Mathematica 11.3 Integration Test Results

Test results for the 98 problems in "4.2.7 (d trig)^m (a+b (c cos)^n)^p.m"

Problem 6: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Sin}[x]}{a - a\,\text{Cos}[x]^2}\,dx$$

Optimal (type 3, 8 leaves, 2 steps):

$$-\frac{\text{ArcTanh}[\text{Cos}[x]]}{a}$$

Result (type 3, 21 leaves):

$$\frac{-\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]\right] + \text{Log}\left[\text{Sin}\left[\frac{x}{2}\right]\right]}{a}$$

Problem 7: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Csc}[x]}{a - a\,\text{Cos}[x]^2}\,dx$$

Optimal (type 3, 22 leaves, 3 steps):

$$-\frac{\text{ArcTanh}[\text{Cos}[x]]}{2\,a} - \frac{\text{Cot}[x]\,\text{Csc}[x]}{2\,a}$$

Result (type 3, 51 leaves):

$$\frac{-\frac{1}{8}\,\text{Csc}\left[\frac{x}{2}\right]^2 - \frac{1}{2}\,\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]\right] + \frac{1}{2}\,\text{Log}\left[\text{Sin}\left[\frac{x}{2}\right]\right] + \frac{1}{8}\,\text{Sec}\left[\frac{x}{2}\right]^2}{a}$$

Problem 9: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Csc}[x]^3}{a - a\,\text{Cos}[x]^2}\,dx$$

Optimal (type 3, 35 leaves, 4 steps):

$$-\frac{3\,\text{ArcTanh}[\text{Cos}[x]]}{8\,a} - \frac{3\,\text{Cot}[x]\,\text{Csc}[x]}{8\,a} - \frac{\text{Cot}[x]\,\text{Csc}[x]^3}{4\,a}$$

Result (type 3, 75 leaves):

$$\frac{-\frac{3}{32}\,\text{Csc}\left[\frac{x}{2}\right]^2-\frac{1}{64}\,\text{Csc}\left[\frac{x}{2}\right]^4-\frac{3}{8}\,\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]\right]+\frac{3}{8}\,\text{Log}\left[\text{Sin}\left[\frac{x}{2}\right]\right]+\frac{3}{32}\,\text{Sec}\left[\frac{x}{2}\right]^2+\frac{1}{64}\,\text{Sec}\left[\frac{x}{2}\right]^4}{a}$$

Problem 11: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Sin}[x]^5}{a+b\,\text{Cos}[x]^2}\,dx$$

Optimal (type 3, 54 leaves, 4 steps):

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

Result (type 3, 116 leaves):

$$\frac{1}{12\,b^{5/2}}\left(-\frac{12\,(a+b)^2\,\text{ArcTan}\left[\frac{\sqrt{b}-\sqrt{a+b}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a}}\right]}{\sqrt{a}}-\frac{12\,(a+b)^2\,\text{ArcTan}\left[\frac{\sqrt{b}+\sqrt{a+b}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a}}\right]}{\sqrt{a}}+3\,\sqrt{b}\,(4\,a+7\,b)\,\text{Cos}[x]-b^{3/2}\,\text{Cos}[3\,x]\right)$$

Problem 12: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Sin}[x]^3}{a+b\,\text{Cos}[x]^2}\,dx$$

Optimal (type 3, 36 leaves, 3 steps):

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

Result (type 3, 90 leaves):

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

Problem 15: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Csc}[x]^3}{a+b\,\text{Cos}[x]^2}\,dx$$

Optimal (type 3, 62 leaves, 5 steps):

$$-\frac{b^{3/2}\,\text{ArcTan}\left[\frac{\sqrt{b}\,\text{Cos}[x]}{\sqrt{a}}\right]}{\sqrt{a}\,(a+b)^2}-\frac{(a+3\,b)\,\text{ArcTanh}[\text{Cos}[x]]}{2\,(a+b)^2}-\frac{\text{Cot}[x]\,\text{Csc}[x]}{2\,(a+b)}$$

Result (type 3, 140 leaves):

$$\frac{1}{8\,\sqrt{a}\,(a+b)^2}\left(-8\,b^{3/2}\,\text{ArcTan}\left[\frac{\sqrt{b}-\sqrt{a+b}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a}}\right]-8\,b^{3/2}\,\text{ArcTan}\left[\frac{\sqrt{b}+\sqrt{a+b}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a}}\right]+\sqrt{a}\left(-(a+b)\,\text{Csc}\left[\frac{x}{2}\right]^2-4\,(a+3\,b)\left(\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]\right]-\text{Log}\left[\text{Sin}\left[\frac{x}{2}\right]\right]\right)+(a+b)\,\text{Sec}\left[\frac{x}{2}\right]^2\right)\right)$$

Problem 16: Result more than twice size of optimal antiderivative.

$$\int\frac{\text{Csc}[x]^5}{a+b\,\text{Cos}[x]^2}\,dx$$

Optimal (type 3, 94 leaves, 6 steps):

$$-\frac{b^{5/2}\,\text{ArcTan}\left[\frac{\sqrt{b}\,\text{Cos}[x]}{\sqrt{a}}\right]}{\sqrt{a}\,(a+b)^3}-\frac{(3\,a^2+10\,a\,b+15\,b^2)\,\text{ArcTanh}[\text{Cos}[x]]}{8\,(a+b)^3}-\frac{(3\,a+7\,b)\,\text{Cot}[x]\,\text{Csc}[x]}{8\,(a+b)^2}-\frac{\text{Cot}[x]\,\text{Csc}[x]^3}{4\,(a+b)}$$

