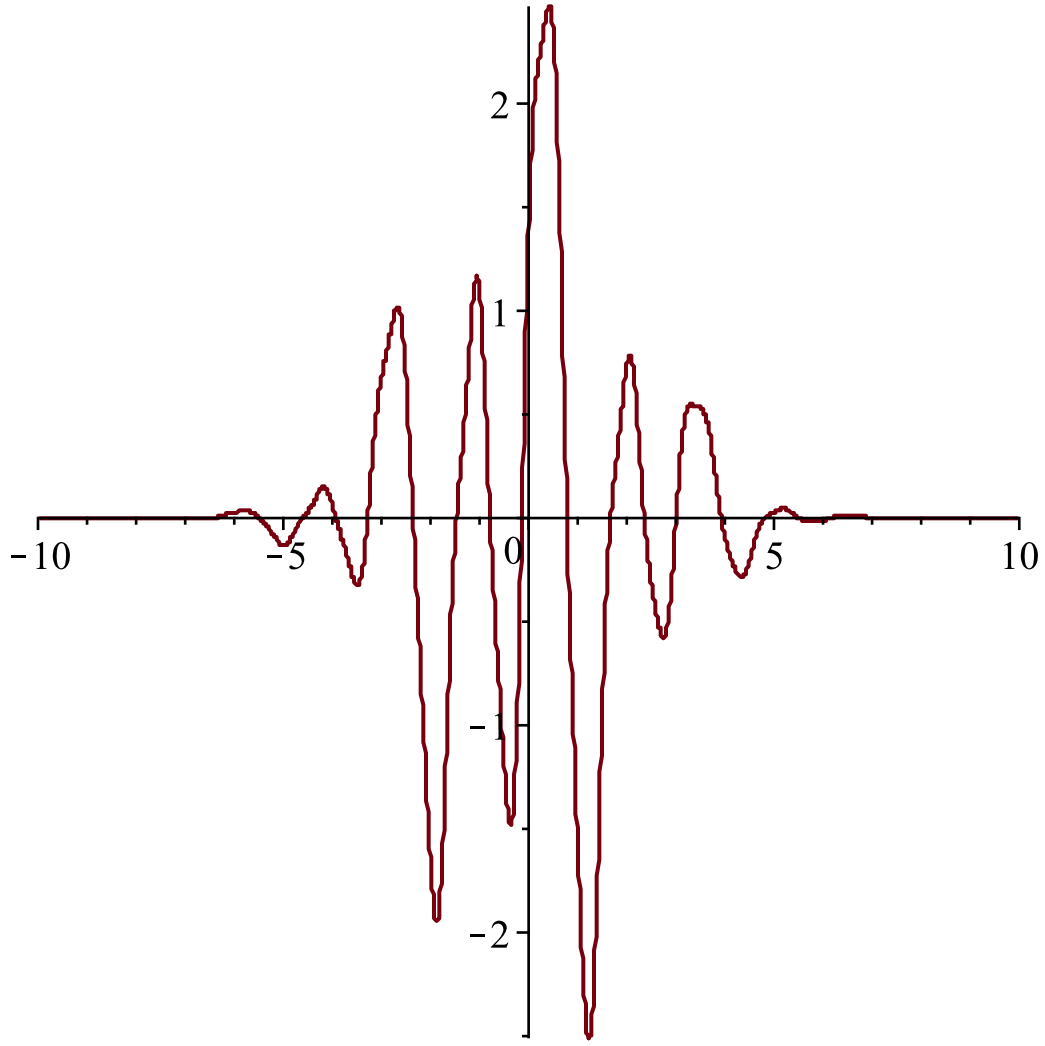
```
restart;
```

$$f := x \to (\cos(2\cdot x) + 2\cdot\sin(4\cdot x) + 0.4\cdot\cos(2\cdot x)\cdot\cos(10\cdot x))\cdot\exp\left(-\frac{x^2}{8}\right)$$

$$x \to (\cos(2\,x) + 2\sin(4\,x) + 0.4\cos(2\,x)\cos(10\,x))\,e^{-\frac{1}{8}x^2} \quad (1)$$

```
plot( f,-10..10, numpoints=2000)
```




```
a0 := value( (1/(2·Pi))*Int(f(x), x=-Pi..Pi) ); # the value of a_0
```

$$-0.01831626531 - 3.819718633\,10^{-15}\,I \quad (2)$$

```
a := n → value( (1/(Pi))*Int(f(x)*cos(n*x), x=-Pi..Pi) ); # the value of a_n
```

$$n \to value\left(\frac{\int_{-\pi}^{\pi} f(x)\cos(n\,x)\,dx}{\pi}\right) \quad (3)$$

```
b := n→ value( (1/(Pi))*Int(f(x)*sin(n*x), x=-Pi..Pi) ); # the value of b_n
```

$$n \to value\left(\frac{\int_{-\pi}^{\pi} f(x)\ \sin(n\,x)\ \mathrm{d}x}{\pi} \right) \tag{4}$$

abs($a0$)

$$0.01831626531 \tag{5}$$

for j **from** 1 **by** 1 **to** 25 **do** $print([j], \mathrm{abs}(a(j)))$ **end do**

