

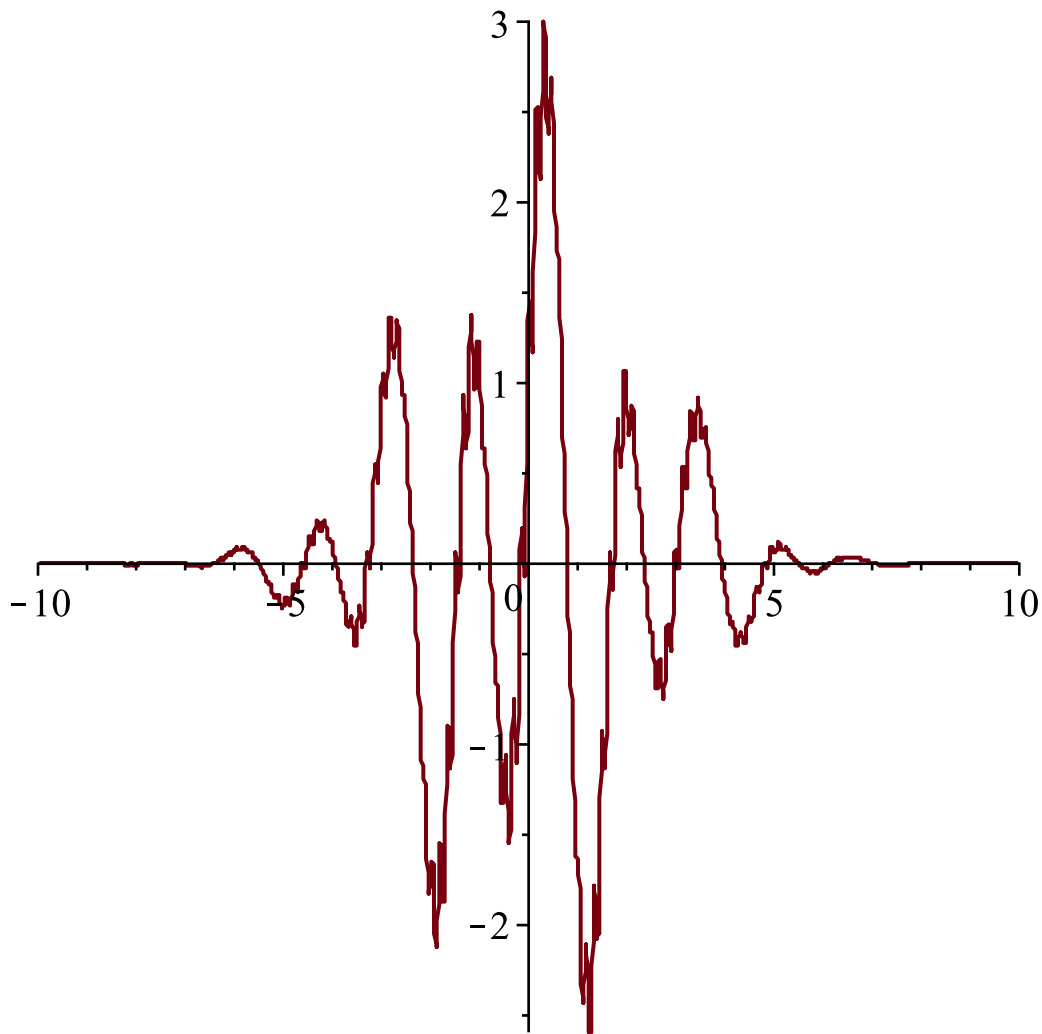
restart;

$$f := x \rightarrow (\cos(2 \cdot x) + 2 \cdot \sin(4 \cdot x) + 0.4 \cdot \cos(2 \cdot x) \cdot \cos(40 \cdot x)) \cdot \exp\left(-\frac{x^2}{10}\right)$$

$$x \rightarrow (\cos(2x) + 2 \sin(4x) + 0.4 \cos(2x) \cos(40x)) e^{-\frac{1}{10}x^2}$$