Result (type 3, 204 leaves):

$$\frac{1}{64\,\sqrt{a}\,(a+b)^3}\left(-64\,b^{5/2}\,\text{ArcTan}\left[\frac{\sqrt{b}-\sqrt{a+b}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a}}\right]-64\,b^{5/2}\,\text{ArcTan}\left[\frac{\sqrt{b}+\sqrt{a+b}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a}}\right]+\sqrt{a}\left(-2\,(3\,a^2+10\,a\,b+7\,b^2)\,\text{Csc}\left[\frac{x}{2}\right]^2-(a+b)^2\,\text{Csc}\left[\frac{x}{2}\right]^4-8\,(3\,a^2+10\,a\,b+15\,b^2)\left(\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]\right]-\text{Log}\left[\text{Sin}\left[\frac{x}{2}\right]\right]\right)+2\,(3\,a^2+10\,a\,b+7\,b^2)\,\text{Sec}\left[\frac{x}{2}\right]^2+(a+b)^2\,\text{Sec}\left[\frac{x}{2}\right]^4\right)\right)$$

Problem 32: Result more than twice size of optimal antiderivative.

$$\int\frac{\text{Sec}[x]}{a+b\,\text{Cos}[x]^2}\,dx$$

Optimal (type 3, 41 leaves, 4 steps):

$$\frac{\text{ArcTanh}[\text{Sin}[x]]}{a}-\frac{\sqrt{b}\,\text{ArcTanh}\left[\frac{\sqrt{b}\,\text{Sin}[x]}{\sqrt{a+b}}\right]}{a\,\sqrt{a+b}}$$

Result (type 3, 93 leaves):

$$\frac{1}{2\,a}\left(-2\,\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]-\text{Sin}\left[\frac{x}{2}\right]\right]+2\,\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]+\text{Sin}\left[\frac{x}{2}\right]\right]+\frac{\sqrt{b}\,\left(\text{Log}\left[\sqrt{a+b}-\sqrt{b}\,\text{Sin}[x]\right]-\text{Log}\left[\sqrt{a+b}+\sqrt{b}\,\text{Sin}[x]\right]\right)}{\sqrt{a+b}}\right)$$

Problem 33: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Sec}[x]^3}{a+b\,\text{Cos}[x]^2}\,dx$$

Optimal (type 3, 59 leaves, 5 steps):

$$\frac{(a-2\,b)\,\text{ArcTanh}[\text{Sin}[x]]}{2\,a^2}+\frac{b^{3/2}\,\text{ArcTanh}\left[\frac{\sqrt{b}\,\text{Sin}[x]}{\sqrt{a+b}}\right]}{a^2\,\sqrt{a+b}}+\frac{\text{Sec}[x]\,\text{Tan}[x]}{2\,a}$$

Result (type 3, 152 leaves):

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

Problem 34: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Sec}[x]^5}{a+b\,\text{Cos}[x]^2}\,dx$$

Optimal (type 3, 90 leaves, 6 steps):

$$\frac{\left(3\,a^2-4\,a\,b+8\,b^2\right)\,\text{ArcTanh}[\text{Sin}[x]]}{8\,a^3}-\frac{b^{5/2}\,\text{ArcTanh}\left[\frac{\sqrt{b}\,\text{Sin}[x]}{\sqrt{a+b}}\right]}{a^3\,\sqrt{a+b}}+\frac{(3\,a-4\,b)\,\text{Sec}[x]\,\text{Tan}[x]}{8\,a^2}+\frac{\text{Sec}[x]^3\,\text{Tan}[x]}{4\,a}$$

Result (type 3, 215 leaves):

$$\frac{1}{16 a^3}\left(-2 \left(3 a^2-4 a b+8 b^2\right) \text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]-\text{Sin}\left[\frac{x}{2}\right]\right]+2 \left(3 a^2-4 a b+8 b^2\right) \text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]+\text{Sin}\left[\frac{x}{2}\right]\right]+\frac{8 b^{5/2} \text{Log}\left[\sqrt{a+b}-\sqrt{b} \text{Sin}[x]\right]}{\sqrt{a+b}}-\frac{8 b^{5/2} \text{Log}\left[\sqrt{a+b}+\sqrt{b} \text{Sin}[x]\right]}{\sqrt{a+b}}+\frac{a^2}{\left(\text{Cos}\left[\frac{x}{2}\right]-\text{Sin}\left[\frac{x}{2}\right]\right)^4}-\frac{a^2}{\left(\text{Cos}\left[\frac{x}{2}\right]+\text{Sin}\left[\frac{x}{2}\right]\right)^4}+\frac{a (-3 a+4 b)}{\left(\text{Cos}\left[\frac{x}{2}\right]+\text{Sin}\left[\frac{x}{2}\right]\right)^2}+\frac{a (-3 a+4 b)}{-1+\text{Sin}[x]}\right)$$

Problem 67: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Cos}[x]}{\sqrt{1+\text{Cos}[x]^2}} \, dx$$

Optimal (type 3, 9 leaves, 2 steps):

$$\text{ArcSin}\left[\frac{\text{Sin}[x]}{\sqrt{2}}\right]$$

Result (type 3, 19 leaves):

$$\text{ArcTan}\left[\frac{\sqrt{2} \text{Sin}[x]}{\sqrt{3+\text{Cos}[2 x]}}\right]$$

Problem 68: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Cos}[5+3 x]}{\sqrt{3+\text{Cos}[5+3 x]^2}} \, dx$$

Optimal (type 3, 15 leaves, 2 steps):

$$\frac{1}{3} \text{ArcSin}\left[\frac{1}{2} \text{Sin}[5+3 x]\right]$$

Result (type 3, 31 leaves):

$$\frac{1}{3} \text{ArcTan}\left[\frac{\sqrt{2} \text{Sin}[5+3 x]}{\sqrt{7+\text{Cos}[2 (5+3 x)]}}\right]$$

Problem 69: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{Cos}[x]}{\sqrt{4-\text{Cos}[x]^2}} \, dx$$

Optimal (type 3, 9 leaves, 2 steps):

$$\text{ArcSinh}\left[\frac{\text{Sin}[x]}{\sqrt{3}}\right]$$

Result (type 3, 21 leaves):

$$\text{ArcTanh}\left[\frac{\sqrt{2}\ \text{Sin}[x]}{\sqrt{7-\text{Cos}[2\,x]}}\right]$$

