Bisection Method:

1. f(x) = x-cos(x)

Input:

>> Ass1

Is the input equation a polynomial?(Y/N)

N

Choose the method of solution by selecting number shown with method:

Bisection-1,

False Position-2,

Fixed Point-3,

Newton-Raphson-4,

Secant-5

1

Enter your function

x-cos(x)

Enter first starting point

0

Enter second starting point

1

Now subsequent enter stopping criteria:\n

Enter the percentage relative error allowed in solution

0.01

Enter Convergence criteria for the function value, i.e., how close f(x) is to zero

0.000000000000000015

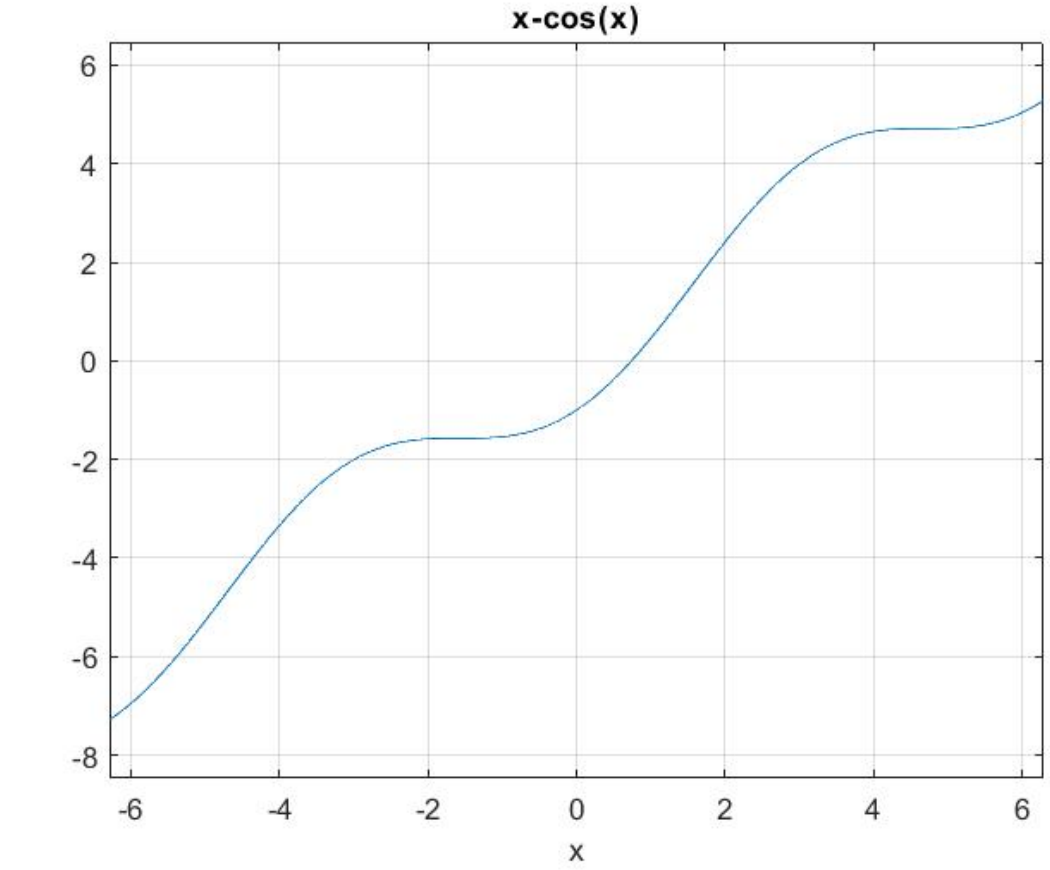
Enter allowed maximum number of iterations

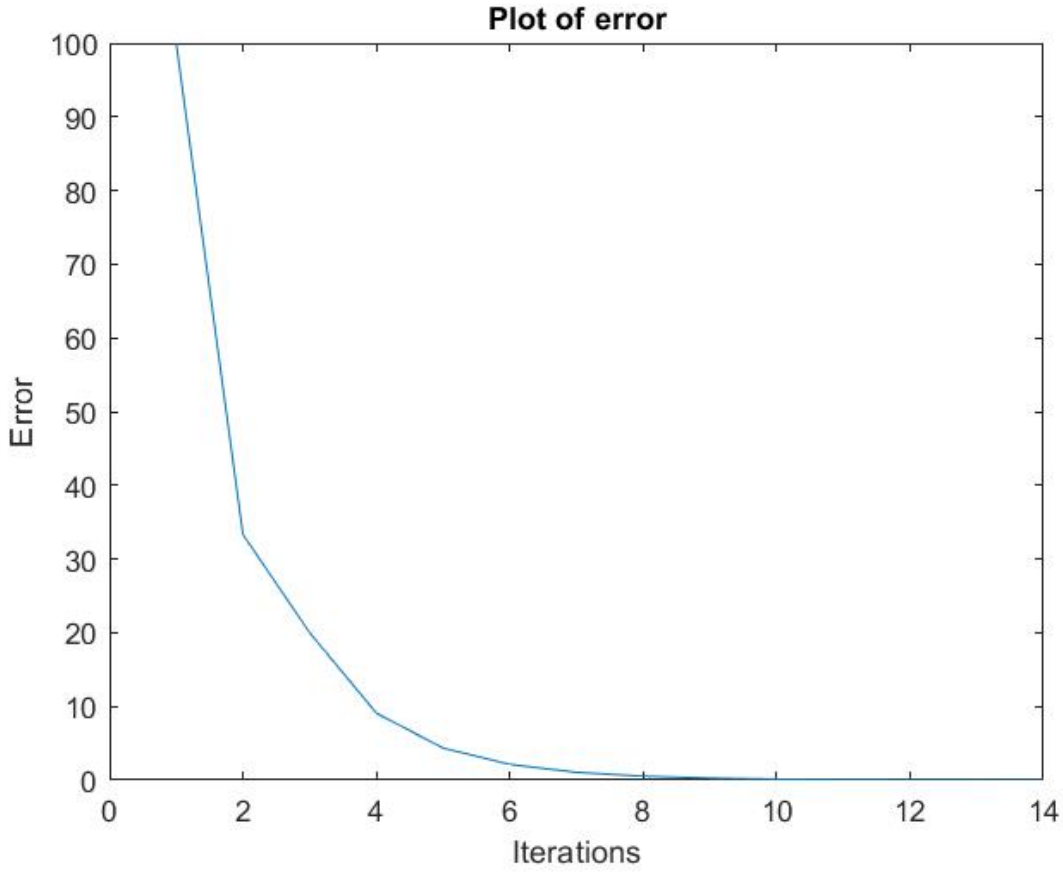
50

Output:

Root is 0.739075

Iterations stopped as relative error stopping criteria was met


x-cos(x)
6
4
2
0
-2
-4
-6
-8
-6
-4
-2
0
2
4
6
x


Plot of error
100
90
80
70
60
50
40
30
20
10
0
Error
0
2
4
6
8
10
12
14
Iterations

2. f(x) = exp(-x)-x

Input:

Is the input equation a polynomial?(Y/N)

N

Choose the method of solution by selecting number shown with method:

Bisection-1,

False Position-2,

Fixed Point-3,

Newton-Raphson-4,

Secant-5

1

Enter your function

exp(-x)-x

Enter first starting point

0

Enter second starting point

1

Now subsequent enter stopping criteria:\n

Enter the percentage relative error allowed in solution

0.05

Enter Convergence criteria for the function value, i.e., how close f(x) is to zero

0.00000000000025

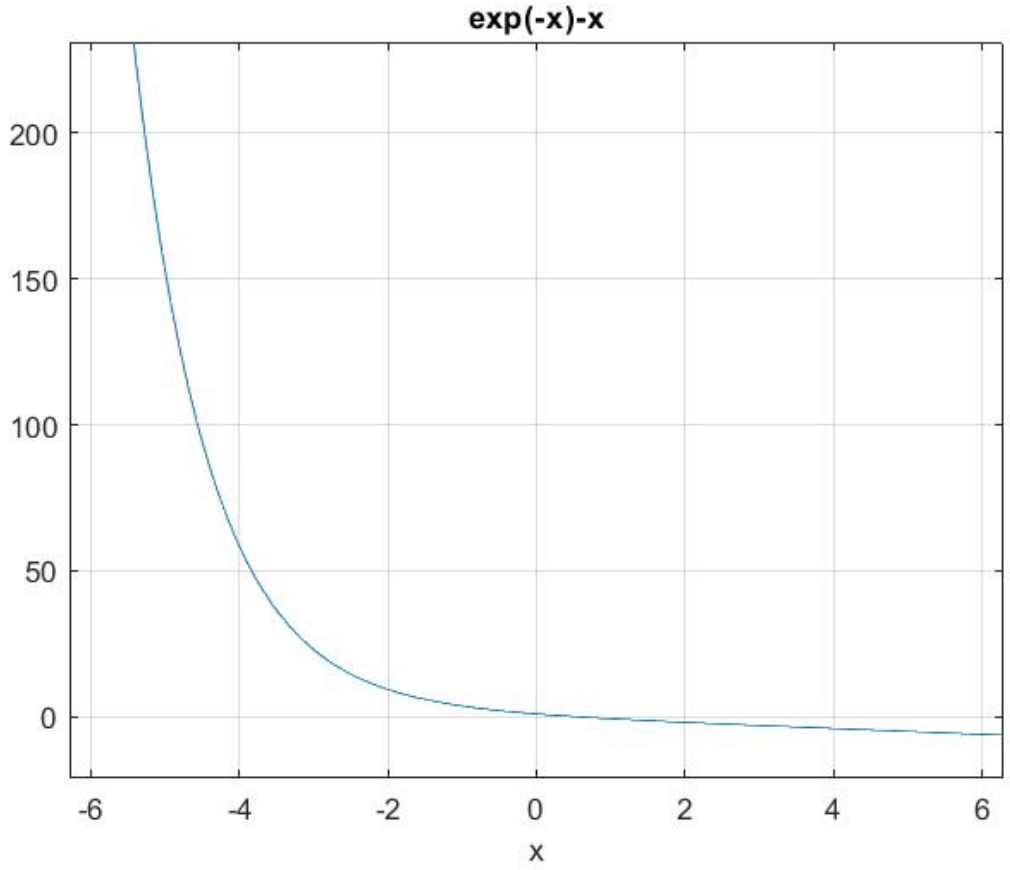
Enter allowed maximum number of iterations

