MA322 – Scientific Computing Lab

Lab – 03

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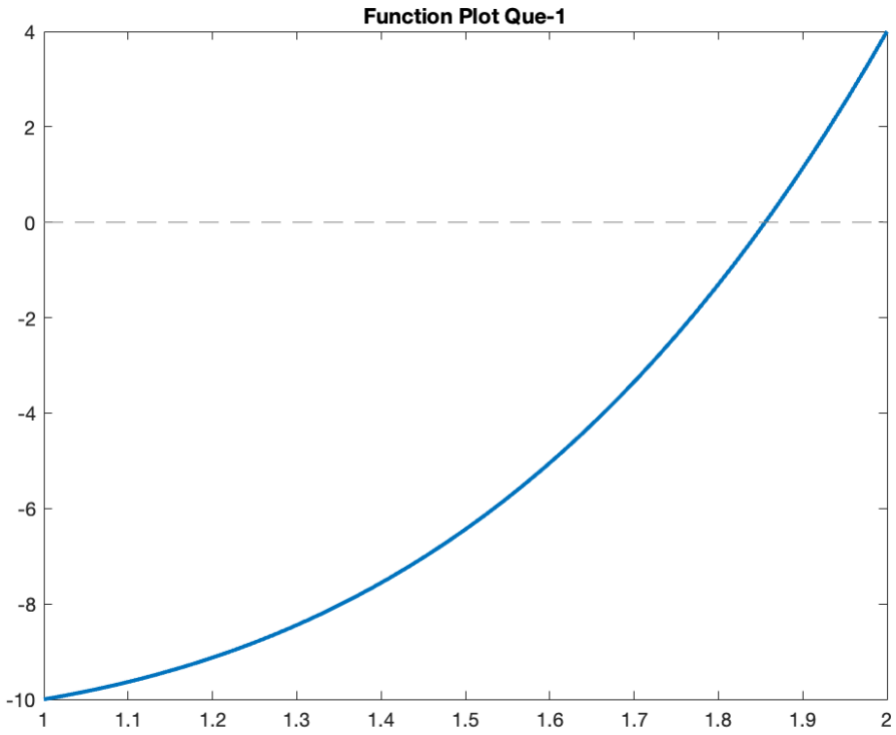
- I have used Error as $|x_{n+1} - x_n|$. To run, open and run output_file.m file.
- For the loglog plot between Error and number of iterations, I have used the inbuilt loglog(.) function in MATLAB.
- For plotting function plot between specific intervals, I have used inbuilt fplot(.) function in MATLAB.

