Function: x * x * x - 2 * sin(x)

```
Enter two valid initial a and b: 1 2
The approximate root of the given function is 1.236183 with 17 number of iterations.
--------------------------------
Process exited after 6.783 seconds with return value 0
Press any key to continue . . .
```

Function: x * x * x – 5

```
Enter two valid initial a and b: 1 2
The approximate root of the given function is 1.709976 with 16 number of iterations.
--------------------------------
Process exited after 1.535 seconds with return value 0
Press any key to continue . . .
```

Function: x * x * x - 3 * x + 1

```
Enter two valid initial points x0 and x1: 0 1
The approximate root of the given function is 0.347296 with 6 number of iterations.
--------------------------------
Process exited after 4.96 seconds with return value 0
Press any key to continue . . .
```

Function: 2 * sin(x) – x

```
Enter two valid initial points x0 and x1: 1 2
The approximate root of the given function is 1.895494 with 5 number of iterations.
--------------------------------
Process exited after 4.731 seconds with return value 0
Press any key to continue . . .
```

Function: x * sin(x) + cos(x) & x * cos(x)

```
Enter a valid input point(x0): 1
The approximate root of given function is: 56.530979 with 6 number of iterations.
--------------------------------
Process exited after 1.506 seconds with return value 0
Press any key to continue . . .
```

Function: x * x * x - 5 * x + 7 & 3 * x * x - 5

```
Enter a valid input point(x0): 2
The approximate root of given function is: -2.747347 with 18 number of iterations.
--------------------------------
Process exited after 1.508 seconds with return value 0
Press any key to continue . . .
```

```
 Enter the degree of the polynomial: 2
Enter the coefficients of the polynomial starting from the highest degree: 1 -3 2
Enter a valid initial point x0: 2
The approximate root of given function 2.000000 with 1 number of iterations.

 Do you want to continue? (y/n): y

 Enter the degree of the polynomial: 4
Enter the coefficients of the polynomial starting from the highest degree: 1 -6 11 -6 1
Enter a valid initial point x0: 1
The approximate root of given function 0.382013 with 12 number of iterations.

 Do you want to continue? (y/n): n

--------------------------------
Process exited after 41.45 seconds with return value 0
Press any key to continue . . .
```

5

Function: 5 + 0.5 * sin(x)

```
Enter an initial point x0: 1
The approximate root of given function is 4.510186 with 7 number of iterations.

--------------------------------
Process exited after 1.47 seconds with return value 0
Press any key to continue . . .
```

