3*d^3*(48*A*d^3+8*B*c*d^2+6*C*c^2*d+15*D*c^3))*(b*x^2+a)^(1/2)*Ellip
ticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/c^(7/2)/d^(9/2
)/(-a*d+b*c)^2/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)+1/105*b*(a*
b*c*d*(33*A*d^3+2*B*c*d^2+33*C*c^2*d-348*D*c^3)-b^2*c^2*(3*A*d^3+4*B*c*d^2
+24*C*c^2*d-192*D*c^3)-a^2*d^2*(24*A*d^3+4*B*c*d^2+3*C*c^2*d-150*D*c^3))*(
b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2)
)/c^(5/2)/d^(9/2)/(-a*d+b*c)^2/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(
1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 9.53 (sec) , antiderivative size = 819, normalized size of antiderivative = 1.02

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \frac{-\sqrt{\frac{b}{a}}dx(a+bx^2)\left(15c^3(bc-ad)^3\left(c^2Cd-Bcd^2+Ad^3-c^3\right.\right.}{}$$

input
```
Integrate[((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(9/2
),x]
```

output
```
(-(Sqrt[b/a]*d*x*(a + b*x^2)*(15*c^3*(b*c - a*d)^3*(c^2*C*d - B*c*d^2 + A*
d^3 - c^3*D) - 3*c^2*(b*c - a*d)^2*(b*c*(16*c^2*C*d - 9*B*c*d^2 + 2*A*d^3
- 23*c^3*D) + a*d*(-8*c^2*C*d + B*c*d^2 + 6*A*d^3 + 15*c^3*D))*(c + d*x^2)
 + c*(b*c - a*d)*(a^2*d^2*(3*c^2*C*d + 4*B*c*d^2 + 24*A*d^3 - 45*c^3*D) -
b^2*c^2*(-57*c^2*C*d + 8*B*c*d^2 + 6*A*d^3 + 141*c^3*D) + a*b*c*d*(-57*c^2
*C*d + B*c*d^2 - 15*A*d^3 + 183*c^3*D))*(c + d*x^2)^2 - (b^3*c^3*(48*c^2*C
*d + 8*B*c*d^2 + 6*A*d^3 - 279*c^3*D) + a^3*d^3*(6*c^2*C*d + 8*B*c*d^2 + 4
8*A*d^3 + 15*c^3*D) - a^2*b*c*d^2*(-12*c^2*C*d + 5*B*c*d^2 + 72*A*d^3 + 26
4*c^3*D) + a*b^2*c^2*d*(-72*c^2*C*d - 5*B*c*d^2 + 12*A*d^3 + 534*c^3*D))*(
c + d*x^2)^3)) + I*b*c*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)^3*Sqrt[1 + (d*x^2)/
c]*((a^3*d^3*(6*c^2*C*d + 8*B*c*d^2 + 48*A*d^3 + 15*c^3*D) - a^2*b*c*d^2*(
-12*c^2*C*d + 5*B*c*d^2 + 72*A*d^3 + 369*c^3*D) + a*b^2*c^2*d*(-72*c^2*C*d
 - 5*B*c*d^2 + 12*A*d^3 + 744*c^3*D) + b^3*(48*c^5*C*d + 8*B*c^4*d^2 + 6*A
*c^3*d^3 - 384*c^6*D))*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] + (b
*c - a*d)*(a*b*c*d*(48*c^2*C*d + B*c*d^2 - 15*A*d^3 - 552*c^3*D) + a^2*d^2
*(3*c^2*C*d + 4*B*c*d^2 + 24*A*d^3 + 165*c^3*D) + 2*b^2*c^2*(-24*c^2*C*d -
 4*B*c*d^2 - 3*A*d^3 + 192*c^3*D))*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)
/(b*c)]))/(105*Sqrt[b/a]*c^4*d^5*(b*c - a*d)^2*Sqrt[a + b*x^2]*(c + d*x^2)
^(7/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1722 vs. $2(806) = 1612$.

Time = 3.05 (sec) , antiderivative size = 1722, normalized size of antiderivative = 2.14, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A(a+bx^2)^{3/2}}{(c+dx^2)^{9/2}}+\frac{Bx^2(a+bx^2)^{3/2}}{(c+dx^2)^{9/2}}+\frac{Cx^4(a+bx^2)^{3/2}}{(c+dx^2)^{9/2}}+\frac{Dx^6(a+bx^2)^{3/2}}{(c+dx^2)^{9/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{(8bc-5ad)D\sqrt{bx^2+a}x^5}{35cd^2(dx^2+c)^{5/2}}-\frac{D(bx^2+a)^{3/2}x^5}{7d(dx^2+c)^{7/2}}-\frac{b(16bc-15ad)D\sqrt{bx^2+a}x^3}{35d^3(bc-ad)(dx^2+c)^{3/2}}-$$
$$\frac{3C(2bc-ad)\sqrt{bx^2+a}x^3}{35cd^2(dx^2+c)^{5/2}}-\frac{C(bx^2+a)^{3/2}x^3}{7d(dx^2+c)^{7/2}}-\frac{2b(32b^2c^2-58abdc+25a^2d^2)D\sqrt{bx^2+a}x}{35d^4(bc-ad)^2\sqrt{dx^2+c}}+$$
$$\frac{(128b^3c^3-248ab^2dc^2+123a^2bd^2c-5a^3d^3)D\sqrt{bx^2+a}x}{35cd^4(bc-ad)^2\sqrt{dx^2+c}}+$$
$$\frac{A(2b^2c^2+5abdc-8a^2d^2)\sqrt{bx^2+a}x}{35c^3d(bc-ad)(dx^2+c)^{3/2}}+\frac{B(8b^2c^2-abdc-4a^2d^2)\sqrt{bx^2+a}x}{105c^2d^2(bc-ad)(dx^2+c)^{3/2}}-$$
$$\frac{C(8b^2c^2-5abdc-2a^2d^2)\sqrt{bx^2+a}x}{35cd^3(bc-ad)(dx^2+c)^{3/2}}-\frac{B(4bc-ad)\sqrt{bx^2+a}x}{35cd^2(dx^2+c)^{5/2}}+\frac{2A(bc+3ad)\sqrt{bx^2+a}x}{35c^2d(dx^2+c)^{5/2}}-$$
$$\frac{B(bx^2+a)^{3/2}x}{7d(dx^2+c)^{7/2}}-\frac{A(bc-ad)\sqrt{bx^2+a}x}{7cd(dx^2+c)^{7/2}}+$$
$$\frac{2A(bc-2ad)(b^2c^2+4abdc-4a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{35c^{7/2}d^{3/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+$$
$$\frac{2C(2bc-ad)(4b^2c^2-4abdc-a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{35c^{3/2}d^{7/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+$$
$$\frac{B(bc+ad)(8b^2c^2-13abdc+8a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{105c^{5/2}d^{5/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$
$$\frac{(128b^3c^3-248ab^2dc^2+123a^2bd^2c-5a^3d^3)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{35\sqrt{c}d^{9/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$
$$\frac{bC(8b^2c^2-11abdc+a^2d^2)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{35\sqrt{c}d^{7/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$
$$\frac{2bB(2b^2c^2-abdc+2a^2d^2)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{105c^{3/2}d^{5/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-$$
$$\frac{Ab(b^2c^2-11abdc+8a^2d^2)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{35c^{5/2}d^{3/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+$$
$$\frac{2b\sqrt{c}(32b^2c^2-58abdc+25a^2d^2)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{35d^{9/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(c + d*x^2)^(9/2),x]
```

output
```
-1/7*(A*(b*c - a*d)*x*Sqrt[a + b*x^2])/(c*d*(c + d*x^2)^(7/2)) - (B*x*(a +
 b*x^2)^(3/2))/(7*d*(c + d*x^2)^(7/2)) - (C*x^3*(a + b*x^2)^(3/2))/(7*d*(c
 + d*x^2)^(7/2)) - (D*x^5*(a + b*x^2)^(3/2))/(7*d*(c + d*x^2)^(7/2)) - (B*
(4*b*c - a*d)*x*Sqrt[a + b*x^2])/(35*c*d^2*(c + d*x^2)^(5/2)) + (2*A*(b*c
+ 3*a*d)*x*Sqrt[a + b*x^2])/(35*c^2*d*(c + d*x^2)^(5/2)) - (3*C*(2*b*c - a
*d)*x^3*Sqrt[a + b*x^2])/(35*c*d^2*(c + d*x^2)^(5/2)) - ((8*b*c - 5*a*d)*D
*x^5*Sqrt[a + b*x^2])/(35*c*d^2*(c + d*x^2)^(5/2)) + (A*(2*b^2*c^2 + 5*a*b
*c*d - 8*a^2*d^2)*x*Sqrt[a + b*x^2])/(35*c^3*d*(b*c - a*d)*(c + d*x^2)^(3/
2)) + (B*(8*b^2*c^2 - a*b*c*d - 4*a^2*d^2)*x*Sqrt[a + b*x^2])/(105*c^2*d^2
*(b*c - a*d)*(c + d*x^2)^(3/2)) - (C*(8*b^2*c^2 - 5*a*b*c*d - 2*a^2*d^2)*x
*Sqrt[a + b*x^2])/(35*c*d^3*(b*c - a*d)*(c + d*x^2)^(3/2)) - (b*(16*b*c -
15*a*d)*D*x^3*Sqrt[a + b*x^2])/(35*d^3*(b*c - a*d)*(c + d*x^2)^(3/2)) - (2
*b*(32*b^2*c^2 - 58*a*b*c*d + 25*a^2*d^2)*D*x*Sqrt[a + b*x^2])/(35*d^4*(b*
c - a*d)^2*Sqrt[c + d*x^2]) + ((128*b^3*c^3 - 248*a*b^2*c^2*d + 123*a^2*b*
c*d^2 - 5*a^3*d^3)*D*x*Sqrt[a + b*x^2])/(35*c*d^4*(b*c - a*d)^2*Sqrt[c + d
*x^2]) + (2*A*(b*c - 2*a*d)*(b^2*c^2 + 4*a*b*c*d - 4*a^2*d^2)*Sqrt[a + b*x
^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(35*c^(7/2)*d
^(3/2)*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]
) + (2*C*(2*b*c - a*d)*(4*b^2*c^2 - 4*a*b*c*d - a^2*d^2)*Sqrt[a + b*x^2]*E
llipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(35*c^(3/2)*d^(...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 1673 vs. $2(767) = 1534$.

Time = 11.31 (sec) , antiderivative size = 1674, normalized size of antiderivative = 2.08

method	result	size
elliptic	Expression too large to display	1674
default	Expression too large to display	10184

input
```
int((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(9/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/7*(A*a*d^4-
A*b*c*d^3-B*a*c*d^3+B*b*c^2*d^2+C*a*c^2*d^2-C*b*c^3*d-D*a*c^3*d+D*b*c^4)/c
/d^8*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)^4+1/35*(6*A*a*d^4+2*A
*b*c*d^3+B*a*c*d^3-9*B*b*c^2*d^2-8*C*a*c^2*d^2+16*C*b*c^3*d+15*D*a*c^3*d-2
3*D*b*c^4)/c^2/d^7*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)^3+1/105
*(24*A*a^2*d^5-15*A*a*b*c*d^4-6*A*b^2*c^2*d^3+4*B*a^2*c*d^4+B*a*b*c^2*d^3-
8*B*b^2*c^3*d^2+3*C*a^2*c^2*d^3-57*C*a*b*c^3*d^2+57*C*b^2*c^4*d-45*D*a^2*c
^3*d^2+183*D*a*b*c^4*d-141*D*b^2*c^5)/d^6/(a*d-b*c)/c^3*x*(b*d*x^4+a*d*x^2
+b*c*x^2+a*c)^(1/2)/(x^2+c/d)^2+1/105*(b*d*x^2+a*d)/c^4/d^5/(a*d-b*c)^2*x*
(48*A*a^3*d^6-72*A*a^2*b*c*d^5+12*A*a*b^2*c^2*d^4+6*A*b^3*c^3*d^3+8*B*a^3*
c*d^5-5*B*a^2*b*c^2*d^4-5*B*a*b^2*c^3*d^3+8*B*b^3*c^4*d^2+6*C*a^3*c^2*d^4+
12*C*a^2*b*c^3*d^3-72*C*a*b^2*c^4*d^2+48*C*b^3*c^5*d+15*D*a^3*c^3*d^3-264*
D*a^2*b*c^4*d^2+534*D*a*b^2*c^5*d-279*D*b^3*c^6)/((x^2+c/d)*(b*d*x^2+a*d))
^(1/2)+(b*(C*b*d+2*D*a*d-4*D*b*c)/d^5+1/105*b*(24*A*a^2*d^5-15*A*a*b*c*d^4
-6*A*b^2*c^2*d^3+4*B*a^2*c*d^4+B*a*b*c^2*d^3-8*B*b^2*c^3*d^2+3*C*a^2*c^2*d
^3-57*C*a*b*c^3*d^2+57*C*b^2*c^4*d-45*D*a^2*c^3*d^2+183*D*a*b*c^4*d-141*D*
b^2*c^5)/d^5/(a*d-b*c)/c^3+1/105/d^5/(a*d-b*c)*(48*A*a^3*d^6-72*A*a^2*b*c*
d^5+12*A*a*b^2*c^2*d^4+6*A*b^3*c^3*d^3+8*B*a^3*c*d^5-5*B*a^2*b*c^2*d^4-5*B
*a*b^2*c^3*d^3+8*B*b^3*c^4*d^2+6*C*a^3*c^2*d^4+12*C*a^2*b*c^3*d^3-72*C*a*b
^2*c^4*d^2+48*C*b^3*c^5*d+15*D*a^3*c^3*d^3-264*D*a^2*b*c^4*d^2+534*D*a*...
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 2936 vs. $2(764) = 1528$.

Time = 0.23 (sec) , antiderivative size = 2936, normalized size of antiderivative = 3.64

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \text{Too large to display}$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(9/2),x, algorit
hm="fricas")
```

output
```
-1/105*(((384*D*b^3*c^7*d^4 - 48*A*a^3*c*d^10 - 24*(31*D*a*b^2 + 2*C*b^3)*
c^6*d^5 + (369*D*a^2*b + 72*C*a*b^2 - 8*B*b^3)*c^5*d^6 - (15*D*a^3 + 12*C*
a^2*b - 5*B*a*b^2 + 6*A*b^3)*c^4*d^7 - (6*C*a^3 - 5*B*a^2*b + 12*A*a*b^2)*
c^3*d^8 - 8*(B*a^3 - 9*A*a^2*b)*c^2*d^9)*x^9 + 4*(384*D*b^3*c^8*d^3 - 48*A
*a^3*c^2*d^9 - 24*(31*D*a*b^2 + 2*C*b^3)*c^7*d^4 + (369*D*a^2*b + 72*C*a*b
^2 - 8*B*b^3)*c^6*d^5 - (15*D*a^3 + 12*C*a^2*b - 5*B*a*b^2 + 6*A*b^3)*c^5*
d^6 - (6*C*a^3 - 5*B*a^2*b + 12*A*a*b^2)*c^4*d^7 - 8*(B*a^3 - 9*A*a^2*b)*c
^3*d^8)*x^7 + 6*(384*D*b^3*c^9*d^2 - 48*A*a^3*c^3*d^8 - 24*(31*D*a*b^2 + 2
*C*b^3)*c^8*d^3 + (369*D*a^2*b + 72*C*a*b^2 - 8*B*b^3)*c^7*d^4 - (15*D*a^3
 + 12*C*a^2*b - 5*B*a*b^2 + 6*A*b^3)*c^6*d^5 - (6*C*a^3 - 5*B*a^2*b + 12*A
*a*b^2)*c^5*d^6 - 8*(B*a^3 - 9*A*a^2*b)*c^4*d^7)*x^5 + 4*(384*D*b^3*c^10*d
 - 48*A*a^3*c^4*d^7 - 24*(31*D*a*b^2 + 2*C*b^3)*c^9*d^2 + (369*D*a^2*b + 7
2*C*a*b^2 - 8*B*b^3)*c^8*d^3 - (15*D*a^3 + 12*C*a^2*b - 5*B*a*b^2 + 6*A*b^
3)*c^7*d^4 - (6*C*a^3 - 5*B*a^2*b + 12*A*a*b^2)*c^6*d^5 - 8*(B*a^3 - 9*A*a
^2*b)*c^5*d^6)*x^3 + (384*D*b^3*c^11 - 48*A*a^3*c^5*d^6 - 24*(31*D*a*b^2 +
 2*C*b^3)*c^10*d + (369*D*a^2*b + 72*C*a*b^2 - 8*B*b^3)*c^9*d^2 - (15*D*a^
3 + 12*C*a^2*b - 5*B*a*b^2 + 6*A*b^3)*c^8*d^3 - (6*C*a^3 - 5*B*a^2*b + 12*
A*a*b^2)*c^7*d^4 - 8*(B*a^3 - 9*A*a^2*b)*c^6*d^5)*x)*sqrt(b*d)*sqrt(-c/d)*
elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((384*D*b^3*c^7*d^4 - 24*A*a
^3*d^11 - 24*(31*D*a*b^2 + 2*C*b^3)*c^6*d^5 + (369*D*a^2*b + 24*(3*C + ...
```

Sympy [F(-1)]

Timed out.

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \text{Timed out}$$

input
```
integrate((b*x**2+a)**(3/2)*(D*x**6+C*x**4+B*x**2+A)/(d*x**2+c)**(9/2),x)
```

output
```
Timed out
```

Maxima [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)(bx^2+a)^{\frac{3}{2}}}{(dx^2+c)^{\frac{9}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(9/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)/(d*x^2 + c)^(9/2),
 x)
```

Giac [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)(bx^2+a)^{\frac{3}{2}}}{(dx^2+c)^{\frac{9}{2}}}\,dx$$

input
```
integrate((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(9/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(b*x^2 + a)^(3/2)/(d*x^2 + c)^(9/2),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx=\int \frac{(b\,x^2+a)^{3/2}\,(A+B\,x^2+C\,x^4+x^6\,D)}{(d\,x^2+c)^{9/2}}\,dx$$

input
```
int(((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(9/2),x)
```

output
```
int(((a + b*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(c + d*x^2)^(9/2), x)
```

Reduce [F]

$$\int \frac{(a+bx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(c+dx^2)^{9/2}}\,dx = \text{too large to display}$$

input
```
int((b*x^2+a)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(d*x^2+c)^(9/2),x)
```

output
```
(9*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**3*c*d**2*x + 18*sqrt(c + d*x**2)*s
qrt(a + b*x**2)*a**3*d**3*x**3 - 9*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*
b**2*d**2*x - 63*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b*c**2*d*x - 132*s
qrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b*c*d**2*x**3 - 36*sqrt(c + d*x**2)*
sqrt(a + b*x**2)*a**2*b*d**3*x**5 - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*
b**3*c*d*x - 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**3*d**2*x**3 + 126*sq
rt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*c**3*x + 294*sqrt(c + d*x**2)*sqrt(
a + b*x**2)*a*b**2*c**2*d*x**3 + 138*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b
**2*c*d**2*x**5 + 18*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*d**3*x**7 +
2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*c*d*x**3 - 84*sqrt(c + d*x**2)*sq
rt(a + b*x**2)*b**3*c**3*x**3 - 42*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*
c**2*d*x**5 - 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c*d**2*x**7 + 216*i
nt((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(3*a**2*c**5*d + 15*a**2*c**4*
d**2*x**2 + 30*a**2*c**3*d**3*x**4 + 30*a**2*c**2*d**4*x**6 + 15*a**2*c*d*
*5*x**8 + 3*a**2*d**6*x**10 - a*b*c**6 - 2*a*b*c**5*d*x**2 + 5*a*b*c**4*d*
*2*x**4 + 20*a*b*c**3*d**3*x**6 + 25*a*b*c**2*d**4*x**8 + 14*a*b*c*d**5*x*
*10 + 3*a*b*d**6*x**12 - b**2*c**6*x**2 - 5*b**2*c**5*d*x**4 - 10*b**2*c**
4*d**2*x**6 - 10*b**2*c**3*d**3*x**8 - 5*b**2*c**2*d**4*x**10 - b**2*c*d**
5*x**12),x)*a**5*c**4*d**5 + 864*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x*
*4)/(3*a**2*c**5*d + 15*a**2*c**4*d**2*x**2 + 30*a**2*c**3*d**3*x**4 + ...
```

3.37 $\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 841

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \frac{(128a^4d^4D-8a^3bd^3(18Cd+23cD)+3a^2b^2d^2(72cCd+56\ldots}{\ldots}$$
$$-\frac{(64a^3d^3D-12a^2bd^2(6Cd+7cD)+3ab^2d(33cCd+28Bd^2+2c^2D)-b^3(9c^2Cd+126Bcd^2+105Ad^3-\ldots}{315b^4d^2}$$
$$+\frac{(48a^2d^2D-abd(54Cd+61cD)+3b^2(24cCd+21Bd^2+c^2D))\,x^3\sqrt{a+bx^2}\sqrt{c+dx^2}}{315b^3d}$$
$$+\frac{(9bCd+10bcD-8adD)x^5\sqrt{a+bx^2}\sqrt{c+dx^2}}{63b^2}+\frac{dDx^7\sqrt{a+bx^2}\sqrt{c+dx^2}}{9b}$$
$$-\frac{\sqrt{a}(128a^4d^4D-8a^3bd^3(18Cd+23cD)+3a^2b^2d^2(72cCd+56Bd^2+9c^2D)-ab^3d(36c^2Cd+273Bcd^2-\ldots}{315b^{9/2}d^3\sqrt{a+\ldots}}$$
$$+\frac{\sqrt{a}(315Ab^4cd^2+64a^4d^3D-12a^3bd^2(6Cd+7cD)+3a^2b^2d(33cCd+28Bd^2+2c^2D)-ab^3(9c^2Cd+12\ldots}{315b^{9/2}d^2\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
1/315*(128*a^4*d^4*D-8*a^3*b*d^3*(18*C*d+23*D*c)+3*a^2*b^2*d^2*(56*B*d^2+7
2*C*c*d+9*D*c^2)-a*b^3*d*(210*A*d^3+273*B*c*d^2+36*C*c^2*d-11*D*c^3)-b^4*c
*(-420*A*d^3-63*B*c*d^2+18*C*c^2*d-8*D*c^3))*x*(d*x^2+c)^(1/2)/b^4/d^3/(b*
x^2+a)^(1/2)-1/315*(64*a^3*d^3*D-12*a^2*b*d^2*(6*C*d+7*D*c)+3*a*b^2*d*(28*
B*d^2+33*C*c*d+2*D*c^2)-b^3*(105*A*d^3+126*B*c*d^2+9*C*c^2*d-4*D*c^3))*x*(
b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b^4/d^2+1/315*(48*a^2*d^2*D-a*b*d*(54*C*d+6
1*D*c)+3*b^2*(21*B*d^2+24*C*c*d+D*c^2))*x^3*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2
)/b^3/d+1/63*(9*C*b*d-8*D*a*d+10*D*b*c)*x^5*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2
)/b^2+1/9*d*D*x^7*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b-1/315*a^(1/2)*(128*a^4
*d^4*D-8*a^3*b*d^3*(18*C*d+23*D*c)+3*a^2*b^2*d^2*(56*B*d^2+72*C*c*d+9*D*c^
2)-a*b^3*d*(210*A*d^3+273*B*c*d^2+36*C*c^2*d-11*D*c^3)-b^4*c*(-420*A*d^3-6
3*B*c*d^2+18*C*c^2*d-8*D*c^3))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)
/(1+b*x^2/a)^(1/2),(1-a*d/b/c)^(1/2))/b^(9/2)/d^3/(b*x^2+a)^(1/2)/(a*(d*x^
2+c)/c/(b*x^2+a))^(1/2)+1/315*a^(1/2)*(315*A*b^4*c*d^2+64*a^4*d^3*D-12*a^3
*b*d^2*(6*C*d+7*D*c)+3*a^2*b^2*d*(28*B*d^2+33*C*c*d+2*D*c^2)-a*b^3*(105*A*
d^3+126*B*c*d^2+9*C*c^2*d-4*D*c^3))*(d*x^2+c)^(1/2)*InverseJacobiAM(arctan
(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/b^(9/2)/d^2/(b*x^2+a)^(1/2)/(a*(d*x
^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 9.60 (sec) , antiderivative size = 557, normalized size of antiderivative = 0.66

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)(c+dx^2)(-64a^3d^3D+12a^2bd^2(6Cd+7cD$$

input
```
Integrate[((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/Sqrt[a + b*x^2],
x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(c + d*x^2)*(-64*a^3*d^3*D + 12*a^2*b*d^2*(6*C*
d + 7*c*D + 4*d*D*x^2) - a*b^2*d*(6*c^2*D + c*d*(99*C + 61*D*x^2) + 2*d^2*
(42*B + 27*C*x^2 + 20*D*x^4)) + b^3*(-4*c^3*D + 3*c^2*d*(3*C + D*x^2) + 2*
c*d^2*(63*B + 36*C*x^2 + 25*D*x^4) + d^3*(105*A + 63*B*x^2 + 45*C*x^4 + 35
*D*x^6))) - I*c*(128*a^4*d^4*D - 8*a^3*b*d^3*(18*C*d + 23*c*D) + 3*a^2*b^2
*d^2*(72*c*C*d + 56*B*d^2 + 9*c^2*D) - a*b^3*d*(36*c^2*C*d + 273*B*c*d^2 +
 210*A*d^3 - 11*c^3*D) + b^4*c*(-18*c^2*C*d + 63*B*c*d^2 + 420*A*d^3 + 8*c
^3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/
a]*x], (a*d)/(b*c)] + I*c*(b*c - a*d)*(-64*a^3*d^3*D + 36*a^2*b*d^2*(2*C*d
 + c*D) - 3*a*b^2*d*(15*c*C*d + 28*B*d^2 - 5*c^2*D) + b^3*(-18*c^2*C*d + 6
3*B*c*d^2 + 105*A*d^3 + 8*c^3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*
EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)])/(315*b^4*Sqrt[b/a]*d^3*Sqr
t[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [A] (verified)

Time = 2.84 (sec) , antiderivative size = 1610, normalized size of antiderivative = 1.91, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 2009}

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

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A(c+dx^2)^{3/2}}{\sqrt{a+bx^2}}+\frac{Bx^2(c+dx^2)^{3/2}}{\sqrt{a+bx^2}}+\frac{Cx^4(c+dx^2)^{3/2}}{\sqrt{a+bx^2}}+\frac{Dx^6(c+dx^2)^{3/2}}{\sqrt{a+bx^2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{dD\sqrt{bx^2+a}\sqrt{dx^2+c}x^7}{9b}+\frac{Cd\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{7b}+\frac{2(5bc-4ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{63b^2}+\frac{Bd\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5b}+\frac{2C(4bc-3ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{35b^2}+\frac{(3b^2c^2-61abdc+48a^2d^2)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{315b^3d}+\frac{Ad\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3b}+\frac{2B(3bc-2ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15b^2}+\frac{C(b^2c^2-11abdc+8a^2d^2)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{35b^3d}-\frac{2(2b^3c^3+3ab^2dc^2-42a^2bd^2c+32a^3d^3)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{315b^4d^2}+\frac{2Ad(2bc-ad)\sqrt{bx^2+a}x}{3b^2\sqrt{dx^2+c}}-\frac{2C(bc-2ad)(b^2c^2+4abdc-4a^2d^2)\sqrt{bx^2+a}x}{35b^4d\sqrt{dx^2+c}}+\frac{B(3b^2c^2-13abdc+8a^2d^2)\sqrt{bx^2+a}x}{15b^3\sqrt{dx^2+c}}+\frac{(8b^4c^4+11ab^3dc^3+27a^2b^2d^2c^2-184a^3bd^3c+128a^4d^4)D\sqrt{bx^2+a}x}{315b^5d^2\sqrt{dx^2+c}}-\frac{2A\sqrt{c}\sqrt{d}(2bc-ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2\sqrt{c}C(bc-2ad)(b^2c^2+4abdc-4a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{35b^4d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{B\sqrt{c}(3b^2c^2-13abdc+8a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^3\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}(8b^4c^4+11ab^3dc^3+27a^2b^2d^2c^2-184a^3bd^3c+128a^4d^4)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{315b^5d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2Bc^{3/2}(3bc-2ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15b^2\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ac^{3/2}(3bc-ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3ab\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}C(b^2c^2-11abdc+8a^2d^2)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{35b^3d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2c^{3/2}(2b^3c^3+3ab^2dc^2-42a^2bd^2c+32a^3d^3)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{315b^4d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/Sqrt[a + b*x^2],x]
```

output
```
(2*A*d*(2*b*c - a*d)*x*Sqrt[a + b*x^2])/(3*b^2*Sqrt[c + d*x^2]) - (2*C*(b*
c - 2*a*d)*(b^2*c^2 + 4*a*b*c*d - 4*a^2*d^2)*x*Sqrt[a + b*x^2])/(35*b^4*d*
Sqrt[c + d*x^2]) + (B*(3*b^2*c^2 - 13*a*b*c*d + 8*a^2*d^2)*x*Sqrt[a + b*x^
2])/(15*b^3*Sqrt[c + d*x^2]) + ((8*b^4*c^4 + 11*a*b^3*c^3*d + 27*a^2*b^2*c
^2*d^2 - 184*a^3*b*c*d^3 + 128*a^4*d^4)*D*x*Sqrt[a + b*x^2])/(315*b^5*d^2*
Sqrt[c + d*x^2]) + (A*d*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*b) + (2*B*(3
*b*c - 2*a*d)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(15*b^2) + (C*(b^2*c^2 -
11*a*b*c*d + 8*a^2*d^2)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(35*b^3*d) - (2
*(2*b^3*c^3 + 3*a*b^2*c^2*d - 42*a^2*b*c*d^2 + 32*a^3*d^3)*D*x*Sqrt[a + b*
x^2]*Sqrt[c + d*x^2])/(315*b^4*d^2) + (B*d*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*
x^2])/(5*b) + (2*C*(4*b*c - 3*a*d)*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3
5*b^2) + ((3*b^2*c^2 - 61*a*b*c*d + 48*a^2*d^2)*D*x^3*Sqrt[a + b*x^2]*Sqrt
[c + d*x^2])/(315*b^3*d) + (C*d*x^5*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(7*b)
 + (2*(5*b*c - 4*a*d)*D*x^5*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(63*b^2) + (d
*D*x^7*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(9*b) - (2*A*Sqrt[c]*Sqrt[d]*(2*b*
c - a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/
(a*d)])/(3*b^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (2
*Sqrt[c]*C*(b*c - 2*a*d)*(b^2*c^2 + 4*a*b*c*d - 4*a^2*d^2)*Sqrt[a + b*x^2]
*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(35*b^4*d^(3/2)*
Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (B*Sqrt[c]*(3*...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 7.05 (sec) , antiderivative size = 1020, normalized size of antiderivative = 1.21

method	result	size
elliptic	Expression too large to display	1020
default	Expression too large to display	2704

input
```
int((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/9*D/b*d*x^7
*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/7*(d^2*C+2*c*d*D-1/9*D/b*d*(8*a*d+8
*b*c))/b/d*x^5*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/5*(B*d^2+2*C*c*d+D*c^
2-7/9*D/b*d*a*c-1/7*(d^2*C+2*c*d*D-1/9*D/b*d*(8*a*d+8*b*c))/b/d*(6*a*d+6*b
*c))/b/d*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(d^2*A+2*c*d*B+C*c^2-
5/7*(d^2*C+2*c*d*D-1/9*D/b*d*(8*a*d+8*b*c))/b/d*a*c-1/5*(B*d^2+2*C*c*d+D*c
^2-7/9*D/b*d*a*c-1/7*(d^2*C+2*c*d*D-1/9*D/b*d*(8*a*d+8*b*c))/b/d*(6*a*d+6*
b*c))/b/d*(4*a*d+4*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(A*c^2-
1/3*(d^2*A+2*c*d*B+C*c^2-5/7*(d^2*C+2*c*d*D-1/9*D/b*d*(8*a*d+8*b*c))/b/d*a
*c-1/5*(B*d^2+2*C*c*d+D*c^2-7/9*D/b*d*a*c-1/7*(d^2*C+2*c*d*D-1/9*D/b*d*(8*
a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/b/d*a*c)/(-b/a)^(1/2)*(1
+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*Elli
pticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(2*A*d*c+B*c^2-3/5*(B*d^2+2
*C*c*d+D*c^2-7/9*D/b*d*a*c-1/7*(d^2*C+2*c*d*D-1/9*D/b*d*(8*a*d+8*b*c))/b/d
*(6*a*d+6*b*c))/b/d*a*c-1/3*(d^2*A+2*c*d*B+C*c^2-5/7*(d^2*C+2*c*d*D-1/9*D/
b*d*(8*a*d+8*b*c))/b/d*a*c-1/5*(B*d^2+2*C*c*d+D*c^2-7/9*D/b*d*a*c-1/7*(d^2
*C+2*c*d*D-1/9*D/b*d*(8*a*d+8*b*c))/b/d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/
b/d*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d
*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/
c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 798, normalized size of antiderivative = 0.95

$$\int \frac{(c+dx^2)^{3/2}\,(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \text{Too large to display}$$

input
```
integrate((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorit
hm="fricas")
```

output
```
-1/315*((8*D*b^4*c^5 + (11*D*a*b^3 - 18*C*b^4)*c^4*d + 9*(3*D*a^2*b^2 - 4*
C*a*b^3 + 7*B*b^4)*c^3*d^2 - (184*D*a^3*b - 216*C*a^2*b^2 + 273*B*a*b^3 -
420*A*b^4)*c^2*d^3 + 2*(64*D*a^4 - 72*C*a^3*b + 84*B*a^2*b^2 - 105*A*a*b^3
)*c*d^4)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)
) - (8*D*b^4*c^5 + (11*D*a*b^3 - 18*C*b^4)*c^4*d + (27*D*a^2*b^2 - 4*(9*C
- D)*a*b^3 + 63*B*b^4)*c^3*d^2 - (184*D*a^3*b - 6*(36*C + D)*a^2*b^2 + 3*(
91*B + 3*C)*a*b^3 - 420*A*b^4)*c^2*d^3 + (128*D*a^4 - 12*(12*C + 7*D)*a^3*
b + 3*(56*B + 33*C)*a^2*b^2 - 42*(5*A + 3*B)*a*b^3 + 315*A*b^4)*c*d^4 + (6
4*D*a^4 - 72*C*a^3*b + 84*B*a^2*b^2 - 105*A*a*b^3)*d^5)*sqrt(b*d)*x*sqrt(-
c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (35*D*b^4*d^5*x^8 + 8*D
*b^4*c^4*d + 5*(10*D*b^4*c*d^4 - (8*D*a*b^3 - 9*C*b^4)*d^5)*x^6 + (11*D*a*
b^3 - 18*C*b^4)*c^3*d^2 + 9*(3*D*a^2*b^2 - 4*C*a*b^3 + 7*B*b^4)*c^2*d^3 -
(184*D*a^3*b - 216*C*a^2*b^2 + 273*B*a*b^3 - 420*A*b^4)*c*d^4 + 2*(64*D*a^
4 - 72*C*a^3*b + 84*B*a^2*b^2 - 105*A*a*b^3)*d^5 + (3*D*b^4*c^2*d^3 - (61*
D*a*b^3 - 72*C*b^4)*c*d^4 + 3*(16*D*a^2*b^2 - 18*C*a*b^3 + 21*B*b^4)*d^5)*
x^4 - (4*D*b^4*c^3*d^2 + 3*(2*D*a*b^3 - 3*C*b^4)*c^2*d^3 - 3*(28*D*a^2*b^2
 - 33*C*a*b^3 + 42*B*b^4)*c*d^4 + (64*D*a^3*b - 72*C*a^2*b^2 + 84*B*a*b^3
- 105*A*b^4)*d^5)*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/(b^5*d^4*x)
```

Sympy [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \int \frac{(c+dx^2)^{\frac{3}{2}}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx$$

input
```
integrate((d*x**2+c)**(3/2)*(D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(1/2),x)
```

output
```
Integral((c + d*x**2)**(3/2)*(A + B*x**2 + C*x**4 + D*x**6)/sqrt(a + b*x**
2), x)
```

Maxima [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)(dx^2+c)^{\frac{3}{2}}}{\sqrt{bx^2+a}}\,dx$$

input
```
integrate((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(d*x^2 + c)^(3/2)/sqrt(b*x^2 + a), x
)
```

Giac [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)(dx^2+c)^{\frac{3}{2}}}{\sqrt{bx^2+a}}\,dx$$

input
```
integrate((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(d*x^2 + c)^(3/2)/sqrt(b*x^2 + a), x
)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \int \frac{(d\,x^2+c)^{3/2}\,(A+B\,x^2+C\,x^4+x^6\,D)}{\sqrt{b\,x^2+a}}\,dx$$

input
```
int(((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(1/2),x)
```

output
```
int(((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(1/2), x)
```

Reduce [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \text{Too large to display}$$

input
```
int((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x)
```

output
```
( - 64*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**3*d**3*x + 156*sqrt(c + d*x**2
)*sqrt(a + b*x**2)*a**2*b*c*d**2*x + 48*sqrt(c + d*x**2)*sqrt(a + b*x**2)*
a**2*b*d**3*x**3 + 21*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**3*d**2*x - 10
5*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*c**2*d*x - 115*sqrt(c + d*x**2)
*sqrt(a + b*x**2)*a*b**2*c*d**2*x**3 - 40*sqrt(c + d*x**2)*sqrt(a + b*x**2
)*a*b**2*d**3*x**5 + 126*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*c*d*x + 63
*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*d**2*x**3 + 5*sqrt(c + d*x**2)*sqr
t(a + b*x**2)*b**3*c**3*x + 75*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c**2
*d*x**3 + 95*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c*d**2*x**5 + 35*sqrt(
c + d*x**2)*sqrt(a + b*x**2)*b**3*d**3*x**7 + 128*int((sqrt(c + d*x**2)*sq
rt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**4*d**4 -
 328*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x*
*2 + b*d*x**4),x)*a**3*b*c*d**3 - 42*int((sqrt(c + d*x**2)*sqrt(a + b*x**2
)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2*b**3*d**3 + 243*int
((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d
*x**4),x)*a**2*b**2*c**2*d**2 + 147*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)
*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**4*c*d**2 - 25*int((s
qrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x*
*4),x)*a*b**3*c**3*d + 63*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*
c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*b**5*c**2*d - 10*int((sqrt(c + d...
```

3.38 $\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 600

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx =$$
$$-\frac{(48a^3d^3D-8a^2bd^2(7Cd+2cD)+ab^2d(21cCd+70Bd^2-9c^2D)+b^3(14c^2Cd-35Bcd^2-105Ad^3-}{105b^3d^3\sqrt{a+bx^2}}$$
$$+\frac{(24a^2d^2D-abd(28Cd+5cD)+b^2(7cCd+35Bd^2-4c^2D))\,x\sqrt{a+bx^2}\sqrt{c+dx^2}}{105b^3d^2}$$
$$+\frac{(7bCd+bcD-6adD)x^3\sqrt{a+bx^2}\sqrt{c+dx^2}}{35b^2d}+\frac{Dx^5\sqrt{a+bx^2}\sqrt{c+dx^2}}{7b}$$
$$+\frac{\sqrt{a}(48a^3d^3D-8a^2bd^2(7Cd+2cD)+ab^2d(21cCd+70Bd^2-9c^2D)+b^3(14c^2Cd-35Bcd^2-105Ac}{105b^{7/2}d^3\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$
$$+\frac{\sqrt{a}(105Ab^3d^2-24a^3d^2D+a^2bd(28Cd+5cD)-ab^2(7cCd+35Bd^2-4c^2D))\sqrt{c+dx^2}\,\text{EllipticF}\left(a\right.}{105b^{7/2}d^2\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
-1/105*(48*a^3*d^3*D-8*a^2*b*d^2*(7*C*d+2*D*c)+a*b^2*d*(70*B*d^2+21*C*c*d-
9*D*c^2)+b^3*(-105*A*d^3-35*B*c*d^2+14*C*c^2*d-8*D*c^3))*x*(d*x^2+c)^(1/2)
/b^3/d^3/(b*x^2+a)^(1/2)+1/105*(24*a^2*d^2*D-a*b*d*(28*C*d+5*D*c)+b^2*(35*
B*d^2+7*C*c*d-4*D*c^2))*x*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b^3/d^2+1/35*(7*
C*b*d-6*D*a*d+D*b*c)*x^3*(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b^2/d+1/7*D*x^5*(
b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b+1/105*a^(1/2)*(48*a^3*d^3*D-8*a^2*b*d^2*(
7*C*d+2*D*c)+a*b^2*d*(70*B*d^2+21*C*c*d-9*D*c^2)+b^3*(-105*A*d^3-35*B*c*d^
2+14*C*c^2*d-8*D*c^3))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^
2/a)^(1/2),(1-a*d/b/c)^(1/2))/b^(7/2)/d^3/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(
b*x^2+a))^(1/2)+1/105*a^(1/2)*(105*A*b^3*d^2-24*a^3*d^2*D+a^2*b*d*(28*C*d+
5*D*c)-a*b^2*(35*B*d^2+7*C*c*d-4*D*c^2))*(d*x^2+c)^(1/2)*InverseJacobiAM(a
rctan(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/b^(7/2)/d^2/(b*x^2+a)^(1/2)/(a
*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 4.66 (sec) , antiderivative size = 398, normalized size of antiderivative = 0.66

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx$$
$$= \frac{\sqrt{\frac{b}{a}}dx(a+bx^2)\,(c+dx^2)\,(24a^2d^2D-abd(28Cd+5cD+18dDx^2)+b^2(-4c^2D+cd(7C+3Dx^2)+d^2}{}$$

input
```
Integrate[(Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/Sqrt[a + b*x^2],x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(c + d*x^2)*(24*a^2*d^2*D - a*b*d*(28*C*d + 5*c
*D + 18*d*D*x^2) + b^2*(-4*c^2*D + c*d*(7*C + 3*D*x^2) + d^2*(35*B + 21*C*
x^2 + 15*D*x^4))) + I*c*(48*a^3*d^3*D - 8*a^2*b*d^2*(7*C*d + 2*c*D) + a*b^
2*d*(21*c*C*d + 70*B*d^2 - 9*c^2*D) - b^3*(-14*c^2*C*d + 35*B*c*d^2 + 105*
A*d^3 + 8*c^3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcS
inh[Sqrt[b/a]*x], (a*d)/(b*c)] - I*c*(-(b*c) + a*d)*(24*a^2*d^2*D + a*b*d*
(-28*C*d + 13*c*D) + b^2*(-14*c*C*d + 35*B*d^2 + 8*c^2*D))*Sqrt[1 + (b*x^2
)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)])/(
105*b^3*Sqrt[b/a]*d^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1259 vs. $2(600) = 1200$.

Time = 2.01 (sec) , antiderivative size = 1259, normalized size of antiderivative = 2.10, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{\sqrt{c+dx^2}\,(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx$$

$$\Big\downarrow \; 7293$$

$$\int \left(\frac{A\sqrt{c+dx^2}}{\sqrt{a+bx^2}}+\frac{Bx^2\sqrt{c+dx^2}}{\sqrt{a+bx^2}}+\frac{Cx^4\sqrt{c+dx^2}}{\sqrt{a+bx^2}}+\frac{Dx^6\sqrt{c+dx^2}}{\sqrt{a+bx^2}}\right)dx$$

$$\Big\downarrow \; 2009$$

$$\frac{D\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{7b}+\frac{C\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5b}+\frac{(bc-6ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{35b^2d}+\frac{B\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3b}+\frac{C(bc-4ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15b^2d}-\frac{(4b^2c^2+5abdc-24a^2d^2)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{105b^3d^2}+\frac{Ad\sqrt{bx^2+a}x}{b\sqrt{dx^2+c}}+\frac{B(bc-2ad)\sqrt{bx^2+a}x}{3b^2\sqrt{dx^2+c}}-\frac{C(2b^2c^2+3abdc-8a^2d^2)\sqrt{bx^2+a}x}{15b^3d\sqrt{dx^2+c}}+\frac{(8b^3c^3+9ab^2dc^2+16a^2bd^2c-48a^3d^3)D\sqrt{bx^2+a}x}{105b^4d^2\sqrt{dx^2+c}}-\frac{B\sqrt{c}(bc-2ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^2\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}C(2b^2c^2+3abdc-8a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^3d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}(8b^3c^3+9ab^2dc^2+16a^2bd^2c-48a^3d^3)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{105b^4d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{A\sqrt{c}\sqrt{d}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}C(bc-4ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15b^2d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}(4b^2c^2+5abdc-24a^2d^2)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{105b^3d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ac^{3/2}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Bc^{3/2}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3b\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/Sqrt[a + b*x^2],x]
```

output
```
(A*d*x*Sqrt[a + b*x^2])/(b*Sqrt[c + d*x^2]) + (B*(b*c - 2*a*d)*x*Sqrt[a +
b*x^2])/(3*b^2*Sqrt[c + d*x^2]) - (C*(2*b^2*c^2 + 3*a*b*c*d - 8*a^2*d^2)*x
*Sqrt[a + b*x^2])/(15*b^3*d*Sqrt[c + d*x^2]) + ((8*b^3*c^3 + 9*a*b^2*c^2*d
 + 16*a^2*b*c*d^2 - 48*a^3*d^3)*D*x*Sqrt[a + b*x^2])/(105*b^4*d^2*Sqrt[c +
 d*x^2]) + (B*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*b) + (C*(b*c - 4*a*d)*
x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(15*b^2*d) - ((4*b^2*c^2 + 5*a*b*c*d -
24*a^2*d^2)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(105*b^3*d^2) + (C*x^3*Sq
rt[a + b*x^2]*Sqrt[c + d*x^2])/(5*b) + ((b*c - 6*a*d)*D*x^3*Sqrt[a + b*x^2
]*Sqrt[c + d*x^2])/(35*b^2*d) + (D*x^5*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(7
*b) - (A*Sqrt[c]*Sqrt[d]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt
[c]], 1 - (b*c)/(a*d)])/(b*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c +
d*x^2]) - (B*Sqrt[c]*(b*c - 2*a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[
d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^2*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(
c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c]*C*(2*b^2*c^2 + 3*a*b*c*d - 8*a^2*
d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d
)])/(15*b^3*d^(3/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2])
 - (Sqrt[c]*(8*b^3*c^3 + 9*a*b^2*c^2*d + 16*a^2*b*c*d^2 - 48*a^3*d^3)*D*Sq
rt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(10
5*b^4*d^(5/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*
c^(3/2)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 6.96 (sec) , antiderivative size = 602, normalized size of antiderivative = 1.00

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(\frac{D x^5\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{7b}+\frac{\left(Cd+Dc-\frac{D(6ad+6bc)}{7b}\right)x^3\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{5bd}+\frac{\left(Bd+Cc-\frac{5Dac}{7b}-\frac{\left(Cd+Dc-\frac{D}{\cdots}\right)}{\cdots}\right.}{\cdots}\right.}{\cdots}$
default	Expression too large to display

input
```
int((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/7*D/b*x^5*(
b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/5*(C*d+D*c-1/7*D/b*(6*a*d+6*b*c))/b/d
*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(B*d+C*c-5/7*D/b*a*c-1/5*(C*d
+D*c-1/7*D/b*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*
x^2+a*c)^(1/2)+(A*c-1/3*(B*d+C*c-5/7*D/b*a*c-1/5*(C*d+D*c-1/7*D/b*(6*a*d+6
*b*c))/b/d*(4*a*d+4*b*c))/b/d*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2
/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1
+(a*d+b*c)/c/b)^(1/2))-(A*d+B*c-3/5*(C*d+D*c-1/7*D/b*(6*a*d+6*b*c))/b/d*a*
c-1/3*(B*d+C*c-5/7*D/b*a*c-1/5*(C*d+D*c-1/7*D/b*(6*a*d+6*b*c))/b/d*(4*a*d+
4*b*c))/b/d*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1
/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a
*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 536, normalized size of antiderivative = 0.89