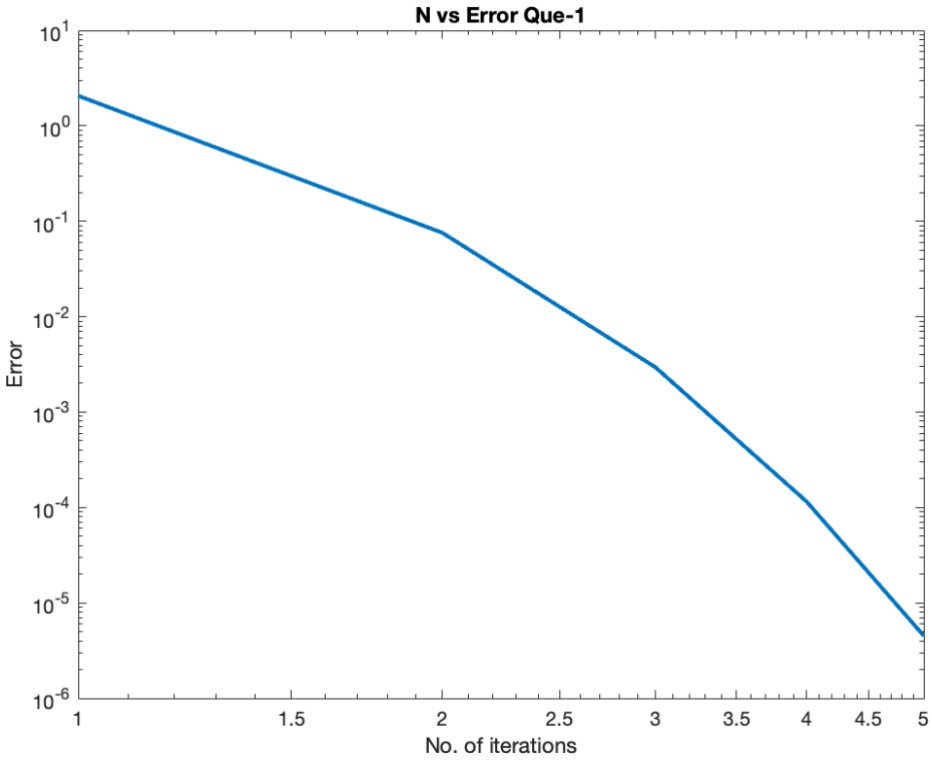
Ques - 1

Function Taken => $f(x) = x^4 - x - 10$ and $g(x) = (x + 10)^{(1/4)}$.

```
Fixed Point Iteration method for Q-1
No. Of Iterations       Approx. Soln.           Error
1                       1.934336420267669       2.065664e+00
2                       1.858658358263916       7.567806e-02
3                       1.855704792559643       2.953566e-03
4                       1.855589234419414       1.155581e-04
5                       1.855584712772906       4.521647e-06

The required root is: 1.855585
The number of iterations performed: 5
```