Function: 5 + 1 * sin(x)

```
Enter an initial point x0: 1
The approximate root of given function is 4.152633 with 18 number of iterations.

--------------------------------
Process exited after 1.328 seconds with return value 0
Press any key to continue . . .
```

```
Input the number of data pairs: 4

Input data pairs x(i) and values f(i) (one set in each line): 1 2
2 3
3 5
4 7

Input x at which interpolation is required: 2

Interpolated function value at x = 2.000000 is 3.000000.
Do you want to input another value? (y/n): y

Input x at which interpolation is required: 4

Interpolated function value at x = 4.000000 is 7.000000.
Do you want to input another value? (y/n): n

--------------------------------
Process exited after 38.23 seconds with return value 0
Press any key to continue . . .
```

```
Input the number of data pairs: 4

Input data pairs x(i) and values f(i) (one set in each line): 1 2

2 3
3 5
4 7

Input x at which interpolation is required:2

Interpolated function value at x = 2.000000 is 2.333333.
Do you want to input another value? (y/n): y

Input x at which interpolation is required:3

Interpolated function value at x = 3.000000 is 5.333333.
Do you want to input another value? (y/n): n

--------------------------------
Process exited after 33.58 seconds with return value 0
Press any key to continue . . .
```

```
Input the number of data pairs: 4

Input data pairs x(i) and values f(i) (one set in each line): 1 2
2 4
3 8
4 16

Enter the value at which interpolation is required: 3

Interpolated function value at x = 3.000000 is 8.000000.
Do you want to input another value? (y/n): y

Enter the value at which interpolation is required: 4

Interpolated function value at x = 4.000000 is 16.000000.
Do you want to input another value? (y/n): n

--------------------------------
Process exited after 30.14 seconds with return value 0
Press any key to continue . . .
```

```
Input the number of data pairs: 3

Input data pairs x(i) and values f(i) (one set in each line): 1 2
2 4
3 8

Enter the value at which interpolation is required: 2

Interpolated function value at x = 2.000000 is 4.000000.
Do you want to input another value? (y/n): y

Enter the value at which interpolation is required: 3

Interpolated function value at x = 3.000000 is 8.000000.
Do you want to input another value? (y/n): n

--------------------------------
Process exited after 21.69 seconds with return value 0
Press any key to continue . . .
```

```
Input the number of data points: 4

Input x and y values (one set on each line): 0 1
1 3
2 5
3 7

The line that is fit to the given data is y = 1.000000 + 2.000000x.
--------------------------------
Process exited after 12.77 seconds with return value 0
Press any key to continue . . .
```

```
Input number of data points: 4

Input degree of required polynomial: 3

Input x and y values (one set on each line): 1 2
2 3
3 5
4 8

Polynomial Coefficients

       2.000000      -0.500000       0.500000       0.000000
--------------------------------
Process exited after 16.23 seconds with return value 0
Press any key to continue . . .
```

```
Input number of data points: 3

Input x and y values (one set on each line): 1 2
2 4
3 8

 The exponential equation that is fit to the given data is y = 1.000000 e ^ 0.693147x.
--------------------------------
Process exited after 11.69 seconds with return value 0
Press any key to continue . . .
```

```
Input number of data points: 3

Input values of x and f(x) one set on each line: 1 2
2 4
3 8

Input xp where derivative is required: 2

Derivative at x = 2.000000 is 3.000000.
Do you want to input another value? (y/n): y

Input xp where derivative is required: 3

Derivative at x = 3.000000 is 5.000000.
Do you want to input another value? (y/n): n

--------------------------------
Process exited after 43.49 seconds with return value 0
Press any key to continue . . .
```

Function: x * x * exp(sqrt(x)) * sin(x)

```
Enter the point at which derivatives are required: 2
Enter the value of h: 1

The first and second derivative at x=2.000000 are 2.445717 and -25.029911 respectively.
Do you want to continue? (y/n): n

--------------------------------
Process exited after 15.44 seconds with return value 0
Press any key to continue . . .
```

Function: sin(x)+cos(x)

```
Enter the point at which derivatives are required: 2
Enter the value of h: 1

The first and second derivative at x=2.000000 are -1.115323 and -3.216947 respectively.
Do you want to continue? (y/n): n

--------------------------------
Process exited after 9.573 seconds with return value 0
Press any key to continue . . .
```

Function: 1.0 - exp(-x / 2.0)

```
Give lower limit of integration a: 0

Give upper limit of integration b: 3

Give the segment width h: 1

Integration between 0.000000 and 3.000000 when h = 1.000000 is 2.190895.
--------------------------------
Process exited after 10.88 seconds with return value 0
Press any key to continue . . .
```

Function: x * x * exp(sqrt(x))

```
Give lower limit of integration a: 0

Give upper limit of integration b: 3

Give the segment width h: 1

Integration between 0.000000 and 3.000000 when h = 1.000000 is 95.476433.
--------------------------------
Process exited after 13.63 seconds with return value 0
Press any key to continue . . .
```

Function: 1.0 - exp(-x / 2.0)

```
Enter the lower limit of integration a: 0
Enter the upper limit of integration b: 3
Give number of segments 'n' (Even number): 4

Integration between 0.000000 and 3.000000 when h = 0.750000 is 1.446092

--------------------------------
Process exited after 9.01 seconds with return value 0
Press any key to continue . . .
```