Problem 70: Result unnecessarily involves imaginary or complex numbers.

$$\int \frac{1}{a+b\,\text{Cos}[x]^4}\,dx$$

Optimal (type 3, 487 leaves, 10 steps):

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

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

$$\left(\left(\sqrt{a}-\sqrt{a+b}\right)\text{Log}\left[\sqrt{a}\ (a+b)^{1/4}-\sqrt{2}\ a^{1/4}\sqrt{a+b-\sqrt{a}\ \sqrt{a+b}}\ \text{Cot}[x]+(a+b)^{3/4}\,\text{Cot}[x]^2\right]\right)\Big/$$

$$\left(4\sqrt{2}\ a^{3/4}\ (a+b)^{1/4}\sqrt{a+b-\sqrt{a}\ \sqrt{a+b}}\right)+$$

$$\left(\left(\sqrt{a}-\sqrt{a+b}\right)\text{Log}\left[\sqrt{a}\ (a+b)^{1/4}+\sqrt{2}\ a^{1/4}\sqrt{a+b-\sqrt{a}\ \sqrt{a+b}}\ \text{Cot}[x]+(a+b)^{3/4}\,\text{Cot}[x]^2\right]\right)\Big/$$

$$\left(4\sqrt{2}\ a^{3/4}\ (a+b)^{1/4}\sqrt{a+b-\sqrt{a}\ \sqrt{a+b}}\right)$$

Result (type 3, 121 leaves):

$$\frac{\text{ArcTan}\left[\frac{\sqrt{a}\ \text{Tan}[x]}{\sqrt{a+i\sqrt{a}\ \sqrt{b}}}\right]}{2\sqrt{a}\ \sqrt{a+i\sqrt{a}\ \sqrt{b}}}-\frac{\text{ArcTanh}\left[\frac{\sqrt{a}\ \text{Tan}[x]}{\sqrt{-a+i\sqrt{a}\ \sqrt{b}}}\right]}{2\sqrt{a}\ \sqrt{-a+i\sqrt{a}\ \sqrt{b}}}$$

Problem 72: Result unnecessarily involves imaginary or complex numbers.

$$\int \frac{1}{1+\text{Cos}[x]^4}\,dx$$

Optimal (type 3, 292 leaves, 10 steps):

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

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

$$\frac{1}{8}\sqrt{-1+\sqrt{2}}\,\text{Log}\left[\sqrt{2}-2\sqrt{-1+\sqrt{2}}\,\text{Cot}[x]+2\,\text{Cot}[x]^2\right]-$$

$$\frac{1}{8}\sqrt{-1+\sqrt{2}}\,\text{Log}\left[1+\sqrt{2\left(-1+\sqrt{2}\right)}\,\text{Cot}[x]+\sqrt{2}\,\text{Cot}[x]^2\right]$$

Result (type 3, 45 leaves):

$$\frac{\text{ArcTan}\left[\frac{\text{Tan}[x]}{\sqrt{1-i}}\right]}{2\sqrt{1-i}}+\frac{\text{ArcTan}\left[\frac{\text{Tan}[x]}{\sqrt{1+i}}\right]}{2\sqrt{1+i}}$$

Problem 74: Result is not expressed in closed-form.

$$\int\frac{1}{a+b\,\text{Cos}[x]^5}\,dx$$

Optimal (type 3, 494 leaves, 12 steps):

$$\frac{2\,\text{ArcTan}\left[\frac{\sqrt{a^{1/5}-b^{1/5}}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a^{1/5}+b^{1/5}}}\right]}{5\,a^{4/5}\sqrt{a^{1/5}-b^{1/5}}\,\sqrt{a^{1/5}+b^{1/5}}}+\frac{2\,\text{ArcTan}\left[\frac{\sqrt{a^{1/5}+(-1)^{1/5}b^{1/5}}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a^{1/5}-(-1)^{1/5}b^{1/5}}}\right]}{5\,a^{4/5}\sqrt{a^{1/5}-(-1)^{1/5}b^{1/5}}\,\sqrt{a^{1/5}+(-1)^{1/5}b^{1/5}}}+$$

$$\frac{2\,\text{ArcTan}\left[\frac{\sqrt{a^{1/5}-(-1)^{2/5}b^{1/5}}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a^{1/5}+(-1)^{2/5}b^{1/5}}}\right]}{5\,a^{4/5}\sqrt{a^{1/5}-(-1)^{2/5}b^{1/5}}\,\sqrt{a^{1/5}+(-1)^{2/5}b^{1/5}}}+$$

$$\frac{2\,\text{ArcTan}\left[\frac{\sqrt{a^{1/5}+(-1)^{3/5}b^{1/5}}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a^{1/5}-(-1)^{3/5}b^{1/5}}}\right]}{5\,a^{4/5}\sqrt{a^{1/5}-(-1)^{3/5}b^{1/5}}\,\sqrt{a^{1/5}+(-1)^{3/5}b^{1/5}}}+\frac{2\,\text{ArcTan}\left[\frac{\sqrt{a^{1/5}-(-1)^{4/5}b^{1/5}}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a^{1/5}+(-1)^{4/5}b^{1/5}}}\right]}{5\,a^{4/5}\sqrt{a^{1/5}-(-1)^{4/5}b^{1/5}}\,\sqrt{a^{1/5}+(-1)^{4/5}b^{1/5}}}$$

Result (type 7, 130 leaves):

$$\frac{8}{5}\,\text{RootSum}\Big[b+5\,b\,\#1^2+10\,b\,\#1^4+32\,a\,\#1^5+10\,b\,\#1^6+5\,b\,\#1^8+b\,\#1^{10}\,\&,$$

$$\frac{2\,\text{ArcTan}\left[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\right]\#1^3-i\,\text{Log}\left[1-2\,\text{Cos}[x]\,\#1+\#1^2\right]\#1^3}{b+4\,b\,\#1^2+16\,a\,\#1^3+6\,b\,\#1^4+4\,b\,\#1^6+b\,\#1^8}\,\&\Big]$$

