Rubi 4.16.1.4 Integration Test Results

on the problems in the test-suite directory "1 Algebraic functions"

Test results for the 1917 problems in "1.1.1.2 (a+b x)^m (c+d x)^n.m"

Problem 369: Result unnecessarily involves higher level functions and more than twice size of optimal antiderivative.

$$\int \left(-\frac{b\, x^m}{2\, (a+b\, x)^{3/2}}+\frac{m\, x^{-1+m}}{\sqrt{a+b\, x}}\right) dx$$

Optimal (type 3, 13 leaves, ? steps):

$$\frac{x^m}{\sqrt{a+b\, x}}$$

Result (type 5, 92 leaves, 5 steps):

$$\frac{x^m \left(-\frac{b\, x}{a}\right)^{-m} \text{Hypergeometric2F1}\left[-\frac{1}{2},\, -m,\, \frac{1}{2},\, 1+\frac{b\, x}{a}\right]}{\sqrt{a+b\, x}}-\frac{2\, m\, x^m \left(-\frac{b\, x}{a}\right)^{-m} \sqrt{a+b\, x}\, \text{Hypergeometric2F1}\left[\frac{1}{2},\, 1-m,\, \frac{3}{2},\, 1+\frac{b\, x}{a}\right]}{a}$$

Test results for the 3201 problems in "1.1.1.3 (a+b x)^m (c+d x)^n (e+f x)^p.m"

Problem 957: Result valid but suboptimal antiderivative.

$$\int (e\, x)^m\, (a-b\, x)^{2+n}\, (a+b\, x)^n\, dx$$

Optimal (type 5, 211 leaves, ? steps):

$$-\frac{(e\,x)^{1+m}\,(a-b\,x)^{1+n}\,(a+b\,x)^{1+n}}{e\,(3+m+2\,n)}+\left(2\,a^2\,(2+m+n)\,(e\,x)^{1+m}\,(a-b\,x)^n\,(a+b\,x)^n\left(1-\frac{b^2\,x^2}{a^2}\right)^{-n}\right.$$
$$\left.\text{Hypergeometric2F1}\left[\frac{1+m}{2},-n,\frac{3+m}{2},\frac{b^2\,x^2}{a^2}\right]\right)\Big/\left(e\,(1+m)\,(3+m+2\,n)\right)-\frac{1}{e^2\,(2+m)}$$
$$2\,a\,b\,(e\,x)^{2+m}\,(a-b\,x)^n\,(a+b\,x)^n\left(1-\frac{b^2\,x^2}{a^2}\right)^{-n}\text{Hypergeometric2F1}\left[\frac{2+m}{2},-n,\frac{4+m}{2},\frac{b^2\,x^2}{a^2}\right]$$

Result (type 5, 238 leaves, 11 steps) :

$$\frac{1}{e\,(1+m)}a^2\,(e\,x)^{1+m}\,(a-b\,x)^n\,(a+b\,x)^n$$
$$\left(1-\frac{b^2\,x^2}{a^2}\right)^{-n}\text{Hypergeometric2F1}\left[\frac{1+m}{2},-n,\frac{3+m}{2},\frac{b^2\,x^2}{a^2}\right]-\frac{1}{e^2\,(2+m)}$$
$$2\,a\,b\,(e\,x)^{2+m}\,(a-b\,x)^n\,(a+b\,x)^n\left(1-\frac{b^2\,x^2}{a^2}\right)^{-n}\text{Hypergeometric2F1}\left[\frac{2+m}{2},-n,\frac{4+m}{2},\frac{b^2\,x^2}{a^2}\right]+$$
$$\frac{1}{e^3\,(3+m)}b^2\,(e\,x)^{3+m}\,(a-b\,x)^n\,(a+b\,x)^n\left(1-\frac{b^2\,x^2}{a^2}\right)^{-n}\text{Hypergeometric2F1}\left[\frac{3+m}{2},-n,\frac{5+m}{2},\frac{b^2\,x^2}{a^2}\right]$$

Test results for the 159 problems in "1.1.1.4 (a+b x)^m (c+d x)^n (e+f x)^p (g+h x)^q.m"

Problem 111: Unable to integrate problem.

$$\int\frac{1}{(a+b\,x)^{3/2}\,(c+d\,x)^{3/2}\,\sqrt{e+f\,x}\,\sqrt{g+h\,x}}\,dx$$

Optimal (type 4, 786 leaves, ? steps):

$$-\frac{2 d^3 \sqrt{a+b x} \sqrt{e+f x} \sqrt{g+h x}}{(b c-a d)^2 (d e-c f) (d g-c h) \sqrt{c+d x}}-\frac{2 b^3 \sqrt{c+d x} \sqrt{e+f x} \sqrt{g+h x}}{(b c-a d)^2 (b e-a f) (b g-a h) \sqrt{a+b x}}+$$

$$\left(2 b \left(a^2 d^2 f h-a b d^2 (f g+e h)+b^2 \left(2 d^2 e g+c^2 f h-c d (f g+e h)\right)\right) \sqrt{c+d x} \sqrt{e+f x} \sqrt{g+h x}\right) \Big/$$
$$\left((b c-a d)^2 (b e-a f) (d e-c f) (b g-a h) (d g-c h) \sqrt{a+b x}\right)-$$

$$\left(2 \sqrt{f g-e h} \left(a^2 d^2 f h-a b d^2 (f g+e h)+b^2 \left(2 d^2 e g+c^2 f h-c d (f g+e h)\right)\right) \sqrt{c+d x}\right.$$
$$\left.\sqrt{-\frac{(b e-a f) (g+h x)}{(f g-e h) (a+b x)}} \text{EllipticE}\left[\text{ArcSin}\left[\frac{\sqrt{b g-a h} \sqrt{e+f x}}{\sqrt{f g-e h} \sqrt{a+b x}}\right],-\frac{(b c-a d) (f g-e h)}{(d e-c f) (b g-a h)}\right]\right) \Big/$$
$$\left((b c-a d)^2 (b e-a f) (d e-c f) \sqrt{b g-a h} (d g-c h) \sqrt{\frac{(b e-a f) (c+d x)}{(d e-c f) (a+b x)}} \sqrt{g+h x}\right)-$$

$$\left(4 b d \sqrt{\frac{(b e-a f) (c+d x)}{(d e-c f) (a+b x)}} \sqrt{g+h x}\right.$$
$$\left.\text{EllipticF}\left[\text{ArcSin}\left[\frac{\sqrt{b g-a h} \sqrt{e+f x}}{\sqrt{f g-e h} \sqrt{a+b x}}\right],-\frac{(b c-a d) (f g-e h)}{(d e-c f) (b g-a h)}\right]\right) \Big/$$
$$\left((b c-a d)^2 \sqrt{b g-a h} \sqrt{f g-e h} \sqrt{c+d x} \sqrt{-\frac{(b e-a f) (g+h x)}{(f g-e h) (a+b x)}}\right)$$