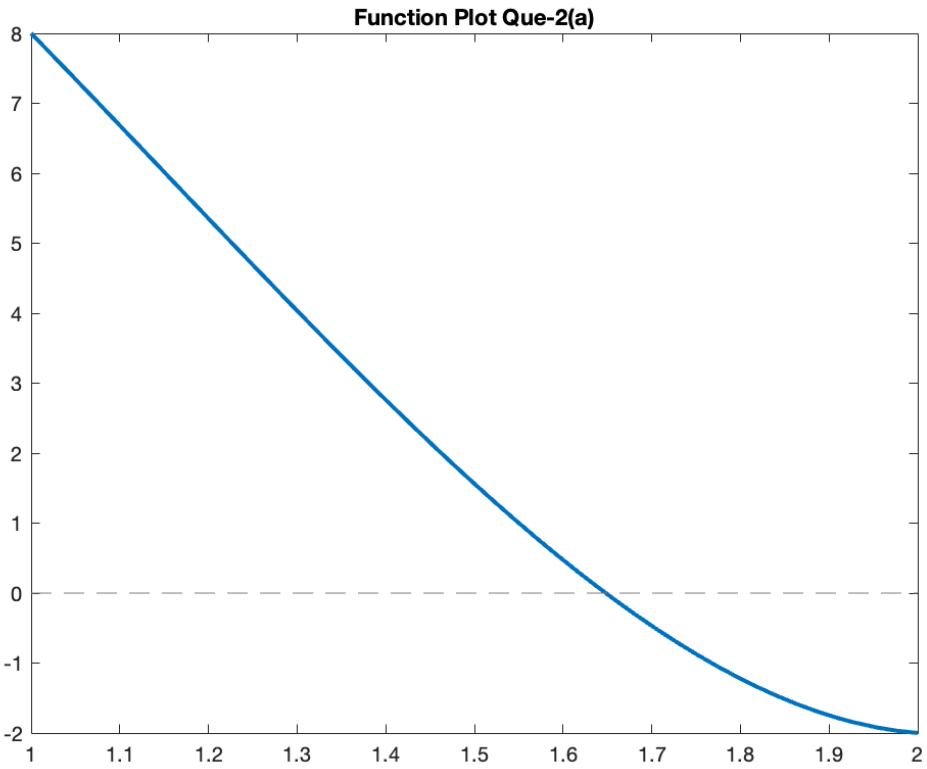


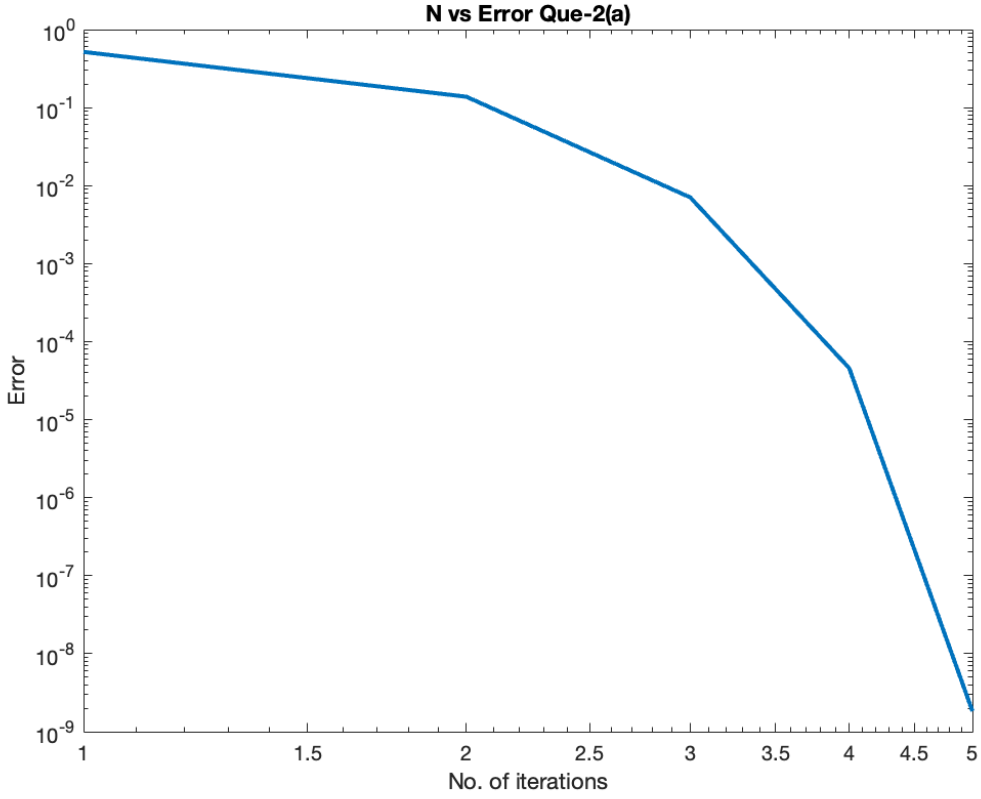
Ques – 2

(a)

```
Modified Newton method for Q-2(a)
No. Of Iterations       Approx. Soln.          Error
1                       1.517412935323383      5.174129e-01
2                       1.655192618525098      1.377797e-01
3                       1.648141093433965      7.051525e-03
4                       1.648095367441193      4.572599e-05
5                       1.648095365607361      1.833832e-09

The required root is: 1.648095
The number of iterations performed: 5
```