Problem 75: Result is not expressed in closed-form.

$$\int \frac{1}{a + b \operatorname{Cos}[x]^6} \, dx$$

Optimal (type 3, 171 leaves, 7 steps):

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

Result (type 7, 146 leaves):

$$\frac{8}{3}\operatorname{RootSum}\Big[b+6 b \#1+15 b \#1^2+64 a \#1^3+20 b \#1^3+15 b \#1^4+6 b \#1^5+b \#1^6\,\&,\; \frac{2\operatorname{ArcTan}\left[\frac{\operatorname{Sin}[2x]}{\operatorname{Cos}[2x]-\#1}\right]\#1^2-i\operatorname{Log}\left[1-2\operatorname{Cos}[2x]\#1+\#1^2\right]\#1^2}{b+5 b \#1+32 a \#1^2+10 b \#1^2+10 b \#1^3+5 b \#1^4+b \#1^5}\,\&\Big]$$

Problem 76: Result is not expressed in closed-form.

$$\int \frac{1}{a + b \operatorname{Cos}[x]^8} \, dx$$

Optimal (type 3, 245 leaves, 9 steps):

$$\frac{\operatorname{ArcTan}\left[\frac{\sqrt{(-a)^{1/4}-b^{1/4}}\operatorname{Cot}[x]}{(-a)^{1/8}}\right]}{4(-a)^{7/8}\sqrt{(-a)^{1/4}-b^{1/4}}}+\frac{\operatorname{ArcTan}\left[\frac{\sqrt{(-a)^{1/4}-i b^{1/4}}\operatorname{Cot}[x]}{(-a)^{1/8}}\right]}{4(-a)^{7/8}\sqrt{(-a)^{1/4}-i b^{1/4}}}+\frac{\operatorname{ArcTan}\left[\frac{\sqrt{(-a)^{1/4}+i b^{1/4}}\operatorname{Cot}[x]}{(-a)^{1/8}}\right]}{4(-a)^{7/8}\sqrt{(-a)^{1/4}+i b^{1/4}}}+\frac{\operatorname{ArcTan}\left[\frac{\sqrt{(-a)^{1/4}+b^{1/4}}\operatorname{Cot}[x]}{(-a)^{1/8}}\right]}{4(-a)^{7/8}\sqrt{(-a)^{1/4}+b^{1/4}}}$$

Result (type 7, 172 leaves):

$$8\operatorname{RootSum}\Big[b+8 b \#1+28 b \#1^2+56 b \#1^3+256 a \#1^4+70 b \#1^4+56 b \#1^5+28 b \#1^6+8 b \#1^7+b \#1^8\,\&,\; \left(2\operatorname{ArcTan}\left[\frac{\operatorname{Sin}[2x]}{\operatorname{Cos}[2x]-\#1}\right]\#1^3-i\operatorname{Log}\left[1-2\operatorname{Cos}[2x]\#1+\#1^2\right]\#1^3\right)\Big/\left(b+7 b \#1+21 b \#1^2+128 a \#1^3+35 b \#1^3+35 b \#1^4+21 b \#1^5+7 b \#1^6+b \#1^7\right)\,\&\Big]$$

Problem 77: Result is not expressed in closed-form.

$$\int \frac{1}{a - b \operatorname{Cos}[x]^5} \, dx$$

Optimal (type 3, 494 leaves, 12 steps):

$$\frac{2\,\text{ArcTan}\left[\frac{\sqrt{a^{1/5}+b^{1/5}}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a^{1/5}-b^{1/5}}}\right]}{5\,a^{4/5}\,\sqrt{a^{1/5}-b^{1/5}}\,\sqrt{a^{1/5}+b^{1/5}}}+\frac{2\,\text{ArcTan}\left[\frac{\sqrt{a^{1/5}-(-1)^{1/5}b^{1/5}}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a^{1/5}+(-1)^{1/5}b^{1/5}}}\right]}{5\,a^{4/5}\,\sqrt{a^{1/5}-(-1)^{1/5}b^{1/5}}\,\sqrt{a^{1/5}+(-1)^{1/5}b^{1/5}}}+$$

$$\frac{2\,\text{ArcTan}\left[\frac{\sqrt{a^{1/5}+(-1)^{2/5}b^{1/5}}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a^{1/5}-(-1)^{2/5}b^{1/5}}}\right]}{5\,a^{4/5}\,\sqrt{a^{1/5}-(-1)^{2/5}b^{1/5}}\,\sqrt{a^{1/5}+(-1)^{2/5}b^{1/5}}}+$$

$$\frac{2\,\text{ArcTan}\left[\frac{\sqrt{a^{1/5}-(-1)^{3/5}b^{1/5}}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a^{1/5}+(-1)^{3/5}b^{1/5}}}\right]}{5\,a^{4/5}\,\sqrt{a^{1/5}-(-1)^{3/5}b^{1/5}}\,\sqrt{a^{1/5}+(-1)^{3/5}b^{1/5}}}+\frac{2\,\text{ArcTan}\left[\frac{\sqrt{a^{1/5}+(-1)^{4/5}b^{1/5}}\,\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{a^{1/5}-(-1)^{4/5}b^{1/5}}}\right]}{5\,a^{4/5}\,\sqrt{a^{1/5}-(-1)^{4/5}b^{1/5}}\,\sqrt{a^{1/5}+(-1)^{4/5}b^{1/5}}}$$

Result (type 7, 130 leaves):

$$-\frac{8}{5}\,\text{RootSum}\Big[b+5\,b\,\#1^2+10\,b\,\#1^4-32\,a\,\#1^5+10\,b\,\#1^6+5\,b\,\#1^8+b\,\#1^{10}\,\&,$$
$$\frac{2\,\text{ArcTan}\left[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\right]\#1^3-i\,\text{Log}\left[1-2\,\text{Cos}[x]\,\#1+\#1^2\right]\#1^3}{b+4\,b\,\#1^2-16\,a\,\#1^3+6\,b\,\#1^4+4\,b\,\#1^6+b\,\#1^8}\,\&\Big]$$