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx =$$

$$-\frac{(8\,Db^3c^4+(9\,Dab^2-14\,Cb^3)c^3d+(16\,Da^2b-21\,Cab^2+35\,Bb^3)c^2d^2-(48\,Da^3-56\,Ca^2b+70\,Bab}{}$$

input
```
integrate((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorit
hm="fricas")
```

output
```
-1/105*((8*D*b^3*c^4 + (9*D*a*b^2 - 14*C*b^3)*c^3*d + (16*D*a^2*b - 21*C*a
*b^2 + 35*B*b^3)*c^2*d^2 - (48*D*a^3 - 56*C*a^2*b + 70*B*a*b^2 - 105*A*b^3
)*c*d^3)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)
) - (8*D*b^3*c^4 + (9*D*a*b^2 - 14*C*b^3)*c^3*d + (16*D*a^2*b - (21*C - 4*
D)*a*b^2 + 35*B*b^3)*c^2*d^2 - (48*D*a^3 - (56*C + 5*D)*a^2*b + 7*(10*B +
C)*a*b^2 - 105*A*b^3)*c*d^3 - (24*D*a^3 - 28*C*a^2*b + 35*B*a*b^2 - 105*A*
b^3)*d^4)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c
)) - (15*D*b^3*d^4*x^6 + 8*D*b^3*c^3*d + (9*D*a*b^2 - 14*C*b^3)*c^2*d^2 +
(16*D*a^2*b - 21*C*a*b^2 + 35*B*b^3)*c*d^3 - (48*D*a^3 - 56*C*a^2*b + 70*B
*a*b^2 - 105*A*b^3)*d^4 + 3*(D*b^3*c*d^3 - (6*D*a*b^2 - 7*C*b^3)*d^4)*x^4
- (4*D*b^3*c^2*d^2 + (5*D*a*b^2 - 7*C*b^3)*c*d^3 - (24*D*a^2*b - 28*C*a*b^
2 + 35*B*b^3)*d^4)*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/(b^4*d^4*x)
```

Sympy [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx$$

input
```
integrate((d*x**2+c)**(1/2)*(D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(1/2),x)
```

output
```
Integral(sqrt(c + d*x**2)*(A + B*x**2 + C*x**4 + D*x**6)/sqrt(a + b*x**2),
 x)
```

Maxima [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{dx^2+c}}{\sqrt{bx^2+a}}\,dx$$

input
```
integrate((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(d*x^2 + c)/sqrt(b*x^2 + a), x)
```

Giac [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{dx^2+c}}{\sqrt{bx^2+a}}\,dx$$

input
```
integrate((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(d*x^2 + c)/sqrt(b*x^2 + a), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx = \int \frac{\sqrt{d\,x^2+c}\,(A+B\,x^2+C\,x^4+x^6\,D)}{\sqrt{b\,x^2+a}}\,dx$$

input
```
int(((c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(1/2),x)
```

output
```
int(((c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(1/2), x)
```

Reduce [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{\sqrt{a+bx^2}}\,dx$$
$$= \frac{24\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,a^2d^2x-33\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,abcdx-18\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,ab\,d^2x^3+35\sqrt{d\,x}}{}$$

input
```
int((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2),x)
```

output
```
(24*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*d**2*x - 33*sqrt(c + d*x**2)*sq
rt(a + b*x**2)*a*b*c*d*x - 18*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*d**2*x
**3 + 35*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*d*x + 3*sqrt(c + d*x**2)*s
qrt(a + b*x**2)*b**2*c**2*x + 24*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*c*
d*x**3 + 15*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*d**2*x**5 - 48*int((sqr
t(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4
),x)*a**3*d**3 + 72*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*
d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2*b*c*d**2 + 35*int((sqrt(c + d*x**2)*
sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**3*d*
*2 - 12*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c
*x**2 + b*d*x**4),x)*a*b**2*c**2*d + 35*int((sqrt(c + d*x**2)*sqrt(a + b*x
**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*b**4*c*d - 6*int((sqr
t(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4
),x)*b**3*c**3 - 24*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x**
2 + b*c*x**2 + b*d*x**4),x)*a**3*c*d**2 + 33*int((sqrt(c + d*x**2)*sqrt(a
+ b*x**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a**2*b*c**2*d + 70*in
t((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**
4),x)*a*b**3*c*d - 3*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x*
*2 + b*c*x**2 + b*d*x**4),x)*a*b**2*c**3)/(105*b**3*d)
```

3.39 $\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 428

$$\begin{aligned}\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx &= \frac{(8a^2d^2D-abd(10Cd-7cD)-b^2(10cCd-15Bd^2-8c^2D))\,x\sqrt{c+dx^2}}{15b^2d^3\sqrt{a+bx^2}} \\ &+ \frac{(5bCd-4bcD-4adD)x\sqrt{a+bx^2}\sqrt{c+dx^2}}{15b^2d^2}+\frac{Dx^3\sqrt{a+bx^2}\sqrt{c+dx^2}}{5bd} \\ &- \frac{\sqrt{a}(8a^2d^2D-abd(10Cd-7cD)-b^2(10cCd-15Bd^2-8c^2D))\,\sqrt{c+dx^2}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{15b^{5/2}d^3\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}} \\ &+ \frac{\sqrt{a}(15Ab^2d^2+4a^2cdD-abc(5Cd-4cD))\,\sqrt{c+dx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right),1-\frac{ad}{bc}\right)}{15b^{5/2}cd^2\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}\end{aligned}$$

output
```
1/15*(8*a^2*d^2*D-a*b*d*(10*C*d-7*D*c)-b^2*(-15*B*d^2+10*C*c*d-8*D*c^2))*x
*(d*x^2+c)^(1/2)/b^2/d^3/(b*x^2+a)^(1/2)+1/15*(5*C*b*d-4*D*a*d-4*D*b*c)*x*
(b*x^2+a)^(1/2)*(d*x^2+c)^(1/2)/b^2/d^2+1/5*D*x^3*(b*x^2+a)^(1/2)*(d*x^2+c
)^(1/2)/b/d-1/15*a^(1/2)*(8*a^2*d^2*D-a*b*d*(10*C*d-7*D*c)-b^2*(-15*B*d^2+
10*C*c*d-8*D*c^2))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)
^(1/2),(1-a*d/b/c)^(1/2))/b^(5/2)/d^3/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^
2+a))^(1/2)+1/15*a^(1/2)*(15*A*b^2*d^2+4*a^2*c*d*D-a*b*c*(5*C*d-4*D*c))*(d
*x^2+c)^(1/2)*InverseJacobiAM(arctan(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))
/b^(5/2)/c/d^2/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 6.36 (sec) , antiderivative size = 311, normalized size of antiderivative = 0.73

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx$$
$$= \frac{-\sqrt{\frac{b}{a}}dx(a+bx^2)\left(c+dx^2\right)\left(4adD+b(-5Cd+4cD-3dDx^2)\right)-ic(8a^2d^2D+abd(-10Cd+7cD)+b}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/(Sqrt[a + b*x^2]*Sqrt[c + d*x^2]),x]
```

output
```
(-(Sqrt[b/a]*d*x*(a + b*x^2)*(c + d*x^2)*(4*a*d*D + b*(-5*C*d + 4*c*D - 3*
d*D*x^2))) - I*c*(8*a^2*d^2*D + a*b*d*(-10*C*d + 7*c*D) + b^2*(-10*c*C*d +
 15*B*d^2 + 8*c^2*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*
ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] + I*(4*a^2*c*d^2*D + a*b*c*d*(-5*C*d +
3*c*D) + b^2*(-10*c^2*C*d + 15*B*c*d^2 - 15*A*d^3 + 8*c^3*D))*Sqrt[1 + (b*
x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]
)/(15*a^2*(b/a)^(5/2)*d^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [A] (verified)

Time = 1.40 (sec) , antiderivative size = 816, normalized size of antiderivative = 1.91, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.050, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A}{\sqrt{a+bx^2}\sqrt{c+dx^2}}+\frac{Bx^2}{\sqrt{a+bx^2}\sqrt{c+dx^2}}+\frac{Cx^4}{\sqrt{a+bx^2}\sqrt{c+dx^2}}+\frac{Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5bd}-\frac{4(bc+ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15b^2d^2}+\frac{C\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3bd}+\frac{B\sqrt{bx^2+a}x}{b\sqrt{dx^2+c}}-\frac{2C(bc+ad)\sqrt{bx^2+a}x}{3b^2d\sqrt{dx^2+c}}+\frac{(8b^2c^2+7abdc+8a^2d^2)D\sqrt{bx^2+a}x}{15b^3d^2\sqrt{dx^2+c}}+\frac{2\sqrt{c}C(bc+ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^2d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}(8b^2c^2+7abdc+8a^2d^2)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^3d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{B\sqrt{c}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{4c^{3/2}(bc+ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15b^2d^{5/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\sqrt{c}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}C\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3bd^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/(Sqrt[a + b*x^2]*Sqrt[c + d*x^2]),x]
```

output
```
(B*x*Sqrt[a + b*x^2])/(b*Sqrt[c + d*x^2]) - (2*C*(b*c + a*d)*x*Sqrt[a + b*
x^2])/(3*b^2*d*Sqrt[c + d*x^2]) + ((8*b^2*c^2 + 7*a*b*c*d + 8*a^2*d^2)*D*x
*Sqrt[a + b*x^2])/(15*b^3*d^2*Sqrt[c + d*x^2]) + (C*x*Sqrt[a + b*x^2]*Sqrt
[c + d*x^2])/(3*b*d) - (4*(b*c + a*d)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
/(15*b^2*d^2) + (D*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(5*b*d) - (B*Sqrt[
c]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)]
)/(b*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (2*S
qrt[c]*C*(b*c + a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]]
, 1 - (b*c)/(a*d)])/(3*b^2*d^(3/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*S
qrt[c + d*x^2]) - (Sqrt[c]*(8*b^2*c^2 + 7*a*b*c*d + 8*a^2*d^2)*D*Sqrt[a +
b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*b^3*d^
(5/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (c^(3/2)*C*
Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(
3*b*d^(3/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*Sq
rt[c]*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*
d)])/(a*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (
4*c^(3/2)*(b*c + a*d)*D*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[
c]], 1 - (b*c)/(a*d)])/(15*b^2*d^(5/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2)
)]*Sqrt[c + d*x^2])
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 6.51 (sec) , antiderivative size = 418, normalized size of antiderivative = 0.98

method	result
elliptic	$\frac{\sqrt{(b x^2+a)(x^2 d+c)}\left(\frac{D x^3\sqrt{b d x^4+a d x^2+x^2 b c+a c}}{5 b d}+\frac{\left(C-\frac{D(4ad+4bc)}{5bd}\right)x\sqrt{b d x^4+a d x^2+x^2 b c+a c}}{3bd}+\frac{\left(A-\frac{\left(C-\frac{D(4ad+4bc)}{5bd}\right)ac}{3bd}\right)\sqrt{1+\frac{b x^2}{a}}}{\sqrt{-\frac{b}{a}}\sqrt{b d x^4}}\right.}{}$
default	Expression too large to display

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/5*D/b/d*x^3
*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(C-1/5*D/b/d*(4*a*d+4*b*c))/b/d*x
*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(A-1/3*(C-1/5*D/b/d*(4*a*d+4*b*c))/b/
d*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b
*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(B-3/
5*D/b/d*a*c-1/3*(C-1/5*D/b/d*(4*a*d+4*b*c))/b/d*(2*a*d+2*b*c))*c/(-b/a)^(1
/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2
)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)
^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.09 (sec) , antiderivative size = 349, normalized size of antiderivative = 0.82

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx = -\frac{(8\,Db^2c^4+(7\,Dab-10\,Cb^2)c^3d+(8\,Da^2-10\,Cab+15\,Bb^2)c^2d^2)\sqrt{bd}x\sqrt{-\frac{c}{d}}E(\arcsin\left(\frac{\sqrt{-\frac{c}{d}}}{x}\right)\mid\frac{ad}{bc})}{}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2),x, algorit
hm="fricas")
```

output
```
-1/15*((8*D*b^2*c^4 + (7*D*a*b - 10*C*b^2)*c^3*d + (8*D*a^2 - 10*C*a*b + 1
5*B*b^2)*c^2*d^2)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x),
a*d/(b*c)) - (8*D*b^2*c^4 + 15*A*b^2*d^4 + (7*D*a*b - 10*C*b^2)*c^3*d + (8
*D*a^2 - 2*(5*C - 2*D)*a*b + 15*B*b^2)*c^2*d^2 + (4*D*a^2 - 5*C*a*b)*c*d^3
)*sqrt(b*d)*x*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (3*
D*b^2*c*d^3*x^4 + 8*D*b^2*c^3*d + (7*D*a*b - 10*C*b^2)*c^2*d^2 + (8*D*a^2
- 10*C*a*b + 15*B*b^2)*c*d^3 - (4*D*b^2*c^2*d^2 + (4*D*a*b - 5*C*b^2)*c*d^
3)*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/(b^3*c*d^4*x)
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx=\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(1/2)/(d*x**2+c)**(1/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4 + D*x**6)/(sqrt(a + b*x**2)*sqrt(c + d*x**2)
), x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{\sqrt{bx^2+a}\sqrt{dx^2+c}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*sqrt(d*x^2 + c)), x
)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{\sqrt{bx^2+a}\sqrt{dx^2+c}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*sqrt(d*x^2 + c)), x
)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx=\int \frac{A+B\,x^2+C\,x^4+x^6\,D}{\sqrt{b\,x^2+a}\,\sqrt{d\,x^2+c}}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(1/2)*(c + d*x^2)^(1/2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(1/2)*(c + d*x^2)^(1/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\sqrt{c+dx^2}}\,dx$$
$$=\frac{-4\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,adx+\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,bcx+3\sqrt{d\,x^2+c}\,\sqrt{b\,x^2+a}\,bd\,x^3+8\left(\int \frac{\sqrt{d\,x^2+c}\,\sqrt{b\,x^2 \cdots}}{bd\,x^4+ad\,x^2+bc \cdots}\right. \cdots}{\cdots}$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2),x)
```

output
```
( - 4*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*d*x + sqrt(c + d*x**2)*sqrt(a +
b*x**2)*b*c*x + 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b*d*x**3 + 8*int((sqrt
(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4)
,x)*a**2*d**2 - 3*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*
x**2 + b*c*x**2 + b*d*x**4),x)*a*b*c*d + 15*int((sqrt(c + d*x**2)*sqrt(a +
 b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*b**3*d - 2*int((s
qrt(c + d*x**2)*sqrt(a + b*x**2)*x**2)/(a*c + a*d*x**2 + b*c*x**2 + b*d*x*
*4),x)*b**2*c**2 + 4*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x*
*2 + b*c*x**2 + b*d*x**4),x)*a**2*c*d + 15*int((sqrt(c + d*x**2)*sqrt(a +
b*x**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b**2*d - int((sqrt(c
+ d*x**2)*sqrt(a + b*x**2))/(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4),x)*a*b*
c**2)/(15*b**2*d)
```

3.40 $\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\left(c+dx^2\right)^{3/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 383

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \frac{(3bCd-4bcD-2adD)x\sqrt{a+bx^2}}{3b^2d^2\sqrt{c+dx^2}} + \frac{Dx^3\sqrt{a+bx^2}}{3bd\sqrt{c+dx^2}} - \frac{(2a^2cd^2D-3abcd(Cd-cD)+b^2(6c^2Cd-3Bcd^2+3Ad^3-8c^3D))\sqrt{a+bx^2}\,E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^2\sqrt{c}d^{5/2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}} + \frac{\sqrt{c}(3Ab^2d^2+a^2cdD+ab(3cCd-3Bd^2-4c^2D))\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3abd^{5/2}(bc-ad)\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
1/3*(3*C*b*d-2*D*a*d-4*D*b*c)*x*(b*x^2+a)^(1/2)/b^2/d^2/(d*x^2+c)^(1/2)+1/
3*D*x^3*(b*x^2+a)^(1/2)/b/d/(d*x^2+c)^(1/2)-1/3*(2*a^2*c*d^2*D-3*a*b*c*d*(
C*d-D*c)+b^2*(3*A*d^3-3*B*c*d^2+6*C*c^2*d-8*D*c^3))*(b*x^2+a)^(1/2)*Ellipt
icE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/b^2/c^(1/2)/d^(
5/2)/(-a*d+b*c)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)+1/3*c^(1/2
)*(3*A*b^2*d^2+a^2*c*d*D+a*b*(-3*B*d^2+3*C*c*d-4*D*c^2))*(b*x^2+a)^(1/2)*I
nverseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/a/b/d^(5/2)/(-
a*d+b*c)/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 8.96 (sec) , antiderivative size = 334, normalized size of antiderivative = 0.87

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \frac{-\sqrt{\frac{b}{a}}dx(a+bx^2)\,(acdD(c+dx^2)-b(3Bcd^2-3Ad^3+4c^3D+c^2(-3Cd$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/(Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)),
x]
```

output
```
(-(Sqrt[b/a]*d*x*(a + b*x^2)*(a*c*d*D*(c + d*x^2) - b*(3*B*c*d^2 - 3*A*d^3
 + 4*c^3*D + c^2*(-3*C*d + d*D*x^2)))) - I*c*(2*a^2*c*d^2*D + 3*a*b*c*d*(-
(C*d) + c*D) + b^2*(6*c^2*C*d - 3*B*c*d^2 + 3*A*d^3 - 8*c^3*D))*Sqrt[1 + (
b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c
)] + I*c*(-(b*c) + a*d)*(a*c*d*D + b*(-6*c*C*d + 3*B*d^2 + 8*c^2*D))*Sqrt[
1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)
/(b*c)])/(3*b*Sqrt[b/a]*c*d^3*(b*c - a*d)*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1076 vs. 2(383) = 766.

Time = 1.77 (sec) , antiderivative size = 1076, normalized size of antiderivative = 2.81, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}dx$$

$$\Big\downarrow \text{ 7293}$$

$$\int \left(\frac{A}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}+\frac{Bx^2}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}+\frac{Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}+\frac{Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{cD\sqrt{bx^2+a}x^3}{d(bc-ad)\sqrt{dx^2+c}}+\frac{(4bc-ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3bd^2(bc-ad)}+\frac{C(2bc-ad)\sqrt{bx^2+a}x}{bd(bc-ad)\sqrt{dx^2+c}}-\frac{(8b^2c^2-3abdc-2a^2d^2)\,D\sqrt{bx^2+a}x}{3b^2d^2(bc-ad)\sqrt{dx^2+c}}-\frac{cC\sqrt{bx^2+a}x}{d(bc-ad)\sqrt{dx^2+c}}-\frac{\sqrt{c}C(2bc-ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{bd^{3/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}(8b^2c^2-3abdc-2a^2d^2)\,D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^2d^{5/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{A\sqrt{d}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{\sqrt{c}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{B\sqrt{c}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}(4bc-ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3bd^{5/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ab\sqrt{c}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{B\sqrt{c}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}C\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{d^{3/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/(Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)),x]
```

output
```
-((c*C*x*Sqrt[a + b*x^2])/(d*(b*c - a*d)*Sqrt[c + d*x^2])) + (C*(2*b*c - a
*d)*x*Sqrt[a + b*x^2])/(b*d*(b*c - a*d)*Sqrt[c + d*x^2]) - ((8*b^2*c^2 - 3
*a*b*c*d - 2*a^2*d^2)*D*x*Sqrt[a + b*x^2])/(3*b^2*d^2*(b*c - a*d)*Sqrt[c +
 d*x^2]) - (c*D*x^3*Sqrt[a + b*x^2])/(d*(b*c - a*d)*Sqrt[c + d*x^2]) + ((4
*b*c - a*d)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*b*d^2*(b*c - a*d)) + (
B*Sqrt[c]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)
/(a*d)])/(Sqrt[d]*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c
 + d*x^2]) - (A*Sqrt[d]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[
c]], 1 - (b*c)/(a*d)])/(Sqrt[c]*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d
*x^2))]*Sqrt[c + d*x^2]) - (Sqrt[c]*C*(2*b*c - a*d)*Sqrt[a + b*x^2]*Ellipt
icE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(b*d^(3/2)*(b*c - a*d)*
Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c]*(8*b^2*c
^2 - 3*a*b*c*d - 2*a^2*d^2)*D*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)
/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^2*d^(5/2)*(b*c - a*d)*Sqrt[(c*(a + b*x^2
))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (c^(3/2)*C*Sqrt[a + b*x^2]*Elliptic
F[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(d^(3/2)*(b*c - a*d)*Sqrt
[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*b*Sqrt[c]*Sqrt[a +
 b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*Sqrt[d
]*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (B*
Sqrt[c]*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 5.51 (sec) , antiderivative size = 539, normalized size of antiderivative = 1.41

method	result
elliptic	$\frac{\sqrt{(b\,x^{2}+a)(x^{2}d+c)}\left(\frac{\left(bd\,x^{2}+ad\right)x\left(A\,d^{3}-Bc\,d^{2}+C\,c^{2}d-Dc^{3}\right)}{c\,d^{3}(ad-bc)\sqrt{\left(x^{2}+\frac{c}{d}\right)\left(bd\,x^{2}+ad\right)}}+\frac{Dx\sqrt{bd\,x^{4}+ad\,x^{2}+x^{2}bc+ac}}{3b\,d^{2}}+\frac{\left(\frac{B\,d^{2}-Ccd+Dc^{2}}{d^{3}}+\frac{A\,d^{3}-Bc\,d^{2}+C\,c^{2}d-Dc}{d^{3}c}\right.}{}\right.}{}$
default	Expression too large to display

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*((b*d*x^2+a*d)
/c/d^3/(a*d-b*c)*x*(A*d^3-B*c*d^2+C*c^2*d-D*c^3)/((x^2+c/d)*(b*d*x^2+a*d))
^(1/2)+1/3*D/b/d^2*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+((B*d^2-C*c*d+D*c
^2)/d^3+(A*d^3-B*c*d^2+C*c^2*d-D*c^3)/d^3/c-a/d^2/c/(a*d-b*c)*(A*d^3-B*c*d
^2+C*c^2*d-D*c^3)-1/3*D/b/d^2*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2
/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1
+(a*d+b*c)/c/b)^(1/2))-(1/d^2*(C*d-D*c)-1/d^2*b*(A*d^3-B*c*d^2+C*c^2*d-D*c
^3)/(a*d-b*c)/c-1/3*D/b/d^2*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2
)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b
/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)
/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 645, normalized size of antiderivative = 1.68

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \frac{((8\,Db^2c^4d-3\,Ab^2cd^4-3\,(Dab+2\,Cb^2)c^3d^2-(2\,Da^2-3\,Cab-3\,Bb^2)c}{}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x, algorit
hm="fricas")
```

output
```
1/3*(((8*D*b^2*c^4*d - 3*A*b^2*c*d^4 - 3*(D*a*b + 2*C*b^2)*c^3*d^2 - (2*D*
a^2 - 3*C*a*b - 3*B*b^2)*c^2*d^3)*x^3 + (8*D*b^2*c^5 - 3*A*b^2*c^2*d^3 - 3
*(D*a*b + 2*C*b^2)*c^4*d - (2*D*a^2 - 3*C*a*b - 3*B*b^2)*c^3*d^2)*x)*sqrt(
b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((8*D*b^2*c^
4*d - 3*(D*a*b + 2*C*b^2)*c^3*d^2 - (2*D*a^2 - (3*C + 4*D)*a*b - 3*B*b^2)*
c^2*d^3 - (D*a^2 + 3*C*a*b + 3*A*b^2)*c*d^4 + 3*(B*a*b - A*b^2)*d^5)*x^3 +
 (8*D*b^2*c^5 - 3*(D*a*b + 2*C*b^2)*c^4*d - (2*D*a^2 - (3*C + 4*D)*a*b - 3
*B*b^2)*c^3*d^2 - (D*a^2 + 3*C*a*b + 3*A*b^2)*c^2*d^3 + 3*(B*a*b - A*b^2)*
c*d^4)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c))
 - (8*D*b^2*c^4*d - 3*A*b^2*c*d^4 - 3*(D*a*b + 2*C*b^2)*c^3*d^2 - (2*D*a^2
 - 3*C*a*b - 3*B*b^2)*c^2*d^3 - (D*b^2*c^2*d^3 - D*a*b*c*d^4)*x^4 + (4*D*b
^2*c^3*d^2 - (2*D*a*b + 3*C*b^2)*c^2*d^3 - (2*D*a^2 - 3*C*a*b)*c*d^4)*x^2)
*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/((b^3*c^2*d^5 - a*b^2*c*d^6)*x^3 + (b^3*
c^3*d^4 - a*b^2*c^2*d^5)*x)
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(1/2)/(d*x**2+c)**(3/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4 + D*x**6)/(sqrt(a + b*x**2)*(c + d*x**2)**(3
/2)), x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \int \frac{Dx^6+Cx^4+Bx^2+A}{\sqrt{bx^2+a}(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(3/2)),
 x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{\sqrt{bx^2+a}(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(3/2)),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx=\int \frac{A+B\,x^2+C\,x^4+x^6\,D}{\sqrt{b\,x^2+a}\,{\left(d\,x^2+c\right)}^{3/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(1/2)*(c + d*x^2)^(3/2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(1/2)*(c + d*x^2)^(3/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}\,dx = \text{Too large to display}$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(3/2),x)
```

output
```
( - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*c*x + 3*sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*b**2*x + 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b*c*x**3 - int((sqr
t(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4
+ b*c**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a*b*c**2*d - int((sqrt(c +
d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c*
*2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*a*b*c*d**2*x**2 - 3*int((sqrt(c +
 d*x**2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c
**2*x**2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*b**3*c*d - 3*int((sqrt(c + d*x**
2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x*
*2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*b**3*d**2*x**2 - 2*int((sqrt(c + d*x**
2)*sqrt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x*
*2 + 2*b*c*d*x**4 + b*d**2*x**6),x)*b**2*c**3 - 2*int((sqrt(c + d*x**2)*sq
rt(a + b*x**2)*x**4)/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 +
2*b*c*d*x**4 + b*d**2*x**6),x)*b**2*c**2*d*x**2 + 3*int((sqrt(c + d*x**2)*
sqrt(a + b*x**2))/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b
*c*d*x**4 + b*d**2*x**6),x)*a**2*c**3 + 3*int((sqrt(c + d*x**2)*sqrt(a + b
*x**2))/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4
+ b*d**2*x**6),x)*a**2*c**2*d*x**2 + 3*int((sqrt(c + d*x**2)*sqrt(a + b*x*
*2))/(a*c**2 + 2*a*c*d*x**2 + a*d**2*x**4 + b*c**2*x**2 + 2*b*c*d*x**4 + b
*d**2*x**6),x)*a*b**2*c**2 + 3*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/...
```

3.41 $\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}(c+dx^2)^{5/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 431

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx = -\frac{(c^2Cd-Bcd^2+Ad^3-c^3D)\,x\sqrt{a+bx^2}}{3cd^2(bc-ad)\,(c+dx^2)^{3/2}}+\frac{Dx\sqrt{a+bx^2}}{bd^2\sqrt{c+dx^2}}$$
$$-\frac{(3a^2c^2d^2D+abd(4c^2Cd-Bcd^2-2Ad^3-13c^3D)-b^2c(2c^2Cd+Bcd^2-4Ad^3-8c^3D))\sqrt{a+bx^2}\,E\left(\mathrm{a}\right.}{3bc^{3/2}d^{5/2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$
$$+\frac{(3Ab^2cd^2+3a^2cd(Cd-2cD)-ab(c^2Cd+2Bcd^2+Ad^3-4c^3D))\sqrt{a+bx^2}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1\right.}{3a\sqrt{c}d^{5/2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
-1/3*(A*d^3-B*c*d^2+C*c^2*d-D*c^3)*x*(b*x^2+a)^(1/2)/c/d^2/(-a*d+b*c)/(d*x
^2+c)^(3/2)+D*x*(b*x^2+a)^(1/2)/b/d^2/(d*x^2+c)^(1/2)-1/3*(3*a^2*c^2*d^2*D
+a*b*d*(-2*A*d^3-B*c*d^2+4*C*c^2*d-13*D*c^3)-b^2*c*(-4*A*d^3+B*c*d^2+2*C*c
^2*d-8*D*c^3))*(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/
2),(1-b*c/a/d)^(1/2))/b/c^(3/2)/d^(5/2)/(-a*d+b*c)^2/(c*(b*x^2+a)/a/(d*x^2
+c))^(1/2)/(d*x^2+c)^(1/2)+1/3*(3*A*b^2*c*d^2+3*a^2*c*d*(C*d-2*D*c)-a*b*(A
*d^3+2*B*c*d^2+C*c^2*d-4*D*c^3))*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^
(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2))/a/c^(1/2)/d^(5/2)/(-a*d+b*c)^2/(c*(b*x
^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 10.84 (sec) , antiderivative size = 453, normalized size of antiderivative = 1.05

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{\sqrt{a + bx^2}\,(c + dx^2)^{5/2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a + bx^2)\,(bc(-4c^4D - 4Ad^4x^2 + cd^3(-5A + Bx^2) + 2c^2d^2(B + C\cdots}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/(Sqrt[a + b*x^2]*(c + d*x^2)^(5/2)),
x]
```

output
```
(Sqrt[b/a]*d*x*(a + b*x^2)*(b*c*(-4*c^4*D - 4*A*d^4*x^2 + c*d^3*(-5*A + B*
x^2) + 2*c^2*d^2*(B + C*x^2) + c^3*d*(C - 5*D*x^2)) + a*d*(6*c^4*D - 4*c^2
*C*d^2*x^2 + 2*A*d^4*x^2 + c*d^3*(3*A + B*x^2) + c^3*(-3*C*d + 7*d*D*x^2))
) - I*c*(3*a^2*c^2*d^2*D + b^2*c*(-2*c^2*C*d - B*c*d^2 + 4*A*d^3 + 8*c^3*D
) - a*b*d*(-4*c^2*C*d + B*c*d^2 + 2*A*d^3 + 13*c^3*D))*Sqrt[1 + (b*x^2)/a]
*(c + d*x^2)*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(
b*c)] + I*c*(-(b*c) + a*d)*(3*a*c*d*(-(C*d) + 3*c*D) + b*(2*c^2*C*d + B*c*
d^2 - A*d^3 - 8*c^3*D))*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)*Sqrt[1 + (d*x^2)/c
]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)])/(3*Sqrt[b/a]*c^2*d^3*(b*
c - a*d)^2*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1150 vs. 2(431) = 862.

Time = 1.84 (sec) , antiderivative size = 1150, normalized size of antiderivative = 2.67, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{\sqrt{a + bx^2}\,(c + dx^2)^{5/2}}\,dx$$

$$\Big\downarrow \; 7293$$

$$\int \left(\frac{A}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}} + \frac{Bx^2}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}} + \frac{Cx^4}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}} + \frac{Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}} \right) dx$$

$$\Big\downarrow \ 2009$$

$$-\frac{cD\sqrt{bx^2+a}x^3}{3d(bc-ad)\,(dx^2+c)^{3/2}} + \frac{(8b^2c^2-13abdc+3a^2d^2)\,D\sqrt{bx^2+a}x}{3bd^2(bc-ad)^2\sqrt{dx^2+c}} - \frac{2c(2bc-3ad)D\sqrt{bx^2+a}x}{3d^2(bc-ad)^2\sqrt{dx^2+c}} + \frac{B\sqrt{bx^2+a}x}{3(bc-ad)\,(dx^2+c)^{3/2}} - \frac{Ad\sqrt{bx^2+a}x}{3c(bc-ad)\,(dx^2+c)^{3/2}} - \frac{cC\sqrt{bx^2+a}x}{3d(bc-ad)\,(dx^2+c)^{3/2}} - \frac{2A\sqrt{d}(2bc-ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3c^{3/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}} + \frac{B(bc+ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3\sqrt{c}\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}} - \frac{\sqrt{c}(8b^2c^2-13abdc+3a^2d^2)\,D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3bd^{5/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}} + \frac{2\sqrt{c}C(bc-2ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3d^{3/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}} + \frac{Ab(3bc-ad)\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a\sqrt{c}\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}} + \frac{2c^{3/2}(2bc-3ad)D\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{5/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}} - \frac{\sqrt{c}C(bc-3ad)\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{3/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}} - \frac{2bB\sqrt{c}\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/(Sqrt[a + b*x^2]*(c + d*x^2)^(5/2)),x]
```

output
```
(B*x*Sqrt[a + b*x^2])/(3*(b*c - a*d)*(c + d*x^2)^(3/2)) - (c*C*x*Sqrt[a +
b*x^2])/(3*d*(b*c - a*d)*(c + d*x^2)^(3/2)) - (A*d*x*Sqrt[a + b*x^2])/(3*c
*(b*c - a*d)*(c + d*x^2)^(3/2)) - (c*D*x^3*Sqrt[a + b*x^2])/(3*d*(b*c - a*
d)*(c + d*x^2)^(3/2)) - (2*c*(2*b*c - 3*a*d)*D*x*Sqrt[a + b*x^2])/(3*d^2*(
b*c - a*d)^2*Sqrt[c + d*x^2]) + ((8*b^2*c^2 - 13*a*b*c*d + 3*a^2*d^2)*D*x*
Sqrt[a + b*x^2])/(3*b*d^2*(b*c - a*d)^2*Sqrt[c + d*x^2]) + (2*Sqrt[c]*C*(b
*c - 2*a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*
c)/(a*d)])/(3*d^(3/2)*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*
Sqrt[c + d*x^2]) - (2*A*Sqrt[d]*(2*b*c - a*d)*Sqrt[a + b*x^2]*EllipticE[Ar
cTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*c^(3/2)*(b*c - a*d)^2*Sqrt
[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*(b*c + a*d)*Sqrt[a
 + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*Sqrt
[c]*Sqrt[d]*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d
*x^2]) - (Sqrt[c]*(8*b^2*c^2 - 13*a*b*c*d + 3*a^2*d^2)*D*Sqrt[a + b*x^2]*E
llipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b*d^(5/2)*(b*c
- a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (2*b*B*S
qrt[c]*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a
*d)])/(3*Sqrt[d]*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[
c + d*x^2]) - (Sqrt[c]*C*(b*c - 3*a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(S
qrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*d^(3/2)*(b*c - a*d)^2*Sqrt[(c*...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 8.72 (sec) , antiderivative size = 756, normalized size of antiderivative = 1.75

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(\frac{x\left(A\,d^3-Bc\,d^2+C\,c^2d-Dc^3\right)\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{3c\,d^4(ad-bc)\left(x^2+\frac{c}{d}\right)^2}+\frac{\left(bd\,x^2+ad\right)x\left(2Aa\,d^4-4Abc\,d^3+Bac\,d^3+Bb\,c^2d^2-4Ca\,c^2d^2+2\right.}{3c^2d^3(ad-bc)^2\sqrt{\left(x^2+\frac{c}{d}\right)\left(bd\,x^2+ad\right.}}\right.}{}$
default	Expression too large to display

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(5/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/3/c/d^4/(a*
d-b*c)*x*(A*d^3-B*c*d^2+C*c^2*d-D*c^3)*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)
/(x^2+c/d)^2+1/3*(b*d*x^2+a*d)/c^2/d^3/(a*d-b*c)^2*x*(2*A*a*d^4-4*A*b*c*d^
3+B*a*c*d^3+B*b*c^2*d^2-4*C*a*c^2*d^2+2*C*b*c^3*d+7*D*a*c^3*d-5*D*b*c^4)/(
(x^2+c/d)*(b*d*x^2+a*d))^(1/2)+((C*d-2*D*c)/d^3+1/3/d^3*b*(A*d^3-B*c*d^2+C
*c^2*d-D*c^3)/(a*d-b*c)/c+1/3/d^3/(a*d-b*c)*(2*A*a*d^4-4*A*b*c*d^3+B*a*c*d
^3+B*b*c^2*d^2-4*C*a*c^2*d^2+2*C*b*c^3*d+7*D*a*c^3*d-5*D*b*c^4)/c^2-1/3*a/
d^2/c^2/(a*d-b*c)^2*(2*A*a*d^4-4*A*b*c*d^3+B*a*c*d^3+B*b*c^2*d^2-4*C*a*c^2
*d^2+2*C*b*c^3*d+7*D*a*c^3*d-5*D*b*c^4))/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1
+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/
2),(-1+(a*d+b*c)/c/b)^(1/2))-(D/d^2-1/3/d^2*b*(2*A*a*d^4-4*A*b*c*d^3+B*a*c
*d^3+B*b*c^2*d^2-4*C*a*c^2*d^2+2*C*b*c^3*d+7*D*a*c^3*d-5*D*b*c^4)/(a*d-b*c
)^2/c^2)*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x
^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2)
)-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1064 vs. $2(406) = 812$.

Time = 0.13 (sec) , antiderivative size = 1064, normalized size of antiderivative = 2.47

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx = \text{Too large to display}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(5/2),x, algorit
hm="fricas")
```

output
```
-1/3*(((8*D*b^2*c^5*d^2 - 2*A*a*b*c*d^6 - (13*D*a*b + 2*C*b^2)*c^4*d^3 + (
3*D*a^2 + 4*C*a*b - B*b^2)*c^3*d^4 - (B*a*b - 4*A*b^2)*c^2*d^5)*x^5 + 2*(8
*D*b^2*c^6*d - 2*A*a*b*c^2*d^5 - (13*D*a*b + 2*C*b^2)*c^5*d^2 + (3*D*a^2 +
 4*C*a*b - B*b^2)*c^4*d^3 - (B*a*b - 4*A*b^2)*c^3*d^4)*x^3 + (8*D*b^2*c^7
- 2*A*a*b*c^3*d^4 - (13*D*a*b + 2*C*b^2)*c^6*d + (3*D*a^2 + 4*C*a*b - B*b^
2)*c^5*d^2 - (B*a*b - 4*A*b^2)*c^4*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e
(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((8*D*b^2*c^5*d^2 - A*a*b*d^7 - (13*D*
a*b + 2*C*b^2)*c^4*d^3 + (3*D*a^2 + 4*(C + D)*a*b - B*b^2)*c^3*d^4 - (6*D*
a^2 + (B + C)*a*b - 4*A*b^2)*c^2*d^5 + (3*C*a^2 - 2*(A + B)*a*b + 3*A*b^2)
*c*d^6)*x^5 + 2*(8*D*b^2*c^6*d - A*a*b*c*d^6 - (13*D*a*b + 2*C*b^2)*c^5*d^
2 + (3*D*a^2 + 4*(C + D)*a*b - B*b^2)*c^4*d^3 - (6*D*a^2 + (B + C)*a*b - 4
*A*b^2)*c^3*d^4 + (3*C*a^2 - 2*(A + B)*a*b + 3*A*b^2)*c^2*d^5)*x^3 + (8*D*
b^2*c^7 - A*a*b*c^2*d^5 - (13*D*a*b + 2*C*b^2)*c^6*d + (3*D*a^2 + 4*(C + D
)*a*b - B*b^2)*c^5*d^2 - (6*D*a^2 + (B + C)*a*b - 4*A*b^2)*c^4*d^3 + (3*C*
a^2 - 2*(A + B)*a*b + 3*A*b^2)*c^3*d^4)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f
(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (8*D*b^2*c^6*d - 2*A*a*b*c^2*d^5 - (13
*D*a*b + 2*C*b^2)*c^5*d^2 + (3*D*a^2 + 4*C*a*b - B*b^2)*c^4*d^3 - (B*a*b -
 4*A*b^2)*c^3*d^4 + 3*(D*b^2*c^4*d^3 - 2*D*a*b*c^3*d^4 + D*a^2*c^2*d^5)*x^
4 + (12*D*b^2*c^5*d^2 - A*a*b*c*d^6 - (20*D*a*b + 3*C*b^2)*c^4*d^3 + (6*D*
a^2 + 5*C*a*b)*c^3*d^4 - (2*B*a*b - 3*A*b^2)*c^2*d^5)*x^2)*sqrt(b*x^2 +...
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx = \int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{\frac{5}{2}}}\,dx$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(1/2)/(d*x**2+c)**(5/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4 + D*x**6)/(sqrt(a + b*x**2)*(c + d*x**2)**(5
/2)), x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{\sqrt{bx^2+a}(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(5/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(5/2)),
 x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{\sqrt{bx^2+a}(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(5/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(5/2)),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx=\int \frac{A+B\,x^2+C\,x^4+x^6\,D}{\sqrt{b\,x^2+a}\,(d\,x^2+c)^{5/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(1/2)*(c + d*x^2)^(5/2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(1/2)*(c + d*x^2)^(5/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{5/2}}\,dx=\text{too large to display}$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(5/2),x)
```

output
```
(3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*c*x + 2*sqrt(c + d*x**2)*sqrt(a + b
*x**2)*a*d*x**3 - sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*x - 2*sqrt(c + d*
x**2)*sqrt(a + b*x**2)*b*c*x**3 - 3*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)
*x**4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a**2*d*
*4*x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4*x**8
 - b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2*c*d*
*3*x**8),x)*a**2*b*c**3*d**2 - 6*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x*
*4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a**2*d**4*
x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4*x**8 -
b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2*c*d**3*
x**8),x)*a**2*b*c**2*d**3*x**2 - 3*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*
x**4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a**2*d**
4*x**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4*x**8
- b**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2*c*d**
3*x**8),x)*a**2*b*c*d**4*x**4 - int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**
4)/(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a**2*d**4*x
**6 - a*b*c**4 - 2*a*b*c**3*d*x**2 + 2*a*b*c*d**3*x**6 + a*b*d**4*x**8 - b
**2*c**4*x**2 - 3*b**2*c**3*d*x**4 - 3*b**2*c**2*d**2*x**6 - b**2*c*d**3*x
**8),x)*a*b**3*c**2*d**2 - 2*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/
(a**2*c**3*d + 3*a**2*c**2*d**2*x**2 + 3*a**2*c*d**3*x**4 + a**2*d**4*x...
```

3.42 $\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 563

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}\,dx = -\frac{\left(c^2Cd-Bcd^2+Ad^3-c^3D\right)x\sqrt{a+bx^2}}{5cd^2(bc-ad)\left(c+dx^2\right)^{5/2}}$$
$$-\frac{\left(ad(6c^2Cd-Bcd^2-4Ad^3-11c^3D)-bc(2c^2Cd+3Bcd^2-8Ad^3-7c^3D)\right)x\sqrt{a+bx^2}}{15c^2d^2(bc-ad)^2\left(c+dx^2\right)^{3/2}}$$
$$-\frac{\left(a^2d^2(3c^2Cd+2Bcd^2+8Ad^3-23c^3D)-b^2c^2(2c^2Cd+3Bcd^2-23Ad^3+8c^3D)+abcd(7c^2Cd-7Bcd\right.}{15c^{5/2}d^{5/2}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$
$$+\frac{\left(15Ab^3c^2d^2-15a^3c^2d^2D-ab^2c(c^2Cd+9Bcd^2+11Ad^3+4c^3D)+a^2bd(9c^2Cd+Bcd^2+4Ad^3+11c^3D\right.}{15ac^{3/2}d^{5/2}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
-1/5*(A*d^3-B*c*d^2+C*c^2*d-D*c^3)*x*(b*x^2+a)^(1/2)/c/d^2/(-a*d+b*c)/(d*x
^2+c)^(5/2)-1/15*(a*d*(-4*A*d^3-B*c*d^2+6*C*c^2*d-11*D*c^3)-b*c*(-8*A*d^3+
3*B*c*d^2+2*C*c^2*d-7*D*c^3))*x*(b*x^2+a)^(1/2)/c^2/d^2/(-a*d+b*c)^2/(d*x^
2+c)^(3/2)-1/15*(a^2*d^2*(8*A*d^3+2*B*c*d^2+3*C*c^2*d-23*D*c^3)-b^2*c^2*(-
23*A*d^3+3*B*c*d^2+2*C*c^2*d+8*D*c^3)+a*b*c*d*(-23*A*d^3-7*B*c*d^2+7*C*c^2
*d+23*D*c^3))*(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2
),(1-b*c/a/d)^(1/2))/c^(5/2)/d^(5/2)/(-a*d+b*c)^3/(c*(b*x^2+a)/a/(d*x^2+c)
)^(1/2)/(d*x^2+c)^(1/2)+1/15*(15*A*b^3*c^2*d^2-15*a^3*c^2*d^2*D-a*b^2*c*(1
1*A*d^3+9*B*c*d^2+C*c^2*d+4*D*c^3)+a^2*b*d*(4*A*d^3+B*c*d^2+9*C*c^2*d+11*D
*c^3))*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),(1-b*c/a/
d)^(1/2))/a/c^(3/2)/d^(5/2)/(-a*d+b*c)^3/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(
d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 12.27 (sec) , antiderivative size = 588, normalized size of antiderivative = 1.04

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{7/2}}\,dx = \frac{-\sqrt{\frac{b}{a}}dx(a+bx^2)\left(3c^2(bc-ad)^2\left(c^2Cd-Bcd^2+Ad^3-c^3D\right)-c(bc-ac\right.}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/(Sqrt[a + b*x^2]*(c + d*x^2)^(7/2)),
x]
```

