Mathematica 11.3 Integration Test Results

Test results for the 218 problems in "8.2 Fresnel integral functions.m"

Problem 9: Unable to integrate problem.

$$\int \frac{\text{FresnelS}[b\,x]}{x}\,dx$$

Optimal (type 5, 73 leaves, 3 steps):

$$\frac{1}{2}\,i\,b\,x\,\text{HypergeometricPFQ}\left[\left\{\frac{1}{2},\frac{1}{2}\right\},\left\{\frac{3}{2},\frac{3}{2}\right\},-\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]-\frac{1}{2}\,i\,b\,x\,\text{HypergeometricPFQ}\left[\left\{\frac{1}{2},\frac{1}{2}\right\},\left\{\frac{3}{2},\frac{3}{2}\right\},\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]$$

Result (type 8, 10 leaves):

$$\int \frac{\text{FresnelS}[b\,x]}{x}\,dx$$

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

$$\int \text{FresnelS}[a+b\,x]\,dx$$

Optimal (type 4, 36 leaves, 1 step):

$$\frac{\text{Cos}\left[\frac{1}{2}\,\pi\,(a+b\,x)^2\right]}{b\,\pi}+\frac{(a+b\,x)\,\text{FresnelS}[a+b\,x]}{b}$$

Result (type 4, 89 leaves):

$$\frac{\text{Cos}\left[\frac{a^2\,\pi}{2}\right]\,\text{Cos}\left[a\,b\,\pi\,x+\frac{1}{2}\,b^2\,\pi\,x^2\right]}{b\,\pi}+\frac{a\,\text{FresnelS}[a+b\,x]}{b}+x\,\text{FresnelS}[a+b\,x]-\frac{\text{Sin}\left[\frac{a^2\,\pi}{2}\right]\,\text{Sin}\left[a\,b\,\pi\,x+\frac{1}{2}\,b^2\,\pi\,x^2\right]}{b\,\pi}$$

Problem 28: Result more than twice size of optimal antiderivative.

$$\int \text{FresnelS}[a+b\,x]\,dx$$

Optimal (type 4, 36 leaves, 1 step):

$$\frac{\text{Cos}\left[\frac{1}{2}\pi\,(a+b\,x)^2\right]}{b\,\pi}+\frac{(a+b\,x)\,\text{FresnelS}[a+b\,x]}{b}$$

Result (type 4, 89 leaves):

$$\frac{\text{Cos}\left[\frac{a^2\pi}{2}\right]\,\text{Cos}\left[a\,b\,\pi\,x+\frac{1}{2}b^2\,\pi\,x^2\right]}{b\,\pi}+\frac{a\,\text{FresnelS}[a+b\,x]}{b}+x\,\text{FresnelS}[a+b\,x]-\frac{\text{Sin}\left[\frac{a^2\pi}{2}\right]\,\text{Sin}\left[a\,b\,\pi\,x+\frac{1}{2}b^2\,\pi\,x^2\right]}{b\,\pi}$$

Problem 31: Unable to integrate problem.

$$\int x^7\,\text{FresnelS}[b\,x]^2\,dx$$

Optimal (type 4, 253 leaves, 23 steps):

$$-\frac{105\,x^2}{16\,b^6\,\pi^4}+\frac{7\,x^6}{48\,b^2\,\pi^2}-\frac{55\,x^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{16\,b^6\,\pi^4}+\frac{x^6\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{16\,b^2\,\pi^2}-\frac{35\,x^3\,\text{Cos}\left[\frac{1}{2}b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{4\,b^5\,\pi^3}+\frac{x^7\,\text{Cos}\left[\frac{1}{2}b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{4\,b\,\pi}-\frac{105\,\text{FresnelS}[b\,x]^2}{8\,b^8\,\pi^4}+\frac{1}{8}x^8\,\text{FresnelS}[b\,x]^2+\frac{105\,x\,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}b^2\,\pi\,x^2\right]}{4\,b^7\,\pi^4}-\frac{7\,x^5\,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}b^2\,\pi\,x^2\right]}{4\,b^3\,\pi^2}+\frac{10\,\text{Sin}\left[b^2\,\pi\,x^2\right]}{b^8\,\pi^5}-\frac{5\,x^4\,\text{Sin}\left[b^2\,\pi\,x^2\right]}{8\,b^4\,\pi^3}$$

Result (type 8, 12 leaves):

$$\int x^7\,\text{FresnelS}[b\,x]^2\,dx$$

Problem 33: Unable to integrate problem.

$$\int x^5\,\text{FresnelS}[b\,x]^2\,dx$$

Optimal (type 5, 265 leaves, 16 steps):

$$\frac{5\,x^4}{24\,b^2\,\pi^2}-\frac{11\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{6\,b^6\,\pi^4}+\frac{x^4\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{12\,b^2\,\pi^2}-\frac{5\,x\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{b^5\,\pi^3}+\frac{x^5\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{3\,b\,\pi}+\frac{5\,\text{FresnelC}[b\,x]\,\text{FresnelS}[b\,x]}{2\,b^6\,\pi^3}+\frac{1}{6}\,x^6\,\text{FresnelS}[b\,x]^2-\frac{5\,i\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]}{8\,b^4\,\pi^3}+\frac{5\,i\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]}{8\,b^4\,\pi^3}-\frac{5\,x^3\,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{3\,b^3\,\pi^2}-\frac{7\,x^2\,\text{Sin}\left[b^2\,\pi\,x^2\right]}{12\,b^4\,\pi^3}$$

Result (type 8, 12 leaves):

$$\int x^5\,\text{FresnelS}[b\,x]^2\,dx$$

Problem 35: Unable to integrate problem.

$$\int x^3\,\text{FresnelS}[b\,x]^2\,dx$$

Optimal (type 4, 140 leaves, 10 steps):

$$\frac{3\,x^2}{8\,b^2\,\pi^2}+\frac{x^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{8\,b^2\,\pi^2}+\frac{x^3\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{2\,b\,\pi}+\frac{3\,\text{FresnelS}[b\,x]^2}{4\,b^4\,\pi^2}+\frac{1}{4}\,x^4\,\text{FresnelS}[b\,x]^2-\frac{3\,x\,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{2\,b^3\,\pi^2}-\frac{\text{Sin}\left[b^2\,\pi\,x^2\right]}{2\,b^4\,\pi^3}$$

Result (type 8, 12 leaves):

$$\int x^3\,\text{FresnelS}[b\,x]^2\,dx$$

Problem 37: Unable to integrate problem.

$$\int x\,\text{FresnelS}[b\,x]^2\,dx$$

Optimal (type 5, 143 leaves, 5 steps):

$$\frac{\text{Cos}\left[b^2\,\pi\,x^2\right]}{4\,b^2\,\pi^2}+\frac{x\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{b\,\pi}-\frac{\text{FresnelC}[b\,x]\,\text{FresnelS}[b\,x]}{2\,b^2\,\pi}+\frac{1}{2}\,x^2\,\text{FresnelS}[b\,x]^2+\frac{i\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]}{8\,\pi}-\frac{i\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]}{8\,\pi}$$

Result (type 8, 10 leaves):

$$\int x\,\text{FresnelS}[b\,x]^2\,dx$$

Problem 43: Unable to integrate problem.

$$\int \frac{\text{FresnelS}[b\,x]^2}{x^5}\,dx$$

Optimal (type 4, 127 leaves, 9 steps):

$$-\frac{b^2}{24\,x^2}+\frac{b^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{24\,x^2}-\frac{b^3\,\pi\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{6\,x}-\frac{1}{12}\,b^4\,\pi^2\,\text{FresnelS}[b\,x]^2-\frac{\text{FresnelS}[b\,x]^2}{4\,x^4}-\frac{b\,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{6\,x^3}+\frac{1}{12}\,b^4\,\pi\,\text{SinIntegral}\left[b^2\,\pi\,x^2\right]$$

Result (type 8, 12 leaves):

$$\int \frac{\text{FresnelS}[b\,x]^2}{x^5}\,dx$$

Problem 47: Unable to integrate problem.