Problem 78: Result is not expressed in closed-form.

$$\int \frac{1}{a-b\,\text{Cos}[x]^6}\,dx$$

Optimal (type 3, 175 leaves, 7 steps):

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

Result (type 7, 146 leaves):

$$-\frac{8}{3}\,\text{RootSum}\Big[b+6\,b\,\#1+15\,b\,\#1^2-64\,a\,\#1^3+20\,b\,\#1^3+15\,b\,\#1^4+6\,b\,\#1^5+b\,\#1^6\,\&,$$
$$\frac{2\,\text{ArcTan}\left[\frac{\text{Sin}[2\,x]}{\text{Cos}[2\,x]-\#1}\right]\#1^2-i\,\text{Log}\left[1-2\,\text{Cos}[2\,x]\,\#1+\#1^2\right]\#1^2}{b+5\,b\,\#1-32\,a\,\#1^2+10\,b\,\#1^2+10\,b\,\#1^3+5\,b\,\#1^4+b\,\#1^5}\,\&\Big]$$

Problem 79: Result is not expressed in closed-form.

$$\int \frac{1}{a-b\,\text{Cos}[x]^8}\,dx$$

Optimal (type 3, 213 leaves, 9 steps):

$$-\frac{\text{ArcTan}\left[\frac{\sqrt{a^{1/4}-b^{1/4}}\,\text{Cot}[x]}{a^{1/8}}\right]}{4\,a^{7/8}\sqrt{a^{1/4}-b^{1/4}}}-\frac{\text{ArcTan}\left[\frac{\sqrt{a^{1/4}-i\,b^{1/4}}\,\text{Cot}[x]}{a^{1/8}}\right]}{4\,a^{7/8}\sqrt{a^{1/4}-i\,b^{1/4}}}-\frac{\text{ArcTan}\left[\frac{\sqrt{a^{1/4}+i\,b^{1/4}}\,\text{Cot}[x]}{a^{1/8}}\right]}{4\,a^{7/8}\sqrt{a^{1/4}+i\,b^{1/4}}}-\frac{\text{ArcTan}\left[\frac{\sqrt{a^{1/4}+b^{1/4}}\,\text{Cot}[x]}{a^{1/8}}\right]}{4\,a^{7/8}\sqrt{a^{1/4}+b^{1/4}}}$$

Result (type 7, 172 leaves):

$$-8\,\text{RootSum}\Big[b+8\,b\,\#1+28\,b\,\#1^2+56\,b\,\#1^3-256\,a\,\#1^4+70\,b\,\#1^4+56\,b\,\#1^5+28\,b\,\#1^6+8\,b\,\#1^7+b\,\#1^8\,\&,\ \left(2\,\text{ArcTan}\left[\frac{\text{Sin}[2\,x]}{\text{Cos}[2\,x]-\#1}\right]\#1^3-i\,\text{Log}\left[1-2\,\text{Cos}[2\,x]\,\#1+\#1^2\right]\#1^3\right)\Big/\left(b+7\,b\,\#1+21\,b\,\#1^2-128\,a\,\#1^3+35\,b\,\#1^3+35\,b\,\#1^4+21\,b\,\#1^5+7\,b\,\#1^6+b\,\#1^7\right)\,\&\Big]$$

Problem 80: Result is not expressed in closed-form.

$$\int \frac{1}{1+\text{Cos}[x]^5}\,dx$$

Optimal (type 3, 223 leaves, 11 steps):

$$\frac{2\,\text{ArcTan}\left[\sqrt{\frac{1-(-1)^{2/5}}{1+(-1)^{2/5}}}\,\text{Tan}\left[\frac{x}{2}\right]\right]}{5\sqrt{1-(-1)^{4/5}}}+\frac{2\,\text{ArcTan}\left[\sqrt{\frac{1-(-1)^{4/5}}{1+(-1)^{4/5}}}\,\text{Tan}\left[\frac{x}{2}\right]\right]}{5\sqrt{1+(-1)^{3/5}}}-\frac{2\,\text{ArcTanh}\left[\frac{\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{-\frac{1-(-1)^{1/5}}{1+(-1)^{1/5}}}}\right]}{5\sqrt{-1+(-1)^{2/5}}}-\frac{2\sqrt{-\frac{1+(-1)^{3/5}}{1-(-1)^{3/5}}}\,\text{ArcTanh}\left[\sqrt{-\frac{1+(-1)^{3/5}}{1-(-1)^{3/5}}}\,\text{Tan}\left[\frac{x}{2}\right]\right]}{5\left(1+(-1)^{3/5}\right)}+\frac{\text{Sin}[x]}{5\,(1+\text{Cos}[x])}$$

Result (type 7, 378 leaves):

$$-\frac{1}{10}\text{RootSum}\Big[1-2\,\#1+8\,\#1^2-14\,\#1^3+30\,\#1^4-14\,\#1^5+8\,\#1^6-2\,\#1^7+\#1^8\,\&,\ \frac{1}{-1+8\,\#1-21\,\#1^2+60\,\#1^3-35\,\#1^4+24\,\#1^5-7\,\#1^6+4\,\#1^7}\Big(2\,\text{ArcTan}\Big[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\Big]-i\,\text{Log}\big[1-2\,\text{Cos}[x]\,\#1+\#1^2\big]-8\,\text{ArcTan}\Big[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\Big]\#1+4\,i\,\text{Log}\big[1-2\,\text{Cos}[x]\,\#1+\#1^2\big]\#1+30\,\text{ArcTan}\Big[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\Big]\#1^2-15\,i\,\text{Log}\big[1-2\,\text{Cos}[x]\,\#1+\#1^2\big]\#1^2-80\,\text{ArcTan}\Big[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\Big]\#1^3+40\,i\,\text{Log}\big[1-2\,\text{Cos}[x]\,\#1+\#1^2\big]\#1^3+30\,\text{ArcTan}\Big[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\Big]\#1^4-15\,i\,\text{Log}\big[1-2\,\text{Cos}[x]\,\#1+\#1^2\big]\#1^4-8\,\text{ArcTan}\Big[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\Big]\#1^5+4\,i\,\text{Log}\big[1-2\,\text{Cos}[x]\,\#1+\#1^2\big]\#1^5+2\,\text{ArcTan}\Big[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\Big]\#1^6-i\,\text{Log}\big[1-2\,\text{Cos}[x]\,\#1+\#1^2\big]\#1^6\Big)\,\&\Big]+\frac{1}{5}\text{Tan}\Big[\frac{x}{2}\Big]$$