[1], 0.1689352965
[2], 0.6997913956
[3], 0.1639504845
[4], 0.02131923542
[5], 0.01173682840
[6], 0.009845704196
[7], 0.03653179993
[8], 0.1372609244
[9], 0.03582556008
[10], 0.008915777563
[11], 0.03504938027
[12], 0.1389502637
[13], 0.03358240613
[14], 0.004845510193
[15], 0.002664029127
[16], 0.001784969863
[17], 0.001331466062
[18], 0.001056006945
[19], 0.0008706973172
[20], 0.0007372293492
[21], 0.0006363674129
[22], 0.0005574061177
[23], 0.0004939059027
[24], 0.0004417517322
[25], 0.0003981843462 (6)

for j **from** 1 **by** 1 **to** 25 **do** $print([j], \mathrm{abs}(b(j)))$ **end do**

[1], 0.01050139527
[2], 0.03191534929
[3], 0.3171675791
[4], 1.412572635
[5], 0.3183464179

$$[6], 0.03451620402$$
$$[7], 0.01514965726$$
$$[8], 0.008154429497$$
$$[9], 0.004990677877$$
$$[10], 0.003315434140$$
$$[11], 0.002331820945$$
$$[12], 0.001710634903$$
$$[13], 0.001296442641$$
$$[14], 0.001008383427$$
$$[15], 0.0008011744704$$
$$[16], 0.0006479430091$$
$$[17], 0.0005319759580$$
$$[18], 0.0004424681294$$
$$[19], 0.0003722023342$$
$$[20], 0.0003162218538$$
$$[21], 0.0002710395211$$
$$[22], 0.0002341498905$$
$$[23], 0.0002037191620$$
$$[24], 0.0001783828166$$
$$[25], 0.0001571104239 \quad \textbf{(7)}$$

 # With tolerance of 0.01 we obtain

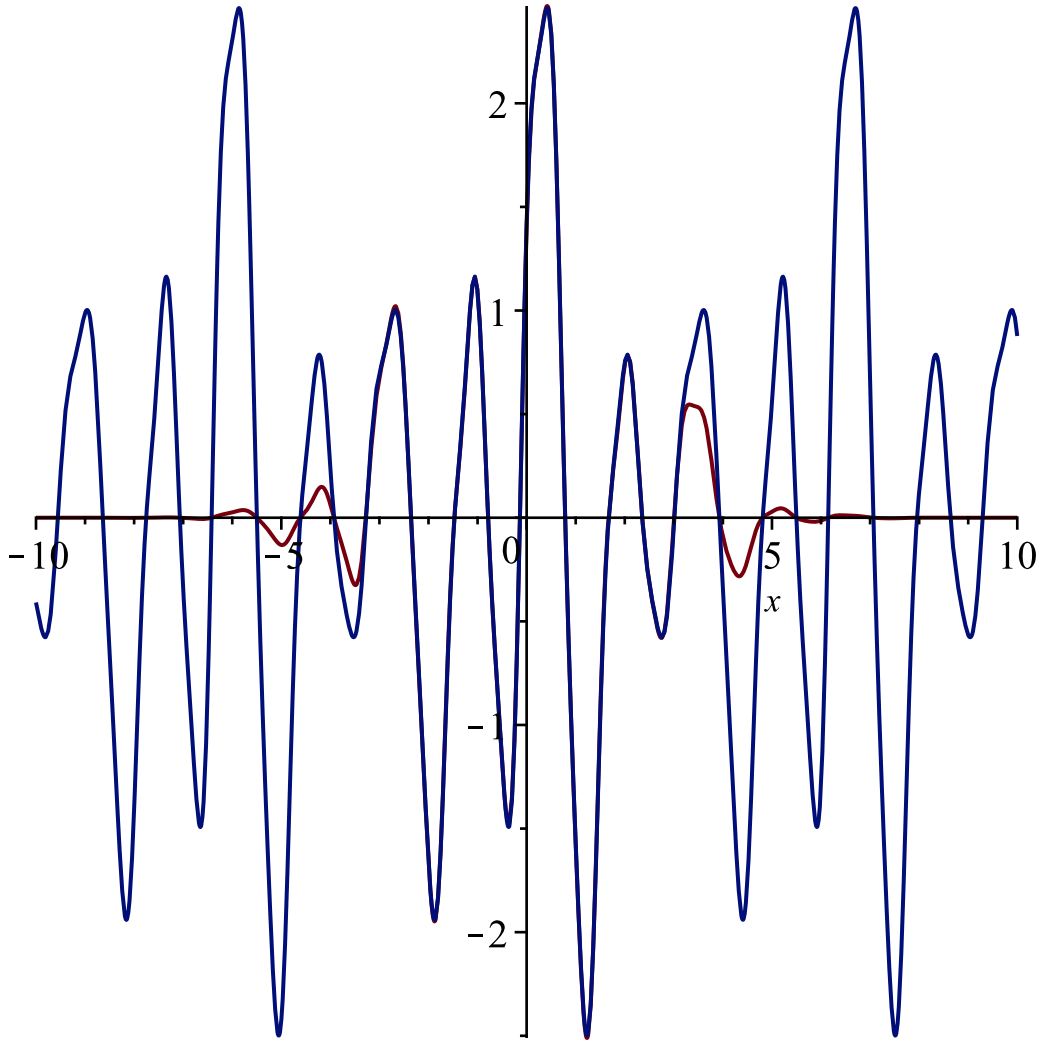
$$a0 + Sum(a(n)\cdot\cos(n\cdot x), n = 1..5) + Sum(a(n)\cdot\cos(n\cdot x), n = 7..9) + Sum(a(n)\cdot\cos(n\cdot x), n = 11..13) + Sum(b(n)\cdot\sin(n\cdot x), n = 1..7);$$