$$\int \frac{\text{FresnelS}[b\,x]^2}{x^9}\,dx$$

Optimal (type 4, 242 leaves, 20 steps):

$$-\frac{b^2}{336\,x^6}+\frac{b^6\,\pi^2}{1680\,x^2}+\frac{b^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{336\,x^6}-\frac{b^6\,\pi^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{336\,x^2}-\frac{b^3\,\pi\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{140\,x^5}+\frac{b^7\,\pi^3\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{420\,x}+\frac{1}{840}\,b^8\,\pi^4\,\text{FresnelS}[b\,x]^2-\frac{\text{FresnelS}[b\,x]^2}{8\,x^8}-\frac{b\,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{28\,x^7}+\frac{b^5\,\pi^2\,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{420\,x^3}-\frac{b^4\,\pi\,\text{Sin}\left[b^2\,\pi\,x^2\right]}{420\,x^4}-\frac{1}{280}\,b^8\,\pi^3\,\text{SinIntegral}\left[b^2\,\pi\,x^2\right]$$

Result (type 8, 12 leaves):

$$\int \frac{\text{FresnelS}[b\,x]^2}{x^9}\,dx$$

Problem 49: Unable to integrate problem.

$$\int (c+d\,x)^2\,\text{FresnelS}[a+b\,x]^2\,dx$$

Optimal (type 5, 497 leaves, 18 steps):

$$\frac{2 d^2 x}{3 b^2 \pi^2}+\frac{d (b c-a d) \operatorname{Cos}\left[\pi (a+b x)^2\right]}{2 b^3 \pi^2}+\frac{d^2 (a+b x) \operatorname{Cos}\left[\pi (a+b x)^2\right]}{6 b^3 \pi^2}-$$
$$\frac{5 d^2 \operatorname{FresnelC}\left[\sqrt{2} (a+b x)\right]}{6 \sqrt{2} b^3 \pi^2}+\frac{2 (b c-a d)^2 \operatorname{Cos}\left[\frac{1}{2} \pi (a+b x)^2\right] \operatorname{FresnelS}[a+b x]}{b^3 \pi}+$$
$$\frac{2 d (b c-a d) (a+b x) \operatorname{Cos}\left[\frac{1}{2} \pi (a+b x)^2\right] \operatorname{FresnelS}[a+b x]}{b^3 \pi}+$$
$$\frac{2 d^2 (a+b x)^2 \operatorname{Cos}\left[\frac{1}{2} \pi (a+b x)^2\right] \operatorname{FresnelS}[a+b x]}{3 b^3 \pi}-$$
$$\frac{d (b c-a d) \operatorname{FresnelC}[a+b x] \operatorname{FresnelS}[a+b x]}{b^3 \pi}+$$
$$\frac{(b c-a d)^2 (a+b x) \operatorname{FresnelS}[a+b x]^2}{b^3}+\frac{d (b c-a d) (a+b x)^2 \operatorname{FresnelS}[a+b x]^2}{b^3}+$$
$$\frac{d^2 (a+b x)^3 \operatorname{FresnelS}[a+b x]^2}{3 b^3}-\frac{(b c-a d)^2 \operatorname{FresnelS}\left[\sqrt{2} (a+b x)\right]}{\sqrt{2} b^3 \pi}+\frac{1}{4 b^3 \pi}$$
$$i d (b c-a d) (a+b x)^2 \operatorname{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i \pi (a+b x)^2\right]-$$
$$\frac{1}{4 b^3 \pi} i d (b c-a d) (a+b x)^2 \operatorname{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i \pi (a+b x)^2\right]-$$
$$\frac{4 d^2 \operatorname{FresnelS}[a+b x] \operatorname{Sin}\left[\frac{1}{2} \pi (a+b x)^2\right]}{3 b^3 \pi^2}$$

Result (type 8, 18 leaves):

$$\int (c+d x)^2 \operatorname{FresnelS}[a+b x]^2 \, dx$$

Problem 50: Unable to integrate problem.

$$\int (c+d x) \operatorname{FresnelS}[a+b x]^2 \, dx$$

Optimal (type 5, 279 leaves, 10 steps):

$$\frac{d\,\text{Cos}\left[\pi\,(a+b\,x)^2\right]}{4\,b^2\,\pi^2}+\frac{2\,(b\,c-a\,d)\,\text{Cos}\left[\frac{1}{2}\,\pi\,(a+b\,x)^2\right]\,\text{FresnelS}[a+b\,x]}{b^2\,\pi}+$$
$$\frac{d\,(a+b\,x)\,\text{Cos}\left[\frac{1}{2}\,\pi\,(a+b\,x)^2\right]\,\text{FresnelS}[a+b\,x]}{b^2\,\pi}-$$
$$\frac{d\,\text{FresnelC}[a+b\,x]\,\text{FresnelS}[a+b\,x]}{2\,b^2\,\pi}+\frac{(b\,c-a\,d)\,(a+b\,x)\,\text{FresnelS}[a+b\,x]^2}{b^2}+$$
$$\frac{d\,(a+b\,x)^2\,\text{FresnelS}[a+b\,x]^2}{2\,b^2}-\frac{(b\,c-a\,d)\,\text{FresnelS}\left[\sqrt{2}\,(a+b\,x)\right]}{\sqrt{2}\,b^2\,\pi}+$$
$$\frac{i\,d\,(a+b\,x)^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2}\,i\,\pi\,(a+b\,x)^2\right]}{8\,b^2\,\pi}-$$
$$\frac{i\,d\,(a+b\,x)^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2}\,i\,\pi\,(a+b\,x)^2\right]}{8\,b^2\,\pi}$$

Result (type 8, 16 leaves):

$$\int (c+d\,x)\,\text{FresnelS}[a+b\,x]^2\,dx$$

Problem 57: Result more than twice size of optimal antiderivative.

$$\int \frac{\text{FresnelS}\left[d\,(a+b\,\text{Log}[c\,x^n])\right]}{x}\,dx$$

Optimal (type 4, 65 leaves, 3 steps):

$$\frac{\text{Cos}\left[\frac{1}{2}\,d^2\,\pi\,(a+b\,\text{Log}[c\,x^n])^2\right]}{b\,d\,n\,\pi}+\frac{\text{FresnelS}\left[d\,(a+b\,\text{Log}[c\,x^n])\right]\,(a+b\,\text{Log}[c\,x^n])}{b\,n}$$

Result (type 4, 164 leaves):

$$\frac{\text{Cos}\left[\frac{1}{2}\,a^2\,d^2\,\pi\right]\,\text{Cos}\left[a\,b\,d^2\,\pi\,\text{Log}[c\,x^n]+\frac{1}{2}\,b^2\,d^2\,\pi\,\text{Log}[c\,x^n]^2\right]}{b\,d\,n\,\pi}+$$
$$\frac{a\,\text{FresnelS}\left[d\,(a+b\,\text{Log}[c\,x^n])\right]}{b\,n}+\frac{\text{FresnelS}\left[d\,(a+b\,\text{Log}[c\,x^n])\right]\,\text{Log}[c\,x^n]}{n}-$$
$$\frac{\text{Sin}\left[\frac{1}{2}\,a^2\,d^2\,\pi\right]\,\text{Sin}\left[a\,b\,d^2\,\pi\,\text{Log}[c\,x^n]+\frac{1}{2}\,b^2\,d^2\,\pi\,\text{Log}[c\,x^n]^2\right]}{b\,d\,n\,\pi}$$

Problem 61: Unable to integrate problem.

$$\int e^{c+\frac{1}{2}\,i\,b^2\,\pi\,x^2}\,\text{FresnelS}[b\,x]\,dx$$

Optimal (type 5, 64 leaves, 4 steps):

$$-\frac{e^c\,\text{Erfi}\left[\left(\frac{1}{2}+\frac{i}{2}\right)\,b\,\sqrt{\pi}\,x\right]^2}{8\,b}+\frac{1}{4}\,i\,b\,e^c\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]$$

Result (type 8, 24 leaves):

$$\int e^{c+\frac{1}{2} i b^2 \pi x^2} \text{FresnelS}[b x] \, dx$$

Problem 62: Unable to integrate problem.

$$\int e^{c-\frac{1}{2} i b^2 \pi x^2} \text{FresnelS}[b x] \, dx$$

Optimal (type 5, 64 leaves, 4 steps):

$$\frac{e^c \text{Erf}\left[\left(\frac{1}{2}+\frac{i}{2}\right) b \sqrt{\pi}\, x\right]^2}{8 b} - \frac{1}{4} i b e^c x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right]$$