Result (type 8, 39 leaves, 0 steps):

$$\text{CannotIntegrate}\left[\frac{1}{(a+b x)^{3/2} (c+d x)^{3/2} \sqrt{e+f x} \sqrt{g+h x}},x\right]$$

Test results for the 34 problems in "1.1.1.5 P(x) (a+b x)^m (c+d x)^n.m"

Test results for the 78 problems in "1.1.1.6 P(x) (a+b x)^m (c+d x)^n (e+f x)^p.m"

Test results for the 35 problems in "1.1.1.7 P(x) (a+b x)^m (c+d x)^n (e+f x)^p (g+h x)^q.m"

Test results for the 1071 problems in "1.1.2.2 (c x)^m (a+b x^2)^p.m"

Problem 662: Result unnecessarily involves higher level functions and more than twice size of optimal antiderivative.

$$\int \left(\frac{a\,(2+m)\,x^{1+m}}{\sqrt{a+b\,x^2}}+\frac{b\,(3+m)\,x^{3+m}}{\sqrt{a+b\,x^2}}\right) dx$$

Optimal (type 3, 17 leaves, ? steps):

$$x^{2+m}\,\sqrt{a+b\,x^2}$$

Result (type 5, 127 leaves, 5 steps):

$$\frac{a\,x^{2+m}\,\sqrt{1+\frac{b\,x^2}{a}}\ \text{Hypergeometric2F1}\left[\frac{1}{2},\frac{2+m}{2},\frac{4+m}{2},-\frac{b\,x^2}{a}\right]}{\sqrt{a+b\,x^2}}+\frac{b\,(3+m)\,x^{4+m}\,\sqrt{1+\frac{b\,x^2}{a}}\ \text{Hypergeometric2F1}\left[\frac{1}{2},\frac{4+m}{2},\frac{6+m}{2},-\frac{b\,x^2}{a}\right]}{(4+m)\,\sqrt{a+b\,x^2}}$$

Problem 664: Result unnecessarily involves higher level functions and more than twice size of optimal antiderivative.

$$\int \left(-\frac{b\,x^{1+m}}{\left(a+b\,x^2\right)^{3/2}}+\frac{m\,x^{-1+m}}{\sqrt{a+b\,x^2}}\right) dx$$

Optimal (type 3, 15 leaves, ? steps):

$$\frac{x^m}{\sqrt{a+b\,x^2}}$$

Result (type 5, 123 leaves, 5 steps):

$$\frac{x^m\,\sqrt{1+\frac{b\,x^2}{a}}\ \text{Hypergeometric2F1}\left[\frac{1}{2},\frac{m}{2},\frac{2+m}{2},-\frac{b\,x^2}{a}\right]}{\sqrt{a+b\,x^2}}-\frac{b\,x^{2+m}\,\sqrt{1+\frac{b\,x^2}{a}}\ \text{Hypergeometric2F1}\left[\frac{3}{2},\frac{2+m}{2},\frac{4+m}{2},-\frac{b\,x^2}{a}\right]}{a\,(2+m)\,\sqrt{a+b\,x^2}}$$

Test results for the 349 problems in "1.1.2.3 (a+b x^2)^p (c+d x^2)^q.m"

Problem 301: Result unnecessarily involves higher level functions.

$$\int \frac{\left(1-2 x^2\right)^m}{\sqrt{1-x^2}}\, dx$$

Optimal (type 5, 62 leaves, ? steps):

$$-\frac{2^{-2-m} \sqrt{x^2} \left(2-4 x^2\right)^{1+m} \text{Hypergeometric2F1}\left[\frac{1}{2}, \frac{1+m}{2}, \frac{3+m}{2}, \left(1-2 x^2\right)^2\right]}{(1+m)\, x}$$

Result (type 6, 23 leaves, 1 step):

$$x\, \text{AppellF1}\left[\frac{1}{2}, -m, \frac{1}{2}, \frac{3}{2}, 2 x^2, x^2\right]$$

Test results for the 1156 problems in "1.1.2.4 (e x)^m (a+b x^2)^p (c+d x^2)^q.m"

Test results for the 115 problems in "1.1.2.5 (a+b x^2)^p (c+d x^2)^q (e+f x^2)^r.m"

Test results for the 51 problems in "1.1.2.6 (g x)^m (a+b x^2)^p (c+d x^2)^q (e+f x^2)^r.m"

Test results for the 174 problems in "1.1.2.8 P(x) (c x)^m (a+b x^2)^p.m"

Test results for the 3078 problems in "1.1.3.2 (c x)^m (a+b x^n)^p.m"

Problem 2686: Result unnecessarily involves higher level functions and more than twice size of optimal antiderivative.

$$\int \left(-\frac{b\, n\, x^{-1+m+n}}{2 \left(a+b x^n\right)^{3/2}}+\frac{m\, x^{-1+m}}{\sqrt{a+b x^n}}\right) dx$$

Optimal (type 3, 15 leaves, ? steps):

$$\frac{x^m}{\sqrt{a+b\,x^n}}$$

Result (type 5, 126 leaves, 5 steps):

$$\frac{x^m\sqrt{1+\frac{b\,x^n}{a}}\;\text{Hypergeometric2F1}\left[\frac{1}{2},\frac{m}{n},\frac{m+n}{n},-\frac{b\,x^n}{a}\right]}{\sqrt{a+b\,x^n}}-\frac{b\,n\,x^{m+n}\sqrt{1+\frac{b\,x^n}{a}}\;\text{Hypergeometric2F1}\left[\frac{3}{2},\frac{m+n}{n},2+\frac{m}{n},-\frac{b\,x^n}{a}\right]}{2\,a\,(m+n)\sqrt{a+b\,x^n}}$$

Problem 2697: Result unnecessarily involves higher level functions and more than twice size of optimal antiderivative.

$$\int\left(\frac{6\,a\,x^2}{b\,(4+m)\sqrt{a+b\,x^{-2+m}}}+\frac{x^m}{\sqrt{a+b\,x^{-2+m}}}\right)dx$$

Optimal (type 3, 26 leaves, ? steps):

$$\frac{2\,x^3\sqrt{a+b\,x^{-2+m}}}{b\,(4+m)}$$

Result (type 5, 160 leaves, 5 steps):

$$\frac{2\,a\,x^3\sqrt{1+\frac{b\,x^{-2+m}}{a}}\;\text{Hypergeometric2F1}\left[\frac{1}{2},-\frac{3}{2-m},-\frac{1+m}{2-m},-\frac{b\,x^{-2+m}}{a}\right]}{b\,(4+m)\sqrt{a+b\,x^{-2+m}}}+\frac{x^{1+m}\sqrt{1+\frac{b\,x^{-2+m}}{a}}\;\text{Hypergeometric2F1}\left[\frac{1}{2},-\frac{1+m}{2-m},\frac{1-2\,m}{2-m},-\frac{b\,x^{-2+m}}{a}\right]}{(1+m)\sqrt{a+b\,x^{-2+m}}}$$