Problem 82: Result is not expressed in closed-form.

$$\int \frac{1}{1+\text{Cos}[x]^8}\,dx$$

Optimal (type 3, 129 leaves, 9 steps):

$$-\frac{\text{ArcTan}\Big[\sqrt{1-(-1)^{1/4}}\,\text{Cot}[x]\Big]}{4\sqrt{1-(-1)^{1/4}}}-\frac{\text{ArcTan}\Big[\sqrt{1+(-1)^{1/4}}\,\text{Cot}[x]\Big]}{4\sqrt{1+(-1)^{1/4}}}-\frac{\text{ArcTan}\Big[\sqrt{1-(-1)^{3/4}}\,\text{Cot}[x]\Big]}{4\sqrt{1-(-1)^{3/4}}}-\frac{\text{ArcTan}\Big[\sqrt{1+(-1)^{3/4}}\,\text{Cot}[x]\Big]}{4\sqrt{1+(-1)^{3/4}}}$$

Result (type 7, 141 leaves):

$$8\,\text{RootSum}\Big[1+8\,\#1+28\,\#1^2+56\,\#1^3+326\,\#1^4+56\,\#1^5+28\,\#1^6+8\,\#1^7+\#1^8\,\&,\ \frac{2\,\text{ArcTan}\Big[\frac{\text{Sin}[2\,x]}{\text{Cos}[2\,x]-\#1}\Big]\#1^3-i\,\text{Log}\big[1-2\,\text{Cos}[2\,x]\,\#1+\#1^2\big]\#1^3}{1+7\,\#1+21\,\#1^2+163\,\#1^3+35\,\#1^4+21\,\#1^5+7\,\#1^6+\#1^7}\,\&\Big]$$

Problem 83: Result is not expressed in closed-form.

$$\int \frac{1}{1-\text{Cos}[x]^5}\,dx$$

Optimal (type 3, 205 leaves, 11 steps):

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

$$\frac{2\,\text{ArcTanh}\left[\frac{\text{Tan}\left[\frac{x}{2}\right]}{\sqrt{-\frac{1-(-1)^{2/5}}{1+(-1)^{2/5}}}}\right]}{5\sqrt{-1+(-1)^{4/5}}}+\frac{2\,\text{ArcTanh}\left[\sqrt{-\frac{1+(-1)^{4/5}}{1-(-1)^{4/5}}}\,\text{Tan}\left[\frac{x}{2}\right]\right]}{5\sqrt{-1-(-1)^{3/5}}}-\frac{\text{Sin}[x]}{5\,(1-\text{Cos}[x])}$$

Result (type 7, 378 leaves):

$$-\frac{1}{5}\text{Cot}\left[\frac{x}{2}\right]+\frac{1}{10}\text{RootSum}\Big[1+2\,\#1+8\,\#1^2+14\,\#1^3+30\,\#1^4+14\,\#1^5+8\,\#1^6+2\,\#1^7+\#1^8\,\&,$$
$$\frac{1}{1+8\,\#1+21\,\#1^2+60\,\#1^3+35\,\#1^4+24\,\#1^5+7\,\#1^6+4\,\#1^7}\left(2\,\text{ArcTan}\left[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\right]-\right.$$
$$i\,\text{Log}\left[1-2\,\text{Cos}[x]\,\#1+\#1^2\right]+8\,\text{ArcTan}\left[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\right]\#1-4\,i\,\text{Log}\left[1-2\,\text{Cos}[x]\,\#1+\#1^2\right]\#1+$$
$$30\,\text{ArcTan}\left[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\right]\#1^2-15\,i\,\text{Log}\left[1-2\,\text{Cos}[x]\,\#1+\#1^2\right]\#1^2+$$
$$80\,\text{ArcTan}\left[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\right]\#1^3-40\,i\,\text{Log}\left[1-2\,\text{Cos}[x]\,\#1+\#1^2\right]\#1^3+$$
$$30\,\text{ArcTan}\left[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\right]\#1^4-15\,i\,\text{Log}\left[1-2\,\text{Cos}[x]\,\#1+\#1^2\right]\#1^4+$$
$$8\,\text{ArcTan}\left[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\right]\#1^5-4\,i\,\text{Log}\left[1-2\,\text{Cos}[x]\,\#1+\#1^2\right]\#1^5+$$
$$\left.2\,\text{ArcTan}\left[\frac{\text{Sin}[x]}{\text{Cos}[x]-\#1}\right]\#1^6-i\,\text{Log}\left[1-2\,\text{Cos}[x]\,\#1+\#1^2\right]\#1^6\right)\&\Big]$$

Problem 88: Result more than twice size of optimal antiderivative.

$$\int\sqrt{1-\text{Cos}[x]^2}\,\text{Tan}[x]\,dx$$

Optimal (type 3, 20 leaves, 5 steps):

$$\text{ArcTanh}\left[\sqrt{\text{Sin}[x]^2}\right]-\sqrt{\text{Sin}[x]^2}$$

Result (type 3, 47 leaves):

$$-\text{Csc}[x]\sqrt{\text{Sin}[x]^2}\left(\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]-\text{Sin}\left[\frac{x}{2}\right]\right]-\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]+\text{Sin}\left[\frac{x}{2}\right]\right]+\text{Sin}[x]\right)$$