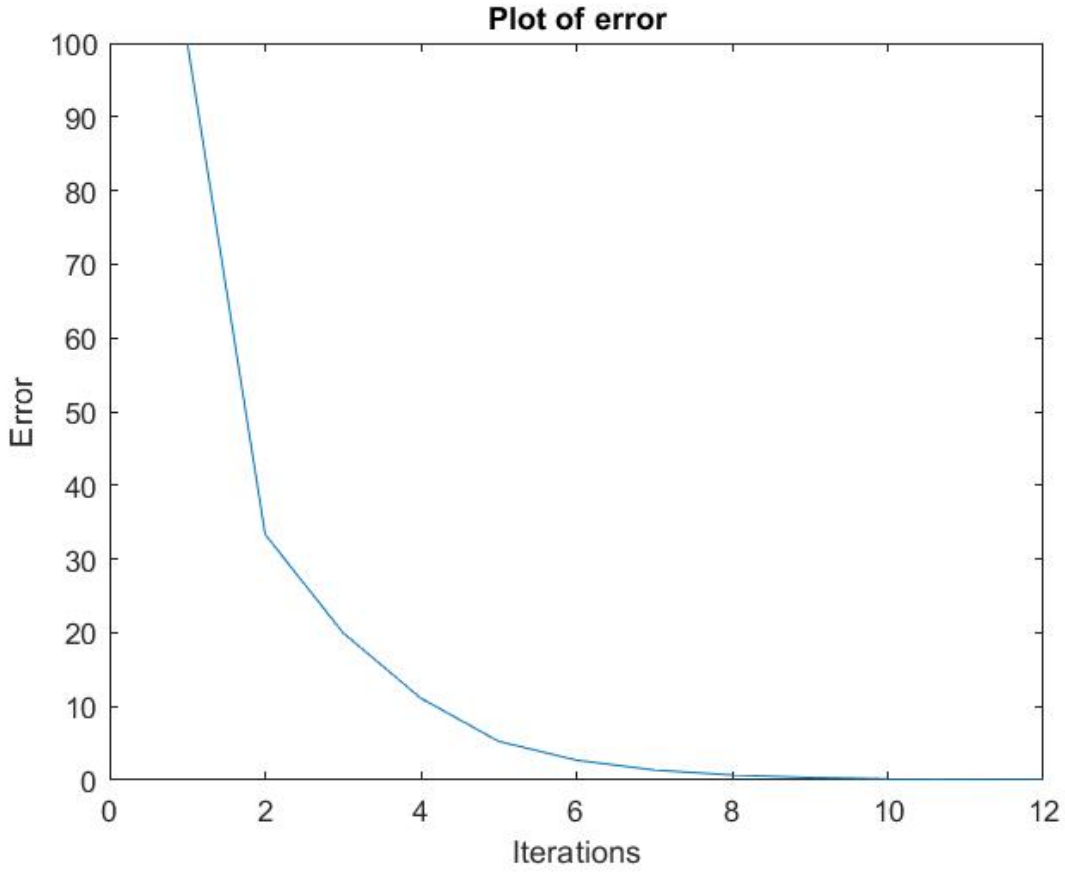
50

Output:

Root is 0.567139

Iterations stopped as relative error stopping criteria was met


exp(-x)-x
200
150
100
50
0
-6
-4
-2
0
2
4
6
x


Plot of error
Error
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
Iterations

Fixed Point Method:

1. F(x) = x-cos(x)

Input:

Is the input equation a polynomial?(Y/N)

N

Choose the method of solution by selecting number shown with method:

Bisection-1,

False Position-2,

Fixed Point Method-3,

Newton-Raphson-4,

Secant-5

3

Enter the function

x-cos(x)

Enter your function g(x) such that your function f(x) is expressed as x=g(x)

cos(x)

Enter starting point

0.5

Now subsequent enter stopping criteria:\n

Enter the relative error allowed in solution

0.01

Enter Convergence criteria for the function value, i.e., how close f(x) is to zero

0.000000025

Enter allowed maximum number of iterations

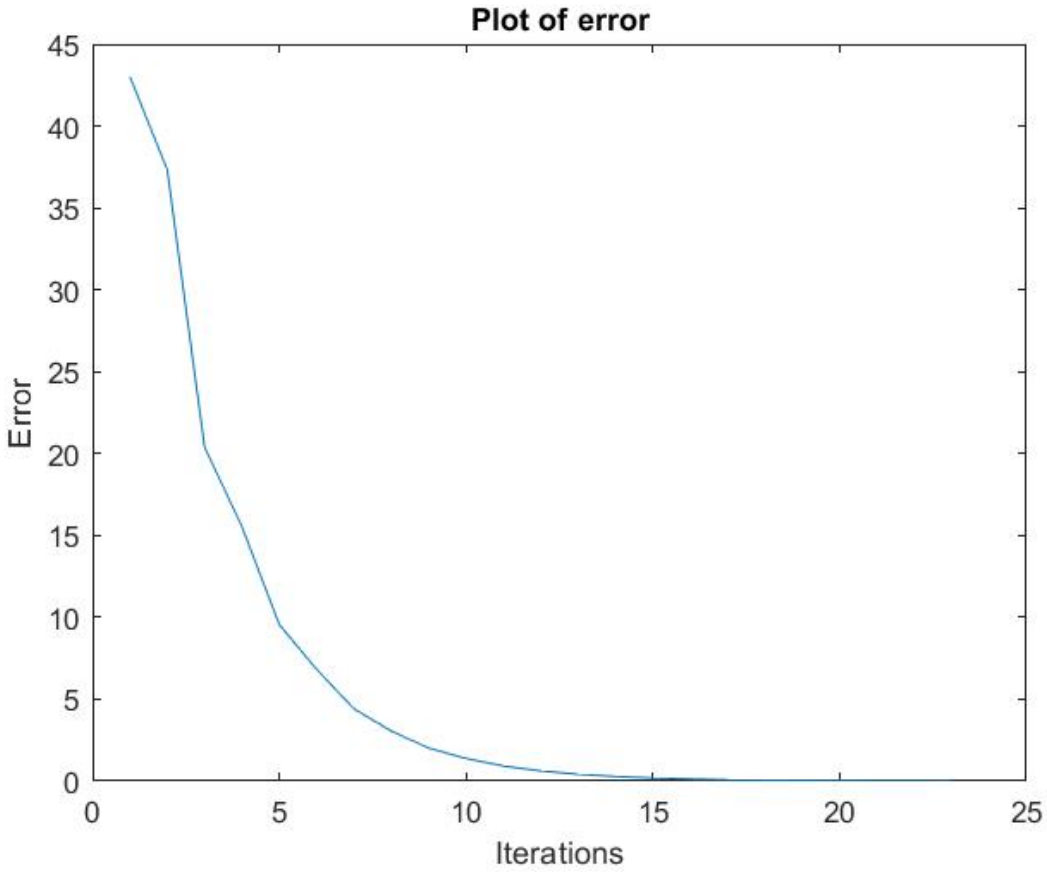
50

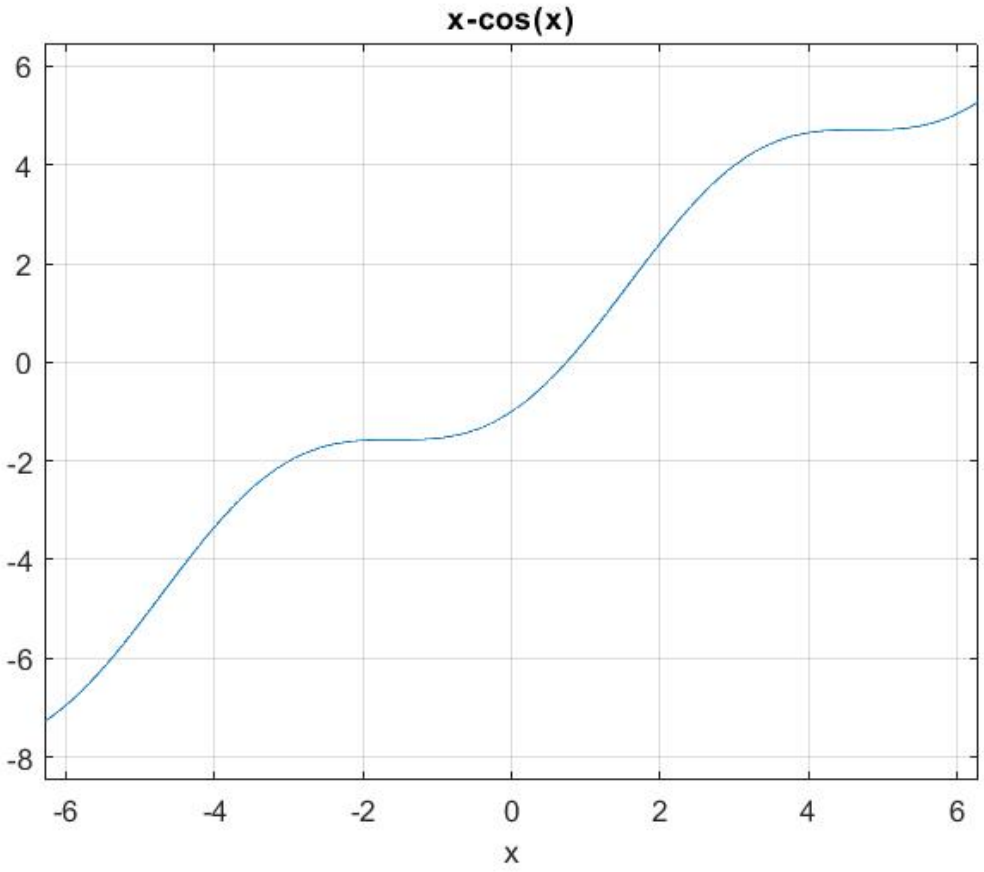
Output:

Root is = 0.739109

Iterations stopped as relative error stopping criteria was met

Undefined function or variable 'promptans1'.


Plot of error
Error
Iterations
0
5
10
15
20
25
30
35
40
45


x-cos(x)
x
-6
-4
-2
0
2
4
6
-8

2. F(x) = exp(-x)-x

Input:

Is the input equation a polynomial?(Y/N)

N

Choose the method of solution by selecting number shown with method:

Bisection-1,

False Position-2,

Fixed Point Method-3,

Newton-Raphson-4,

Secant-5

3

Enter the function

exp(-x)-x

Enter your function g(x) such that your function f(x) is expressed as x=g(x)

exp(-x)

Enter starting point

0

Now subsequent enter stopping criteria:\n

Enter the relative error allowed in solution

0.05

Enter Convergence criteria for the function value, i.e., how close f(x) is to zero