Result (type 8, 24 leaves):

$$\int e^{c-\frac{1}{2} i b^2 \pi x^2} \text{FresnelS}[b x] \, dx$$

Problem 63: Unable to integrate problem.

$$\int \text{FresnelS}[b x] \text{Sin}\left[c+\frac{1}{2} b^2 \pi x^2\right] dx$$

Optimal (type 5, 101 leaves, 4 steps):

$$\frac{\text{Cos}[c] \text{FresnelS}[b x]^2}{2 b} + \frac{\text{FresnelC}[b x] \text{FresnelS}[b x] \text{Sin}[c]}{2 b} - \frac{1}{8} i b x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right] \text{Sin}[c] + \frac{1}{8} i b x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i b^2 \pi x^2\right] \text{Sin}[c]$$

Result (type 8, 21 leaves):

$$\int \text{FresnelS}[b x] \text{Sin}\left[c+\frac{1}{2} b^2 \pi x^2\right] dx$$

Problem 64: Unable to integrate problem.

$$\int \text{Cos}\left[c+\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x] \, dx$$

Optimal (type 5, 101 leaves, 4 steps):

$$\frac{\text{Cos}[c] \text{FresnelC}[b x] \text{FresnelS}[b x]}{2 b} - \frac{1}{8} i b x^2 \text{Cos}[c] \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right] + \frac{1}{8} i b x^2 \text{Cos}[c] \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i b^2 \pi x^2\right] - \frac{\text{FresnelS}[b x]^2 \text{Sin}[c]}{2 b}$$

Result (type 8, 21 leaves):

$$\int \text{Cos}\left[c+\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x] \, dx$$

Problem 71: Unable to integrate problem.

$$\int x^8 \text{FresnelS}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right] dx$$

Optimal (type 4, 232 leaves, 22 steps):

$$\frac{105 x^2}{4 b^7 \pi^4}-\frac{7 x^6}{12 b^3 \pi^2}+\frac{55 x^2 \text{Cos}\left[b^2 \pi x^2\right]}{4 b^7 \pi^4}-\frac{x^6 \text{Cos}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}+\frac{35 x^3 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{b^6 \pi^3}-\frac{x^7 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{b^2 \pi}+\frac{105 \text{FresnelS}[b x]^2}{2 b^9 \pi^4}-\frac{105 x \text{FresnelS}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^8 \pi^4}+\frac{7 x^5 \text{FresnelS}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^4 \pi^2}-\frac{40 \text{Sin}\left[b^2 \pi x^2\right]}{b^9 \pi^5}+\frac{5 x^4 \text{Sin}\left[b^2 \pi x^2\right]}{2 b^5 \pi^3}$$

Result (type 8, 22 leaves):

$$\int x^8 \text{FresnelS}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right] dx$$

Problem 73: Unable to integrate problem.

$$\int x^6 \text{FresnelS}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right] dx$$

Optimal (type 5, 248 leaves, 15 steps):

$$-\frac{5 x^4}{8 b^3 \pi^2}+\frac{11 \text{Cos}\left[b^2 \pi x^2\right]}{2 b^7 \pi^4}-\frac{x^4 \text{Cos}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}+\frac{15 x \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{b^6 \pi^3}-\frac{x^5 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{b^2 \pi}-\frac{15 \text{FresnelC}[b x] \text{FresnelS}[b x]}{2 b^7 \pi^3}+\frac{15 i x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right]}{8 b^5 \pi^3}-\frac{15 i x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i b^2 \pi x^2\right]}{8 b^5 \pi^3}+\frac{5 x^3 \text{FresnelS}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^4 \pi^2}+\frac{7 x^2 \text{Sin}\left[b^2 \pi x^2\right]}{4 b^5 \pi^3}$$

Result (type 8, 22 leaves):

$$\int x^6 \text{FresnelS}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right] dx$$

Problem 75: Unable to integrate problem.

$$\int x^4 \,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,dx$$

Optimal (type 4, 120 leaves, 9 steps):

$$-\frac{3\,x^2}{4\,b^3\,\pi^2}-\frac{x^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{4\,b^3\,\pi^2}-\frac{x^3\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{b^2\,\pi}-\frac{3\,\text{FresnelS}[b\,x]^2}{2\,b^5\,\pi^2}+\frac{3\,x\,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{b^4\,\pi^2}+\frac{\text{Sin}\left[b^2\,\pi\,x^2\right]}{b^5\,\pi^3}$$

Result (type 8, 22 leaves):

$$\int x^4 \,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,dx$$

Problem 77: Unable to integrate problem.

$$\int x^2 \,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,dx$$

Optimal (type 5, 137 leaves, 4 steps):

$$-\frac{\text{Cos}\left[b^2\,\pi\,x^2\right]}{4\,b^3\,\pi^2}-\frac{x\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{b^2\,\pi}+\frac{\text{FresnelC}[b\,x]\,\text{FresnelS}[b\,x]}{2\,b^3\,\pi}-\frac{i\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]}{8\,b\,\pi}+\frac{i\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]}{8\,b\,\pi}$$

Result (type 8, 22 leaves):

$$\int x^2 \,\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,dx$$

Problem 83: Unable to integrate problem.

$$\int \frac{\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{x^4}\,dx$$

Optimal (type 4, 109 leaves, 8 steps):

$$-\frac{b}{12\,x^2}+\frac{b\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{12\,x^2}-\frac{b^2\,\pi\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelS}[b\,x]}{3\,x}-\frac{1}{6}\,b^3\,\pi^2\,\text{FresnelS}[b\,x]^2-\frac{\text{FresnelS}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{3\,x^3}+\frac{1}{6}\,b^3\,\pi\,\text{SinIntegral}\left[b^2\,\pi\,x^2\right]$$

Result (type 8, 22 leaves):

$$\int \frac{\text{FresnelS}[b x] \, \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{x^4} \, dx$$

Problem 87: Unable to integrate problem.

$$\int \frac{\text{FresnelS}[b x] \, \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{x^8} \, dx$$

Optimal (type 4, 224 leaves, 19 steps):

$$-\frac{b}{84 x^6}+\frac{b^5 \pi^2}{420 x^2}+\frac{b \,\text{Cos}\left[b^2 \pi x^2\right]}{84 x^6}-\frac{b^5 \pi^2 \,\text{Cos}\left[b^2 \pi x^2\right]}{84 x^2}-\frac{b^2 \pi \,\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{35 x^5}+\frac{b^6 \pi^3 \,\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{105 x}+\frac{1}{210} b^7 \pi^4 \,\text{FresnelS}[b x]^2-\frac{\text{FresnelS}[b x] \,\text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{7 x^7}+\frac{b^4 \pi^2 \,\text{FresnelS}[b x] \,\text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{105 x^3}-\frac{b^3 \pi \,\text{Sin}\left[b^2 \pi x^2\right]}{105 x^4}-\frac{1}{70} b^7 \pi^3 \,\text{SinIntegral}\left[b^2 \pi x^2\right]$$

Result (type 8, 22 leaves):

$$\int \frac{\text{FresnelS}[b x] \, \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{x^8} \, dx$$

Problem 91: Unable to integrate problem.

$$\int x^8 \,\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x] \, dx$$

Optimal (type 5, 307 leaves, 23 steps):

$$\frac{35 x^4}{8 b^5 \pi^3}-\frac{x^8}{16 b \pi}-\frac{40 \,\text{Cos}\left[b^2 \pi x^2\right]}{b^9 \pi^5}+\frac{5 x^4 \,\text{Cos}\left[b^2 \pi x^2\right]}{2 b^5 \pi^3}-\frac{105 x \,\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{b^8 \pi^4}+\frac{7 x^5 \,\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{b^4 \pi^2}+\frac{105 \,\text{FresnelC}[b x] \,\text{FresnelS}[b x]}{2 b^9 \pi^4}-\frac{105 \,\mathrm{i}\, x^2 \,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} \mathrm{i}\, b^2 \pi x^2\right]}{8 b^7 \pi^4}+\frac{105 \,\mathrm{i}\, x^2 \,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} \mathrm{i}\, b^2 \pi x^2\right]}{8 b^7 \pi^4}-\frac{35 x^3 \,\text{FresnelS}[b x] \,\text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^6 \pi^3}+\frac{x^7 \,\text{FresnelS}[b x] \,\text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^2 \pi}-\frac{55 x^2 \,\text{Sin}\left[b^2 \pi x^2\right]}{4 b^7 \pi^4}+\frac{x^6 \,\text{Sin}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}$$