Problem 91: Result more than twice size of optimal antiderivative.

$$\int\frac{\text{Tan}[x]}{\sqrt{1-\text{Cos}[x]^2}}\,dx$$

Optimal (type 3, 9 leaves, 4 steps):

$$\text{ArcTanh}\left[\sqrt{\text{Sin}[x]^2}\right]$$

Result (type 3, 44 leaves):

$$\frac{\left(-\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]-\text{Sin}\left[\frac{x}{2}\right]\right]+\text{Log}\left[\text{Cos}\left[\frac{x}{2}\right]+\text{Sin}\left[\frac{x}{2}\right]\right]\right)\text{Sin}[x]}{\sqrt{\text{Sin}[x]^2}}$$

Problem 92: Result is not expressed in closed-form.

$$\int \frac{\text{Tan}[x]^3}{a+b\,\text{Cos}[x]^3}\,dx$$

Optimal (type 3, 153 leaves, 11 steps):

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

Result (type 7, 217 leaves):

$$\frac{1}{6\,a}\left(6\left(\text{Log}[\text{Cos}[x]]+\text{Log}\left[\text{Sec}\left[\frac{x}{2}\right]^2\right]\right)-2\,\text{RootSum}\left[a+b+3\,a\,\#1-3\,b\,\#1+3\,a\,\#1^2+3\,b\,\#1^2+a\,\#1^3-b\,\#1^3\,\&,\right.\right.$$
$$\left(a\,\text{Log}\left[-\#1+\text{Tan}\left[\frac{x}{2}\right]^2\right]+b\,\text{Log}\left[-\#1+\text{Tan}\left[\frac{x}{2}\right]^2\right]+2\,a\,\text{Log}\left[-\#1+\text{Tan}\left[\frac{x}{2}\right]^2\right]\#1+\right.$$
$$\left.4\,b\,\text{Log}\left[-\#1+\text{Tan}\left[\frac{x}{2}\right]^2\right]\#1+a\,\text{Log}\left[-\#1+\text{Tan}\left[\frac{x}{2}\right]^2\right]\#1^2-b\,\text{Log}\left[-\#1+\text{Tan}\left[\frac{x}{2}\right]^2\right]\#1^2\right)\Big/$$
$$\left.\left.\left(a-b+2\,a\,\#1+2\,b\,\#1+a\,\#1^2-b\,\#1^2\right)\,\&\right]+3\,\text{Sec}[x]^2\right)$$

Problem 93: Result more than twice size of optimal antiderivative.

$$\int \sqrt{a+b\,\text{Cos}[x]^3}\,\text{Tan}[x]\,dx$$

Optimal (type 3, 45 leaves, 5 steps):

$$\frac{2}{3}\sqrt{a}\,\text{ArcTanh}\left[\frac{\sqrt{a+b\,\text{Cos}[x]^3}}{\sqrt{a}}\right]-\frac{2}{3}\sqrt{a+b\,\text{Cos}[x]^3}$$

Result (type 3, 668 leaves):

$$-\Bigg(\Bigg(\sqrt{4\,a+3\,b\,\mathrm{Cos}[x]+b\,\mathrm{Cos}[3\,x]}$$

$$\left(b+a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}-\sqrt{a}\,\sqrt{b}\,\mathrm{ArcSinh}\Big[\frac{\sqrt{a}\,\left(\mathrm{Sec}[x]^2\right)^{3/4}}{\sqrt{b}}\Big]\,\left(\mathrm{Sec}[x]^2\right)^{3/4}\sqrt{1+\frac{a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}}{b}}\right)$$

$$\mathrm{Tan}[x]\,\sqrt{\mathrm{Cos}[x]^4\,\left(a+b\,\sqrt{\mathrm{Sec}[x]^2}+2\,a\,\mathrm{Tan}[x]^2+a\,\mathrm{Tan}[x]^4\right)}\Bigg)\Big/$$

$$\Bigg(3\,\left(b+a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}\right)\,\Bigg(\Bigg(2\,a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}\,\Bigg(b+a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}-$$

$$\sqrt{a}\,\sqrt{b}\,\mathrm{ArcSinh}\Big[\frac{\sqrt{a}\,\left(\mathrm{Sec}[x]^2\right)^{3/4}}{\sqrt{b}}\Big]\,\left(\mathrm{Sec}[x]^2\right)^{3/4}\sqrt{1+\frac{a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}}{b}}\Bigg)\,\mathrm{Tan}[x]$$

$$\sqrt{\mathrm{Cos}[x]^4\,\left(a+b\,\sqrt{\mathrm{Sec}[x]^2}+2\,a\,\mathrm{Tan}[x]^2+a\,\mathrm{Tan}[x]^4\right)}\Bigg)\Big/\left(b+a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}\right)^2-$$

$$\Bigg(2\,\Bigg(\frac{3}{2}\,a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}\,\mathrm{Tan}[x]-\frac{3\,a^{3/2}\,\mathrm{ArcSinh}\Big[\frac{\sqrt{a}\,\left(\mathrm{Sec}[x]^2\right)^{3/4}}{\sqrt{b}}\Big]\,\left(\mathrm{Sec}[x]^2\right)^{9/4}\,\mathrm{Tan}[x]}{2\,\sqrt{b}\,\sqrt{1+\frac{a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}}{b}}}-$$

$$\frac{3}{2}\,\sqrt{a}\,\sqrt{b}\,\mathrm{ArcSinh}\Big[\frac{\sqrt{a}\,\left(\mathrm{Sec}[x]^2\right)^{3/4}}{\sqrt{b}}\Big]\,\left(\mathrm{Sec}[x]^2\right)^{3/4}\sqrt{1+\frac{a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}}{b}}\,\mathrm{Tan}[x]\Bigg)$$

