Assignment-3

Course: SC-374

Computational and Numerical Methods

Instructor: Prof. Arnab Kumar

Made by:

Yatin Patel – 201601454

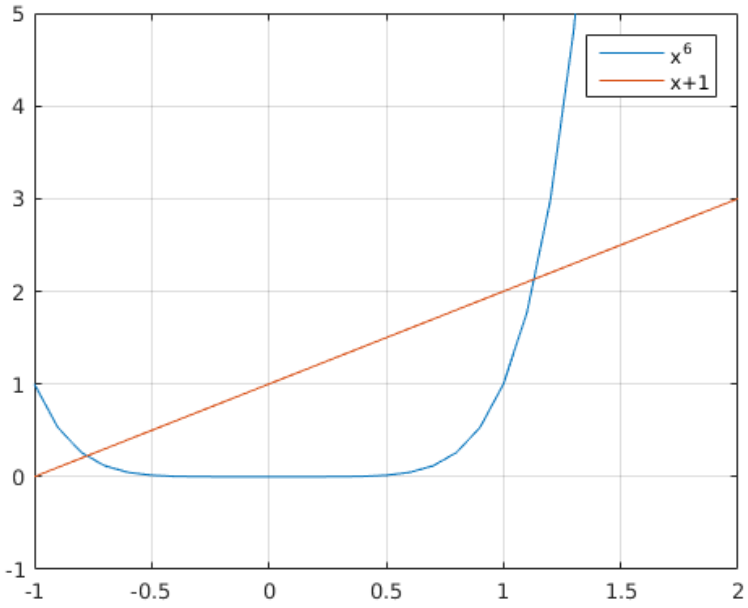
Rutvik Kothari – 201601417

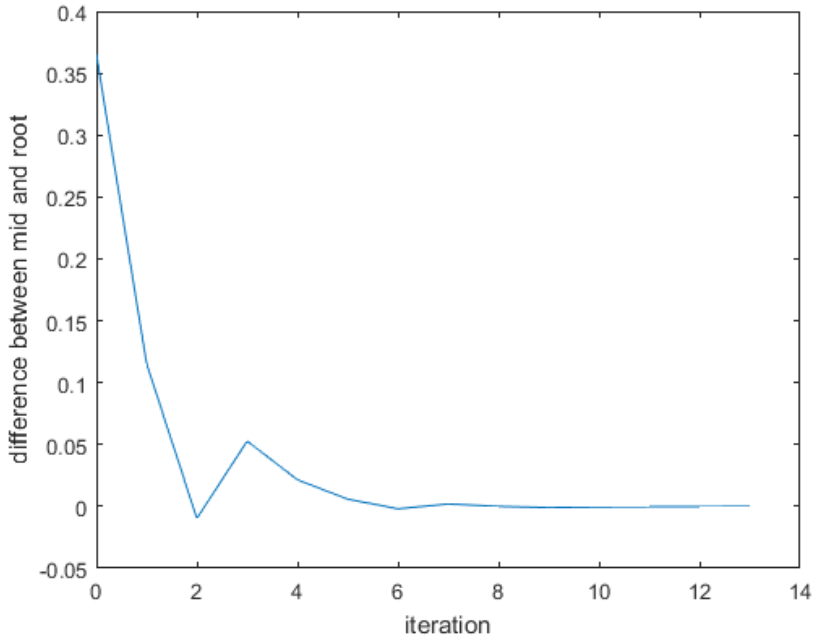
Problem: 1

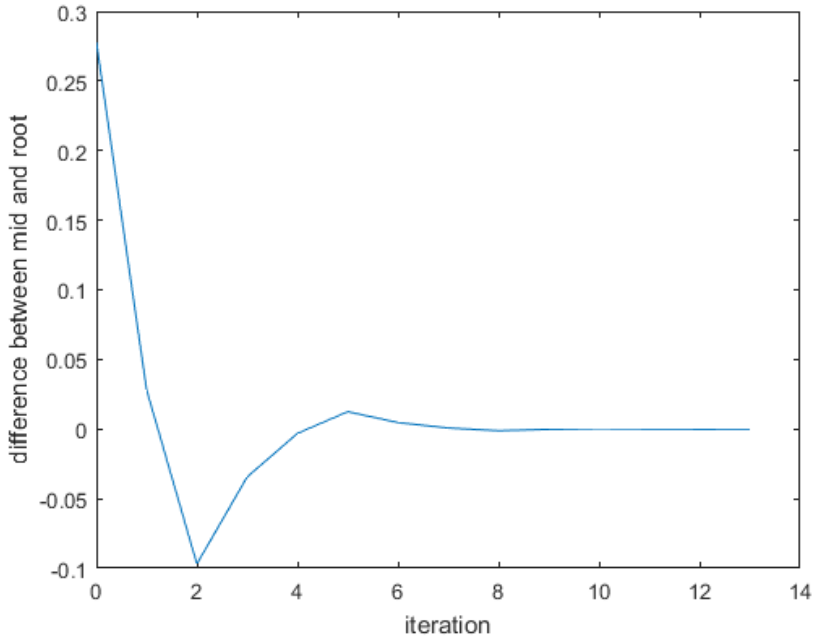
♦ **Statement:**

Write a code, applying the algorithm of the bisection method to determine both the real roots of $\boldsymbol{f(x) = x^6 - x - 1 = 0}$.

♦ **Graphs:**







♦ **Observations:**

Smallest Root which we are getting is at x = -0.7781 .

Largest Root which we are getting is at x = 1.1347 .