Result (type 8, 22 leaves):

$$\int x^8 \,\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x] \, dx$$

Problem 93: Unable to integrate problem.

$$\int x^6 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x] \, dx$$

Optimal (type 4, 184 leaves, 16 steps):

$$\frac{15 x^2}{4 b^5 \pi^3} - \frac{x^6}{12 b \pi} + \frac{7 x^2 \operatorname{Cos}\left[b^2 \pi x^2\right]}{4 b^5 \pi^3} + \frac{5 x^3 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x]}{b^4 \pi^2} + \frac{15 \operatorname{FresnelS}[b x]^2}{2 b^7 \pi^3} - \frac{15 x \operatorname{FresnelS}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^6 \pi^3} + \frac{x^5 \operatorname{FresnelS}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^2 \pi} - \frac{11 \operatorname{Sin}\left[b^2 \pi x^2\right]}{2 b^7 \pi^4} + \frac{x^4 \operatorname{Sin}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}$$

Result (type 8, 22 leaves):

$$\int x^6 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x] \, dx$$

Problem 95: Unable to integrate problem.

$$\int x^4 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x] \, dx$$

Optimal (type 5, 195 leaves, 10 steps):

$$-\frac{x^4}{8 b \pi} + \frac{\operatorname{Cos}\left[b^2 \pi x^2\right]}{b^5 \pi^3} + \frac{3 x \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x]}{b^4 \pi^2} - \frac{3 \operatorname{FresnelC}[b x] \operatorname{FresnelS}[b x]}{2 b^5 \pi^2} + \frac{3 i x^2 \operatorname{HypergeometricPFQ}\left[\{1, 1\}, \left\{\frac{3}{2}, 2\right\}, -\frac{1}{2} i b^2 \pi x^2\right]}{8 b^3 \pi^2} - \frac{3 i x^2 \operatorname{HypergeometricPFQ}\left[\{1, 1\}, \left\{\frac{3}{2}, 2\right\}, \frac{1}{2} i b^2 \pi x^2\right]}{8 b^3 \pi^2} + \frac{x^3 \operatorname{FresnelS}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^2 \pi} + \frac{x^2 \operatorname{Sin}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}$$

Result (type 8, 22 leaves):

$$\int x^4 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x] \, dx$$

Problem 97: Unable to integrate problem.

$$\int x^2 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x] \, dx$$

Optimal (type 4, 73 leaves, 5 steps):

$$-\frac{x^2}{4 b \pi}-\frac{\text{FresnelS}[b x]^2}{2 b^3 \pi}+\frac{x\, \text{FresnelS}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^2 \pi}+\frac{\operatorname{Sin}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}$$

Result (type 8, 22 leaves):

$$\int x^2 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x] \, dx$$

Problem 99: Unable to integrate problem.

$$\int \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x] \, dx$$

Optimal (type 5, 80 leaves, 1 step):

$$\frac{\text{FresnelC}[b x]\, \text{FresnelS}[b x]}{2 b}-\frac{1}{8} i\, b x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i\, b^2 \pi x^2\right]+$$
$$\frac{1}{8} i\, b x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i\, b^2 \pi x^2\right]$$

Result (type 8, 19 leaves):

$$\int \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x] \, dx$$

Problem 101: Unable to integrate problem.

$$\int \frac{\operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{x^2} \, dx$$

Optimal (type 4, 48 leaves, 4 steps):

$$-\frac{\operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{x}-\frac{1}{2} b \pi\, \text{FresnelS}[b x]^2+\frac{1}{4} b\, \text{SinIntegral}\left[b^2 \pi x^2\right]$$

Result (type 8, 22 leaves):

$$\int \frac{\operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{x^2} \, dx$$

Problem 105: Unable to integrate problem.

$$\int \frac{\operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelS}[b x]}{x^6} \, dx$$

Optimal (type 4, 163 leaves, 13 steps):

$$\frac{b^3 \pi}{60 x^2} - \frac{b^3 \pi \operatorname{Cos}[b^2 \pi x^2]}{24 x^2} - \frac{\operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x]}{5 x^5} + \frac{b^4 \pi^2 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x]}{15 x} + \frac{1}{30} b^5 \pi^3 \operatorname{FresnelS}[b x]^2 + \frac{b^2 \pi \operatorname{FresnelS}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{15 x^3} - \frac{b \operatorname{Sin}[b^2 \pi x^2]}{40 x^4} - \frac{7}{120} b^5 \pi^2 \operatorname{SinIntegral}[b^2 \pi x^2]$$

Result (type 8, 22 leaves):

$$\int \frac{\operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x]}{x^6} \, dx$$

Problem 109: Unable to integrate problem.

$$\int \frac{\operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x]}{x^{10}} \, dx$$

Optimal (type 4, 278 leaves, 26 steps):

$$\frac{b^3 \pi}{756 x^6} - \frac{b^7 \pi^3}{3780 x^2} - \frac{11 b^3 \pi \operatorname{Cos}[b^2 \pi x^2]}{3024 x^6} + \frac{5 b^7 \pi^3 \operatorname{Cos}[b^2 \pi x^2]}{2016 x^2} - \frac{\operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x]}{9 x^9} + \frac{b^4 \pi^2 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x]}{315 x^5} - \frac{b^8 \pi^4 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x]}{945 x} - \frac{b^9 \pi^5 \operatorname{FresnelS}[b x]^2}{1890} + \frac{b^2 \pi \operatorname{FresnelS}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{63 x^7} - \frac{b^6 \pi^3 \operatorname{FresnelS}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{945 x^3} - \frac{b \operatorname{Sin}[b^2 \pi x^2]}{144 x^8} + \frac{67 b^5 \pi^2 \operatorname{Sin}[b^2 \pi x^2]}{30240 x^4} + \frac{83 b^9 \pi^4 \operatorname{SinIntegral}[b^2 \pi x^2]}{30240}$$

Result (type 8, 22 leaves):

$$\int \frac{\operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelS}[b x]}{x^{10}} \, dx$$

Problem 118: Unable to integrate problem.

$$\int \frac{\operatorname{FresnelC}[b x]}{x} \, dx$$

Optimal (type 5, 69 leaves, 3 steps):

$$\frac{1}{2} b x \operatorname{HypergeometricPFQ}\left[\left\{\frac{1}{2}, \frac{1}{2}\right\}, \left\{\frac{3}{2}, \frac{3}{2}\right\}, -\frac{1}{2} i b^2 \pi x^2\right] + \frac{1}{2} b x \operatorname{HypergeometricPFQ}\left[\left\{\frac{1}{2}, \frac{1}{2}\right\}, \left\{\frac{3}{2}, \frac{3}{2}\right\}, \frac{1}{2} i b^2 \pi x^2\right]$$

Result (type 8, 10 leaves):

$$\int \frac{\text{FresnelC}[b\,x]}{x}\,dx$$

Problem 131: Result more than twice size of optimal antiderivative.

$$\int \text{FresnelC}[a+b\,x]\,dx$$

Optimal (type 4, 37 leaves, 1 step):

$$\frac{(a+b\,x)\,\text{FresnelC}[a+b\,x]}{b}-\frac{\text{Sin}\left[\frac{1}{2}\,\pi\,(a+b\,x)^2\right]}{b\,\pi}$$

Result (type 4, 90 leaves):

$$\frac{a\,\text{FresnelC}[a+b\,x]}{b}+x\,\text{FresnelC}[a+b\,x]-\frac{\text{Cos}\left[a\,b\,\pi\,x+\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{Sin}\left[\frac{a^2\,\pi}{2}\right]}{b\,\pi}-\frac{\text{Cos}\left[\frac{a^2\,\pi}{2}\right]\,\text{Sin}\left[a\,b\,\pi\,x+\frac{1}{2}\,b^2\,\pi\,x^2\right]}{b\,\pi}$$

Problem 137: Result more than twice size of optimal antiderivative.

