Mathematica 11.3 Integration Test Results

Test results for the 21 problems in "4.2.8 (a+b cos)^m (c+d trig)^n.m"

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

$$\int \frac{(c + d\,\mathrm{Sec}[e + f x])^4}{a + b\,\mathrm{Cos}[e + f x]}\,dx$$

Optimal (type 3, 247 leaves, 12 steps):

$$\frac{2 (a c - b d)^4 \,\mathrm{ArcTan}\left[\frac{\sqrt{a-b}\,\mathrm{Tan}\left[\frac{1}{2}(e+f x)\right]}{\sqrt{a+b}}\right]}{a^4 \sqrt{a-b}\,\sqrt{a+b}\,f} + \frac{d^3 (4 a c - b d)\,\mathrm{ArcTanh}[\mathrm{Sin}[e + f x]]}{2 a^2 f} + \frac{d (2 a c - b d)\left(2 a^2 c^2 - 2 a b c d + b^2 d^2\right)\mathrm{ArcTanh}[\mathrm{Sin}[e + f x]]}{a^4 f} + \frac{d^4\,\mathrm{Tan}[e + f x]}{a f} + \frac{d^2\left(6 a^2 c^2 - 4 a b c d + b^2 d^2\right)\mathrm{Tan}[e + f x]}{a^3 f} + \frac{d^3 (4 a c - b d)\,\mathrm{Sec}[e + f x]\,\mathrm{Tan}[e + f x]}{2 a^2 f} + \frac{d^4\,\mathrm{Tan}[e + f x]^3}{3 a f}$$

Result (type 3, 952 leaves):

$$-\frac{2\,(a\,c-b\,d)^4\,\text{ArcTanh}\left[\frac{(a-b)\,\text{Tan}\left[\frac{1}{2}\,(e+f\,x)\right]}{\sqrt{-a^2+b^2}}\right]\,\text{Cos}[e+f\,x]^4\,(c+d\,\text{Sec}[e+f\,x])^4}{a^4\,\sqrt{-a^2+b^2}\,\,f\,(d+c\,\text{Cos}[e+f\,x])^4}+$$

$$\left(\left(-8\,a^3\,c^3\,d+12\,a^2\,b\,c^2\,d^2-4\,a^3\,c\,d^3-8\,a\,b^2\,c\,d^3+a^2\,b\,d^4+2\,b^3\,d^4\right)\,\text{Cos}[e+f\,x]^4\right.$$
$$\left.\text{Log}\left[\text{Cos}\left[\frac{1}{2}\,(e+f\,x)\right]-\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]\right]\,(c+d\,\text{Sec}[e+f\,x])^4\right)\Big/\left(2\,a^4\,f\,(d+c\,\text{Cos}[e+f\,x])^4\right)+$$

$$\left(\left(8\,a^3\,c^3\,d-12\,a^2\,b\,c^2\,d^2+4\,a^3\,c\,d^3+8\,a\,b^2\,c\,d^3-a^2\,b\,d^4-2\,b^3\,d^4\right)\,\text{Cos}[e+f\,x]^4\right.$$
$$\left.\text{Log}\left[\text{Cos}\left[\frac{1}{2}\,(e+f\,x)\right]+\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]\right]\,(c+d\,\text{Sec}[e+f\,x])^4\right)\Big/\left(2\,a^4\,f\,(d+c\,\text{Cos}[e+f\,x])^4\right)+$$

$$\frac{\left(12\,a\,c\,d^3+a\,d^4-3\,b\,d^4\right)\,\text{Cos}[e+f\,x]^4\,(c+d\,\text{Sec}[e+f\,x])^4}{12\,a^2\,f\,(d+c\,\text{Cos}[e+f\,x])^4\,\left(\text{Cos}\left[\frac{1}{2}\,(e+f\,x)\right]-\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]\right)^2}+$$

$$\frac{d^4\,\text{Cos}[e+f\,x]^4\,(c+d\,\text{Sec}[e+f\,x])^4\,\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]}{6\,a\,f\,(d+c\,\text{Cos}[e+f\,x])^4\,\left(\text{Cos}\left[\frac{1}{2}\,(e+f\,x)\right]-\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]\right)^3}+$$

$$\frac{d^4\,\text{Cos}[e+f\,x]^4\,(c+d\,\text{Sec}[e+f\,x])^4\,\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]}{6\,a\,f\,(d+c\,\text{Cos}[e+f\,x])^4\,\left(\text{Cos}\left[\frac{1}{2}\,(e+f\,x)\right]+\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]\right)^3}+$$

$$\frac{\left(-12\,a\,c\,d^3-a\,d^4+3\,b\,d^4\right)\,\text{Cos}[e+f\,x]^4\,(c+d\,\text{Sec}[e+f\,x])^4}{12\,a^2\,f\,(d+c\,\text{Cos}[e+f\,x])^4\,\left(\text{Cos}\left[\frac{1}{2}\,(e+f\,x)\right]+\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]\right)^2}+$$