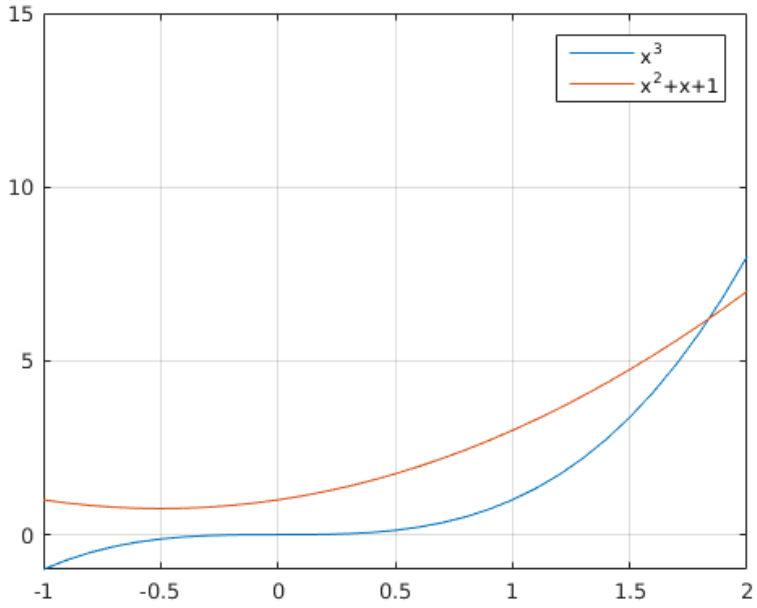
Problem: 2

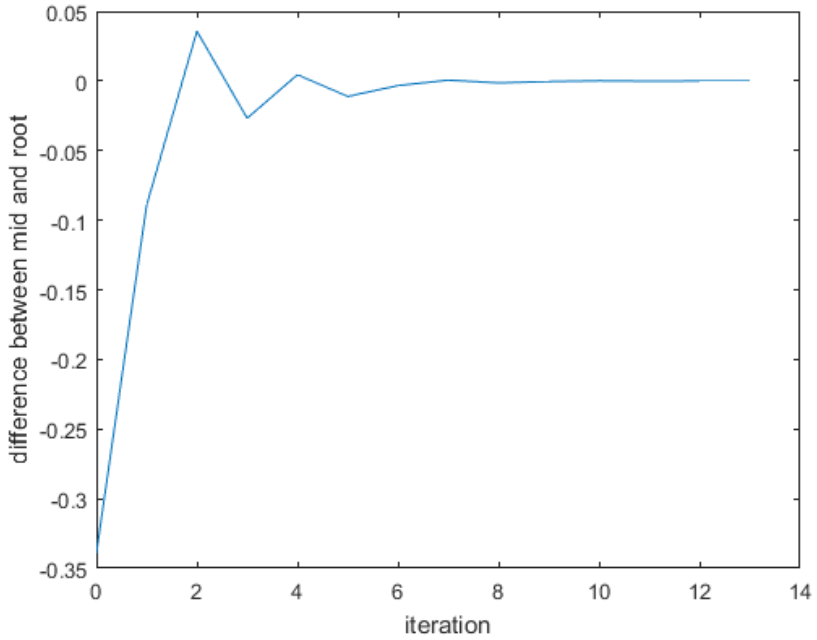
♦ **Statement:**

Use the bisection method to find the real roots of the following functions, using an error tolerance of € = 0.0001.

(A) $f(x) = x^3 - x^2 - x - 1 = 0$

♦ **Graphs:**



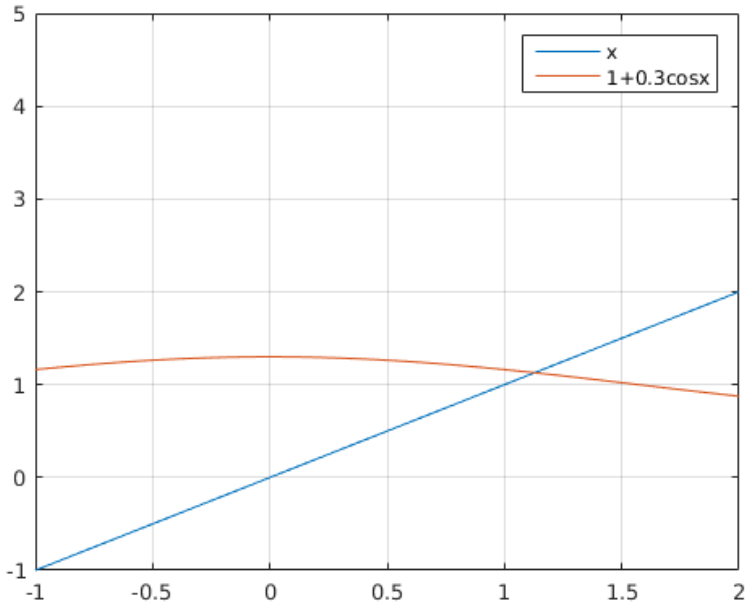


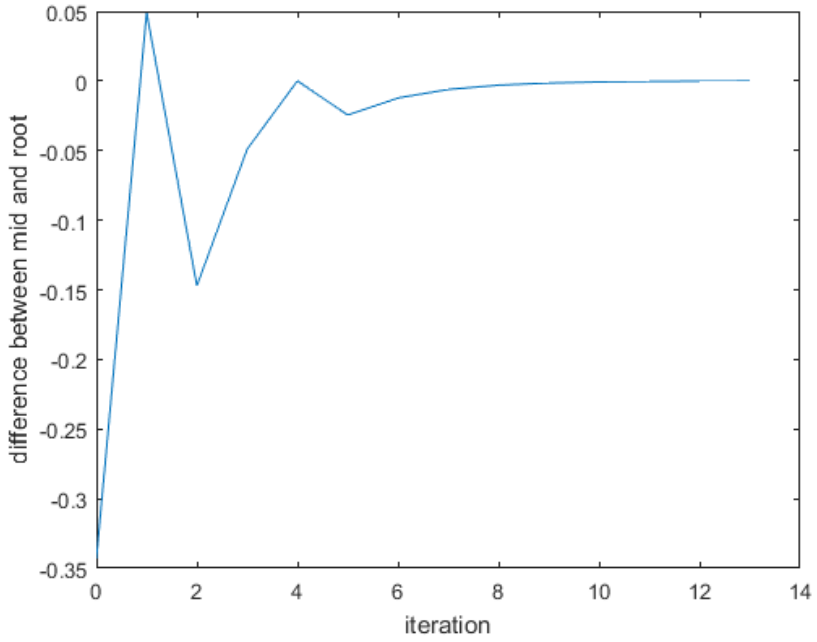
♦ **Observations:**

Root which we are getting is at x = 1.8393 .