0.0000000000025

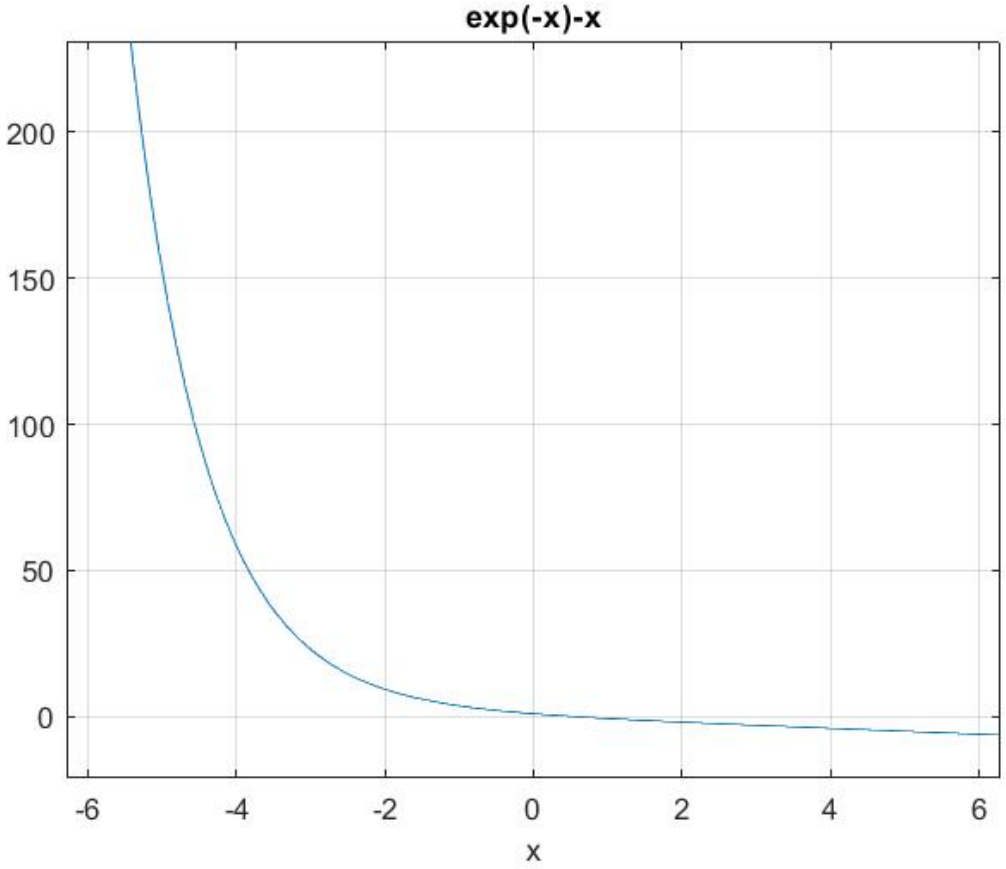
Enter allowed maximum number of iterations

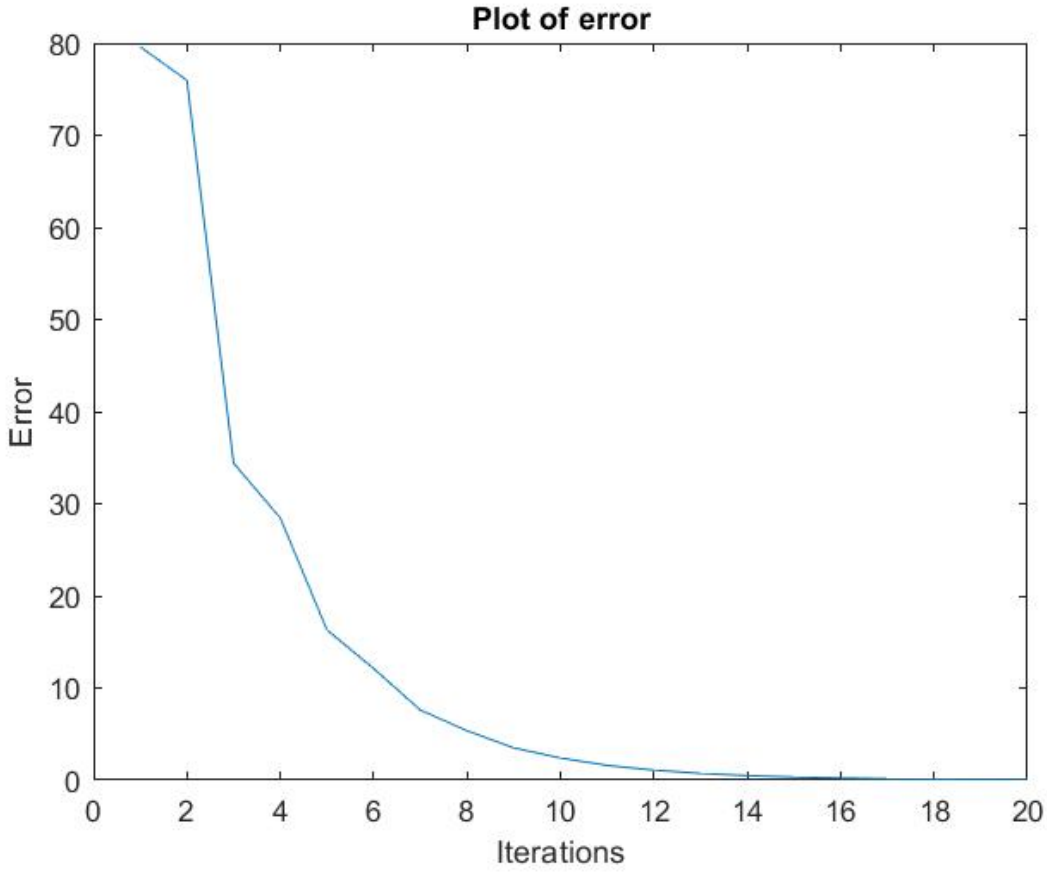
50

Output:

Root is = 0.567068

Iterations stopped as relative error stopping criteria was met


exp(-x)-x
200
150
100
50
0
-6
-4
-2
0
2
4
6
x


Plot of error
80
70
60
50
40
30
20
10
0
Error
0
2
4
6
8
10
12
14
16
18
20
Iterations

Newton Raphson Method:

1. F(x) = x-cos(x)

Input:

>> Ass1

Is the input equation a polynomial?(Y/N)

N

Choose the method of solution by selecting number shown with method:

Bisection-1,

False Position-2,

Fixed Point Method-3,

Newton-Raphson-4,

Secant-5

4

Enter your function f(x)

x-cos(x)

Enter first derivative of function f(x)

1+sin(x)

Enter starting point

0

Now subsequent enter stopping criteria:

Enter the relative error allowed in solution

0.01

Enter Convergence criteria for the function value, i.e., how close f(x) is to zero

0.000000000025

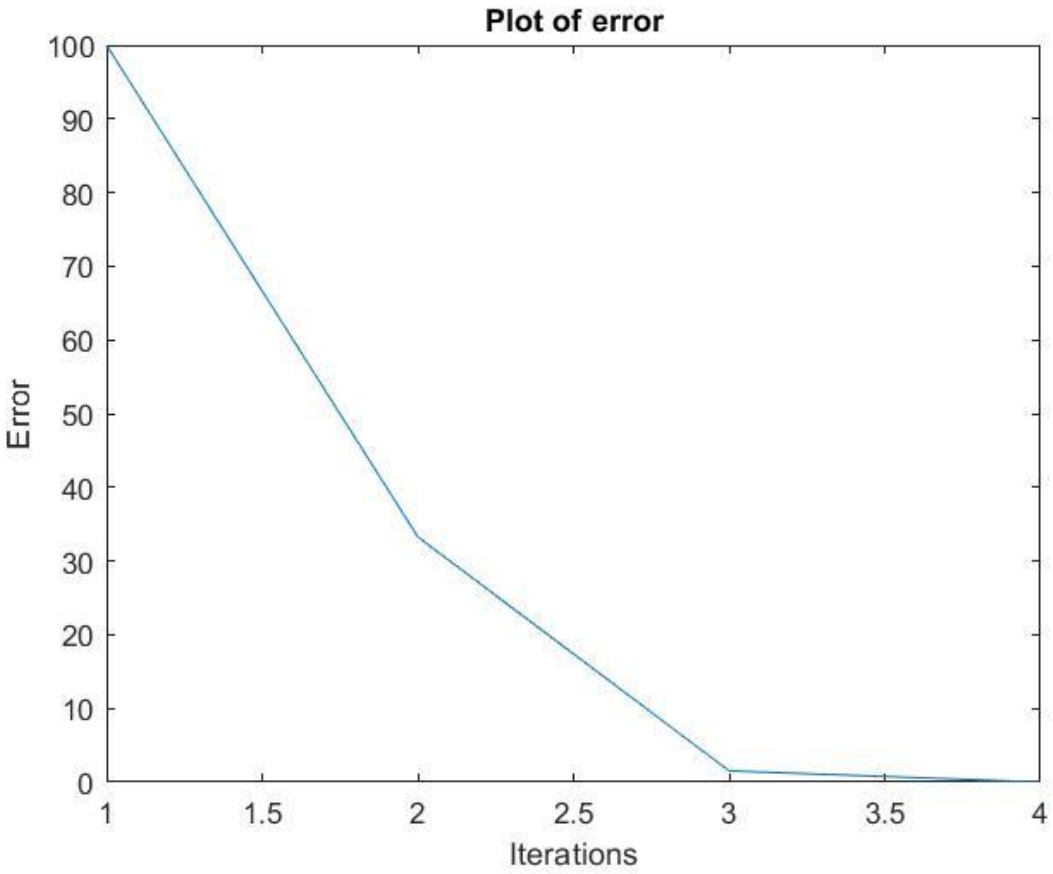
Enter allowed maximum number of iterations

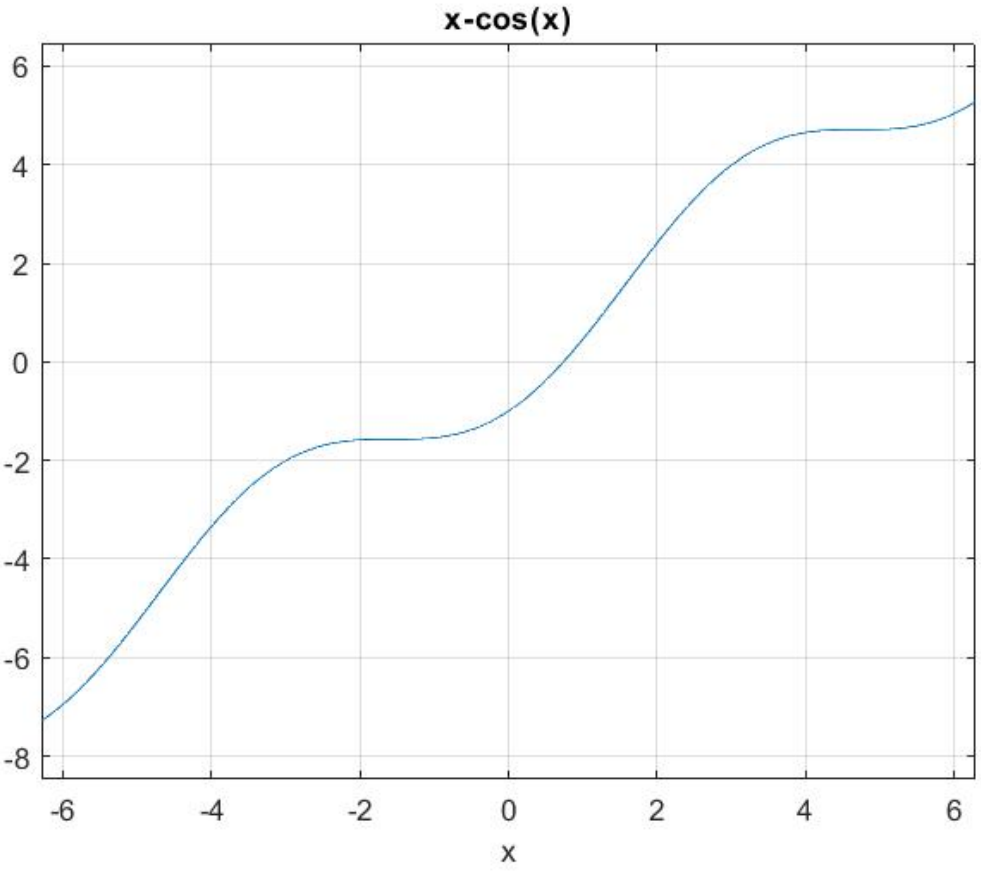
50

Output:

Root is 0.739085

Iterations stopped as relative error stopping criteria was met


Plot of error
Error
Iterations
100
90
80
70
60
50
40
30
20
10
0
1
1.5
2
2.5
3
3.5
4


x-cos(x)
x
6
4
2
0
-2
-4
-6
-8
-6
-4
-2
0
2
4
6

2. F(x) = exp(-x)-x

Input:

>> Ass1

Is the input equation a polynomial?(Y/N)

N

Choose the method of solution by selecting number shown with method:

Bisection-1,

False Position-2,

Fixed Point Method-3,

Newton-Raphson-4,

Secant-5

4

Enter your function f(x)

exp(-x)-x

Enter first derivative of function f(x)

-1*exp(-1)-1

Enter starting point

0.2

Now subsequent enter stopping criteria:

Enter the relative error allowed in solution

0.05

Enter Convergence criteria for the function value, i.e., how close f(x) is to zero

0.000000000025

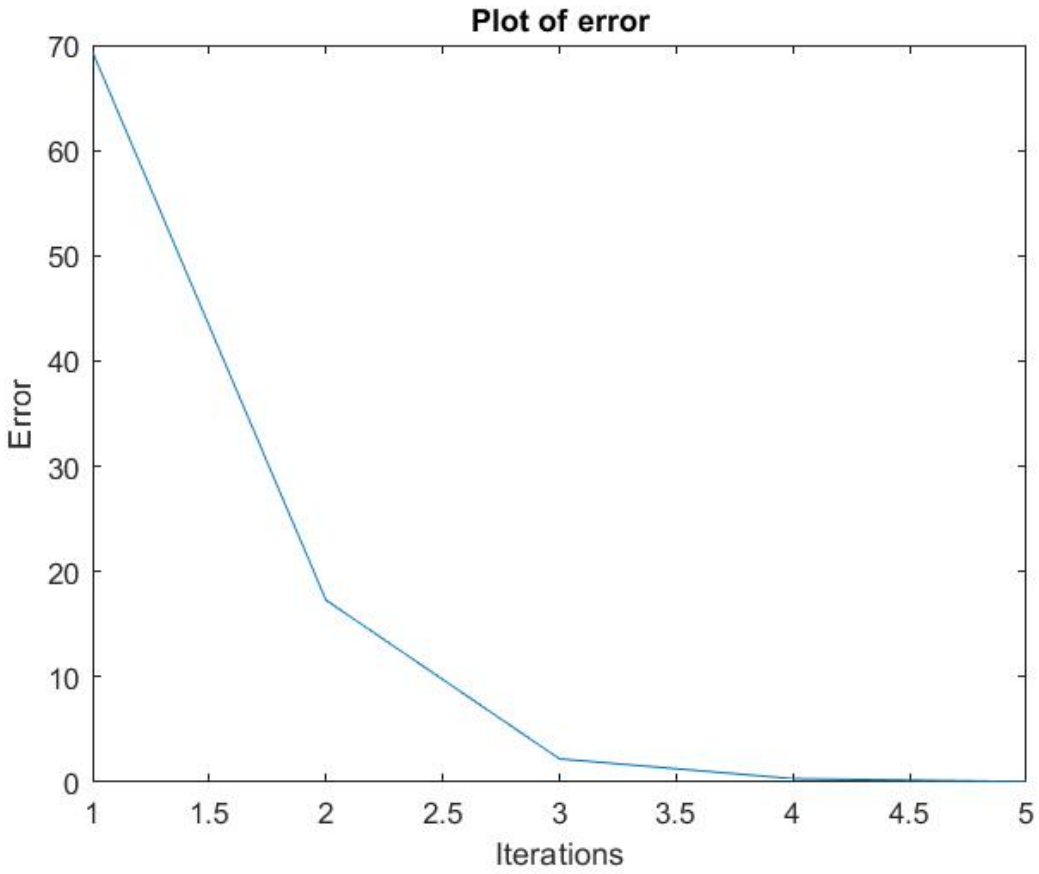
Enter allowed maximum number of iterations

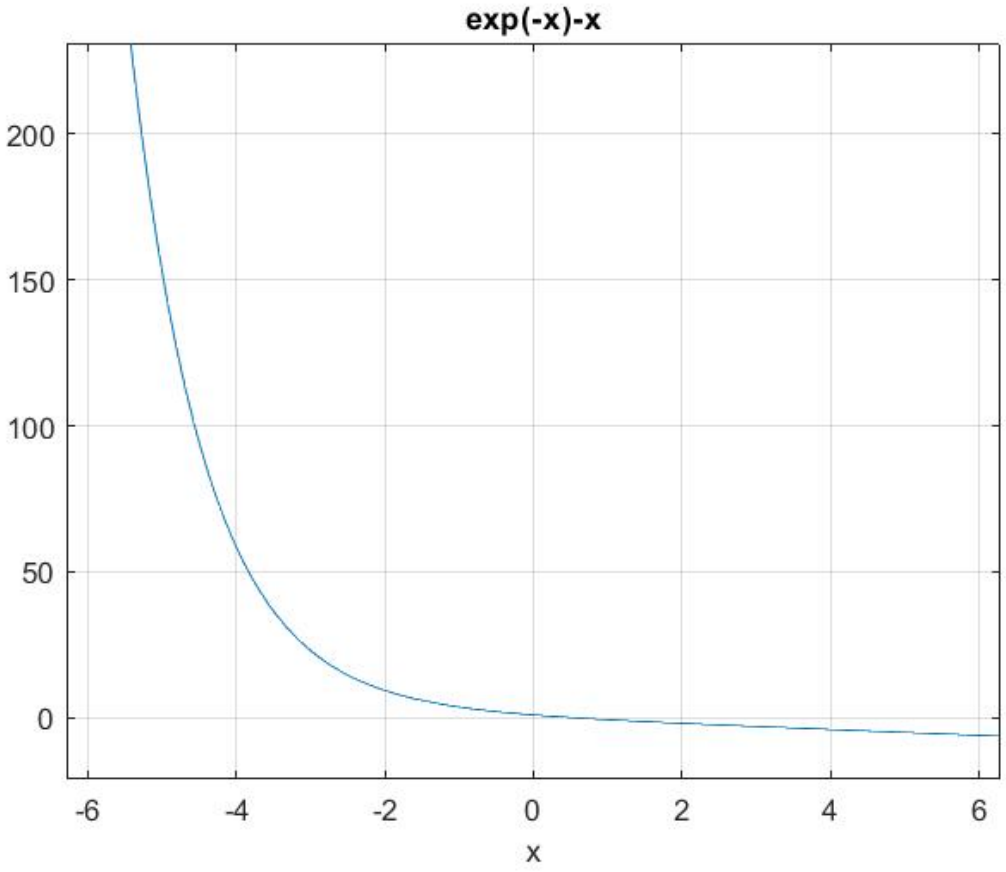
50

Output:

Root is 0.567178

Iterations stopped as relative error stopping criteria was met


Plot of error
Error
Iterations
70
60
50
40
30
20
10
0
1
1.5
2
2.5
3
3.5
4
4.5
5


exp(-x)-x
x
200
150
100
50
0
-6
-4
-2
0
2
4
6

False Position Method:

1. F(x) = x-cos(x)

Input:

Is the input equation a polynomial?(Y/N)

N

Choose the method of solution by selecting number shown with method:

Bisection-1,

False Position-2,

Fixed Point-3,

Newton-Raphson-4,

Secant-5

2

Enter your function

x-cos(x)

Enter first starting point

0

Enter second starting point

1

Now subsequent enter stopping criteria:

Enter the relative error allowed in solution

0.01

Enter Convergence criteria for the function value, i.e., how close f(x) is to zero