output
```
(-(Sqrt[b/a]*d*x*(a + b*x^2)*(3*c^2*(b*c - a*d)^2*(c^2*C*d - B*c*d^2 + A*d
^3 - c^3*D) - c*(b*c - a*d)*(b*c*(2*c^2*C*d + 3*B*c*d^2 - 8*A*d^3 - 7*c^3*
D) + a*d*(-6*c^2*C*d + B*c*d^2 + 4*A*d^3 + 11*c^3*D))*(c + d*x^2) - (-(a^2
*d^2*(3*c^2*C*d + 2*B*c*d^2 + 8*A*d^3 - 23*c^3*D)) + a*b*c*d*(-7*c^2*C*d +
 7*B*c*d^2 + 23*A*d^3 - 23*c^3*D) + b^2*c^2*(2*c^2*C*d + 3*B*c*d^2 - 23*A*
d^3 + 8*c^3*D))*(c + d*x^2)^2)) + I*c*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)^2*Sq
rt[1 + (d*x^2)/c]*(b*(-(a^2*d^2*(3*c^2*C*d + 2*B*c*d^2 + 8*A*d^3 - 23*c^3*
D)) + a*b*c*d*(-7*c^2*C*d + 7*B*c*d^2 + 23*A*d^3 - 23*c^3*D) + b^2*c^2*(2*
c^2*C*d + 3*B*c*d^2 - 23*A*d^3 + 8*c^3*D))*EllipticE[I*ArcSinh[Sqrt[b/a]*x
], (a*d)/(b*c)] - (b*c - a*d)*(15*a^2*c^2*d^2*D + a*b*d*(-6*c^2*C*d + B*c*
d^2 + 4*A*d^3 - 19*c^3*D) + b^2*c*(2*c^2*C*d + 3*B*c*d^2 - 8*A*d^3 + 8*c^3
*D))*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(15*Sqrt[b/a]*c^3*d^
3*(b*c - a*d)^3*Sqrt[a + b*x^2]*(c + d*x^2)^(5/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1311 vs. $2(563) = 1126$.

Time = 2.29 (sec) , antiderivative size = 1311, normalized size of antiderivative = 2.33, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}+\frac{Bx^2}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}+\frac{Cx^4}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}+\frac{Dx^6}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{cD\sqrt{bx^2+a}x^3}{5d(bc-ad)\left(dx^2+c\right)^{5/2}}-\frac{4Ad(2bc-ad)\sqrt{bx^2+a}x}{15c^2(bc-ad)^2\left(dx^2+c\right)^{3/2}}+\frac{B(3bc+ad)\sqrt{bx^2+a}x}{15c(bc-ad)^2\left(dx^2+c\right)^{3/2}}-\frac{4c(bc-2ad)D\sqrt{bx^2+a}x}{15d^2(bc-ad)^2\left(dx^2+c\right)^{3/2}}+\frac{2C(bc-3ad)\sqrt{bx^2+a}x}{15d(bc-ad)^2\left(dx^2+c\right)^{3/2}}+\frac{B\sqrt{bx^2+a}x}{5(bc-ad)\left(dx^2+c\right)^{5/2}}-\frac{Ad\sqrt{bx^2+a}x}{5c(bc-ad)\left(dx^2+c\right)^{5/2}}-\frac{cC\sqrt{bx^2+a}x}{5d(bc-ad)\left(dx^2+c\right)^{5/2}}+\frac{C\left(2b^2c^2-7abdc-3a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15\sqrt{c}d^{3/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{B\left(3b^2c^2+7abdc-2a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15c^{3/2}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{A\sqrt{d}\left(23b^2c^2-23abdc+8a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15c^{5/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}\left(8b^2c^2-23abdc+23a^2d^2\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15d^{5/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{bB(9bc-ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15\sqrt{c}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ab\left(15b^2c^2-11abdc+4a^2d^2\right)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15ac^{3/2}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}\left(4b^2c^2-11abdc+15a^2d^2\right)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15d^{5/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{b\sqrt{c}C(bc-9ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15d^{3/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/(Sqrt[a + b*x^2]*(c + d*x^2)^(7/2)),x]
```

output
```
(B*x*Sqrt[a + b*x^2])/(5*(b*c - a*d)*(c + d*x^2)^(5/2)) - (c*C*x*Sqrt[a +
b*x^2])/(5*d*(b*c - a*d)*(c + d*x^2)^(5/2)) - (A*d*x*Sqrt[a + b*x^2])/(5*c
*(b*c - a*d)*(c + d*x^2)^(5/2)) - (c*D*x^3*Sqrt[a + b*x^2])/(5*d*(b*c - a*
d)*(c + d*x^2)^(5/2)) + (2*C*(b*c - 3*a*d)*x*Sqrt[a + b*x^2])/(15*d*(b*c -
 a*d)^2*(c + d*x^2)^(3/2)) - (4*A*d*(2*b*c - a*d)*x*Sqrt[a + b*x^2])/(15*c
^2*(b*c - a*d)^2*(c + d*x^2)^(3/2)) + (B*(3*b*c + a*d)*x*Sqrt[a + b*x^2])/
(15*c*(b*c - a*d)^2*(c + d*x^2)^(3/2)) - (4*c*(b*c - 2*a*d)*D*x*Sqrt[a + b
*x^2])/(15*d^2*(b*c - a*d)^2*(c + d*x^2)^(3/2)) + (C*(2*b^2*c^2 - 7*a*b*c*
d - 3*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 -
(b*c)/(a*d)])/(15*Sqrt[c]*d^(3/2)*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c
 + d*x^2))]*Sqrt[c + d*x^2]) + (B*(3*b^2*c^2 + 7*a*b*c*d - 2*a^2*d^2)*Sqrt
[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*c
^(3/2)*Sqrt[d]*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c
+ d*x^2]) - (A*Sqrt[d]*(23*b^2*c^2 - 23*a*b*c*d + 8*a^2*d^2)*Sqrt[a + b*x^
2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*c^(5/2)*(b
*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt
[c]*(8*b^2*c^2 - 23*a*b*c*d + 23*a^2*d^2)*D*Sqrt[a + b*x^2]*EllipticE[ArcT
an[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*d^(5/2)*(b*c - a*d)^3*Sqrt[
(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (b*Sqrt[c]*C*(b*c - 9*
a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 1145 vs. $2(534) = 1068$.

Time = 11.10 (sec) , antiderivative size = 1146, normalized size of antiderivative = 2.04

method	result	size
elliptic	Expression too large to display	1146
default	Expression too large to display	5930

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(7/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/5/c/d^5/(a*
d-b*c)*x*(A*d^3-B*c*d^2+C*c^2*d-D*c^3)*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)
/(x^2+c/d)^3+1/15*(4*A*a*d^4-8*A*b*c*d^3+B*a*c*d^3+3*B*b*c^2*d^2-6*C*a*c^2
*d^2+2*C*b*c^3*d+11*D*a*c^3*d-7*D*b*c^4)/d^4/(a*d-b*c)^2/c^2*x*(b*d*x^4+a*
d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)^2+1/15*(b*d*x^2+a*d)/c^3/d^3/(a*d-b*c)^
3*x*(8*A*a^2*d^5-23*A*a*b*c*d^4+23*A*b^2*c^2*d^3+2*B*a^2*c*d^4-7*B*a*b*c^2
*d^3-3*B*b^2*c^3*d^2+3*C*a^2*c^2*d^3+7*C*a*b*c^3*d^2-2*C*b^2*c^4*d-23*D*a^
2*c^3*d^2+23*D*a*b*c^4*d-8*D*b^2*c^5)/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+(D/d
^3+1/15*b*(4*A*a*d^4-8*A*b*c*d^3+B*a*c*d^3+3*B*b*c^2*d^2-6*C*a*c^2*d^2+2*C
*b*c^3*d+11*D*a*c^3*d-7*D*b*c^4)/c^2/d^3/(a*d-b*c)^2+1/15/d^3/(a*d-b*c)^2*
(8*A*a^2*d^5-23*A*a*b*c*d^4+23*A*b^2*c^2*d^3+2*B*a^2*c*d^4-7*B*a*b*c^2*d^3
-3*B*b^2*c^3*d^2+3*C*a^2*c^2*d^3+7*C*a*b*c^3*d^2-2*C*b^2*c^4*d-23*D*a^2*c^
3*d^2+23*D*a*b*c^4*d-8*D*b^2*c^5)/c^3-1/15*a/d^2/c^3/(a*d-b*c)^3*(8*A*a^2*
d^5-23*A*a*b*c*d^4+23*A*b^2*c^2*d^3+2*B*a^2*c*d^4-7*B*a*b*c^2*d^3-3*B*b^2*
c^3*d^2+3*C*a^2*c^2*d^3+7*C*a*b*c^3*d^2-2*C*b^2*c^4*d-23*D*a^2*c^3*d^2+23*
D*a*b*c^4*d-8*D*b^2*c^5))/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)
/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c
)/c/b)^(1/2))+1/15/d^3*b*(8*A*a^2*d^5-23*A*a*b*c*d^4+23*A*b^2*c^2*d^3+2*B*
a^2*c*d^4-7*B*a*b*c^2*d^3-3*B*b^2*c^3*d^2+3*C*a^2*c^2*d^3+7*C*a*b*c^3*d^2-
2*C*b^2*c^4*d-23*D*a^2*c^3*d^2+23*D*a*b*c^4*d-8*D*b^2*c^5)/(a*d-b*c)^3/...
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 2064 vs. $2(533) = 1066$.

Time = 0.17 (sec) , antiderivative size = 2064, normalized size of antiderivative = 3.67

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{\sqrt{a + bx^2}\,(c + dx^2)^{7/2}}\,dx = \text{Too large to display}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(7/2),x, algorit
hm="fricas")
```

output
```
-1/15*((8*D*b^4*c^8 - 8*A*a^2*b^2*c^3*d^5 - (23*D*a*b^3 - 2*C*b^4)*c^7*d +
 (23*D*a^2*b^2 - 7*C*a*b^3 + 3*B*b^4)*c^6*d^2 - (3*C*a^2*b^2 - 7*B*a*b^3 +
 23*A*b^4)*c^5*d^3 - (2*B*a^2*b^2 - 23*A*a*b^3)*c^4*d^4 + (8*D*b^4*c^5*d^3
 - 8*A*a^2*b^2*d^8 - (23*D*a*b^3 - 2*C*b^4)*c^4*d^4 + (23*D*a^2*b^2 - 7*C*
a*b^3 + 3*B*b^4)*c^3*d^5 - (3*C*a^2*b^2 - 7*B*a*b^3 + 23*A*b^4)*c^2*d^6 -
(2*B*a^2*b^2 - 23*A*a*b^3)*c*d^7)*x^6 + 3*(8*D*b^4*c^6*d^2 - 8*A*a^2*b^2*c
*d^7 - (23*D*a*b^3 - 2*C*b^4)*c^5*d^3 + (23*D*a^2*b^2 - 7*C*a*b^3 + 3*B*b^
4)*c^4*d^4 - (3*C*a^2*b^2 - 7*B*a*b^3 + 23*A*b^4)*c^3*d^5 - (2*B*a^2*b^2 -
 23*A*a*b^3)*c^2*d^6)*x^4 + 3*(8*D*b^4*c^7*d - 8*A*a^2*b^2*c^2*d^6 - (23*D
*a*b^3 - 2*C*b^4)*c^6*d^2 + (23*D*a^2*b^2 - 7*C*a*b^3 + 3*B*b^4)*c^5*d^3 -
 (3*C*a^2*b^2 - 7*B*a*b^3 + 23*A*b^4)*c^4*d^4 - (2*B*a^2*b^2 - 23*A*a*b^3)
*c^3*d^5)*x^2)*sqrt(a*c)*sqrt(-b/a)*elliptic_e(arcsin(x*sqrt(-b/a)), a*d/(
b*c)) - (8*D*b^4*c^8 + (4*D*a^2*b^2 - 23*D*a*b^3 + 2*C*b^4)*c^7*d - (11*D*
a^3*b - (C + 23*D)*a^2*b^2 + 7*C*a*b^3 - 3*B*b^4)*c^6*d^2 + (15*D*a^4 - 9*
C*a^3*b + 3*(3*B - C)*a^2*b^2 - (15*A - 7*B)*a*b^3 - 23*A*b^4)*c^5*d^3 - (
B*a^3*b - (11*A - 2*B)*a^2*b^2 - 23*A*a*b^3)*c^4*d^4 - 4*(A*a^3*b + 2*A*a^
2*b^2)*c^3*d^5 + (8*D*b^4*c^5*d^3 + (4*D*a^2*b^2 - 23*D*a*b^3 + 2*C*b^4)*c
^4*d^4 - (11*D*a^3*b - (C + 23*D)*a^2*b^2 + 7*C*a*b^3 - 3*B*b^4)*c^3*d^5 +
 (15*D*a^4 - 9*C*a^3*b + 3*(3*B - C)*a^2*b^2 - (15*A - 7*B)*a*b^3 - 23*A*b
^4)*c^2*d^6 - (B*a^3*b - (11*A - 2*B)*a^2*b^2 - 23*A*a*b^3)*c*d^7 - 4*(...
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\left(c+dx^2\right)^{7/2}}\,dx=\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\left(c+dx^2\right)^{\frac{7}{2}}}\,dx$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(1/2)/(d*x**2+c)**(7/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4 + D*x**6)/(sqrt(a + b*x**2)*(c + d*x**2)**(7
/2)), x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{7/2}}\,dx = \int \frac{Dx^6+Cx^4+Bx^2+A}{\sqrt{bx^2+a}(dx^2+c)^{\frac{7}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(7/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(7/2)),
 x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{7/2}}\,dx = \int \frac{Dx^6+Cx^4+Bx^2+A}{\sqrt{bx^2+a}(dx^2+c)^{\frac{7}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(7/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/(sqrt(b*x^2 + a)*(d*x^2 + c)^(7/2)),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{7/2}}\,dx = \int \frac{A+B\,x^2+C\,x^4+x^6\,D}{\sqrt{b\,x^2+a}\,{\left(d\,x^2+c\right)}^{7/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(1/2)*(c + d*x^2)^(7/2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(1/2)*(c + d*x^2)^(7/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\sqrt{a+bx^2}\,(c+dx^2)^{7/2}}\,dx = \text{too large to display}$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(1/2)/(d*x^2+c)^(7/2),x)
```

output
```
( - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*c*x - 4*sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*a*d*x**3 - sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*x + 2*sqrt(c +
 d*x**2)*sqrt(a + b*x**2)*b*c*x**3 - 16*int((sqrt(c + d*x**2)*sqrt(a + b*x
**2)*x**4)/(2*a**2*c**4*d + 8*a**2*c**3*d**2*x**2 + 12*a**2*c**2*d**3*x**4
 + 8*a**2*c*d**4*x**6 + 2*a**2*d**5*x**8 - a*b*c**5 - 2*a*b*c**4*d*x**2 +
2*a*b*c**3*d**2*x**4 + 8*a*b*c**2*d**3*x**6 + 7*a*b*c*d**4*x**8 + 2*a*b*d*
*5*x**10 - b**2*c**5*x**2 - 4*b**2*c**4*d*x**4 - 6*b**2*c**3*d**2*x**6 - 4
*b**2*c**2*d**3*x**8 - b**2*c*d**4*x**10),x)*a**3*c**3*d**3 - 48*int((sqrt
(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(2*a**2*c**4*d + 8*a**2*c**3*d**2*x**2
 + 12*a**2*c**2*d**3*x**4 + 8*a**2*c*d**4*x**6 + 2*a**2*d**5*x**8 - a*b*c*
*5 - 2*a*b*c**4*d*x**2 + 2*a*b*c**3*d**2*x**4 + 8*a*b*c**2*d**3*x**6 + 7*a
*b*c*d**4*x**8 + 2*a*b*d**5*x**10 - b**2*c**5*x**2 - 4*b**2*c**4*d*x**4 -
6*b**2*c**3*d**2*x**6 - 4*b**2*c**2*d**3*x**8 - b**2*c*d**4*x**10),x)*a**3
*c**2*d**4*x**2 - 48*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(2*a**2*
c**4*d + 8*a**2*c**3*d**2*x**2 + 12*a**2*c**2*d**3*x**4 + 8*a**2*c*d**4*x*
*6 + 2*a**2*d**5*x**8 - a*b*c**5 - 2*a*b*c**4*d*x**2 + 2*a*b*c**3*d**2*x**
4 + 8*a*b*c**2*d**3*x**6 + 7*a*b*c*d**4*x**8 + 2*a*b*d**5*x**10 - b**2*c**
5*x**2 - 4*b**2*c**4*d*x**4 - 6*b**2*c**3*d**2*x**6 - 4*b**2*c**2*d**3*x**
8 - b**2*c*d**4*x**10),x)*a**3*c*d**5*x**4 - 16*int((sqrt(c + d*x**2)*sqrt
(a + b*x**2)*x**4)/(2*a**2*c**4*d + 8*a**2*c**3*d**2*x**2 + 12*a**2*c**...
```

3.43 $\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 621

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx =$$

$$-\frac{(192a^3d^3D-12a^2bd^2(14Cd+19cD)+ab^2d(189cCd+140Bd^2+30c^2D)-b^3(21c^2Cd+140Bcd^2+10}{105b^4d^2\sqrt{a+bx^2}}$$

$$+\frac{(48a^2d^2D-3abd(14Cd+17cD)+b^2(42cCd+35Bd^2+3c^2D))\,x^3\sqrt{c+dx^2}}{105b^3d\sqrt{a+bx^2}}$$

$$+\frac{(7bCd+8bcD-8adD)x^5\sqrt{c+dx^2}}{35b^2\sqrt{a+bx^2}}+\frac{dDx^7\sqrt{c+dx^2}}{7b\sqrt{a+bx^2}}$$

$$+\frac{(105Ab^4cd^2+384a^4d^3D-24a^3bd^2(14Cd+17cD)+a^2b^2d(336cCd+280Bd^2+33c^2D)-ab^3(21c^2Cd+}{105\sqrt{a}b^{9/2}d^2\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

$$+\frac{\sqrt{a}(105b^3d(Bc+Ad)-192a^3d^2D+12a^2bd(14Cd+15cD)-ab^2(147cCd+140Bd^2+3c^2D))\sqrt{c+dx^2}}{105b^{9/2}d\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
-1/105*(192*a^3*d^3*D-12*a^2*b*d^2*(14*C*d+19*D*c)+a*b^2*d*(140*B*d^2+189*
C*c*d+30*D*c^2)-b^3*(105*A*d^3+140*B*c*d^2+21*C*c^2*d-6*D*c^3))*x*(d*x^2+c
)^(1/2)/b^4/d^2/(b*x^2+a)^(1/2)+1/105*(48*a^2*d^2*D-3*a*b*d*(14*C*d+17*D*c
)+b^2*(35*B*d^2+42*C*c*d+3*D*c^2))*x^3*(d*x^2+c)^(1/2)/b^3/d/(b*x^2+a)^(1/
2)+1/35*(7*C*b*d-8*D*a*d+8*D*b*c)*x^5*(d*x^2+c)^(1/2)/b^2/(b*x^2+a)^(1/2)+
1/7*d*D*x^7*(d*x^2+c)^(1/2)/b/(b*x^2+a)^(1/2)+1/105*(105*A*b^4*c*d^2+384*a
^4*d^3*D-24*a^3*b*d^2*(14*C*d+17*D*c)+a^2*b^2*d*(280*B*d^2+336*C*c*d+33*D*
c^2)-a*b^3*(210*A*d^3+245*B*c*d^2+21*C*c^2*d-6*D*c^3))*(d*x^2+c)^(1/2)*Ell
ipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)^(1/2),(1-a*d/b/c)^(1/2))/a^(1/2)/b^(9
/2)/d^2/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)+1/105*a^(1/2)*(105
*b^3*d*(A*d+B*c)-192*a^3*d^2*D+12*a^2*b*d*(14*C*d+15*D*c)-a*b^2*(140*B*d^2
+147*C*c*d+3*D*c^2))*(d*x^2+c)^(1/2)*InverseJacobiAM(arctan(b^(1/2)*x/a^(1
/2)),(1-a*d/b/c)^(1/2))/b^(9/2)/d/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a)
)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 10.37 (sec) , antiderivative size = 499, normalized size of antiderivative = 0.80

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}\left(\sqrt{\frac{b}{a}}dx(c+dx^2)\left(105Ab^3d(bc-ad)+a(192a^3d^2D-1\right.\right.}{}$$

input
```
Integrate[((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(a + b*x^2)^(3/2
),x]
```

output
```
(Sqrt[b/a]*(Sqrt[b/a]*d*x*(c + d*x^2)*(105*A*b^3*d*(b*c - a*d) + a*(192*a^
3*d^2*D - 12*a^2*b*d*(14*C*d + 15*c*D - 4*d*D*x^2) + a*b^2*(3*c^2*D + 3*c*
d*(49*C - 17*D*x^2) + 2*d^2*(70*B - 21*C*x^2 - 12*D*x^4)) + b^3*(35*B*d*(-
3*c + d*x^2) + 3*x^2*(c^2*D + 2*c*d*(7*C + 4*D*x^2) + d^2*x^2*(7*C + 5*D*x
^2))))) + I*c*(105*A*b^4*c*d^2 + 384*a^4*d^3*D - 24*a^3*b*d^2*(14*C*d + 17
*c*D) + a^2*b^2*d*(336*c*C*d + 280*B*d^2 + 33*c^2*D) + a*b^3*(-21*c^2*C*d
- 245*B*c*d^2 - 210*A*d^3 + 6*c^3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)
/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - I*c*(-(b*c) + a*d)*(-
105*A*b^3*d^2 + 192*a^3*d^2*D - 12*a^2*b*d*(14*C*d + 3*c*D) + a*b^2*(21*c*
C*d + 140*B*d^2 - 6*c^2*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*Ellipt
icF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(105*b^5*d^2*Sqrt[a + b*x^2]*Sq
rt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1422 vs. $2(621) = 1242$.

Time = 2.56 (sec) , antiderivative size = 1422, normalized size of antiderivative = 2.29, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 2009}

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

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A(c+dx^2)^{3/2}}{(a+bx^2)^{3/2}}+\frac{Bx^2(c+dx^2)^{3/2}}{(a+bx^2)^{3/2}}+\frac{Cx^4(c+dx^2)^{3/2}}{(a+bx^2)^{3/2}}+\frac{Dx^6(c+dx^2)^{3/2}}{(a+bx^2)^{3/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{D(dx^2+c)^{3/2}x^5}{b\sqrt{bx^2+a}}+\frac{8dD\sqrt{bx^2+a}\sqrt{dx^2+c}x^5}{7b^2}-\frac{C(dx^2+c)^{3/2}x^3}{b\sqrt{bx^2+a}}+\frac{6Cd\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5b^2}+\frac{(43bc-48ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{35b^3}-\frac{B(dx^2+c)^{3/2}x}{b\sqrt{bx^2+a}}+\frac{4Bd\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3b^2}+\frac{C(7bc-8ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{5b^3}+\frac{(b^2c^2-60abdc+64a^2d^2)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{35b^4d}+\frac{A(bc-ad)\sqrt{dx^2+c}x}{ab\sqrt{bx^2+a}}+\frac{Bd(7bc-8ad)\sqrt{bx^2+a}x}{3b^3\sqrt{dx^2+c}}-\frac{Ad(bc-2ad)\sqrt{bx^2+a}x}{ab^2\sqrt{dx^2+c}}+\frac{C(b^2c^2-16abdc+16a^2d^2)\sqrt{bx^2+a}x}{5b^4\sqrt{dx^2+c}}-\frac{(2b^3c^3+11ab^2dc^2-136a^2bd^2c+128a^3d^3)D\sqrt{bx^2+a}x}{35b^5d\sqrt{dx^2+c}}-\frac{B\sqrt{c}\sqrt{d}(7bc-8ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\sqrt{c}\sqrt{d}(bc-2ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{ab^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C(b^2c^2-16abdc+16a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{5b^4\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}(2b^3c^3+11ab^2dc^2-136a^2bd^2c+128a^3d^3)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{35b^5d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}C(7bc-8ad)\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{5b^3\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Bc^{3/2}(3bc-4ad)\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3ab^2\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}(b^2c^2-60abdc+64a^2d^2)D\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{35b^4d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Ac^{3/2}\sqrt{d}\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{ab\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(a + b*x^2)^(3/2),x]
```

output
```
(B*d*(7*b*c - 8*a*d)*x*Sqrt[a + b*x^2])/(3*b^3*Sqrt[c + d*x^2]) - (A*d*(b*
c - 2*a*d)*x*Sqrt[a + b*x^2])/(a*b^2*Sqrt[c + d*x^2]) + (C*(b^2*c^2 - 16*a
*b*c*d + 16*a^2*d^2)*x*Sqrt[a + b*x^2])/(5*b^4*Sqrt[c + d*x^2]) - ((2*b^3*
c^3 + 11*a*b^2*c^2*d - 136*a^2*b*c*d^2 + 128*a^3*d^3)*D*x*Sqrt[a + b*x^2])
/(35*b^5*d*Sqrt[c + d*x^2]) + (A*(b*c - a*d)*x*Sqrt[c + d*x^2])/(a*b*Sqrt[
a + b*x^2]) + (4*B*d*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*b^2) + (C*(7*b*
c - 8*a*d)*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(5*b^3) + ((b^2*c^2 - 60*a*b
*c*d + 64*a^2*d^2)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(35*b^4*d) + (6*C*
d*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(5*b^2) + ((43*b*c - 48*a*d)*D*x^3*
Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(35*b^3) + (8*d*D*x^5*Sqrt[a + b*x^2]*Sqr
t[c + d*x^2])/(7*b^2) - (B*x*(c + d*x^2)^(3/2))/(b*Sqrt[a + b*x^2]) - (C*x
^3*(c + d*x^2)^(3/2))/(b*Sqrt[a + b*x^2]) - (D*x^5*(c + d*x^2)^(3/2))/(b*S
qrt[a + b*x^2]) - (B*Sqrt[c]*Sqrt[d]*(7*b*c - 8*a*d)*Sqrt[a + b*x^2]*Ellip
ticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^3*Sqrt[(c*(a + b*
x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (A*Sqrt[c]*Sqrt[d]*(b*c - 2*a*d)
*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/
(a*b^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (Sqrt[c]*C
*(b^2*c^2 - 16*a*b*c*d + 16*a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqr
t[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(5*b^4*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a
*(c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c]*(2*b^3*c^3 + 11*a*b^2*c^2*d ...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 1330 vs. $2(580) = 1160$.

Time = 9.47 (sec) , antiderivative size = 1331, normalized size of antiderivative = 2.14

method	result	size
elliptic	Expression too large to display	1331
default	Expression too large to display	2043

input
```
int((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(-(b*d*x^2+b*c
)*(A*a*b^3*d-A*b^4*c-B*a^2*b^2*d+B*a*b^3*c+C*a^3*b*d-C*a^2*b^2*c-D*a^4*d+D
*a^3*b*c)/a/b^5*x/((x^2+a/b)*(b*d*x^2+b*c))^(1/2)+1/7*D/b^2*d*x^5*(b*d*x^4
+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/5*(1/b^2*d*(C*b*d-D*a*d+2*D*b*c)-1/7*D/b^2*d
*(6*a*d+6*b*c))/b/d*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(1/b^3*(B*
b^2*d^2-C*a*b*d^2+2*C*b^2*c*d+D*a^2*d^2-2*D*a*b*c*d+D*b^2*c^2)-5/7*D/b^2*d
*a*c-1/5*(1/b^2*d*(C*b*d-D*a*d+2*D*b*c)-1/7*D/b^2*d*(6*a*d+6*b*c))/b/d*(4*
a*d+4*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(-(A*a*b^3*d^2-2*A*b
^4*c*d-B*a^2*b^2*d^2+2*B*a*b^3*c*d-B*b^4*c^2+C*a^3*b*d^2-2*C*a^2*b^2*c*d+C
*a*b^3*c^2-D*a^4*d^2+2*D*a^3*b*c*d-D*a^2*b^2*c^2)/b^5+(A*a*b^3*d-A*b^4*c-B
*a^2*b^2*d+B*a*b^3*c+C*a^3*b*d-C*a^2*b^2*c-D*a^4*d+D*a^3*b*c)/b^5*(a*d-b*c
)/a+1/b^4*c*(A*a*b^3*d-A*b^4*c-B*a^2*b^2*d+B*a*b^3*c+C*a^3*b*d-C*a^2*b^2*c
-D*a^4*d+D*a^3*b*c)/a-1/3*(1/b^3*(B*b^2*d^2-C*a*b*d^2+2*C*b^2*c*d+D*a^2*d^
2-2*D*a*b*c*d+D*b^2*c^2)-5/7*D/b^2*d*a*c-1/5*(1/b^2*d*(C*b*d-D*a*d+2*D*b*c
)-1/7*D/b^2*d*(6*a*d+6*b*c))/b/d*(4*a*d+4*b*c))/b/d*a*c)/(-b/a)^(1/2)*(1+b
*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*Ellipt
icF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(1/b^4*(A*b^3*d^2-B*a*b^2*d^2
+2*B*b^3*c*d+C*a^2*b*d^2-2*C*a*b^2*c*d+C*b^3*c^2-D*a^3*d^2+2*D*a^2*b*c*d-D
*a*b^2*c^2)+(A*a*b^3*d-A*b^4*c-B*a^2*b^2*d+B*a*b^3*c+C*a^3*b*d-C*a^2*b^2*c
-D*a^4*d+D*a^3*b*c)/b^4*d/a-3/5*(1/b^2*d*(C*b*d-D*a*d+2*D*b*c)-1/7*D/b^...
```

Fricas [A] (verification not implemented)

Time = 0.11 (sec) , antiderivative size = 1057, normalized size of antiderivative = 1.70

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx = \text{Too large to display}$$

input
```
integrate((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorit
hm="fricas")
```

output
```
1/105*(((6*D*a*b^4*c^4 + 3*(11*D*a^2*b^3 - 7*C*a*b^4)*c^3*d - (408*D*a^3*b
^2 - 336*C*a^2*b^3 + 245*B*a*b^4 - 105*A*b^5)*c^2*d^2 + 2*(192*D*a^4*b - 1
68*C*a^3*b^2 + 140*B*a^2*b^3 - 105*A*a*b^4)*c*d^3)*x^3 + (6*D*a^2*b^3*c^4
+ 3*(11*D*a^3*b^2 - 7*C*a^2*b^3)*c^3*d - (408*D*a^4*b - 336*C*a^3*b^2 + 24
5*B*a^2*b^3 - 105*A*a*b^4)*c^2*d^2 + 2*(192*D*a^5 - 168*C*a^4*b + 140*B*a^
3*b^2 - 105*A*a^2*b^3)*c*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sq
rt(-c/d)/x), a*d/(b*c)) - ((6*D*a*b^4*c^4 + 3*(11*D*a^2*b^3 - 7*C*a*b^4)*c
^3*d - (408*D*a^3*b^2 - 3*(112*C + D)*a^2*b^3 + 245*B*a*b^4 - 105*A*b^5)*c
^2*d^2 + (384*D*a^4*b - 12*(28*C + 15*D)*a^3*b^2 + 7*(40*B + 21*C)*a^2*b^3
 - 105*(2*A + B)*a*b^4)*c*d^3 + (192*D*a^4*b - 168*C*a^3*b^2 + 140*B*a^2*b
^3 - 105*A*a*b^4)*d^4)*x^3 + (6*D*a^2*b^3*c^4 + 3*(11*D*a^3*b^2 - 7*C*a^2*
b^3)*c^3*d - (408*D*a^4*b - 3*(112*C + D)*a^3*b^2 + 245*B*a^2*b^3 - 105*A*
a*b^4)*c^2*d^2 + (384*D*a^5 - 12*(28*C + 15*D)*a^4*b + 7*(40*B + 21*C)*a^3
*b^2 - 105*(2*A + B)*a^2*b^3)*c*d^3 + (192*D*a^5 - 168*C*a^4*b + 140*B*a^3
*b^2 - 105*A*a^2*b^3)*d^4)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f(arcsin(sqrt(
-c/d)/x), a*d/(b*c)) + (15*D*a*b^4*d^4*x^8 - 6*D*a^2*b^3*c^3*d + 3*(8*D*a*
b^4*c*d^3 - (8*D*a^2*b^3 - 7*C*a*b^4)*d^4)*x^6 - 3*(11*D*a^3*b^2 - 7*C*a^2
*b^3)*c^2*d^2 + (408*D*a^4*b - 336*C*a^3*b^2 + 245*B*a^2*b^3 - 105*A*a*b^4
)*c*d^3 - 2*(192*D*a^5 - 168*C*a^4*b + 140*B*a^3*b^2 - 105*A*a^2*b^3)*d^4
+ (3*D*a*b^4*c^2*d^2 - 3*(17*D*a^2*b^3 - 14*C*a*b^4)*c*d^3 + (48*D*a^3*...
```

Sympy [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx = \int \frac{(c+dx^2)^{\frac{3}{2}}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x**2+c)**(3/2)*(D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(3/2),x)
```

output
```
Integral((c + d*x**2)**(3/2)*(A + B*x**2 + C*x**4 + D*x**6)/(a + b*x**2)**
(3/2), x)
```

Maxima [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)(dx^2+c)^{\frac{3}{2}}}{(bx^2+a)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(d*x^2 + c)^(3/2)/(b*x^2 + a)^(3/2),
 x)
```

Giac [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)(dx^2+c)^{\frac{3}{2}}}{(bx^2+a)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(d*x^2 + c)^(3/2)/(b*x^2 + a)^(3/2),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx=\int \frac{(d\,x^2+c)^{3/2}\,(A+B\,x^2+C\,x^4+x^6\,D)}{(b\,x^2+a)^{3/2}}\,dx$$

input
```
int(((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(3/2),x)
```

output
```
int(((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(3/2), x)
```

Reduce [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx = \text{too large to display}$$

input

```
int((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x)
```

output

```
( - 144*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**3*c*d**2*x + 96*sqrt(c + d*x*
*2)*sqrt(a + b*x**2)*a**3*d**3*x**3 + 279*sqrt(c + d*x**2)*sqrt(a + b*x**2
)*a**2*b*c**2*d*x - 186*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b*c*d**2*x*
*3 - 48*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*b*d**3*x**5 + 105*sqrt(c +
d*x**2)*sqrt(a + b*x**2)*a*b**3*c*d*x + 70*sqrt(c + d*x**2)*sqrt(a + b*x**
2)*a*b**3*d**2*x**3 - 135*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*c**3*x
+ 90*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*c**2*d*x**3 + 90*sqrt(c + d*
x**2)*sqrt(a + b*x**2)*a*b**2*c*d**2*x**5 + 30*sqrt(c + d*x**2)*sqrt(a + b
*x**2)*a*b**2*d**3*x**7 + 105*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**4*c**2*
x - 384*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2
 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**5*d**4 +
 936*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 +
2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**4*b*c*d**3
- 384*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 +
 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**4*b*d**4*x
**2 - 70*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**
2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**3*b**3*
d**3 - 717*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x
**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**3*b**
2*c**2*d**2 + 936*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c ...
```

3.44 $\int \frac{\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)}{\left(a+bx^2\right)^{3/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 428

$$\int \frac{\sqrt{c+dx^2}\left(A+Bx^2+Cx^4+Dx^6\right)}{\left(a+bx^2\right)^{3/2}}\,dx = \frac{\left(24a^2d^2D-abd(20Cd+7cD)+b^2\left(5cCd+15Bd^2-2c^2D\right)\right)x}{15b^3d^2\sqrt{a+bx^2}}$$

$$+\frac{(5bCd+bcD-6adD)x^3\sqrt{c+dx^2}}{15b^2d\sqrt{a+bx^2}}+\frac{Dx^5\sqrt{c+dx^2}}{5b\sqrt{a+bx^2}}$$

$$+\frac{\left(15Ab^3d^2-48a^3d^2D+8a^2bd(5Cd+cD)-ab^2\left(5cCd+30Bd^2-2c^2D\right)\right)\sqrt{c+dx^2}\,E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\right.}{15\sqrt{a}b^{7/2}d^2\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

$$+\frac{\sqrt{a}\left(15b^2Bd+24a^2dD-ab(20Cd+cD)\right)\sqrt{c+dx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right),1-\frac{ad}{bc}\right)}{15b^{7/2}d\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
1/15*(24*a^2*d^2*D-a*b*d*(20*C*d+7*D*c)+b^2*(15*B*d^2+5*C*c*d-2*D*c^2))*x*
(d*x^2+c)^(1/2)/b^3/d^2/(b*x^2+a)^(1/2)+1/15*(5*C*b*d-6*D*a*d+D*b*c)*x^3*(
d*x^2+c)^(1/2)/b^2/d/(b*x^2+a)^(1/2)+1/5*D*x^5*(d*x^2+c)^(1/2)/b/(b*x^2+a)
^(1/2)+1/15*(15*A*b^3*d^2-48*a^3*d^2*D+8*a^2*b*d*(5*C*d+D*c)-a*b^2*(30*B*d
^2+5*C*c*d-2*D*c^2))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/
a)^(1/2),(1-a*d/b/c)^(1/2))/a^(1/2)/b^(7/2)/d^2/(b*x^2+a)^(1/2)/(a*(d*x^2+
c)/c/(b*x^2+a))^(1/2)+1/15*a^(1/2)*(15*b^2*B*d+24*a^2*d*D-a*b*(20*C*d+D*c)
)*(d*x^2+c)^(1/2)*InverseJacobiAM(arctan(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1
/2))/b^(7/2)/d/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 5.49 (sec) , antiderivative size = 358, normalized size of antiderivative = 0.84

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}\left(\sqrt{\frac{b}{a}}dx(c+dx^2)\left(15Ab^3d+a(-24a^2dD+ab(20Cd+D(c\right.\right.}{}$$

input
```
Integrate[(Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(a + b*x^2)^(3/2),
x]
```

output
```
(Sqrt[b/a]*(Sqrt[b/a]*d*x*(c + d*x^2)*(15*A*b^3*d + a*(-24*a^2*d*D + a*b*(
20*C*d + D*(c - 6*d*x^2)) + b^2*(-15*B*d + x^2*(5*C*d + c*D + 3*d*D*x^2)))
) - I*c*(-15*A*b^3*d^2 + 48*a^3*d^2*D - 8*a^2*b*d*(5*C*d + c*D) + a*b^2*(5
*c*C*d + 30*B*d^2 - 2*c^2*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*Elli
pticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] + I*c*(-15*A*b^3*d^2 + 24*a^3*d
^2*D - a^2*b*d*(20*C*d + 7*c*D) + a*b^2*(5*c*C*d + 15*B*d^2 - 2*c^2*D))*Sq
rt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a
*d)/(b*c)]))/(15*b^4*d^2*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 990 vs. $2(428) = 856$.