(B) $\boldsymbol{f(x) = x - 1 - 0.3cosx = 0}$

♦ **Graphs:**



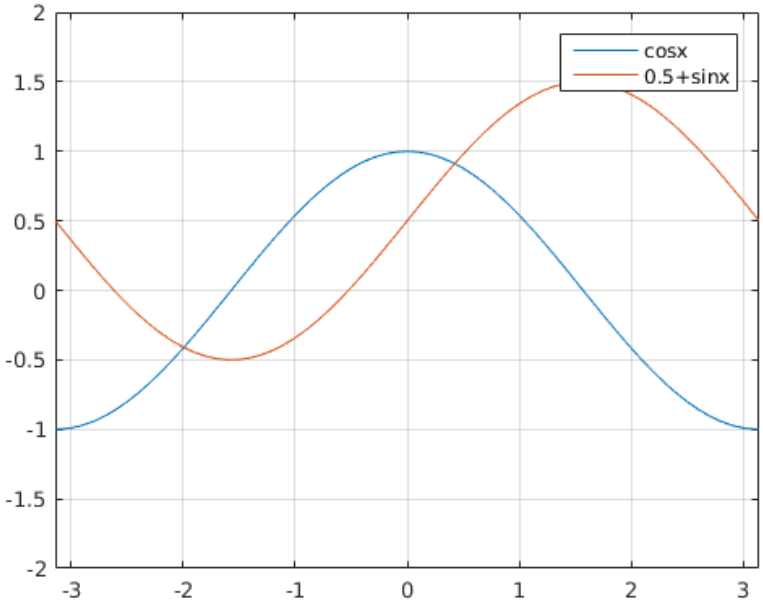


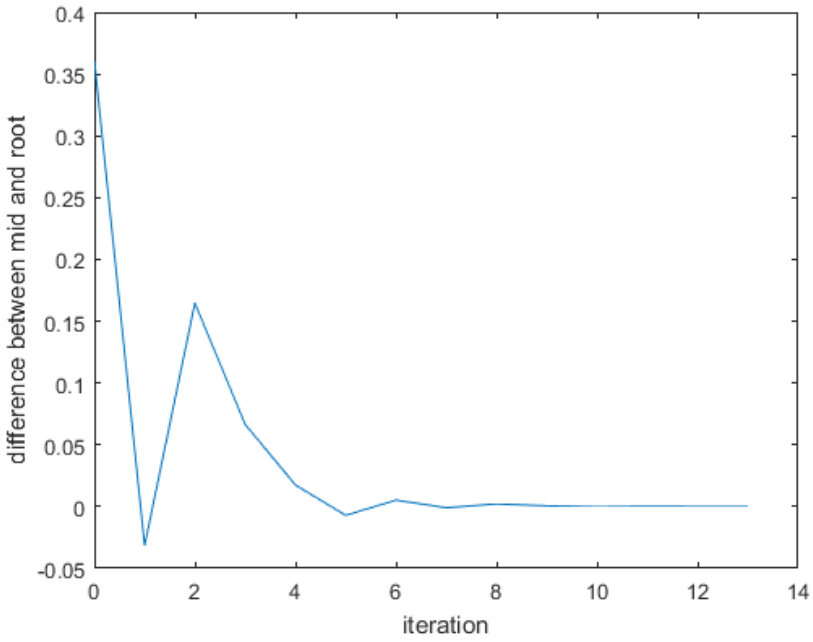
♦ **Observations:**

Root which we are getting is at x = 1.1284 .