Problem 2699: Result unnecessarily involves higher level functions and more than twice size of optimal antiderivative.

$$\int\left(-\frac{b\,n\,x^{-1+m+n}}{2\,(a+b\,x^n)^{3/2}}+\frac{m\,x^{-1+m}}{\sqrt{a+b\,x^n}}\right)dx$$

Optimal (type 3, 15 leaves, ? steps):

$$\frac{x^m}{\sqrt{a+b\,x^n}}$$

Result (type 5, 126 leaves, 5 steps):

$$\frac{x^m \sqrt{1+\frac{b x^n}{a}}\ \text{Hypergeometric2F1}\left[\frac{1}{2},\frac{m}{n},\frac{m+n}{n},-\frac{b x^n}{a}\right]}{\sqrt{a+b x^n}}-\frac{b\, n\, x^{m+n} \sqrt{1+\frac{b x^n}{a}}\ \text{Hypergeometric2F1}\left[\frac{3}{2},\frac{m+n}{n},2+\frac{m}{n},-\frac{b x^n}{a}\right]}{2 a (m+n) \sqrt{a+b x^n}}$$

Test results for the 385 problems in "1.1.3.3 (a+b x^n)^p (c+d x^n)^q.m"

Test results for the 1081 problems in "1.1.3.4 (e x)^m (a+b x^n)^p (c+d x^n)^q.m"

Problem 455: Result unnecessarily involves higher level functions.

$$\int \frac{x^6}{\left(8 c-d x^3\right)^2 \left(c+d x^3\right)^{3/2}}\, dx$$

Optimal (type 4, 256 leaves, ? steps):

$$\frac{2 x \left(4 c+d x^3\right)}{81 c d^2 \left(8 c-d x^3\right) \sqrt{c+d x^3}}-\left(2 \sqrt{2+\sqrt{3}}\ \left(c^{1/3}+d^{1/3} x\right) \sqrt{\frac{c^{2/3}-c^{1/3} d^{1/3} x+d^{2/3} x^2}{\left(\left(1+\sqrt{3}\right) c^{1/3}+d^{1/3} x\right)^2}}\ \text{EllipticF}\left[\text{ArcSin}\left[\frac{\left(1-\sqrt{3}\right) c^{1/3}+d^{1/3} x}{\left(1+\sqrt{3}\right) c^{1/3}+d^{1/3} x}\right],-7-4 \sqrt{3}\right]\right)\Big/\left(81\times 3^{1/4} c\, d^{7/3} \sqrt{\frac{c^{1/3} \left(c^{1/3}+d^{1/3} x\right)}{\left(\left(1+\sqrt{3}\right) c^{1/3}+d^{1/3} x\right)^2}}\ \sqrt{c+d x^3}\right)$$

Result (type 6, 66 leaves, 2 steps):

$$\frac{x^7 \sqrt{1+\frac{d x^3}{c}}\ \text{AppellF1}\left[\frac{7}{3},2,\frac{3}{2},\frac{10}{3},\frac{d x^3}{8 c},-\frac{d x^3}{c}\right]}{448 c^3 \sqrt{c+d x^3}}$$

Test results for the 46 problems in "1.1.3.6 (g x)^m (a+b x^n)^p (c+d x^n)^q (e+f x^n)^r.m"

Test results for the 594 problems in "1.1.3.8 P(x) (c x)^m (a+b x^n)^p.m"

Test results for the 454 problems in "1.1.4.2 (c x)^m (a x^j+b x^n)^p.m"

Test results for the 298 problems in "1.1.4.3 (e x)^m (a x^j+b x^k)^p (c+d x^n)^q.m"

Test results for the 143 problems in "1.2.1.1 (a+b x+c x^2)^p.m"

Test results for the 2590 problems in "1.2.1.2 (d+e x)^m (a+b x+c x^2)^p.m"

Test results for the 2646 problems in "1.2.1.3 (d+e x)^m (f+g x) (a+b x+c x^2)^p.m"

Test results for the 958 problems in "1.2.1.4 (d+e x)^m (f+g x)^n (a+b x+c x^2)^p.m"

Problem 833: Result valid but suboptimal antiderivative.

$$\int \frac{\sqrt{-1+x}\ \sqrt{1+x}}{1+x-x^2}\,dx$$

Optimal (type 3, 91 leaves, ? steps):

$$-\text{ArcCosh}[x]+\sqrt{\frac{2}{5}\left(-1+\sqrt{5}\right)}\ \text{ArcTan}\left[\frac{\sqrt{1+x}}{\sqrt{-2+\sqrt{5}}\ \sqrt{-1+x}}\right]+\sqrt{\frac{2}{5}\left(1+\sqrt{5}\right)}\ \text{ArcTanh}\left[\frac{\sqrt{1+x}}{\sqrt{2+\sqrt{5}}\ \sqrt{-1+x}}\right]$$

Result (type 3, 191 leaves, 9 steps):

$$\frac{\sqrt{\frac{1}{10}\left(-1+\sqrt{5}\right)}\ \sqrt{-1+x}\ \sqrt{1+x}\ \text{ArcTan}\left[\frac{2-\left(1-\sqrt{5}\right)x}{\sqrt{2\left(-1+\sqrt{5}\right)}\ \sqrt{-1+x^2}}\right]}{\sqrt{-1+x^2}}-$$

$$\frac{\sqrt{-1+x}\ \sqrt{1+x}\ \text{ArcTanh}\left[\frac{x}{\sqrt{-1+x^2}}\right]}{\sqrt{-1+x^2}}-\frac{\sqrt{\frac{1}{10}\left(1+\sqrt{5}\right)}\ \sqrt{-1+x}\ \sqrt{1+x}\ \text{ArcTanh}\left[\frac{2-\left(1+\sqrt{5}\right)x}{\sqrt{2\left(1+\sqrt{5}\right)}\ \sqrt{-1+x^2}}\right]}{\sqrt{-1+x^2}}$$

Test results for the 123 problems in "1.2.1.5 (a+b x+c x^2)^p (d+e x+f x^2)^q.m"

Test results for the 143 problems in "1.2.1.6 (g+h x)^m (a+b x+c x^2)^p (d+e x+f x^2)^q.m"