Time = 1.69 (sec) , antiderivative size = 990, normalized size of antiderivative = 2.31, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{\sqrt{c+dx^2}\,(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A\sqrt{c+dx^2}}{(a+bx^2)^{3/2}}+\frac{Bx^2\sqrt{c+dx^2}}{(a+bx^2)^{3/2}}+\frac{Cx^4\sqrt{c+dx^2}}{(a+bx^2)^{3/2}}+\frac{Dx^6\sqrt{c+dx^2}}{(a+bx^2)^{3/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{D\sqrt{dx^2+c}x^5}{b\sqrt{bx^2+a}}+\frac{6D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{5b^2}-\frac{C\sqrt{dx^2+c}x^3}{b\sqrt{bx^2+a}}+\frac{4C\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3b^2}+\frac{(bc-24ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15b^3d}-\frac{B\sqrt{dx^2+c}x}{b\sqrt{bx^2+a}}+\frac{2Bd\sqrt{bx^2+a}x}{b^2\sqrt{dx^2+c}}+\frac{C(bc-8ad)\sqrt{bx^2+a}x}{3b^3\sqrt{dx^2+c}}-\frac{2(b^2c^2+4abdc-24a^2d^2)D\sqrt{bx^2+a}x}{15b^4d\sqrt{dx^2+c}}+\frac{A\sqrt{dx^2+c}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{\sqrt{a}\sqrt{b}\sqrt{bx^2+a}\sqrt{\frac{a(dx^2+c)}{c(bx^2+a)}}}-\frac{\sqrt{c}C(bc-8ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^3\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2\sqrt{c}(b^2c^2+4abdc-24a^2d^2)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^4d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2B\sqrt{c}\sqrt{d}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}(bc-24ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15b^3d^{3/2}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Bc^{3/2}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{ab\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{4c^{3/2}C\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3b^2\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(a + b*x^2)^(3/2),x]
```

output
```
(2*B*d*x*Sqrt[a + b*x^2])/(b^2*Sqrt[c + d*x^2]) + (C*(b*c - 8*a*d)*x*Sqrt[
a + b*x^2])/(3*b^3*Sqrt[c + d*x^2]) - (2*(b^2*c^2 + 4*a*b*c*d - 24*a^2*d^2
)*D*x*Sqrt[a + b*x^2])/(15*b^4*d*Sqrt[c + d*x^2]) - (B*x*Sqrt[c + d*x^2])/
(b*Sqrt[a + b*x^2]) - (C*x^3*Sqrt[c + d*x^2])/(b*Sqrt[a + b*x^2]) - (D*x^5
*Sqrt[c + d*x^2])/(b*Sqrt[a + b*x^2]) + (4*C*x*Sqrt[a + b*x^2]*Sqrt[c + d*
x^2])/(3*b^2) + ((b*c - 24*a*d)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(15*b
^3*d) + (6*D*x^3*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(5*b^2) + (A*Sqrt[c + d*
x^2]*EllipticE[ArcTan[(Sqrt[b]*x)/Sqrt[a]], 1 - (a*d)/(b*c)])/(Sqrt[a]*Sqr
t[b]*Sqrt[a + b*x^2]*Sqrt[(a*(c + d*x^2))/(c*(a + b*x^2))]) - (2*B*Sqrt[c]
*Sqrt[d]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/
(a*d)])/(b^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (Sqr
t[c]*C*(b*c - 8*a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]]
, 1 - (b*c)/(a*d)])/(3*b^3*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*S
qrt[c + d*x^2]) + (2*Sqrt[c]*(b^2*c^2 + 4*a*b*c*d - 24*a^2*d^2)*D*Sqrt[a +
 b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*b^4*d
^(3/2)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*c^(3/2)
*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/
(a*b*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (4*c
^(3/2)*C*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/
(a*d)])/(3*b^2*Sqrt[d]*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 5.95 (sec) , antiderivative size = 715, normalized size of antiderivative = 1.67

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(\frac{\left(bd\,x^2+bc\right)\left(b^3A-a\,b^2B+a^2bC-a^3D\right)x}{a\,b^4\sqrt{\left(x^2+\frac{a}{b}\right)\left(bd\,x^2+bc\right)}}+\frac{Dx^3\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{5b^2}+\frac{\left(\frac{Cbd-Dad+Dbc}{b^2}-\frac{D(4ad+4bc)}{5b^2}\right)x\sqrt{bd\,x^4+}}{3bd}\right.}{}$
default	Expression too large to display

input
```
int((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*((b*d*x^2+b*c)
*(A*b^3-B*a*b^2+C*a^2*b-D*a^3)/a/b^4*x/((x^2+a/b)*(b*d*x^2+b*c))^(1/2)+1/5
*D/b^2*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(1/b^2*(C*b*d-D*a*d+D*b
*c)-1/5*D/b^2*(4*a*d+4*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+((A
*b^3*d-B*a*b^2*d+B*b^3*c+C*a^2*b*d-C*a*b^2*c-D*a^3*d+D*a^2*b*c)/b^4-(A*b^3
-B*a*b^2+C*a^2*b-D*a^3)/b^4*(a*d-b*c)/a-1/b^3*c*(A*b^3-B*a*b^2+C*a^2*b-D*a
^3)/a-1/3*(1/b^2*(C*b*d-D*a*d+D*b*c)-1/5*D/b^2*(4*a*d+4*b*c))/b/d*a*c)/(-b
/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c
)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(1/b^3*(B*b^2*d
-C*a*b*d+C*b^2*c+D*a^2*d-D*a*b*c)-(A*b^3-B*a*b^2+C*a^2*b-D*a^3)/b^3*d/a-3/
5*D/b^2*a*c-1/3*(1/b^2*(C*b*d-D*a*d+D*b*c)-1/5*D/b^2*(4*a*d+4*b*c))/b/d*(2
*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a
*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(
1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 670, normalized size of antiderivative = 1.57

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx = \frac{((2\,Dab^3c^3+(8\,Da^2b^2-5\,Cab^3)c^2d-(48\,Da^3b-40\,Ca^2b^2+}{}$$

input
```
integrate((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorit
hm="fricas")
```

output
```
1/15*(((2*D*a*b^3*c^3 + (8*D*a^2*b^2 - 5*C*a*b^3)*c^2*d - (48*D*a^3*b - 40
*C*a^2*b^2 + 30*B*a*b^3 - 15*A*b^4)*c*d^2)*x^3 + (2*D*a^2*b^2*c^3 + (8*D*a
^3*b - 5*C*a^2*b^2)*c^2*d - (48*D*a^4 - 40*C*a^3*b + 30*B*a^2*b^2 - 15*A*a
*b^3)*c*d^2)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/
(b*c)) - ((2*D*a*b^3*c^3 + (8*D*a^2*b^2 - 5*C*a*b^3)*c^2*d - (48*D*a^3*b -
 (40*C + D)*a^2*b^2 + 30*B*a*b^3 - 15*A*b^4)*c*d^2 - (24*D*a^3*b - 20*C*a^
2*b^2 + 15*B*a*b^3)*d^3)*x^3 + (2*D*a^2*b^2*c^3 + (8*D*a^3*b - 5*C*a^2*b^2
)*c^2*d - (48*D*a^4 - (40*C + D)*a^3*b + 30*B*a^2*b^2 - 15*A*a*b^3)*c*d^2
- (24*D*a^4 - 20*C*a^3*b + 15*B*a^2*b^2)*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*elli
ptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) + (3*D*a*b^3*d^3*x^6 - 2*D*a^2*b^2
*c^2*d + (D*a*b^3*c*d^2 - (6*D*a^2*b^2 - 5*C*a*b^3)*d^3)*x^4 - (8*D*a^3*b
- 5*C*a^2*b^2)*c*d^2 + (48*D*a^4 - 40*C*a^3*b + 30*B*a^2*b^2 - 15*A*a*b^3)
*d^3 - (2*D*a*b^3*c^2*d + (7*D*a^2*b^2 - 5*C*a*b^3)*c*d^2 - (24*D*a^3*b -
20*C*a^2*b^2 + 15*B*a*b^3)*d^3)*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/(a*b
^5*d^3*x^3 + a^2*b^4*d^3*x)
```

Sympy [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx = \int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x**2+c)**(1/2)*(D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(3/2),x)
```

output
```
Integral(sqrt(c + d*x**2)*(A + B*x**2 + C*x**4 + D*x**6)/(a + b*x**2)**(3/
2), x)
```

Maxima [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{dx^2+c}}{(bx^2+a)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(d*x^2 + c)/(b*x^2 + a)^(3/2), x
)
```

Giac [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx=\int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{dx^2+c}}{(bx^2+a)^{\frac{3}{2}}}\,dx$$

input
```
integrate((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(d*x^2 + c)/(b*x^2 + a)^(3/2), x
)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx=\int \frac{\sqrt{d\,x^2+c}\,\left(A+B\,x^2+C\,x^4+x^6\,D\right)}{{\left(b\,x^2+a\right)}^{3/2}}\,dx$$

input
```
int(((c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(3/2),x)
```

output
```
int(((c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(3/2), x)
```

Reduce [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{3/2}}\,dx = \text{too large to display}$$

input
```
int((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2),x)
```

output
```
(6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*c*d*x - 4*sqrt(c + d*x**2)*sqrt(
a + b*x**2)*a**2*d**2*x**3 + 5*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*d*
x - 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c**2*x + 4*sqrt(c + d*x**2)*sq
rt(a + b*x**2)*a*b*c*d*x**3 + 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*d**2
*x**5 + 5*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c*x + 16*int((sqrt(c + d*
x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*
d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**4*d**3 - 24*int((sqrt(c + d*x**2
)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x*
*4 + b**2*c*x**4 + b**2*d*x**6),x)*a**3*b*c*d**2 + 16*int((sqrt(c + d*x**2
)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x*
*4 + b**2*c*x**4 + b**2*d*x**6),x)*a**3*b*d**3*x**2 + 5*int((sqrt(c + d*x*
*2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*
x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**2*b**3*d**2 + 8*int((sqrt(c + d*x*
*2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*
x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**2*b**2*c**2*d - 24*int((sqrt(c + d
*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b
*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**2*b**2*c*d**2*x**2 - 5*int((sqr
t(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2
+ 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a*b**4*c*d + 5*int((sqrt(c
+ d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 +...
```

3.45 $\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 383

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx = \frac{(3bCd-2bcD-4adD)x\sqrt{c+dx^2}}{3b^2d^2\sqrt{a+bx^2}}+\frac{Dx^3\sqrt{c+dx^2}}{3bd\sqrt{a+bx^2}}$$
$$+\frac{(3Ab^3d^2-8a^3d^2D+3a^2bd(2Cd+cD)-ab^2(3cCd+3Bd^2-2c^2D))\sqrt{c+dx^2}\,E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{3\sqrt{a}b^{5/2}d^2(bc-ad)\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$
$$+\frac{\sqrt{a}(3b^2d(Bc-Ad)+4a^2cdD-abc(3Cd+cD))\sqrt{c+dx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right),1-\frac{ad}{bc}\right)}{3b^{5/2}cd(bc-ad)\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
1/3*(3*C*b*d-4*D*a*d-2*D*b*c)*x*(d*x^2+c)^(1/2)/b^2/d^2/(b*x^2+a)^(1/2)+1/
3*D*x^3*(d*x^2+c)^(1/2)/b/d/(b*x^2+a)^(1/2)+1/3*(3*A*b^3*d^2-8*a^3*d^2*D+3
*a^2*b*d*(2*C*d+D*c)-a*b^2*(3*B*d^2+3*C*c*d-2*D*c^2))*(d*x^2+c)^(1/2)*Elli
pticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)^(1/2),(1-a*d/b/c)^(1/2))/a^(1/2)/b^(5/
2)/d^2/(-a*d+b*c)/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)+1/3*a^(1
/2)*(3*b^2*d*(-A*d+B*c)+4*a^2*c*d*D-a*b*c*(3*C*d+D*c))*(d*x^2+c)^(1/2)*Inv
erseJacobiAM(arctan(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/b^(5/2)/c/d/(-a*
d+b*c)/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 8.97 (sec) , antiderivative size = 336, normalized size of antiderivative = 0.88

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx = \frac{\sqrt{\frac{b}{a}}\left(\sqrt{\frac{b}{a}}dx(c+dx^2)\left(-3Ab^3d+a(4a^2dD+b^2(3Bd-cDx^2)+ab(-3Cd\right.\right.}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(3/2)*Sqrt[c + d*x^2]),
x]
```

output
```
(Sqrt[b/a]*(Sqrt[b/a]*d*x*(c + d*x^2)*(-3*A*b^3*d + a*(4*a^2*d*D + b^2*(3*
B*d - c*D*x^2) + a*b*(-3*C*d - c*D + d*D*x^2))) + I*c*(-3*A*b^3*d^2 + 8*a^
3*d^2*D - 3*a^2*b*d*(2*C*d + c*D) + a*b^2*(3*c*C*d + 3*B*d^2 - 2*c^2*D))*S
qrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (
a*d)/(b*c)] - I*(-(b*c) + a*d)*(3*A*b^2*d^2 + 4*a^2*c*d*D + a*b*c*(-3*C*d
+ 2*c*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt
[b/a]*x], (a*d)/(b*c)]))/(3*b^3*d^2*(-(b*c) + a*d)*Sqrt[a + b*x^2]*Sqrt[c
+ d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1233 vs. 2(383) = 766.

Time = 1.82 (sec) , antiderivative size = 1233, normalized size of antiderivative = 3.22, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.050, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx$$

$$\Big\downarrow \; 7293$$

$$\int \left(\frac{A}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}+\frac{Bx^2}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}+\frac{Cx^4}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}+\frac{Dx^6}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{aD\sqrt{dx^2+c}x^3}{b(bc-ad)\sqrt{bx^2+a}}+\frac{(bc-4ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3b^2d(bc-ad)}+\frac{Ab\sqrt{dx^2+c}x}{a(bc-ad)\sqrt{bx^2+a}}-\frac{B\sqrt{dx^2+c}x}{(bc-ad)\sqrt{bx^2+a}}+\frac{aC\sqrt{dx^2+c}x}{b(bc-ad)\sqrt{bx^2+a}}-\frac{(2b^2c^2+3abdc-8a^2d^2)D\sqrt{bx^2+a}x}{3b^3d(bc-ad)\sqrt{dx^2+c}}-\frac{Ad\sqrt{bx^2+a}x}{a(bc-ad)\sqrt{dx^2+c}}+\frac{Bd\sqrt{bx^2+a}x}{b(bc-ad)\sqrt{dx^2+c}}+\frac{C(bc-2ad)\sqrt{bx^2+a}x}{b^2(bc-ad)\sqrt{dx^2+c}}+\frac{\sqrt{c}(2b^2c^2+3abdc-8a^2d^2)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^3d^{3/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C(bc-2ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b^2\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\sqrt{c}\sqrt{d}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{a(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{B\sqrt{c}\sqrt{d}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}(bc-4ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3b^2d^{3/2}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{A\sqrt{c}\sqrt{d}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Bc^{3/2}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}C\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{b\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(3/2)*Sqrt[c + d*x^2]),x]
```

output
```
-((A*d*x*Sqrt[a + b*x^2])/(a*(b*c - a*d)*Sqrt[c + d*x^2])) + (B*d*x*Sqrt[a
 + b*x^2])/(b*(b*c - a*d)*Sqrt[c + d*x^2]) + (C*(b*c - 2*a*d)*x*Sqrt[a + b
*x^2])/(b^2*(b*c - a*d)*Sqrt[c + d*x^2]) - ((2*b^2*c^2 + 3*a*b*c*d - 8*a^2
*d^2)*D*x*Sqrt[a + b*x^2])/(3*b^3*d*(b*c - a*d)*Sqrt[c + d*x^2]) + (A*b*x*
Sqrt[c + d*x^2])/(a*(b*c - a*d)*Sqrt[a + b*x^2]) - (B*x*Sqrt[c + d*x^2])/(
(b*c - a*d)*Sqrt[a + b*x^2]) + (a*C*x*Sqrt[c + d*x^2])/(b*(b*c - a*d)*Sqrt
[a + b*x^2]) + (a*D*x^3*Sqrt[c + d*x^2])/(b*(b*c - a*d)*Sqrt[a + b*x^2]) +
 ((b*c - 4*a*d)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*b^2*d*(b*c - a*d))
 + (A*Sqrt[c]*Sqrt[d]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]
], 1 - (b*c)/(a*d)])/(a*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*
Sqrt[c + d*x^2]) - (B*Sqrt[c]*Sqrt[d]*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sq
rt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(b*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(
a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (Sqrt[c]*C*(b*c - 2*a*d)*Sqrt[a + b*x^2
]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(b^2*Sqrt[d]*(b
*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c
]*(2*b^2*c^2 + 3*a*b*c*d - 8*a^2*d^2)*D*Sqrt[a + b*x^2]*EllipticE[ArcTan[(
Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^3*d^(3/2)*(b*c - a*d)*Sqrt[(c*
(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*c^(3/2)*Sqrt[a + b*x^2
]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*Sqrt[d]*(b*c
 - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (c^(3/...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 6.62 (sec) , antiderivative size = 538, normalized size of antiderivative = 1.40

method	result
elliptic	$\frac{\sqrt{(b x^2+a)(x^2 d+c)}\left(-\frac{(bd x^2+bc)x(b^3A-a b^2B+a^2bC-a^3D)}{b^3a(ad-bc)\sqrt{\left(x^2+\frac{a}{b}\right)(bd x^2+bc)}}+\frac{Dx\sqrt{bd x^4+ad x^2+x^2bc+ac}}{3d b^2}+\frac{\left(\frac{B b^2-Cab+Da^2}{b^3}+\frac{b^3A-a b^2B+a^2bC-a^3}{b^3a}\right.}{}\right.}{}$
default	Expression too large to display

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(1/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(-(b*d*x^2+b*c
)/b^3/a/(a*d-b*c)*x*(A*b^3-B*a*b^2+C*a^2*b-D*a^3)/((x^2+a/b)*(b*d*x^2+b*c)
)^(1/2)+1/3*D/d/b^2*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+((B*b^2-C*a*b+D*
a^2)/b^3+(A*b^3-B*a*b^2+C*a^2*b-D*a^3)/b^3/a+1/b^2*c/a/(a*d-b*c)*(A*b^3-B*
a*b^2+C*a^2*b-D*a^3)-1/3*D/d/b^2*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*
x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),
(-1+(a*d+b*c)/c/b)^(1/2))-(1/b^2*(C*b-D*a)+1/b^2*d*(A*b^3-B*a*b^2+C*a^2*b-
D*a^3)/(a*d-b*c)/a-1/3*D/d/b^2*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(
1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*
(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b
*c)/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 716 vs. $2(354) = 708$.

Time = 0.10 (sec) , antiderivative size = 716, normalized size of antiderivative = 1.87

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx = \frac{((2\,Dab^3c^4+3\,(Da^2b^2-Cab^3)c^3d-(8\,Da^3b-6\,Ca^2b^2+3\,Bab^3-3\,Ab^4}{}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(1/2),x, algorit
hm="fricas")
```

output
```
1/3*(((2*D*a*b^3*c^4 + 3*(D*a^2*b^2 - C*a*b^3)*c^3*d - (8*D*a^3*b - 6*C*a^
2*b^2 + 3*B*a*b^3 - 3*A*b^4)*c^2*d^2)*x^3 + (2*D*a^2*b^2*c^4 + 3*(D*a^3*b
- C*a^2*b^2)*c^3*d - (8*D*a^4 - 6*C*a^3*b + 3*B*a^2*b^2 - 3*A*a*b^3)*c^2*d
^2)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) -
((2*D*a*b^3*c^4 + 3*A*a*b^3*d^4 + 3*(D*a^2*b^2 - C*a*b^3)*c^3*d - (8*D*a^3
*b - (6*C + D)*a^2*b^2 + 3*B*a*b^3 - 3*A*b^4)*c^2*d^2 - (4*D*a^3*b - 3*C*a
^2*b^2 + 3*B*a*b^3)*c*d^3)*x^3 + (2*D*a^2*b^2*c^4 + 3*A*a^2*b^2*d^4 + 3*(D
*a^3*b - C*a^2*b^2)*c^3*d - (8*D*a^4 - (6*C + D)*a^3*b + 3*B*a^2*b^2 - 3*A
*a*b^3)*c^2*d^2 - (4*D*a^4 - 3*C*a^3*b + 3*B*a^2*b^2)*c*d^3)*x)*sqrt(b*d)*
sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (2*D*a^2*b^2*c^3*
d + 3*(D*a^3*b - C*a^2*b^2)*c^2*d^2 - (8*D*a^4 - 6*C*a^3*b + 3*B*a^2*b^2 -
 3*A*a*b^3)*c*d^3 - (D*a*b^3*c^2*d^2 - D*a^2*b^2*c*d^3)*x^4 + (2*D*a*b^3*c
^3*d + (2*D*a^2*b^2 - 3*C*a*b^3)*c^2*d^2 - (4*D*a^3*b - 3*C*a^2*b^2)*c*d^3
)*x^2)*sqrt(b*x^2 + a)*sqrt(d*x^2 + c))/((a*b^5*c^2*d^3 - a^2*b^4*c*d^4)*x
^3 + (a^2*b^4*c^2*d^3 - a^3*b^3*c*d^4)*x)
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx=\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{\frac{3}{2}}\sqrt{c+dx^2}}\,dx$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(3/2)/(d*x**2+c)**(1/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4 + D*x**6)/((a + b*x**2)**(3/2)*sqrt(c + d*x*
*2)), x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}\sqrt{dx^2+c}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(1/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*sqrt(d*x^2 + c)),
 x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx = \int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}\sqrt{dx^2+c}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(1/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*sqrt(d*x^2 + c)),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\sqrt{c+dx^2}}\,dx = \int \frac{A+B\,x^2+C\,x^4+x^6\,D}{(b\,x^2+a)^{3/2}\,\sqrt{d\,x^2+c}}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(3/2)*(c + d*x^2)^(1/2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(3/2)*(c + d*x^2)^(1/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\left(a+bx^2\right)^{3/2}\sqrt{c+dx^2}}\,dx=\text{Too large to display}$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(1/2),x)
```

output
```
( - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*c*x + 2*sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*a*d*x**3 + 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*x - 8*int((s
qrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**
2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**3*d**2 + 5*int((sqrt(c
 + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2
*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**2*b*c*d - 8*int((sqrt(c + d
*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b
*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a**2*b*d**2*x**2 - 3*int((sqrt(c +
 d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a
*b*d*x**4 + b**2*c*x**4 + b**2*d*x**6),x)*a*b**3*d + 5*int((sqrt(c + d*x**
2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x
**4 + b**2*c*x**4 + b**2*d*x**6),x)*a*b**2*c*d*x**2 - 3*int((sqrt(c + d*x*
*2)*sqrt(a + b*x**2)*x**4)/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*
x**4 + b**2*c*x**4 + b**2*d*x**6),x)*b**4*d*x**2 + 6*int((sqrt(c + d*x**2)
*sqrt(a + b*x**2))/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b
**2*c*x**4 + b**2*d*x**6),x)*a**3*b*d + 3*int((sqrt(c + d*x**2)*sqrt(a + b
*x**2))/(a**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4
+ b**2*d*x**6),x)*a**3*c**2 - 3*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a
**2*c + a**2*d*x**2 + 2*a*b*c*x**2 + 2*a*b*d*x**4 + b**2*c*x**4 + b**2*d*x
**6),x)*a**2*b**2*c + 6*int((sqrt(c + d*x**2)*sqrt(a + b*x**2))/(a**2*c...
```

3.46 $\int \frac{A+Bx^2+Cx^4+Dx^6}{\left(a+bx^2\right)^{3/2}\left(c+dx^2\right)^{3/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 405

$$\begin{aligned}\int \frac{A+Bx^2+Cx^4+Dx^6}{\left(a+bx^2\right)^{3/2}\left(c+dx^2\right)^{3/2}}\,dx &= \frac{\left(Ab^3-a\left(b^2B-abC+a^2D\right)\right)x}{ab^2(bc-ad)\sqrt{a+bx^2}\sqrt{c+dx^2}}+\frac{Dx\sqrt{a+bx^2}}{b^2d\sqrt{c+dx^2}} \\ &+ \frac{\left(Ab^3cd^2-2a^3cd^2D+a^2bcd(Cd+2cD)+ab^2\left(c^2Cd-2Bcd^2+Ad^3-2c^3D\right)\right)\sqrt{a+bx^2}\,E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)\right.}{ab^2\sqrt{c}d^{3/2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}} \\ &+ \frac{\sqrt{c}\left(b^2d(Bc-2Ad)+a^2cdD-ab\left(2cCd-Bd^2-c^2D\right)\right)\sqrt{a+bx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{abd^{3/2}(bc-ad)^2\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}\end{aligned}$$

output
```
(A*b^3-a*(B*b^2-C*a*b+D*a^2))*x/a/b^2/(-a*d+b*c)/(b*x^2+a)^(1/2)/(d*x^2+c)
^(1/2)+D*x*(b*x^2+a)^(1/2)/b^2/d/(d*x^2+c)^(1/2)+(A*b^3*c*d^2-2*a^3*c*d^2*
D+a^2*b*c*d*(C*d+2*D*c)+a*b^2*(A*d^3-2*B*c*d^2+C*c^2*d-2*D*c^3))*(b*x^2+a)
^(1/2)*EllipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/a/
b^2/c^(1/2)/d^(3/2)/(-a*d+b*c)^2/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)
^(1/2)+c^(1/2)*(b^2*d*(-2*A*d+B*c)+a^2*c*d*D-a*b*(-B*d^2+2*C*c*d-D*c^2))*(
b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),(1-b*c/a/d)^(1/2)
)/a/b/d^(3/2)/(-a*d+b*c)^2/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 11.62 (sec) , antiderivative size = 402, normalized size of antiderivative = 0.99

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(Abd(a^2d^2+abd^2x^2+b^2c(c+dx^2))-ac(a^2dD(c+dx^2)+ab(-2c$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)
),x]
```

output
```
(Sqrt[b/a]*d*x*(A*b*d*(a^2*d^2 + a*b*d^2*x^2 + b^2*c*(c + d*x^2)) - a*c*(a
^2*d*D*(c + d*x^2) + a*b*(-2*c*C*d + c^2*D + d^2*(B - C*x^2)) + b^2*(c*(-(
C*d) + c*D)*x^2 + B*d*(c + 2*d*x^2)))) - I*c*(-(A*b^3*c*d^2) + 2*a^3*c*d^2
*D - a^2*b*c*d*(C*d + 2*c*D) + a*b^2*(-(c^2*C*d) + 2*B*c*d^2 - A*d^3 + 2*c
^3*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/
a]*x], (a*d)/(b*c)] + I*c*(-(b*c) + a*d)*(A*b^2*d^2 + a^2*c*d*D + a*b*(c*C
*d - B*d^2 - 2*c^2*D))*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I
*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)])/(a^2*(b/a)^(3/2)*c*d^2*(b*c - a*d)^2*
Sqrt[a + b*x^2]*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1101 vs. 2(405) = 810.

Time = 1.82 (sec) , antiderivative size = 1101, normalized size of antiderivative = 2.72, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx$$

$$\Big\downarrow \; 7293$$

$$\int \left(\frac{A}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}+\frac{Bx^2}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}+\frac{Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}+\frac{Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{3}}\right.$$

$$\Big\downarrow \; 2009$$

$$\frac{aDx^3}{b(bc-ad)\sqrt{bx^2+a}\sqrt{dx^2+c}}-\frac{c(bc+ad)D\sqrt{bx^2+a}x}{bd(bc-ad)^2\sqrt{dx^2+c}}+\frac{2\left(b^2c^2-abdc+a^2d^2\right)D\sqrt{bx^2+a}x}{b^2d(bc-ad)^2\sqrt{dx^2+c}}+\frac{Abx}{a(bc-ad)\sqrt{bx^2+a}\sqrt{dx^2+c}}-\frac{Bx}{(bc-ad)\sqrt{bx^2+a}\sqrt{dx^2+c}}+\frac{aCx}{b(bc-ad)\sqrt{bx^2+a}\sqrt{dx^2+c}}+\frac{A\sqrt{d}(bc+ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{a\sqrt{c}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}C(bc+ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2\sqrt{c}\left(b^2c^2-abdc+a^2d^2\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{b^2d^{3/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2B\sqrt{c}\sqrt{d}\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{B\sqrt{c}(bc+ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}(bc+ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{bd^{3/2}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2Ab\sqrt{c}\sqrt{d}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{a(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2c^{3/2}C\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)),x]
```

output
```
(A*b*x)/(a*(b*c - a*d)*Sqrt[a + b*x^2]*Sqrt[c + d*x^2]) - (B*x)/((b*c - a*
d)*Sqrt[a + b*x^2]*Sqrt[c + d*x^2]) + (a*C*x)/(b*(b*c - a*d)*Sqrt[a + b*x^
2]*Sqrt[c + d*x^2]) + (a*D*x^3)/(b*(b*c - a*d)*Sqrt[a + b*x^2]*Sqrt[c + d*
x^2]) - (c*(b*c + a*d)*D*x*Sqrt[a + b*x^2])/(b*d*(b*c - a*d)^2*Sqrt[c + d*
x^2]) + (2*(b^2*c^2 - a*b*c*d + a^2*d^2)*D*x*Sqrt[a + b*x^2])/(b^2*d*(b*c
- a*d)^2*Sqrt[c + d*x^2]) - (2*B*Sqrt[c]*Sqrt[d]*Sqrt[a + b*x^2]*EllipticE
[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/((b*c - a*d)^2*Sqrt[(c*(a
+ b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c]*C*(b*c + a*d)*Sqrt[
a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(b*Sqr
t[d]*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2])
+ (A*Sqrt[d]*(b*c + a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt
[c]], 1 - (b*c)/(a*d)])/(a*Sqrt[c]*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(
c + d*x^2))]*Sqrt[c + d*x^2]) - (2*Sqrt[c]*(b^2*c^2 - a*b*c*d + a^2*d^2)*D
*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/
(b^2*d^(3/2)*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c +
d*x^2]) - (2*c^(3/2)*C*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c
]], 1 - (b*c)/(a*d)])/(Sqrt[d]*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c +
d*x^2))]*Sqrt[c + d*x^2]) - (2*A*b*Sqrt[c]*Sqrt[d]*Sqrt[a + b*x^2]*Ellipti
cF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(a*(b*c - a*d)^2*Sqrt[(c
*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*Sqrt[c]*(b*c + a*d...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 797 vs. $2(384) = 768$.

Time = 8.47 (sec) , antiderivative size = 798, normalized size of antiderivative = 1.97

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(-\frac{2bd\left(-\frac{\left(Aa\,b^2d^3+A\,b^3c\,d^2-2Ba\,b^2c\,d^2+a^2bcC\,d^2+Ca\,b^2c^2d-a^3c\,d^2D-Da\,b^2c^3\right)x^3}{2b^2d^2ac\left(a^2d^2-2abcd+b^2c^2\right)}-\frac{\left(A\,a^2b\,d^3+A\,b^3c^2d-B\,a^2bc\,d^2 \ldots\right.}{2b^2d^2 \ldots}\right.}{\sqrt{\left(x^4+\frac{(ad+bc)x^2}{db}+\frac{ac}{db}\right)bd}} \ldots\right.}{\ldots}$
default	Expression too large to display

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(-2*b*d*(-1/2/
b^2/d^2*(A*a*b^2*d^3+A*b^3*c*d^2-2*B*a*b^2*c*d^2+C*a^2*b*c*d^2+C*a*b^2*c^2
*d-D*a^3*c*d^2-D*a*b^2*c^3)/a/c/(a^2*d^2-2*a*b*c*d+b^2*c^2)*x^3-1/2/b^2/d^
2*(A*a^2*b*d^3+A*b^3*c^2*d-B*a^2*b*c*d^2-B*a*b^2*c^2*d+2*C*a^2*b*c^2*d-D*a
^3*c^2*d-D*a^2*b*c^3)/a/c/(a^2*d^2-2*a*b*c*d+b^2*c^2)*x)/((x^4+(a*d+b*c)/d
/b*x^2+a*c/d/b)*b*d)^(1/2)+((C*b*d-D*a*d-D*b*c)/b^2/d^2+1/b^2/d^2*(A*b^2*d
^2-C*a*b*c*d+D*a^2*c*d+D*a*b*c^2)/a/c-1/b/d*(A*a^2*b*d^3+A*b^3*c^2*d-B*a^2
*b*c*d^2-B*a*b^2*c^2*d+2*C*a^2*b*c^2*d-D*a^3*c^2*d-D*a^2*b*c^3)/a/c/(a^2*d
^2-2*a*b*c*d+b^2*c^2))/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b
*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c
/b)^(1/2))-(D/b/d-1/b/d*(A*a*b^2*d^3+A*b^3*c*d^2-2*B*a*b^2*c*d^2+C*a^2*b*c
*d^2+C*a*b^2*c^2*d-D*a^3*c*d^2-D*a*b^2*c^3)/a/c/(a^2*d^2-2*a*b*c*d+b^2*c^2
))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c
*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-Elli
pticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1185 vs. $2(386) = 772$.

Time = 0.12 (sec) , antiderivative size = 1185, normalized size of antiderivative = 2.93

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{(a + bx^2)^{3/2}\,(c + dx^2)^{3/2}}\,dx = \text{Too large to display}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x, algorit
hm="fricas")
```

output
```
-(((2*D*a*b^3*c^4*d - A*a*b^3*c*d^4 - (2*D*a^2*b^2 + C*a*b^3)*c^3*d^2 + (2
*D*a^3*b - C*a^2*b^2 + 2*B*a*b^3 - A*b^4)*c^2*d^3)*x^5 + (2*D*a*b^3*c^5 -
C*a*b^3*c^4*d - A*a^2*b^2*c*d^4 - (2*C*a^2*b^2 - 2*B*a*b^3 + A*b^4)*c^3*d^
2 + (2*D*a^4 - C*a^3*b + 2*B*a^2*b^2 - 2*A*a*b^3)*c^2*d^3)*x^3 + (2*D*a^2*
b^2*c^5 - A*a^2*b^2*c^2*d^3 - (2*D*a^3*b + C*a^2*b^2)*c^4*d + (2*D*a^4 - C
*a^3*b + 2*B*a^2*b^2 - A*a*b^3)*c^3*d^2)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_
e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((2*D*a*b^3*c^4*d - (2*D*a^2*b^2 + C*
a*b^3)*c^3*d^2 + (2*D*a^3*b - (C - D)*a^2*b^2 + 2*B*a*b^3 - A*b^4)*c^2*d^3
 + (D*a^3*b - 2*C*a^2*b^2 - (A - B)*a*b^3)*c*d^4 + (B*a^2*b^2 - 2*A*a*b^3)
*d^5)*x^5 + (2*D*a*b^3*c^5 - C*a*b^3*c^4*d - ((2*C - D)*a^2*b^2 - 2*B*a*b^
3 + A*b^4)*c^3*d^2 + (2*D*a^4 - (C - 2*D)*a^3*b + 2*(B - C)*a^2*b^2 - (2*A
 - B)*a*b^3)*c^2*d^3 + (D*a^4 - 2*C*a^3*b - (A - 2*B)*a^2*b^2 - 2*A*a*b^3)
*c*d^4 + (B*a^3*b - 2*A*a^2*b^2)*d^5)*x^3 + (2*D*a^2*b^2*c^5 - (2*D*a^3*b
+ C*a^2*b^2)*c^4*d + (2*D*a^4 - (C - D)*a^3*b + 2*B*a^2*b^2 - A*a*b^3)*c^3
*d^2 + (D*a^4 - 2*C*a^3*b - (A - B)*a^2*b^2)*c^2*d^3 + (B*a^3*b - 2*A*a^2*
b^2)*c*d^4)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x), a*d/(
b*c)) - (2*D*a^2*b^2*c^4*d - A*a^2*b^2*c*d^4 - (2*D*a^3*b + C*a^2*b^2)*c^3
*d^2 + (2*D*a^4 - C*a^3*b + 2*B*a^2*b^2 - A*a*b^3)*c^2*d^3 + (D*a*b^3*c^3*
d^2 - 2*D*a^2*b^2*c^2*d^3 + D*a^3*b*c*d^4)*x^4 + (2*D*a*b^3*c^4*d - (D*a^2
*b^2 + C*a*b^3)*c^3*d^2 - (D*a^3*b - B*a*b^3)*c^2*d^3 + (2*D*a^4 - C*a^...
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx=\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{\frac{3}{2}}(c+dx^2)^{\frac{3}{2}}}\,dx$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(3/2)/(d*x**2+c)**(3/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4 + D*x**6)/((a + b*x**2)**(3/2)*(c + d*x**2)*
*(3/2)), x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*(d*x^2 + c)^(3/2)
), x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*(d*x^2 + c)^(3/2)
), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx=\int \frac{A+B\,x^2+C\,x^4+x^6\,D}{(b\,x^2+a)^{3/2}\,(d\,x^2+c)^{3/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{3/2}}\,dx=\text{too large to display}$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(3/2),x)
```

output
```
(2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*d*x + sqrt(c + d*x**2)*sqrt(a + b*x
**2)*b*c*x + sqrt(c + d*x**2)*sqrt(a + b*x**2)*b*d*x**3 - 3*int((sqrt(c +
d*x**2)*sqrt(a + b*x**2)*x**2)/(a**2*c**2 + 2*a**2*c*d*x**2 + a**2*d**2*x*
*4 + 2*a*b*c**2*x**2 + 4*a*b*c*d*x**4 + 2*a*b*d**2*x**6 + b**2*c**2*x**4 +
 2*b**2*c*d*x**6 + b**2*d**2*x**8),x)*a**2*b*c**2*d - 3*int((sqrt(c + d*x*
*2)*sqrt(a + b*x**2)*x**2)/(a**2*c**2 + 2*a**2*c*d*x**2 + a**2*d**2*x**4 +
 2*a*b*c**2*x**2 + 4*a*b*c*d*x**4 + 2*a*b*d**2*x**6 + b**2*c**2*x**4 + 2*b
**2*c*d*x**6 + b**2*d**2*x**8),x)*a**2*b*c*d**2*x**2 + int((sqrt(c + d*x**
2)*sqrt(a + b*x**2)*x**2)/(a**2*c**2 + 2*a**2*c*d*x**2 + a**2*d**2*x**4 +
2*a*b*c**2*x**2 + 4*a*b*c*d*x**4 + 2*a*b*d**2*x**6 + b**2*c**2*x**4 + 2*b*
*2*c*d*x**6 + b**2*d**2*x**8),x)*a*b**3*c*d + int((sqrt(c + d*x**2)*sqrt(a
 + b*x**2)*x**2)/(a**2*c**2 + 2*a**2*c*d*x**2 + a**2*d**2*x**4 + 2*a*b*c**
2*x**2 + 4*a*b*c*d*x**4 + 2*a*b*d**2*x**6 + b**2*c**2*x**4 + 2*b**2*c*d*x*
*6 + b**2*d**2*x**8),x)*a*b**3*d**2*x**2 - 3*int((sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*x**2)/(a**2*c**2 + 2*a**2*c*d*x**2 + a**2*d**2*x**4 + 2*a*b*c**2
*x**2 + 4*a*b*c*d*x**4 + 2*a*b*d**2*x**6 + b**2*c**2*x**4 + 2*b**2*c*d*x**
6 + b**2*d**2*x**8),x)*a*b**2*c**2*d*x**2 - 3*int((sqrt(c + d*x**2)*sqrt(a
 + b*x**2)*x**2)/(a**2*c**2 + 2*a**2*c*d*x**2 + a**2*d**2*x**4 + 2*a*b*c**
2*x**2 + 4*a*b*c*d*x**4 + 2*a*b*d**2*x**6 + b**2*c**2*x**4 + 2*b**2*c*d*x*
*6 + b**2*d**2*x**8),x)*a*b**2*c*d**2*x**4 + int((sqrt(c + d*x**2)*sqrt...
```

3.47 $\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 531

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx = \frac{(Ab^3-a(b^2B-abC+a^2D))\,x}{ab^2(bc-ad)\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}$$

$$+\frac{(3Ab^3cd^2+3a^2bcCd^2-3a^3cd^2D+ab^2(c^2Cd-4Bcd^2+Ad^3-c^3D))\,x\sqrt{a+bx^2}}{3ab^2cd(bc-ad)^2\,(c+dx^2)^{3/2}}$$

$$+\frac{(3Ab^3c^2d^2-3a^3c^2d^2D+a^2bd(7c^2Cd-Bcd^2-2Ad^3-7c^3D)+ab^2c(c^2Cd-7Bcd^2+7Ad^3+2c^3D))\,\sqrt{}}{3abc^{3/2}d^{3/2}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

$$+\frac{(3b^2cd(Bc-3Ad)-3a^2cd(Cd-3cD)-ab(5c^2Cd-5Bcd^2-Ad^3+c^3D))\,\sqrt{a+bx^2}\,\text{EllipticF}\Big(\arctan}{3a\sqrt{c}d^{3/2}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
(A*b^3-a*(B*b^2-C*a*b+D*a^2))*x/a/b^2/(-a*d+b*c)/(b*x^2+a)^(1/2)/(d*x^2+c)
^(3/2)+1/3*(3*A*b^3*c*d^2+3*a^2*b*c*C*d^2-3*a^3*c*d^2*D+a*b^2*(A*d^3-4*B*c
*d^2+C*c^2*d-D*c^3))*x*(b*x^2+a)^(1/2)/a/b^2/c/d/(-a*d+b*c)^2/(d*x^2+c)^(3
/2)+1/3*(3*A*b^3*c^2*d^2-3*a^3*c^2*d^2*D+a^2*b*d*(-2*A*d^3-B*c*d^2+7*C*c^2
*d-7*D*c^3)+a*b^2*c*(7*A*d^3-7*B*c*d^2+C*c^2*d+2*D*c^3))*(b*x^2+a)^(1/2)*E
llipticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/a/b/c^(3/2
)/d^(3/2)/(-a*d+b*c)^3/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)+1/3
*(3*b^2*c*d*(-3*A*d+B*c)-3*a^2*c*d*(C*d-3*D*c)-a*b*(-A*d^3-5*B*c*d^2+5*C*c
^2*d+D*c^3))*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/2)*x/c^(1/2)),(1-
b*c/a/d)^(1/2))/a/c^(1/2)/d^(3/2)/(-a*d+b*c)^3/(c*(b*x^2+a)/a/(d*x^2+c))^(
1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 13.29 (sec) , antiderivative size = 640, normalized size of antiderivative = 1.21

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\,(c+dx^2)^{5/2}}\,dx = \frac{\sqrt{\frac{b}{a}}\left(\sqrt{\frac{b}{a}}dx\left(-Ad\left(3b^3c^2(c+dx^2)^2-a^3d^3(3c+2dx^2)+ab^2cd^2x^2(8c+7\right.\right.\right.}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(3/2)*(c + d*x^2)^(5/2)
),x]
```

output
```
(Sqrt[b/a]*(Sqrt[b/a]*d*x*(-(A*d*(3*b^3*c^2*(c + d*x^2)^2 - a^3*d^3*(3*c +
 2*d*x^2) + a*b^2*c*d^2*x^2*(8*c + 7*d*x^2) + 2*a^2*b*d^2*(4*c^2 + 2*c*d*x
^2 - d^2*x^4))) + a*c*(a^2*d*(9*c^3*D + B*d^3*x^2 + c*d^2*x^2*(-4*C + 3*D*
x^2) + c^2*(-3*C*d + 13*d*D*x^2)) + a*b*(-(c^4*D) + B*d^4*x^4 + c*d^3*x^2*
(4*B - 7*C*x^2) + c^3*(-5*C*d + 4*d*D*x^2) + c^2*d^2*(5*B - 10*C*x^2 + 7*D
*x^4)) + b^2*c*(B*d*(3*c^2 + 11*c*d*x^2 + 7*d^2*x^4) - c*x^2*(c^2*D + C*d^
2*x^2 + 2*c*d*(C + D*x^2))))) + I*c*(-3*A*b^3*c^2*d^2 + 3*a^3*c^2*d^2*D -
a*b^2*c*(c^2*C*d - 7*B*c*d^2 + 7*A*d^3 + 2*c^3*D) + a^2*b*d*(-7*c^2*C*d +
B*c*d^2 + 2*A*d^3 + 7*c^3*D))*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)*Sqrt[1 + (d*
x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] + I*c*(-(b*c) + a*d
)*(-3*A*b^2*c*d^2 + 3*a^2*c*d*(-(C*d) + 2*c*D) - a*b*(c^2*C*d - 4*B*c*d^2
+ A*d^3 + 2*c^3*D))*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)*Sqrt[1 + (d*x^2)/c]*El
lipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(3*b*c^2*d^2*(-(b*c) + a*d)
^3*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1245 vs. 2(531) = 1062.

Time = 2.08 (sec) , antiderivative size = 1245, normalized size of antiderivative = 2.34, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.050, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}+\frac{Bx^2}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}+\frac{Cx^4}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}+\frac{Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{5}}\right.$$

$$\Big\downarrow \text{2009}$$

$$\frac{aDx^3}{b(bc-ad)\sqrt{bx^2+a}\,(dx^2+c)^{3/2}}+\frac{Ad(3bc+ad)\sqrt{bx^2+a}x}{3ac(bc-ad)^2\,(dx^2+c)^{3/2}}+\frac{C(bc+3ad)\sqrt{bx^2+a}x}{3b(bc-ad)^2\,(dx^2+c)^{3/2}}-\frac{c(bc+3ad)D\sqrt{bx^2+a}x}{3bd(bc-ad)^2\,(dx^2+c)^{3/2}}-\frac{4Bd\sqrt{bx^2+a}x}{3(bc-ad)^2\,(dx^2+c)^{3/2}}+\frac{Abx}{a(bc-ad)\sqrt{bx^2+a}\,(dx^2+c)^{3/2}}-\frac{Bx}{(bc-ad)\sqrt{bx^2+a}\,(dx^2+c)^{3/2}}+\frac{aCx}{b(bc-ad)\sqrt{bx^2+a}\,(dx^2+c)^{3/2}}-\frac{B\sqrt{d}(7bc+ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3\sqrt{c}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}C(bc+7ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\sqrt{d}(3b^2c^2+7abdc-2a^2d^2)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3ac^{3/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}(2b^2c^2-7abdc-3a^2d^2)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3bd^{3/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Ab\sqrt{d}(9bc-ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a\sqrt{c}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C(5bc+3ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{bB\sqrt{c}(3bc+5ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}(bc-9ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3d^{3/2}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(3/2)*(c + d*x^2)^(5/2)),x]
```

output
```
(A*b*x)/(a*(b*c - a*d)*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)) - (B*x)/((b*c -
a*d)*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)) + (a*C*x)/(b*(b*c - a*d)*Sqrt[a +
b*x^2]*(c + d*x^2)^(3/2)) + (a*D*x^3)/(b*(b*c - a*d)*Sqrt[a + b*x^2]*(c +
d*x^2)^(3/2)) - (4*B*d*x*Sqrt[a + b*x^2])/(3*(b*c - a*d)^2*(c + d*x^2)^(3/
2)) + (A*d*(3*b*c + a*d)*x*Sqrt[a + b*x^2])/(3*a*c*(b*c - a*d)^2*(c + d*x^
2)^(3/2)) + (C*(b*c + 3*a*d)*x*Sqrt[a + b*x^2])/(3*b*(b*c - a*d)^2*(c + d*
x^2)^(3/2)) - (c*(b*c + 3*a*d)*D*x*Sqrt[a + b*x^2])/(3*b*d*(b*c - a*d)^2*(
c + d*x^2)^(3/2)) - (B*Sqrt[d]*(7*b*c + a*d)*Sqrt[a + b*x^2]*EllipticE[Arc
Tan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*Sqrt[c]*(b*c - a*d)^3*Sqrt[
(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c]*C*(b*c + 7*a*
d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)]
)/(3*Sqrt[d]*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c +
d*x^2]) + (A*Sqrt[d]*(3*b^2*c^2 + 7*a*b*c*d - 2*a^2*d^2)*Sqrt[a + b*x^2]*E
llipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*a*c^(3/2)*(b*c
- a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (Sqrt[c]
*(2*b^2*c^2 - 7*a*b*c*d - 3*a^2*d^2)*D*Sqrt[a + b*x^2]*EllipticE[ArcTan[(S
qrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b*d^(3/2)*(b*c - a*d)^3*Sqrt[(c*(
a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (A*b*Sqrt[d]*(9*b*c - a*d)
*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/
(3*a*Sqrt[c]*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 11.08 (sec) , antiderivative size = 949, normalized size of antiderivative = 1.79

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(-\frac{\left(bd\,x^2+bc\right)x\left(b^3A-a\,b^2B+a^2bC-a^3D\right)}{ba(ad-bc)^3\sqrt{\left(x^2+\frac{a}{b}\right)\left(bd\,x^2+bc\right)}}+\frac{x\left(A\,d^3-Bc\,d^2+C\,c^2d-Dc^3\right)\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{3c\,d^3(ad-bc)^2\left(x^2+\frac{c}{d}\right)^2}+\frac{\left(bd\,x^2+ad\right)x\left(2Ac\right.}{}\right.}{}$
default	Expression too large to display

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(5/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(-(b*d*x^2+b*c
)/b/a/(a*d-b*c)^3*x*(A*b^3-B*a*b^2+C*a^2*b-D*a^3)/((x^2+a/b)*(b*d*x^2+b*c)
)^(1/2)+1/3/c/d^3/(a*d-b*c)^2*x*(A*d^3-B*c*d^2+C*c^2*d-D*c^3)*(b*d*x^4+a*d
*x^2+b*c*x^2+a*c)^(1/2)/(x^2+c/d)^2+1/3*(b*d*x^2+a*d)/c^2/d^2/(a*d-b*c)^3*
x*(2*A*a*d^4-7*A*b*c*d^3+B*a*c*d^3+4*B*b*c^2*d^2-4*C*a*c^2*d^2-C*b*c^3*d+7
*D*a*c^3*d-2*D*b*c^4)/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+(D/b/d^2+1/b*(A*b^3-
B*a*b^2+C*a^2*b-D*a^3)/(a*d-b*c)^2/a+c/a/(a*d-b*c)^3*(A*b^3-B*a*b^2+C*a^2*
b-D*a^3)+1/3/d^2*b*(A*d^3-B*c*d^2+C*c^2*d-D*c^3)/(a*d-b*c)^2/c+1/3/d^2/(a*
d-b*c)^2*(2*A*a*d^4-7*A*b*c*d^3+B*a*c*d^3+4*B*b*c^2*d^2-4*C*a*c^2*d^2-C*b*
c^3*d+7*D*a*c^3*d-2*D*b*c^4)/c^2-1/3*a/d/c^2/(a*d-b*c)^3*(2*A*a*d^4-7*A*b*
c*d^3+B*a*c*d^3+4*B*b*c^2*d^2-4*C*a*c^2*d^2-C*b*c^3*d+7*D*a*c^3*d-2*D*b*c^
4))/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*
x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-((A*b^3-
B*a*b^2+C*a^2*b-D*a^3)*d/(a*d-b*c)^3/a-1/3*b/d*(2*A*a*d^4-7*A*b*c*d^3+B*a*
c*d^3+4*B*b*c^2*d^2-4*C*a*c^2*d^2-C*b*c^3*d+7*D*a*c^3*d-2*D*b*c^4)/(a*d-b*
c)^3/c^2)*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*
x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2
))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 2094 vs. $2(506) = 1012$.

Time = 0.17 (sec) , antiderivative size = 2094, normalized size of antiderivative = 3.94

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{(a + bx^2)^{3/2} (c + dx^2)^{5/2}} \, dx = \text{Too large to display}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(5/2),x, algorit
hm="fricas")
```

output
```
-1/3*((2*D*a^2*b^3*c^6 - 2*A*a^3*b^2*c^2*d^4 - (7*D*a^3*b^2 - C*a^2*b^3)*c
^5*d - (3*D*a^4*b - 7*C*a^3*b^2 + 7*B*a^2*b^3 - 3*A*a*b^4)*c^4*d^2 - (B*a^
3*b^2 - 7*A*a^2*b^3)*c^3*d^3 + (2*D*a*b^4*c^4*d^2 - 2*A*a^2*b^3*d^6 - (7*D
*a^2*b^3 - C*a*b^4)*c^3*d^3 - (3*D*a^3*b^2 - 7*C*a^2*b^3 + 7*B*a*b^4 - 3*A
*b^5)*c^2*d^4 - (B*a^2*b^3 - 7*A*a*b^4)*c*d^5)*x^6 + (4*D*a*b^4*c^5*d - 2*
A*a^3*b^2*d^6 - 2*(6*D*a^2*b^3 - C*a*b^4)*c^4*d^2 - (13*D*a^3*b^2 - 15*C*a
^2*b^3 + 14*B*a*b^4 - 6*A*b^5)*c^3*d^3 - (3*D*a^4*b - 7*C*a^3*b^2 + 9*B*a^
2*b^3 - 17*A*a*b^4)*c^2*d^4 - (B*a^3*b^2 - 3*A*a^2*b^3)*c*d^5)*x^4 + (2*D*
a*b^4*c^6 - 4*A*a^3*b^2*c*d^5 - (3*D*a^2*b^3 - C*a*b^4)*c^5*d - (17*D*a^3*
b^2 - 9*C*a^2*b^3 + 7*B*a*b^4 - 3*A*b^5)*c^4*d^2 - (6*D*a^4*b - 14*C*a^3*b
^2 + 15*B*a^2*b^3 - 13*A*a*b^4)*c^3*d^3 - 2*(B*a^3*b^2 - 6*A*a^2*b^3)*c^2*
d^4)*x^2)*sqrt(a*c)*sqrt(-b/a)*elliptic_e(arcsin(x*sqrt(-b/a)), a*d/(b*c))
 - (2*D*a^2*b^3*c^6 + (D*a^4*b - 7*D*a^3*b^2 + C*a^2*b^3)*c^5*d - (9*D*a^5
 - (5*C - 3*D)*a^4*b + (3*B - 7*C)*a^3*b^2 + 7*B*a^2*b^3 - 3*A*a*b^4)*c^4*
d^2 + (3*C*a^5 - 5*B*a^4*b + (9*A - B)*a^3*b^2 + 7*A*a^2*b^3)*c^3*d^3 - (A
*a^4*b + 2*A*a^3*b^2)*c^2*d^4 + (2*D*a*b^4*c^4*d^2 + (D*a^3*b^2 - 7*D*a^2*
b^3 + C*a*b^4)*c^3*d^3 - (9*D*a^4*b - (5*C - 3*D)*a^3*b^2 + (3*B - 7*C)*a^
2*b^3 + 7*B*a*b^4 - 3*A*b^5)*c^2*d^4 + (3*C*a^4*b - 5*B*a^3*b^2 + (9*A - B
)*a^2*b^3 + 7*A*a*b^4)*c*d^5 - (A*a^3*b^2 + 2*A*a^2*b^3)*d^6)*x^6 + (4*D*a
*b^4*c^5*d + 2*(D*a^3*b^2 - 6*D*a^2*b^3 + C*a*b^4)*c^4*d^2 - (17*D*a^4*...
```