(C) $\boldsymbol{f(x) = cosx - sinx - 0.5 = 0}$

♦ **Graphs:**



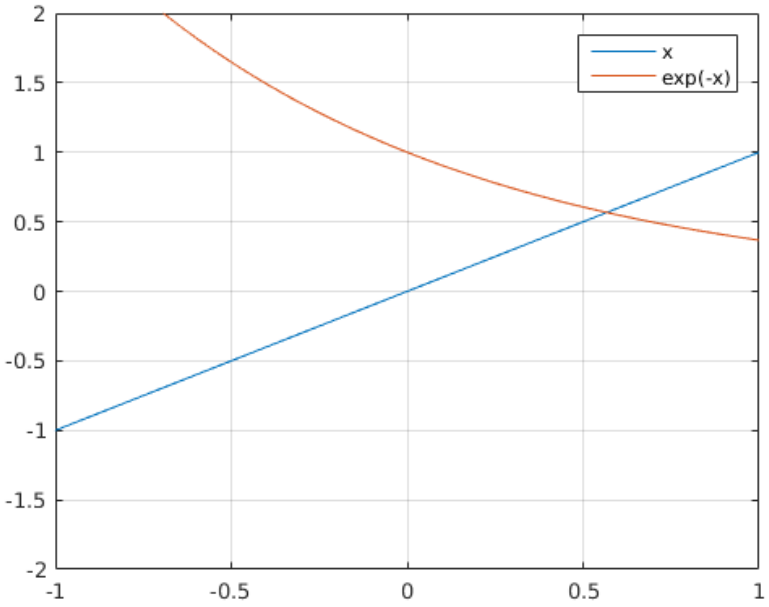


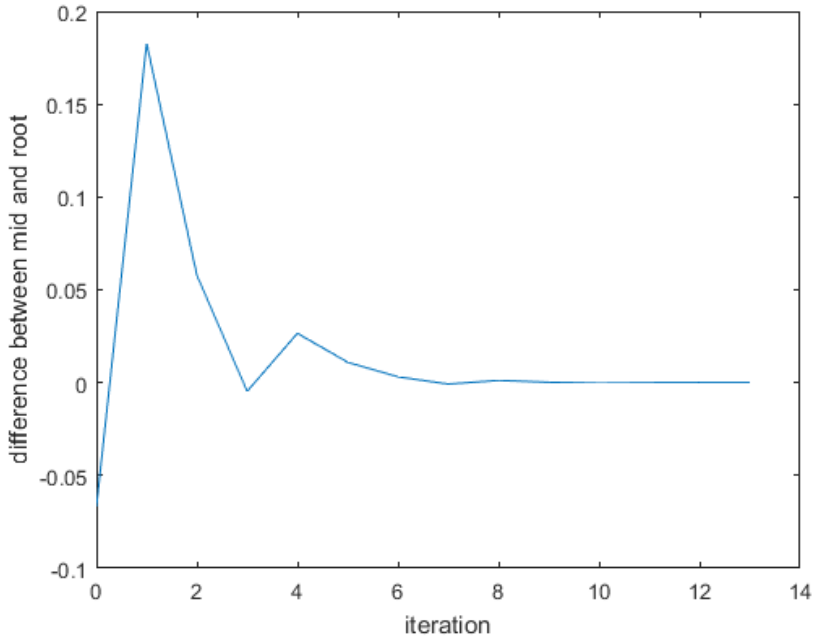
♦ **Observations:**

Root which we are getting is at x = 0.4241 .

(D) $f(x) = x - e^{-x} = 0$

♦ **Graphs:**



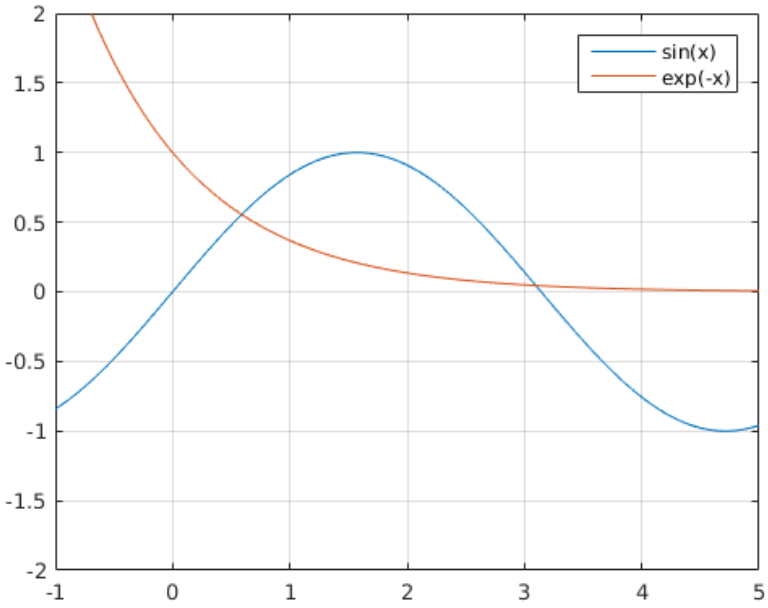


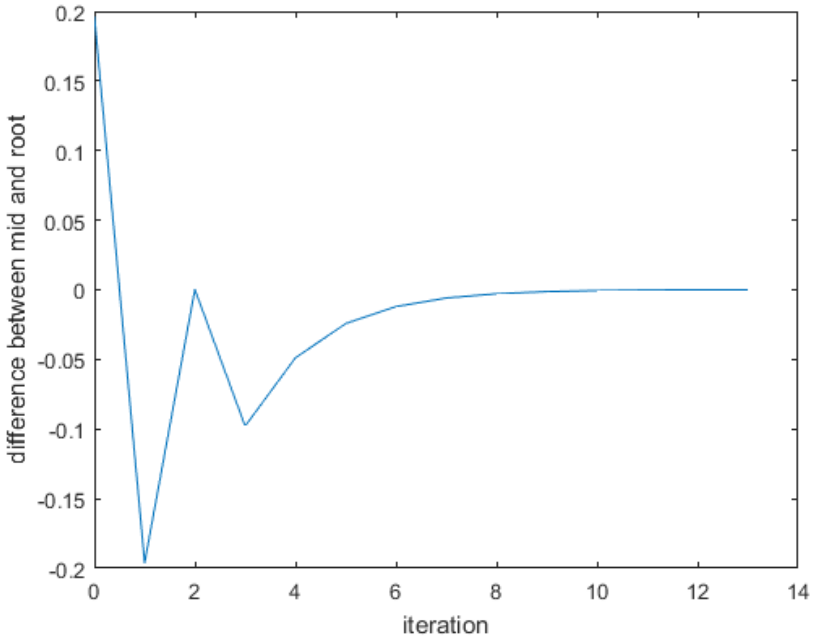
♦ **Observations:**

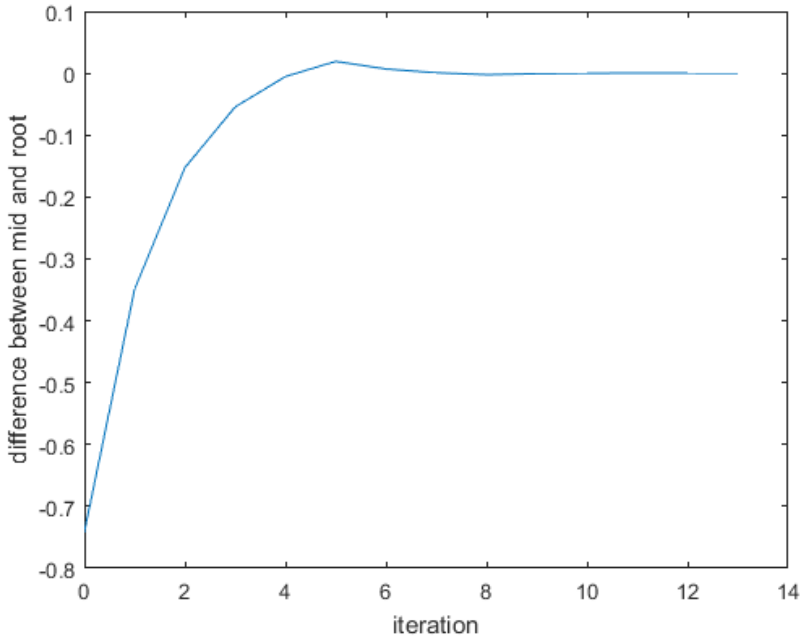
Root which we are getting is at x = 0.5672 .