Test results for the 400 problems in "1.2.1.9 P(x) (d+e x)^m (a+b x+c x^2)^p.m"

Test results for the 1126 problems in "1.2.2.2 (d x)^m (a+b x^2+c x^4)^p.m"

Test results for the 413 problems in "1.2.2.3 (d+e x^2)^m (a+b x^2+c x^4)^p.m"

Problem 174: Unable to integrate problem.

$$\int \frac{\sqrt{a+b\,x^2}}{\sqrt{1-x^4}}\,dx$$

Optimal (type 4, 112 leaves, ? steps):

$$\frac{a\,\sqrt{1-x^2}\ \sqrt{\frac{a\left(1+x^2\right)}{a+b\,x^2}}\ \text{EllipticPi}\left[\frac{b}{a+b},\ \text{ArcSin}\left[\frac{\sqrt{a+b}\ x}{\sqrt{a+b\,x^2}}\right],\ -\frac{a-b}{a+b}\right]}{\sqrt{a+b}\ \sqrt{1+x^2}\ \sqrt{\frac{a\left(1-x^2\right)}{a+b\,x^2}}}$$

Result (type 8, 25 leaves, 0 steps):

$$\text{Unintegrable}\left[\frac{\sqrt{a+b\,x^2}}{\sqrt{1-x^4}},\,x\right]$$

Test results for the 413 problems in "1.2.2.4 (f x)^m (d+e x^2)^q (a+b x^2+c x^4)^p.m"

Problem 374: Result valid but suboptimal antiderivative.

$$\int \frac{\left(d+e\,x^2\right)^{3/2}}{x^2\,\left(a+b\,x^2+c\,x^4\right)}\,dx$$

Optimal (type 3, 260 leaves, ? steps):

$$-\frac{d\,\sqrt{d+e\,x^2}}{a\,x}-\frac{\left(2\,c\,d-\left(b-\sqrt{b^2-4\,a\,c}\right)\,e\right)^{3/2}\,\text{ArcTan}\left[\frac{\sqrt{2\,c\,d-\left(b-\sqrt{b^2-4\,a\,c}\right)\,e}\;x}{\sqrt{b-\sqrt{b^2-4\,a\,c}}\;\sqrt{d+e\,x^2}}\right]}{\sqrt{b^2-4\,a\,c}\,\left(b-\sqrt{b^2-4\,a\,c}\right)^{3/2}}+$$

$$\frac{\left(2\,c\,d-\left(b+\sqrt{b^2-4\,a\,c}\right)\,e\right)^{3/2}\,\text{ArcTan}\left[\frac{\sqrt{2\,c\,d-\left(b+\sqrt{b^2-4\,a\,c}\right)\,e}\;x}{\sqrt{b+\sqrt{b^2-4\,a\,c}}\;\sqrt{d+e\,x^2}}\right]}{\sqrt{b^2-4\,a\,c}\,\left(b+\sqrt{b^2-4\,a\,c}\right)^{3/2}}$$

Result (type 3, 432 leaves, 16 steps):

$$-\frac{d\sqrt{d+e x^2}}{a x}-\left(\sqrt{2 c d-\left(b-\sqrt{b^2-4 a c}\right) e}\,\left(d+\frac{b d-2 a e}{\sqrt{b^2-4 a c}}\right)\text{ArcTan}\left[\frac{\sqrt{2 c d-\left(b-\sqrt{b^2-4 a c}\right) e}\,x}{\sqrt{b-\sqrt{b^2-4 a c}}\,\sqrt{d+e x^2}}\right]\right)\Big/\left(2 a\sqrt{b-\sqrt{b^2-4 a c}}\right)-\left(\sqrt{2 c d-\left(b+\sqrt{b^2-4 a c}\right) e}\,\left(d-\frac{b d-2 a e}{\sqrt{b^2-4 a c}}\right)\text{ArcTan}\left[\frac{\sqrt{2 c d-\left(b+\sqrt{b^2-4 a c}\right) e}\,x}{\sqrt{b+\sqrt{b^2-4 a c}}\,\sqrt{d+e x^2}}\right]\right)\Big/\left(2 a\sqrt{b+\sqrt{b^2-4 a c}}\right)+\frac{d\sqrt{e}\,\text{ArcTanh}\left[\frac{\sqrt{e}\,x}{\sqrt{d+e x^2}}\right]}{a}-\frac{\sqrt{e}\left(d-\frac{b d-2 a e}{\sqrt{b^2-4 a c}}\right)\text{ArcTanh}\left[\frac{\sqrt{e}\,x}{\sqrt{d+e x^2}}\right]}{2 a}-\frac{\sqrt{e}\left(d+\frac{b d-2 a e}{\sqrt{b^2-4 a c}}\right)\text{ArcTanh}\left[\frac{\sqrt{e}\,x}{\sqrt{d+e x^2}}\right]}{2 a}$$

Test results for the 111 problems in "1.2.2.5 P(x) (a+b x^2+c x^4)^p.m"

Test results for the 145 problems in "1.2.2.6 P(x) (d x)^m (a+b x^2+c x^4)^p.m"

Test results for the 42 problems in "1.2.2.7 P(x) (d+e x^2)^q (a+b x^2+c x^4)^p.m"

Test results for the 4 problems in "1.2.2.8 P(x) (d+e x)^q (a+b x^2+c x^4)^p.m"

Test results for the 664 problems in "1.2.3.2 (d x)^m (a+b x^n+c x^(2 n))^p.m"

Problem 24: Result valid but suboptimal antiderivative.

$$\int x^8 \left(a^2+2 a b x^3+b^2 x^6\right)^{3/2} \, dx$$

Optimal (type 2, 119 leaves, ? steps):

$$\frac{a^2 \left(a+b x^3\right)^3 \sqrt{a^2+2 a b x^3+b^2 x^6}}{12 b^3}-\frac{2 a \left(a+b x^3\right)^4 \sqrt{a^2+2 a b x^3+b^2 x^6}}{15 b^3}+\frac{\left(a+b x^3\right)^5 \sqrt{a^2+2 a b x^3+b^2 x^6}}{18 b^3}$$

Result (type 2, 167 leaves, 4 steps):

$$\frac{a^3 x^9 \sqrt{a^2+2 a b x^3+b^2 x^6}}{9 \left(a+b x^3\right)}+\frac{a^2 b x^{12} \sqrt{a^2+2 a b x^3+b^2 x^6}}{4 \left(a+b x^3\right)}+\frac{a b^2 x^{15} \sqrt{a^2+2 a b x^3+b^2 x^6}}{5 \left(a+b x^3\right)}+\frac{b^3 x^{18} \sqrt{a^2+2 a b x^3+b^2 x^6}}{18 \left(a+b x^3\right)}$$

Problem 478: Result unnecessarily involves higher level functions.