0.00000000000025

Enter allowed maximum number of iterations

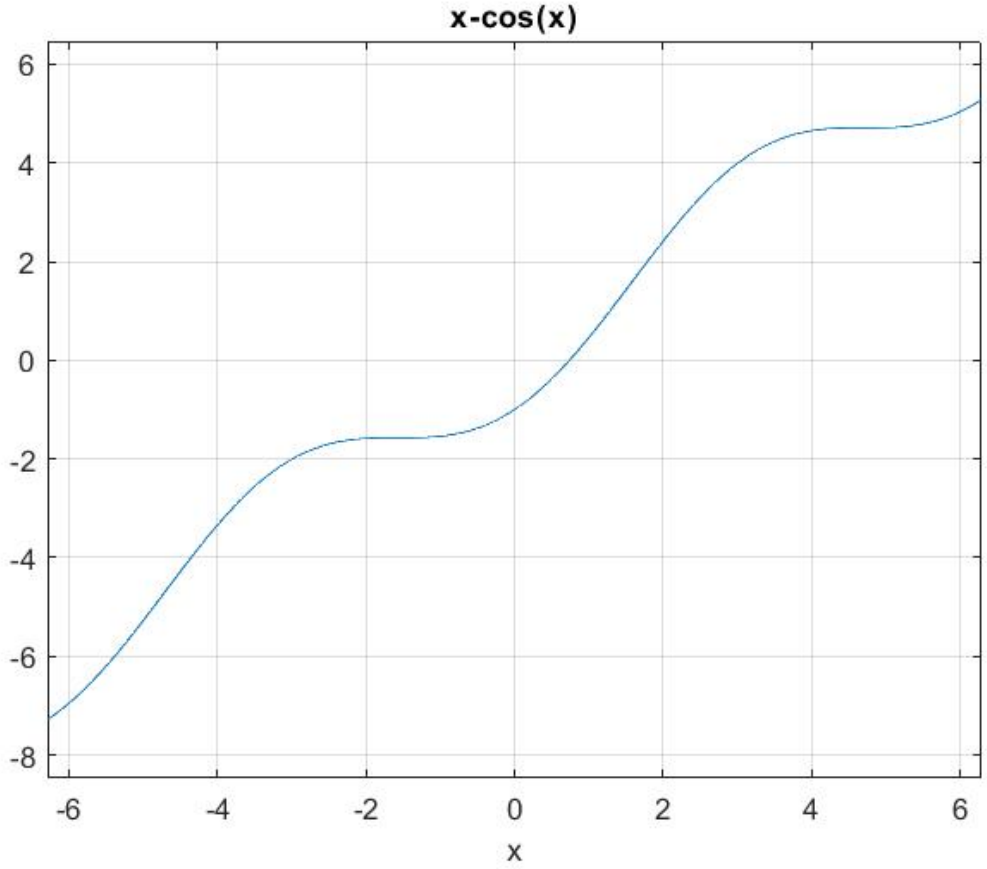
50

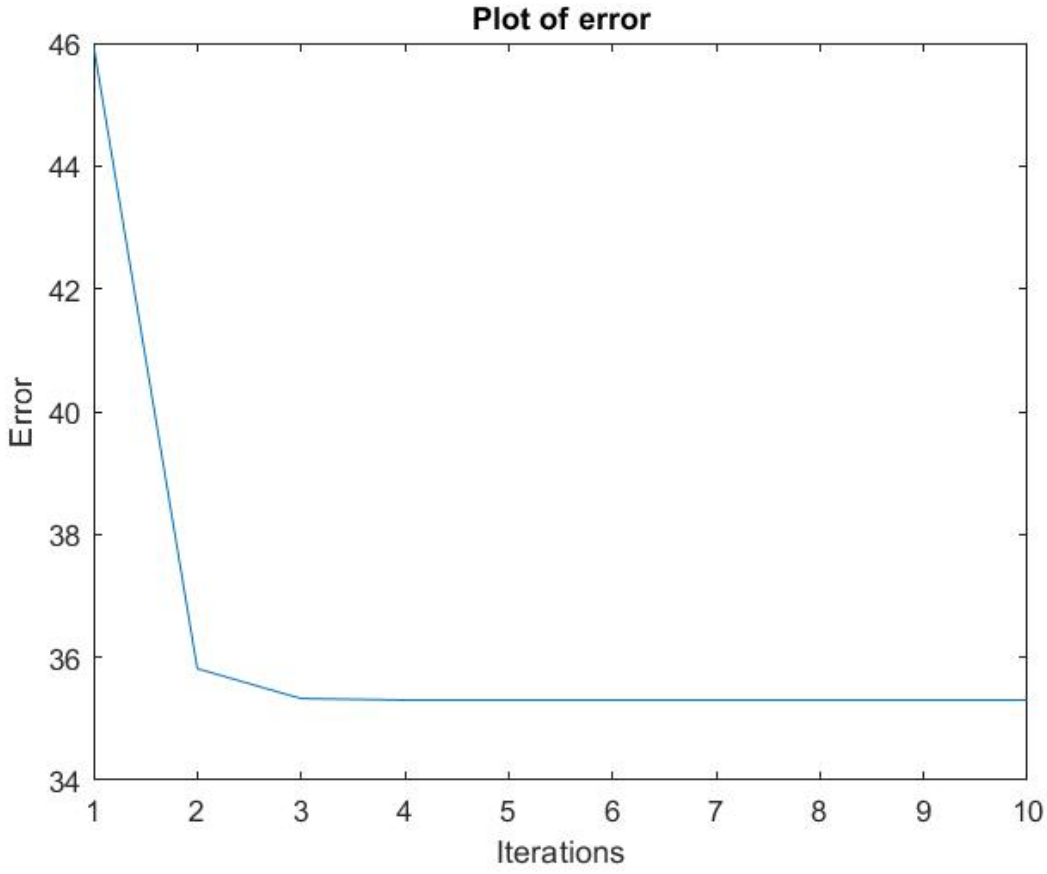
Output:

answer = 0.739085

Iterations stopped as function value was close to zero as required

Undefined function or variable 'promptans1'.


x-cos(x)
6
4
2
0
-2
-4
-6
-8
-6
-4
-2
0
2
4
6
x


Plot of error
46
44
42
40
38
36
34
Error
1
2
3
4
5
6
7
8
9
10
Iterations

2. F(x) = exp(-x)-x

Input:

>> Ass1

Is the input equation a polynomial?(Y/N)

N

Choose the method of solution by selecting number shown with method:

Bisection-1,

False Position-2,

Fixed Point-3,

Newton-Raphson-4,

Secant-5

2

Enter your function

exp(-x)-x

Enter first starting point

0

Enter second starting point

1

Now subsequent enter stopping criteria:

Enter the relative error allowed in solution

0.05

Enter Convergence criteria for the function value, i.e., how close f(x) is to zero

0.00000000000025

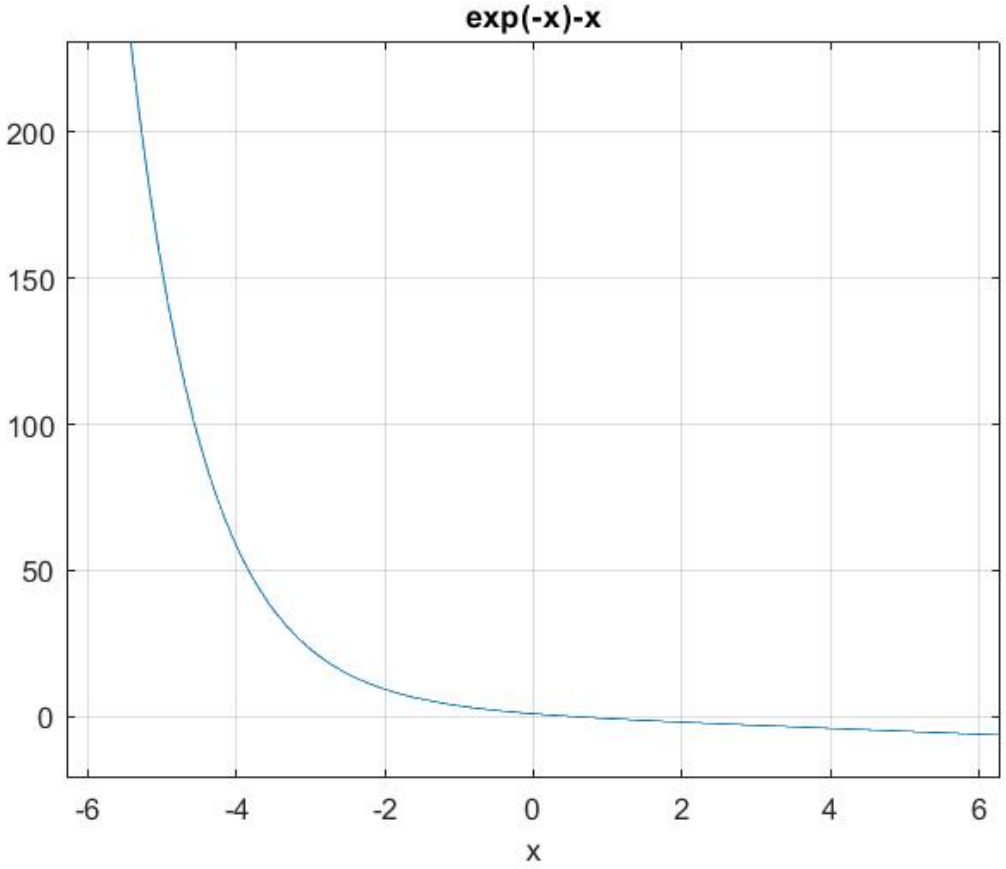
Enter allowed maximum number of iterations

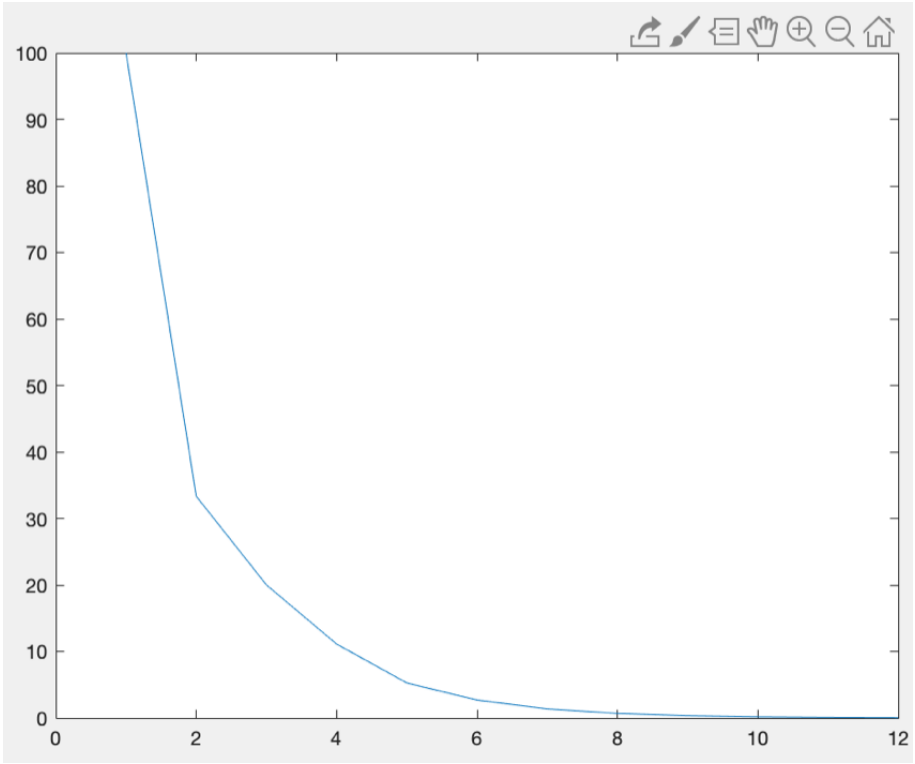
50

Output:

answer = 0.567139

Iterations stopped as relative error stopping criteria was met


exp(-x)-x
200
150
100
50
0
-6
-4
-2
0
2
4
6
x


100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12

Secant:

1. F(x) = x-cos(x)

Input:

>> Ass1

Is the input equation a polynomial?(Y/N)

N

Choose the method of solution by selecting number shown with method:

Bisection-1,

False Position-2,

Fixed Point Method-3,

Newton-Raphson-4,

Secant-5

5

Enter your function

x-cos(x)

Enter first starting point

0

Enter second starting point

1

Now subsequent enter stopping criteria:\n

Enter the relative error allowed in solution

0.01

Enter absolute value of Convergence criteria for the function value, i.e., how close f(x) is to zero

0.000000000025

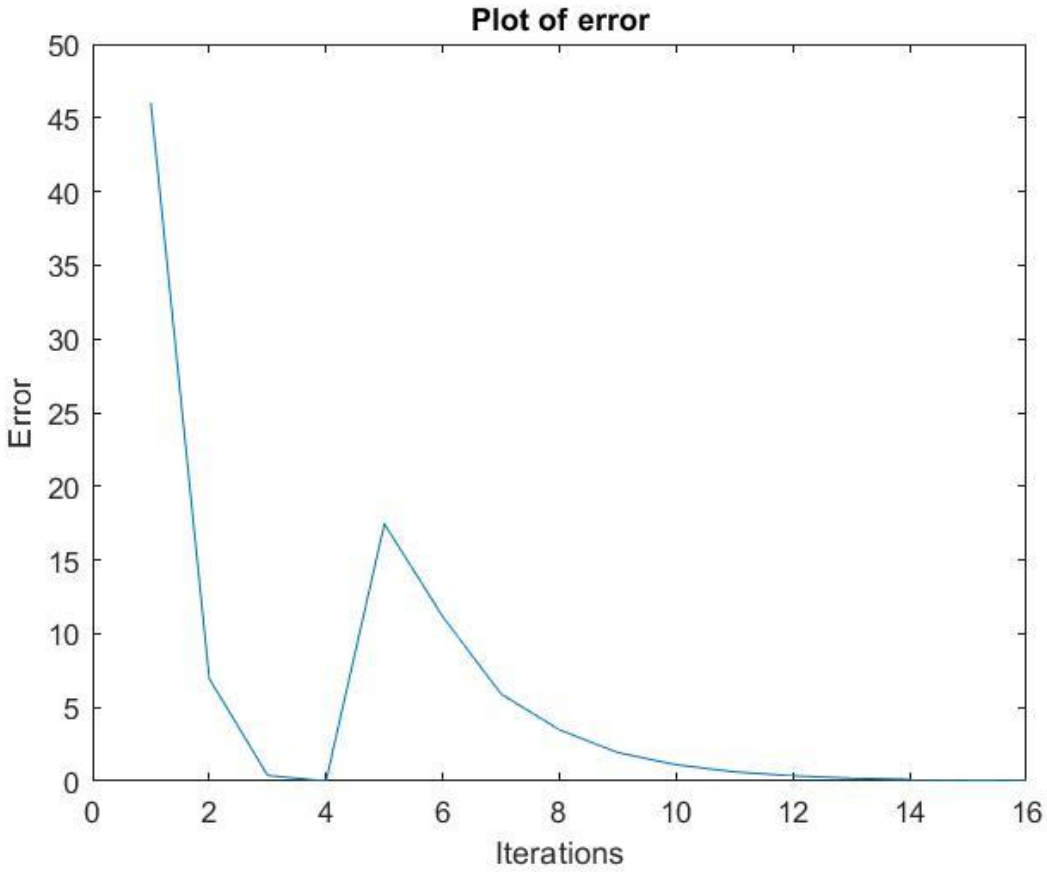
Enter allowed maximum number of iterations