(E) $\boldsymbol{f(x) = e^{-x} - sinx = 0}$

♦ **Graphs:**


sin(x)
exp(-x)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-1
0
1
2
3
4
5


difference between mid and root
iteration
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
0
2
4
6
8
10
12
14



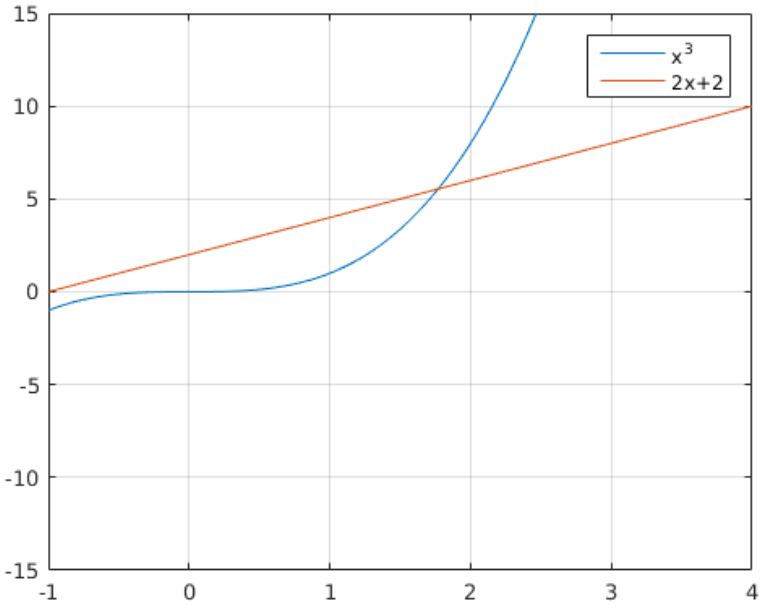
♦ **Observations:**

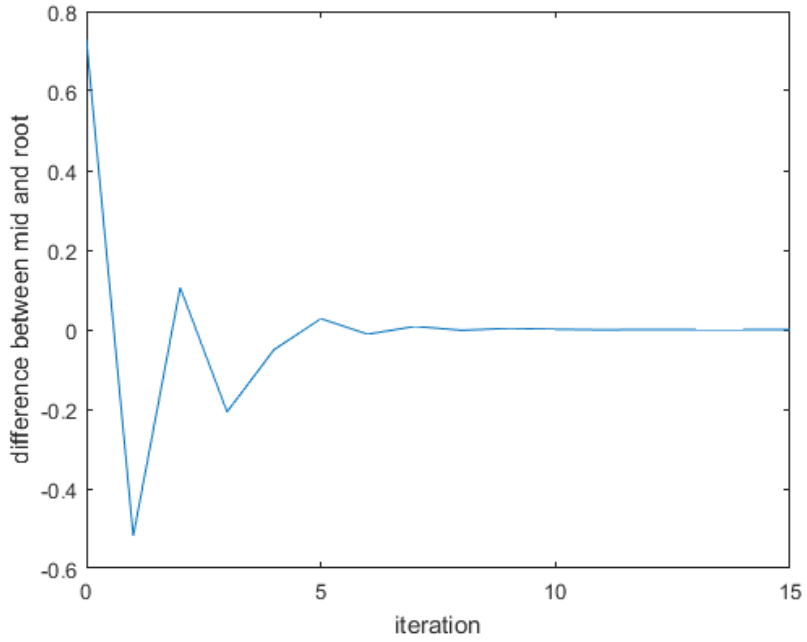
Root which we are getting is at x = 0.5885 .

Root which we are getting is at x = 3.0964 .

