Numerical Differential and Integration

Numerical Integration

1. Trapezoidal Rule (Two point Rule)
2. Simpson’s Rule (Three point Rule)
3. Simpson’s Rule (Four point Rule)

Simpson’s Rule (Three point Rule)

If a function y=f(x) is defined and continuous on an interval [x0,x1]=[a,b], then

Composite Simpson’s Rule (Three point Rule)

Algorithm

1. Start
2. Declare variables and define function as f(x)
3. Choose value of lower limit , upper limit , number of subintervals n
4. Compute
5. Compute
6. Display
7. Stop

1.

Integrating f(x) = x\*x+1 by Simpson's 1/3 rule

Enter the values of x0, xn, n : 1 2 6

The approximate value of the integral is I = 3.22222257

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Process exited with return value 0

Press any key to continue . . .

2.

Integrating f(x) = pow(sin(x),0.5) by Simpson's 1/3 rule

Enter the values of x0, xn, n : 0 1.570796 6

The approximate value of the integral is I = 1.36181378

3.a

Integrating f(x) = asin(x)/x by Simpson's 1/3 rule

Enter the values of x0, xn, n : 0 1 6

The approximate value of the integral is I = -1.#IND0000

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Process exited with return value 0

Press any key to continue . . .

3.b

Integrating f(x) = atan(x)/x by Simpson's 1/3 rule

Enter the values of x0, xn, n : 0 1 6

The approximate value of the integral is I = -1.#IND0000

4.

Integrating f(x) = exp(sin(x)) by Simpson's 1/3 rule

Enter the values of x0, xn, n : 0 1.57 6

The approximate value of the integral is I = 3.57640195

5.

Integrating f(x) = x\*x\*log(x) by Simpson's 1/3 rule

Enter the values of x0, xn, n : 3 7 6

The approximate value of the integral is I = 219.86097717

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Process exited with return value 0

Press any key to continue . . .

6.

Integrating f(x) = 1/(1+x\*x) by Simpson's 1/3 rule

Enter the values of x0, xn, n : -1 1 6

The approximate value of the integral is I = 1.68205142

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Process exited with return value 0

Press any key to continue . . .

1.

Integrating f(x) = x\*x+1 by Simpson's 1/3 rule

Enter the values of x0, xn, n : 1 2 6

Length of each interval = h = 0.166667

Table for functional values:

x f(x)

1.000000 2.000000

1.166667 2.361111

1.333333 2.777778

1.500000 3.250000

1.666667 3.777778

1.833333 4.361111

2.000000 5.000000

The approximate value of the integral is I = 3.33333349

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Process exited with return value 0

Press any key to continue . . .

2.

Integrating f(x) = pow(sin(x),0.5) by Simpson's 1/3 rule

Enter the values of x0, xn, n : 0 1.570796 6

Length of each interval = h = 0.261799

Table for functional values:

x f(x)

0.000000 0.000000

0.261799 0.508743

0.523599 0.707107

0.785398 0.840896

1.047197 0.930605

1.308997 0.982815

1.570796 1.000000

The approximate value of the integral is I = 1.18728089

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Process exited with return value 0

Press any key to continue . . .

3.a)

Integrating f(x) = asin(x)/x by Simpson's 1/3 rule

Enter the values of x0, xn, n : 0.000001 1 6

Length of each interval = h = 0.166666

Table for functional values:

x f(x)

0.000001 1.000000

0.166667 1.004689

0.333334 1.019511

0.500000 1.047198

0.666667 1.094592

0.833333 1.182133

1.000000 1.570796

The approximate value of the integral is I = 1.09639204

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Process exited with return value 0

Press any key to continue . . .

3.b)

Integrating f(x) = atan(x)/x by Simpson's 1/3 rule

Enter the values of x0, xn, n : 0.000001 1 6

Length of each interval = h = 0.166666

Table for functional values:

x f(x)

0.000001 1.000000

0.166667 0.990892

0.333334 0.965252

0.500000 0.927295

0.666667 0.882004

0.833333 0.833686

1.000000 0.785398

The approximate value of the integral is I = 0.91596574

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Process exited with return value 0

Press any key to continue . . .

4.

Integrating f(x) = exp(sin(x)) by Simpson's 1/3 rule

Enter the values of x0, xn, n : 0 1.570796 6

Length of each interval = h = 0.261799

Table for functional values:

x f(x)

0.000000 1.000000

0.261799 1.295399

0.523599 1.648721

0.785398 2.028115

1.047197 2.377442

1.308997 2.627219

1.570796 2.718282

The approximate value of the integral is I = 3.10437632

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Process exited with return value 0

Press any key to continue . . .