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

Optimal (type 3, 146 leaves, ? steps):

$$-\frac{\left(a+b x^{1/3}\right)\left(a^2+2 a b x^{1/3}+b^2 x^{2/3}\right)^p}{a x}+\frac{b (1-p)\left(a+b x^{1/3}\right)\left(a^2+2 a b x^{1/3}+b^2 x^{2/3}\right)^p}{a^2 x^{2/3}}-\frac{b^2 (1-2 p)(1-p)\left(a+b x^{1/3}\right)\left(a^2+2 a b x^{1/3}+b^2 x^{2/3}\right)^p}{a^3 x^{1/3}}$$

Result (type 5, 162 leaves, 7 steps) :

$$\frac{1}{a^3 (1+2 p)} 2 b^3 (1-2 p)(1-p) p \left(1+\frac{b x^{1/3}}{a}\right)\left(a^2+2 a b x^{1/3}+b^2 x^{2/3}\right)^p \text{Hypergeometric2F1}\left[1, 1+2 p, 2 (1+p), 1+\frac{b x^{1/3}}{a}\right]+\frac{1}{a^3 (1+2 p)} 3 b^3 \left(1+\frac{b x^{1/3}}{a}\right)\left(a^2+2 a b x^{1/3}+b^2 x^{2/3}\right)^p \text{Hypergeometric2F1}\left[4, 1+2 p, 2 (1+p), 1+\frac{b x^{1/3}}{a}\right]$$

Test results for the 96 problems in "1.2.3.3 (d+e x^n)^q (a+b x^n+c x^(2 n))^p.m"

Test results for the 156 problems in "1.2.3.4 (f x)^m (d+e x^n)^q (a+b x^n+c x^(2 n))^p.m"

Test results for the 17 problems in "1.2.3.5 P(x) (d x)^m (a+b x^n+c x^(2 n))^p.m"

Test results for the 140 problems in "1.2.4.2 (d x)^m (a x^q+b x^n+c x^(2 n-q))^p.m"

Test results for the 494 problems in "1.3.1 Rational functions.m"

Problem 174: Result unnecessarily involves higher level functions and more than twice size of optimal antiderivative.

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

Optimal (type 3, 27 leaves, ? steps):

$$\frac{x^{1+p}\left(b x+c x^3\right)^{1+p}}{2 (1+p)}$$

Result (type 5, 116 leaves, 7 steps) :

$$\frac{1}{2\,(1+p)} b\, x^{2+p} \left(1+\frac{c\, x^2}{b}\right)^{-p} \left(b\, x+c\, x^3\right)^p \text{Hypergeometric2F1}\left[-p,\ 1+p,\ 2+p,\ -\frac{c\, x^2}{b}\right] + \frac{1}{2+p} c\, x^{4+p} \left(1+\frac{c\, x^2}{b}\right)^{-p} \left(b\, x+c\, x^3\right)^p \text{Hypergeometric2F1}\left[-p,\ 2+p,\ 3+p,\ -\frac{c\, x^2}{b}\right]$$

Problem 221: Result valid but suboptimal antiderivative.

$$\int (1+2\,x)\ \left(x+x^2\right)^3 \left(-18+7\,\left(x+x^2\right)^3\right)^2 \,dx$$

Optimal (type 1, 33 leaves, ? steps):

$$81\, x^4\, (1+x)^4 - 36\, x^7\, (1+x)^7 + \frac{49}{10}\, x^{10}\, (1+x)^{10}$$

Result (type 1, 96 leaves, 3 steps):

$$81\, x^4 + 324\, x^5 + 486\, x^6 + 288\, x^7 - 171\, x^8 - 756\, x^9 - \frac{12\,551\, x^{10}}{10} - 1211\, x^{11} - \frac{1071\, x^{12}}{2} + 336\, x^{13} + 993\, x^{14} + \frac{6174\, x^{15}}{5} + 1029\, x^{16} + 588\, x^{17} + \frac{441\, x^{18}}{2} + 49\, x^{19} + \frac{49\, x^{20}}{10}$$

Problem 222: Result valid but suboptimal antiderivative.

$$\int x^3\, (1+x)^3\, (1+2\,x)\ \left(-18+7\, x^3\, (1+x)^3\right)^2 \,dx$$

Optimal (type 1, 33 leaves, ? steps):

$$81\, x^4\, (1+x)^4 - 36\, x^7\, (1+x)^7 + \frac{49}{10}\, x^{10}\, (1+x)^{10}$$

Result (type 1, 96 leaves, 2 steps):

$$81\, x^4 + 324\, x^5 + 486\, x^6 + 288\, x^7 - 171\, x^8 - 756\, x^9 - \frac{12\,551\, x^{10}}{10} - 1211\, x^{11} - \frac{1071\, x^{12}}{2} + 336\, x^{13} + 993\, x^{14} + \frac{6174\, x^{15}}{5} + 1029\, x^{16} + 588\, x^{17} + \frac{441\, x^{18}}{2} + 49\, x^{19} + \frac{49\, x^{20}}{10}$$

Problem 329: Result valid but suboptimal antiderivative.

$$\int \frac{-20\, x + 4\, x^2}{9 - 10\, x^2 + x^4} \,dx$$

Optimal (type 3, 31 leaves, ? steps):

$$\text{Log}[1-x] - \frac{1}{2}\,\text{Log}[3-x] + \frac{3}{2}\,\text{Log}[1+x] - 2\,\text{Log}[3+x]$$

Result (type 3, 41 leaves, 11 steps):

$$-\frac{3}{2}\,\text{ArcTanh}\left[\frac{x}{3}\right] + \frac{\text{ArcTanh}[x]}{2} + \frac{5}{4}\,\text{Log}\left[1-x^2\right] - \frac{5}{4}\,\text{Log}\left[9-x^2\right]$$

Problem 393: Unable to integrate problem.

$$\int \frac{\left(1+x^2\right)^2}{a x^6+b \left(1+x^2\right)^3} \, dx$$

Optimal (type 3, 168 leaves, ? steps):

$$\frac{\text{ArcTan}\left[\frac{\sqrt{a^{1/3}+b^{1/3}}\, x}{b^{1/6}}\right]}{3 \sqrt{a^{1/3}+b^{1/3}}\, b^{5/6}}+\frac{\text{ArcTan}\left[\frac{\sqrt{-(-1)^{1/3} a^{1/3}+b^{1/3}}\, x}{b^{1/6}}\right]}{3 \sqrt{-(-1)^{1/3} a^{1/3}+b^{1/3}}\, b^{5/6}}+\frac{\text{ArcTan}\left[\frac{\sqrt{(-1)^{2/3} a^{1/3}+b^{1/3}}\, x}{b^{1/6}}\right]}{3 \sqrt{(-1)^{2/3} a^{1/3}+b^{1/3}}\, b^{5/6}}$$

