Simpsons Method

This method is used to find an integral of a function.
Let a,b be the lower and upper bounds,2N be the total number of intervals and h be the length of the interval then:

$$\int_a^b f(x)\,dx = h/3\,(f(x_0)+ 4(f(x_1) + f(x_3) + f(x_5)+.....+f(x_{2N-1}))+ 2\,(f(x_2) + f(x_4) + ...+f(x_{2N-2})) + f(x_{2N}))$$

(here x_0,x_1,x_2..... are the values of x at each interval)

Simpson1

The integal to be found is:

$$\int_0^1 x(1 - x^2)\,dx$$

Program is simpson1.c attached above.
*1.**When a = 0, b = 1, h = 0.25 is:***
Required input:
./simpson1 0 1 0.25
Output:
x[0] = 0.000000, f[0] = 0.000000
x[1] = 0.250000, f[1] = 0.234375
x[2] = 0.500000, f[2] = 0.375000
x[3] = 0.750000, f[3] = 0.328125
x[4] = 1.000000, f[4] = 0.000000
Ans = 0.250000
*2.**When a = 0, b = 1, h = 0.1 is:***
Required input:
./simpson1 0 1 0.1
Output:
x[0] = 0.000000, f[0] = 0.000000
x[1] = 0.100000, f[1] = 0.099000
x[2] = 0.200000, f[2] = 0.192000
x[3] = 0.300000, f[3] = 0.273000
x[4] = 0.400000, f[4] = 0.336000
x[5] = 0.500000, f[5] = 0.375000
x[6] = 0.600000, f[6] = 0.384000
x[7] = 0.700000, f[7] = 0.357000
x[8] = 0.800000, f[8] = 0.288000
x[9] = 0.900000, f[9] = 0.171000
x[10] = 1.000000, f[10] = 0.000000
Ans = 0.250000
*3.**When a = 0, b = 1, h = 0.05 is:***
Required input:
./simpson1 0 1 0.05
Output:
x[0] = 0.000000, f[0] = 0.000000
x[1] = 0.050000, f[1] = 0.049875
x[2] = 0.100000, f[2] = 0.099000
x[3] = 0.150000, f[3] = 0.146625
x[4] = 0.200000, f[4] = 0.192000
x[5] = 0.250000, f[5] = 0.234375

x[6] = 0.300000, f[6] = 0.273000
x[7] = 0.350000, f[7] = 0.307125
x[8] = 0.400000, f[8] = 0.336000
x[9] = 0.450000, f[9] = 0.358875
x[10] = 0.500000, f[10] = 0.375000
x[11] = 0.550000, f[11] = 0.383625
x[12] = 0.600000, f[12] = 0.384000
x[13] = 0.650000, f[13] = 0.375375
x[14] = 0.700000, f[14] = 0.357000
x[15] = 0.750000, f[15] = 0.328125
x[16] = 0.800000, f[16] = 0.288000
x[17] = 0.850000, f[17] = 0.235875
x[18] = 0.900000, f[18] = 0.171000
x[19] = 0.950000, f[19] = 0.092625
x[20] = 1.000000, f[20] = 0.000000
Ans = 0.250000

Simpson2

The integal to be found is:

$$\int_0^1 1/(1+x^3)\,dx$$

Program is simpson2.c attached above.
*1.**When a = 0, b = 1, h = 0.25 is:***
Required input:
./simpson2 0 1 0.25
Output:
x[0] = 0.000000, f[0] = 1.000000
x[1] = 0.250000, f[1] = 0.984615
x[2] = 0.500000, f[2] = 0.888889
x[3] = 0.750000, f[3] = 0.703297
x[4] = 1.000000, f[4] = 0.500000
Ans = 0.835786
*2.**When a = 0, b = 1, h = 0.1 is:***
Required input:
./simpson2 0 1 0.1
Output:
x[0] = 0.000000, f[0] = 1.000000
x[1] = 0.100000, f[1] = 0.999001
x[2] = 0.200000, f[2] = 0.992063
x[3] = 0.300000, f[3] = 0.973710
x[4] = 0.400000, f[4] = 0.939850
x[5] = 0.500000, f[5] = 0.888889
x[6] = 0.600000, f[6] = 0.822368
x[7] = 0.700000, f[7] = 0.744602
x[8] = 0.800000, f[8] = 0.661376
x[9] = 0.900000, f[9] = 0.578369
x[10] = 1.000000, f[10] = 0.500000
Ans = 0.835653
*3.**When a = 0, b = 1, h = 0.05 is:***