(F) $\boldsymbol{f(x) = x^3 - 2x - 2 = 0}$

♦ **Graphs:**



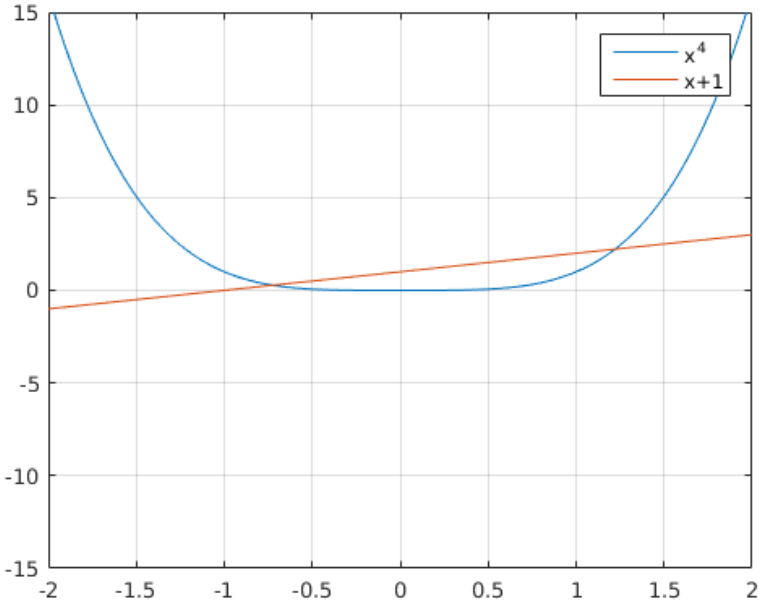


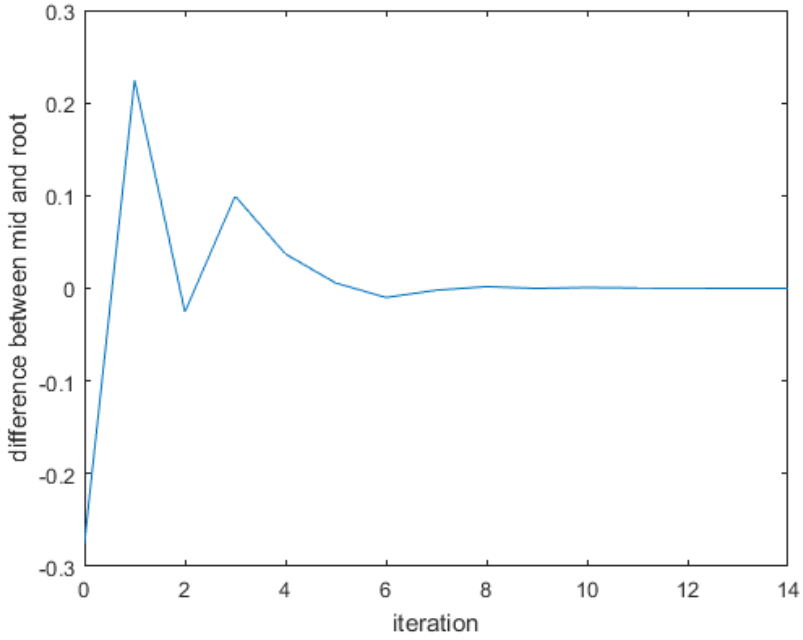
♦ **Observations:**

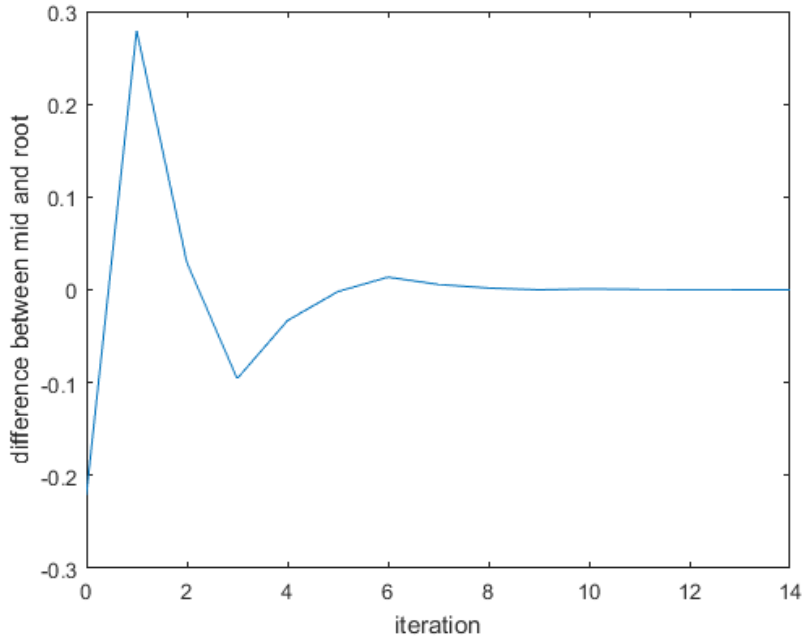
Root which we are getting is at x = 1.7693 .

(G) $f(x) = x^4 - x - 1 = 0$

♦ **Graphs:**


15
10
5
0
-5
-10
-15
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
x^4
x+1


0.3
0.2
0.1
0
-0.1
-0.2
-0.3
0
2
4
6
8
10
12
14
difference between mid and root
iteration