$$\int \text{FresnelC}[a+b\,x]\,dx$$

Optimal (type 4, 37 leaves, 1 step):

$$\frac{(a+b\,x)\,\text{FresnelC}[a+b\,x]}{b}-\frac{\text{Sin}\left[\frac{1}{2}\,\pi\,(a+b\,x)^2\right]}{b\,\pi}$$

Result (type 4, 90 leaves):

$$\frac{a\,\text{FresnelC}[a+b\,x]}{b}+x\,\text{FresnelC}[a+b\,x]-\frac{\text{Cos}\left[a\,b\,\pi\,x+\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{Sin}\left[\frac{a^2\,\pi}{2}\right]}{b\,\pi}-\frac{\text{Cos}\left[\frac{a^2\,\pi}{2}\right]\,\text{Sin}\left[a\,b\,\pi\,x+\frac{1}{2}\,b^2\,\pi\,x^2\right]}{b\,\pi}$$

Problem 140: Unable to integrate problem.

$$\int x^7\,\text{FresnelC}[b\,x]^2\,dx$$

Optimal (type 4, 253 leaves, 23 steps):

$$-\frac{105 x^2}{16 b^6 \pi^4}+\frac{7 x^6}{48 b^2 \pi^2}+\frac{55 x^2 \operatorname{Cos}\left[b^2 \pi x^2\right]}{16 b^6 \pi^4}-\frac{x^6 \operatorname{Cos}\left[b^2 \pi x^2\right]}{16 b^2 \pi^2}+\frac{105 x \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelC}[b x]}{4 b^7 \pi^4}-\frac{7 x^5 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelC}[b x]}{4 b^3 \pi^2}-\frac{105 \operatorname{FresnelC}[b x]^2}{8 b^8 \pi^4}+\frac{1}{8} x^8 \operatorname{FresnelC}[b x]^2+\frac{35 x^3 \operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{4 b^5 \pi^3}-\frac{x^7 \operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{4 b \pi}-\frac{10 \operatorname{Sin}\left[b^2 \pi x^2\right]}{b^8 \pi^5}+\frac{5 x^4 \operatorname{Sin}\left[b^2 \pi x^2\right]}{8 b^4 \pi^3}$$

Result (type 8, 12 leaves):

$$\int x^7 \operatorname{FresnelC}[b x]^2 \, dx$$

Problem 142: Unable to integrate problem.

$$\int x^5 \operatorname{FresnelC}[b x]^2 \, dx$$

Optimal (type 5, 265 leaves, 16 steps):

$$\frac{5 x^4}{24 b^2 \pi^2}+\frac{11 \operatorname{Cos}\left[b^2 \pi x^2\right]}{6 b^6 \pi^4}-\frac{x^4 \operatorname{Cos}\left[b^2 \pi x^2\right]}{12 b^2 \pi^2}-\frac{5 x^3 \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelC}[b x]}{3 b^3 \pi^2}+\frac{1}{6} x^6 \operatorname{FresnelC}[b x]^2-\frac{5 \operatorname{FresnelC}[b x] \operatorname{FresnelS}[b x]}{2 b^6 \pi^3}-\frac{5 i x^2 \operatorname{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right]}{8 b^4 \pi^3}+\frac{5 i x^2 \operatorname{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i b^2 \pi x^2\right]}{8 b^4 \pi^3}+\frac{5 x \operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^5 \pi^3}-\frac{x^5 \operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{3 b \pi}+\frac{7 x^2 \operatorname{Sin}\left[b^2 \pi x^2\right]}{12 b^4 \pi^3}$$

Result (type 8, 12 leaves):

$$\int x^5 \operatorname{FresnelC}[b x]^2 \, dx$$

Problem 144: Unable to integrate problem.

$$\int x^3 \operatorname{FresnelC}[b x]^2 \, dx$$

Optimal (type 4, 140 leaves, 10 steps):

$$\frac{3\,x^2}{8\,b^2\,\pi^2}-\frac{x^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{8\,b^2\,\pi^2}-\frac{3\,x\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelC}[b\,x]}{2\,b^3\,\pi^2}+\frac{3\,\text{FresnelC}[b\,x]^2}{4\,b^4\,\pi^2}+$$
$$\frac{1}{4}\,x^4\,\text{FresnelC}[b\,x]^2-\frac{x^3\,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{2\,b\,\pi}+\frac{\text{Sin}\left[b^2\,\pi\,x^2\right]}{2\,b^4\,\pi^3}$$

Result (type 8, 12 leaves):

$$\int x^3\,\text{FresnelC}[b\,x]^2\,dx$$

Problem 146: Unable to integrate problem.

$$\int x\,\text{FresnelC}[b\,x]^2\,dx$$

Optimal (type 5, 144 leaves, 5 steps):

$$-\frac{\text{Cos}\left[b^2\,\pi\,x^2\right]}{4\,b^2\,\pi^2}+\frac{1}{2}\,x^2\,\text{FresnelC}[b\,x]^2+\frac{\text{FresnelC}[b\,x]\,\text{FresnelS}[b\,x]}{2\,b^2\,\pi}+$$
$$\frac{i\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]}{8\,\pi}-$$
$$\frac{i\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]}{8\,\pi}-\frac{x\,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{b\,\pi}$$

Result (type 8, 10 leaves):

$$\int x\,\text{FresnelC}[b\,x]^2\,dx$$

Problem 152: Unable to integrate problem.

$$\int \frac{\text{FresnelC}[b\,x]^2}{x^5}\,dx$$

Optimal (type 4, 127 leaves, 9 steps):

$$-\frac{b^2}{24\,x^2}-\frac{b^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{24\,x^2}-\frac{b\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelC}[b\,x]}{6\,x^3}-\frac{1}{12}\,b^4\,\pi^2\,\text{FresnelC}[b\,x]^2-$$
$$\frac{\text{FresnelC}[b\,x]^2}{4\,x^4}+\frac{b^3\,\pi\,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{6\,x}-\frac{1}{12}\,b^4\,\pi\,\text{SinIntegral}\left[b^2\,\pi\,x^2\right]$$

Result (type 8, 12 leaves):

$$\int \frac{\text{FresnelC}[b\,x]^2}{x^5}\,dx$$

Problem 156: Unable to integrate problem.

$$\int \frac{\text{FresnelC}[b\,x]^2}{x^9}\,dx$$

Optimal (type 4, 242 leaves, 20 steps):

$$-\frac{b^2}{336\,x^6}+\frac{b^6\,\pi^2}{1680\,x^2}-\frac{b^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{336\,x^6}+\frac{b^6\,\pi^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{336\,x^2}-\frac{b\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelC}[b\,x]}{28\,x^7}+\frac{b^5\,\pi^2\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelC}[b\,x]}{420\,x^3}+\frac{1}{840}\,b^8\,\pi^4\,\text{FresnelC}[b\,x]^2-\frac{\text{FresnelC}[b\,x]^2}{8\,x^8}+\frac{b^3\,\pi\,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{140\,x^5}-\frac{b^7\,\pi^3\,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{420\,x}+\frac{b^4\,\pi\,\text{Sin}\left[b^2\,\pi\,x^2\right]}{420\,x^4}+\frac{1}{280}\,b^8\,\pi^3\,\text{SinIntegral}\left[b^2\,\pi\,x^2\right]$$

Result (type 8, 12 leaves):

$$\int \frac{\text{FresnelC}[b\,x]^2}{x^9}\,dx$$

Problem 158: Unable to integrate problem.