Sympy [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\,(c+dx^2)^{5/2}}\,dx = \text{Timed out}$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(3/2)/(d*x**2+c)**(5/2),x)
```

output
```
Timed out
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\,(c+dx^2)^{5/2}}\,dx = \int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(5/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*(d*x^2 + c)^(5/2)
), x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}\,(c+dx^2)^{5/2}}\,dx = \int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{3}{2}}(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(5/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(3/2)*(d*x^2 + c)^(5/2)
), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx=\int \frac{A+B\,x^2+C\,x^4+x^6\,D}{(b\,x^2+a)^{3/2}\,(d\,x^2+c)^{5/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(3/2)*(c + d*x^2)^(5/2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(3/2)*(c + d*x^2)^(5/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{3/2}(c+dx^2)^{5/2}}\,dx=\text{too large to display}$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(3/2)/(d*x^2+c)^(5/2),x)
```

output
```
( - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*c*x - 2*sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*a*d*x**3 - sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*x - 3*int((sqr
t(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c**3 + 3*a**2*c**2*d*x**2 + 3*a
**2*c*d**2*x**4 + a**2*d**3*x**6 + 2*a*b*c**3*x**2 + 6*a*b*c**2*d*x**4 + 6
*a*b*c*d**2*x**6 + 2*a*b*d**3*x**8 + b**2*c**3*x**4 + 3*b**2*c**2*d*x**6 +
 3*b**2*c*d**2*x**8 + b**2*d**3*x**10),x)*a**2*b*c**3*d - 6*int((sqrt(c +
d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c**3 + 3*a**2*c**2*d*x**2 + 3*a**2*c*
d**2*x**4 + a**2*d**3*x**6 + 2*a*b*c**3*x**2 + 6*a*b*c**2*d*x**4 + 6*a*b*c
*d**2*x**6 + 2*a*b*d**3*x**8 + b**2*c**3*x**4 + 3*b**2*c**2*d*x**6 + 3*b**
2*c*d**2*x**8 + b**2*d**3*x**10),x)*a**2*b*c**2*d**2*x**2 - 3*int((sqrt(c
+ d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c**3 + 3*a**2*c**2*d*x**2 + 3*a**2*
c*d**2*x**4 + a**2*d**3*x**6 + 2*a*b*c**3*x**2 + 6*a*b*c**2*d*x**4 + 6*a*b
*c*d**2*x**6 + 2*a*b*d**3*x**8 + b**2*c**3*x**4 + 3*b**2*c**2*d*x**6 + 3*b
**2*c*d**2*x**8 + b**2*d**3*x**10),x)*a**2*b*c*d**3*x**4 - 3*int((sqrt(c +
 d*x**2)*sqrt(a + b*x**2)*x**4)/(a**2*c**3 + 3*a**2*c**2*d*x**2 + 3*a**2*c
*d**2*x**4 + a**2*d**3*x**6 + 2*a*b*c**3*x**2 + 6*a*b*c**2*d*x**4 + 6*a*b*
c*d**2*x**6 + 2*a*b*d**3*x**8 + b**2*c**3*x**4 + 3*b**2*c**2*d*x**6 + 3*b*
*2*c*d**2*x**8 + b**2*d**3*x**10),x)*a*b**3*c**2*d - 6*int((sqrt(c + d*x**
2)*sqrt(a + b*x**2)*x**4)/(a**2*c**3 + 3*a**2*c**2*d*x**2 + 3*a**2*c*d**2*
x**4 + a**2*d**3*x**6 + 2*a*b*c**3*x**2 + 6*a*b*c**2*d*x**4 + 6*a*b*c*d...
```

3.48 $\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 545

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \frac{\left(\frac{5Abc}{a}-5(Bc+Ad)+\frac{5a(cC+Bd)}{b}+\frac{8a^3dD}{b^3}-\frac{5a^2(Cd+cD)}{b^2}\right)x\sqrt{c}}{15b(a+bx^2)^{3/2}}$$

$$+\frac{dDx^7\sqrt{c+dx^2}}{5b(a+bx^2)^{3/2}}$$

$$+\frac{(56a^2d^2D-abd(35Cd+47cD)+b^2(20cCd+15Bd^2+3c^2D))\,x\sqrt{c+dx^2}}{15b^4d\sqrt{a+bx^2}}$$

$$+\frac{(5bCd+6bcD-8adD)x^3\sqrt{c+dx^2}}{15b^3\sqrt{a+bx^2}}$$

$$+\frac{(10Ab^3d(bc+ad)+a(5b^3Bcd-128a^3d^2D+8a^2bd(10Cd+11cD)-ab^2(40cCd+40Bd^2+3c^2D)))\sqrt{c}}{15a^{3/2}b^{9/2}d\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

$$-\frac{(5Ab^3d-5ab^2(3cC+4Bd)-64a^3dD+4a^2b(10Cd+9cD))\sqrt{c+dx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right),1-\frac{ad}{bc}\right)}{15\sqrt{a}b^{9/2}\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
1/15*(5*A*b*c/a-5*A*d-5*B*c+5*a*(B*d+C*c)/b+8*a^3*d*D/b^3-5*a^2*(C*d+D*c)/
b^2)*x*(d*x^2+c)^(1/2)/b/(b*x^2+a)^(3/2)+1/5*d*D*x^7*(d*x^2+c)^(1/2)/b/(b*
x^2+a)^(3/2)+1/15*(56*a^2*d^2*D-a*b*d*(35*C*d+47*D*c)+b^2*(15*B*d^2+20*C*c
*d+3*D*c^2))*x*(d*x^2+c)^(1/2)/b^4/d/(b*x^2+a)^(1/2)+1/15*(5*C*b*d-8*D*a*d
+6*D*b*c)*x^3*(d*x^2+c)^(1/2)/b^3/(b*x^2+a)^(1/2)+1/15*(10*A*b^3*d*(a*d+b*
c)+a*(5*b^3*B*c*d-128*a^3*d^2*D+8*a^2*b*d*(10*C*d+11*D*c)-a*b^2*(40*B*d^2+
40*C*c*d+3*D*c^2)))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a
)^(1/2),(1-a*d/b/c)^(1/2))/a^(3/2)/b^(9/2)/d/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/
c/(b*x^2+a))^(1/2)-1/15*(5*A*b^3*d-5*a*b^2*(4*B*d+3*C*c)-64*a^3*d*D+4*a^2*
b*(10*C*d+9*D*c))*(d*x^2+c)^(1/2)*InverseJacobiAM(arctan(b^(1/2)*x/a^(1/2)
),(1-a*d/b/c)^(1/2))/a^(1/2)/b^(9/2)/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2
+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 9.49 (sec) , antiderivative size = 489, normalized size of antiderivative = 0.90

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \frac{\left(\frac{b}{a}\right)^{3/2}\left(\sqrt{\frac{b}{a}}dx(c+dx^2)\left(-64a^5dD+10Ab^5cx^2+5ab^4(3Ac\right.\right.}{}$$

input
```
Integrate[((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(a + b*x^2)^(5/2
),x]
```

output
```
((b/a)^(3/2)*(Sqrt[b/a]*d*x*(c + d*x^2)*(-64*a^5*d*D + 10*A*b^5*c*x^2 + 5*
a*b^4*(3*A*c + B*c*x^2 + 2*A*d*x^2) + 4*a^4*b*(10*C*d + 9*c*D - 20*d*D*x^2
) + a^3*b^2*(-15*c*C - 20*B*d + 50*C*d*x^2 + 47*c*D*x^2 - 8*d*D*x^4) + a^2
*b^3*(5*A*d + x^2*(-20*c*C - 25*B*d + 5*C*d*x^2 + 6*c*D*x^2 + 3*d*D*x^4)))
 - I*c*(-10*A*b^3*d*(b*c + a*d) + a*(-5*b^3*B*c*d + 128*a^3*d^2*D - 8*a^2*
b*d*(10*C*d + 11*c*D) + a*b^2*(40*c*C*d + 40*B*d^2 + 3*c^2*D)))*(a + b*x^2
)*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x]
, (a*d)/(b*c)] + I*c*(-5*A*b^3*d*(2*b*c + a*d) + a*(-5*b^3*B*c*d + 64*a^3*
d^2*D - 4*a^2*b*d*(10*C*d + 13*c*D) + a*b^2*(25*c*C*d + 20*B*d^2 + 3*c^2*D
)))*(a + b*x^2)*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSin
h[Sqrt[b/a]*x], (a*d)/(b*c)]))/(15*b^6*d*(a + b*x^2)^(3/2)*Sqrt[c + d*x^2]
)
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1334 vs. 2(545) = 1090.

Time = 2.55 (sec) , antiderivative size = 1334, normalized size of antiderivative = 2.45, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 2009}

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

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A(c+dx^2)^{3/2}}{(a+bx^2)^{5/2}}+\frac{Bx^2(c+dx^2)^{3/2}}{(a+bx^2)^{5/2}}+\frac{Cx^4(c+dx^2)^{3/2}}{(a+bx^2)^{5/2}}+\frac{Dx^6(c+dx^2)^{3/2}}{(a+bx^2)^{5/2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$-\frac{D(dx^2+c)^{3/2}x^5}{3b(bx^2+a)^{3/2}}+\frac{(5bc-8ad)D\sqrt{dx^2+c}x^5}{3ab^2\sqrt{bx^2+a}}-\frac{C(dx^2+c)^{3/2}x^3}{3b(bx^2+a)^{3/2}}-\frac{(25bc-48ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x^3}{15ab^3}+\frac{C(bc-2ad)\sqrt{dx^2+c}x^3}{ab^2\sqrt{bx^2+a}}-\frac{B(dx^2+c)^{3/2}x}{3b(bx^2+a)^{3/2}}-\frac{C(3bc-8ad)\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3ab^3}+\frac{4(9bc-16ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{15b^4}+\frac{B(bc-4ad)\sqrt{dx^2+c}x}{3ab^2\sqrt{bx^2+a}}+\frac{A(bc-ad)\sqrt{dx^2+c}x}{3ab(bx^2+a)^{3/2}}-\frac{Bd(bc-8ad)\sqrt{bx^2+a}x}{3ab^3\sqrt{dx^2+c}}+\frac{8Cd(bc-2ad)\sqrt{bx^2+a}x}{3b^4\sqrt{dx^2+c}}+\frac{(3b^2c^2-88abdc+128a^2d^2)D\sqrt{bx^2+a}x}{15b^5\sqrt{dx^2+c}}+\frac{2A(bc+ad)\sqrt{dx^2+c}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{3a^{3/2}b^{3/2}\sqrt{bx^2+a}\sqrt{\frac{a(dx^2+c)}{c(bx^2+a)}}}+\frac{B\sqrt{c}\sqrt{d}(bc-8ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3ab^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{8\sqrt{c}C\sqrt{d}(bc-2ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^4\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}(3b^2c^2-88abdc+128a^2d^2)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{15b^5\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}C(3bc-8ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3ab^3\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{4c^{3/2}(9bc-16ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{15b^4\sqrt{d}\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{4Bc^{3/2}\sqrt{d}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3ab^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Ac^{3/2}\sqrt{d}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a^2b\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + D*x^6))/(a + b*x^2)^(5/2),x]
```

output
```
-1/3*(B*d*(b*c - 8*a*d)*x*Sqrt[a + b*x^2])/(a*b^3*Sqrt[c + d*x^2]) + (8*C*
d*(b*c - 2*a*d)*x*Sqrt[a + b*x^2])/(3*b^4*Sqrt[c + d*x^2]) + ((3*b^2*c^2 -
 88*a*b*c*d + 128*a^2*d^2)*D*x*Sqrt[a + b*x^2])/(15*b^5*Sqrt[c + d*x^2]) +
 (A*(b*c - a*d)*x*Sqrt[c + d*x^2])/(3*a*b*(a + b*x^2)^(3/2)) + (B*(b*c - 4
*a*d)*x*Sqrt[c + d*x^2])/(3*a*b^2*Sqrt[a + b*x^2]) + (C*(b*c - 2*a*d)*x^3*
Sqrt[c + d*x^2])/(a*b^2*Sqrt[a + b*x^2]) + ((5*b*c - 8*a*d)*D*x^5*Sqrt[c +
 d*x^2])/(3*a*b^2*Sqrt[a + b*x^2]) - (C*(3*b*c - 8*a*d)*x*Sqrt[a + b*x^2]*
Sqrt[c + d*x^2])/(3*a*b^3) + (4*(9*b*c - 16*a*d)*D*x*Sqrt[a + b*x^2]*Sqrt[
c + d*x^2])/(15*b^4) - ((25*b*c - 48*a*d)*D*x^3*Sqrt[a + b*x^2]*Sqrt[c + d
*x^2])/(15*a*b^3) - (B*x*(c + d*x^2)^(3/2))/(3*b*(a + b*x^2)^(3/2)) - (C*x
^3*(c + d*x^2)^(3/2))/(3*b*(a + b*x^2)^(3/2)) - (D*x^5*(c + d*x^2)^(3/2))/
(3*b*(a + b*x^2)^(3/2)) + (2*A*(b*c + a*d)*Sqrt[c + d*x^2]*EllipticE[ArcTa
n[(Sqrt[b]*x)/Sqrt[a]], 1 - (a*d)/(b*c)])/(3*a^(3/2)*b^(3/2)*Sqrt[a + b*x^
2]*Sqrt[(a*(c + d*x^2))/(c*(a + b*x^2))]) + (B*Sqrt[c]*Sqrt[d]*(b*c - 8*a*
d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)]
)/(3*a*b^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (8*Sqr
t[c]*C*Sqrt[d]*(b*c - 2*a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/
Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^4*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*S
qrt[c + d*x^2]) - (Sqrt[c]*(3*b^2*c^2 - 88*a*b*c*d + 128*a^2*d^2)*D*Sqrt[a
 + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(15*...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 1119 vs. 2(503) = 1006.

Time = 9.75 (sec) , antiderivative size = 1120, normalized size of antiderivative = 2.06

method	result	size
elliptic	Expression too large to display	1120
default	Expression too large to display	2960

input
```
int((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(-1/3*(A*a*b^3
*d-A*b^4*c-B*a^2*b^2*d+B*a*b^3*c+C*a^3*b*d-C*a^2*b^2*c-D*a^4*d+D*a^3*b*c)/
a/b^6*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+a/b)^2+1/3*(b*d*x^2+b*c)*
(2*A*a*b^3*d+2*A*b^4*c-5*B*a^2*b^2*d+B*a*b^3*c+8*C*a^3*b*d-4*C*a^2*b^2*c-1
1*D*a^4*d+7*D*a^3*b*c)/a^2/b^5*x/((x^2+a/b)*(b*d*x^2+b*c))^(1/2)+1/5*D/b^3
*d*x^3*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+1/3*(d/b^3*(C*b*d-2*D*a*d+2*D*b
*c)-1/5*D/b^3*d*(4*a*d+4*b*c))/b/d*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+(
(A*b^3*d^2-2*B*a*b^2*d^2+2*B*b^3*c*d+3*C*a^2*b*d^2-4*C*a*b^2*c*d+C*b^3*c^2
-4*D*a^3*d^2+6*D*a^2*b*c*d-2*D*a*b^2*c^2)/b^5-1/3*(A*a*b^3*d-A*b^4*c-B*a^2
*b^2*d+B*a*b^3*c+C*a^3*b*d-C*a^2*b^2*c-D*a^4*d+D*a^3*b*c)/b^5*d/a-1/3*(2*A
*a*b^3*d+2*A*b^4*c-5*B*a^2*b^2*d+B*a*b^3*c+8*C*a^3*b*d-4*C*a^2*b^2*c-11*D*
a^4*d+7*D*a^3*b*c)/b^5*(a*d-b*c)/a^2-1/3/b^4*c*(2*A*a*b^3*d+2*A*b^4*c-5*B*
a^2*b^2*d+B*a*b^3*c+8*C*a^3*b*d-4*C*a^2*b^2*c-11*D*a^4*d+7*D*a^3*b*c)/a^2-
1/3*(d/b^3*(C*b*d-2*D*a*d+2*D*b*c)-1/5*D/b^3*d*(4*a*d+4*b*c))/b/d*a*c)/(-b
/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c
)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(1/b^4*(B*b^2*d
^2-2*C*a*b*d^2+2*C*b^2*c*d+3*D*a^2*d^2-4*D*a*b*c*d+D*b^2*c^2)-1/3*(2*A*a*b
^3*d+2*A*b^4*c-5*B*a^2*b^2*d+B*a*b^3*c+8*C*a^3*b*d-4*C*a^2*b^2*c-11*D*a^4*
d+7*D*a^3*b*c)/b^4*d/a^2-3/5*D/b^3*d*a*c-1/3*(d/b^3*(C*b*d-2*D*a*d+2*D*b*c
)-1/5*D/b^3*d*(4*a*d+4*b*c))/b/d*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2...
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1191 vs. $2(503) = 1006$.

Time = 0.13 (sec) , antiderivative size = 1191, normalized size of antiderivative = 2.19

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \text{Too large to display}$$

input
```
integrate((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2),x, algorit
hm="fricas")
```

output
```
-1/15*(((3*D*a^2*b^4*c^3 - (88*D*a^3*b^3 - 40*C*a^2*b^4 + 5*B*a*b^5 + 10*A
*b^6)*c^2*d + 2*(64*D*a^4*b^2 - 40*C*a^3*b^3 + 20*B*a^2*b^4 - 5*A*a*b^5)*c
*d^2)*x^5 + 2*(3*D*a^3*b^3*c^3 - (88*D*a^4*b^2 - 40*C*a^3*b^3 + 5*B*a^2*b^
4 + 10*A*a*b^5)*c^2*d + 2*(64*D*a^5*b - 40*C*a^4*b^2 + 20*B*a^3*b^3 - 5*A*
a^2*b^4)*c*d^2)*x^3 + (3*D*a^4*b^2*c^3 - (88*D*a^5*b - 40*C*a^4*b^2 + 5*B*
a^3*b^3 + 10*A*a^2*b^4)*c^2*d + 2*(64*D*a^6 - 40*C*a^5*b + 20*B*a^4*b^2 -
5*A*a^3*b^3)*c*d^2)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x
), a*d/(b*c)) - ((3*D*a^2*b^4*c^3 - (88*D*a^3*b^3 - 40*C*a^2*b^4 + 5*B*a*b
^5 + 10*A*b^6)*c^2*d + (128*D*a^4*b^2 - 4*(20*C + 9*D)*a^3*b^3 + 5*(8*B +
3*C)*a^2*b^4 - 10*A*a*b^5)*c*d^2 + (64*D*a^4*b^2 - 40*C*a^3*b^3 + 20*B*a^2
*b^4 - 5*A*a*b^5)*d^3)*x^5 + 2*(3*D*a^3*b^3*c^3 - (88*D*a^4*b^2 - 40*C*a^3
*b^3 + 5*B*a^2*b^4 + 10*A*a*b^5)*c^2*d + (128*D*a^5*b - 4*(20*C + 9*D)*a^4
*b^2 + 5*(8*B + 3*C)*a^3*b^3 - 10*A*a^2*b^4)*c*d^2 + (64*D*a^5*b - 40*C*a^
4*b^2 + 20*B*a^3*b^3 - 5*A*a^2*b^4)*d^3)*x^3 + (3*D*a^4*b^2*c^3 - (88*D*a^
5*b - 40*C*a^4*b^2 + 5*B*a^3*b^3 + 10*A*a^2*b^4)*c^2*d + (128*D*a^6 - 4*(2
0*C + 9*D)*a^5*b + 5*(8*B + 3*C)*a^4*b^2 - 10*A*a^3*b^3)*c*d^2 + (64*D*a^6
 - 40*C*a^5*b + 20*B*a^4*b^2 - 5*A*a^3*b^3)*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*e
lliptic_f(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - (3*D*a^2*b^4*d^3*x^8 + 3*D*a^
4*b^2*c^2*d + (6*D*a^2*b^4*c*d^2 - (8*D*a^3*b^3 - 5*C*a^2*b^4)*d^3)*x^6 +
(3*D*a^2*b^4*c^2*d - (41*D*a^3*b^3 - 20*C*a^2*b^4)*c*d^2 + 3*(16*D*a^4*...
```

Sympy [F]

$$\int \frac{(c+dx^2)^{3/2}\,(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \int \frac{(c+dx^2)^{\frac{3}{2}}\,(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{\frac{5}{2}}}\,dx$$

input
```
integrate((d*x**2+c)**(3/2)*(D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(5/2),x)
```

output
```
Integral((c + d*x**2)**(3/2)*(A + B*x**2 + C*x**4 + D*x**6)/(a + b*x**2)**
(5/2), x)
```

Maxima [F]

$$\int \frac{(c+dx^2)^{3/2} (A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}} \, dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)(dx^2+c)^{\frac{3}{2}}}{(bx^2+a)^{\frac{5}{2}}} \, dx$$

input
```
integrate((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(d*x^2 + c)^(3/2)/(b*x^2 + a)^(5/2),
 x)
```

Giac [F]

$$\int \frac{(c+dx^2)^{3/2} (A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}} \, dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)(dx^2+c)^{\frac{3}{2}}}{(bx^2+a)^{\frac{5}{2}}} \, dx$$

input
```
integrate((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*(d*x^2 + c)^(3/2)/(b*x^2 + a)^(5/2),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(c+dx^2)^{3/2} (A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}} \, dx = \int \frac{(d\,x^2+c)^{3/2}\,(A+B\,x^2+C\,x^4+x^6\,D)}{(b\,x^2+a)^{5/2}} \, dx$$

input
```
int(((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(5/2),x)
```

output
```
int(((c + d*x^2)^(3/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(5/2), x)
```

Reduce [F]

$$\int \frac{(c+dx^2)^{3/2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \text{too large to display}$$

input
```
int((d*x^2+c)^(3/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2),x)
```

output
```
( - 144*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*c*d*x + 96*sqrt(c + d*x**2)
*sqrt(a + b*x**2)*a**2*d**2*x**3 + 69*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*
b*c**2*x - 142*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c*d*x**3 - 16*sqrt(c
+ d*x**2)*sqrt(a + b*x**2)*a*b*d**2*x**5 - 15*sqrt(c + d*x**2)*sqrt(a + b*
x**2)*b**3*c*x + 30*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*d*x**3 + 46*sqr
t(c + d*x**2)*sqrt(a + b*x**2)*b**2*c**2*x**3 + 22*sqrt(c + d*x**2)*sqrt(a
 + b*x**2)*b**2*c*d*x**5 + 6*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*d**2*x
**7 - 384*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**3*c + a**3*d*x*
*2 + 3*a**2*b*c*x**2 + 3*a**2*b*d*x**4 + 3*a*b**2*c*x**4 + 3*a*b**2*d*x**6
 + b**3*c*x**6 + b**3*d*x**8),x)*a**5*d**3 + 504*int((sqrt(c + d*x**2)*sqr
t(a + b*x**2)*x**4)/(a**3*c + a**3*d*x**2 + 3*a**2*b*c*x**2 + 3*a**2*b*d*x
**4 + 3*a*b**2*c*x**4 + 3*a*b**2*d*x**6 + b**3*c*x**6 + b**3*d*x**8),x)*a*
*4*b*c*d**2 - 768*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**3*c + a
**3*d*x**2 + 3*a**2*b*c*x**2 + 3*a**2*b*d*x**4 + 3*a*b**2*c*x**4 + 3*a*b**
2*d*x**6 + b**3*c*x**6 + b**3*d*x**8),x)*a**4*b*d**3*x**2 - 90*int((sqrt(c
 + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**3*c + a**3*d*x**2 + 3*a**2*b*c*x**2
+ 3*a**2*b*d*x**4 + 3*a*b**2*c*x**4 + 3*a*b**2*d*x**6 + b**3*c*x**6 + b**3
*d*x**8),x)*a**3*b**3*d**2 - 225*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x*
*4)/(a**3*c + a**3*d*x**2 + 3*a**2*b*c*x**2 + 3*a**2*b*d*x**4 + 3*a*b**2*c
*x**4 + 3*a*b**2*d*x**6 + b**3*c*x**6 + b**3*d*x**8),x)*a**3*b**2*c**2*...
```

3.49 $\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 449

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \frac{\left(\frac{A}{a}-\frac{b^2B-abC+2a^2D}{b^3}\right)x\sqrt{c+dx^2}}{3(a+bx^2)^{3/2}} + \frac{Dx^5\sqrt{c+dx^2}}{3b(a+bx^2)^{3/2}} + \frac{(3bCd+bcD-6adD)x\sqrt{c+dx^2}}{3b^3d\sqrt{a+bx^2}} + \frac{(Ab^3d(2bc-ad)+a(b^3Bcd-16a^3d^2D+8a^2bd(Cd+2cD)-ab^2(7cCd+2Bd^2+c^2D)))\sqrt{c+dx^2}E\left(\text{a}\right.}{3a^{3/2}b^{7/2}d(bc-ad)\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}} - \frac{(Ab^3d-ab^2(3cC+Bd)-8a^3dD+a^2b(4Cd+7cD))\sqrt{c+dx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right),1-\frac{ad}{bc}\right)}{3\sqrt{a}b^{7/2}(bc-ad)\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
1/3*(A/a-(B*b^2-C*a*b+2*D*a^2)/b^3)*x*(d*x^2+c)^(1/2)/(b*x^2+a)^(3/2)+1/3*
D*x^5*(d*x^2+c)^(1/2)/b/(b*x^2+a)^(3/2)+1/3*(3*C*b*d-6*D*a*d+D*b*c)*x*(d*x
^2+c)^(1/2)/b^3/d/(b*x^2+a)^(1/2)+1/3*(A*b^3*d*(-a*d+2*b*c)+a*(b^3*B*c*d-1
6*a^3*d^2*D+8*a^2*b*d*(C*d+2*D*c)-a*b^2*(2*B*d^2+7*C*c*d+D*c^2)))*(d*x^2+c
)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)^(1/2),(1-a*d/b/c)^(1/2))/a
^(3/2)/b^(7/2)/d/(-a*d+b*c)/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2
)-1/3*(A*b^3*d-a*b^2*(B*d+3*C*c)-8*a^3*d*D+a^2*b*(4*C*d+7*D*c))*(d*x^2+c)^
(1/2)*InverseJacobiAM(arctan(b^(1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/a^(1/2)
/b^(7/2)/(-a*d+b*c)/(b*x^2+a)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 7.58 (sec) , antiderivative size = 447, normalized size of antiderivative = 1.00

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \frac{\left(\frac{b}{a}\right)^{3/2}\left(\sqrt{\frac{b}{a}}dx(c+dx^2)\left(8a^5dD-2Ab^5cx^2+ab^4(-3Ac-Bc\right.\right.}{}$$

input
```
Integrate[(Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(a + b*x^2)^(5/2),
x]
```

output
```
((b/a)^(3/2)*(Sqrt[b/a]*d*x*(c + d*x^2)*(8*a^5*d*D - 2*A*b^5*c*x^2 + a*b^4
*(-3*A*c - B*c*x^2 + A*d*x^2) + a^4*b*(-4*C*d - 7*c*D + 10*d*D*x^2) + a^2*
b^3*(2*A*d + x^2*(4*c*C + 2*B*d - c*D*x^2)) + a^3*b^2*(3*c*(C - 3*D*x^2) +
 d*(B - 5*C*x^2 + D*x^4))) + I*c*(A*b^3*d*(-2*b*c + a*d) + a*(-(b^3*B*c*d)
 + 16*a^3*d^2*D - 8*a^2*b*d*(C*d + 2*c*D) + a*b^2*(7*c*C*d + 2*B*d^2 + c^2
*D)))*(a + b*x^2)*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcS
inh[Sqrt[b/a]*x], (a*d)/(b*c)] - I*c*(-(b*c) + a*d)*(2*A*b^3*d + a*(b^2*B*
d + 8*a^2*d*D - a*b*(4*C*d + c*D)))*(a + b*x^2)*Sqrt[1 + (b*x^2)/a]*Sqrt[1
 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(3*b^5*d*(-
(b*c) + a*d)*(a + b*x^2)^(3/2)*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1269 vs. $2(449) = 898$.

Time = 2.01 (sec) , antiderivative size = 1269, normalized size of antiderivative = 2.83, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx$$

$$\Big\downarrow \text{ 7293}$$

$$\int \left(\frac{A\sqrt{c+dx^2}}{(a+bx^2)^{5/2}}+\frac{Bx^2\sqrt{c+dx^2}}{(a+bx^2)^{5/2}}+\frac{Cx^4\sqrt{c+dx^2}}{(a+bx^2)^{5/2}}+\frac{Dx^6\sqrt{c+dx^2}}{(a+bx^2)^{5/2}}\right)dx$$

$$\Big\downarrow \text{ 2009}$$

$$-\frac{D\sqrt{dx^2+c}x^5}{3b\left(bx^2+a\right)^{3/2}}-\frac{(5bc-6ad)D\sqrt{dx^2+c}x^3}{3b^2(bc-ad)\sqrt{bx^2+a}}-\frac{C\sqrt{dx^2+c}x^3}{3b\left(bx^2+a\right)^{3/2}}+\frac{(7bc-8ad)D\sqrt{bx^2+a}\sqrt{dx^2+c}x}{3b^3(bc-ad)}-\frac{C(3bc-4ad)\sqrt{dx^2+c}x}{3b^2(bc-ad)\sqrt{bx^2+a}}+\frac{A\sqrt{dx^2+c}x}{3a\left(bx^2+a\right)^{3/2}}-\frac{B\sqrt{dx^2+c}x}{3b\left(bx^2+a\right)^{3/2}}+\frac{\left(b^2c^2-16abdc+16a^2d^2\right)D\sqrt{bx^2+a}x}{3b^4(bc-ad)\sqrt{dx^2+c}}+\frac{Cd(7bc-8ad)\sqrt{bx^2+a}x}{3b^3(bc-ad)\sqrt{dx^2+c}}+\frac{A(2bc-ad)\sqrt{dx^2+c}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{3a^{3/2}\sqrt{b}(bc-ad)\sqrt{bx^2+a}\sqrt{\frac{a(dx^2+c)}{c(bx^2+a)}}}+\frac{B(bc-2ad)\sqrt{dx^2+c}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{3\sqrt{a}b^{3/2}(bc-ad)\sqrt{bx^2+a}\sqrt{\frac{a(dx^2+c)}{c(bx^2+a)}}}-\frac{\sqrt{c}\left(b^2c^2-16abdc+16a^2d^2\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^4\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{\sqrt{c}C\sqrt{d}(7bc-8ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^3(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}(7bc-8ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3b^3\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}C(3bc-4ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3ab^2\sqrt{d}(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Ac^{3/2}\sqrt{d}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a^2(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{Bc^{3/2}\sqrt{d}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3ab(bc-ad)\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(Sqrt[c + d*x^2]*(A + B*x^2 + C*x^4 + D*x^6))/(a + b*x^2)^(5/2),x]
```

output
```
(C*d*(7*b*c - 8*a*d)*x*Sqrt[a + b*x^2])/(3*b^3*(b*c - a*d)*Sqrt[c + d*x^2]
) + ((b^2*c^2 - 16*a*b*c*d + 16*a^2*d^2)*D*x*Sqrt[a + b*x^2])/(3*b^4*(b*c
- a*d)*Sqrt[c + d*x^2]) + (A*x*Sqrt[c + d*x^2])/(3*a*(a + b*x^2)^(3/2)) -
(B*x*Sqrt[c + d*x^2])/(3*b*(a + b*x^2)^(3/2)) - (C*x^3*Sqrt[c + d*x^2])/(3
*b*(a + b*x^2)^(3/2)) - (D*x^5*Sqrt[c + d*x^2])/(3*b*(a + b*x^2)^(3/2)) -
(C*(3*b*c - 4*a*d)*x*Sqrt[c + d*x^2])/(3*b^2*(b*c - a*d)*Sqrt[a + b*x^2])
- ((5*b*c - 6*a*d)*D*x^3*Sqrt[c + d*x^2])/(3*b^2*(b*c - a*d)*Sqrt[a + b*x^
2]) + ((7*b*c - 8*a*d)*D*x*Sqrt[a + b*x^2]*Sqrt[c + d*x^2])/(3*b^3*(b*c -
a*d)) + (B*(b*c - 2*a*d)*Sqrt[c + d*x^2]*EllipticE[ArcTan[(Sqrt[b]*x)/Sqrt
[a]], 1 - (a*d)/(b*c)])/(3*Sqrt[a]*b^(3/2)*(b*c - a*d)*Sqrt[a + b*x^2]*Sqr
t[(a*(c + d*x^2))/(c*(a + b*x^2))]) + (A*(2*b*c - a*d)*Sqrt[c + d*x^2]*Ell
ipticE[ArcTan[(Sqrt[b]*x)/Sqrt[a]], 1 - (a*d)/(b*c)])/(3*a^(3/2)*Sqrt[b]*(
b*c - a*d)*Sqrt[a + b*x^2]*Sqrt[(a*(c + d*x^2))/(c*(a + b*x^2))]) - (Sqrt[
c]*C*Sqrt[d]*(7*b*c - 8*a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/
Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^3*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c
+ d*x^2))]*Sqrt[c + d*x^2]) - (Sqrt[c]*(b^2*c^2 - 16*a*b*c*d + 16*a^2*d^2)
*D*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)]
)/(3*b^4*Sqrt[d]*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c
+ d*x^2]) - (A*c^(3/2)*Sqrt[d]*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x
)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*a^2*(b*c - a*d)*Sqrt[(c*(a + b*x^2))/(...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 7.45 (sec) , antiderivative size = 821, normalized size of antiderivative = 1.83

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(\frac{\left(b^3A-a\,b^2B+a^2bC-a^3D\right)x\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{3a\,b^5\left(x^2+\frac{a}{b}\right)^2}+\frac{\left(bd\,x^2+bc\right)x\left(A\,b^3da-2A\,b^4c+2B\,a^2b^2d-B\,b^3ca-5C\,a^3bd+4C\right.}{3b^4a^2(ad-bc)\sqrt{\left(x^2+\frac{a}{b}\right)\left(bd\,x^2+bc\right)}}\right.}{}$
default	Expression too large to display

input
```
int((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/3*(A*b^3-B*
a*b^2+C*a^2*b-D*a^3)/a/b^5*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/(x^2+a/b)
^2+1/3*(b*d*x^2+b*c)/b^4/a^2/(a*d-b*c)*x*(A*a*b^3*d-2*A*b^4*c+2*B*a^2*b^2*
d-B*a*b^3*c-5*C*a^3*b*d+4*C*a^2*b^2*c+8*D*a^4*d-7*D*a^3*b*c)/((x^2+a/b)*(b
*d*x^2+b*c))^(1/2)+1/3*D/b^3*x*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)+((B*b^2
*d-2*C*a*b*d+C*b^2*c+3*D*a^2*d-2*D*a*b*c)/b^4+1/3*(A*b^3-B*a*b^2+C*a^2*b-D
*a^3)/b^4*d/a-1/3/b^4*(A*a*b^3*d-2*A*b^4*c+2*B*a^2*b^2*d-B*a*b^3*c-5*C*a^3
*b*d+4*C*a^2*b^2*c+8*D*a^4*d-7*D*a^3*b*c)/a^2-1/3/b^3*c/a^2/(a*d-b*c)*(A*a
*b^3*d-2*A*b^4*c+2*B*a^2*b^2*d-B*a*b^3*c-5*C*a^3*b*d+4*C*a^2*b^2*c+8*D*a^4
*d-7*D*a^3*b*c)-1/3*D/b^3*a*c)/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^
(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*
d+b*c)/c/b)^(1/2))-(1/b^3*(C*b*d-2*D*a*d+D*b*c)-1/3/b^3*d*(A*a*b^3*d-2*A*b
^4*c+2*B*a^2*b^2*d-B*a*b^3*c-5*C*a^3*b*d+4*C*a^2*b^2*c+8*D*a^4*d-7*D*a^3*b
*c)/(a*d-b*c)/a^2-1/3*D/b^3*(2*a*d+2*b*c))*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2
)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b
/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)
/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1154 vs. $2(415) = 830$.

Time = 0.14 (sec) , antiderivative size = 1154, normalized size of antiderivative = 2.57

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \text{Too large to display}$$

input
```
integrate((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2),x, algorit
hm="fricas")
```

output
```
-1/3*(((D*a^2*b^4*c^3 - (16*D*a^3*b^3 - 7*C*a^2*b^4 + B*a*b^5 + 2*A*b^6)*c
^2*d + (16*D*a^4*b^2 - 8*C*a^3*b^3 + 2*B*a^2*b^4 + A*a*b^5)*c*d^2)*x^5 + 2
*(D*a^3*b^3*c^3 - (16*D*a^4*b^2 - 7*C*a^3*b^3 + B*a^2*b^4 + 2*A*a*b^5)*c^2
*d + (16*D*a^5*b - 8*C*a^4*b^2 + 2*B*a^3*b^3 + A*a^2*b^4)*c*d^2)*x^3 + (D*
a^4*b^2*c^3 - (16*D*a^5*b - 7*C*a^4*b^2 + B*a^3*b^3 + 2*A*a^2*b^4)*c^2*d +
 (16*D*a^6 - 8*C*a^5*b + 2*B*a^4*b^2 + A*a^3*b^3)*c*d^2)*x)*sqrt(b*d)*sqrt
(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((D*a^2*b^4*c^3 - (16
*D*a^3*b^3 - 7*C*a^2*b^4 + B*a*b^5 + 2*A*b^6)*c^2*d + (16*D*a^4*b^2 - (8*C
 + 7*D)*a^3*b^3 + (2*B + 3*C)*a^2*b^4 + A*a*b^5)*c*d^2 + (8*D*a^4*b^2 - 4*
C*a^3*b^3 + B*a^2*b^4 - A*a*b^5)*d^3)*x^5 + 2*(D*a^3*b^3*c^3 - (16*D*a^4*b
^2 - 7*C*a^3*b^3 + B*a^2*b^4 + 2*A*a*b^5)*c^2*d + (16*D*a^5*b - (8*C + 7*D
)*a^4*b^2 + (2*B + 3*C)*a^3*b^3 + A*a^2*b^4)*c*d^2 + (8*D*a^5*b - 4*C*a^4*
b^2 + B*a^3*b^3 - A*a^2*b^4)*d^3)*x^3 + (D*a^4*b^2*c^3 - (16*D*a^5*b - 7*C
*a^4*b^2 + B*a^3*b^3 + 2*A*a^2*b^4)*c^2*d + (16*D*a^6 - (8*C + 7*D)*a^5*b
+ (2*B + 3*C)*a^4*b^2 + A*a^3*b^3)*c*d^2 + (8*D*a^6 - 4*C*a^5*b + B*a^4*b^
2 - A*a^3*b^3)*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/d)/x
), a*d/(b*c)) - (D*a^4*b^2*c^2*d + (D*a^2*b^4*c*d^2 - D*a^3*b^3*d^3)*x^6 +
 (D*a^2*b^4*c^2*d - (7*D*a^3*b^3 - 3*C*a^2*b^4)*c*d^2 + 3*(2*D*a^4*b^2 - C
*a^3*b^3)*d^3)*x^4 - (16*D*a^5*b - 7*C*a^4*b^2 + B*a^3*b^3 + 2*A*a^2*b^4)*
c*d^2 + (16*D*a^6 - 8*C*a^5*b + 2*B*a^4*b^2 + A*a^3*b^3)*d^3 + (2*D*a^3...
```

Sympy [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{\frac{5}{2}}}\,dx$$

input
```
integrate((d*x**2+c)**(1/2)*(D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(5/2),x)
```

output
```
Integral(sqrt(c + d*x**2)*(A + B*x**2 + C*x**4 + D*x**6)/(a + b*x**2)**(5/
2), x)
```

Maxima [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{dx^2+c}}{(bx^2+a)^{\frac{5}{2}}}\,dx$$

input
```
integrate((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(d*x^2 + c)/(b*x^2 + a)^(5/2), x
)
```

Giac [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \int \frac{(Dx^6+Cx^4+Bx^2+A)\sqrt{dx^2+c}}{(bx^2+a)^{\frac{5}{2}}}\,dx$$

input
```
integrate((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)*sqrt(d*x^2 + c)/(b*x^2 + a)^(5/2), x
)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \int \frac{\sqrt{d\,x^2+c}\,(A+B\,x^2+C\,x^4+x^6\,D)}{(b\,x^2+a)^{5/2}}\,dx$$

input
```
int(((c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(5/2),x)
```

output
```
int(((c + d*x^2)^(1/2)*(A + B*x^2 + C*x^4 + x^6*D))/(a + b*x^2)^(5/2), x)
```

Reduce [F]

$$\int \frac{\sqrt{c+dx^2}(A+Bx^2+Cx^4+Dx^6)}{(a+bx^2)^{5/2}}\,dx = \text{too large to display}$$

input
```
int((d*x^2+c)^(1/2)*(D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2),x)
```

output

```
(18*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a**2*c*d*x - 12*sqrt(c + d*x**2)*sqr
t(a + b*x**2)*a**2*d**2*x**3 + 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b**2*
d*x - 12*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*c**2*x + 20*sqrt(c + d*x**2
)*sqrt(a + b*x**2)*a*b*c*d*x**3 + 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*b*
d**2*x**5 + 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**3*c*x - 8*sqrt(c + d*x*
*2)*sqrt(a + b*x**2)*b**2*c**2*x**3 - 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*
b**2*c*d*x**5 + 48*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**4*c*d
+ a**4*d**2*x**2 - a**3*b*c**2 + 2*a**3*b*c*d*x**2 + 3*a**3*b*d**2*x**4 -
3*a**2*b**2*c**2*x**2 + 3*a**2*b**2*d**2*x**6 - 3*a*b**3*c**2*x**4 - 2*a*b
**3*c*d*x**6 + a*b**3*d**2*x**8 - b**4*c**2*x**6 - b**4*c*d*x**8),x)*a**6*
d**4 - 120*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**4*c*d + a**4*d
**2*x**2 - a**3*b*c**2 + 2*a**3*b*c*d*x**2 + 3*a**3*b*d**2*x**4 - 3*a**2*b
**2*c**2*x**2 + 3*a**2*b**2*d**2*x**6 - 3*a*b**3*c**2*x**4 - 2*a*b**3*c*d*
x**6 + a*b**3*d**2*x**8 - b**4*c**2*x**6 - b**4*c*d*x**8),x)*a**5*b*c*d**3
 + 96*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**4*c*d + a**4*d**2*x
**2 - a**3*b*c**2 + 2*a**3*b*c*d*x**2 + 3*a**3*b*d**2*x**4 - 3*a**2*b**2*c
**2*x**2 + 3*a**2*b**2*d**2*x**6 - 3*a*b**3*c**2*x**4 - 2*a*b**3*c*d*x**6
+ a*b**3*d**2*x**8 - b**4*c**2*x**6 - b**4*c*d*x**8),x)*a**5*b*d**4*x**2 +
 9*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**4*c*d + a**4*d**2*x**2
 - a**3*b*c**2 + 2*a**3*b*c*d*x**2 + 3*a**3*b*d**2*x**4 - 3*a**2*b**2*c...
```

3.50 $\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 428

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}\,dx = \frac{(Ab^3-a(b^2B-abC+a^2D))\,x\sqrt{c+dx^2}}{3ab^2(bc-ad)\,(a+bx^2)^{3/2}} + \frac{Dx\sqrt{c+dx^2}}{b^2d\sqrt{a+bx^2}}$$
$$+ \frac{(2Ab^3d(bc-2ad)+a(b^3Bcd-8a^3d^2D+a^2bd(2Cd+13cD)-ab^2(4cCd-Bd^2+3c^2D)))\,\sqrt{c+dx^2}\,E(}{3a^{3/2}b^{5/2}d(bc-ad)^2\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$
$$- \frac{(Ab^3cd-ab^2(3c^2C-2Bcd+3Ad^2)-4a^3cdD+a^2bc(Cd+6cD))\,\sqrt{c+dx^2}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right),1\right.}{3\sqrt{a}b^{5/2}c(bc-ad)^2\sqrt{a+bx^2}\sqrt{\frac{a(c+dx^2)}{c(a+bx^2)}}}$$

output
```
1/3*(A*b^3-a*(B*b^2-C*a*b+D*a^2))*x*(d*x^2+c)^(1/2)/a/b^2/(-a*d+b*c)/(b*x^
2+a)^(3/2)+D*x*(d*x^2+c)^(1/2)/b^2/d/(b*x^2+a)^(1/2)+1/3*(2*A*b^3*d*(-2*a*
d+b*c)+a*(b^3*B*c*d-8*a^3*d^2*D+a^2*b*d*(2*C*d+13*D*c)-a*b^2*(-B*d^2+4*C*c
*d+3*D*c^2)))*(d*x^2+c)^(1/2)*EllipticE(b^(1/2)*x/a^(1/2)/(1+b*x^2/a)^(1/2
),(1-a*d/b/c)^(1/2))/a^(3/2)/b^(5/2)/d/(-a*d+b*c)^2/(b*x^2+a)^(1/2)/(a*(d*
x^2+c)/c/(b*x^2+a))^(1/2)-1/3*(A*b^3*c*d-a*b^2*(3*A*d^2-2*B*c*d+3*C*c^2)-4
*a^3*c*d*D+a^2*b*c*(C*d+6*D*c))*(d*x^2+c)^(1/2)*InverseJacobiAM(arctan(b^(
1/2)*x/a^(1/2)),(1-a*d/b/c)^(1/2))/a^(1/2)/b^(5/2)/c/(-a*d+b*c)^2/(b*x^2+a
)^(1/2)/(a*(d*x^2+c)/c/(b*x^2+a))^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 13.30 (sec) , antiderivative size = 445, normalized size of antiderivative = 1.04

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}\,dx = \frac{\left(\frac{b}{a}\right)^{3/2}\left(\sqrt{\frac{b}{a}}dx(c+dx^2)\left(-4a^5dD+2Ab^5cx^2+ab^4(3Ac+Bcx^2-4Adx^2\right.\right.}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(5/2)*Sqrt[c + d*x^2]),
x]
```

output
```
((b/a)^(3/2)*(Sqrt[b/a]*d*x*(c + d*x^2)*(-4*a^5*d*D + 2*A*b^5*c*x^2 + a*b^
4*(3*A*c + B*c*x^2 - 4*A*d*x^2) + a^2*b^3*(-5*A*d + (-4*c*C + B*d)*x^2) +
a^4*b*(C*d + 6*c*D - 5*d*D*x^2) + a^3*b^2*(2*d*(B + C*x^2) + c*(-3*C + 7*D
*x^2))) - I*c*(-2*A*b^3*d*(b*c - 2*a*d) + a*(-(b^3*B*c*d) + 8*a^3*d^2*D -
a^2*b*d*(2*C*d + 13*c*D) + a*b^2*(4*c*C*d - B*d^2 + 3*c^2*D)))*(a + b*x^2)
*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/a]*x],
 (a*d)/(b*c)] + I*(-(b*c) + a*d)*(A*b^2*d*(2*b*c - 3*a*d) + a*c*(b^2*B*d +
 4*a^2*d*D - a*b*(C*d + 3*c*D)))*(a + b*x^2)*Sqrt[1 + (b*x^2)/a]*Sqrt[1 +
(d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)]))/(3*b^4*d*(b*c
- a*d)^2*(a + b*x^2)^(3/2)*Sqrt[c + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1157 vs. 2(428) = 856.