(1)

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



$a_0 := \text{value}\left(\frac{1}{2 \cdot \text{Pi}}\right) * \text{Int}(f(x), x = -\text{Pi} .. \text{Pi})$; # the value of a_0

$$-0.01939716410 - 7.321127380 \cdot 10^{-15} \text{I}$$

(2)

$a := n \rightarrow \text{value}\left(\frac{1}{\text{Pi}}\right) * \text{Int}(f(x) * \cos(n * x), x = -\text{Pi} .. \text{Pi})$; # the value of a_n

$$n \rightarrow \text{value}\left(\frac{\int_{-\pi}^{\pi} f(x) \cos(nx) \, dx}{\pi}\right)$$

(3)

$b := n \rightarrow \text{value}\left(\frac{1}{\text{Pi}}\right) * \text{Int}(f(x) * \sin(n * x), x = -\text{Pi} .. \text{Pi})$; # the value of b_n

$$n \rightarrow value \left(\frac{\int_{-\pi}^{\pi} f(x) \sin(n x) \, dx}{\pi} \right) \quad (4)$$

abs(*a0*)

0.01939716410

(5)

```

for j from 1 by 1 to 50 do print( [j], abs(a(j)) ) end do
[ 1 ], 0.1476872214
[ 2 ], 0.7445477843
[ 3 ], 0.1422293659
[ 4 ], 0.02149944693
[ 5 ], 0.01003136555
[ 6 ], 0.005926364799
[ 7 ], 0.003969783887
[ 8 ], 0.002871757925
[ 9 ], 0.002188597981
[10 ], 0.001732390166
[11 ], 0.001411692307
[12 ], 0.001177360422
[13 ], 0.001000940386
[14 ], 0.0008649783387
[15 ], 0.0007582674793
[16 ], 0.0006733448947
[17 ], 0.0006050957368
[18 ], 0.0005499380238
[19 ], 0.0005053288305
[20 ], 0.0004694573254
[21 ], 0.0004410519426
[22 ], 0.0004192615147
[23 ], 0.0004035885961
[24 ], 0.0003938648562
[25 ], 0.0003902675324
[26 ], 0.0003933856890
[27 ], 0.0004043593937
[28 ], 0.0004251411185
[29 ], 0.0004589829907
[30 ], 0.0005113772273
[31 ], 0.0005919861954
[32 ], 0.0007189579587

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[33], 0.0009297561837
[34], 0.001313016999
[35], 0.002126626146
[36], 0.004413440527
[37], 0.02855314628
[38], 0.1488080948
[39], 0.02963351236
[40], 0.007849913064
[41], 0.02962380552
[42], 0.1488275819
[43], 0.02852373085
[44], 0.004373870827
[45], 0.002076594105
[46], 0.001252126110
[47], 0.0008575132591
[48], 0.0006347625537
[49], 0.0004951172555
[50], 0.0004009763730

(6)

for j from 1 by 1 to 50 do $print([j], \text{abs}(b(j)))$ end do

[1], 0.01091687016
[2], 0.03459209603
[3], 0.2753152502
[4], 1.500943508
[5], 0.2765252713
[6], 0.03726288640
[7], 0.01569455126
[8], 0.008398605247
[9], 0.005128640916
[10], 0.003403251820
[11], 0.002392010828
[12], 0.001754049513
[13], 0.001328960626
[14], 0.001033460984
[15], 0.0008209713323
[16], 0.0006638742324
[17], 0.0005450045873
[18], 0.0004532703805

$$\begin{aligned}
& [19], 0.0003812656244 \\
& [20], 0.0003239054464 \\
& [21], 0.0002776133758 \\
& [22], 0.0002398203080 \\
& [23], 0.0002086461556 \\
& [24], 0.0001826921482 \\
& [25], 0.0001609021128 \\
& [26], 0.0001424678719 \\