$$\int (c+d\,x)^2\,\text{FresnelC}[a+b\,x]^2\,dx$$

Optimal (type 5, 495 leaves, 18 steps):

$$\frac{2 d^2 x}{3 b^2 \pi^2} - \frac{d (b c - a d) \operatorname{Cos}\left[\pi (a + b x)^2\right]}{2 b^3 \pi^2} - \frac{d^2 (a + b x) \operatorname{Cos}\left[\pi (a + b x)^2\right]}{6 b^3 \pi^2} - \frac{4 d^2 \operatorname{Cos}\left[\frac{1}{2} \pi (a + b x)^2\right] \operatorname{FresnelC}[a + b x]}{3 b^3 \pi^2} + \frac{(b c - a d)^2 (a + b x) \operatorname{FresnelC}[a + b x]^2}{b^3} + \frac{d (b c - a d) (a + b x)^2 \operatorname{FresnelC}[a + b x]^2}{b^3} + \frac{d^2 (a + b x)^3 \operatorname{FresnelC}[a + b x]^2}{3 b^3} + \frac{5 d^2 \operatorname{FresnelC}\left[\sqrt{2} (a + b x)\right]}{6 \sqrt{2} b^3 \pi^2} + \frac{d (b c - a d) \operatorname{FresnelC}[a + b x] \operatorname{FresnelS}[a + b x]}{b^3 \pi} + \frac{(b c - a d)^2 \operatorname{FresnelS}\left[\sqrt{2} (a + b x)\right]}{\sqrt{2} b^3 \pi} + \frac{1}{4 b^3 \pi} i d (b c - a d) (a + b x)^2 \operatorname{HypergeometricPFQ}\left[\{1, 1\}, \left\{\frac{3}{2}, 2\right\}, -\frac{1}{2} i \pi (a + b x)^2\right] - \frac{1}{4 b^3 \pi} i d (b c - a d) (a + b x)^2 \operatorname{HypergeometricPFQ}\left[\{1, 1\}, \left\{\frac{3}{2}, 2\right\}, \frac{1}{2} i \pi (a + b x)^2\right] - \frac{2 (b c - a d)^2 \operatorname{FresnelC}[a + b x] \operatorname{Sin}\left[\frac{1}{2} \pi (a + b x)^2\right]}{b^3 \pi} - \frac{2 d (b c - a d) (a + b x) \operatorname{FresnelC}[a + b x] \operatorname{Sin}\left[\frac{1}{2} \pi (a + b x)^2\right]}{b^3 \pi} - \frac{2 d^2 (a + b x)^2 \operatorname{FresnelC}[a + b x] \operatorname{Sin}\left[\frac{1}{2} \pi (a + b x)^2\right]}{3 b^3 \pi}$$

Result (type 8, 18 leaves):

$$\int (c + d x)^2 \operatorname{FresnelC}[a + b x]^2 \, dx$$

Problem 159: Unable to integrate problem.

$$\int (c + d x) \operatorname{FresnelC}[a + b x]^2 \, dx$$

Optimal (type 5, 279 leaves, 10 steps):

$$-\frac{d\,\mathrm{Cos}\left[\pi\,(a+b\,x)^2\right]}{4\,b^2\,\pi^2}+\frac{(b\,c-a\,d)\,(a+b\,x)\,\mathrm{FresnelC}[a+b\,x]^2}{b^2}+\frac{d\,(a+b\,x)^2\,\mathrm{FresnelC}[a+b\,x]^2}{2\,b^2}+$$
$$\frac{d\,\mathrm{FresnelC}[a+b\,x]\,\mathrm{FresnelS}[a+b\,x]}{2\,b^2\,\pi}+\frac{(b\,c-a\,d)\,\mathrm{FresnelS}\left[\sqrt{2}\,(a+b\,x)\right]}{\sqrt{2}\,b^2\,\pi}+$$
$$\frac{i\,d\,(a+b\,x)^2\,\mathrm{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2}\,i\,\pi\,(a+b\,x)^2\right]}{8\,b^2\,\pi}-$$
$$\frac{i\,d\,(a+b\,x)^2\,\mathrm{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2}\,i\,\pi\,(a+b\,x)^2\right]}{8\,b^2\,\pi}-$$
$$\frac{2\,(b\,c-a\,d)\,\mathrm{FresnelC}[a+b\,x]\,\mathrm{Sin}\left[\frac{1}{2}\,\pi\,(a+b\,x)^2\right]}{b^2\,\pi}-\frac{d\,(a+b\,x)\,\mathrm{FresnelC}[a+b\,x]\,\mathrm{Sin}\left[\frac{1}{2}\,\pi\,(a+b\,x)^2\right]}{b^2\,\pi}$$

Result (type 8, 16 leaves):

$$\int (c+d\,x)\,\mathrm{FresnelC}[a+b\,x]^2\,dx$$

Problem 166: Result more than twice size of optimal antiderivative.

$$\int \frac{\mathrm{FresnelC}\left[d\,\left(a+b\,\mathrm{Log}\left[c\,x^n\right]\right)\right]}{x}\,dx$$

Optimal (type 4, 66 leaves, 3 steps):

$$\frac{\mathrm{FresnelC}\left[d\,\left(a+b\,\mathrm{Log}\left[c\,x^n\right]\right)\right]\,\left(a+b\,\mathrm{Log}\left[c\,x^n\right]\right)}{b\,n}-\frac{\mathrm{Sin}\left[\frac{1}{2}\,d^2\,\pi\,\left(a+b\,\mathrm{Log}\left[c\,x^n\right]\right)^2\right]}{b\,d\,n\,\pi}$$

Result (type 4, 165 leaves):

$$\frac{a\,\mathrm{FresnelC}\left[d\,\left(a+b\,\mathrm{Log}\left[c\,x^n\right]\right)\right]}{b\,n}+\frac{\mathrm{FresnelC}\left[d\,\left(a+b\,\mathrm{Log}\left[c\,x^n\right]\right)\right]\,\mathrm{Log}\left[c\,x^n\right]}{n}-$$
$$\frac{\mathrm{Cos}\left[a\,b\,d^2\,\pi\,\mathrm{Log}\left[c\,x^n\right]+\frac{1}{2}\,b^2\,d^2\,\pi\,\mathrm{Log}\left[c\,x^n\right]^2\right]\,\mathrm{Sin}\left[\frac{1}{2}\,a^2\,d^2\,\pi\right]}{b\,d\,n\,\pi}-$$
$$\frac{\mathrm{Cos}\left[\frac{1}{2}\,a^2\,d^2\,\pi\right]\,\mathrm{Sin}\left[a\,b\,d^2\,\pi\,\mathrm{Log}\left[c\,x^n\right]+\frac{1}{2}\,b^2\,d^2\,\pi\,\mathrm{Log}\left[c\,x^n\right]^2\right]}{b\,d\,n\,\pi}$$

Problem 170: Unable to integrate problem.

$$\int e^{c+\frac{1}{2}\,i\,b^2\,\pi\,x^2}\,\mathrm{FresnelC}[b\,x]\,dx$$

Optimal (type 5, 64 leaves, 4 steps):

$$-\frac{i\,e^c\,\mathrm{Erfi}\left[\left(\frac{1}{2}+\frac{i}{2}\right)\,b\,\sqrt{\pi}\,x\right]^2}{8\,b}+\frac{1}{4}\,b\,e^c\,x^2\,\mathrm{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]$$

Result (type 8, 24 leaves):

$$\int e^{c+\frac{1}{2} i b^2 \pi x^2} \text{FresnelC}[b x] \, dx$$

Problem 171: Unable to integrate problem.

$$\int e^{c-\frac{1}{2} i b^2 \pi x^2} \text{FresnelC}[b x] \, dx$$

Optimal (type 5, 64 leaves, 4 steps):

$$-\frac{i e^c \text{Erf}\left[\left(\frac{1}{2}+\frac{i}{2}\right) b \sqrt{\pi}\, x\right]^2}{8 b}+\frac{1}{4} b e^c x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right]$$

Result (type 8, 24 leaves):

$$\int e^{c-\frac{1}{2} i b^2 \pi x^2} \text{FresnelC}[b x] \, dx$$

Problem 172: Unable to integrate problem.

$$\int \text{FresnelC}[b x] \, \text{Sin}\left[c+\frac{1}{2} b^2 \pi x^2\right] dx$$

Optimal (type 5, 101 leaves, 4 steps):

$$\frac{\text{Cos}[c] \, \text{FresnelC}[b x] \, \text{FresnelS}[b x]}{2 b}+\frac{1}{8} i b x^2 \text{Cos}[c] \, \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right]-\frac{1}{8} i b x^2 \text{Cos}[c] \, \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i b^2 \pi x^2\right]+\frac{\text{FresnelC}[b x]^2 \text{Sin}[c]}{2 b}$$

Result (type 8, 21 leaves):

$$\int \text{FresnelC}[b x] \, \text{Sin}\left[c+\frac{1}{2} b^2 \pi x^2\right] dx$$

Problem 173: Unable to integrate problem.

$$\int \text{Cos}\left[c+\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x] \, dx$$