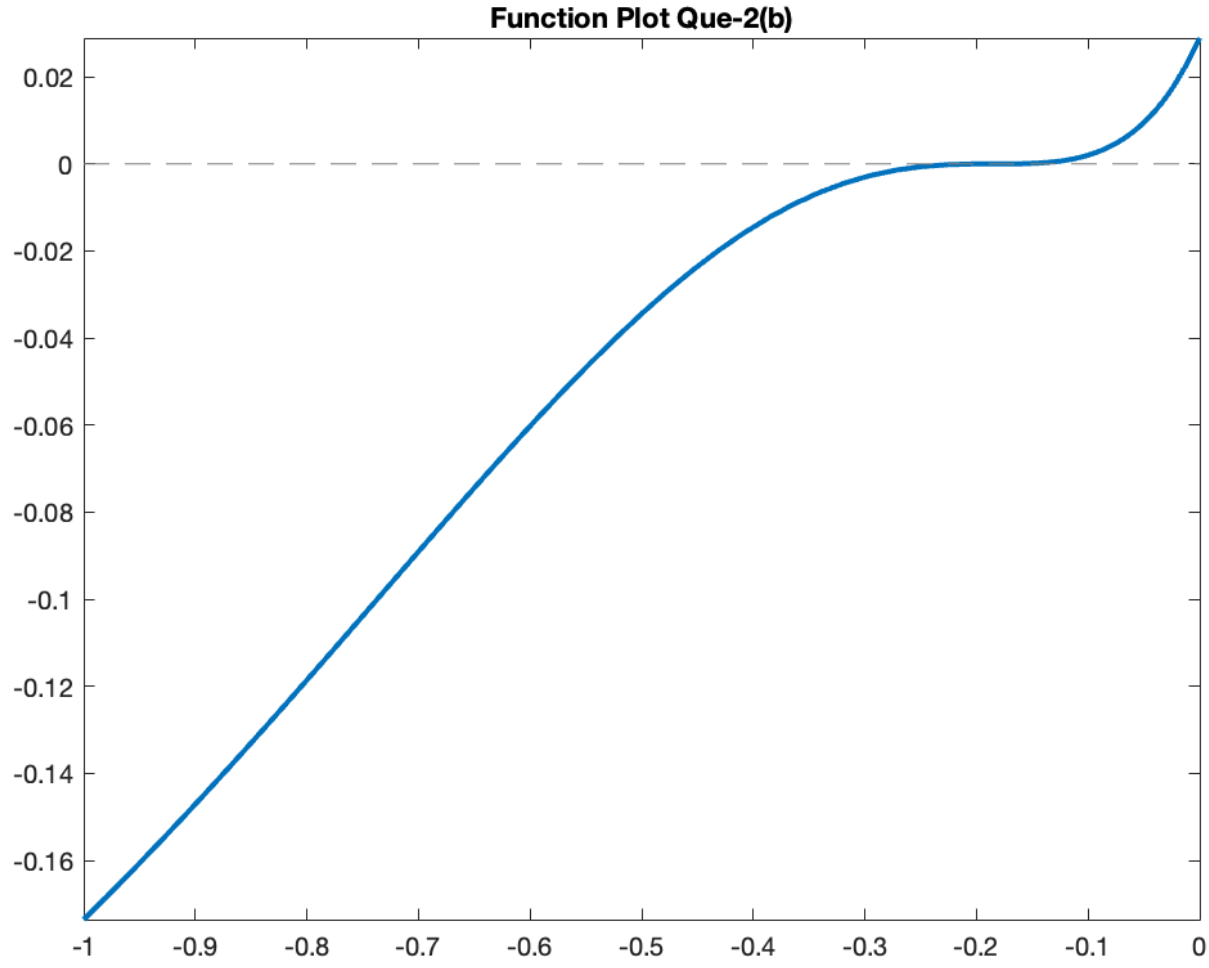

Function Plot Que-2(a)
8
7
6
5
4
3
2
1
0
-1
-2
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2