$$-0.01831626531 - 3.819718633\ 10^{-15}\,\mathrm{I} + \sum_{n=1}^{5} 0.07978845607\,\left(8.378942534\ 10^{-126}\,\mathrm{erf}(1.110720735 + 16.97056275\,\mathrm{I} + 1.414213562\,\mathrm{I}\,n) + 8.378942534\ 10^{-126}\,\mathrm{erf}(1.110720735 - 16.97056275\,\mathrm{I} - 1.414213562\,\mathrm{I}\,n) + \mathrm{e}^{96.\,n - 288.}\,\mathrm{erf}(1.110720735 + 16.97056275\,\mathrm{I} - 1.414213562\,\mathrm{I}\,n) + \mathrm{e}^{-128. + 16.\,n}\,\mathrm{erf}(1.110720735 + 11.31370850\,\mathrm{I} + 1.414213562\,\mathrm{I}\,n) + \mathrm{e}^{80.\,n - 128.}\,\mathrm{erf}(1.110720735 + 11.31370850\,\mathrm{I} - 1.414213562\,\mathrm{I}\,n) + 5.\,\mathrm{e}^{-8. + 40.\,n}\,\mathrm{erf}(1.110720735 + 2.828427125\,\mathrm{I} + 1.414213562\,\mathrm{I}\,n) + 5.\,\mathrm{e}^{56.\,n - 8.}\,\mathrm{erf}(1.110720735 + 2.828427125\,\mathrm{I} - 1.414213562\,\mathrm{I}\,n) + 5.\,\mathrm{e}^{56.\,n - 8.}\,\mathrm{erf}(1.110720735 - 2.828427125\,\mathrm{I} + 1.414213562\,\mathrm{I}\,n) + 5.\,\mathrm{e}^{-8. + 40.\,n}\,\mathrm{erf}(1.110720735 - 2.828427125\,\mathrm{I} - 1.414213562\,\mathrm{I}\,n) + \mathrm{e}^{80.\,n - 128.}\,\mathrm{erf}(1.110720735 - 11.31370850\,\mathrm{I} + 1.414213562\,\mathrm{I}\,n) + \mathrm{e}^{-128. + 16.\,n}\,\mathrm{erf}(1.110720735 - 11.31370850\,\mathrm{I} - 1.414213562\,\mathrm{I}\,n) + \mathrm{e}^{96.\,n - 288.}\,\mathrm{erf}(1.110720735 - 16.97056275\,\mathrm{I} + 1.414213562\,\mathrm{I}\,n)\right)\,\mathrm{e}^{-2.\,n^2 - 48.\,n}\,\cos(n\,x) \quad \textbf{(8)}$$