Function: x * x * exp(sqrt(x))

```
Enter the lower limit of integration a: 0
Enter the upper limit of integration b: 3
Give number of segments 'n' (Even number): 4

Integration between 0.000000 and 3.000000 when h = 0.750000 is 40.572098

--------------------------------
Process exited after 11.57 seconds with return value 0
Press any key to continue . . .
```

Function: exp(-x * x)

```
Give lower limit of integration a: 0

Give upper limit of integration b: 3

Give number of segments n (divisible by 3): 9

Integration between 0.000000 and 3.000000 when h = 0.333333 is 0.886194.
--------------------------------
Process exited after 10.15 seconds with return value 0
Press any key to continue . . .
```

Function: x * x * exp(sqrt(x))

```
Give lower limit of integration a: 0

Give upper limit of integration b: 3

Give number of segments n (divisible by 3): 9

Integration between 0.000000 and 3.000000 when h = 0.333333 is 40.562805.
--------------------------------
Process exited after 10.28 seconds with return value 0
Press any key to continue . . .
```

```
Input the number of variables: 2

Input coefficients a(i,j), row-wise (one row on each line):
1 2
3 4

Enter vector b:
10
20

Solution vector x:
        0.000000
        5.000000

--------------------------------
Process exited after 14.09 seconds with return value 0
Press any key to continue . . .
```

```
Input the number of variables: 2
Input coefficients a(i,j) row-wise (one row at a line): 1 2
3 4
Enter vector b:10
20

Solution vector x:
-0.000001       5.000000
--------------------------------
Process exited after 15.25 seconds with return value 0
Press any key to continue . . .
```

```
Input the number of variables: 3
Input coefficients a(i,j) row-wise (one row on each line): 4 -1 0
-1 4 -1
0 -1 3

Enter vector b: 6
-1
4
1.500000        0.125000        1.375000
1.531250        0.476563        1.492188
1.619141        0.527832        1.509277
1.631958        0.535309        1.511770
1.633827        0.536399        1.512133
1.634100        0.536558        1.512186
1.634140        0.536581        1.512194

Solution vector x:
1.634140        0.536581        1.512194        Number of iterations: 7

--------------------------------
Process exited after 33.85 seconds with return value 0
Press any key to continue . . .
```

```
Input number of variables: 2
Input coefficients a(i,j) row-wise (one row on each line): 3 1
1 2

Enter vector b: 9
8
3.000000        2.500000
2.166667        2.916667
2.027778        2.986111
2.004630        2.997685
2.000772        2.999614
2.000129        2.999936
2.000021        2.999989

Solution vector x:
2.000021        2.999989        Number of iterations: 7

--------------------------------
Process exited after 23.32 seconds with return value 0
Press any key to continue . . .
```

```
Input the size of matrix: 2
Input elements a(i,j) row-wise (one row at a time): 3 1
1 2
Eigen value: 4.000000
Eigen vector: 1.000000  0.750000
Eigen value: 3.750000
Eigen vector: 1.000000  0.666667
Eigen value: 3.666667
Eigen vector: 1.000000  0.636364
Eigen value: 3.636364
Eigen vector: 1.000000  0.625000
Eigen value: 3.625000
Eigen vector: 1.000000  0.620690
Eigen value: 3.620690
Eigen vector: 1.000000  0.619048
Eigen value: 3.619048
Eigen vector: 1.000000  0.618421
Eigen value: 3.618421
Eigen vector: 1.000000  0.618182
Eigen value: 3.618182
Eigen vector: 1.000000  0.618090
Approximate eigen value is: 3.618182.
Corresponding eigen vector is:
1.000000        0.618090
Number of iterations: 9
--------------------------------
Process exited after 8.711 seconds with return value 0
Press any key to continue . . .
```