5.

Integrating f(x) = x\*x\*log(x) by Simpson's 1/3 rule

Enter the values of x0, xn, n : 3 7 6

Length of each interval = h = 0.666667

Table for functional values:

x f(x)

3.000000 9.887511

3.666667 17.468139

4.333333 27.534554

5.000000 40.235948

5.666667 55.699975

6.333333 74.038164

7.000000 95.349597

The approximate value of the integral is I = 177.48338318

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Process exited with return value 0

Press any key to continue . . .

6.

Integrating f(x) = 1/(1+x\*x) by Simpson's 1/3 rule

Enter the values of x0, xn, n : -1 1 6

Length of each interval = h = 0.333333

Table for functional values:

x f(x)

-1.000000 0.500000

-0.666667 0.692308

-0.333333 0.900000

0.000000 1.000000

0.333333 0.900000

0.666667 0.692308

1.000000 0.500000

The approximate value of the integral is I = 1.57094026

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Process exited with return value 0

Press any key to continue . . .

1.

Integrating f(x) = x\*x+1 by Simpson's 3/8 rule

Enter the values of x0, xn, n : 1 2 6

Length of each interval = h = 0.166667

Table for functional values:

x f(x)

1.000000 2.000000

1.166667 2.361111

1.333333 2.777778

1.500000 3.250000

1.666667 3.777778

1.833333 4.361111

2.000000 5.000000

The approximate value of the integral is I = 3.33333325

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Process exited with return value 0

Press any key to continue . . .

2.

Integrating f(x) = pow(sin(x),0.5) by Simpson's 3/8 rule

Enter the values of x0, xn, n : 0 1.570796 6

Length of each interval = h = 0.261799

Table for functional values:

x f(x)

0.000000 0.000000

0.261799 0.508743

0.523599 0.707107

0.785398 0.840896

1.047197 0.930605

1.308997 0.982815

1.570796 1.000000

The approximate value of the integral is I = 1.18492997

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Process exited with return value 0

Press any key to continue . . .

3.a)

Integrating f(x) = asin(x)/x by Simpson's 3/8 rule

Enter the values of x0, xn, n : 0.000001 1 6

Length of each interval = h = 0.166666

Table for functional values:

x f(x)

0.000001 1.000000

0.166667 1.004689

0.333334 1.019511

0.500000 1.047198

0.666667 1.094592

0.833333 1.182133

1.000000 1.570796

The approximate value of the integral is I = 1.09799659

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Process exited with return value 0

Press any key to continue . . .

3.b)

Integrating f(x) = atan(x)/x by Simpson's 3/8 rule

Enter the values of x0, xn, n : 0.000001 1 6

Length of each interval = h = 0.166666

Table for functional values:

x f(x)

0.000001 1.000000

0.166667 0.990892

0.333334 0.965252

0.500000 0.927295

0.666667 0.882004

0.833333 0.833686

1.000000 0.785398

The approximate value of the integral is I = 0.91596705

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Process exited with return value 0

Press any key to continue . . .

4.

Integrating f(x) = exp(sin(x)) by Simpson's 3/8 rule

Enter the values of x0, xn, n : 0 1.570796 6

Length of each interval = h = 0.261799

Table for functional values:

x f(x)

0.000000 1.000000

0.261799 1.295399

0.523599 1.648721

0.785398 2.028115

1.047197 2.377442

1.308997 2.627219

1.570796 2.718282

The approximate value of the integral is I = 3.10436988

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Process exited with return value 0

Press any key to continue . . .

5.

Integrating f(x) = x\*x\*log(x) by Simpson's 3/8 rule

Enter the values of x0, xn, n : 3 7 6

Length of each interval = h = 0.666667

Table for functional values:

x f(x)

3.000000 9.887511

3.666667 17.468139

4.333333 27.534554

5.000000 40.235948

5.666667 55.699975

6.333333 74.038164

7.000000 95.349597

The approximate value of the integral is I = 177.48286438

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Process exited with return value 0

Press any key to continue . . .

6.

Integrating f(x) = 1/(1+x\*x) by Simpson's 3/8 rule

Enter the values of x0, xn, n : -1 1 6

Length of each interval = h = 0.333333

Table for functional values:

x f(x)

-1.000000 0.500000

-0.666667 0.692308

-0.333333 0.900000

0.000000 1.000000

0.333333 0.900000

0.666667 0.692308

1.000000 0.500000

The approximate value of the integral is I = 1.56923079

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Process exited with return value 0

Press any key to continue . . .