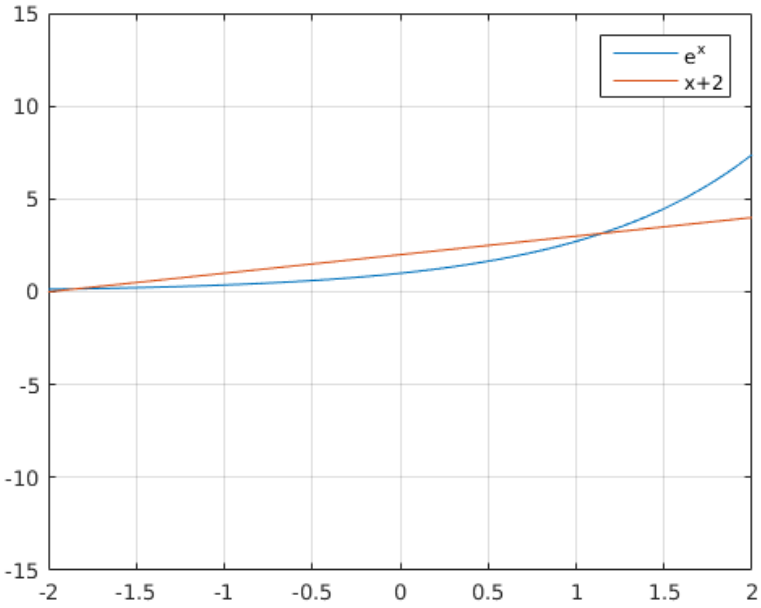
♦ **Observations:**

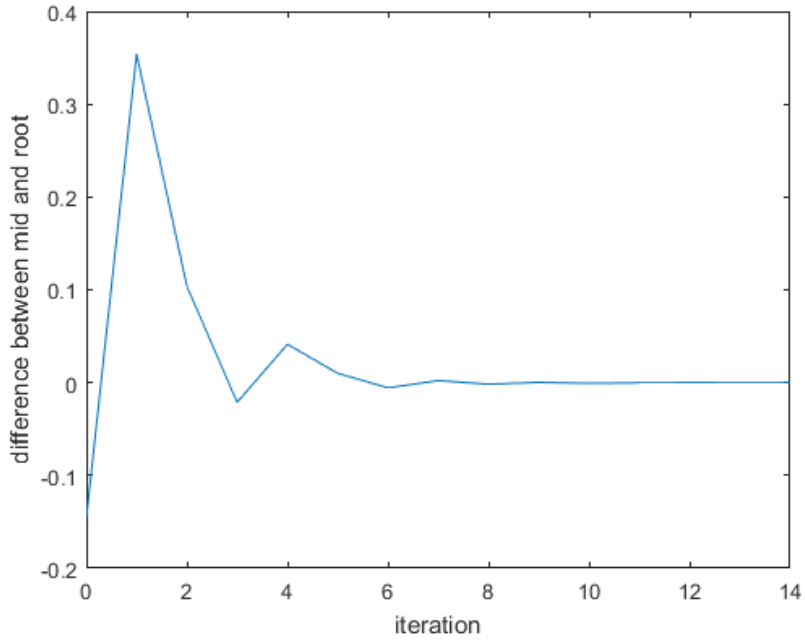
Smallest Root which we are getting is at x = -0.7245 .

Largest Root which we are getting is at x = 1.2207 .

(H) $\boldsymbol{f(x) = e^x - x - 2 = 0}$

♦ **Graphs:**



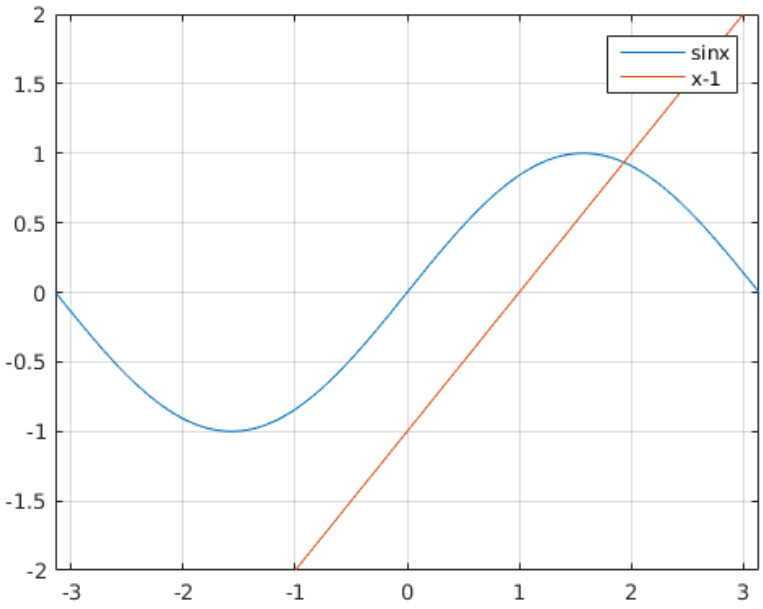


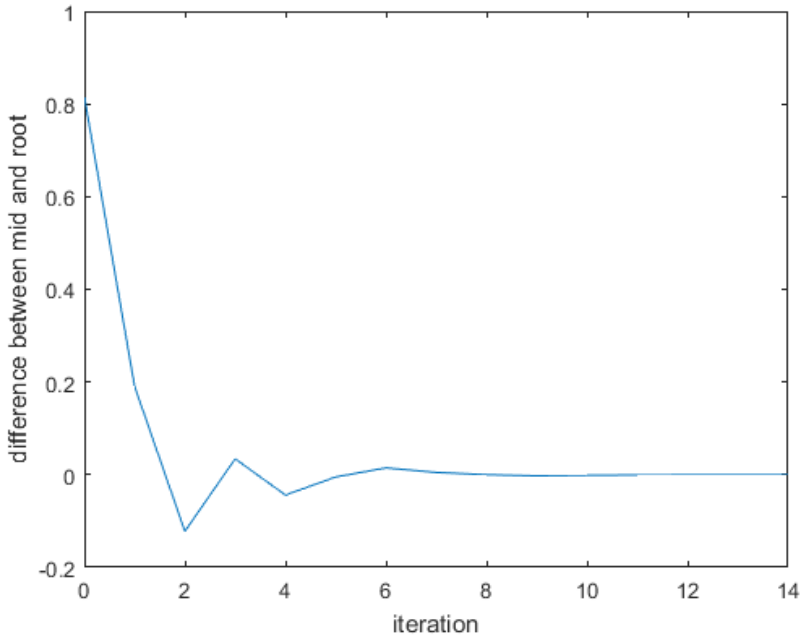
♦ **Observations:**

Root which we are getting is at x = 1.1462 .