Optimal (type 5, 101 leaves, 4 steps):

$$\frac{\text{Cos}[c] \, \text{FresnelC}[b x]^2}{2 b}-\frac{\text{FresnelC}[b x] \, \text{FresnelS}[b x] \, \text{Sin}[c]}{2 b}-\frac{1}{8} i b x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right] \text{Sin}[c]+\frac{1}{8} i b x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i b^2 \pi x^2\right] \text{Sin}[c]$$

Result (type 8, 21 leaves):

$$\int \text{Cos}\left[c+\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x] \, dx$$

Problem 180: Unable to integrate problem.

$$\int x^8 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x] \, dx$$

Optimal (type 4, 231 leaves, 22 steps):

$$\frac{105 x^2}{4 b^7 \pi^4}-\frac{7 x^6}{12 b^3 \pi^2}-\frac{55 x^2 \text{Cos}\left[b^2 \pi x^2\right]}{4 b^7 \pi^4}+\frac{x^6 \text{Cos}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}-\frac{105 x \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{b^8 \pi^4}+\frac{7 x^5 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{b^4 \pi^2}+\frac{105 \text{FresnelC}[b x]^2}{2 b^9 \pi^4}-\frac{35 x^3 \text{FresnelC}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^6 \pi^3}+\frac{x^7 \text{FresnelC}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^2 \pi}+\frac{40 \text{Sin}\left[b^2 \pi x^2\right]}{b^9 \pi^5}-\frac{5 x^4 \text{Sin}\left[b^2 \pi x^2\right]}{2 b^5 \pi^3}$$

Result (type 8, 22 leaves):

$$\int x^8 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x] \, dx$$

Problem 182: Unable to integrate problem.

$$\int x^6 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x] \, dx$$

Optimal (type 5, 247 leaves, 15 steps):

$$-\frac{5 x^4}{8 b^3 \pi^2}-\frac{11 \text{Cos}\left[b^2 \pi x^2\right]}{2 b^7 \pi^4}+\frac{x^4 \text{Cos}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}+\frac{5 x^3 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{b^4 \pi^2}+\frac{15 \text{FresnelC}[b x] \text{FresnelS}[b x]}{2 b^7 \pi^3}+\frac{15 i x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right]}{8 b^5 \pi^3}-\frac{15 i x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i b^2 \pi x^2\right]}{8 b^5 \pi^3}-\frac{15 x \text{FresnelC}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^6 \pi^3}+\frac{x^5 \text{FresnelC}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^2 \pi}-\frac{7 x^2 \text{Sin}\left[b^2 \pi x^2\right]}{4 b^5 \pi^3}$$

Result (type 8, 22 leaves):

$$\int x^6 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x] \, dx$$

Problem 184: Unable to integrate problem.

$$\int x^4 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x] \, dx$$

Optimal (type 4, 120 leaves, 9 steps):

$$-\frac{3 x^2}{4 b^3 \pi^2}+\frac{x^2 \text{Cos}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}+\frac{3 x \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{b^4 \pi^2}-\frac{3 \text{FresnelC}[b x]^2}{2 b^5 \pi^2}+\frac{x^3 \text{FresnelC}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^2 \pi}-\frac{\text{Sin}\left[b^2 \pi x^2\right]}{b^5 \pi^3}$$

Result (type 8, 22 leaves):

$$\int x^4 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x] \, dx$$

Problem 186: Unable to integrate problem.

$$\int x^2 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x] \, dx$$

Optimal (type 5, 136 leaves, 4 steps):

$$\frac{\text{Cos}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}-\frac{\text{FresnelC}[b x] \text{FresnelS}[b x]}{2 b^3 \pi}-\frac{i x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right]}{8 b \pi}+\frac{i x^2 \text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i b^2 \pi x^2\right]}{8 b \pi}+\frac{x \text{FresnelC}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^2 \pi}$$

Result (type 8, 22 leaves):

$$\int x^2 \text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x] \, dx$$

Problem 192: Unable to integrate problem.

$$\int \frac{\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{x^4} \, dx$$

Optimal (type 4, 109 leaves, 8 steps):

$$-\frac{b}{12 x^2}-\frac{b \text{Cos}\left[b^2 \pi x^2\right]}{12 x^2}-\frac{\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{3 x^3}-\frac{1}{6} b^3 \pi^2 \text{FresnelC}[b x]^2+\frac{b^2 \pi \text{FresnelC}[b x] \text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{3 x}-\frac{1}{6} b^3 \pi \text{SinIntegral}\left[b^2 \pi x^2\right]$$

Result (type 8, 22 leaves):

$$\int \frac{\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{x^4} \, dx$$

Problem 196: Unable to integrate problem.

$$\int \frac{\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{x^8} \, dx$$

Optimal (type 4, 224 leaves, 19 steps):

$$-\frac{b}{84 x^6}+\frac{b^5 \pi^2}{420 x^2}-\frac{b \,\text{Cos}\left[b^2 \pi x^2\right]}{84 x^6}+\frac{b^5 \pi^2 \,\text{Cos}\left[b^2 \pi x^2\right]}{84 x^2}-\frac{\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{7 x^7}+\frac{b^4 \pi^2 \,\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{105 x^3}+\frac{1}{210} b^7 \pi^4 \,\text{FresnelC}[b x]^2+\frac{b^2 \pi \,\text{FresnelC}[b x] \,\text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{35 x^5}-\frac{b^6 \pi^3 \,\text{FresnelC}[b x] \,\text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{105 x}+\frac{b^3 \pi \,\text{Sin}\left[b^2 \pi x^2\right]}{105 x^4}+\frac{1}{70} b^7 \pi^3 \,\text{SinIntegral}\left[b^2 \pi x^2\right]$$

Result (type 8, 22 leaves):

$$\int \frac{\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{x^8} \, dx$$

Problem 200: Unable to integrate problem.

$$\int x^8 \,\text{FresnelC}[b x] \,\text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right] dx$$

Optimal (type 5, 308 leaves, 23 steps):

$$-\frac{35 x^4}{8 b^5 \pi^3}+\frac{x^8}{16 b \pi}-\frac{40 \,\text{Cos}\left[b^2 \pi x^2\right]}{b^9 \pi^5}+\frac{5 x^4 \,\text{Cos}\left[b^2 \pi x^2\right]}{2 b^5 \pi^3}+\frac{35 x^3 \,\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{b^6 \pi^3}-\frac{x^7 \,\text{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \text{FresnelC}[b x]}{b^2 \pi}+\frac{105 \,\text{FresnelC}[b x] \,\text{FresnelS}[b x]}{2 b^9 \pi^4}+\frac{105 \,i\, x^2 \,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2} i b^2 \pi x^2\right]}{8 b^7 \pi^4}-\frac{105 \,i\, x^2 \,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2} i b^2 \pi x^2\right]}{8 b^7 \pi^4}-\frac{105 x \,\text{FresnelC}[b x] \,\text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^8 \pi^4}+\frac{7 x^5 \,\text{FresnelC}[b x] \,\text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{b^4 \pi^2}-\frac{55 x^2 \,\text{Sin}\left[b^2 \pi x^2\right]}{4 b^7 \pi^4}+\frac{x^6 \,\text{Sin}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}$$

Result (type 8, 22 leaves):

$$\int x^8 \,\text{FresnelC}[b x] \,\text{Sin}\left[\frac{1}{2} b^2 \pi x^2\right] dx$$

Problem 202: Unable to integrate problem.

$$\int x^6 \,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,dx$$

Optimal (type 4, 185 leaves, 16 steps):

$$-\frac{15\,x^2}{4\,b^5\,\pi^3}+\frac{x^6}{12\,b\,\pi}+\frac{7\,x^2\,\text{Cos}\left[b^2\,\pi\,x^2\right]}{4\,b^5\,\pi^3}+\frac{15\,x\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelC}[b\,x]}{b^6\,\pi^3}-\frac{x^5\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelC}[b\,x]}{b^2\,\pi}-\frac{15\,\text{FresnelC}[b\,x]^2}{2\,b^7\,\pi^3}+\frac{5\,x^3\,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{b^4\,\pi^2}-\frac{11\,\text{Sin}\left[b^2\,\pi\,x^2\right]}{2\,b^7\,\pi^4}+\frac{x^4\,\text{Sin}\left[b^2\,\pi\,x^2\right]}{4\,b^3\,\pi^2}$$

Result (type 8, 22 leaves):

$$\int x^6 \,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,dx$$

Problem 204: Unable to integrate problem.

