Mathematica 11.3 Integration Test Results

Test results for the 24 problems in "4.6.3.1 (a+b csc)^m (d csc)^n (A+B csc).m"

Problem 3: Result more than twice size of optimal antiderivative.

$$\int \text{Csc}[c+dx]\,(a+a\,\text{Csc}[c+dx])\,(A+A\,\text{Csc}[c+dx])\,dx$$

Optimal (type 3, 51 leaves, 6 steps):

$$-\frac{3\,a\,A\,\text{ArcTanh}[\text{Cos}[c+dx]]}{2\,d}-\frac{2\,a\,A\,\text{Cot}[c+dx]}{d}-\frac{a\,A\,\text{Cot}[c+dx]\,\text{Csc}[c+dx]}{2\,d}$$

Result (type 3, 137 leaves):

$$-\frac{2\,a\,A\,\text{Cot}[c+dx]}{d}-\frac{a\,A\,\text{Csc}\left[\frac{1}{2}(c+dx)\right]^2}{8\,d}-\frac{a\,A\,\text{Log}\left[\text{Cos}\left[\frac{c}{2}+\frac{dx}{2}\right]\right]}{d}-\frac{a\,A\,\text{Log}\left[\text{Cos}\left[\frac{1}{2}(c+dx)\right]\right]}{2\,d}+\frac{a\,A\,\text{Log}\left[\text{Sin}\left[\frac{c}{2}+\frac{dx}{2}\right]\right]}{d}+\frac{a\,A\,\text{Log}\left[\text{Sin}\left[\frac{1}{2}(c+dx)\right]\right]}{2\,d}+\frac{a\,A\,\text{Sec}\left[\frac{1}{2}(c+dx)\right]^2}{8\,d}$$

Problem 4: Result more than twice size of optimal antiderivative.

$$\int (a+a\,\text{Csc}[c+dx])\,(A+A\,\text{Csc}[c+dx])\,\text{Sin}[c+dx]\,dx$$

Optimal (type 3, 33 leaves, 5 steps):

$$2\,a\,A\,x-\frac{a\,A\,\text{ArcTanh}[\text{Cos}[c+dx]]}{d}-\frac{a\,A\,\text{Cos}[c+dx]}{d}$$

Result (type 3, 72 leaves):

$$2\,a\,A\,x-\frac{a\,A\,\text{Cos}[c]\,\text{Cos}[dx]}{d}-\frac{a\,A\,\text{Log}\left[\text{Cos}\left[\frac{c}{2}+\frac{dx}{2}\right]\right]}{d}+\frac{a\,A\,\text{Log}\left[\text{Sin}\left[\frac{c}{2}+\frac{dx}{2}\right]\right]}{d}+\frac{a\,A\,\text{Sin}[c]\,\text{Sin}[dx]}{d}$$

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

$$\int \text{Csc}[c+dx]\,(a-a\,\text{Csc}[c+dx])\,(A+A\,\text{Csc}[c+dx])\,dx$$

Optimal (type 3, 38 leaves, 3 steps):

$$-\frac{a\,A\,\text{ArcTanh}[\text{Cos}[c+dx]]}{2\,d}+\frac{a\,A\,\text{Cot}[c+dx]\,\text{Csc}[c+dx]}{2\,d}$$

Result (type 3, 79 leaves):

$$-a A \left(-\frac{\csc\left[\frac{1}{2}(c+dx)\right]^2}{8d}+\frac{\log\left[\cos\left[\frac{1}{2}(c+dx)\right]\right]}{2d}-\frac{\log\left[\sin\left[\frac{1}{2}(c+dx)\right]\right]}{2d}+\frac{\sec\left[\frac{1}{2}(c+dx)\right]^2}{8d}\right)$$

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

$$\int \csc[c+dx]\,(a+a\csc[c+dx])\,(A-A\csc[c+dx])\,dx$$

Optimal (type 3, 38 leaves, 3 steps):

$$-\frac{a A \operatorname{ArcTanh}[\cos[c+dx]]}{2d}+\frac{a A \cot[c+dx]\csc[c+dx]}{2d}$$