& [27], 0.0001267635071 \\
& [28], 0.0001132989032 \\
& [29], 0.0001016864089 \\
& [30], 0.00009161657464 \\
& [31], 0.00008284026687 \\
& [32], 0.00007515532835 \\
& [33], 0.00006839651869 \\
& [34], 0.00006242785255 \\
& [35], 0.00005713670894 \\
& [36], 0.00005242926239 \\
& [37], 0.00004822691080 \\
& [38], 0.00004446346069 \\
& [39], 0.00004108289374 \\
& [40], 0.00003803758254 \\
& [41], 0.00003528685600 \\
& [42], 0.00003279583906 \\
& [43], 0.00003053450916 \\
& [44], 0.00002847692439 \\
& [45], 0.00002660058933 \\
& [46], 0.00002488593129 \\
& [47], 0.00002331586568 \\
& [48], 0.00002187543397 \\
& [49], 0.00002055150067 \\
& [50], 0.00001933249879
\end{aligned} \tag{7}$$

$N := 6 :$

$$a0 + \text{Sum}(a(n) \cdot \cos(n \cdot x), n = 1 .. N) + \text{Sum}(b(n) \cdot \sin(n \cdot x), n = 1 .. N);$$

$$- 0.01939716410 - 7.321127380 \cdot 10^{-15} I + \sum_{n=1}^6 \tag{8}$$

$$\begin{aligned}
& 0.08920620578 e^{-2.500000000 n^2 - 210. n} \left(e^{420. n - 4410.} \operatorname{erf}(0.9934588266 + 66.40783086 I \right. \\
& \left. - 1.581138830 I n) + e^{-3610. + 20. n} \operatorname{erf}(0.9934588266 + 60.08327554 I + 1.581138830 I n) \right)
\end{aligned}$$

$$\begin{aligned}
& + e^{400.n - 3610.} \operatorname{erf}(0.9934588266 + 60.08327554 I - 1.581138830 I n) \\
& + 5. e^{-10. + 200.n} \operatorname{erf}(0.9934588266 + 3.162277660 I + 1.581138830 I n) \\
& + 5. e^{220.n - 10.} \operatorname{erf}(0.9934588266 + 3.162277660 I - 1.581138830 I n) \\
& + 5. e^{220.n - 10.} \operatorname{erf}(0.9934588266 - 3.162277660 I + 1.581138830 I n) \\
& + 5. e^{-10. + 200.n} \operatorname{erf}(0.9934588266 - 3.162277660 I - 1.581138830 I n) \\
& + e^{400.n - 3610.} \operatorname{erf}(0.9934588266 - 60.08327554 I + 1.581138830 I n) \\
& + e^{-3610. + 20.n} \operatorname{erf}(0.9934588266 - 60.08327554 I - 1.581138830 I n) \\
& + e^{420.n - 4410.} \operatorname{erf}(0.9934588266 - 66.40783086 I + 1.581138830 I n) \\
& + 5.772112761 \cdot 10^{-1916} \operatorname{erf}(0.9934588266 + 66.40783086 I + 1.581138830 I n) \\
& + 5.772112761 \cdot 10^{-1916} \operatorname{erf}(0.9934588266 - 66.40783086 I - 1.581138830 I n) \big) \cos(n x) \\
& + \sum_{n=1}^6 \big(-0.8920620578 e^{-2.500000000 n^2 - 20.n - 40.} \big(-1. e^{40.n} \operatorname{erf}(0.9934588266 \\
& + 6.324555320 I - 1.581138830 I n) - 1. e^{40.n} \operatorname{erf}(0.9934588266 - 6.324555320 I \\
& + 1.581138830 I n) + \operatorname{erf}(0.9934588266 + 6.324555320 I + 1.581138830 I n) \\
& + \operatorname{erf}(0.9934588266 - 6.324555320 I - 1.581138830 I n) \big) \sin(n x) \big)
\end{aligned}$$

$S := \text{value}(\%) :$

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