$$\int x^4 \,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,dx$$

Optimal (type 5, 196 leaves, 10 steps):

$$\frac{x^4}{8\,b\,\pi}+\frac{\text{Cos}\left[b^2\,\pi\,x^2\right]}{b^5\,\pi^3}-\frac{x^3\,\text{Cos}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,\text{FresnelC}[b\,x]}{b^2\,\pi}-\frac{3\,\text{FresnelC}[b\,x]\,\text{FresnelS}[b\,x]}{2\,b^5\,\pi^2}-\frac{3\,i\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},-\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]}{8\,b^3\,\pi^2}+\frac{3\,i\,x^2\,\text{HypergeometricPFQ}\left[\{1,1\},\left\{\frac{3}{2},2\right\},\frac{1}{2}\,i\,b^2\,\pi\,x^2\right]}{8\,b^3\,\pi^2}+\frac{3\,x\,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]}{b^4\,\pi^2}+\frac{x^2\,\text{Sin}\left[b^2\,\pi\,x^2\right]}{4\,b^3\,\pi^2}$$

Result (type 8, 22 leaves):

$$\int x^4 \,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,dx$$

Problem 206: Unable to integrate problem.

$$\int x^2 \,\text{FresnelC}[b\,x]\,\text{Sin}\left[\frac{1}{2}\,b^2\,\pi\,x^2\right]\,dx$$

Optimal (type 4, 74 leaves, 5 steps):

$$\frac{x^2}{4 b \pi} - \frac{x \operatorname{Cos}\left[\frac{1}{2} b^2 \pi x^2\right] \operatorname{FresnelC}[b x]}{b^2 \pi} + \frac{\operatorname{FresnelC}[b x]^2}{2 b^3 \pi} + \frac{\operatorname{Sin}\left[b^2 \pi x^2\right]}{4 b^3 \pi^2}$$

Result (type 8, 22 leaves) :

$$\int x^2 \operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right] dx$$

Problem 208: Unable to integrate problem.

$$\int \operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right] dx$$

Optimal (type 5, 80 leaves, 1 step) :

$$\frac{\operatorname{FresnelC}[b x] \operatorname{FresnelS}[b x]}{2 b} + \frac{1}{8} i b x^2 \operatorname{HypergeometricPFQ}\left[\{1, 1\}, \left\{\frac{3}{2}, 2\right\}, -\frac{1}{2} i b^2 \pi x^2\right] - \frac{1}{8} i b x^2 \operatorname{HypergeometricPFQ}\left[\{1, 1\}, \left\{\frac{3}{2}, 2\right\}, \frac{1}{2} i b^2 \pi x^2\right]$$

Result (type 8, 19 leaves) :

$$\int \operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right] dx$$

Problem 210: Unable to integrate problem.

$$\int \frac{\operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{x^2} dx$$

Optimal (type 4, 48 leaves, 4 steps) :

$$\frac{1}{2} b \pi \operatorname{FresnelC}[b x]^2 - \frac{\operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{x} + \frac{1}{4} b \operatorname{SinIntegral}\left[b^2 \pi x^2\right]$$

Result (type 8, 22 leaves) :

$$\int \frac{\operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{x^2} dx$$

Problem 214: Unable to integrate problem.

$$\int \frac{\operatorname{FresnelC}[b x] \operatorname{Sin}\left[\frac{1}{2} b^2 \pi x^2\right]}{x^6} dx$$

Optimal (type 4, 163 leaves, 13 steps) :

$$-\frac{b^3\pi}{60x^2}-\frac{b^3\pi\,\mathrm{Cos}\left[b^2\pi x^2\right]}{24x^2}-\frac{b^2\pi\,\mathrm{Cos}\left[\frac{1}{2}b^2\pi x^2\right]\mathrm{FresnelC}[b\,x]}{15x^3}-\frac{1}{30}b^5\pi^3\,\mathrm{FresnelC}[b\,x]^2-\frac{\mathrm{FresnelC}[b\,x]\,\mathrm{Sin}\left[\frac{1}{2}b^2\pi x^2\right]}{5x^5}+\frac{b^4\pi^2\,\mathrm{FresnelC}[b\,x]\,\mathrm{Sin}\left[\frac{1}{2}b^2\pi x^2\right]}{15x}-\frac{b\,\mathrm{Sin}\left[b^2\pi x^2\right]}{40x^4}-\frac{7}{120}b^5\pi^2\,\mathrm{SinIntegral}\left[b^2\pi x^2\right]$$

Result (type 8, 22 leaves) :

$$\int\frac{\mathrm{FresnelC}[b\,x]\,\mathrm{Sin}\left[\frac{1}{2}b^2\pi x^2\right]}{x^6}\,dx$$

Problem 218: Unable to integrate problem.

$$\int\frac{\mathrm{FresnelC}[b\,x]\,\mathrm{Sin}\left[\frac{1}{2}b^2\pi x^2\right]}{x^{10}}\,dx$$

Optimal (type 4, 278 leaves, 26 steps) :

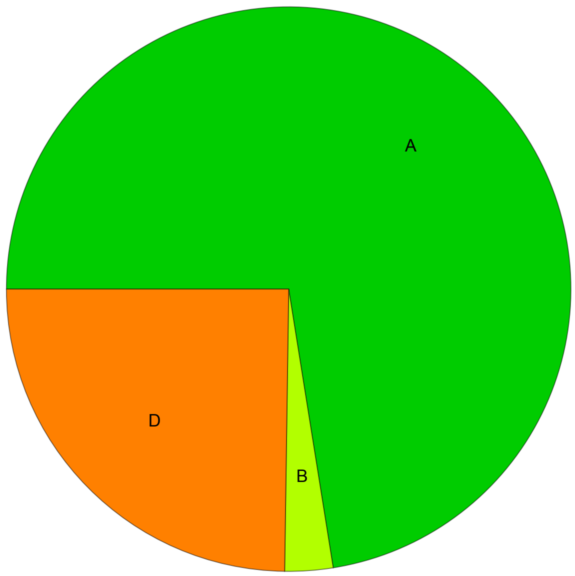
$$-\frac{b^3\pi}{756x^6}+\frac{b^7\pi^3}{3780x^2}-\frac{11b^3\pi\,\mathrm{Cos}\left[b^2\pi x^2\right]}{3024x^6}+\frac{5b^7\pi^3\,\mathrm{Cos}\left[b^2\pi x^2\right]}{2016x^2}-\frac{b^2\pi\,\mathrm{Cos}\left[\frac{1}{2}b^2\pi x^2\right]\mathrm{FresnelC}[b\,x]}{63x^7}+\frac{b^6\pi^3\,\mathrm{Cos}\left[\frac{1}{2}b^2\pi x^2\right]\mathrm{FresnelC}[b\,x]}{945x^3}+\frac{b^9\pi^5\,\mathrm{FresnelC}[b\,x]^2}{1890}-\frac{\mathrm{FresnelC}[b\,x]\,\mathrm{Sin}\left[\frac{1}{2}b^2\pi x^2\right]}{9x^9}+\frac{b^4\pi^2\,\mathrm{FresnelC}[b\,x]\,\mathrm{Sin}\left[\frac{1}{2}b^2\pi x^2\right]}{315x^5}-\frac{b^8\pi^4\,\mathrm{FresnelC}[b\,x]\,\mathrm{Sin}\left[\frac{1}{2}b^2\pi x^2\right]}{945x}-\frac{b\,\mathrm{Sin}\left[b^2\pi x^2\right]}{144x^8}+\frac{67b^5\pi^2\,\mathrm{Sin}\left[b^2\pi x^2\right]}{30\,240x^4}+\frac{83b^9\pi^4\,\mathrm{SinIntegral}\left[b^2\pi x^2\right]}{30\,240}$$

Result (type 8, 22 leaves) :

$$\int\frac{\mathrm{FresnelC}[b\,x]\,\mathrm{Sin}\left[\frac{1}{2}b^2\pi x^2\right]}{x^{10}}\,dx$$

Summary of Integration Test Results

218 integration problems



A - 158 optimal antiderivatives

B - 6 more than twice size of optimal antiderivatives

C - 0 unnecessarily complex antiderivatives

D - 54 unable to integrate problems

E - 0 integration timeouts