

Three Integration Methods © March 24, 2024, by James Pate Williams. Jr.

The three one-dimensional integration algorithms tested were:

1. Trapezoidal Rule
2. Simpson's Rule
3. Integral function in NUMAL C Package of DLLs.

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
5000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap:  0.0688978845 Time: 0.000000
Simp:  0.0688405578 Time: 0.000000
Inte:  0.0688405639 Time: 0.002000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
6000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap:  0.0688803695 Time: 0.000000
Simp:  0.0688405610 Time: 0.000000
Inte:  0.0688405639 Time: 0.002000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
7000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap: 0.0688698087 Time: 0.000000
Simp: 0.0688405623 Time: 0.000000
Inte: 0.0688405639 Time: 0.002000
Another run (n or y)?
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
8000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap: 0.0688629544 Time: 0.001000
Simp: 0.0688405629 Time: 0.000000
Inte: 0.0688405639 Time: 0.002000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
9000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap: 0.0688582551 Time: 0.001000
Simp: 0.0688405633 Time: 0.000000
Inte: 0.0688405639 Time: 0.002000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
10000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap: 0.0688548937 Time: 0.000000
Simp: 0.0688405635 Time: 0.001000
Inte: 0.0688405639 Time: 0.002000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
11000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap: 0.0688524067 Time: 0.000000
Simp: 0.0688405636 Time: 0.001000
Inte: 0.0688405639 Time: 0.002000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
12000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap: 0.0688505151 Time: 0.000000
Simp: 0.0688405637 Time: 0.000000
Inte: 0.0688405639 Time: 0.002000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
13000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap: 0.0688490431 Time: 0.000000
Simp: 0.0688405637 Time: 0.000000
Inte: 0.0688405639 Time: 0.002000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
14000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap: 0.0688478750 Time: 0.001000
Simp: 0.0688405638 Time: 0.000000
Inte: 0.0688405639 Time: 0.002000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
15000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap: 0.0688469327 Time: 0.000000
Simp: 0.0688405638 Time: 0.001000
Inte: 0.0688405639 Time: 0.002000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
16000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
1
Trap: 0.0688461614 Time: 0.001000
Simp: 0.0688405638 Time: 0.000000
Inte: 0.0688405639 Time: 0.002000
Another run (n or y)? n
```

Wolfram Alpha approximates the integral as 0.06881:

[Integrate\[x*sin\(x*x\),{x,0,10}\] - Wolfram|Alpha \(wolframalpha.com\)](https://www.wolframalpha.com/input/?i=Integrate[x*sin(x*x),{x,0,10}])

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
1000
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
2
Trap: 0.5000150315 Time: 0.000000
Simp: 0.5000066975 Time: 0.000000
Inte: 0.5000066976 Time: 0.000000
Another run (n or y)? n
```

```
Enter the lt endpoint a:
0
Enter the rt endpoint b:
10
Enter the # of steps:
1500
== Function Menu ==
1 f(x) = x * sin(x * x)
2 g(x) = exp(-x) * cos(x)
2
Trap: 0.5000104016 Time: 0.000000
Simp: 0.5000066976 Time: 0.000000
Inte: 0.5000066976 Time: 0.000000
Another run (n or y)? n
```

Wolfram Alpha approximates the integral as 0.50001:

[Integrate\[Power\[e,-x\]*cos\(x\),{x,0,10}\] - Wolfram|Alpha \(wolframalpha.com\)](https://www.wolframalpha.com/input/?i=Integrate[Power[e,-x]*cos(x),{x,0,10}])