$$+\sum_{n=7}^{9} 0.07978845607\,\left(8.378942534\,10^{-126}\,\mathrm{erf}(1.110720735+16.97056275\,\mathrm{I}\right.$$
$$\left.+1.414213562\,\mathrm{I}\,n\right)+8.378942534\,10^{-126}\,\mathrm{erf}(1.110720735-16.97056275\,\mathrm{I}$$
$$-1.414213562\,\mathrm{I}\,n)+e^{96.\,n-288.}\,\mathrm{erf}(1.110720735+16.97056275\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)$$
$$+e^{-128.+16.\,n}\,\mathrm{erf}(1.110720735+11.31370850\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)$$
$$+e^{80.\,n-128.}\,\mathrm{erf}(1.110720735+11.31370850\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)$$
$$+5.\,e^{-8.+40.\,n}\,\mathrm{erf}(1.110720735+2.828427125\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)$$
$$+5.\,e^{56.\,n-8.}\,\mathrm{erf}(1.110720735+2.828427125\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)$$
$$+5.\,e^{56.\,n-8.}\,\mathrm{erf}(1.110720735-2.828427125\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)$$
$$+5.\,e^{-8.+40.\,n}\,\mathrm{erf}(1.110720735-2.828427125\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)$$
$$+e^{80.\,n-128.}\,\mathrm{erf}(1.110720735-11.31370850\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)$$
$$+e^{-128.+16.\,n}\,\mathrm{erf}(1.110720735-11.31370850\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)$$
$$\left.+e^{96.\,n-288.}\,\mathrm{erf}(1.110720735-16.97056275\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)\right)\,e^{-2.\,n^2-48.\,n}\cos(n\,x)$$
$$+\sum_{n=11}^{13} 0.07978845607\,\left(8.378942534\,10^{-126}\,\mathrm{erf}(1.110720735+16.97056275\,\mathrm{I}\right.$$
$$\left.+1.414213562\,\mathrm{I}\,n\right)+8.378942534\,10^{-126}\,\mathrm{erf}(1.110720735-16.97056275\,\mathrm{I}$$
$$-1.414213562\,\mathrm{I}\,n)+e^{96.\,n-288.}\,\mathrm{erf}(1.110720735+16.97056275\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)$$
$$+e^{-128.+16.\,n}\,\mathrm{erf}(1.110720735+11.31370850\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)$$
$$+e^{80.\,n-128.}\,\mathrm{erf}(1.110720735+11.31370850\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)$$
$$+5.\,e^{-8.+40.\,n}\,\mathrm{erf}(1.110720735+2.828427125\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)$$
$$+5.\,e^{56.\,n-8.}\,\mathrm{erf}(1.110720735+2.828427125\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)$$
$$+5.\,e^{56.\,n-8.}\,\mathrm{erf}(1.110720735-2.828427125\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)$$
$$+5.\,e^{-8.+40.\,n}\,\mathrm{erf}(1.110720735-2.828427125\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)$$
$$+e^{80.\,n-128.}\,\mathrm{erf}(1.110720735-11.31370850\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)$$
$$+e^{-128.+16.\,n}\,\mathrm{erf}(1.110720735-11.31370850\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)$$
$$\left.+e^{96.\,n-288.}\,\mathrm{erf}(1.110720735-16.97056275\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)\right)\,e^{-2.\,n^2-48.\,n}\cos(n\,x)$$
$$+\sum_{n=1}^{7}\left(-0.7978845607\,e^{-2.\,n^2-16.\,n-32.}\,\left(-1.\,e^{32.\,n}\,\mathrm{erf}(1.110720735-5.656854249\,\mathrm{I}\right.\right.$$
$$\left.+1.414213562\,\mathrm{I}\,n)-1.\,e^{32.\,n}\,\mathrm{erf}(1.110720735+5.656854249\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)\right.$$
$$+\mathrm{erf}(1.110720735-5.656854249\,\mathrm{I}-1.414213562\,\mathrm{I}\,n)+\mathrm{erf}(1.110720735$$
$$\left.\left.+5.656854249\,\mathrm{I}+1.414213562\,\mathrm{I}\,n)\right)\sin(n\,x)\right)$$

$S := value(\%)$:

$plot(\{f(x), S\}, x = -10..10)$



 # With tolerance of 0.3 we obtain

$$a(2)\cdot\cos(2\cdot x)+Sum(b(n)\cdot\sin(n\cdot x),n=3..5);$$

$$(0.6997913956+0.\,I)\cos(2x)+\sum_{n=3}^{5}\left(-0.7978845607\,e^{-2.n^2-16.n-32.}\left(\right.\right. \tag{9}$$