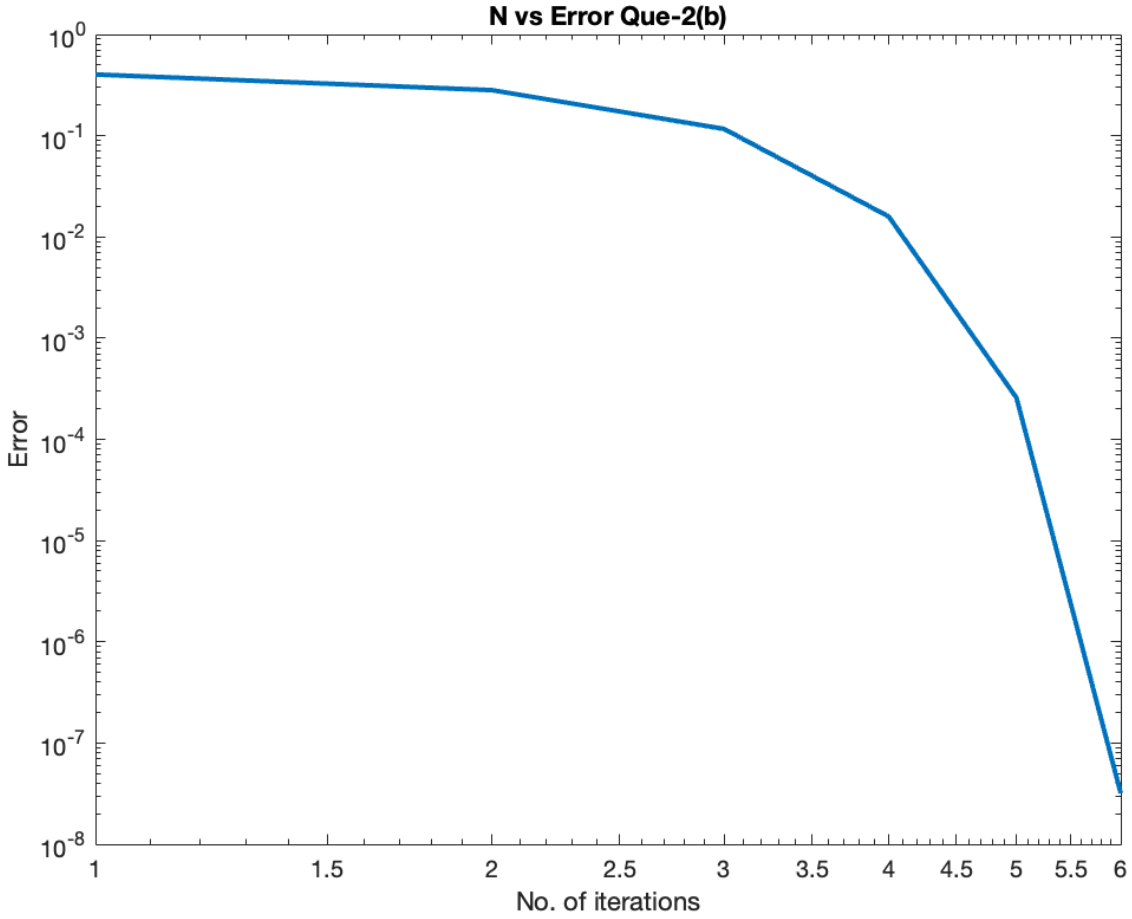

N vs Error Que-2(a)
Error
No. of iterations
1
1.5
2
2.5
3
3.5
4
4.5
5

(b)

```
Modified Newton method for Q-2(b)
No. Of Iterations       Approx. Soln.           Error
1                       -0.597623770991382      4.023762e-01
2                       -0.315924472491960      2.816993e-01
3                       -0.199398569173855      1.165259e-01
4                       -0.183514246382248      1.588432e-02
5                       -0.183256523940214      2.577224e-04
6                       -0.183256555802237      3.186202e-08

The required root is: -0.183257
The number of iterations performed: 6
```