$$\sqrt{\mathrm{Cos}[x]^4\,\left(a+b\,\sqrt{\mathrm{Sec}[x]^2}+2\,a\,\mathrm{Tan}[x]^2+a\,\mathrm{Tan}[x]^4\right)}\Bigg)\Big/\left(3\,\left(b+a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}\right)\right)-$$

$$\Bigg(\Bigg(b+a\,\left(\mathrm{Sec}[x]^2\right)^{3/2}-\sqrt{a}\,\sqrt{b}\,\mathrm{ArcSinh}\Big[\frac{\sqrt{a}\,\left(\mathrm{Sec}[x]^2\right)^{3/4}}{\sqrt{b}}\Big]$$

$$\left(\text{Sec}[x]^2\right)^{3/4}\sqrt{1+\frac{a\left(\text{Sec}[x]^2\right)^{3/2}}{b}}$$

$$\left(\text{Cos}[x]^4\left(4\,a\,\text{Sec}[x]^2\,\text{Tan}[x]+b\sqrt{\text{Sec}[x]^2}\,\text{Tan}[x]+4\,a\,\text{Sec}[x]^2\,\text{Tan}[x]^3\right)-\right.$$

$$\left.\left.4\,\text{Cos}[x]^3\,\text{Sin}[x]\left(a+b\sqrt{\text{Sec}[x]^2}+2\,a\,\text{Tan}[x]^2+a\,\text{Tan}[x]^4\right)\right)\right)\Big/$$

$$\left.\left.\left.\left(3\left(b+a\left(\text{Sec}[x]^2\right)^{3/2}\right)\sqrt{\text{Cos}[x]^4\left(a+b\sqrt{\text{Sec}[x]^2}+2\,a\,\text{Tan}[x]^2+a\,\text{Tan}[x]^4\right)}\right)\right)\right)\right)$$

Problem 94: Result more than twice size of optimal antiderivative.

$$\int\frac{\text{Tan}[x]}{\sqrt{a+b\,\text{Cos}[x]^3}}\,dx$$

Optimal (type 3, 28 leaves, 4 steps):

$$\frac{2\,\text{ArcTanh}\left[\frac{\sqrt{a+b\,\text{Cos}[x]^3}}{\sqrt{a}}\right]}{3\sqrt{a}}$$

Result (type 3, 207 leaves):

$$\left(128\sqrt{b}\,\text{ArcSinh}\left[\frac{\sqrt{a}\left(\text{Sec}[x]^2\right)^{3/4}}{\sqrt{b}}\right]\text{Cos}[x]^4\left(\text{Sec}[x]^2\right)^{3/4}\left(b\,\text{Cos}[x]^2+a\sqrt{\text{Sec}[x]^2}\right)\right.$$

$$\left.\sqrt{1+\frac{a\left(\text{Sec}[x]^2\right)^{3/2}}{b}}\left(a+2\,a\,\text{Cot}[x]^2+\text{Cot}[x]^4\left(a+b\sqrt{\text{Sec}[x]^2}\right)\right)\text{Sin}[x]^4\right)\Big/$$

$$\left(3\sqrt{a}\sqrt{4\,a+3\,b\,\text{Cos}[x]+b\,\text{Cos}[3\,x]}\left(32\,a^2+10\,b^2+b^2\,\text{Cos}[6\,x]+24\,a\,b\sqrt{\text{Sec}[x]^2}+\right.\right.$$

$$\left.\left.2\,b\,\text{Cos}[4\,x]\left(3\,b+4\,a\sqrt{\text{Sec}[x]^2}\right)+b\,\text{Cos}[2\,x]\left(15\,b+32\,a\sqrt{\text{Sec}[x]^2}\right)\right)\right)$$

Problem 95: Result unnecessarily involves higher level functions and more than twice size of optimal antiderivative.

$$\int\sqrt{a+b\,\text{Cos}[x]^4}\,\text{Tan}[x]\,dx$$

Optimal (type 3, 45 leaves, 5 steps):

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

Result (type 4, 47 997 leaves) : Display of huge result suppressed!

Problem 96: Result unnecessarily involves higher level functions and more than twice size of optimal antiderivative.

$$\int \frac{\text{Tan}[x]}{\sqrt{a+b\,\text{Cos}[x]^4}}\,dx$$

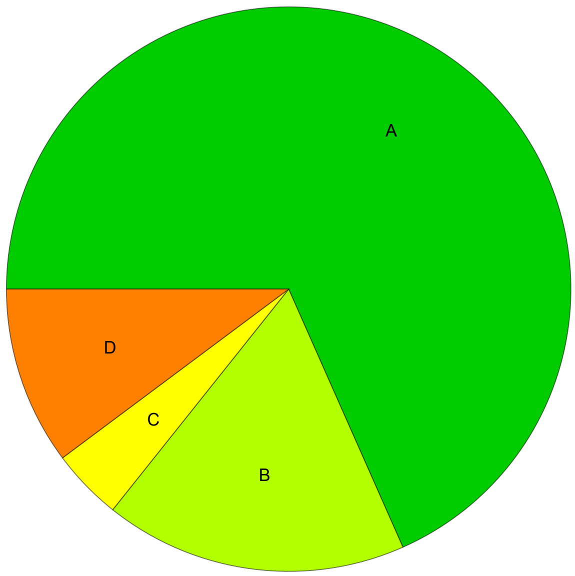
Optimal (type 3, 28 leaves, 4 steps) :

$$\frac{\text{ArcTanh}\left[\frac{\sqrt{a+b\,\text{Cos}[x]^4}}{\sqrt{a}}\right]}{2\sqrt{a}}$$

Result (type 4, 48 584 leaves) : Display of huge result suppressed!

Summary of Integration Test Results

98 integration problems



A - 67 optimal antiderivatives

B - 17 more than twice size of optimal antiderivatives

C - 4 unnecessarily complex antiderivatives

D - 10 unable to integrate problems

E - 0 integration timeouts