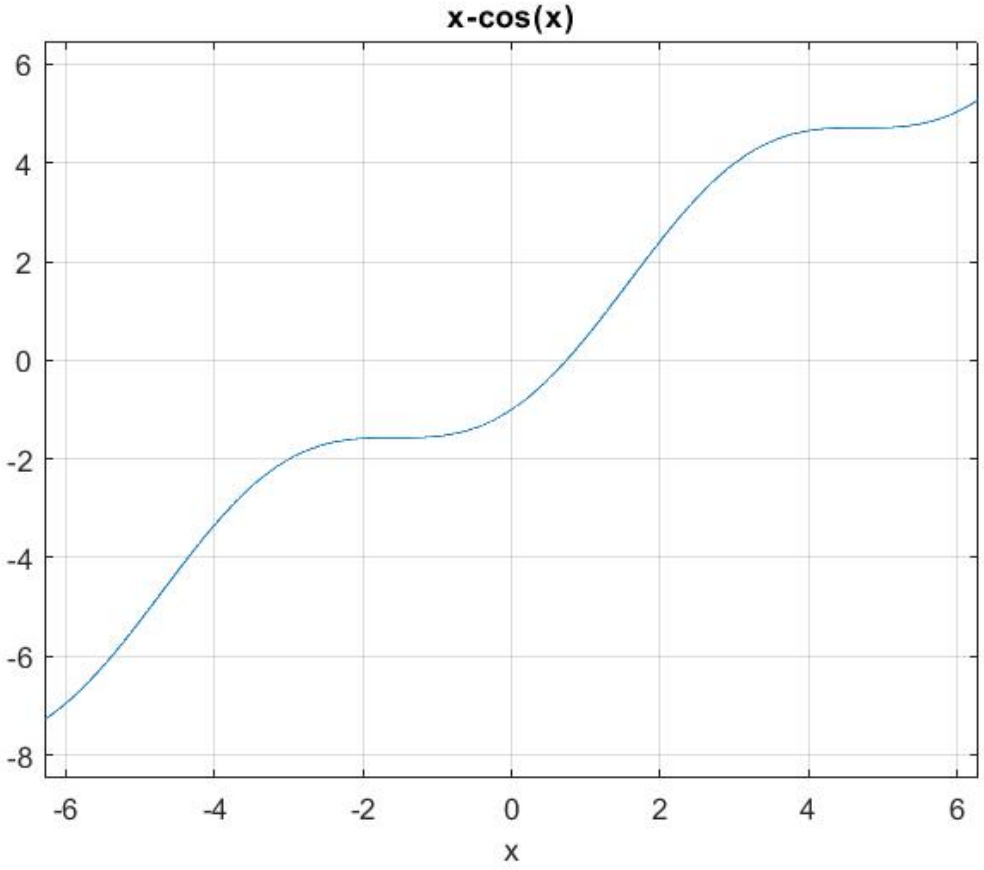
50

Output:

Root is 0.739085

Iterations stopped as relative error stopping criteria was met.


Plot of error
Error
Iterations
50
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16


x-cos(x)
x
6
4
2
0
-2
-4
-6
-8
-6
-4
-2
0
2
4
6

2. F(x) = exp(-x)-x

Input:

>> Ass1

Is the input equation a polynomial?(Y/N)

N

Choose the method of solution by selecting number shown with method:

Bisection-1,

False Position-2,

Fixed Point Method-3,

Newton-Raphson-4,

Secant-5

5

Enter your function

exp(-x)-x

Enter first starting point

0

Enter second starting point

1

Now subsequent enter stopping criteria:\n

Enter the relative error allowed in solution

0.01

Enter absolute value of Convergence criteria for the function value, i.e., how close f(x) is to zero

0.000000000025

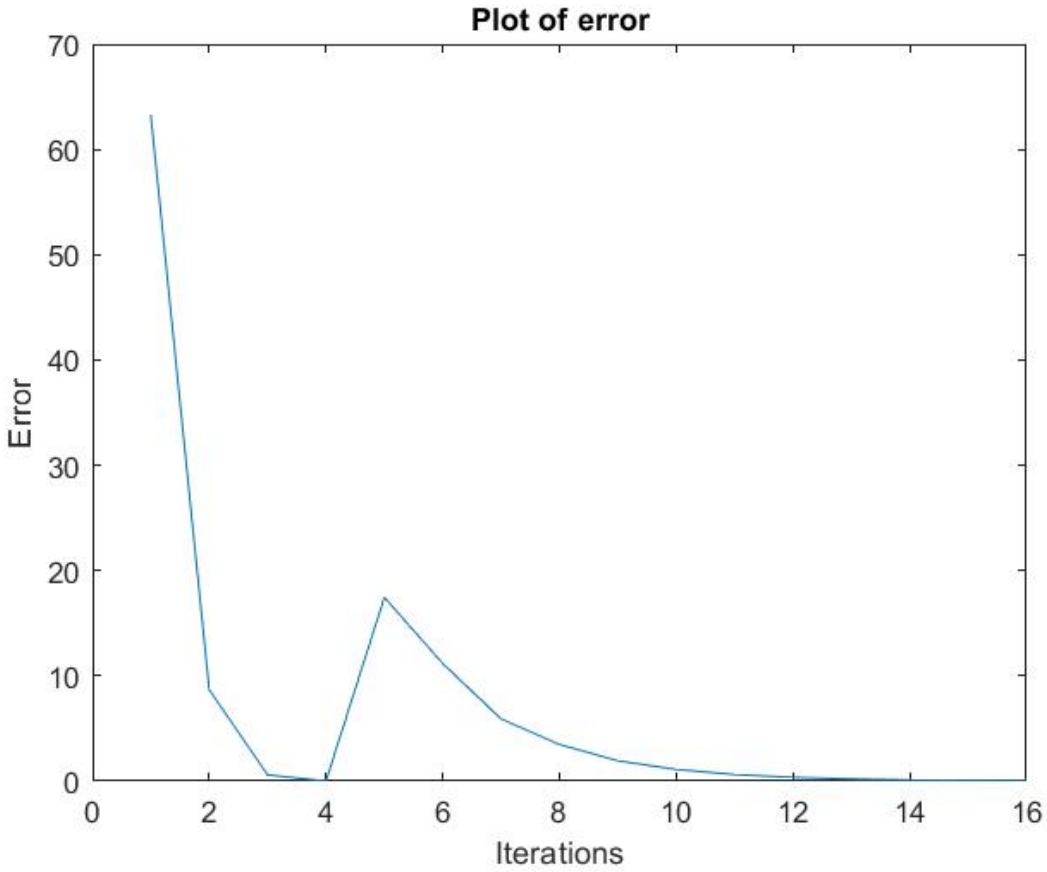
Enter allowed maximum number of iterations

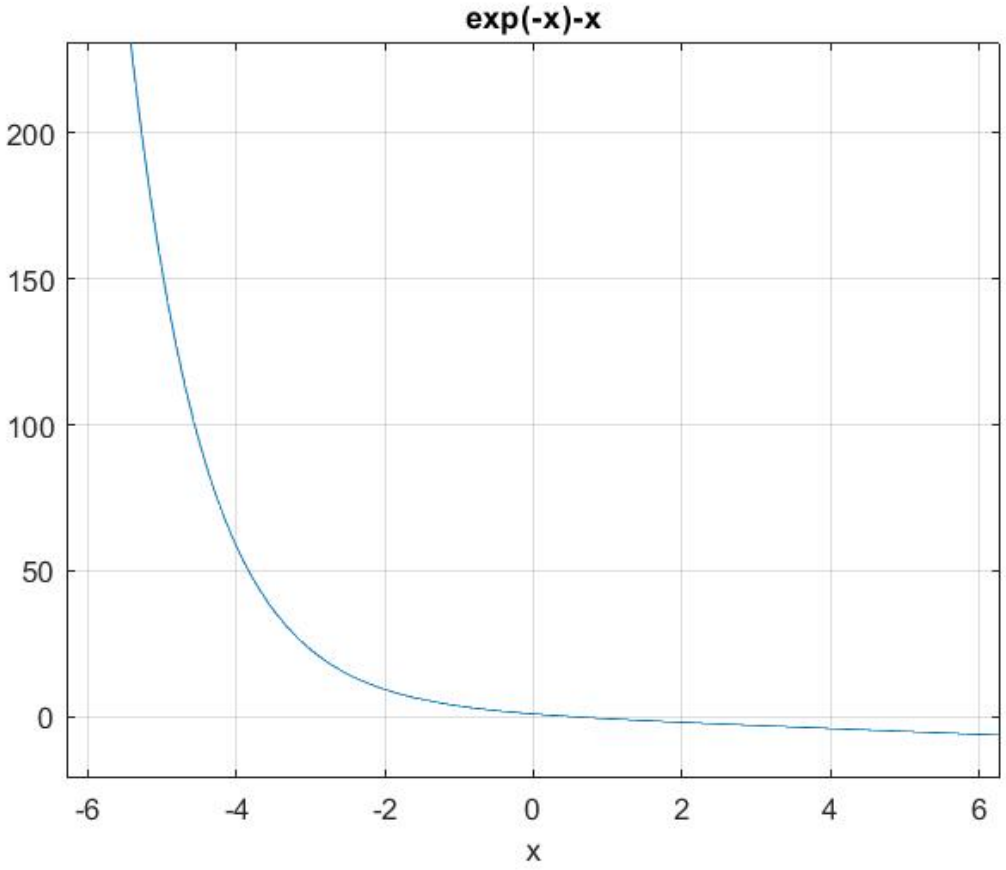
50

Output:

Root is 0.567143

Iterations stopped as relative error stopping criteria was met


Plot of error
Error
Iterations
0
10
20
30
40
50
60
70
0
2
4
6
8
10
12
14
16


exp(-x)-x
x
0
50
100
150
200
-6
-4
-2
0
2
4
6

Muller Method:

Input:

>> Ass1

Is the input equation a polynomial?(Y/N)

Y

Choose One of the following methods: Muller-1, Bairstow-2

1

Input Degree of Polynomial

4

Enter all degree+1 number of coefficients with each input followed by space

1 -7.4 20.44 -24.184 9.6448

Enter first starting point

-1

Enter 2nd starting point

0

Enter third starting point

1

Now subsequent enter stopping criteria:

Enter the relative error allowed in solution

0.01

Enter Convergence criteria for the function value, i.e., how close f(x) is to zero

0.0000000000025

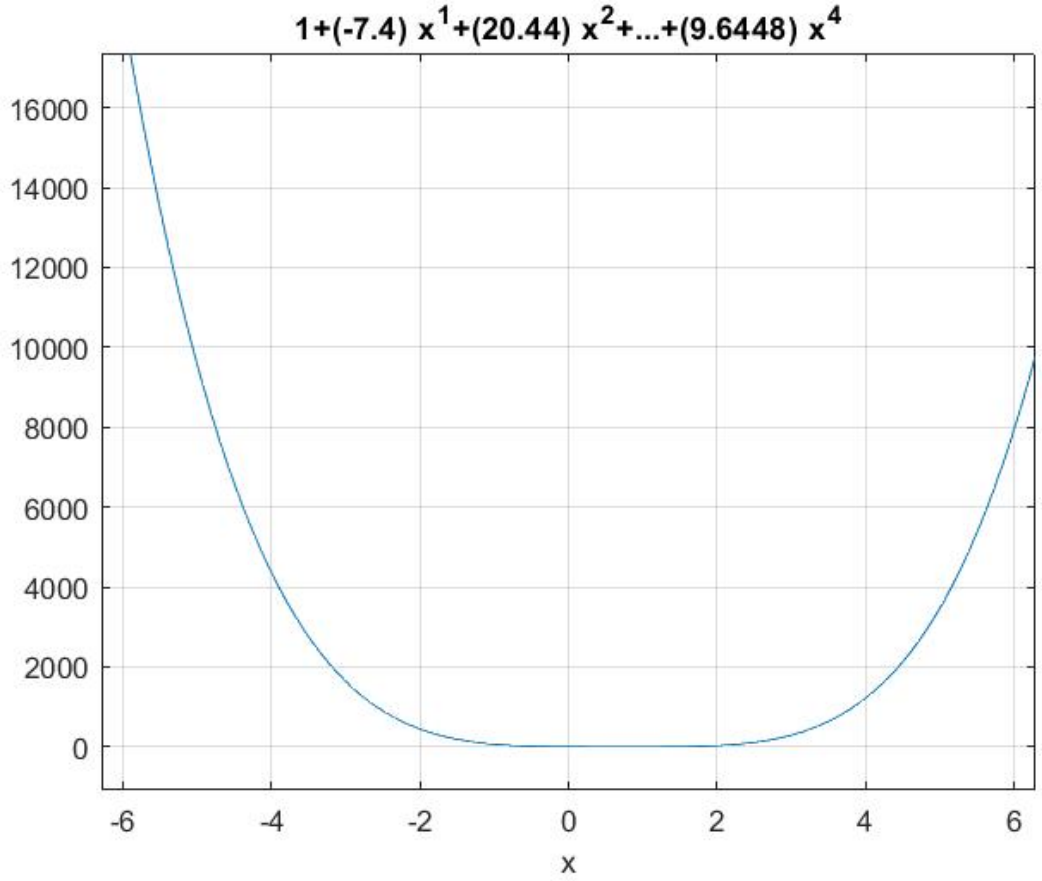
Enter allowed maximum number of iterations

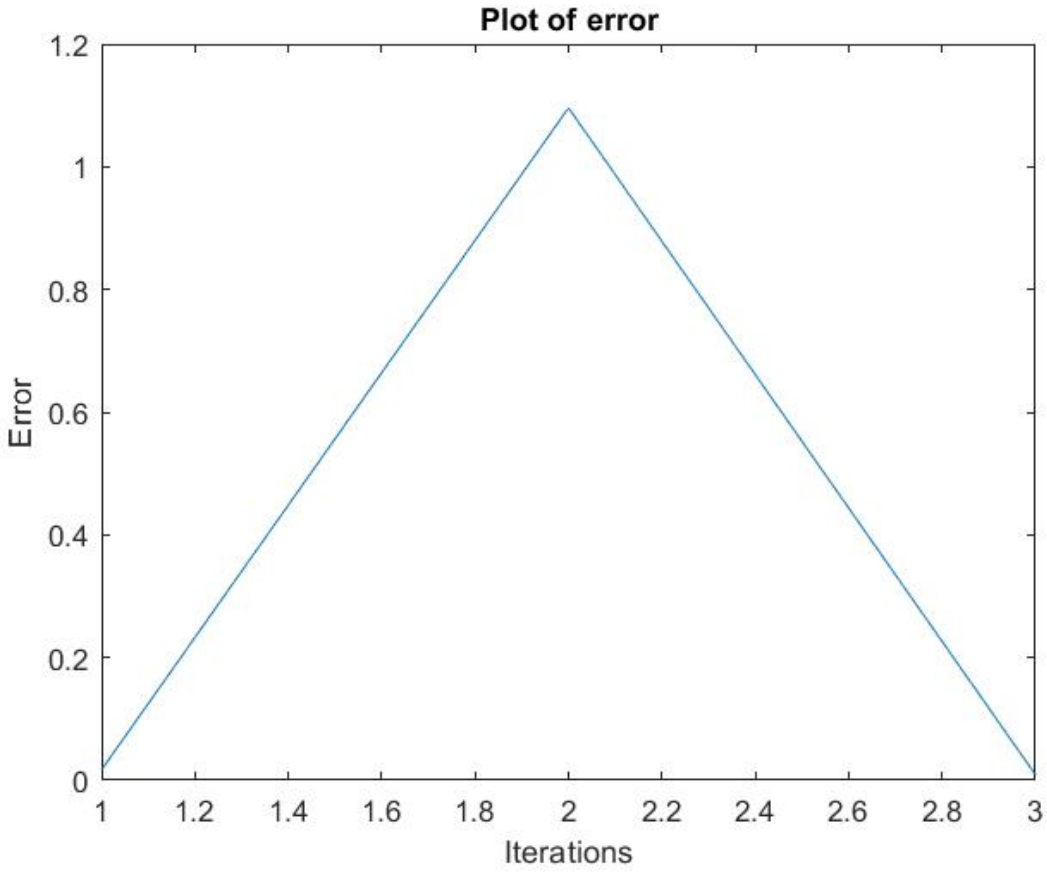
50

Output:

Root is 0.481042+0.000000i

Iterations stopped as relative error stopping criteria was met


1+(-7.4) x^1+(20.44) x^2+...+(9.6448) x^4
16000
14000
12000
10000
8000
6000
4000
2000
0
-6
-4
-2
0
2
4
6
x


Plot of error
1.2
1
0.8
0.6
0.4
0.2
0
Error
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
Iterations

Bairstow Method:

1. (r=4,s=-5)

Input:

Is the input equation a polynomial?(Y/N)