Time = 1.88 (sec) , antiderivative size = 1157, normalized size of antiderivative = 2.70, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.050$, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}\,dx$$

$$\Big\downarrow \; 7293$$

$$\int \left(\frac{A}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}+\frac{Bx^2}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}+\frac{Cx^4}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}+\frac{Dx^6}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}\right)dx$$

$$\Big\downarrow \text{2009}$$

$$\frac{aD\sqrt{dx^2+c}x^3}{3b(bc-ad)\left(bx^2+a\right)^{3/2}}+\frac{2a(3bc-2ad)D\sqrt{dx^2+c}x}{3b^2(bc-ad)^2\sqrt{bx^2+a}}+\frac{Ab\sqrt{dx^2+c}x}{3a(bc-ad)\left(bx^2+a\right)^{3/2}}-\frac{B\sqrt{dx^2+c}x}{3(bc-ad)\left(bx^2+a\right)^{3/2}}+\frac{aC\sqrt{dx^2+c}x}{3b(bc-ad)\left(bx^2+a\right)^{3/2}}+\frac{\left(3b^2c^2-13abdc+8a^2d^2\right)D\sqrt{bx^2+a}x}{3b^3(bc-ad)^2\sqrt{dx^2+c}}-\frac{2\sqrt{a}C(2bc-ad)\sqrt{dx^2+c}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{3b^{3/2}(bc-ad)^2\sqrt{bx^2+a}\sqrt{\frac{a(dx^2+c)}{c(bx^2+a)}}}+\frac{B(bc+ad)\sqrt{dx^2+c}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{3\sqrt{a}\sqrt{b}(bc-ad)^2\sqrt{bx^2+a}\sqrt{\frac{a(dx^2+c)}{c(bx^2+a)}}}+\frac{2A\sqrt{b}(bc-2ad)\sqrt{dx^2+c}E\left(\arctan\left(\frac{\sqrt{b}x}{\sqrt{a}}\right)|1-\frac{ad}{bc}\right)}{3a^{3/2}(bc-ad)^2\sqrt{bx^2+a}\sqrt{\frac{a(dx^2+c)}{c(bx^2+a)}}}-\frac{\sqrt{c}\left(3b^2c^2-13abdc+8a^2d^2\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^3\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}C(3bc-ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3ab\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2c^{3/2}(3bc-2ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3b^2\sqrt{d}(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{A\sqrt{c}\sqrt{d}(bc-3ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a^2(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{2Bc^{3/2}\sqrt{d}\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a(bc-ad)^2\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(5/2)*Sqrt[c + d*x^2]),x]
```

output
```
((3*b^2*c^2 - 13*a*b*c*d + 8*a^2*d^2)*D*x*Sqrt[a + b*x^2])/(3*b^3*(b*c - a
*d)^2*Sqrt[c + d*x^2]) + (A*b*x*Sqrt[c + d*x^2])/(3*a*(b*c - a*d)*(a + b*x
^2)^(3/2)) - (B*x*Sqrt[c + d*x^2])/(3*(b*c - a*d)*(a + b*x^2)^(3/2)) + (a*
C*x*Sqrt[c + d*x^2])/(3*b*(b*c - a*d)*(a + b*x^2)^(3/2)) + (a*D*x^3*Sqrt[c
 + d*x^2])/(3*b*(b*c - a*d)*(a + b*x^2)^(3/2)) + (2*a*(3*b*c - 2*a*d)*D*x*
Sqrt[c + d*x^2])/(3*b^2*(b*c - a*d)^2*Sqrt[a + b*x^2]) + (2*A*Sqrt[b]*(b*c
 - 2*a*d)*Sqrt[c + d*x^2]*EllipticE[ArcTan[(Sqrt[b]*x)/Sqrt[a]], 1 - (a*d)
/(b*c)])/(3*a^(3/2)*(b*c - a*d)^2*Sqrt[a + b*x^2]*Sqrt[(a*(c + d*x^2))/(c*
(a + b*x^2))]) - (2*Sqrt[a]*C*(2*b*c - a*d)*Sqrt[c + d*x^2]*EllipticE[ArcT
an[(Sqrt[b]*x)/Sqrt[a]], 1 - (a*d)/(b*c)])/(3*b^(3/2)*(b*c - a*d)^2*Sqrt[a
 + b*x^2]*Sqrt[(a*(c + d*x^2))/(c*(a + b*x^2))]) + (B*(b*c + a*d)*Sqrt[c +
 d*x^2]*EllipticE[ArcTan[(Sqrt[b]*x)/Sqrt[a]], 1 - (a*d)/(b*c)])/(3*Sqrt[a
]*Sqrt[b]*(b*c - a*d)^2*Sqrt[a + b*x^2]*Sqrt[(a*(c + d*x^2))/(c*(a + b*x^2
))]) - (Sqrt[c]*(3*b^2*c^2 - 13*a*b*c*d + 8*a^2*d^2)*D*Sqrt[a + b*x^2]*Ell
ipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^3*Sqrt[d]*(b*c
- a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (2*B*c^(
3/2)*Sqrt[d]*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b
*c)/(a*d)])/(3*a*(b*c - a*d)^2*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[
c + d*x^2]) - (A*Sqrt[c]*Sqrt[d]*(b*c - 3*a*d)*Sqrt[a + b*x^2]*EllipticF[A
rcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*a^2*(b*c - a*d)^2*Sqrt...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 8.83 (sec) , antiderivative size = 764, normalized size of antiderivative = 1.79

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\left(-\frac{x\left(b^3A-a\,b^2B+a^2bC-a^3D\right)\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{3b^4a(ad-bc)\left(x^2+\frac{a}{b}\right)^2}-\frac{\left(bd\,x^2+bc\right)x\left(4A\,b^3da-2A\,b^4c-B\,a^2b^2d-B\,b^3ca-2C\,a^3bd+4 \right.}{3b^3a^2(ad-bc)^2\sqrt{\left(x^2+\frac{a}{b}\right)\left(bd\,x^2+bc \right.}}\right.}{}$
default	Expression too large to display

input

```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(1/2),x,method=_RETURN
VERBOSE)
```

output

```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(-1/3/b^4/a/(a
*d-b*c)*x*(A*b^3-B*a*b^2+C*a^2*b-D*a^3)*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2
)/(x^2+a/b)^2-1/3*(b*d*x^2+b*c)/b^3/a^2/(a*d-b*c)^2*x*(4*A*a*b^3*d-2*A*b^4
*c-B*a^2*b^2*d-B*a*b^3*c-2*C*a^3*b*d+4*C*a^2*b^2*c+5*D*a^4*d-7*D*a^3*b*c)/
((x^2+a/b)*(b*d*x^2+b*c))^(1/2)+((C*b-2*D*a)/b^3-1/3/b^3*d*(A*b^3-B*a*b^2+
C*a^2*b-D*a^3)/(a*d-b*c)/a+1/3/b^3/(a*d-b*c)*(4*A*a*b^3*d-2*A*b^4*c-B*a^2*
b^2*d-B*a*b^3*c-2*C*a^3*b*d+4*C*a^2*b^2*c+5*D*a^4*d-7*D*a^3*b*c)/a^2+1/3/b
^2*c/a^2/(a*d-b*c)^2*(4*A*a*b^3*d-2*A*b^4*c-B*a^2*b^2*d-B*a*b^3*c-2*C*a^3*
b*d+4*C*a^2*b^2*c+5*D*a^4*d-7*D*a^3*b*c))/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(
1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1
/2),(-1+(a*d+b*c)/c/b)^(1/2))-(D/b^2+1/3/b^2*d*(4*A*a*b^3*d-2*A*b^4*c-B*a^
2*b^2*d-B*a*b^3*c-2*C*a^3*b*d+4*C*a^2*b^2*c+5*D*a^4*d-7*D*a^3*b*c)/(a*d-b*
c)^2/a^2)*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*
x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2
))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 1217 vs. $2(402) = 804$.

Time = 0.14 (sec) , antiderivative size = 1217, normalized size of antiderivative = 2.84

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}\,dx = \text{Too large to display}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(1/2),x, algorit
hm="fricas")
```

output
```
-1/3*(((3*D*a^2*b^4*c^4 - (13*D*a^3*b^3 - 4*C*a^2*b^4 + B*a*b^5 + 2*A*b^6)
*c^3*d + (8*D*a^4*b^2 - 2*C*a^3*b^3 - B*a^2*b^4 + 4*A*a*b^5)*c^2*d^2)*x^5
+ 2*(3*D*a^3*b^3*c^4 - (13*D*a^4*b^2 - 4*C*a^3*b^3 + B*a^2*b^4 + 2*A*a*b^5
)*c^3*d + (8*D*a^5*b - 2*C*a^4*b^2 - B*a^3*b^3 + 4*A*a^2*b^4)*c^2*d^2)*x^3
 + (3*D*a^4*b^2*c^4 - (13*D*a^5*b - 4*C*a^4*b^2 + B*a^3*b^3 + 2*A*a^2*b^4)
*c^3*d + (8*D*a^6 - 2*C*a^5*b - B*a^4*b^2 + 4*A*a^3*b^3)*c^2*d^2)*x)*sqrt(
b*d)*sqrt(-c/d)*elliptic_e(arcsin(sqrt(-c/d)/x), a*d/(b*c)) - ((3*D*a^2*b^
4*c^4 + 3*A*a^2*b^4*d^4 - (13*D*a^3*b^3 - 4*C*a^2*b^4 + B*a*b^5 + 2*A*b^6)
*c^3*d + (8*D*a^4*b^2 - 2*(C + 3*D)*a^3*b^3 - (B - 3*C)*a^2*b^4 + 4*A*a*b^
5)*c^2*d^2 + (4*D*a^4*b^2 - C*a^3*b^3 - 2*B*a^2*b^4 - A*a*b^5)*c*d^3)*x^5
+ 2*(3*D*a^3*b^3*c^4 + 3*A*a^3*b^3*d^4 - (13*D*a^4*b^2 - 4*C*a^3*b^3 + B*a
^2*b^4 + 2*A*a*b^5)*c^3*d + (8*D*a^5*b - 2*(C + 3*D)*a^4*b^2 - (B - 3*C)*a
^3*b^3 + 4*A*a^2*b^4)*c^2*d^2 + (4*D*a^5*b - C*a^4*b^2 - 2*B*a^3*b^3 - A*a
^2*b^4)*c*d^3)*x^3 + (3*D*a^4*b^2*c^4 + 3*A*a^4*b^2*d^4 - (13*D*a^5*b - 4*
C*a^4*b^2 + B*a^3*b^3 + 2*A*a^2*b^4)*c^3*d + (8*D*a^6 - 2*(C + 3*D)*a^5*b
- (B - 3*C)*a^4*b^2 + 4*A*a^3*b^3)*c^2*d^2 + (4*D*a^6 - C*a^5*b - 2*B*a^4*
b^2 - A*a^3*b^3)*c*d^3)*x)*sqrt(b*d)*sqrt(-c/d)*elliptic_f(arcsin(sqrt(-c/
d)/x), a*d/(b*c)) - (3*D*a^4*b^2*c^3*d - (13*D*a^5*b - 4*C*a^4*b^2 + B*a^3
*b^3 + 2*A*a^2*b^4)*c^2*d^2 + (8*D*a^6 - 2*C*a^5*b - B*a^4*b^2 + 4*A*a^3*b
^3)*c*d^3 + 3*(D*a^2*b^4*c^3*d - 2*D*a^3*b^3*c^2*d^2 + D*a^4*b^2*c*d^3)...
```

Sympy [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}\,dx=\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{\frac{5}{2}}\sqrt{c+dx^2}}\,dx$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(5/2)/(d*x**2+c)**(1/2),x)
```

output
```
Integral((A + B*x**2 + C*x**4 + D*x**6)/((a + b*x**2)**(5/2)*sqrt(c + d*x*
*2)), x)
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{5}{2}}\sqrt{dx^2+c}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(1/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(5/2)*sqrt(d*x^2 + c)),
 x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{5}{2}}\sqrt{dx^2+c}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(1/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(5/2)*sqrt(d*x^2 + c)),
 x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\sqrt{c+dx^2}}\,dx=\int \frac{A+B\,x^2+C\,x^4+x^6\,D}{(b\,x^2+a)^{5/2}\,\sqrt{d\,x^2+c}}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(5/2)*(c + d*x^2)^(1/2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(5/2)*(c + d*x^2)^(1/2)), x)
```

Reduce [F]

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{(a + bx^2)^{5/2} \sqrt{c + dx^2}} \, dx = \text{too large to display}$$

input

```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(1/2),x)
```

output

```
( - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*c*x + 2*sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*a*d*x**3 + sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*x - 2*sqrt(c +
 d*x**2)*sqrt(a + b*x**2)*b*c*x**3 - 8*int((sqrt(c + d*x**2)*sqrt(a + b*x*
*2)*x**4)/(a**4*c*d + a**4*d**2*x**2 - a**3*b*c**2 + 2*a**3*b*c*d*x**2 + 3
*a**3*b*d**2*x**4 - 3*a**2*b**2*c**2*x**2 + 3*a**2*b**2*d**2*x**6 - 3*a*b*
*3*c**2*x**4 - 2*a*b**3*c*d*x**6 + a*b**3*d**2*x**8 - b**4*c**2*x**6 - b**
4*c*d*x**8),x)*a**5*d**3 + 15*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)
/(a**4*c*d + a**4*d**2*x**2 - a**3*b*c**2 + 2*a**3*b*c*d*x**2 + 3*a**3*b*d
**2*x**4 - 3*a**2*b**2*c**2*x**2 + 3*a**2*b**2*d**2*x**6 - 3*a*b**3*c**2*x
**4 - 2*a*b**3*c*d*x**6 + a*b**3*d**2*x**8 - b**4*c**2*x**6 - b**4*c*d*x**
8),x)*a**4*b*c*d**2 - 16*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**
4*c*d + a**4*d**2*x**2 - a**3*b*c**2 + 2*a**3*b*c*d*x**2 + 3*a**3*b*d**2*x
**4 - 3*a**2*b**2*c**2*x**2 + 3*a**2*b**2*d**2*x**6 - 3*a*b**3*c**2*x**4 -
 2*a*b**3*c*d*x**6 + a*b**3*d**2*x**8 - b**4*c**2*x**6 - b**4*c*d*x**8),x)
*a**4*b*d**3*x**2 + int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**4*c*d
 + a**4*d**2*x**2 - a**3*b*c**2 + 2*a**3*b*c*d*x**2 + 3*a**3*b*d**2*x**4 -
 3*a**2*b**2*c**2*x**2 + 3*a**2*b**2*d**2*x**6 - 3*a*b**3*c**2*x**4 - 2*a*
b**3*c*d*x**6 + a*b**3*d**2*x**8 - b**4*c**2*x**6 - b**4*c*d*x**8),x)*a**3
*b**3*d**2 - 9*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**4*c*d + a*
*4*d**2*x**2 - a**3*b*c**2 + 2*a**3*b*c*d*x**2 + 3*a**3*b*d**2*x**4 - 3...
```

3.51 $\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{3/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 525

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{3/2}}\,dx = \frac{(Ab^3-a(b^2B-abC+a^2D))\,x}{3ab^2(bc-ad)\,(a+bx^2)^{3/2}\sqrt{c+dx^2}}$$
$$+\frac{(2Ab^3(bc-3ad)+a(b^3Bc-ab^2(4cC-3Bd)+7a^2bcD-3a^3dD))\,x}{3a^2b^2(bc-ad)^2\sqrt{a+bx^2}\sqrt{c+dx^2}}$$
$$+\frac{(Ab^2d(2b^2c^2-7abcd-3a^2d^2)+ac(b^3Bcd-2a^3d^2D-a^2bd(Cd-7cD)-ab^2(7cCd-7Bd^2-3c^2D)))}{3a^2b^2\sqrt{c}\sqrt{d}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$
$$-\frac{\sqrt{c}(Ab^3cd-ab^2(3c^2C-5Bcd+9Ad^2)-a^3cdD-a^2b(5cCd-3Bd^2-9c^2D))\sqrt{a+bx^2}\,\text{EllipticF}\left(\text{arc}\right.}{3a^2b\sqrt{d}(bc-ad)^3\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
1/3*(A*b^3-a*(B*b^2-C*a*b+D*a^2))*x/a/b^2/(-a*d+b*c)/(b*x^2+a)^(3/2)/(d*x^
2+c)^(1/2)+1/3*(2*A*b^3*(-3*a*d+b*c)+a*(b^3*B*c-a*b^2*(-3*B*d+4*C*c)+7*a^2
*b*c*D-3*a^3*d*D))*x/a^2/b^2/(-a*d+b*c)^2/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)+
1/3*(A*b^2*d*(-3*a^2*d^2-7*a*b*c*d+2*b^2*c^2)+a*c*(b^3*B*c*d-2*a^3*d^2*D-a
^2*b*d*(C*d-7*D*c)-a*b^2*(-7*B*d^2+7*C*c*d-3*D*c^2)))*(b*x^2+a)^(1/2)*Elli
pticE(d^(1/2)*x/c^(1/2)/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/a^2/b^2/c^(1/
2)/d^(1/2)/(-a*d+b*c)^3/(c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)-1/
3*c^(1/2)*(A*b^3*c*d-a*b^2*(9*A*d^2-5*B*c*d+3*C*c^2)-a^3*c*d*D-a^2*b*(-3*B
*d^2+5*C*c*d-9*D*c^2))*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/2)*x/c^
(1/2)),(1-b*c/a/d)^(1/2))/a^2/b/d^(1/2)/(-a*d+b*c)^3/(c*(b*x^2+a)/a/(d*x^2
+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 13.90 (sec) , antiderivative size = 613, normalized size of antiderivative = 1.17

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{3/2}}\,dx = \frac{\sqrt{\frac{b}{a}}dx(a^5cdD(c+dx^2)-2Ab^5c^2x^2(c+dx^2)-ab^4c(c+dx^2)\left(3Ac+Bcx\right.}{}$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(5/2)*(c + d*x^2)^(3/2)
),x]
```

output
```
(Sqrt[b/a]*d*x*(a^5*c*d*D*(c + d*x^2) - 2*A*b^5*c^2*x^2*(c + d*x^2) - a*b^
4*c*(c + d*x^2)*(3*A*c + B*c*x^2 - 7*A*d*x^2) + a^2*b^3*(c*x^2*(4*c^2*C -
4*B*c*d + 7*c*C*d*x^2 - 7*B*d^2*x^2 - 3*c^2*D*x^2) + A*d*(8*c^2 + 8*c*d*x^
2 + 3*d^2*x^4)) + a^3*b^2*(6*A*d^3*x^2 + c*d^2*x^2*(-11*B + C*x^2) + c^3*(
3*C - 13*D*x^2) + c^2*d*(-5*B + 10*C*x^2 - 7*D*x^4)) + a^4*b*(3*A*d^3 - 9*
c^3*D + c^2*d*(5*C - 4*D*x^2) + c*d^2*(-3*B + 2*C*x^2 + 2*D*x^4))) + I*c*(
A*b^2*d*(-2*b^2*c^2 + 7*a*b*c*d + 3*a^2*d^2) + a*c*(-(b^3*B*c*d) + 2*a^3*d
^2*D + a^2*b*d*(C*d - 7*c*D) + a*b^2*(7*c*C*d - 7*B*d^2 - 3*c^2*D)))*(a +
b*x^2)*Sqrt[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticE[I*ArcSinh[Sqrt[b/
a]*x], (a*d)/(b*c)] - I*c*(-(b*c) + a*d)*(2*A*b^2*d*(b*c - 3*a*d) + a*(b^2
*B*c*d + a^2*c*d*D + a*b*(-4*c*C*d + 3*B*d^2 + 3*c^2*D)))*(a + b*x^2)*Sqrt
[1 + (b*x^2)/a]*Sqrt[1 + (d*x^2)/c]*EllipticF[I*ArcSinh[Sqrt[b/a]*x], (a*d
)/(b*c)])/(3*a^3*(b/a)^(3/2)*c*d*(-(b*c) + a*d)^3*(a + b*x^2)^(3/2)*Sqrt[c
 + d*x^2])
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1262 vs. 2(525) = 1050.

Time = 1.99 (sec) , antiderivative size = 1262, normalized size of antiderivative = 2.40, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.050, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{\left(a+bx^2\right)^{5/2}\left(c+dx^2\right)^{3/2}}\,dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(\frac{A}{\left(a+bx^2\right)^{5/2}\left(c+dx^2\right)^{3/2}}+\frac{Bx^2}{\left(a+bx^2\right)^{5/2}\left(c+dx^2\right)^{3/2}}+\frac{Cx^4}{\left(a+bx^2\right)^{5/2}\left(c+dx^2\right)^{3/2}}+\frac{Dx^6}{\left(a+bx^2\right)^{5/2}\left(c+dx^2\right)^{3}}\right.$$

$$\Big\downarrow \text{2009}$$

$$\frac{aDx^3}{3b(bc-ad)\left(bx^2+a\right)^{3/2}\sqrt{dx^2+c}}+\frac{B(bc+3ad)x}{3a(bc-ad)^2\sqrt{bx^2+a}\sqrt{dx^2+c}}+\frac{2a(3bc-ad)Dx}{3b^2(bc-ad)^2\sqrt{bx^2+a}\sqrt{dx^2+c}}-\frac{4cCx}{3(bc-ad)^2\sqrt{bx^2+a}\sqrt{dx^2+c}}+\frac{2Ab(bc-3ad)x}{3a^2(bc-ad)^2\sqrt{bx^2+a}\sqrt{dx^2+c}}+\frac{Abx}{3a(bc-ad)\left(bx^2+a\right)^{3/2}\sqrt{dx^2+c}}-\frac{Bx}{3(bc-ad)\left(bx^2+a\right)^{3/2}\sqrt{dx^2+c}}+\frac{aCx}{3b(bc-ad)\left(bx^2+a\right)^{3/2}\sqrt{dx^2+c}}-\frac{\sqrt{c}C\sqrt{d}(7bc+ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{B\sqrt{c}\sqrt{d}(bc+7ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3a(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{A\sqrt{d}\left(2b^2c^2-7abdc-3a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3a^2\sqrt{c}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}\left(3b^2c^2+7abdc-2a^2d^2\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b^2\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{B\sqrt{c}\sqrt{d}(5bc+3ad)\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{c^{3/2}C(3bc+5ad)\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{c^{3/2}(9bc-ad)D\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3b\sqrt{d}(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Ab\sqrt{c}\sqrt{d}(bc-9ad)\sqrt{bx^2+a}\,\mathrm{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a^2(bc-ad)^3\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(5/2)*(c + d*x^2)^(3/2)),x]
```

output
```
(A*b*x)/(3*a*(b*c - a*d)*(a + b*x^2)^(3/2)*Sqrt[c + d*x^2]) - (B*x)/(3*(b*
c - a*d)*(a + b*x^2)^(3/2)*Sqrt[c + d*x^2]) + (a*C*x)/(3*b*(b*c - a*d)*(a
+ b*x^2)^(3/2)*Sqrt[c + d*x^2]) + (a*D*x^3)/(3*b*(b*c - a*d)*(a + b*x^2)^(
3/2)*Sqrt[c + d*x^2]) - (4*c*C*x)/(3*(b*c - a*d)^2*Sqrt[a + b*x^2]*Sqrt[c
+ d*x^2]) + (2*A*b*(b*c - 3*a*d)*x)/(3*a^2*(b*c - a*d)^2*Sqrt[a + b*x^2]*S
qrt[c + d*x^2]) + (B*(b*c + 3*a*d)*x)/(3*a*(b*c - a*d)^2*Sqrt[a + b*x^2]*S
qrt[c + d*x^2]) + (2*a*(3*b*c - a*d)*D*x)/(3*b^2*(b*c - a*d)^2*Sqrt[a + b*
x^2]*Sqrt[c + d*x^2]) - (Sqrt[c]*C*Sqrt[d]*(7*b*c + a*d)*Sqrt[a + b*x^2]*E
llipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b*(b*c - a*d)^3
*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (B*Sqrt[c]*Sqrt[
d]*(b*c + 7*a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1
- (b*c)/(a*d)])/(3*a*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*S
qrt[c + d*x^2]) + (A*Sqrt[d]*(2*b^2*c^2 - 7*a*b*c*d - 3*a^2*d^2)*Sqrt[a +
b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*a^2*Sqr
t[c]*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2])
+ (Sqrt[c]*(3*b^2*c^2 + 7*a*b*c*d - 2*a^2*d^2)*D*Sqrt[a + b*x^2]*EllipticE
[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*b^2*Sqrt[d]*(b*c - a*d)
^3*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) - (A*b*Sqrt[c]*S
qrt[d]*(b*c - 9*a*d)*Sqrt[a + b*x^2]*EllipticF[ArcTan[(Sqrt[d]*x)/Sqrt[c]]
, 1 - (b*c)/(a*d)])/(3*a^2*(b*c - a*d)^3*Sqrt[(c*(a + b*x^2))/(a*(c + d...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [A] (verified)

Time = 11.03 (sec) , antiderivative size = 950, normalized size of antiderivative = 1.81

method	result
elliptic	$\frac{\sqrt{(b\,x^2+a)(x^2d+c)}\Bigg(\frac{x\left(b^3A-a\,b^2B+a^2bC-a^3D\right)\sqrt{bd\,x^4+ad\,x^2+x^2bc+ac}}{3b^3a(ad-bc)^2\left(x^2+\frac{a}{b}\right)^2}+\frac{\left(bd\,x^2+bc\right)x\left(7A\,b^3da-2A\,b^4c-4B\,a^2b^2d-B\,b^3ca+C\,a^3bd+4C\right.}{3b^2a^2(ad-bc)^3\sqrt{\left(x^2+\frac{a}{b}\right)\left(bd\,x^2+bc\right)}}}{}$
default	Expression too large to display

input

```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(3/2),x,method=_RETURN
VERBOSE)
```

output

```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*(1/3/b^3/a/(a*
d-b*c)^2*x*(A*b^3-B*a*b^2+C*a^2*b-D*a^3)*(b*d*x^4+a*d*x^2+b*c*x^2+a*c)^(1/
2)/(x^2+a/b)^2+1/3*(b*d*x^2+b*c)/b^2/a^2/(a*d-b*c)^3*x*(7*A*a*b^3*d-2*A*b^
4*c-4*B*a^2*b^2*d-B*a*b^3*c+C*a^3*b*d+4*C*a^2*b^2*c+2*D*a^4*d-7*D*a^3*b*c)
/((x^2+a/b)*(b*d*x^2+b*c))^(1/2)+(b*d*x^2+a*d)/c/d/(a*d-b*c)^3*x*(A*d^3-B*
c*d^2+C*c^2*d-D*c^3)/((x^2+c/d)*(b*d*x^2+a*d))^(1/2)+(D/d/b^2+1/3/b^2*d*(A
*b^3-B*a*b^2+C*a^2*b-D*a^3)/(a*d-b*c)^2/a-1/3/(a*d-b*c)^2/b^2*(7*A*a*b^3*d
-2*A*b^4*c-4*B*a^2*b^2*d-B*a*b^3*c+C*a^3*b*d+4*C*a^2*b^2*c+2*D*a^4*d-7*D*a
^3*b*c)/a^2-1/3/b*c/a^2/(a*d-b*c)^3*(7*A*a*b^3*d-2*A*b^4*c-4*B*a^2*b^2*d-B
*a*b^3*c+C*a^3*b*d+4*C*a^2*b^2*c+2*D*a^4*d-7*D*a^3*b*c)+1/d*(A*d^3-B*c*d^2
+C*c^2*d-D*c^3)/(a*d-b*c)^2/c-a/c/(a*d-b*c)^3*(A*d^3-B*c*d^2+C*c^2*d-D*c^3
))/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*x^2+b*c*x
^2+a*c)^(1/2)*EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))-(-1/3*d/b
*(7*A*a*b^3*d-2*A*b^4*c-4*B*a^2*b^2*d-B*a*b^3*c+C*a^3*b*d+4*C*a^2*b^2*c+2*
D*a^4*d-7*D*a^3*b*c)/(a*d-b*c)^3/a^2-(A*d^3-B*c*d^2+C*c^2*d-D*c^3)*b/(a*d-
b*c)^3/c)*c/(-b/a)^(1/2)*(1+b*x^2/a)^(1/2)*(1+d*x^2/c)^(1/2)/(b*d*x^4+a*d*
x^2+b*c*x^2+a*c)^(1/2)/d*(EllipticF(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2
))-EllipticE(x*(-b/a)^(1/2),(-1+(a*d+b*c)/c/b)^(1/2))))
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 2017 vs. $2(494) = 988$.

Time = 0.19 (sec) , antiderivative size = 2017, normalized size of antiderivative = 3.84

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{(a + bx^2)^{5/2} (c + dx^2)^{3/2}} \, dx = \text{Too large to display}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(3/2),x, algorit
hm="fricas")
```

output
```
-1/3*((3*D*a^4*b^3*c^4 - 3*A*a^4*b^3*c*d^3 + (3*D*a^2*b^5*c^3*d - 3*A*a^2*
b^5*d^4 + (7*D*a^3*b^4 - 7*C*a^2*b^5 + B*a*b^6 + 2*A*b^7)*c^2*d^2 - (2*D*a
^4*b^3 + C*a^3*b^4 - 7*B*a^2*b^5 + 7*A*a*b^6)*c*d^3)*x^6 + (7*D*a^5*b^2 -
7*C*a^4*b^3 + B*a^3*b^4 + 2*A*a^2*b^5)*c^3*d - (2*D*a^6*b + C*a^5*b^2 - 7*
B*a^4*b^3 + 7*A*a^3*b^4)*c^2*d^2 + (3*D*a^2*b^5*c^4 - 6*A*a^3*b^4*d^4 + (1
3*D*a^3*b^4 - 7*C*a^2*b^5 + B*a*b^6 + 2*A*b^7)*c^3*d + 3*(4*D*a^4*b^3 - 5*
C*a^3*b^4 + 3*B*a^2*b^5 - A*a*b^6)*c^2*d^2 - (4*D*a^5*b^2 + 2*C*a^4*b^3 -
14*B*a^3*b^4 + 17*A*a^2*b^5)*c*d^3)*x^4 + (6*D*a^3*b^4*c^4 - 3*A*a^4*b^3*d
^4 + (17*D*a^4*b^3 - 14*C*a^3*b^4 + 2*B*a^2*b^5 + 4*A*a*b^6)*c^3*d + 3*(D*
a^5*b^2 - 3*C*a^4*b^3 + 5*B*a^3*b^4 - 4*A*a^2*b^5)*c^2*d^2 - (2*D*a^6*b +
C*a^5*b^2 - 7*B*a^4*b^3 + 13*A*a^3*b^4)*c*d^3)*x^2)*sqrt(a*c)*sqrt(-b/a)*e
lliptic_e(arcsin(x*sqrt(-b/a)), a*d/(b*c)) - (3*D*a^4*b^3*c^4 + (3*D*a^2*b
^5*c^3*d + (9*D*a^4*b^3 - (3*C - 7*D)*a^3*b^4 - 7*C*a^2*b^5 + B*a*b^6 + 2*
A*b^7)*c^2*d^2 - (D*a^5*b^2 + (5*C + 2*D)*a^4*b^3 - (5*B - C)*a^3*b^4 - (A
 + 7*B)*a^2*b^5 + 7*A*a*b^6)*c*d^3 + 3*(B*a^4*b^3 - 3*A*a^3*b^4 - A*a^2*b^
5)*d^4)*x^6 + (9*D*a^6*b - (3*C - 7*D)*a^5*b^2 - 7*C*a^4*b^3 + B*a^3*b^4 +
 2*A*a^2*b^5)*c^3*d - (D*a^7 + (5*C + 2*D)*a^6*b - (5*B - C)*a^5*b^2 - (A
+ 7*B)*a^4*b^3 + 7*A*a^3*b^4)*c^2*d^2 + 3*(B*a^6*b - 3*A*a^5*b^2 - A*a^4*b
^3)*c*d^3 + (3*D*a^2*b^5*c^4 + (9*D*a^4*b^3 - (3*C - 13*D)*a^3*b^4 - 7*C*a
^2*b^5 + B*a*b^6 + 2*A*b^7)*c^3*d + (17*D*a^5*b^2 - (11*C - 12*D)*a^4*b...
```

Sympy [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{3/2}}\,dx = \text{Timed out}$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(5/2)/(d*x**2+c)**(3/2),x)
```

output
```
Timed out
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{3/2}}\,dx = \int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{5}{2}}(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(3/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(5/2)*(d*x^2 + c)^(3/2)
), x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{3/2}}\,dx = \int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{5}{2}}(dx^2+c)^{\frac{3}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(3/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(5/2)*(d*x^2 + c)^(3/2)
), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\,(c+dx^2)^{3/2}}\,dx=\int \frac{A+B\,x^2+C\,x^4+x^6\,D}{(b\,x^2+a)^{5/2}\,(d\,x^2+c)^{3/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(5/2)*(c + d*x^2)^(3/2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(5/2)*(c + d*x^2)^(3/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}\,(c+dx^2)^{3/2}}\,dx=\text{too large to display}$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(3/2),x)
```

output

```
( - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*c*x - sqrt(c + d*x**2)*sqrt(a +
b*x**2)*b**2*x - 2*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b*c*x**3 - 5*int((sqr
t(c + d*x**2)*sqrt(a + b*x**2)*x**4)/(a**3*c**2 + 2*a**3*c*d*x**2 + a**3*d
**2*x**4 + 3*a**2*b*c**2*x**2 + 6*a**2*b*c*d*x**4 + 3*a**2*b*d**2*x**6 + 3
*a*b**2*c**2*x**4 + 6*a*b**2*c*d*x**6 + 3*a*b**2*d**2*x**8 + b**3*c**2*x**
6 + 2*b**3*c*d*x**8 + b**3*d**2*x**10),x)*a**3*b*c**2*d - 5*int((sqrt(c +
d*x**2)*sqrt(a + b*x**2)*x**4)/(a**3*c**2 + 2*a**3*c*d*x**2 + a**3*d**2*x*
*4 + 3*a**2*b*c**2*x**2 + 6*a**2*b*c*d*x**4 + 3*a**2*b*d**2*x**6 + 3*a*b**
2*c**2*x**4 + 6*a*b**2*c*d*x**6 + 3*a*b**2*d**2*x**8 + b**3*c**2*x**6 + 2*
b**3*c*d*x**8 + b**3*d**2*x**10),x)*a**3*b*c*d**2*x**2 - 3*int((sqrt(c + d
*x**2)*sqrt(a + b*x**2)*x**4)/(a**3*c**2 + 2*a**3*c*d*x**2 + a**3*d**2*x**
4 + 3*a**2*b*c**2*x**2 + 6*a**2*b*c*d*x**4 + 3*a**2*b*d**2*x**6 + 3*a*b**2
*c**2*x**4 + 6*a*b**2*c*d*x**6 + 3*a*b**2*d**2*x**8 + b**3*c**2*x**6 + 2*b
**3*c*d*x**8 + b**3*d**2*x**10),x)*a**2*b**3*c*d - 3*int((sqrt(c + d*x**2)
*sqrt(a + b*x**2)*x**4)/(a**3*c**2 + 2*a**3*c*d*x**2 + a**3*d**2*x**4 + 3*
a**2*b*c**2*x**2 + 6*a**2*b*c*d*x**4 + 3*a**2*b*d**2*x**6 + 3*a*b**2*c**2*
x**4 + 6*a*b**2*c*d*x**6 + 3*a*b**2*d**2*x**8 + b**3*c**2*x**6 + 2*b**3*c*
d*x**8 + b**3*d**2*x**10),x)*a**2*b**3*d**2*x**2 + 2*int((sqrt(c + d*x**2)
*sqrt(a + b*x**2)*x**4)/(a**3*c**2 + 2*a**3*c*d*x**2 + a**3*d**2*x**4 + 3*
a**2*b*c**2*x**2 + 6*a**2*b*c*d*x**4 + 3*a**2*b*d**2*x**6 + 3*a*b**2*c*...
```

3.52 $\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}\,dx$

Optimal result

Integrand size = 40, antiderivative size = 695

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}\,dx = \frac{(Ab^3-a(b^2B-abC+a^2D))\,x}{3ab^2(bc-ad)\,(a+bx^2)^{3/2}\,(c+dx^2)^{3/2}}$$

$$+\frac{(2Ab^3(bc-4ad)+a(b^3Bc-ab^2(4cC-5Bd)-a^3dD-a^2b(2Cd-7cD)))\,x}{3a^2b^2(bc-ad)^2\sqrt{a+bx^2}\,(c+dx^2)^{3/2}}$$

$$+\frac{(Abd(2b^2c^2-9abcd-a^2d^2)+ac(b^2Bcd-a^2d(3Cd-7cD)-ab(5cCd-7Bd^2-c^2D)))\,x\sqrt{a+bx^2}}{3a^2bc(bc-ad)^3\,(c+dx^2)^{3/2}}$$

$$+\frac{(2Abd(b^3c^3-5ab^2c^2d-5a^2bcd^2+a^3d^3)+ac(b^3Bc^2d+a^3cd^2D-a^2bd(8cCd-Bd^2-14c^2D)-ab^2c(8c}{3a^2bc^{3/2}\sqrt{d}(bc-ad)^4\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

$$-\frac{(Ab^3c^2d-ab^2c(3c^2C-8Bcd+18Ad^2)-a^3cd(3Cd-8cD)-a^2b(10c^2Cd-8Bcd^2-Ad^3-8c^3D))\,\sqrt{c}}{3a^2\sqrt{c}\sqrt{d}(bc-ad)^4\sqrt{\frac{c(a+bx^2)}{a(c+dx^2)}}\sqrt{c+dx^2}}$$

output
```
1/3*(A*b^3-a*(B*b^2-C*a*b+D*a^2))*x/a/b^2/(-a*d+b*c)/(b*x^2+a)^(3/2)/(d*x^
2+c)^(3/2)+1/3*(2*A*b^3*(-4*a*d+b*c)+a*(b^3*B*c-a*b^2*(-5*B*d+4*C*c)-a^3*d
*D-a^2*b*(2*C*d-7*D*c)))*x/a^2/b^2/(-a*d+b*c)^2/(b*x^2+a)^(1/2)/(d*x^2+c)^
(3/2)+1/3*(A*b*d*(-a^2*d^2-9*a*b*c*d+2*b^2*c^2)+a*c*(b^2*B*c*d-a^2*d*(3*C*
d-7*D*c)-a*b*(-7*B*d^2+5*C*c*d-D*c^2)))*x*(b*x^2+a)^(1/2)/a^2/b/c/(-a*d+b*
c)^3/(d*x^2+c)^(3/2)+1/3*(2*A*b*d*(a^3*d^3-5*a^2*b*c*d^2-5*a*b^2*c^2*d+b^3
*c^3)+a*c*(b^3*B*c^2*d+a^3*c*d^2*D-a^2*b*d*(-B*d^2+8*C*c*d-14*D*c^2)-a*b^2
*c*(-14*B*d^2+8*C*c*d-D*c^2)))*(b*x^2+a)^(1/2)*EllipticE(d^(1/2)*x/c^(1/2)
/(1+d*x^2/c)^(1/2),(1-b*c/a/d)^(1/2))/a^2/b/c^(3/2)/d^(1/2)/(-a*d+b*c)^4/(
c*(b*x^2+a)/a/(d*x^2+c))^(1/2)/(d*x^2+c)^(1/2)-1/3*(A*b^3*c^2*d-a*b^2*c*(1
8*A*d^2-8*B*c*d+3*C*c^2)-a^3*c*d*(3*C*d-8*D*c)-a^2*b*(-A*d^3-8*B*c*d^2+10*
C*c^2*d-8*D*c^3))*(b*x^2+a)^(1/2)*InverseJacobiAM(arctan(d^(1/2)*x/c^(1/2)
),(1-b*c/a/d)^(1/2))/a^2/c^(1/2)/d^(1/2)/(-a*d+b*c)^4/(c*(b*x^2+a)/a/(d*x^
2+c))^(1/2)/(d*x^2+c)^(1/2)
```

Mathematica [C] (verified)

Result contains complex when optimal does not.

Time = 12.71 (sec) , antiderivative size = 616, normalized size of antiderivative = 0.89

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}\,dx = \frac{-\sqrt{\frac{b}{a}}dx\Big(a^2c(-bc+ad)\left(-c^2Cd+Bcd^2-Ad^3+c^3D\right)(a+bx^2)^2-a^2(b$$

input
```
Integrate[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(5/2)*(c + d*x^2)^(5/2)
),x]
```

output
```
(-(Sqrt[b/a]*d*x*(a^2*c*(-(b*c) + a*d)*(-(c^2*C*d) + B*c*d^2 - A*d^3 + c^3
*D)*(a + b*x^2)^2 - a^2*(b*c*(-4*c^2*C*d + 7*B*c*d^2 - 10*A*d^3 + c^3*D) +
 a*d*(-4*c^2*C*d + B*c*d^2 + 2*A*d^3 + 7*c^3*D))*(a + b*x^2)^2*(c + d*x^2)
 - a*c^2*(-(b*c) + a*d)*(-(A*b^3) + a*(b^2*B - a*b*C + a^2*D))*(c + d*x^2)
^2 - c^2*(2*A*b^3*(b*c - 5*a*d) + a*(b^3*B*c + a*b^2*(-4*c*C + 7*B*d) + a^
3*d*D + a^2*b*(-4*C*d + 7*c*D)))*(a + b*x^2)*(c + d*x^2)^2)) + I*c*(a + b*
x^2)*Sqrt[1 + (b*x^2)/a]*(c + d*x^2)*Sqrt[1 + (d*x^2)/c]*((2*A*b*d*(b^3*c^
3 - 5*a*b^2*c^2*d - 5*a^2*b*c*d^2 + a^3*d^3) + a*c*(b^3*B*c^2*d + a^3*c*d^
2*D + a*b^2*c*(-8*c*C*d + 14*B*d^2 + c^2*D) + a^2*b*d*(-8*c*C*d + B*d^2 +
14*c^2*D)))*EllipticE[I*ArcSinh[Sqrt[b/a]*x], (a*d)/(b*c)] - (b*c - a*d)*(
A*b*d*(2*b^2*c^2 - 9*a*b*c*d - a^2*d^2) + a*c*(b^2*B*c*d + a^2*d*(-3*C*d +
 7*c*D) + a*b*(-5*c*C*d + 7*B*d^2 + c^2*D)))*EllipticF[I*ArcSinh[Sqrt[b/a]
*x], (a*d)/(b*c)]))/(3*a^2*Sqrt[b/a]*c^2*d*(b*c - a*d)^4*(a + b*x^2)^(3/2)
*(c + d*x^2)^(3/2))
```

Rubi [B] (verified)

Leaf count is larger than twice the leaf count of optimal. 1507 vs. 2(695) = 1390.

