Mathematica 11.3 Integration Test Results

Test results for the 9 problems in "Jeffrey Problems.m"

Problem 2: Result more than twice size of optimal antiderivative.

$$\int \frac{1 + \text{Cos}[x] + 2\,\text{Sin}[x]}{3 + \text{Cos}[x]^2 + 2\,\text{Sin}[x] - 2\,\text{Cos}[x]\,\text{Sin}[x]}\, dx$$

Optimal (type 3, 19 leaves, ? steps):

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

Result (type 3, 46 leaves) :

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

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

$$\int \frac{-5 + 2\,\text{Cos}[x] + 7\,\text{Cos}[x]^2}{-1 + 2\,\text{Cos}[x] - 9\,\text{Cos}[x]^2 + 4\,\text{Cos}[x]^3}\, dx$$

Optimal (type 3, 25 leaves, ? steps):

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

Result (type 3, 63 leaves) :

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

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

$$\int \frac{3}{5 + 4\,\text{Sin}[x]}\, dx$$

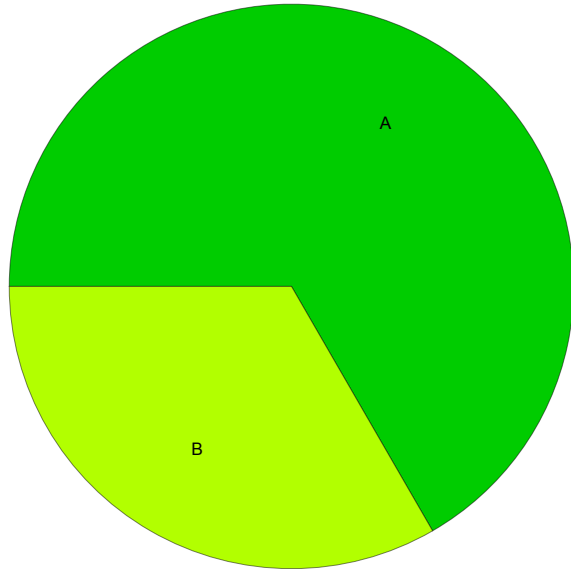Optimal (type 3, 14 leaves, 2 steps) :

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

Result (type 3, 79 leaves):

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

Summary of Integration Test Results

9 integration problems

A - 6 optimal antiderivatives

B - 3 more than twice size of optimal antiderivatives

C - 0 unnecessarily complex antiderivatives

D - 0 unable to integrate problems

E - 0 integration timeouts