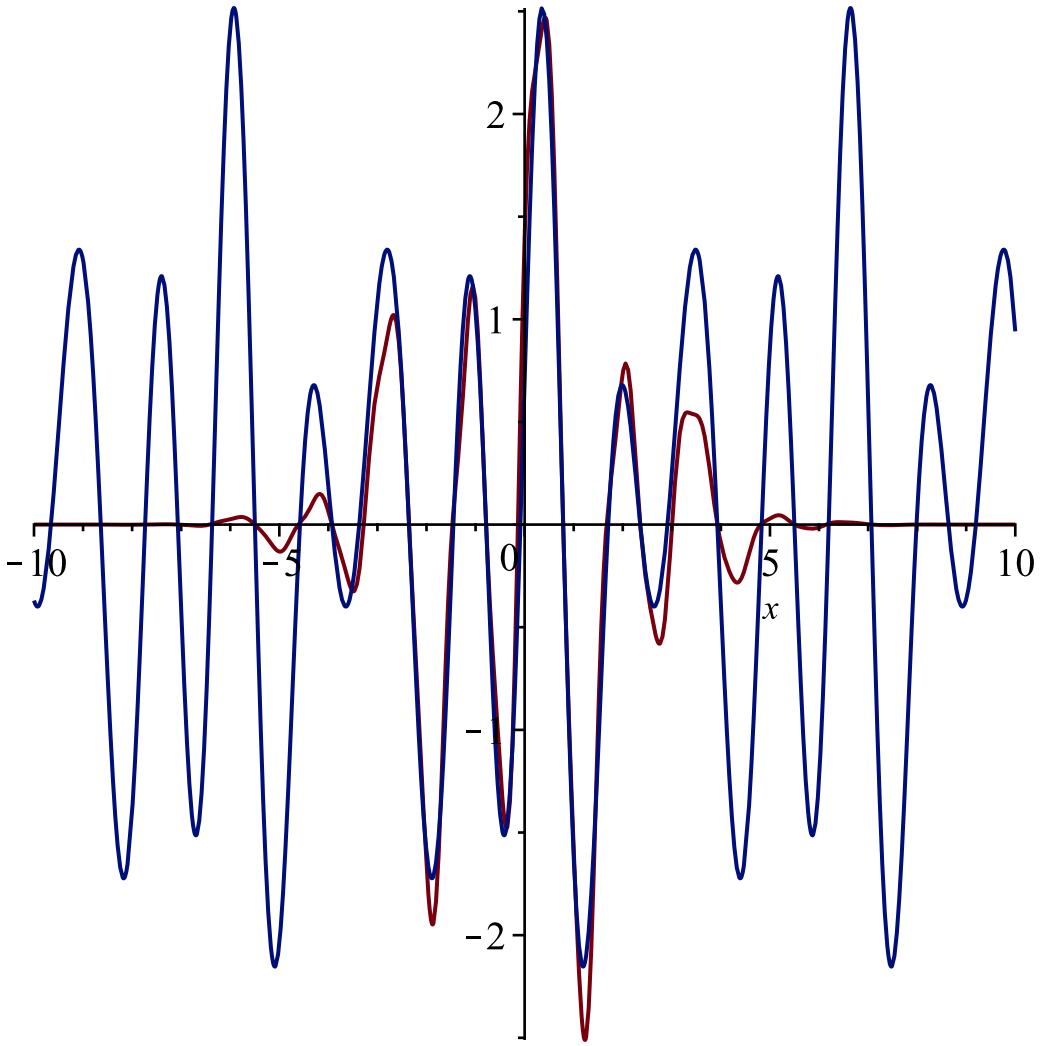
$$-1.\,e^{32.n}\,\mathrm{erf}(1.110720735-5.656854249\,I+1.414213562\,I\,n)-1.\,e^{32.n}\,\mathrm{erf}(1.110720735$$

$$+5.656854249\,I-1.414213562\,I\,n)+\mathrm{erf}(1.110720735-5.656854249\,I$$

$$\left.\left.-1.414213562\,I\,n)+\mathrm{erf}(1.110720735+5.656854249\,I+1.414213562\,I\,n)\right)\sin(n\,x)\right)$$

$S := value(\%)$:

$plot(\{f(x),S\},x=-10..10)$


2
1
−1
−2
−10
−5
0
5
10
x