Function: x * x + y * y

```
Input initial value of x & y: 0 1
Input x at which y is required: 1
Input step-size h: 0.1

 1       0.100000        1.100000

 2       0.200000        1.222000

 3       0.300000        1.375328

 4       0.400000        1.573481

 5       0.500000        1.837066

 6       0.600000        2.199547

 7       0.700000        2.719347

 8       0.800000        3.507832

 9       0.900000        4.802320

 10      1.000000        7.189548
Value of y at x = 1.000000 is 7.189548.

--------------------------------
Process exited after 46.63 seconds with return value 0
Press any key to continue . . .
```

Function: 2 * x + y

```
Input initial value of x & y: 0 1
Input x at which y is required: 1
Input step-size h: 0.1

 1       0.100000        1.100000

 2       0.200000        1.230000

 3       0.300000        1.393000

 4       0.400000        1.592300

 5       0.500000        1.831530

 6       0.600000        2.114683

 7       0.700000        2.446151

 8       0.800000        2.830767

 9       0.900000        3.273843

 10      1.000000        3.781228
Value of y at x = 1.000000 is 3.781228.

--------------------------------
Process exited after 9.542 seconds with return value 0
Press any key to continue . . .
```

Function: y - x * x + 1

```
Input initial values of x & y: 0 1
Input x at which y is required: 1
Input step-size h: 0.1

 1       0.100000        1.209500
.
 2       0.200000        1.438947
.
 3       0.300000        1.688337
.
 4       0.400000        1.957662
.
 5       0.500000        2.246917
.
 6       0.600000        2.556093
.
 7       0.700000        2.885183
.
 8       0.800000        3.234177
.
 9       0.900000        3.603066
.
 10      1.000000        3.991838
.
Value of y at x = 1.000000 is 3.991838
.
--------------------------------
Process exited after 9.728 seconds with return value 0
Press any key to continue . . .
```

Function: 2 * x + y – 1

```
Input initial values of x & y: 0 1
Input x at which y is required: 1
Input step-size h: 0.1

 1       0.100000        1.010000
.
 2       0.200000        1.042050
.
 3       0.300000        1.098465
.
 4       0.400000        1.181804
.
 5       0.500000        1.294894
.
 6       0.600000        1.440857
.
 7       0.700000        1.623147
.
 8       0.800000        1.845578
.
 9       0.900000        2.112364
.
 10      1.000000        2.428162
.
Value of y at x = 1.000000 is 2.428162
.
--------------------------------
Process exited after 6.114 seconds with return value 0
Press any key to continue . . .
```

Function: y - x * x + 1

```
Input initial value of x and y: 0 1
Input x at which y is required: 1
Input step-size h: 0.1

 1       0.100000        1.210000
.
 2       0.200000        1.440000
.
 3       0.300000        1.689999
.
 4       0.400000        1.959999
.
 5       0.500000        2.249999
.
 6       0.600000        2.559999
.
 7       0.700000        2.889998
.
 8       0.800000        3.239998
.
 9       0.900000        3.609998
.
 10      1.000000        3.999997
.Value of y at x = 1.000000 is 3.999997.

--------------------------------
Process exited after 8.15 seconds with return value 0
Press any key to continue . . .
```