Required input:

./simpson2 0 1 0.05

Output:

x[0] = 0.000000, f[0] = 1.000000
x[1] = 0.050000, f[1] = 0.999875
x[2] = 0.100000, f[2] = 0.999001
x[3] = 0.150000, f[3] = 0.996636
x[4] = 0.200000, f[4] = 0.992063
x[5] = 0.250000, f[5] = 0.984615
x[6] = 0.300000, f[6] = 0.973710
x[7] = 0.350000, f[7] = 0.958888
x[8] = 0.400000, f[8] = 0.939850
x[9] = 0.450000, f[9] = 0.916485
x[10] = 0.500000, f[10] = 0.888889
x[11] = 0.550000, f[11] = 0.857357
x[12] = 0.600000, f[12] = 0.822368
x[13] = 0.650000, f[13] = 0.784545
x[14] = 0.700000, f[14] = 0.744602
x[15] = 0.750000, f[15] = 0.703297
x[16] = 0.800000, f[16] = 0.661376
x[17] = 0.850000, f[17] = 0.619531
x[18] = 0.900000, f[18] = 0.578369
x[19] = 0.950000, f[19] = 0.538394
x[20] = 1.000000, f[20] = 0.500000
Ans = 0.835649

Simpson3

The integal to be found is:

$$\int_0^1 \log_e(x)\,dx$$

Program is simpson3.c attached above.

*1.**When a = 0, b = 1, h = 0.25 is:***

Required input:

./simpson3 0 1 0.25

Output:

x[0] = 0.000000, f[0] = 0.000000
x[1] = 0.250000, f[1] = 0.223144
x[2] = 0.500000, f[2] = 0.405465
x[3] = 0.750000, f[3] = 0.559616
x[4] = 1.000000, f[4] = 0.693147
Ans = 0.386260

*2.**When a = 0, b = 1, h = 0.1 is:***

Required input:

./simpson3 0 1 0.1

Output:

x[0] = 0.000000, f[0] = 0.000000
x[1] = 0.100000, f[1] = 0.095310
x[2] = 0.200000, f[2] = 0.182322
x[3] = 0.300000, f[3] = 0.262364

x[4] = 0.400000, f[4] = 0.336472
x[5] = 0.500000, f[5] = 0.405465
x[6] = 0.600000, f[6] = 0.470004
x[7] = 0.700000, f[7] = 0.530628
x[8] = 0.800000, f[8] = 0.587787
x[9] = 0.900000, f[9] = 0.641854
x[10] = 1.000000, f[10] = 0.693147
Ans = 0.386293

3.When a = 0, b = 1, h = 0.1 is:

Required input:

./simpson3 0 1 0.05

Output:

x[0] = 0.000000, f[0] = 0.000000
x[1] = 0.050000, f[1] = 0.048790
x[2] = 0.100000, f[2] = 0.095310
x[3] = 0.150000, f[3] = 0.139762
x[4] = 0.200000, f[4] = 0.182322
x[5] = 0.250000, f[5] = 0.223144
x[6] = 0.300000, f[6] = 0.262364
x[7] = 0.350000, f[7] = 0.300105
x[8] = 0.400000, f[8] = 0.336472
x[9] = 0.450000, f[9] = 0.371564
x[10] = 0.500000, f[10] = 0.405465
x[11] = 0.550000, f[11] = 0.438255
x[12] = 0.600000, f[12] = 0.470004
x[13] = 0.650000, f[13] = 0.500775
x[14] = 0.700000, f[14] = 0.530628
x[15] = 0.750000, f[15] = 0.559616
x[16] = 0.800000, f[16] = 0.587787
x[17] = 0.850000, f[17] = 0.615186
x[18] = 0.900000, f[18] = 0.641854
x[19] = 0.950000, f[19] = 0.667829
x[20] = 1.000000, f[20] = 0.693147
Ans = 0.386294