Practical Work with Working Examples:

Bisection Method:

Output:

Instance 1:

$$f(x) = x^3 - 3x + 1$$

```
Enter the values of a and b: 0 1
The root is: 0.347321
```

Instance 2:

$$f(x) = x^3 - 2sin(x)$$

```
Enter the values of a and b: 0.5 2
The root is: 1.236176
```

Lagrange's Method:

Instance 1:

x	$\frac{1}{3}$	$\frac{1}{4}$	1
f	2	−1	7

```
Enter the number of data points: 3
Enter the data points: 0.33 2
0.25 -1
1 7
Input x at which interpolation is required: 0.5
Interpolated function value at x = 0.50000 is 6.67288.
```

Instance 2:

x	-1	-2	2	4
$f(x)$	-1	-9	11	69

```
Enter the number of data points: 4
Enter the data points: -1 -1
-2 -9
2 11
4 69
Input x at which interpolation is required: 0
Interpolated function value at x = 0.00000 is 1.00000.
```

Trapezoidal Method:

Instance 1:

Change the function in the program according to question.

$$\int_0^1 e^{-x^2}$$

```
Enter the lower limit of integration: 0
Enter the upper limit of integration: 1
Enter the number of subintervals: 5
The value of the integral is 0.74437.
```

Instance 2:

$$\int_0^{\pi} (3\cos x + 5)\, dx \text{ with } n = 5$$

```
Enter the lower limit of integration: 0
Enter the upper limit of integration: 3.14
Enter the number of subintervals: 5
The value of the integral is 15.70462
```

Runge Kutta:

Instance 1

$$y' = y + sinx$$
$$y(0) = 2$$

from $y(0) = 2$ we get initial values of x and y

```
Input initial values of x and y: 0 2

Input x at which y is required: 0.3

Input the number of steps: 0.1

1       0.100000        2.215508
2       0.200000        2.464138
3       0.300000        2.749218
Value of y at x = 0.300000 is 2.749218
```

Instance 2:

$$y' = ycosx$$
$$y(0) = 1$$

Initial conditions here are 0 and 1

```
Input initial values of x and y: 0 1

Input x at which y is required: 0.5

Input the number of steps: 0.25

1       0.250000        1.280688
2       0.500000        1.615127
Value of y at x = 0.500000 is 1.615127
```