Time = 2.62 (sec) , antiderivative size = 1507, normalized size of antiderivative = 2.17, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.050, Rules used = {7293, 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.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}dx$$

$$\Big\downarrow \ 7293$$

$$\int \left(\frac{A}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}+\frac{Bx^2}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}+\frac{Cx^4}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}+\frac{Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{5}}\right.$$

$$\Big\downarrow \ 2009$$

$$\frac{aDx^3}{3b(bc-ad)\left(bx^2+a\right)^{3/2}\left(dx^2+c\right)^{3/2}}-\frac{Cd(5bc+3ad)\sqrt{bx^2+a}x}{3b(bc-ad)^3\left(dx^2+c\right)^{3/2}}+\frac{Bd(bc+7ad)\sqrt{bx^2+a}x}{3a(bc-ad)^3\left(dx^2+c\right)^{3/2}}+\frac{Ad\left(2b^2c^2-9abdc-a^2d^2\right)\sqrt{bx^2+a}x}{3a^2c(bc-ad)^3\left(dx^2+c\right)^{3/2}}+\frac{c(bc+7ad)D\sqrt{bx^2+a}x}{3b(bc-ad)^3\left(dx^2+c\right)^{3/2}}-\frac{2C(2bc+ad)x}{3b(bc-ad)^2\sqrt{bx^2+a}\left(dx^2+c\right)^{3/2}}+\frac{B(bc+5ad)x}{3a(bc-ad)^2\sqrt{bx^2+a}\left(dx^2+c\right)^{3/2}}+\frac{2acDx}{b(bc-ad)^2\sqrt{bx^2+a}\left(dx^2+c\right)^{3/2}}+\frac{2Ab(bc-4ad)x}{3a^2(bc-ad)^2\sqrt{bx^2+a}\left(dx^2+c\right)^{3/2}}+\frac{Abx}{3a(bc-ad)\left(bx^2+a\right)^{3/2}\left(dx^2+c\right)^{3/2}}-\frac{Bx}{3(bc-ad)\left(bx^2+a\right)^{3/2}\left(dx^2+c\right)^{3/2}}+\frac{aCx}{3b(bc-ad)\left(bx^2+a\right)^{3/2}\left(dx^2+c\right)^{3/2}}-\frac{8\sqrt{c}C\sqrt{d}(bc+ad)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3(bc-ad)^4\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{2A\sqrt{d}(bc+ad)\left(b^2c^2-6abdc+a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3a^2c^{3/2}(bc-ad)^4\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{B\sqrt{d}\left(b^2c^2+14abdc+a^2d^2\right)\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3a\sqrt{c}(bc-ad)^4\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}\left(b^2c^2+14abdc+a^2d^2\right)D\sqrt{bx^2+a}E\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)|1-\frac{bc}{ad}\right)}{3b\sqrt{d}(bc-ad)^4\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{8bB\sqrt{c}\sqrt{d}(bc+ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a(bc-ad)^4\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}+\frac{\sqrt{c}C(3bc+ad)(bc+3ad)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a\sqrt{d}(bc-ad)^4\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{Ab\sqrt{d}\left(b^2c^2-18abdc+a^2d^2\right)\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3a^2\sqrt{c}(bc-ad)^4\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}-\frac{8c^{3/2}(bc+ad)D\sqrt{bx^2+a}\,\text{EllipticF}\left(\arctan\left(\frac{\sqrt{d}x}{\sqrt{c}}\right),1-\frac{bc}{ad}\right)}{3\sqrt{d}(bc-ad)^4\sqrt{\frac{c(bx^2+a)}{a(dx^2+c)}}\sqrt{dx^2+c}}$$

input
```
Int[(A + B*x^2 + C*x^4 + D*x^6)/((a + b*x^2)^(5/2)*(c + d*x^2)^(5/2)),x]
```

output
```
(A*b*x)/(3*a*(b*c - a*d)*(a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)) - (B*x)/(3*(
b*c - a*d)*(a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)) + (a*C*x)/(3*b*(b*c - a*d)
*(a + b*x^2)^(3/2)*(c + d*x^2)^(3/2)) + (a*D*x^3)/(3*b*(b*c - a*d)*(a + b*
x^2)^(3/2)*(c + d*x^2)^(3/2)) + (2*A*b*(b*c - 4*a*d)*x)/(3*a^2*(b*c - a*d)
^2*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)) - (2*C*(2*b*c + a*d)*x)/(3*b*(b*c -
a*d)^2*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)) + (B*(b*c + 5*a*d)*x)/(3*a*(b*c
- a*d)^2*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)) + (2*a*c*D*x)/(b*(b*c - a*d)^2
*Sqrt[a + b*x^2]*(c + d*x^2)^(3/2)) - (C*d*(5*b*c + 3*a*d)*x*Sqrt[a + b*x^
2])/(3*b*(b*c - a*d)^3*(c + d*x^2)^(3/2)) + (B*d*(b*c + 7*a*d)*x*Sqrt[a +
b*x^2])/(3*a*(b*c - a*d)^3*(c + d*x^2)^(3/2)) + (A*d*(2*b^2*c^2 - 9*a*b*c*
d - a^2*d^2)*x*Sqrt[a + b*x^2])/(3*a^2*c*(b*c - a*d)^3*(c + d*x^2)^(3/2))
+ (c*(b*c + 7*a*d)*D*x*Sqrt[a + b*x^2])/(3*b*(b*c - a*d)^3*(c + d*x^2)^(3/
2)) - (8*Sqrt[c]*C*Sqrt[d]*(b*c + a*d)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(S
qrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])/(3*(b*c - a*d)^4*Sqrt[(c*(a + b*x^2)
)/(a*(c + d*x^2))]*Sqrt[c + d*x^2]) + (2*A*Sqrt[d]*(b*c + a*d)*(b^2*c^2 -
6*a*b*c*d + a^2*d^2)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]]
, 1 - (b*c)/(a*d)])/(3*a^2*c^(3/2)*(b*c - a*d)^4*Sqrt[(c*(a + b*x^2))/(a*(
c + d*x^2))]*Sqrt[c + d*x^2]) + (B*Sqrt[d]*(b^2*c^2 + 14*a*b*c*d + a^2*d^2
)*Sqrt[a + b*x^2]*EllipticE[ArcTan[(Sqrt[d]*x)/Sqrt[c]], 1 - (b*c)/(a*d)])
/(3*a*Sqrt[c]*(b*c - a*d)^4*Sqrt[(c*(a + b*x^2))/(a*(c + d*x^2))]*Sqrt[...
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [B] (verified)

Leaf count of result is larger than twice the leaf count of optimal. 1510 vs. $2(660) = 1320$.

Time = 22.03 (sec) , antiderivative size = 1511, normalized size of antiderivative = 2.17

method	result	size
elliptic	Expression too large to display	1511
default	Expression too large to display	6642

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(5/2),x,method=_RETURN
VERBOSE)
```

output
```
((b*x^2+a)*(d*x^2+c))^(1/2)/(b*x^2+a)^(1/2)/(d*x^2+c)^(1/2)*((1/3/b^3/d^3*
(A*a*b^2*d^3+A*b^3*c*d^2-2*B*a*b^2*c*d^2+C*a^2*b*c*d^2+C*a*b^2*c^2*d-D*a^3
*c*d^2-D*a*b^2*c^3)/a/c/(a^2*d^2-2*a*b*c*d+b^2*c^2)*x^3+1/3/b^3/d^3*(A*a^2
*b*d^3+A*b^3*c^2*d-B*a^2*b*c*d^2-B*a*b^2*c^2*d+2*C*a^2*b*c^2*d-D*a^3*c^2*d
-D*a^2*b*c^3)/a/c/(a^2*d^2-2*a*b*c*d+b^2*c^2)*x)*(b*d*x^4+a*d*x^2+b*c*x^2+
a*c)^(1/2)/(x^4+(a*d+b*c)/d/b*x^2+a*c/d/b)^2-2*b*d*(-1/6/b/d*(2*A*a^3*b*d^
4-10*A*a^2*b^2*c*d^3-10*A*a*b^3*c^2*d^2+2*A*b^4*c^3*d+B*a^3*b*c*d^3+14*B*a
^2*b^2*c^2*d^2+B*a*b^3*c^3*d-8*C*a^3*b*c^2*d^2-8*C*a^2*b^2*c^3*d+D*a^4*c^2
*d^2+14*D*a^3*b*c^3*d+D*a^2*b^2*c^4)/a^2/c^2/(a^2*d^2-2*a*b*c*d+b^2*c^2)^2
*x^3-1/6*(2*A*a^4*b*d^5-9*A*a^3*b^2*c*d^4-2*A*a^2*b^3*c^2*d^3-9*A*a*b^4*c^
3*d^2+2*A*b^5*c^4*d+B*a^4*b*c*d^4+7*B*a^3*b^2*c^2*d^3+7*B*a^2*b^3*c^3*d^2+
B*a*b^4*c^4*d-5*C*a^4*b*c^2*d^3-6*C*a^3*b^2*c^3*d^2-5*C*a^2*b^3*c^4*d+D*a^
5*c^2*d^3+7*D*a^4*b*c^3*d^2+7*D*a^3*b^2*c^4*d+D*a^2*b^3*c^5)/a^2/c^2/(a^2*
d^2-2*a*b*c*d+b^2*c^2)^2/b^2/d^2*x)/((x^4+(a*d+b*c)/d/b*x^2+a*c/d/b)*b*d)^
(1/2)+(1/3/b/d/(a^2*d^2-2*a*b*c*d+b^2*c^2)*(2*A*a^2*b*d^3-6*A*a*b^2*c*d^2+
2*A*b^3*c^2*d+B*a^2*b*c*d^2+B*a*b^2*c^2*d-2*C*a^2*b*c^2*d+D*a^3*c^2*d+D*a^
2*b*c^3)/a^2/c^2-1/3/b/d*(2*A*a^4*b*d^5-9*A*a^3*b^2*c*d^4-2*A*a^2*b^3*c^2*
d^3-9*A*a*b^4*c^3*d^2+2*A*b^5*c^4*d+B*a^4*b*c*d^4+7*B*a^3*b^2*c^2*d^3+7*B*
a^2*b^3*c^3*d^2+B*a*b^4*c^4*d-5*C*a^4*b*c^2*d^3-6*C*a^3*b^2*c^3*d^2-5*C*a^
2*b^3*c^4*d+D*a^5*c^2*d^3+7*D*a^4*b*c^3*d^2+7*D*a^3*b^2*c^4*d+D*a^2*b^3...
```

Fricas [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 3222 vs. $2(649) = 1298$.

Time = 0.36 (sec) , antiderivative size = 3222, normalized size of antiderivative = 4.64

$$\int \frac{A + Bx^2 + Cx^4 + Dx^6}{(a + bx^2)^{5/2} (c + dx^2)^{5/2}} \, dx = \text{Too large to display}$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(5/2),x, algorit
hm="fricas")
```

output
```
Too large to include
```

Sympy [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}\,dx=\text{Timed out}$$

input
```
integrate((D*x**6+C*x**4+B*x**2+A)/(b*x**2+a)**(5/2)/(d*x**2+c)**(5/2),x)
```

output
```
Timed out
```

Maxima [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{5}{2}}(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(5/2),x, algorit
hm="maxima")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(5/2)*(d*x^2 + c)^(5/2)
), x)
```

Giac [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}\,dx=\int \frac{Dx^6+Cx^4+Bx^2+A}{(bx^2+a)^{\frac{5}{2}}(dx^2+c)^{\frac{5}{2}}}\,dx$$

input
```
integrate((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(5/2),x, algorit
hm="giac")
```

output
```
integrate((D*x^6 + C*x^4 + B*x^2 + A)/((b*x^2 + a)^(5/2)*(d*x^2 + c)^(5/2)
), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}\,dx=\int \frac{A+B\,x^2+C\,x^4+x^6\,D}{(b\,x^2+a)^{5/2}\,(d\,x^2+c)^{5/2}}\,dx$$

input
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(5/2)*(c + d*x^2)^(5/2)),x)
```

output
```
int((A + B*x^2 + C*x^4 + x^6*D)/((a + b*x^2)^(5/2)*(c + d*x^2)^(5/2)), x)
```

Reduce [F]

$$\int \frac{A+Bx^2+Cx^4+Dx^6}{(a+bx^2)^{5/2}(c+dx^2)^{5/2}}\,dx=\text{too large to display}$$

input
```
int((D*x^6+C*x^4+B*x^2+A)/(b*x^2+a)^(5/2)/(d*x^2+c)^(5/2),x)
```

output
```
( - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*a*c*x - 2*sqrt(c + d*x**2)*sqrt(a
+ b*x**2)*a*d*x**3 - 3*sqrt(c + d*x**2)*sqrt(a + b*x**2)*b**2*x - 2*sqrt(c
 + d*x**2)*sqrt(a + b*x**2)*b*c*x**3 - 9*int((sqrt(c + d*x**2)*sqrt(a + b*
x**2)*x**4)/(a**4*c**3*d + 3*a**4*c**2*d**2*x**2 + 3*a**4*c*d**3*x**4 + a*
*4*d**4*x**6 + a**3*b*c**4 + 6*a**3*b*c**3*d*x**2 + 12*a**3*b*c**2*d**2*x*
*4 + 10*a**3*b*c*d**3*x**6 + 3*a**3*b*d**4*x**8 + 3*a**2*b**2*c**4*x**2 +
12*a**2*b**2*c**3*d*x**4 + 18*a**2*b**2*c**2*d**2*x**6 + 12*a**2*b**2*c*d*
*3*x**8 + 3*a**2*b**2*d**4*x**10 + 3*a*b**3*c**4*x**4 + 10*a*b**3*c**3*d*x
**6 + 12*a*b**3*c**2*d**2*x**8 + 6*a*b**3*c*d**3*x**10 + a*b**3*d**4*x**12
 + b**4*c**4*x**6 + 3*b**4*c**3*d*x**8 + 3*b**4*c**2*d**2*x**10 + b**4*c*d
**3*x**12),x)*a**4*b*c**3*d**2 - 18*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)
*x**4)/(a**4*c**3*d + 3*a**4*c**2*d**2*x**2 + 3*a**4*c*d**3*x**4 + a**4*d*
*4*x**6 + a**3*b*c**4 + 6*a**3*b*c**3*d*x**2 + 12*a**3*b*c**2*d**2*x**4 +
10*a**3*b*c*d**3*x**6 + 3*a**3*b*d**4*x**8 + 3*a**2*b**2*c**4*x**2 + 12*a*
*2*b**2*c**3*d*x**4 + 18*a**2*b**2*c**2*d**2*x**6 + 12*a**2*b**2*c*d**3*x*
*8 + 3*a**2*b**2*d**4*x**10 + 3*a*b**3*c**4*x**4 + 10*a*b**3*c**3*d*x**6 +
 12*a*b**3*c**2*d**2*x**8 + 6*a*b**3*c*d**3*x**10 + a*b**3*d**4*x**12 + b*
*4*c**4*x**6 + 3*b**4*c**3*d*x**8 + 3*b**4*c**2*d**2*x**10 + b**4*c*d**3*x
**12),x)*a**4*b*c**2*d**3*x**2 - 9*int((sqrt(c + d*x**2)*sqrt(a + b*x**2)*
x**4)/(a**4*c**3*d + 3*a**4*c**2*d**2*x**2 + 3*a**4*c*d**3*x**4 + a**4*...
```

3.53 $\int \frac{(a+bx^2)^p (A+Bx^2+Cx^4)}{c+dx^2} \, dx$

Optimal result

Integrand size = 31, antiderivative size = 174

$$\int \frac{(a+bx^2)^p (A+Bx^2+Cx^4)}{c+dx^2} \, dx = \frac{Cx(a+bx^2)^{1+p}}{bd(3+2p)} + \frac{(c^2C-Bcd+Ad^2)\, x(a+bx^2)^p \left(1+\frac{bx^2}{a}\right)^{-p} \operatorname{AppellF1}\left(\frac{1}{2},-p,1,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)}{cd^2} - \frac{\left(cC-Bd+\frac{aCd}{3b+2bp}\right) x(a+bx^2)^p \left(1+\frac{bx^2}{a}\right)^{-p} \operatorname{Hypergeometric2F1}\left(\frac{1}{2},-p,\frac{3}{2},-\frac{bx^2}{a}\right)}{d^2}$$

output
```
C*x*(b*x^2+a)^(p+1)/b/d/(3+2*p)+(A*d^2-B*c*d+C*c^2)*x*(b*x^2+a)^p*AppellF1
(1/2,-p,1,3/2,-b*x^2/a,-d*x^2/c)/c/d^2/((1+b*x^2/a)^p)-(C*c-B*d+a*C*d/(2*b
*p+3*b))*x*(b*x^2+a)^p*hypergeom([1/2, -p],[3/2],-b*x^2/a)/d^2/((1+b*x^2/a
)^p)
```

Mathematica [A] (warning: unable to verify)

Time = 0.67 (sec) , antiderivative size = 256, normalized size of antiderivative = 1.47

$$\int \frac{(a+bx^2)^p (A+Bx^2+Cx^4)}{c+dx^2}\,dx$$

$$= \frac{x(a+bx^2)^p \left(\frac{9ac(c^2C-Bcd+Ad^2)\,\text{AppellF1}\left(\frac{1}{2},-p,1,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)}{(c+dx^2)\left(3ac\,\text{AppellF1}\left(\frac{1}{2},-p,1,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+2x^2\left(bcp\,\text{AppellF1}\left(\frac{3}{2},1-p,1,\frac{5}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)-ad\,\text{AppellF1}\left(\frac{3}{2},-p,2,\frac{5}{2},-\right.\right.\right.}\right.}{}$$

input
```
Integrate[((a + b*x^2)^p*(A + B*x^2 + C*x^4))/(c + d*x^2),x]
```

output
```
(x*(a + b*x^2)^p*((9*a*c*(c^2*C - B*c*d + A*d^2)*AppellF1[1/2, -p, 1, 3/2,
 -((b*x^2)/a), -((d*x^2)/c)])/((c + d*x^2)*(3*a*c*AppellF1[1/2, -p, 1, 3/2
, -((b*x^2)/a), -((d*x^2)/c)] + 2*x^2*(b*c*p*AppellF1[3/2, 1 - p, 1, 5/2,
-((b*x^2)/a), -((d*x^2)/c)] - a*d*AppellF1[3/2, -p, 2, 5/2, -((b*x^2)/a),
-((d*x^2)/c)]))) + ((-3*c*C + 3*B*d)*Hypergeometric2F1[1/2, -p, 3/2, -((b*
x^2)/a)] + C*d*x^2*Hypergeometric2F1[3/2, -p, 5/2, -((b*x^2)/a)])/(1 + (b*
x^2)/a)^p))/(3*d^2)
```

Rubi [A] (verified)

Time = 0.55 (sec) , antiderivative size = 186, normalized size of antiderivative = 1.07, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.065$, Rules used = {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.

$$\int \frac{(a+bx^2)^p (A+Bx^2+Cx^4)}{c+dx^2}\,dx$$

$$\Big\downarrow \; 7276$$

$$\int \left(\frac{(a+bx^2)^p (Ad^2-Bcd+c^2C)}{d^2 (c+dx^2)} - \frac{(a+bx^2)^p (cC-Bd)}{d^2} + \frac{Cx^2 (a+bx^2)^p}{d}\right) dx$$

$$\Big\downarrow \; 2009$$

$$\frac{x(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}(Ad^2-Bcd+c^2C)\,\text{AppellF1}\left(\frac{1}{2},-p,1,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)}{cd^2}-\frac{x(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}(cC-Bd)\,\text{Hypergeometric2F1}\left(\frac{1}{2},-p,\frac{3}{2},-\frac{bx^2}{a}\right)}{d^2}+\frac{Cx^3(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}\text{Hypergeometric2F1}\left(\frac{3}{2},-p,\frac{5}{2},-\frac{bx^2}{a}\right)}{3d}$$

input
```
Int[((a + b*x^2)^p*(A + B*x^2 + C*x^4))/(c + d*x^2),x]
```

output
```
((c^2*C - B*c*d + A*d^2)*x*(a + b*x^2)^p*AppellF1[1/2, -p, 1, 3/2, -((b*x^
2)/a), -((d*x^2)/c)])/(c*d^2*(1 + (b*x^2)/a)^p) - ((c*C - B*d)*x*(a + b*x^
2)^p*Hypergeometric2F1[1/2, -p, 3/2, -((b*x^2)/a)])/(d^2*(1 + (b*x^2)/a)^p
) + (C*x^3*(a + b*x^2)^p*Hypergeometric2F1[3/2, -p, 5/2, -((b*x^2)/a)])/(3
*d*(1 + (b*x^2)/a)^p)
```

Defintions of rubi rules used

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

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]
```

Maple [F]

$$\int \frac{(b\,x^2+a)^p\,(C\,x^4+x^2B+A)}{x^2d+c}dx$$

input
```
int((b*x^2+a)^p*(C*x^4+B*x^2+A)/(d*x^2+c),x)
```

output
```
int((b*x^2+a)^p*(C*x^4+B*x^2+A)/(d*x^2+c),x)
```

Fricas [F]

$$\int \frac{(a+bx^2)^p (A+Bx^2+Cx^4)}{c+dx^2} dx = \int \frac{(Cx^4+Bx^2+A)(bx^2+a)^p}{dx^2+c} dx$$

input
```
integrate((b*x^2+a)^p*(C*x^4+B*x^2+A)/(d*x^2+c),x, algorithm="fricas")
```

output
```
integral((C*x^4 + B*x^2 + A)*(b*x^2 + a)^p/(d*x^2 + c), x)
```

Sympy [F(-1)]

Timed out.

$$\int \frac{(a+bx^2)^p (A+Bx^2+Cx^4)}{c+dx^2} dx = \text{Timed out}$$

input
```
integrate((b*x**2+a)**p*(C*x**4+B*x**2+A)/(d*x**2+c),x)
```

output
```
Timed out
```

Maxima [F]

$$\int \frac{(a+bx^2)^p (A+Bx^2+Cx^4)}{c+dx^2} dx = \int \frac{(Cx^4+Bx^2+A)(bx^2+a)^p}{dx^2+c} dx$$

input
```
integrate((b*x^2+a)^p*(C*x^4+B*x^2+A)/(d*x^2+c),x, algorithm="maxima")
```

output
```
integrate((C*x^4 + B*x^2 + A)*(b*x^2 + a)^p/(d*x^2 + c), x)
```

Giac [F]

$$\int \frac{(a+bx^2)^p (A+Bx^2+Cx^4)}{c+dx^2}\,dx = \int \frac{(Cx^4+Bx^2+A)(bx^2+a)^p}{dx^2+c}\,dx$$

input
```
integrate((b*x^2+a)^p*(C*x^4+B*x^2+A)/(d*x^2+c),x, algorithm="giac")
```

output
```
integrate((C*x^4 + B*x^2 + A)*(b*x^2 + a)^p/(d*x^2 + c), x)
```

Mupad [F(-1)]

Timed out.

$$\int \frac{(a+bx^2)^p (A+Bx^2+Cx^4)}{c+dx^2}\,dx = \int \frac{(b\,x^2+a)^p\,(C\,x^4+B\,x^2+A)}{d\,x^2+c}\,dx$$

input
```
int(((a + b*x^2)^p*(A + B*x^2 + C*x^4))/(c + d*x^2),x)
```

output
```
int(((a + b*x^2)^p*(A + B*x^2 + C*x^4))/(c + d*x^2), x)
```

Reduce [F]

$$\int \frac{(a+bx^2)^p (A+Bx^2+Cx^4)}{c+dx^2}\,dx = \text{too large to display}$$

input
```
int((b*x^2+a)^p*(C*x^4+B*x^2+A)/(d*x^2+c),x)
```

output