$$(I)\ f(x) = 1 - x + sinx = 0$$

♦ **Graphs:**



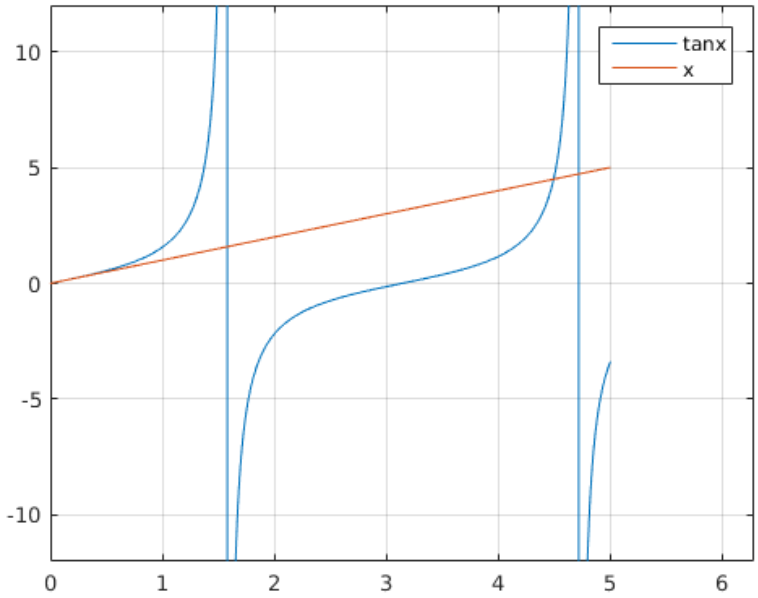


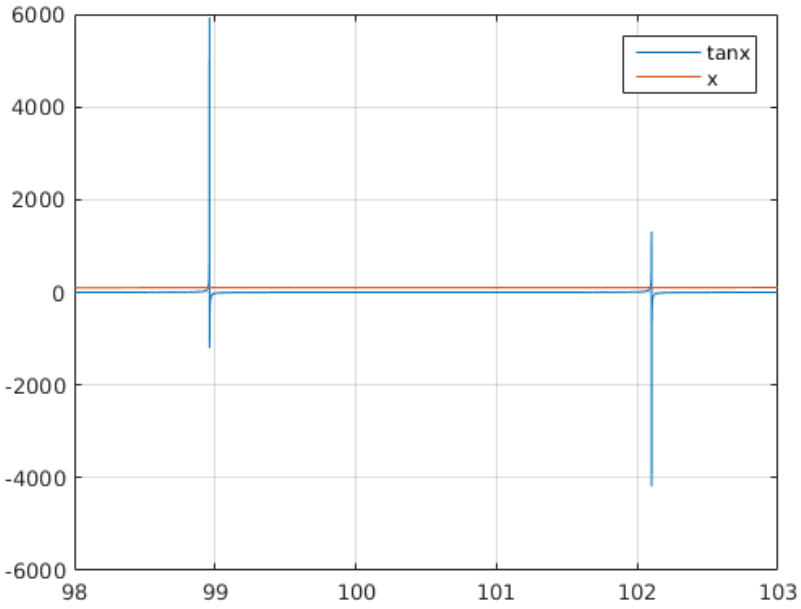
♦ **Observations:**

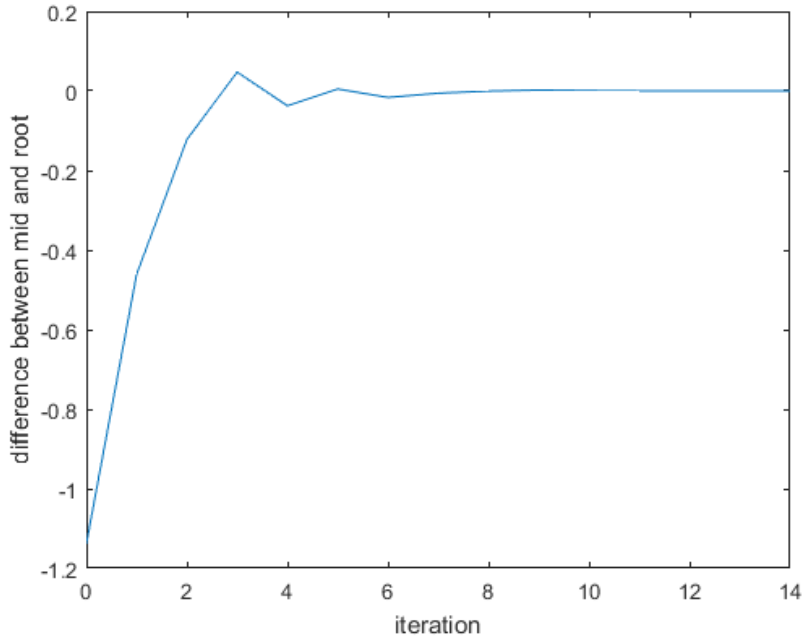
Root which we are getting is at x = 1.9345 .

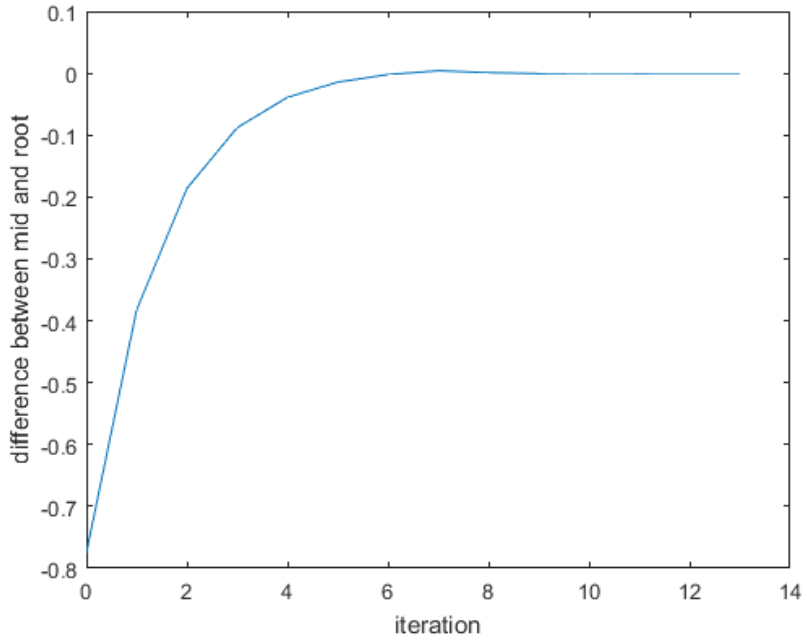
(J) $f(x) = x - tanx = 0$

♦ **Graphs:**









♦ **Observations:**

Smallest non-zero positive Root which we are getting is at x = 4.4934 .

Root closest to x = 100 , which we are getting is at x = 98.9501 .