Result (type 8, 68 leaves, 5 steps):

$$\text{CannotIntegrate}\left[\frac{1}{a x^6+b \left(1+x^2\right)^3}, x\right]+$$
$$2\, \text{CannotIntegrate}\left[\frac{x^2}{a x^6+b \left(1+x^2\right)^3}, x\right]+\text{CannotIntegrate}\left[\frac{x^4}{a x^6+b \left(1+x^2\right)^3}, x\right]$$

Problem 493: Unable to integrate problem.

$$\int \left(\frac{3 \left(-47+228 x+120 x^2+19 x^3\right)}{\left(3+x+x^4\right)^4}+\frac{42-320 x-75 x^2-8 x^3}{\left(3+x+x^4\right)^3}+\frac{30 x}{\left(3+x+x^4\right)^2}\right) dx$$

Optimal (type 1, 27 leaves, ? steps):

$$\frac{2-3 x+5 x^2+x^4-5 x^6}{\left(3+x+x^4\right)^3}$$

Result (type 8, 121 leaves, 7 steps):

$$-\frac{19}{4 \left(3+x+x^4\right)^3}+\frac{1}{\left(3+x+x^4\right)^2}-\frac{621}{4} \text{CannotIntegrate}\left[\frac{1}{\left(3+x+x^4\right)^4}, x\right]+$$
$$684\, \text{CannotIntegrate}\left[\frac{x}{\left(3+x+x^4\right)^4}, x\right]+360\, \text{CannotIntegrate}\left[\frac{x^2}{\left(3+x+x^4\right)^4}, x\right]+$$
$$44\, \text{CannotIntegrate}\left[\frac{1}{\left(3+x+x^4\right)^3}, x\right]-320\, \text{CannotIntegrate}\left[\frac{x}{\left(3+x+x^4\right)^3}, x\right]-$$
$$75\, \text{CannotIntegrate}\left[\frac{x^2}{\left(3+x+x^4\right)^3}, x\right]+30\, \text{CannotIntegrate}\left[\frac{x}{\left(3+x+x^4\right)^2}, x\right]$$

Problem 494: Unable to integrate problem.

$$\int \left(\frac{-3+10 x+4 x^3-30 x^5}{\left(3+x+x^4\right)^3}-\frac{3 \left(1+4 x^3\right) \left(2-3 x+5 x^2+x^4-5 x^6\right)}{\left(3+x+x^4\right)^4}\right) dx$$

Optimal (type 1, 27 leaves, ? steps):

$$\frac{2-3x+5x^2+x^4-5x^6}{\left(3+x+x^4\right)^3}$$

Result (type 8, 177 leaves, 13 steps):

$$\frac{7}{2\left(3+x+x^4\right)^3}-\frac{63x}{22\left(3+x+x^4\right)^3}-\frac{12x^2}{\left(3+x+x^4\right)^3}-\frac{5x^3}{\left(3+x+x^4\right)^3}+\frac{3x^4}{2\left(3+x+x^4\right)^3}-\frac{10x^6}{\left(3+x+x^4\right)^3}-\frac{1}{2\left(3+x+x^4\right)^2}+\frac{5x^2}{\left(3+x+x^4\right)^2}+\frac{144}{11}\text{CannotIntegrate}\left[\frac{1}{\left(3+x+x^4\right)^4},x\right]+\frac{828}{11}\text{CannotIntegrate}\left[\frac{x}{\left(3+x+x^4\right)^4},x\right]+18\,\text{CannotIntegrate}\left[\frac{x^2}{\left(3+x+x^4\right)^4},x\right]-4\,\text{CannotIntegrate}\left[\frac{1}{\left(3+x+x^4\right)^3},x\right]-20\,\text{CannotIntegrate}\left[\frac{x}{\left(3+x+x^4\right)^3},x\right]$$

Test results for the 1025 problems in "1.3.2 Algebraic functions.m"

Problem 197: Unable to integrate problem.

$$\int\frac{\left(d^3+e^3x^3\right)^p}{d+e\,x}\,dx$$

Optimal (type 6, 135 leaves, ? steps):

$$\frac{1}{e\,p}\left(d^3+e^3x^3\right)^p\left(1+\frac{2\left(d+e\,x\right)}{\left(-3+i\sqrt{3}\right)d}\right)^{-p}\left(1-\frac{2\left(d+e\,x\right)}{\left(3+i\sqrt{3}\right)d}\right)^{-p}\text{AppellF1}\left[p,-p,-p,1+p,-\frac{2\left(d+e\,x\right)}{\left(-3+i\sqrt{3}\right)d},\frac{2\left(d+e\,x\right)}{\left(3+i\sqrt{3}\right)d}\right]$$

Result (type 8, 23 leaves, 0 steps):

$$\text{CannotIntegrate}\left[\frac{\left(d^3+e^3x^3\right)^p}{d+e\,x},x\right]$$

Problem 396: Result unnecessarily involves higher level functions and more than twice size of optimal antiderivative.

$$\int\left(\frac{\sqrt{a\,x^{2n}}}{\sqrt{1+x^n}}+\frac{2\,x^{-n}\sqrt{a\,x^{2n}}}{\left(2+n\right)\sqrt{1+x^n}}\right)dx$$

Optimal (type 3, 34 leaves, ? steps):

$$\frac{2\,x^{1-n}\sqrt{a\,x^{2n}}\sqrt{1+x^n}}{2+n}$$

Result (type 5, 80 leaves, 5 steps):

$$\frac{x\sqrt{a\,x^{2\,n}}\;\text{Hypergeometric2F1}\left[\frac{1}{2},1+\frac{1}{n},2+\frac{1}{n},-x^n\right]}{1+n}+\frac{2\,x^{1-n}\sqrt{a\,x^{2\,n}}\;\text{Hypergeometric2F1}\left[\frac{1}{2},\frac{1}{n},1+\frac{1}{n},-x^n\right]}{2+n}$$

Problem 616: Unable to integrate problem.

$$\int\frac{1}{x^2}\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n\left(-a\,d+(b\,d\,m+a\,e\,n)\,x+(c\,d+b\,e+a\,f+2\,c\,d\,m+b\,e\,m+b\,e\,n+2\,a\,f\,n)\,x^2+(2\,c\,e+2\,b\,f+2\,a\,g+2\,c\,e\,m+b\,f\,m+c\,e\,n+2\,b\,f\,n+3\,a\,g\,n)\,x^3+(3\,c\,f+3\,b\,g+2\,c\,f\,m+b\,g\,m+2\,c\,f\,n+3\,b\,g\,n)\,x^4+c\,g\,(4+2\,m+3\,n)\,x^5\right)dx$$