Y

Choose One of the following methods: Muller-1, Bairstow-2

2

Input your polynomial: x^4-7.4*x^3+20.44*x^2-24.184*x+9.6448

Starting value of r: 4

Starting value of s: -5

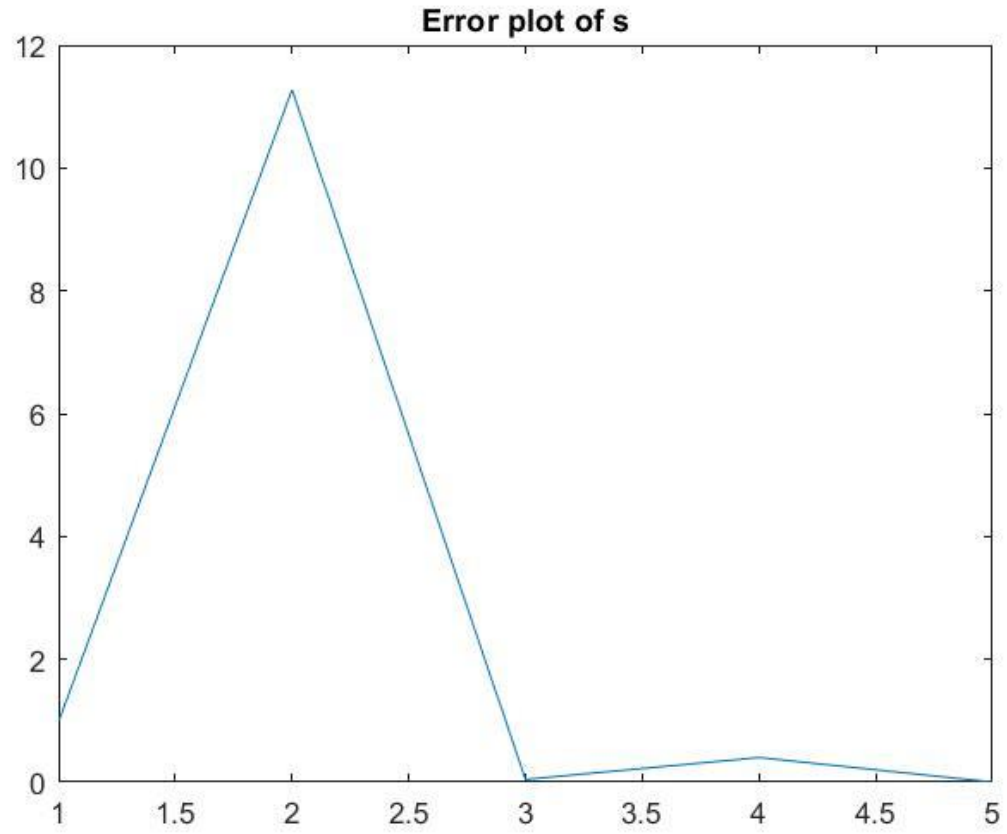
Allowed Value of relative error: 0.01

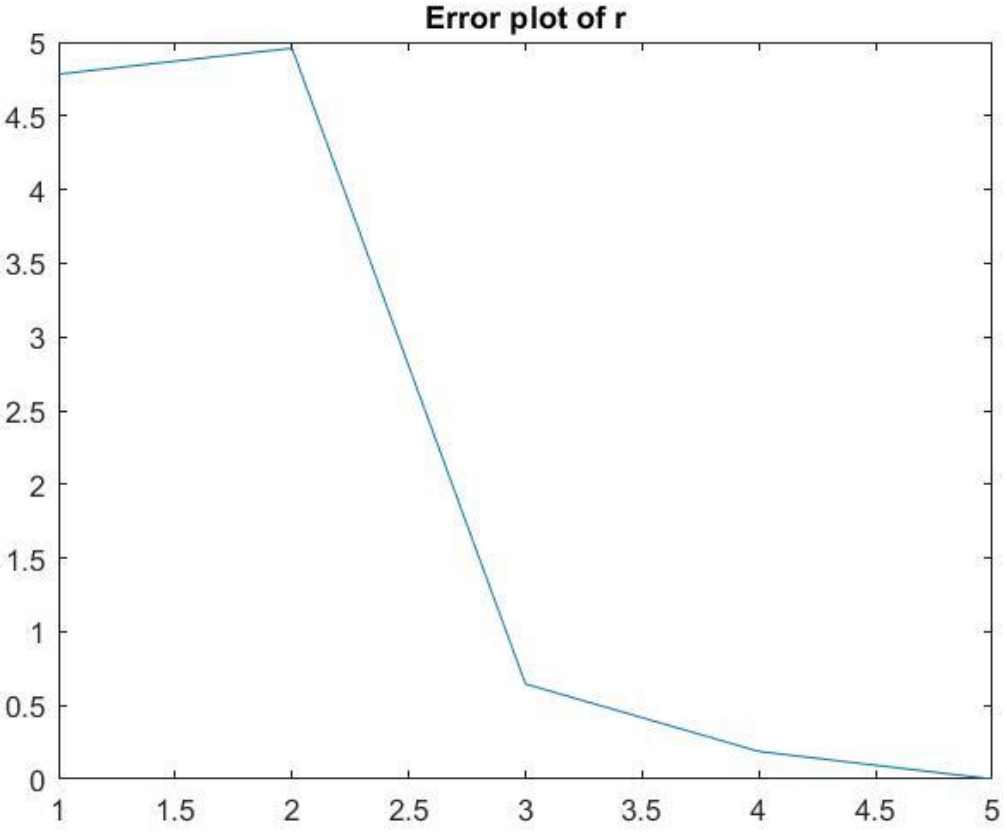
Allowed maximum iteration: 50

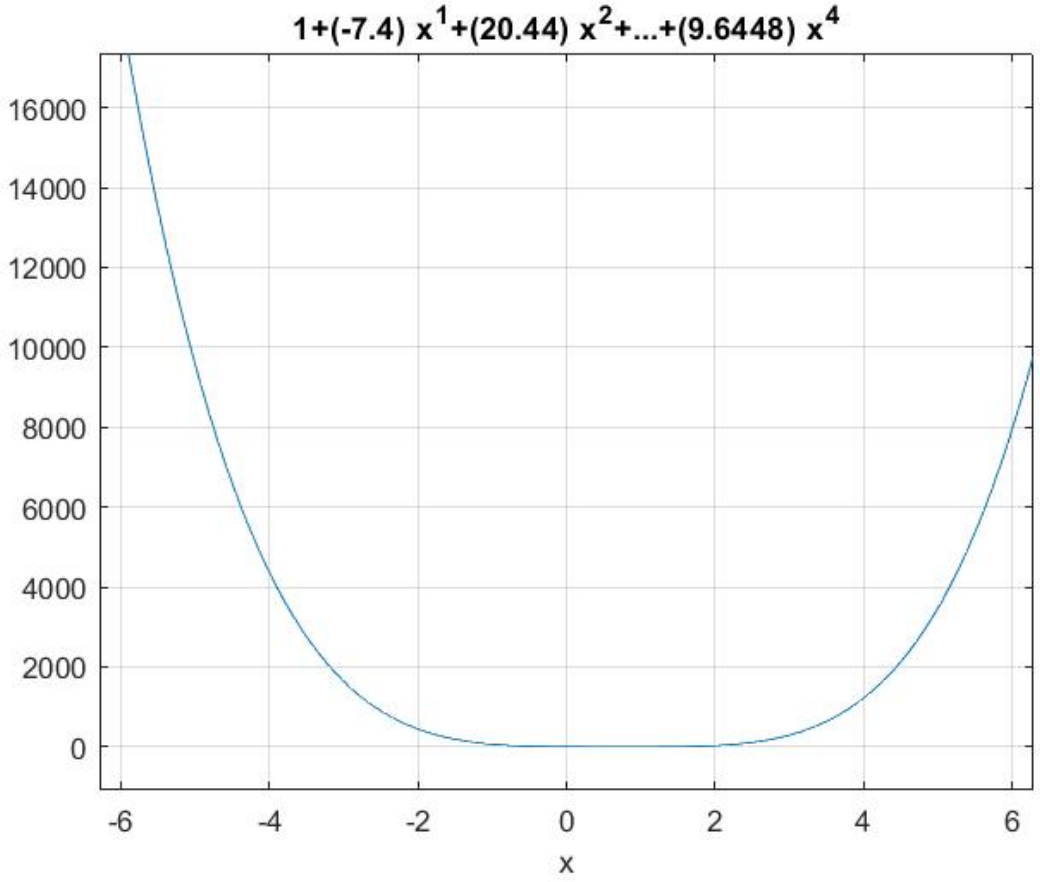
Output:

The two roots of the functions are: 2.200000 + 1.280000i, 2.200000 - 1.280000i

The two roots of the functions are: 2.199918, 0.800061


Error plot of s
12
10
8
6
4
2
0
1
1.5
2
2.5
3
3.5
4
4.5
5


Error plot of r
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1
1.5
2
2.5
3
3.5
4
4.5
5


1+(-7.4) x^1+(20.44) x^2+...+(9.6448) x^4
16000
14000
12000
10000
8000
6000
4000
2000
0
-6
-4
-2
0
2
4
6
x

2. (r=2,s=-2)

Input:

>> Ass1

Is the input equation a polynomial?(Y/N)

Y

Choose One of the following methods: Muller-1, Bairstow-2

2

Input your polynomial: x^4-7.4*x^3+20.44*x^2-24.184*x+9.6448

Starting value of r: 2

Starting value of s: -2

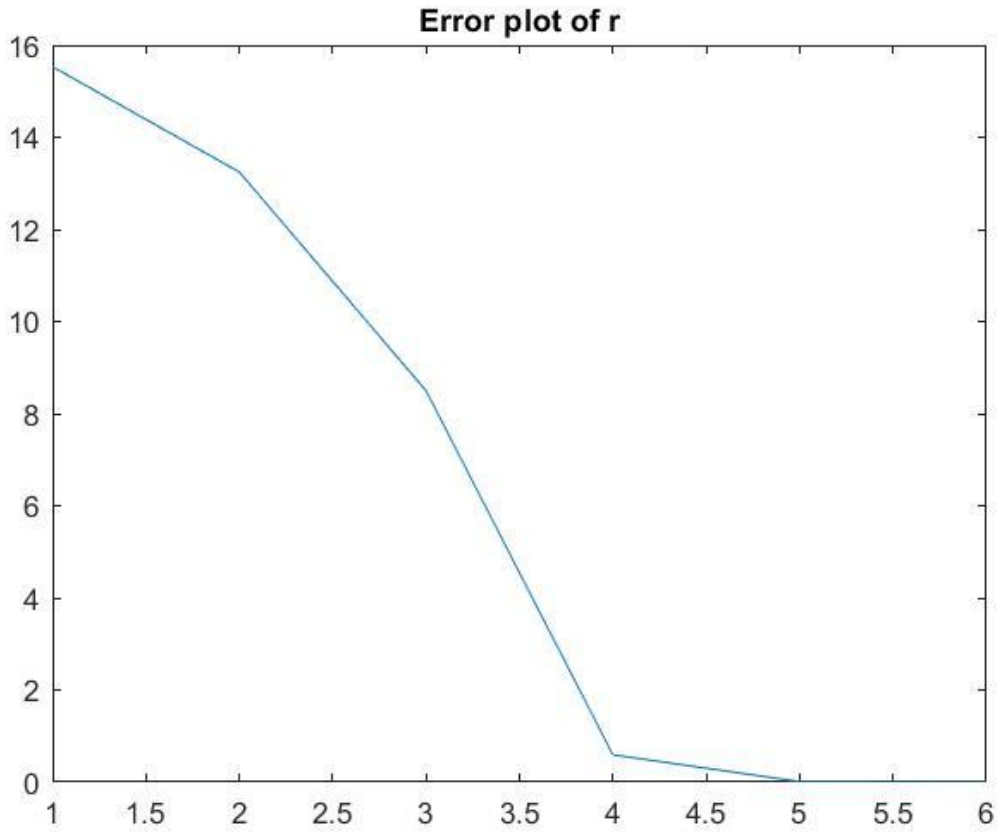
Allowed Value of relative error: 0.01

Allowed maximum iteration: 50

Output:

Roots of the functions are: 2.200000, 0.800000

Roots of the function are: 2.200000 + 0.800000i, 2.200000 - 0.800000i


Error plot of r
16
14
12
10
8
6
4
2
0
1
1.5
2
2.5
3
3.5
4
4.5
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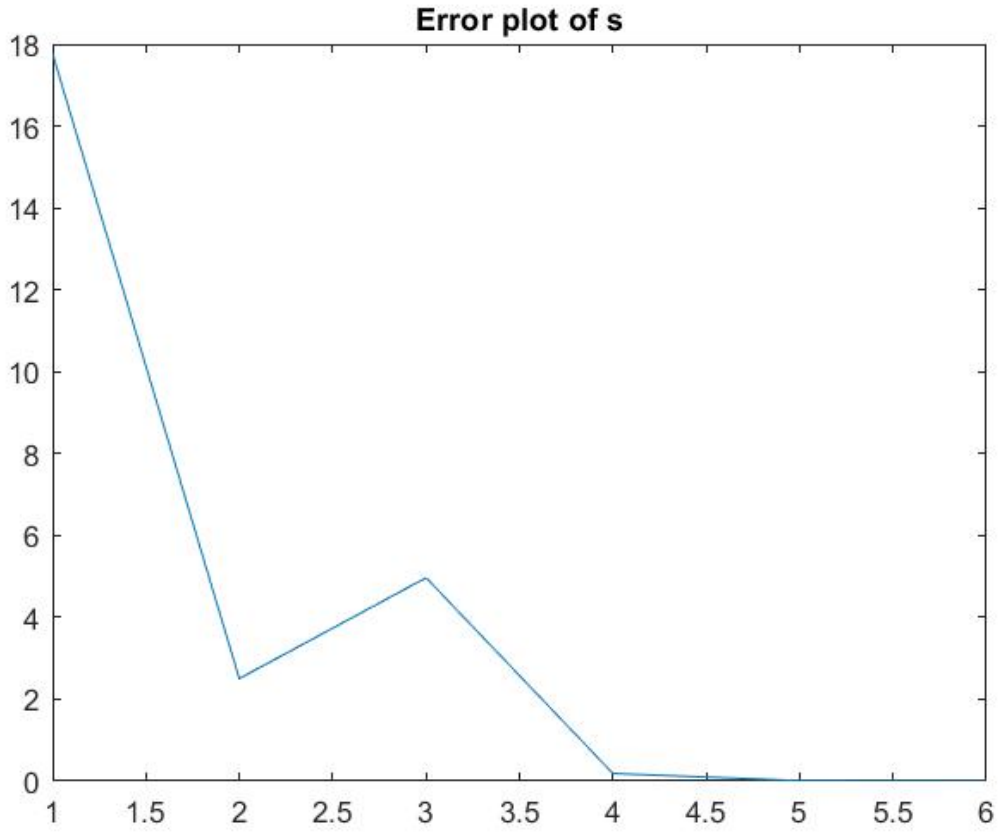
5.5
6


Error plot of s
18
16
14
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