Function: 2 * x + y – 1

```
Input initial value of x and y: 0 1
Input x at which y is required: 1
Input step-size h: 0.1

 1       0.100000        1.010342
.
 2       0.200000        1.042805
.
 3       0.300000        1.099717
.
 4       0.400000        1.183648
.
 5       0.500000        1.297441
.
 6       0.600000        1.444236
.
 7       0.700000        1.627503
.
 8       0.800000        1.851079
.
 9       0.900000        2.119203
.
 10      1.000000        2.436559
.Value of y at x = 1.000000 is 2.436559.

--------------------------------
Process exited after 5.872 seconds with return value 0
Press any key to continue . . .
```

```
 Enter the initial point x: 0

 Enter the value of y_1(x): 1

 Enter the value of y_2(x): 2

 Enter the step length: 0.1

 Enter the point x at which y(x) is required: 0.5


Calculation of y_1(0.500000) and y_2(0.500000):

 x               y_1(x)                  y_2(x)
 0.000000        1.000000        2.000000
 0.100000        0.409717        2.405025
 0.200000        -0.008976       2.664522
 0.300000        -0.292730       2.811585
 0.400000        -0.471319       2.872695
 0.500000        -0.568907       2.868974

 Do you want to approximate at another point? (y/n): y

 Enter the point x at which y(x) is required: 1


Calculation of y_1(1.000000) and y_2(1.000000):

 x               y_1(x)                  y_2(x)
 0.000000        1.000000        2.000000
 0.100000        0.409717        2.405025
 0.200000        -0.008976       2.664522
 0.300000        -0.292730       2.811585
 0.400000        -0.471319       2.872695
 0.500000        -0.568907       2.868974
 0.600000        -0.605079       2.817204
 0.700000        -0.595684       2.730659
 0.800000        -0.553522       2.619786
 0.900000        -0.488902       2.492751
 1.000000        -0.410098       2.355891

 Do you want to approximate at another point? (y/n): n

--------------------------------
Process exited after 40.28 seconds with return value 0
Press any key to continue . . .
```

```
 Enter the initial point x: 0

 Enter the value of y(x): 1

 Enter the value of y'(x): 2

 Enter the step length: 0.1


 Enter the point x at which y(x) is required: 0.5


Calculation of y(0.500000):
 x               y(x)
 0.000000        1.000000
 0.100000        1.215000
 0.200000        1.464235
 0.300000        1.752885
 0.400000        2.087134
 0.500000        2.474370
 The approximate value of y(0.500000) is 2.474370.

 Do you want to approximate at another point? (y/n): y


 Enter the point x at which y(x) is required: 1


Calculation of y(1.000000):
 x               y(x)
 0.000000        1.000000
 0.100000        1.215000
 0.200000        1.464235
 0.300000        1.752885
 0.400000        2.087134
 0.500000        2.474370
 0.600000        2.923424
 0.700000        3.444849
 0.800000        4.051252
 0.900000        4.757688
 1.000000        5.582119
 The approximate value of y(1.000000) is 5.582119.

 Do you want to approximate at another point? (y/n): n

--------------------------------
Process exited after 22.04 seconds with return value 0
Press any key to continue . . .
```

```
Enter the first boundary conditions x and y(x): 0 1

Enter the second boundary conditions x and y(x): 1 2

Enter the step length: 0.5

Enter the first guess of y'(0.000000): 0.1
Calculation of y(1.000000) for guess value 0.100000:
 x               y(x)
 0.000000       1.000000
 0.500000       1.175000
 1.000000       1.739063
The calculated value of y(1.000000) is 1.739063.
Enter the second guess of y'(0.000000): 0.2
Calculation of y(1.000000) for guess value 0.200000:
 x               y(x)
 0.000000       1.000000
 0.500000       1.225000
 1.000000       1.845312
The calculated value of y(1.000000) is 1.845312.Calculation of y(1.000000) for guess value 0.345588:
 x               y(x)
 0.000000       1.000000
 0.500000       1.297794
 1.000000       2.000000
The extrapolated value of y'(0.000000) is 0.345588.
The calculated value of y(1.000000) using y'(0.000000) = 0.345588 is 2.000000.
Enter the point x at which y(x) is required: 1
Calculation of y(1.000000) for guess value 0.345588:
 x               y(x)
 0.000000       1.000000
 0.500000       1.297794
 1.000000       2.000000
 The approximate value of y(1.000000) is 2.000000.
Do you want to approximate at another point? (y/n): y

Enter the point x at which y(x) is required: 2
Calculation of y(2.000000) for guess value 0.345588:
 x               y(x)
 0.000000       1.000000
 0.500000       1.297794
 1.000000       2.000000
 1.500000       3.900678
 2.000000       10.088057
 The approximate value of y(2.000000) is 10.088057.
Do you want to approximate at another point? (y/n): n

--------------------------------
Process exited after 18.68 seconds with return value 0
Press any key to continue . . .
```