Optimal (type 3, 37 leaves, ? steps):

$$\frac{\left(a+b\,x+c\,x^2\right)^{1+m}\left(d+e\,x+f\,x^2+g\,x^3\right)^{1+n}}{x}$$

Result (type 8, 306 leaves, 2 steps):

$$(c\,(d+2\,d\,m)+b\,e\,(1+m+n)+a\,f\,(1+2\,n))\;\text{CannotIntegrate}\left[\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n,x\right]-a\,d\,\text{CannotIntegrate}\left[\frac{\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n}{x^2},x\right]+(b\,d\,m+a\,e\,n)\;\text{CannotIntegrate}\left[\frac{\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n}{x},x\right]+(c\,e\,(2+2\,m+n)+b\,f\,(2+m+2\,n)+a\,g\,(2+3\,n))\;\text{CannotIntegrate}\left[x\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n,x\right]+(c\,f\,(3+2\,m+2\,n)+b\,g\,(3+m+3\,n))\;\text{CannotIntegrate}\left[x^2\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n,x\right]+c\,g\,(4+2\,m+3\,n)\;\text{CannotIntegrate}\left[x^3\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n,x\right]$$

Problem 617: Unable to integrate problem.

$$\int\frac{1}{x^3}\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n\left(-2\,a\,d+(-b\,d-a\,e+b\,d\,m+a\,e\,n)\,x+(2\,c\,d\,m+b\,e\,m+b\,e\,n+2\,a\,f\,n)\,x^2+(c\,e+b\,f+a\,g+2\,c\,e\,m+b\,f\,m+c\,e\,n+2\,b\,f\,n+3\,a\,g\,n)\,x^3+(2\,c\,f+2\,b\,g+2\,c\,f\,m+b\,g\,m+2\,c\,f\,n+3\,b\,g\,n)\,x^4+c\,g\,(3+2\,m+3\,n)\,x^5\right)dx$$

Optimal (type 3, 37 leaves, ? steps):

$$\frac{\left(a+b\,x+c\,x^2\right)^{1+m}\left(d+e\,x+f\,x^2+g\,x^3\right)^{1+n}}{x^2}$$

Result (type 8, 305 leaves, 2 steps):

$$(c\,e\,(1+2m+n)+b\,f\,(1+m+2n)+a\,g\,(1+3n))$$
$$\text{CannotIntegrate}\left[\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n,\,x\right]-$$
$$2\,a\,d\,\text{CannotIntegrate}\left[\frac{\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n}{x^3},\,x\right]-$$
$$(b\,d\,(1-m)+a\,e\,(1-n))\,\text{CannotIntegrate}\left[\frac{\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n}{x^2},\,x\right]+$$
$$(2\,c\,d\,m+2\,a\,f\,n+b\,e\,(m+n))\,\text{CannotIntegrate}\left[\frac{\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n}{x},\,x\right]+$$
$$(2\,c\,f\,(1+m+n)+b\,g\,(2+m+3n))\,\text{CannotIntegrate}\left[x\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n,\,x\right]+$$
$$c\,g\,(3+2m+3n)\,\text{CannotIntegrate}\left[x^2\left(a+b\,x+c\,x^2\right)^m\left(d+e\,x+f\,x^2+g\,x^3\right)^n,\,x\right]$$

Problem 941: Result unnecessarily involves higher level functions.

$$\int\left(\left(1-x^6\right)^{2/3}+\frac{\left(1-x^6\right)^{2/3}}{x^6}\right)dx$$

Optimal (type 2, 35 leaves, ? steps):

$$-\frac{\left(1-x^6\right)^{2/3}}{5\,x^5}+\frac{1}{5}\,x\left(1-x^6\right)^{2/3}$$

Result (type 5, 36 leaves, 3 steps):

$$-\frac{\text{Hypergeometric2F1}\left[-\frac{5}{6},\,-\frac{2}{3},\,\frac{1}{6},\,x^6\right]}{5\,x^5}+x\,\text{Hypergeometric2F1}\left[-\frac{2}{3},\,\frac{1}{6},\,\frac{7}{6},\,x^6\right]$$

Problem 995: Unable to integrate problem.

$$\int\sqrt{1-x^2+x\sqrt{-1+x^2}}\,dx$$

Optimal (type 3, 63 leaves, ? steps):

$$\frac{1}{4}\left(3\,x+\sqrt{-1+x^2}\right)\sqrt{1-x^2+x\sqrt{-1+x^2}}+\frac{3\,\text{ArcSin}\left[x-\sqrt{-1+x^2}\right]}{4\sqrt{2}}$$

Result (type 8, 24 leaves, 0 steps):

$$\text{CannotIntegrate}\left[\sqrt{1-x^2+x\sqrt{-1+x^2}},\,x\right]$$

Problem 996: Unable to integrate problem.

$$\int\frac{\sqrt{-x+\sqrt{x}\,\sqrt{1+x}}}{\sqrt{1+x}}\,dx$$

Optimal (type 3, 66 leaves, ? steps):

$$\frac{1}{2}\left(\sqrt{x}+3\sqrt{1+x}\right)\sqrt{-x+\sqrt{x}\,\sqrt{1+x}}-\frac{3\,\text{ArcSin}\left[\sqrt{x}-\sqrt{1+x}\right]}{2\sqrt{2}}$$

Result (type 8, 31 leaves, 1 step):

$$\text{CannotIntegrate}\left[\frac{\sqrt{-x+\sqrt{x}\,\sqrt{1+x}}}{\sqrt{1+x}},x\right]$$

Problem 997: Result valid but suboptimal antiderivative.

$$\int -\frac{x+2\sqrt{1+x^2}}{x+x^3+\sqrt{1+x^2}}\,dx$$

Optimal (type 3, 78 leaves, ? steps):

$$-\sqrt{2\left(1+\sqrt{5}\right)}\,\text{ArcTan}\left[\sqrt{-2+\sqrt{5}}\,\left(x+\sqrt{1+x^2}\right)\right]+\sqrt{2\left(-1+\sqrt{5}\right)}\,\text{ArcTanh}\left[\sqrt{2+\sqrt{5}}\,\left(x+\sqrt{1+x^2}\right)\right]$$