Result (type 3, 79 leaves):

$$-a A \left(-\frac{\csc\left[\frac{1}{2}(c+dx)\right]^2}{8d}+\frac{\log\left[\cos\left[\frac{1}{2}(c+dx)\right]\right]}{2d}-\frac{\log\left[\sin\left[\frac{1}{2}(c+dx)\right]\right]}{2d}+\frac{\sec\left[\frac{1}{2}(c+dx)\right]^2}{8d}\right)$$

Problem 21: Result more than twice size of optimal antiderivative.

$$\int \csc[c+dx]\,(a-a\csc[c+dx])\,(A-A\csc[c+dx])\,dx$$

Optimal (type 3, 51 leaves, 6 steps):

$$-\frac{3 a A \operatorname{ArcTanh}[\cos[c+dx]]}{2d}+\frac{2 a A \cot[c+dx]}{d}-\frac{a A \cot[c+dx]\csc[c+dx]}{2d}$$

Result (type 3, 137 leaves):

$$\frac{2 a A \cot[c+dx]}{d}-\frac{a A \csc\left[\frac{1}{2}(c+dx)\right]^2}{8d}-\frac{a A \log\left[\cos\left[\frac{c}{2}+\frac{dx}{2}\right]\right]}{d}-\frac{a A \log\left[\cos\left[\frac{1}{2}(c+dx)\right]\right]}{2d}+\frac{a A \log\left[\sin\left[\frac{c}{2}+\frac{dx}{2}\right]\right]}{d}+\frac{a A \log\left[\sin\left[\frac{1}{2}(c+dx)\right]\right]}{2d}+\frac{a A \sec\left[\frac{1}{2}(c+dx)\right]^2}{8d}$$

Problem 22: Result more than twice size of optimal antiderivative.

$$\int (a-a\csc[c+dx])\,(A-A\csc[c+dx])\sin[c+dx]\,dx$$

Optimal (type 3, 33 leaves, 5 steps):

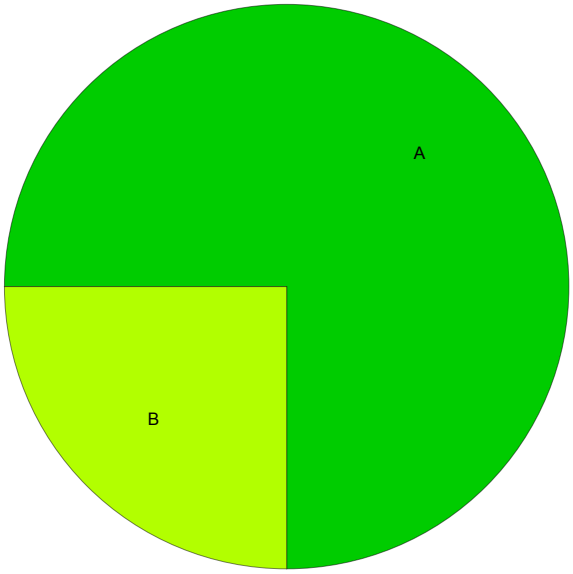
$$-2 a A x-\frac{a A \operatorname{ArcTanh}[\cos[c+dx]]}{d}-\frac{a A \cos[c+dx]}{d}$$

Result (type 3, 72 leaves):

$$-2 a A x-\frac{a A \cos[c]\cos[dx]}{d}-\frac{a A \log\left[\cos\left[\frac{c}{2}+\frac{dx}{2}\right]\right]}{d}+\frac{a A \log\left[\sin\left[\frac{c}{2}+\frac{dx}{2}\right]\right]}{d}+\frac{a A \sin[c]\sin[dx]}{d}$$

Summary of Integration Test Results

24 integration problems



A - 18 optimal antiderivatives

B - 6 more than twice size of optimal antiderivatives

C - 0 unnecessarily complex antiderivatives

D - 0 unable to integrate problems

E - 0 integration timeouts