```
(2*(a + b*x**2)**p*a*c*d*p*x + 2*(a + b*x**2)**p*b**2*d*p*x + 3*(a + b*x**
2)**p*b**2*d*x - 2*(a + b*x**2)**p*b*c**2*p*x - 3*(a + b*x**2)**p*b*c**2*x
 + 2*(a + b*x**2)**p*b*c*d*p*x**3 + (a + b*x**2)**p*b*c*d*x**3 + 16*int((a
 + b*x**2)**p/(4*a*c*p**2 + 8*a*c*p + 3*a*c + 4*a*d*p**2*x**2 + 8*a*d*p*x*
*2 + 3*a*d*x**2 + 4*b*c*p**2*x**2 + 8*b*c*p*x**2 + 3*b*c*x**2 + 4*b*d*p**2
*x**4 + 8*b*d*p*x**4 + 3*b*d*x**4),x)*a**2*b*d**2*p**4 + 64*int((a + b*x**
2)**p/(4*a*c*p**2 + 8*a*c*p + 3*a*c + 4*a*d*p**2*x**2 + 8*a*d*p*x**2 + 3*a
*d*x**2 + 4*b*c*p**2*x**2 + 8*b*c*p*x**2 + 3*b*c*x**2 + 4*b*d*p**2*x**4 +
8*b*d*p*x**4 + 3*b*d*x**4),x)*a**2*b*d**2*p**3 + 88*int((a + b*x**2)**p/(4
*a*c*p**2 + 8*a*c*p + 3*a*c + 4*a*d*p**2*x**2 + 8*a*d*p*x**2 + 3*a*d*x**2
+ 4*b*c*p**2*x**2 + 8*b*c*p*x**2 + 3*b*c*x**2 + 4*b*d*p**2*x**4 + 8*b*d*p*
x**4 + 3*b*d*x**4),x)*a**2*b*d**2*p**2 + 48*int((a + b*x**2)**p/(4*a*c*p**
2 + 8*a*c*p + 3*a*c + 4*a*d*p**2*x**2 + 8*a*d*p*x**2 + 3*a*d*x**2 + 4*b*c*
p**2*x**2 + 8*b*c*p*x**2 + 3*b*c*x**2 + 4*b*d*p**2*x**4 + 8*b*d*p*x**4 + 3
*b*d*x**4),x)*a**2*b*d**2*p + 9*int((a + b*x**2)**p/(4*a*c*p**2 + 8*a*c*p
+ 3*a*c + 4*a*d*p**2*x**2 + 8*a*d*p*x**2 + 3*a*d*x**2 + 4*b*c*p**2*x**2 +
8*b*c*p*x**2 + 3*b*c*x**2 + 4*b*d*p**2*x**4 + 8*b*d*p*x**4 + 3*b*d*x**4),x
)*a**2*b*d**2 - 8*int((a + b*x**2)**p/(4*a*c*p**2 + 8*a*c*p + 3*a*c + 4*a*
d*p**2*x**2 + 8*a*d*p*x**2 + 3*a*d*x**2 + 4*b*c*p**2*x**2 + 8*b*c*p*x**2 +
 3*b*c*x**2 + 4*b*d*p**2*x**4 + 8*b*d*p*x**4 + 3*b*d*x**4),x)*a**2*c**2...
```

3.54 $\int (A+Bx)\left(a+bx^2\right)^p\left(c+dx^2\right)^q\,dx$

Optimal result

Integrand size = 24, antiderivative size = 152

$$\int (A+Bx)\left(a+bx^2\right)^p\left(c+dx^2\right)^q\,dx = Ax\left(a+bx^2\right)^p\left(1+\frac{bx^2}{a}\right)^{-p}\left(c+dx^2\right)^q\left(1+\frac{dx^2}{c}\right)^{-q}\operatorname{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right) + \frac{B\left(a+bx^2\right)^{1+p}\left(c+dx^2\right)^{1+q}\operatorname{Hypergeometric2F1}\left(1,2+p+q,2+p,-\frac{d(a+bx^2)}{bc-ad}\right)}{2(bc-ad)(1+p)}$$

output
```
A*x*(b*x^2+a)^p*(d*x^2+c)^q*AppellF1(1/2,-p,-q,3/2,-b*x^2/a,-d*x^2/c)/((1+
b*x^2/a)^p)/((1+d*x^2/c)^q)+1/2*B*(b*x^2+a)^(p+1)*(d*x^2+c)^(1+q)*hypergeo
m([1, 2+p+q],[2+p],-d*(b*x^2+a)/(-a*d+b*c))/(-a*d+b*c)/(p+1)
```

Mathematica [A] (warning: unable to verify)

Time = 0.42 (sec) , antiderivative size = 236, normalized size of antiderivative = 1.55

$$\int (A+Bx)\left(a+bx^2\right)^p\left(c+dx^2\right)^q\,dx=\frac{1}{2}x\left(a+bx^2\right)^p\left(c+dx^2\right)^q\left(Bx\left(1+\frac{bx^2}{a}\right)^{-p}\left(1+\frac{dx^2}{c}\right)^{-q}\text{AppellF1}\left(1,-p,-q,2,-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+\frac{6aAc\,\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)}{3ac\,\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+2x^2\left(bcp\,\text{AppellF1}\left(\frac{3}{2},1-p,-q,\frac{5}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+adq\,\text{App}\right.}\right.$$

input
```
Integrate[(A + B*x)*(a + b*x^2)^p*(c + d*x^2)^q,x]
```

output
```
(x*(a + b*x^2)^p*(c + d*x^2)^q*((B*x*AppellF1[1, -p, -q, 2, -((b*x^2)/a),
-((d*x^2)/c)])/((1 + (b*x^2)/a)^p*(1 + (d*x^2)/c)^q) + (6*a*A*c*AppellF1[1
/2, -p, -q, 3/2, -((b*x^2)/a), -((d*x^2)/c)])/(3*a*c*AppellF1[1/2, -p, -q,
 3/2, -((b*x^2)/a), -((d*x^2)/c)] + 2*x^2*(b*c*p*AppellF1[3/2, 1 - p, -q,
5/2, -((b*x^2)/a), -((d*x^2)/c)] + a*d*q*AppellF1[3/2, -p, 1 - q, 5/2, -((
b*x^2)/a), -((d*x^2)/c)]))))/2
```

Rubi [A] (verified)

Time = 0.36 (sec) , antiderivative size = 167, normalized size of antiderivative = 1.10, number of steps used = 8, number of rules used = 7, $\frac{\text{number of rules}}{\text{integrand size}}=0.292$, Rules used = {1343, 334, 334, 333, 353, 80, 79}

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.

$$\int (A+Bx)\left(a+bx^2\right)^p\left(c+dx^2\right)^q\,dx$$

$$\Big\downarrow \text{1343}$$

$$A\int \left(bx^2+a\right)^p\left(dx^2+c\right)^q dx+B\int x\left(bx^2+a\right)^p\left(dx^2+c\right)^q dx$$

$$\Big\downarrow \text{334}$$

$$A(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}\int\left(\frac{bx^2}{a}+1\right)^p(dx^2+c)^q\,dx+B\int x(bx^2+a)^p(dx^2+c)^q\,dx$$

$$\Big\downarrow \text{334}$$

$$A(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}(c+dx^2)^q\left(\frac{dx^2}{c}+1\right)^{-q}\int\left(\frac{bx^2}{a}+1\right)^p\left(\frac{dx^2}{c}+1\right)^q dx+ B\int x(bx^2+a)^p(dx^2+c)^q\,dx$$

$$\Big\downarrow \text{333}$$

$$B\int x(bx^2+a)^p(dx^2+c)^q\,dx+ Ax(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}(c+dx^2)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)$$

$$\Big\downarrow \text{353}$$

$$\frac{1}{2}B\int(bx^2+a)^p(dx^2+c)^q\,dx^2+ Ax(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}(c+dx^2)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)$$

$$\Big\downarrow \text{80}$$

$$\frac{1}{2}B(c+dx^2)^q\left(\frac{b(c+dx^2)}{bc-ad}\right)^{-q}\int(bx^2+a)^p\left(\frac{bdx^2}{bc-ad}+\frac{bc}{bc-ad}\right)^q dx^2+ Ax(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}(c+dx^2)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)$$

$$\Big\downarrow \text{79}$$

$$Ax(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}(c+dx^2)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+ \frac{B(a+bx^2)^{p+1}(c+dx^2)^q\left(\frac{b(c+dx^2)}{bc-ad}\right)^{-q}\text{Hypergeometric2F1}\left(p+1,-q,p+2,-\frac{d(bx^2+a)}{bc-ad}\right)}{2b(p+1)}$$

input
```
Int[(A + B*x)*(a + b*x^2)^p*(c + d*x^2)^q,x]
```

output
```
(A*x*(a + b*x^2)^p*(c + d*x^2)^q*AppellF1[1/2, -p, -q, 3/2, -((b*x^2)/a),
-((d*x^2)/c)])/((1 + (b*x^2)/a)^p*(1 + (d*x^2)/c)^q) + (B*(a + b*x^2)^(1 +
 p)*(c + d*x^2)^q*Hypergeometric2F1[1 + p, -q, 2 + p, -((d*(a + b*x^2))/(b
*c - a*d))])/(2*b*(1 + p)*((b*(c + d*x^2))/(b*c - a*d))^q)
```

Defintions of rubi rules used

rule 79
```
Int[((a_) + (b_.)*(x_))^(m_)*((c_) + (d_.)*(x_))^(n_), x_Symbol] :> Simp[((
a + b*x)^(m + 1)/(b*(m + 1)*(b/(b*c - a*d))^n))*Hypergeometric2F1[-n, m + 1
, m + 2, (-d)*((a + b*x)/(b*c - a*d))], x] /; FreeQ[{a, b, c, d, m, n}, x]
&&  !IntegerQ[m] &&  !IntegerQ[n] && GtQ[b/(b*c - a*d), 0] && (RationalQ[m]
 ||  !(RationalQ[n] && GtQ[-d/(b*c - a*d), 0]))
```

rule 80
```
Int[((a_) + (b_.)*(x_))^(m_)*((c_) + (d_.)*(x_))^(n_), x_Symbol] :> Simp[(c
 + d*x)^FracPart[n]/((b/(b*c - a*d))^IntPart[n]*(b*((c + d*x)/(b*c - a*d)))
^FracPart[n])   Int[(a + b*x)^m*Simp[b*(c/(b*c - a*d)) + b*d*(x/(b*c - a*d)
), x]^n, x], x] /; FreeQ[{a, b, c, d, m, n}, x] &&  !IntegerQ[m] &&  !Integ
erQ[n] && (RationalQ[m] ||  !SimplerQ[n + 1, m + 1])
```

rule 333
```
Int[((a_) + (b_.)*(x_)^2)^(p_)*((c_) + (d_.)*(x_)^2)^(q_), x_Symbol] :> Sim
p[a^p*c^q*x*AppellF1[1/2, -p, -q, 3/2, (-b)*(x^2/a), (-d)*(x^2/c)], x] /; F
reeQ[{a, b, c, d, p, q}, x] && NeQ[b*c - a*d, 0] && (IntegerQ[p] || GtQ[a,
0]) && (IntegerQ[q] || GtQ[c, 0])
```

rule 334
```
Int[((a_) + (b_.)*(x_)^2)^(p_)*((c_) + (d_.)*(x_)^2)^(q_), x_Symbol] :> Sim
p[a^IntPart[p]*((a + b*x^2)^FracPart[p]/(1 + b*(x^2/a))^FracPart[p])   Int[
(1 + b*(x^2/a))^p*(c + d*x^2)^q, x], x] /; FreeQ[{a, b, c, d, p, q}, x] &&
NeQ[b*c - a*d, 0] &&  !(IntegerQ[p] || GtQ[a, 0])
```

rule 353
```
Int[(x_)*((a_) + (b_.)*(x_)^2)^(p_.)*((c_) + (d_.)*(x_)^2)^(q_.), x_Symbol]
 :> Simp[1/2   Subst[Int[(a + b*x)^p*(c + d*x)^q, x], x, x^2], x] /; FreeQ[
{a, b, c, d, p, q}, x] && NeQ[b*c - a*d, 0]
```

rule 1343
```
Int[((g_) + (h_.)*(x_))*((a_) + (c_.)*(x_)^2)^(p_)*((d_) + (f_.)*(x_)^2)^(q
_), x_Symbol] :> Simp[g   Int[(a + c*x^2)^p*(d + f*x^2)^q, x], x] + Simp[h
  Int[x*(a + c*x^2)^p*(d + f*x^2)^q, x], x] /; FreeQ[{a, c, d, f, g, h, p,
q}, x]
```

Maple [F]

$$\int (Bx + A)\left(b\,x^{2} + a\right)^{p}\left(x^{2} d + c\right)^{q} dx$$

input
```
int((B*x+A)*(b*x^2+a)^p*(d*x^2+c)^q,x)
```

output
```
int((B*x+A)*(b*x^2+a)^p*(d*x^2+c)^q,x)
```

Fricas [F]

$$\int (A + Bx)\left(a + bx^{2}\right)^{p}\left(c + dx^{2}\right)^{q} dx = \int (Bx + A)\left(bx^{2} + a\right)^{p}\left(dx^{2} + c\right)^{q} dx$$

input
```
integrate((B*x+A)*(b*x^2+a)^p*(d*x^2+c)^q,x, algorithm="fricas")
```

output
```
integral((B*x + A)*(b*x^2 + a)^p*(d*x^2 + c)^q, x)
```

Sympy [F(-1)]

Timed out.

$$\int (A + Bx)\left(a + bx^{2}\right)^{p}\left(c + dx^{2}\right)^{q} dx = \text{Timed out}$$

input
```
integrate((B*x+A)*(b*x**2+a)**p*(d*x**2+c)**q,x)
```

output
```
Timed out
```

Maxima [F]

$$\int (A+Bx)\left(a+bx^2\right)^p\left(c+dx^2\right)^q\,dx=\int (Bx+A)\left(bx^2+a\right)^p\left(dx^2+c\right)^q\,dx$$

input
```
integrate((B*x+A)*(b*x^2+a)^p*(d*x^2+c)^q,x, algorithm="maxima")
```

output
```
integrate((B*x + A)*(b*x^2 + a)^p*(d*x^2 + c)^q, x)
```

Giac [F]

$$\int (A+Bx)\left(a+bx^2\right)^p\left(c+dx^2\right)^q\,dx=\int (Bx+A)\left(bx^2+a\right)^p\left(dx^2+c\right)^q\,dx$$

input
```
integrate((B*x+A)*(b*x^2+a)^p*(d*x^2+c)^q,x, algorithm="giac")
```

output
```
integrate((B*x + A)*(b*x^2 + a)^p*(d*x^2 + c)^q, x)
```

Mupad [F(-1)]

Timed out.

$$\int (A+Bx)\left(a+bx^2\right)^p\left(c+dx^2\right)^q\,dx=\int \left(b\,x^2+a\right)^p\,\left(d\,x^2+c\right)^q\,(A+B\,x)\,dx$$

input
```
int((a + b*x^2)^p*(c + d*x^2)^q*(A + B*x),x)
```

output
```
int((a + b*x^2)^p*(c + d*x^2)^q*(A + B*x), x)
```

Reduce [F]

$$\int (A+Bx)\left(a+bx^2\right)^p\left(c+dx^2\right)^q\,dx=\int (Bx+A)\left(b\,x^2+a\right)^p\left(d\,x^2+c\right)^q dx$$

input
```
int((B*x+A)*(b*x^2+a)^p*(d*x^2+c)^q,x)
```

output
```
int((B*x+A)*(b*x^2+a)^p*(d*x^2+c)^q,x)
```

3.55 $\int (a+bx^2)^p (A+Cx^2) (c+dx^2)^q \, dx$

Optimal result

Integrand size = 26, antiderivative size = 166

$$\int (a+bx^2)^p (A+Cx^2) (c+dx^2)^q \, dx = Ax(a+bx^2)^p \left(1+\frac{bx^2}{a}\right)^{-p} (c+dx^2)^q \left(1+\frac{dx^2}{c}\right)^{-q} \operatorname{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right) + \frac{1}{3}Cx^3(a+bx^2)^p \left(1+\frac{bx^2}{a}\right)^{-p} (c+dx^2)^q \left(1+\frac{dx^2}{c}\right)^{-q} \operatorname{AppellF1}\left(\frac{3}{2},-p,-q,\frac{5}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)$$

output
```
A*x*(b*x^2+a)^p*(d*x^2+c)^q*AppellF1(1/2,-p,-q,3/2,-b*x^2/a,-d*x^2/c)/((1+
b*x^2/a)^p)/((1+d*x^2/c)^q)+1/3*C*x^3*(b*x^2+a)^p*(d*x^2+c)^q*AppellF1(3/2
,-p,-q,5/2,-b*x^2/a,-d*x^2/c)/((1+b*x^2/a)^p)/((1+d*x^2/c)^q)
```

Mathematica [A] (warning: unable to verify)

Time = 0.34 (sec) , antiderivative size = 242, normalized size of antiderivative = 1.46

$$\int \left(a+bx^2\right)^p \left(A+Cx^2\right) \left(c+dx^2\right)^q \,dx = \frac{1}{3}x\left(a+bx^2\right)^p \left(c+dx^2\right)^q \left(\frac{9aAc\,\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)}{3ac\,\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+2x^2\left(bcp\,\text{AppellF1}\left(\frac{3}{2},1-p,-q,\frac{5}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+ \cdots\right.} + Cx^2\left(1+\frac{bx^2}{a}\right)^{-p}\left(1+\frac{dx^2}{c}\right)^{-q}\text{AppellF1}\left(\frac{3}{2},-p,-q,\frac{5}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)\right)$$

input
```
Integrate[(a + b*x^2)^p*(A + C*x^2)*(c + d*x^2)^q,x]
```

output
```
(x*(a + b*x^2)^p*(c + d*x^2)^q*((9*a*A*c*AppellF1[1/2, -p, -q, 3/2, -((b*x
^2)/a), -((d*x^2)/c)])/(3*a*c*AppellF1[1/2, -p, -q, 3/2, -((b*x^2)/a), -((
d*x^2)/c)] + 2*x^2*(b*c*p*AppellF1[3/2, 1 - p, -q, 5/2, -((b*x^2)/a), -((d
*x^2)/c)] + a*d*q*AppellF1[3/2, -p, 1 - q, 5/2, -((b*x^2)/a), -((d*x^2)/c)
])) + (C*x^2*AppellF1[3/2, -p, -q, 5/2, -((b*x^2)/a), -((d*x^2)/c)])/((1 +
 (b*x^2)/a)^p*(1 + (d*x^2)/c)^q)))/3
```

Rubi [A] (verified)

Time = 0.36 (sec) , antiderivative size = 166, normalized size of antiderivative = 1.00, number of steps used = 7, number of rules used = 7, $\frac{\text{number of rules}}{\text{integrand size}}$ = 0.269, Rules used = {406, 334, 334, 333, 395, 395, 394}

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.

$$\int \left(A+Cx^2\right) \left(a+bx^2\right)^p \left(c+dx^2\right)^q \,dx$$

$$\Big\downarrow \; 406$$

$$A\int \left(bx^2+a\right)^p \left(dx^2+c\right)^q dx + C\int x^2\left(bx^2+a\right)^p \left(dx^2+c\right)^q dx$$

$$\Big\downarrow \text{334}$$

$$A\left(a+bx^2\right)^p\left(\frac{bx^2}{a}+1\right)^{-p}\int \left(\frac{bx^2}{a}+1\right)^p\left(dx^2+c\right)^q dx+C\int x^2\left(bx^2+a\right)^p\left(dx^2+c\right)^q dx$$

$$\Big\downarrow \text{334}$$

$$A\left(a+bx^2\right)^p\left(\frac{bx^2}{a}+1\right)^{-p}\left(c+dx^2\right)^q\left(\frac{dx^2}{c}+1\right)^{-q}\int \left(\frac{bx^2}{a}+1\right)^p\left(\frac{dx^2}{c}+1\right)^q dx+ C\int x^2\left(bx^2+a\right)^p\left(dx^2+c\right)^q dx$$

$$\Big\downarrow \text{333}$$

$$C\int x^2\left(bx^2+a\right)^p\left(dx^2+c\right)^q dx+ Ax\left(a+bx^2\right)^p\left(\frac{bx^2}{a}+1\right)^{-p}\left(c+dx^2\right)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)$$

$$\Big\downarrow \text{395}$$

$$C\left(a+bx^2\right)^p\left(\frac{bx^2}{a}+1\right)^{-p}\int x^2\left(\frac{bx^2}{a}+1\right)^p\left(dx^2+c\right)^q dx+ Ax\left(a+bx^2\right)^p\left(\frac{bx^2}{a}+1\right)^{-p}\left(c+dx^2\right)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)$$

$$\Big\downarrow \text{395}$$

$$C\left(a+bx^2\right)^p\left(\frac{bx^2}{a}+1\right)^{-p}\left(c+dx^2\right)^q\left(\frac{dx^2}{c}+1\right)^{-q}\int x^2\left(\frac{bx^2}{a}+1\right)^p\left(\frac{dx^2}{c}+1\right)^q dx+ Ax\left(a+bx^2\right)^p\left(\frac{bx^2}{a}+1\right)^{-p}\left(c+dx^2\right)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)$$

$$\Big\downarrow \text{394}$$

$$Ax\left(a+bx^2\right)^p\left(\frac{bx^2}{a}+1\right)^{-p}\left(c+dx^2\right)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+ \frac{1}{3}Cx^3\left(a+bx^2\right)^p\left(\frac{bx^2}{a}+1\right)^{-p}\left(c+dx^2\right)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{3}{2},-p,-q,\frac{5}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)$$

input
```
Int[(a + b*x^2)^p*(A + C*x^2)*(c + d*x^2)^q,x]
```

output
```
(A*x*(a + b*x^2)^p*(c + d*x^2)^q*AppellF1[1/2, -p, -q, 3/2, -((b*x^2)/a),
-((d*x^2)/c)])/((1 + (b*x^2)/a)^p*(1 + (d*x^2)/c)^q) + (C*x^3*(a + b*x^2)^
p*(c + d*x^2)^q*AppellF1[3/2, -p, -q, 5/2, -((b*x^2)/a), -((d*x^2)/c)])/(3
*(1 + (b*x^2)/a)^p*(1 + (d*x^2)/c)^q)
```

Defintions of rubi rules used

rule 333
```
Int[((a_) + (b_.)*(x_)^2)^(p_)*((c_) + (d_.)*(x_)^2)^(q_), x_Symbol] :> Sim
p[a^p*c^q*x*AppellF1[1/2, -p, -q, 3/2, (-b)*(x^2/a), (-d)*(x^2/c)], x] /; F
reeQ[{a, b, c, d, p, q}, x] && NeQ[b*c - a*d, 0] && (IntegerQ[p] || GtQ[a,
0]) && (IntegerQ[q] || GtQ[c, 0])
```

rule 334
```
Int[((a_) + (b_.)*(x_)^2)^(p_)*((c_) + (d_.)*(x_)^2)^(q_), x_Symbol] :> Sim
p[a^IntPart[p]*((a + b*x^2)^FracPart[p]/(1 + b*(x^2/a))^FracPart[p])   Int[
(1 + b*(x^2/a))^p*(c + d*x^2)^q, x], x] /; FreeQ[{a, b, c, d, p, q}, x] &&
NeQ[b*c - a*d, 0] &&  !(IntegerQ[p] || GtQ[a, 0])
```

rule 394
```
Int[((e_.)*(x_))^(m_.)*((a_) + (b_.)*(x_)^2)^(p_)*((c_) + (d_.)*(x_)^2)^(q_
), x_Symbol] :> Simp[a^p*c^q*((e*x)^(m + 1)/(e*(m + 1)))*AppellF1[(m + 1)/2
, -p, -q, 1 + (m + 1)/2, (-b)*(x^2/a), (-d)*(x^2/c)], x] /; FreeQ[{a, b, c,
 d, e, m, p, q}, x] && NeQ[b*c - a*d, 0] && NeQ[m, -1] && NeQ[m, 1] && (Int
egerQ[p] || GtQ[a, 0]) && (IntegerQ[q] || GtQ[c, 0])
```

rule 395
```
Int[((e_.)*(x_))^(m_.)*((a_) + (b_.)*(x_)^2)^(p_)*((c_) + (d_.)*(x_)^2)^(q_
), x_Symbol] :> Simp[a^IntPart[p]*((a + b*x^2)^FracPart[p]/(1 + b*(x^2/a))^
FracPart[p])   Int[(e*x)^m*(1 + b*(x^2/a))^p*(c + d*x^2)^q, x], x] /; FreeQ
[{a, b, c, d, e, m, p, q}, x] && NeQ[b*c - a*d, 0] && NeQ[m, -1] && NeQ[m,
1] &&  !(IntegerQ[p] || GtQ[a, 0])
```

rule 406
```
Int[((a_) + (b_.)*(x_)^2)^(p_.)*((c_) + (d_.)*(x_)^2)^(q_.)*((e_) + (f_.)*(
x_)^2), x_Symbol] :> Simp[e   Int[(a + b*x^2)^p*(c + d*x^2)^q, x], x] + Sim
p[f   Int[x^2*(a + b*x^2)^p*(c + d*x^2)^q, x], x] /; FreeQ[{a, b, c, d, e,
f, p, q}, x]
```

Maple [F]

$$\int (b\,x^2+a)^p\,(C\,x^2+A)\,(x^2d+c)^q\,dx$$

input
```
int((b*x^2+a)^p*(C*x^2+A)*(d*x^2+c)^q,x)
```

output
```
int((b*x^2+a)^p*(C*x^2+A)*(d*x^2+c)^q,x)
```

Fricas [F]

$$\int (a+bx^2)^p\,(A+Cx^2)\,(c+dx^2)^q\,dx=\int (Cx^2+A)(bx^2+a)^p(dx^2+c)^q\,dx$$

input
```
integrate((b*x^2+a)^p*(C*x^2+A)*(d*x^2+c)^q,x, algorithm="fricas")
```

output
```
integral((C*x^2 + A)*(b*x^2 + a)^p*(d*x^2 + c)^q, x)
```

Sympy [F(-1)]

Timed out.

$$\int (a+bx^2)^p\,(A+Cx^2)\,(c+dx^2)^q\,dx=\text{Timed out}$$

input
```
integrate((b*x**2+a)**p*(C*x**2+A)*(d*x**2+c)**q,x)
```

output
```
Timed out
```

Maxima [F]

$$\int \left(a+bx^2\right)^p \left(A+Cx^2\right) \left(c+dx^2\right)^q \,dx = \int \left(Cx^2+A\right)\left(bx^2+a\right)^p \left(dx^2+c\right)^q \,dx$$

input
```
integrate((b*x^2+a)^p*(C*x^2+A)*(d*x^2+c)^q,x, algorithm="maxima")
```

output
```
integrate((C*x^2 + A)*(b*x^2 + a)^p*(d*x^2 + c)^q, x)
```

Giac [F]

$$\int \left(a+bx^2\right)^p \left(A+Cx^2\right) \left(c+dx^2\right)^q \,dx = \int \left(Cx^2+A\right)\left(bx^2+a\right)^p \left(dx^2+c\right)^q \,dx$$

input
```
integrate((b*x^2+a)^p*(C*x^2+A)*(d*x^2+c)^q,x, algorithm="giac")
```

output
```
integrate((C*x^2 + A)*(b*x^2 + a)^p*(d*x^2 + c)^q, x)
```

Mupad [F(-1)]

Timed out.

$$\int \left(a+bx^2\right)^p \left(A+Cx^2\right) \left(c+dx^2\right)^q \,dx = \int \left(C\,x^2+A\right)\,{\left(b\,x^2+a\right)}^p\,{\left(d\,x^2+c\right)}^q \,dx$$

input
```
int((A + C*x^2)*(a + b*x^2)^p*(c + d*x^2)^q,x)
```

output
```
int((A + C*x^2)*(a + b*x^2)^p*(c + d*x^2)^q, x)
```

Reduce [F]

$$\int (a+bx^2)^p (A+Cx^2) (c+dx^2)^q \, dx = \text{too large to display}$$

input
```
int((b*x^2+a)^p*(C*x^2+A)*(d*x^2+c)^q,x)
```

output
```
(2*(c + d*x**2)**q*(a + b*x**2)**p*a*b*d*p*x + 2*(c + d*x**2)**q*(a + b*x*
*2)**p*a*b*d*q*x + 3*(c + d*x**2)**q*(a + b*x**2)**p*a*b*d*x + 2*(c + d*x*
*2)**q*(a + b*x**2)**p*a*c*d*p*x + 2*(c + d*x**2)**q*(a + b*x**2)**p*b*c**
2*q*x + 2*(c + d*x**2)**q*(a + b*x**2)**p*b*c*d*p*x**3 + 2*(c + d*x**2)**q
*(a + b*x**2)**p*b*c*d*q*x**3 + (c + d*x**2)**q*(a + b*x**2)**p*b*c*d*x**3
 + 16*int(((c + d*x**2)**q*(a + b*x**2)**p*x**2)/(4*a*c*p**2 + 8*a*c*p*q +
 8*a*c*p + 4*a*c*q**2 + 8*a*c*q + 3*a*c + 4*a*d*p**2*x**2 + 8*a*d*p*q*x**2
 + 8*a*d*p*x**2 + 4*a*d*q**2*x**2 + 8*a*d*q*x**2 + 3*a*d*x**2 + 4*b*c*p**2
*x**2 + 8*b*c*p*q*x**2 + 8*b*c*p*x**2 + 4*b*c*q**2*x**2 + 8*b*c*q*x**2 + 3
*b*c*x**2 + 4*b*d*p**2*x**4 + 8*b*d*p*q*x**4 + 8*b*d*p*x**4 + 4*b*d*q**2*x
**4 + 8*b*d*q*x**4 + 3*b*d*x**4),x)*a**2*b*d**2*p**4 + 48*int(((c + d*x**2
)**q*(a + b*x**2)**p*x**2)/(4*a*c*p**2 + 8*a*c*p*q + 8*a*c*p + 4*a*c*q**2
+ 8*a*c*q + 3*a*c + 4*a*d*p**2*x**2 + 8*a*d*p*q*x**2 + 8*a*d*p*x**2 + 4*a*
d*q**2*x**2 + 8*a*d*q*x**2 + 3*a*d*x**2 + 4*b*c*p**2*x**2 + 8*b*c*p*q*x**2
 + 8*b*c*p*x**2 + 4*b*c*q**2*x**2 + 8*b*c*q*x**2 + 3*b*c*x**2 + 4*b*d*p**2
*x**4 + 8*b*d*p*q*x**4 + 8*b*d*p*x**4 + 4*b*d*q**2*x**4 + 8*b*d*q*x**4 + 3
*b*d*x**4),x)*a**2*b*d**2*p**3*q + 56*int(((c + d*x**2)**q*(a + b*x**2)**p
*x**2)/(4*a*c*p**2 + 8*a*c*p*q + 8*a*c*p + 4*a*c*q**2 + 8*a*c*q + 3*a*c +
4*a*d*p**2*x**2 + 8*a*d*p*q*x**2 + 8*a*d*p*x**2 + 4*a*d*q**2*x**2 + 8*a*d*
q*x**2 + 3*a*d*x**2 + 4*b*c*p**2*x**2 + 8*b*c*p*q*x**2 + 8*b*c*p*x**2 +...
```

3.56 $\int (a+bx^2)^p (A+Bx+Cx^2) (c+dx^2)^q \, dx$

Optimal result

Integrand size = 29, antiderivative size = 237

$$\begin{aligned}\int (a+bx^2)^p (A+Bx+Cx^2) (c+dx^2)^q \, dx &= Ax(a+bx^2)^p \left(1+\frac{bx^2}{a}\right)^{-p} (c+dx^2)^q \left(1+\frac{dx^2}{c}\right)^{-q} \text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},\right.\\ &\left.-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+\frac{1}{3}Cx^3(a+bx^2)^p\left(1+\frac{bx^2}{a}\right)^{-p}(c+dx^2)^q\left(1\right.\\ &\left.+\frac{dx^2}{c}\right)^{-q}\text{AppellF1}\left(\frac{3}{2},-p,-q,\frac{5}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)\\ &+\frac{B(a+bx^2)^{1+p}(c+dx^2)^{1+q}\text{Hypergeometric2F1}\left(1,2+p+q,2+p,-\frac{d(a+bx^2)}{bc-ad}\right)}{2(bc-ad)(1+p)}\end{aligned}$$

output
```
A*x*(b*x^2+a)^p*(d*x^2+c)^q*AppellF1(1/2,-p,-q,3/2,-b*x^2/a,-d*x^2/c)/((1+
b*x^2/a)^p)/((1+d*x^2/c)^q)+1/3*C*x^3*(b*x^2+a)^p*(d*x^2+c)^q*AppellF1(3/2
,-p,-q,5/2,-b*x^2/a,-d*x^2/c)/((1+b*x^2/a)^p)/((1+d*x^2/c)^q)+1/2*B*(b*x^2
+a)^(p+1)*(d*x^2+c)^(1+q)*hypergeom([1, 2+p+q],[2+p],-d*(b*x^2+a)/(-a*d+b*
c))/(-a*d+b*c)/(p+1)
```

Mathematica [A] (warning: unable to verify)

Time = 0.64 (sec) , antiderivative size = 302, normalized size of antiderivative = 1.27

$$\int \left(a+bx^2\right)^p \left(A+Bx+Cx^2\right) \left(c+dx^2\right)^q \, dx = \frac{1}{6}x\left(a+bx^2\right)^p \left(c + dx^2\right)^q \left(3Bx\left(1+\frac{bx^2}{a}\right)^{-p}\left(1+\frac{dx^2}{c}\right)^{-q}\text{AppellF1}\left(1,-p,-q,2,-\frac{bx^2}{a},-\frac{dx^2}{c}\right) + \frac{18aAc\,\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)}{3ac\,\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+2x^2\left(bcp\,\text{AppellF1}\left(\frac{3}{2},1-p,-q,\frac{5}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+adq\,\text{App}\right.} + 2Cx^2\left(1+\frac{bx^2}{a}\right)^{-p}\left(1+\frac{dx^2}{c}\right)^{-q}\text{AppellF1}\left(\frac{3}{2},-p,-q,\frac{5}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)\right)$$

input
```
Integrate[(a + b*x^2)^p*(A + B*x + C*x^2)*(c + d*x^2)^q,x]
```

output
```
(x*(a + b*x^2)^p*(c + d*x^2)^q*((3*B*x*AppellF1[1, -p, -q, 2, -((b*x^2)/a)
, -((d*x^2)/c)])/((1 + (b*x^2)/a)^p*(1 + (d*x^2)/c)^q) + (18*a*A*c*AppellF
1[1/2, -p, -q, 3/2, -((b*x^2)/a), -((d*x^2)/c)])/(3*a*c*AppellF1[1/2, -p,
-q, 3/2, -((b*x^2)/a), -((d*x^2)/c)] + 2*x^2*(b*c*p*AppellF1[3/2, 1 - p, -
q, 5/2, -((b*x^2)/a), -((d*x^2)/c)] + a*d*q*AppellF1[3/2, -p, 1 - q, 5/2,
-((b*x^2)/a), -((d*x^2)/c)])) + (2*C*x^2*AppellF1[3/2, -p, -q, 5/2, -((b*x
^2)/a), -((d*x^2)/c)])/((1 + (b*x^2)/a)^p*(1 + (d*x^2)/c)^q)))/6
```

Rubi [A] (verified)

Time = 0.68 (sec) , antiderivative size = 252, normalized size of antiderivative = 1.06, number of steps used = 2, number of rules used = 2, $\frac{\text{number of rules}}{\text{integrand size}} = 0.069$, Rules used = {7293, 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.

$$\int \left(a+bx^2\right)^p \left(A+Bx+Cx^2\right) \left(c+dx^2\right)^q \, dx$$

$$\Big\downarrow \text{7293}$$

$$\int \left(A(a+bx^2)^p(c+dx^2)^q+Bx(a+bx^2)^p(c+dx^2)^q+Cx^2(a+bx^2)^p(c+dx^2)^q\right)dx$$

$$\Big\downarrow \text{2009}$$

$$Ax(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}(c+dx^2)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{1}{2},-p,-q,\frac{3}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+\frac{1}{3}Cx^3(a+bx^2)^p\left(\frac{bx^2}{a}+1\right)^{-p}(c+dx^2)^q\left(\frac{dx^2}{c}+1\right)^{-q}\text{AppellF1}\left(\frac{3}{2},-p,-q,\frac{5}{2},-\frac{bx^2}{a},-\frac{dx^2}{c}\right)+\frac{B(a+bx^2)^{p+1}(c+dx^2)^q\left(\frac{b(c+dx^2)}{bc-ad}\right)^{-q}\text{Hypergeometric2F1}\left(p+1,-q,p+2,-\frac{d(bx^2+a)}{bc-ad}\right)}{2b(p+1)}$$

input
```
Int[(a + b*x^2)^p*(A + B*x + C*x^2)*(c + d*x^2)^q,x]
```

output
```
(A*x*(a + b*x^2)^p*(c + d*x^2)^q*AppellF1[1/2, -p, -q, 3/2, -((b*x^2)/a),
-((d*x^2)/c)])/((1 + (b*x^2)/a)^p*(1 + (d*x^2)/c)^q) + (C*x^3*(a + b*x^2)^
p*(c + d*x^2)^q*AppellF1[3/2, -p, -q, 5/2, -((b*x^2)/a), -((d*x^2)/c)])/(3
*(1 + (b*x^2)/a)^p*(1 + (d*x^2)/c)^q) + (B*(a + b*x^2)^(1 + p)*(c + d*x^2)
^q*Hypergeometric2F1[1 + p, -q, 2 + p, -((d*(a + b*x^2))/(b*c - a*d))])/(2
*b*(1 + p)*((b*(c + d*x^2))/(b*c - a*d))^q)
```

Defintions of rubi rules used

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

rule 7293
```
Int[u_, x_Symbol] :> With[{v = ExpandIntegrand[u, x]}, Int[v, x] /; SumQ[v]
]
```

Maple [F]

$$\int (b\,x^2+a)^p\,(C\,x^2+Bx+A)\,(x^2d+c)^q\,dx$$

input
```
int((b*x^2+a)^p*(C*x^2+B*x+A)*(d*x^2+c)^q,x)
```

output
```
int((b*x^2+a)^p*(C*x^2+B*x+A)*(d*x^2+c)^q,x)
```

Fricas [F]

$$\int (a+bx^2)^p\,(A+Bx+Cx^2)\,(c+dx^2)^q\,dx=\int (Cx^2+Bx+A)\,(bx^2+a)^p\,(dx^2+c)^q\,dx$$

input
```
integrate((b*x^2+a)^p*(C*x^2+B*x+A)*(d*x^2+c)^q,x, algorithm="fricas")
```

output
```
integral((C*x^2 + B*x + A)*(b*x^2 + a)^p*(d*x^2 + c)^q, x)
```

Sympy [F(-1)]

Timed out.

$$\int (a+bx^2)^p\,(A+Bx+Cx^2)\,(c+dx^2)^q\,dx=\text{Timed out}$$

input
```
integrate((b*x**2+a)**p*(C*x**2+B*x+A)*(d*x**2+c)**q,x)
```

output
```
Timed out
```

Maxima [F]

$$\int \left(a+bx^2\right)^p \left(A+Bx+Cx^2\right) \left(c+dx^2\right)^q \, dx = \int \left(Cx^2+Bx+A\right)\left(bx^2+a\right)^p\left(dx^2+c\right)^q \, dx$$

input
```
integrate((b*x^2+a)^p*(C*x^2+B*x+A)*(d*x^2+c)^q,x, algorithm="maxima")
```

output
```
integrate((C*x^2 + B*x + A)*(b*x^2 + a)^p*(d*x^2 + c)^q, x)
```

Giac [F]

$$\int \left(a+bx^2\right)^p \left(A+Bx+Cx^2\right) \left(c+dx^2\right)^q \, dx = \int \left(Cx^2+Bx+A\right)\left(bx^2+a\right)^p\left(dx^2+c\right)^q \, dx$$

input
```
integrate((b*x^2+a)^p*(C*x^2+B*x+A)*(d*x^2+c)^q,x, algorithm="giac")
```

output
```
integrate((C*x^2 + B*x + A)*(b*x^2 + a)^p*(d*x^2 + c)^q, x)
```

Mupad [F(-1)]

Timed out.

$$\int \left(a+bx^2\right)^p \left(A+Bx+Cx^2\right) \left(c+dx^2\right)^q \, dx = \int \left(b\,x^2+a\right)^p \left(d\,x^2+c\right)^q \left(C\,x^2+B\,x+A\right) \, dx$$

input
```
int((a + b*x^2)^p*(c + d*x^2)^q*(A + B*x + C*x^2),x)
```

output
```
int((a + b*x^2)^p*(c + d*x^2)^q*(A + B*x + C*x^2), x)
```

Reduce [F]

$$\int (a+bx^2)^p (A+Bx+Cx^2) (c+dx^2)^q \, dx = \int (b\,x^2+a)^p \left(C\,x^2+Bx+A\right) \left(d\,x^2+c\right)^q dx$$

input
```
int((b*x^2+a)^p*(C*x^2+B*x+A)*(d*x^2+c)^q,x)
```

output
```
int((b*x^2+a)^p*(C*x^2+B*x+A)*(d*x^2+c)^q,x)
```

3.57 $\int (a+bx^2)^p (c+dx^2)^q (aAc+A(bc(1+2(1+p))+$

Optimal result

Integrand size = 65, antiderivative size = 25

$$\int (a+bx^2)^p (c+dx^2)^q (aAc+A(bc(1+2(1+p))+ad(1+2(1+q)))x^2 + Abd(1+2(2+p+q))x^4)\,dx = Ax(a+bx^2)^{1+p}(c+dx^2)^{1+q}$$

output
```
A*x*(b*x^2+a)^(p+1)*(d*x^2+c)^(1+q)
```

Mathematica [A] (verified)

Time = 0.71 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00

$$\int (a+bx^2)^p (c+dx^2)^q (aAc+A(bc(1+2(1+p))+ad(1+2(1+q)))x^2 + Abd(1+2(2+p+q))x^4)\,dx = Ax(a+bx^2)^{1+p}(c+dx^2)^{1+q}$$

input
```
Integrate[(a + b*x^2)^p*(c + d*x^2)^q*(a*A*c + A*(b*c*(1 + 2*(1 + p)) + a*
d*(1 + 2*(1 + q)))*x^2 + A*b*d*(1 + 2*(2 + p + q))*x^4),x]
```

output
```
A*x*(a + b*x^2)^(1 + p)*(c + d*x^2)^(1 + q)
```

Rubi [A] (verified)

Time = 0.24 (sec) , antiderivative size = 25, normalized size of antiderivative = 1.00, number of steps used = 1, number of rules used = 1, $\frac{\text{number of rules}}{\text{integrand size}} = 0.015$, Rules used = {2023}

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.

$$\int (a+bx^2)^p (c+dx^2)^q \left(Ax^2(ad(2(q+1)+1)+bc(2(p+1)+1))+aAc+Abdx^4(2(p+q+2)+1)\right) dx$$

$$\Big\downarrow \ 2023$$

$$Ax(a+bx^2)^{p+1}(c+dx^2)^{q+1}$$

input
```
Int[(a + b*x^2)^p*(c + d*x^2)^q*(a*A*c + A*(b*c*(1 + 2*(1 + p)) + a*d*(1 +
 2*(1 + q)))*x^2 + A*b*d*(1 + 2*(2 + p + q))*x^4),x]
```

output
```
A*x*(a + b*x^2)^(1 + p)*(c + d*x^2)^(1 + q)
```

Defintions of rubi rules used

rule 2023
```
Int[(Pp_)*(Qq_)^(m_.)*(Rr_)^(n_.), x_Symbol] :> With[{p = Expon[Pp, x], q =
 Expon[Qq, x], r = Expon[Rr, x]}, Simp[Coeff[Pp, x, p]*x^(p - q - r + 1)*Qq
^(m + 1)*(Rr^(n + 1)/((p + m*q + n*r + 1)*Coeff[Qq, x, q]*Coeff[Rr, x, r]))
, x] /; NeQ[p + m*q + n*r + 1, 0] && EqQ[(p + m*q + n*r + 1)*Coeff[Qq, x, q
]*Coeff[Rr, x, r]*Pp, Coeff[Pp, x, p]*x^(p - q - r)*((p - q - r + 1)*Qq*Rr
+ (m + 1)*x*Rr*D[Qq, x] + (n + 1)*x*Qq*D[Rr, x])]] /; FreeQ[{m, n}, x] && P
olyQ[Pp, x] && PolyQ[Qq, x] && PolyQ[Rr, x] && NeQ[m, -1] && NeQ[n, -1]
```

Maple [A] (verified)

Time = 9.36 (sec) , antiderivative size = 26, normalized size of antiderivative = 1.04

method	result
gosper	$Ax(b\,x^2+a)^{p+1}\,(x^2d+c)^{1+q}$
risch	$(b\,x^2+a)^p\,(bd\,x^4+ad\,x^2+x^2bc+ac)\,xA(x^2d+c)^q$
parallelrisch	$\frac{A\,x^5\,(b\,x^2+a)^p\,(x^2d+c)^q\,b^2d^2+A\,x^3\,(b\,x^2+a)^p\,(x^2d+c)^q\,ab\,d^2+A\,x^3\,(b\,x^2+a)^p\,(x^2d+c)^q\,b^2cd+Ax\,(b\,x^2+a)^p\,(x^2d+c)^q\,abcd}{bd}$
orering	$\frac{(b\,x^2+a)\,(x^2d+c)\,x\,(b\,x^2+a)^p\,(x^2d+c)^q\,(Aac+A(bc(3+2p)+ad(3+2q))x^2+Abd(5+2p+2q)x^4)}{2bd\,x^4p+2bd\,x^4q+5bd\,x^4+2adq\,x^2+2bcp\,x^2+3ad\,x^2+3x^2bc+ac}$

input

```
int((b*x^2+a)^p*(d*x^2+c)^q*(A*a*c+A*(b*c*(3+2*p)+a*d*(3+2*q))*x^2+A*b*d*(
5+2*p+2*q)*x^4),x,method=_RETURNVERBOSE)
```

output

```
A*x*(b*x^2+a)^(p+1)*(d*x^2+c)^(1+q)
```

Fricas [A] (verification not implemented)

Time = 0.10 (sec) , antiderivative size = 45, normalized size of antiderivative = 1.80

$$\int (a+bx^2)^p\,(c+dx^2)^q\,(aAc+A(bc(1+2(1+p))+ad(1+2(1+q)))x^2 + Abd(1+2(2+p+q))x^4)\;dx = (Abdx^5+Aacx+(Abc+Aad)x^3)\,(bx^2+a)^p\,(dx^2+c)^q$$

input

```
integrate((b*x^2+a)^p*(d*x^2+c)^q*(a*A*c+A*(b*c*(3+2*p)+a*d*(3+2*q))*x^2+A
*b*d*(5+2*p+2*q)*x^4),x, algorithm="fricas")
```

output

```
(A*b*d*x^5 + A*a*c*x + (A*b*c + A*a*d)*x^3)*(b*x^2 + a)^p*(d*x^2 + c)^q
```

Sympy [F(-1)]

Timed out.

$$\int \left(a+bx^2\right)^p \left(c+dx^2\right)^q \left(aAc+A(bc(1+2(1+p))+ad(1+2(1+q)))x^2 + Abd(1+2(2+p+q))x^4\right)\,dx = \text{Timed out}$$

input
```
integrate((b*x**2+a)**p*(d*x**2+c)**q*(a*A*c+A*(b*c*(3+2*p)+a*d*(3+2*q))*x
**2+A*b*d*(5+2*p+2*q)*x**4),x)
```

output
```
Timed out
```

Maxima [A] (verification not implemented)

Time = 0.08 (sec) , antiderivative size = 48, normalized size of antiderivative = 1.92

$$\int \left(a+bx^2\right)^p \left(c+dx^2\right)^q \left(aAc+A(bc(1+2(1+p))+ad(1+2(1+q)))x^2+Abd(1+2(2+p+q))x^4\right)\,dx = \left(Abdx^5+(bc+ad)Ax^3+Aacx\right)e^{\left(p\log\left(bx^2+a\right)+q\log\left(dx^2+c\right)\right)}$$

input
```
integrate((b*x^2+a)^p*(d*x^2+c)^q*(a*A*c+A*(b*c*(3+2*p)+a*d*(3+2*q))*x^2+A
*b*d*(5+2*p+2*q)*x^4),x, algorithm="maxima")
```

output
```
(A*b*d*x^5 + (b*c + a*d)*A*x^3 + A*a*c*x)*e^(p*log(b*x^2 + a) + q*log(d*x^
2 + c))
```

Giac [B] (verification not implemented)

Leaf count of result is larger than twice the leaf count of optimal. 99 vs. 2(25) = 50.

Time = 0.24 (sec) , antiderivative size = 99, normalized size of antiderivative = 3.96

$$\int \left(a+bx^2\right)^p \left(c+dx^2\right)^q \left(aAc+A(bc(1+2(1+p))+ad(1+2(1+q)))x^2 + Abd(1+2(2+p+q))x^4\right)\,dx = \left(bx^2+a\right)^p\left(dx^2+c\right)^qAbdx^5 + \left(bx^2+a\right)^p\left(dx^2+c\right)^qAbcx^3 + \left(bx^2+a\right)^p\left(dx^2+c\right)^qAadx^3 + \left(bx^2+a\right)^p\left(dx^2+c\right)^qAacx$$

input
```
integrate((b*x^2+a)^p*(d*x^2+c)^q*(a*A*c+A*(b*c*(3+2*p)+a*d*(3+2*q))*x^2+A
*b*d*(5+2*p+2*q)*x^4),x, algorithm="giac")
```

output
```
(b*x^2 + a)^p*(d*x^2 + c)^q*A*b*d*x^5 + (b*x^2 + a)^p*(d*x^2 + c)^q*A*b*c*
x^3 + (b*x^2 + a)^p*(d*x^2 + c)^q*A*a*d*x^3 + (b*x^2 + a)^p*(d*x^2 + c)^q*
A*a*c*x
```

Mupad [B] (verification not implemented)

Time = 1.44 (sec) , antiderivative size = 62, normalized size of antiderivative = 2.48

$$\int \left(a+bx^2\right)^p \left(c+dx^2\right)^q \left(aAc+A(bc(1+2(1+p))+ad(1+2(1+q)))x^2 + Abd(1+2(2+p+q))x^4\right) dx = \left(d\,x^2+c\right)^q \left(A\,x^3\left(b\,x^2+a\right)^p (a\,d+b\,c) + A\,a\,c\,x\left(b\,x^2+a\right)^p + A\,b\,d\,x^5\left(b\,x^2+a\right)^p\right)$$

input
```
int((a + b*x^2)^p*(c + d*x^2)^q*(A*a*c + A*x^2*(b*c*(2*p + 3) + a*d*(2*q +
 3)) + A*b*d*x^4*(2*p + 2*q + 5)),x)
```

output
```
(c + d*x^2)^q*(A*x^3*(a + b*x^2)^p*(a*d + b*c) + A*a*c*x*(a + b*x^2)^p + A
*b*d*x^5*(a + b*x^2)^p)
```

Reduce [B] (verification not implemented)

Time = 0.17 (sec) , antiderivative size = 43, normalized size of antiderivative = 1.72

$$\int \left(a+bx^2\right)^p \left(c+dx^2\right)^q \left(aAc+A(bc(1+2(1+p))+ad(1+2(1+q)))x^2 + Abd(1+2(2+p+q))x^4\right) dx = \left(d\,x^2+c\right)^q \left(b\,x^2+a\right)^p ax\left(bd\,x^4+ad\,x^2+bc\,x^2+ac\right)$$

input
```
int((b*x^2+a)^p*(d*x^2+c)^q*(a*A*c+A*(b*c*(3+2*p)+a*d*(3+2*q))*x^2+A*b*d*(
5+2*p+2*q)*x^4),x)
```

output
```
(c + d*x**2)**q*(a + b*x**2)**p*a*x*(a*c + a*d*x**2 + b*c*x**2 + b*d*x**4)
```

CHAPTER 4

Appendix

4.1 Listing of Grading functions

The following are the current version of the grading functions used for grading the quality of the antiderivative with reference to the optimal antiderivative included in the test suite.

There is a version for Maple and for Mathematica/Rubi. There is a version for grading Sympy and version for use with Sagemath.

The following are links to the current source code.

The following are the listings of source code of the grading functions.

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,leaf
    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]
```

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 issue
        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
                                   convert(leaf_count_result,string),"$ vs. $2(",
                                   convert(leaf_count_optimal,string),")=",convert(2*leaf_co
            fi;
        fi;
    else #ExpnType(result) > ExpnType(optimal)
        if debug then
            print("ExpnType(result) > ExpnType(optimal)");
        fi;
        return "C",cat("Result contains higher order function than in optimal. Order ",
                       convert(ExpnType_result,string)," vs. order ",
                       convert(ExpnType_optimal,string),".");
    fi;

end proc:

#
# is_contains_complex(result)
# takes expressions and returns true if it contains "I" else false
#
#Nasser 032417
is_contains_complex:= proc(expression)
  return (has(expression,I));
end proc:

# The following summarizes the type number assigned an expression
# based on the functions it involves
# 1 = rational function
# 2 = algebraic function
# 3 = elementary function
# 4 = special function
# 5 = hyperpergeometric function
```

```
# 6 = appell function
# 7 = rootsum function
# 8 = integrate function
# 9 = unknown function

ExpnType := proc(expn)
  if type(expn,'atomic') then
    1
  elif type(expn,'list') then
    apply(max,map(ExpnType,expn))
  elif type(expn,'sqrt') then
    if type(op(1,expn),'rational') then
      1
    else
      max(2,ExpnType(op(1,expn)))
    end if
  elif type(expn,'`^`') then
    if type(op(2,expn),'integer') then
      ExpnType(op(1,expn))
    elif type(op(2,expn),'rational') then
      if type(op(1,expn),'rational') then
        1
      else
        max(2,ExpnType(op(1,expn)))
      end if
    else
        max(3,ExpnType(op(1,expn)),ExpnType(op(2,expn)))
    end if
  elif type(expn,'`+`') or type(expn,'`*`') then
    max(ExpnType(op(1,expn)),max(ExpnType(rest(expn))))
  elif ElementaryFunctionQ(op(0,expn)) then
    max(3,ExpnType(op(1,expn)))
  elif SpecialFunctionQ(op(0,expn)) then
    max(4,apply(max,map(ExpnType,[op(expn)])))
  elif HypergeometricFunctionQ(op(0,expn)) then
    max(5,apply(max,map(ExpnType,[op(expn)])))
  elif AppellFunctionQ(op(0,expn)) then
    max(6,apply(max,map(ExpnType,[op(expn)])))
  elif op(0,expn)='int' then
    max(8,apply(max,map(ExpnType,[op(expn)]))) else
  9
```

```
  end if
end proc:


ElementaryFunctionQ := proc(func)
  member(func,[
        exp,log,ln,
        sin,cos,tan,cot,sec,csc,
        arcsin,arccos,arctan,arccot,arcsec,arccsc,
        sinh,cosh,tanh,coth,sech,csch,
        arcsinh,arccosh,arctanh,arccoth,arcsech,arccsch])
end proc:

SpecialFunctionQ := proc(func)
  member(func,[
        erf,erfc,erfi,
        FresnelS,FresnelC,
        Ei,Ei,Li,Si,Ci,Shi,Chi,
        GAMMA,lnGAMMA,Psi,Zeta,polylog,dilog,LambertW,
        EllipticF,EllipticE,EllipticPi])
end proc:

HypergeometricFunctionQ := proc(func)
  member(func,[Hypergeometric1F1,hypergeom,HypergeometricPFQ])
end proc:

AppellFunctionQ := proc(func)
  member(func,[AppellF1])
end proc:

# u is a sum or product.  rest(u) returns all but the
# first term or factor of u.
rest := proc(u) local v;
  if nops(u)=2 then
     op(2,u)
  else
     apply(op(0,u),op(2..nops(u),u))
  end if
end proc:

#leafcount(u) returns the number of nodes in u.
```

```
#Nasser 3/23/17  Replaced by build-in leafCount from package in Maple
leafcount := proc(u)
   MmaTranslator[Mma][LeafCount](u);
end proc:
```

Sympy grading function

```
#Dec 24, 2019. Nasser M. Abbasi:
#              Port of original Maple grading function by
#              Albert Rich to use with Sympy/Python
#Dec 27, 2019  Nasser. Added `RootSum`. See problem 177, Timofeev file
#              added 'exp_polar'
from sympy import *

def leaf_count(expr):
   #sympy do not have leaf count function. This is approximation
   return round(1.7*count_ops(expr))

def is_sqrt(expr):
   if isinstance(expr,Pow):
      if expr.args[1] == Rational(1,2):
         return True
      else:
         return False
   else:
      return False

def is_elementary_function(func):
   return func in [exp,log,ln,sin,cos,tan,cot,sec,csc,
         asin,acos,atan,acot,asec,acsc,sinh,cosh,tanh,coth,sech,csch,
         asinh,acosh,atanh,acoth,asech,acsch
      ]

def is_special_function(func):
   return func in [ erf,erfc,erfi,
          fresnels,fresnelc,Ei,Ei,Li,Si,Ci,Shi,Chi,
          gamma,loggamma,digamma,zeta,polylog,LambertW,
          elliptic_f,elliptic_e,elliptic_pi,exp_polar
       ]
```

```
def is_hypergeometric_function(func):
   return func in [hyper]

def is_appell_function(func):
   return func in [appellf1]

def is_atom(expn):
   try:
      if expn.isAtom or isinstance(expn,int) or isinstance(expn,float):
        return True
      else:
        return False

   except AttributeError as error:
      return False

def expnType(expn):
   debug=False
   if debug:
      print("expn=",expn,"type(expn)=",type(expn))

   if is_atom(expn):
     return 1
   elif isinstance(expn,list):
      return max(map(expnType, expn))   #apply(max,map(ExpnType,expn))
   elif  is_sqrt(expn):
      if isinstance(expn.args[0],Rational): #type(op(1,expn),'rational')
         return 1
      else:
         return max(2,expnType(expn.args[0]))  #max(2,ExpnType(op(1,expn)))
   elif isinstance(expn,Pow):    #type(expn,'`^`')
      if isinstance(expn.args[1],Integer):  #type(op(2,expn),'integer')
         return expnType(expn.args[0])    #ExpnType(op(1,expn))
      elif isinstance(expn.args[1],Rational):  #type(op(2,expn),'rational')
         if isinstance(expn.args[0],Rational): #type(op(1,expn),'rational')
            return 1
         else:
            return max(2,expnType(expn.args[0]))  #max(2,ExpnType(op(1,expn)))
      else:
         return max(3,expnType(expn.args[0]),expnType(expn.args[1])) #max(3,ExpnType(op(1,expn)),Expr
   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 lar
            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(
    else:
        grade = "C"
        grade_annotation ="Result contains higher order function than in optimal. Order "+str(ExpnType(


#print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)

return grade, grade_annotation
```

SageMath grading function

```
#Dec 24, 2019. Nasser: Ported original Maple grading function by
#              Albert Rich to use with Sagemath. This is used to
#              grade Fricas, Giac and Maxima results.
#Dec 24, 2019. Nasser: Added 'exp_integral_e' and 'sng', 'sin_integral'
#              'arctan2','floor','abs','log_integral'
#June 4, 2022  Made default grade_annotation "none" instead of "" due
#              issue later when reading the file.
#July 14, 2022. Added ellipticF. This is until they fix sagemath, then remove it.
```

```
from sage.all import *
from sage.symbolic.operators import add_vararg, mul_vararg

debug=False;

def tree_size(expr):
    r"""
    Return the tree size of this expression.
    """
    #print("Enter tree_size, expr is ",expr)

    if expr not in SR:
        # deal with lists, tuples, vectors
        return 1 + sum(tree_size(a) for a in expr)
    expr = SR(expr)
    x, aa = expr.operator(), expr.operands()
    if x is None:
        return 1
    else:
        return 1 + sum(tree_size(a) for a in aa)

def is_sqrt(expr):
    if expr.operator() == operator.pow:   #isinstance(expr,Pow):
        if expr.operands()[1]==1/2: #expr.args[1] == Rational(1,2):
            if debug: print ("expr is sqrt")
            return True
        else:
            return False
    else:
        return False

def is_elementary_function(func):
    #debug=False
    m = func.name() in ['exp','log','ln',
            'sin','cos','tan','cot','sec','csc',
            'arcsin','arccos','arctan','arccot','arcsec','arccsc',
            'sinh','cosh','tanh','coth','sech','csch',
            'arcsinh','arccosh','arctanh','arccoth','arcsech','arccsch','sgn',
        'arctan2','floor','abs'
        ]
    if debug:
```

```
        if m:
            print ("func ", func , " is elementary_function")
        else:
            print ("func ", func , " is NOT elementary_function")


    return m

def is_special_function(func):
    #debug=False
    if debug:
        print ("type(func)=", type(func))

    m= func.name() in ['erf','erfc','erfi','fresnel_sin','fresnel_cos','Ei',
          'Ei','Li','Si','sin_integral','Ci','cos_integral','Shi','sinh_integral'
          'Chi','cosh_integral','gamma','log_gamma','psi','zeta',
          'polylog','lambert_w','elliptic_f','elliptic_e','ellipticF',
          'elliptic_pi','exp_integral_e','log_integral',
          'weierstrassPInverse','weierstrass','weierstrassP','weierstrassZeta',
          'weierstrassPPrime','weierstrassSigma']

    if debug:
        print ("m=",m)
        if m:
            print ("func ", func ," is special_function")
        else:
            print ("func ", func ," is NOT special_function")


    return m


def is_hypergeometric_function(func):
    return func.name() in ['hypergeometric','hypergeometric_M','hypergeometric_U']

def is_appell_function(func):
    return func.name() in ['hypergeometric']   #[appellf1] can't find this in sagemath

def is_atom(expn):

    #debug=False
```

```
    if debug:
         print ("Enter is_atom, expn=",expn)

    if not hasattr(expn, 'parent'):
        return False


    #thanks to answer at https://ask.sagemath.org/question/49179/what-is-sagemath-equivalent-to-atomic
    try:
        if expn.parent() is SR:
            return expn.operator() is None
        if expn.parent() in (ZZ, QQ, AA, QQbar):
            return expn in expn.parent() # Should always return True
        if hasattr(expn.parent(),"base_ring") and hasattr(expn.parent(),"gens"):
            return expn in expn.parent().base_ring() or expn in expn.parent().gens()

        return False

    except AttributeError as error:
        print("Exception,AttributeError in  is_atom")
        print ("cought exception" , type(error).__name__ )
        return False


def expnType(expn):

    if debug:
        print (">>>>>Enter expnType, expn=", expn)
        print (">>>>>is_atom(expn)=", is_atom(expn))

    if is_atom(expn):
        return 1
    elif type(expn)==list:   #isinstance(expn,list):
        return max(map(expnType, expn))   #apply(max,map(ExpnType,expn))
    elif  is_sqrt(expn):
        if  type(expn.operands()[0])==Rational: #type(isinstance(expn.args[0],Rational):
            return 1
        else:
            return max(2,expnType(expn.operands()[0]))  #max(2,expnType(expn.args[0]))
    elif expn.operator() == operator.pow:   #isinstance(expn,Pow)
        if type(expn.operands()[1])==Integer:  #isinstance(expn.args[1],Integer)
```

```
            return expnType(expn.operands()[0])    #expnType(expn.args[0])
        elif type(expn.operands()[1])==Rational:  #isinstance(expn.args[1],Rational)
            if type(expn.operands()[0])==Rational: #isinstance(expn.args[0],Rational)
                return 1
            else:
                return max(2,expnType(expn.operands()[0]))  #max(2,expnType(expn.args[0]))
        else:
            return max(3,expnType(expn.operands()[0]),expnType(expn.operands()[1])) #max(3,expnType(expr
    elif expn.operator() == add_vararg or expn.operator() == mul_vararg: #isinstance(expn,Add) or isins
        m1 = expnType(expn.operands()[0]) #expnType(expn.args[0])
        m2 = expnType(expn.operands()[1:]) #expnType(list(expn.args[1:]))
        return max(m1,m2)  #max(ExpnType(op(1,expn)),max(ExpnType(rest(expn))))
    elif is_elementary_function(expn.operator()):  #is_elementary_function(expn.func)
        return max(3,expnType(expn.operands()[0]))
    elif is_special_function(expn.operator()): #is_special_function(expn.func)
        m1 = max(map(expnType, expn.operands()))      #max(map(expnType, list(expn.args)))
        return max(4,m1)    #max(4,m1)
    elif is_hypergeometric_function(expn.operator()): #is_hypergeometric_function(expn.func)
        m1 = max(map(expnType, expn.operands()))       #max(map(expnType, list(expn.args)))
        return max(5,m1)    #max(5,m1)
    elif is_appell_function(expn.operator()):
        m1 = max(map(expnType, expn.operands()))       #max(map(expnType, list(expn.args)))
        return max(6,m1)    #max(6,m1)
    elif str(expn).find("Integral") != -1: #this will never happen, since it
                #is checked before calling the grading function that is passed.
                #but kept it here.
        m1 = max(map(expnType, expn.operands()))       #max(map(expnType, list(expn.args)))
        return max(8,m1)    #max(5,apply(max,map(ExpnType,[op(expn)])))
    else:
        return 9

#main function
def grade_antiderivative(result,optimal):


    if debug:
        print ("Enter grade_antiderivative for sagemath")
        print("Enter grade_antiderivative, result=",result)
        print("Enter grade_antiderivative, optimal=",optimal)
        print("type(anti)=",type(result))
        print("type(optimal)=",type(optimal))
```

```
leaf_count_result  = tree_size(result) #leaf_count(result)
leaf_count_optimal = tree_size(optimal) #leaf_count(optimal)

#if debug: print ("leaf_count_result=", leaf_count_result, "leaf_count_optimal=",leaf_count_optimal)


expnType_result  = expnType(result)
expnType_optimal = expnType(optimal)

if debug: print ("expnType_result=", expnType_result, "expnType_optimal=",expnType_optimal)

if expnType_result <= expnType_optimal:
    if result.has(I):
        if optimal.has(I): #both result and optimal complex
            if leaf_count_result <= 2*leaf_count_optimal:
                grade = "A"
                grade_annotation ="none"
            else:
                grade = "B"
                grade_annotation ="Both result and optimal contain complex but leaf count of result is larger
        else: #result contains complex but optimal is not
            grade = "C"
            grade_annotation ="Result contains complex when optimal does not."
    else: # result do not contain complex, this assumes optimal do not as well
        if leaf_count_result <= 2*leaf_count_optimal:
            grade = "A"
            grade_annotation ="none"
        else:
            grade = "B"
            grade_annotation ="Leaf count of result is larger than twice the leaf count of optimal. "+str(lea
else:
    grade = "C"
    grade_annotation ="Result contains higher order function than in optimal. Order "+str(expnType_re


print("Before returning. grade=",grade, " grade_annotation=",grade_annotation)

return grade, grade_annotation
```

4.2 Links to plain text integration problems used in this report for each CAS

1. Mathematica integration problems as .m file
2. Maple integration problems as .txt file
3. Sagemath integration problems as .sage file
4. Reduce integration problems as .txt file
5. Mupad integration problems as .txt file
6. Sympy integration problems as .py file