$$\left(\text{Cos}[e+f\,x]^4\,(c+d\,\text{Sec}[e+f\,x])^4\,\left(18\,a^2\,c^2\,d^2\,\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]-\right.\right.$$
$$\left.\left.12\,a\,b\,c\,d^3\,\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]+2\,a^2\,d^4\,\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]+3\,b^2\,d^4\,\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]\right)\right)\Big/$$
$$\left(3\,a^3\,f\,(d+c\,\text{Cos}[e+f\,x])^4\,\left(\text{Cos}\left[\frac{1}{2}\,(e+f\,x)\right]-\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]\right)\right)+$$

$$\left(\text{Cos}[e+f\,x]^4\,(c+d\,\text{Sec}[e+f\,x])^4\,\left(18\,a^2\,c^2\,d^2\,\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]-\right.\right.$$
$$\left.\left.12\,a\,b\,c\,d^3\,\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]+2\,a^2\,d^4\,\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]+3\,b^2\,d^4\,\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]\right)\right)\Big/$$
$$\left(3\,a^3\,f\,(d+c\,\text{Cos}[e+f\,x])^4\,\left(\text{Cos}\left[\frac{1}{2}\,(e+f\,x)\right]+\text{Sin}\left[\frac{1}{2}\,(e+f\,x)\right]\right)\right)$$

Problem 16: Unable to integrate problem.

$$\int\frac{\sqrt{c+d\,\text{Sec}[e+f\,x]}}{a+b\,\text{Cos}[e+f\,x]}\,dx$$

Optimal (type 4, 213 leaves, 4 steps):

$$\frac{2\sqrt{c+d}\,\text{Cot}[e+f x]\,\text{EllipticF}\left[\text{ArcSin}\left[\frac{\sqrt{c+d\,\text{Sec}[e+f x]}}{\sqrt{c+d}}\right],\frac{c+d}{c-d}\right]\sqrt{\frac{d\,(1-\text{Sec}[e+f x])}{c+d}}\,\sqrt{-\frac{d\,(1+\text{Sec}[e+f x])}{c-d}}}{a f}+$$

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

Result (type 8, 29 leaves):

$$\int\frac{\sqrt{c+d\,\text{Sec}[e+f x]}}{a+b\,\text{Cos}[e+f x]}\,dx$$

Problem 17: Unable to integrate problem.

$$\int\frac{1}{(a+b\,\text{Cos}[e+f x])\,\sqrt{c+d\,\text{Sec}[e+f x]}}\,dx$$

Optimal (type 4, 102 leaves, 2 steps):

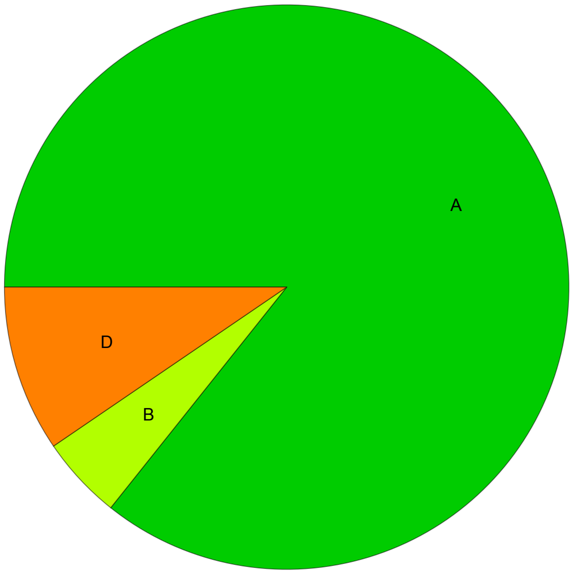
$$\frac{2\,\text{EllipticPi}\left[\frac{2 a}{a+b},\text{ArcSin}\left[\frac{\sqrt{1-\text{Sec}[e+f x]}}{\sqrt{2}}\right],\frac{2 d}{c+d}\right]\sqrt{\frac{c+d\,\text{Sec}[e+f x]}{c+d}}\,\text{Tan}[e+f x]}{(a+b)\,f\sqrt{c+d\,\text{Sec}[e+f x]}\,\sqrt{-\text{Tan}[e+f x]^2}}$$

Result (type 8, 29 leaves):

$$\int\frac{1}{(a+b\,\text{Cos}[e+f x])\,\sqrt{c+d\,\text{Sec}[e+f x]}}\,dx$$

Summary of Integration Test Results

21 integration problems



A - 18 optimal antiderivatives

B - 1 more than twice size of optimal antiderivatives

C - 0 unnecessarily complex antiderivatives

D - 2 unable to integrate problems

E - 0 integration timeouts