Result (type 3, 319 leaves, 25 steps):

$$-2\sqrt{\frac{2}{5\left(1+\sqrt{5}\right)}}\,\text{ArcTan}\left[\sqrt{\frac{2}{1+\sqrt{5}}}\,x\right]-\sqrt{\frac{1}{10}\left(1+\sqrt{5}\right)}\,\text{ArcTan}\left[\sqrt{\frac{2}{1+\sqrt{5}}}\,x\right]-\sqrt{\frac{2}{5\left(-1+\sqrt{5}\right)}}\,\text{ArcTan}\left[\sqrt{\frac{2}{-1+\sqrt{5}}}\,\sqrt{1+x^2}\right]-\sqrt{\frac{2}{5}\left(-1+\sqrt{5}\right)}\,\text{ArcTan}\left[\sqrt{\frac{2}{-1+\sqrt{5}}}\,\sqrt{1+x^2}\right]-2\sqrt{\frac{2}{5\left(-1+\sqrt{5}\right)}}\,\text{ArcTanh}\left[\sqrt{\frac{2}{-1+\sqrt{5}}}\,x\right]+\sqrt{\frac{1}{10}\left(-1+\sqrt{5}\right)}\,\text{ArcTanh}\left[\sqrt{\frac{2}{-1+\sqrt{5}}}\,x\right]-\sqrt{\frac{2}{5\left(1+\sqrt{5}\right)}}\,\text{ArcTanh}\left[\sqrt{\frac{2}{1+\sqrt{5}}}\,\sqrt{1+x^2}\right]+\sqrt{\frac{2}{5}\left(1+\sqrt{5}\right)}\,\text{ArcTanh}\left[\sqrt{\frac{2}{1+\sqrt{5}}}\,\sqrt{1+x^2}\right]$$

Problem 1017: Result valid but suboptimal antiderivative.

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

Optimal (type 3, 103 leaves, ? steps):

$$\frac{\sqrt{3}\,\text{ArcTan}\left[\frac{1-\frac{2\cdot 2^{1/3}(1-x)}{(1-x^3)^{1/3}}}{\sqrt{3}}\right]}{2^{2/3}}-\frac{\text{Log}\left[1+2\left(1-x\right)^3-x^3\right]}{2\times 2^{2/3}}+\frac{3\,\text{Log}\left[2^{1/3}\left(1-x\right)+\left(1-x^3\right)^{1/3}\right]}{2\times 2^{2/3}}$$

Result (type 3, 425 leaves, 42 steps):

$$\frac{2^{1/3}\,\text{ArcTan}\left[\frac{1-\frac{2\times 2^{1/3}(1-x)}{(1-x^3)^{1/3}}}{\sqrt{3}}\right]}{\sqrt{3}}+\frac{\text{ArcTan}\left[\frac{1+\frac{2^{1/3}(1-x)}{(1-x^3)^{1/3}}}{\sqrt{3}}\right]}{2^{2/3}\sqrt{3}}-\frac{\text{ArcTan}\left[\frac{1-\frac{2\times 2^{1/3}x}{(1-x^3)^{1/3}}}{\sqrt{3}}\right]}{2^{2/3}\sqrt{3}}+\frac{\text{ArcTan}\left[\frac{1+2^{2/3}(1-x^3)^{1/3}}{\sqrt{3}}\right]}{2^{2/3}\sqrt{3}}+$$

$$\frac{\text{Log}\left[1+x^3\right]}{3\times 2^{2/3}}+\frac{\text{Log}\left[2^{2/3}-\frac{1-x}{(1-x^3)^{1/3}}\right]}{3\times 2^{2/3}}-\frac{\text{Log}\left[1+\frac{2^{2/3}(1-x)^2}{(1-x^3)^{2/3}}-\frac{2^{1/3}(1-x)}{(1-x^3)^{1/3}}\right]}{3\times 2^{2/3}}+\frac{1}{3}\times 2^{1/3}\,\text{Log}\left[1+\frac{2^{1/3}(1-x)}{(1-x^3)^{1/3}}\right]-$$

$$\frac{\text{Log}\left[2\times 2^{1/3}+\frac{(1-x)^2}{(1-x^3)^{2/3}}+\frac{2^{2/3}(1-x)}{(1-x^3)^{1/3}}\right]}{6\times 2^{2/3}}-\frac{\text{Log}\left[2^{1/3}-(1-x^3)^{1/3}\right]}{2\times 2^{2/3}}-\frac{\text{Log}\left[-2^{1/3}x-(1-x^3)^{1/3}\right]}{2\times 2^{2/3}}$$

Problem 1018: Result unnecessarily involves imaginary or complex numbers.

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

Optimal (type 3, 49 leaves, ? steps):

$$-\frac{1}{4}\,\text{ArcTan}\left[\frac{1+x^2}{x\sqrt{-1+x^4}}\right]-\frac{1}{4}\,\text{ArcTanh}\left[\frac{1-x^2}{x\sqrt{-1+x^4}}\right]$$

Result (type 3, 47 leaves, 9 steps):

$$\left(-\frac{1}{8}-\frac{i}{8}\right)\text{ArcTan}\left[\frac{(1+i)\,x}{\sqrt{-1+x^4}}\right]+\left(\frac{1}{8}+\frac{i}{8}\right)\text{ArcTanh}\left[\frac{(1+i)\,x}{\sqrt{-1+x^4}}\right]$$

Problem 1023: Unable to integrate problem.

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

Optimal (type 3, 34 leaves, ? steps):

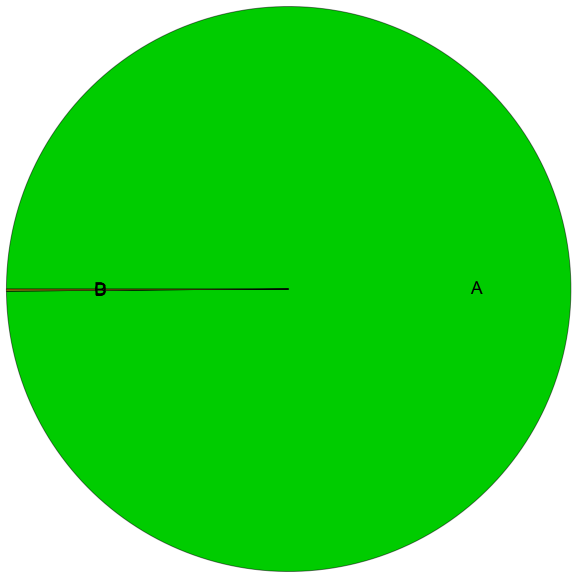
$$-\frac{(1-x)\,(1+x+x^2+x^3)^{-n}\,(1-x^4)^n}{1+n}$$

Result (type 8, 25 leaves, 0 steps):

$$\text{CannotIntegrate}\left[(1+x+x^2+x^3)^{-n}\,(1-x^4)^n,\ x\right]$$

Summary of Integration Test Results

26125 integration problems



A - 26092 optimal antiderivatives

B - 9 valid but suboptimal antiderivatives

C - 13 unnecessarily complex antiderivatives

D - 11 unable to integrate problems

E - 0 integration timeouts

F - 0 invalid antiderivatives