Blog Entry © Tuesday June 30, 2026, by James Pate Williams, Jr., Exploration of the One and Two-Dimensional Functions Exp(-x * x) and Exp(-x * x – y * y)

$$f(x,y) = e^{-x^2-y^2} = e^{-x^2}e^{-y^2} = g(x)h(y)$$

$$g(x) = e^{-x^2}$$

$$g(x) = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{n!}$$

$$\int g(x)dx = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1) \cdot n!} + C$$

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f(x) = exp(-x * x)
f(x, y) = exp(-x * x - y * y)
x = 1
y = 1
== Menu ==
0 Compute 1d Series
1 Compute 2d Series
2 Compute 1d Series Integral
3 Compute 2d Series Integral
4 Compute 1d Function
5 Compute 2d Function
6 Compute 1d Simpson Integral
7 Compute 2d Simpson Seq Integral
8 Compute 2d Simpson Mul Integral
9 Exit
Option 1 - 9: 0
Average Result = 0.367879441171449
Average Runtime (ns) = 126
# Terms = 22
Number runs = 1000
== Menu ==
0 Compute 1d Series
1 Compute 2d Series
2 Compute 1d Series Integral
3 Compute 2d Series Integral
4 Compute 1d Function
5 Compute 2d Function
6 Compute 1d Simpson Integral
7 Compute 2d Simpson Seq Integral
8 Compute 2d Simpson Mul Integral
9 Exit
Option 1 - 9: 4
Average Result = 0.367879441171449
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```
Average Runtime (ns) = 34
# Steps = 128
Number runs = 1000
== Menu ==
0 Compute 1d Series
1 Compute 2d Series
2 Compute 1d Series Integral
3 Compute 2d Series Integral
4 Compute 1d Function
5 Compute 2d Function
6 Compute 1d Simpson Integral
7 Compute 2d Simpson Seq Integral
8 Compute 2d Simpson Mul Integral
9 Exit
Option 1 - 9: 1
Average Result = 0.135335283236613
Average Runtime (ns) = 36
# Terms = 22
Number runs = 1000
== Menu ==
0 Compute 1d Series
1 Compute 2d Series
2 Compute 1d Series Integral
3 Compute 2d Series Integral
4 Compute 1d Function
5 Compute 2d Function
6 Compute 1d Simpson Integral
7 Compute 2d Simpson Seq Integral
8 Compute 2d Simpson Mul Integral
9 Exit
Option 1 - 9: 5
Average Result = 0.135335283236613
Average Runtime (ns) = 36
# Steps = 128
Number runs = 1000
== Menu ==
0 Compute 1d Series
1 Compute 2d Series
2 Compute 1d Series Integral
3 Compute 2d Series Integral
4 Compute 1d Function
5 Compute 2d Function
6 Compute 1d Simpson Integral
7 Compute 2d Simpson Seq Integral
8 Compute 2d Simpson Mul Integral
9 Exit
Option 1 - 9: 2
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```
Average Result = 0.746824132812433
Average Runtime (ns) = 34
# Terms = 22
Number runs = 1000
== Menu ==
0 Compute 1d Series
1 Compute 2d Series
2 Compute 1d Series Integral
3 Compute 2d Series Integral
4 Compute 1d Function
5 Compute 2d Function
6 Compute 1d Simpson Integral
7 Compute 2d Simpson Seq Integral
8 Compute 2d Simpson Mul Integral
9 Exit
Option 1 - 9: 6
Average Result = 0.746824132842894
Average Runtime (ns) = 2507
# Steps = 128
Number runs = 1000
== Menu ==
0 Compute 1d Series
1 Compute 2d Series
2 Compute 1d Series Integral
3 Compute 2d Series Integral
4 Compute 1d Function
5 Compute 2d Function
6 Compute 1d Simpson Integral
7 Compute 2d Simpson Seq Integral
8 Compute 2d Simpson Mul Integral
9 Exit
Option 1 - 9: 3
Average Result = 0.557746285351031
Average Runtime (ns) = 36
# Steps = 128
Number runs = 1000
== Menu ==
0 Compute 1d Series
1 Compute 2d Series
2 Compute 1d Series Integral
3 Compute 2d Series Integral
4 Compute 1d Function
5 Compute 2d Function
6 Compute 1d Simpson Integral
7 Compute 2d Simpson Seq Integral
8 Compute 2d Simpson Mul Integral
9 Exit
```

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Option 1 - 9: 7
Average Result = 0.566035400931470
Average Runtime (ns) = 27
# Steps = 128
Number runs = 1000
== Menu ==
0 Compute 1d Series
1 Compute 2d Series
2 Compute 1d Series Integral
3 Compute 2d Series Integral
4 Compute 1d Function
5 Compute 2d Function
6 Compute 1d Simpson Integral
7 Compute 2d Simpson Seq Integral
8 Compute 2d Simpson Mul Integral
9 Exit
Option 1 - 9: 8
Average Result = 0.566035400931470
Average Runtime (ns) = 579210
# Steps = 128
Number runs = 1000
== Menu ==
0 Compute 1d Series
1 Compute 2d Series
2 Compute 1d Series Integral
3 Compute 2d Series Integral
4 Compute 1d Function
5 Compute 2d Function
6 Compute 1d Simpson Integral
7 Compute 2d Simpson Seq Integral
8 Compute 2d Simpson Mul Integral
9 Exit
Option 1 - 9: 9

C:\Users\James\OneDrive\ExpExperiment\x64\Release\ExpExperiment.
exe (process 7216) exited with code 0 (0x0).
Press any key to close this window . . .
```