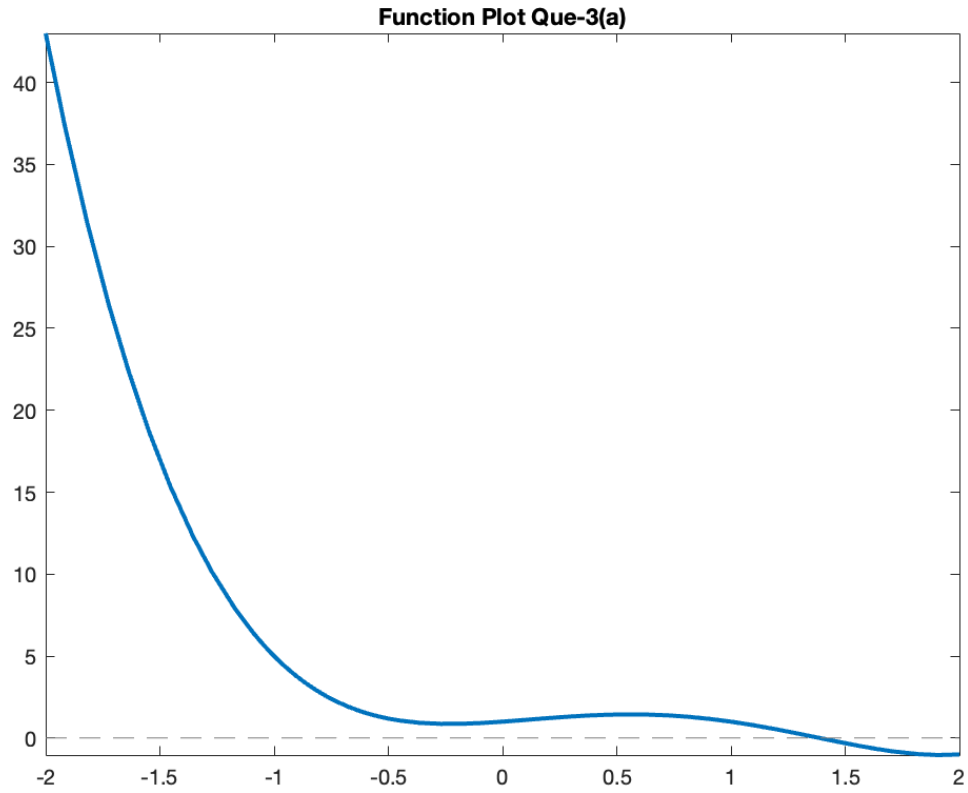


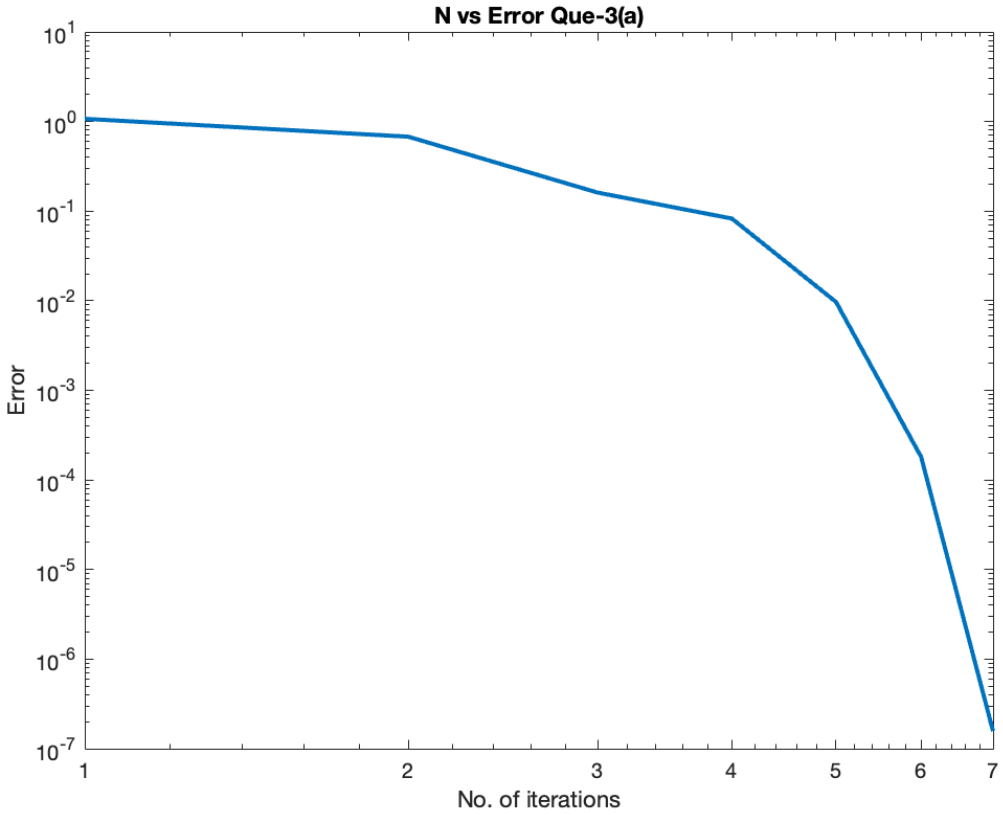
Ques – 3

(a)

```
Muller method for Q-3(a)
No. Of Iterations       Approx. Soln.                    Error
1                       -1.000000e-01 + i8.888194e-01   1.072381e+00
2                       -2.880152e-01 + i2.382530e-01   6.771900e-01
3                       -3.744124e-01 + i3.742351e-01   1.611074e-01
4                       -3.470404e-01 + i4.521998e-01   8.263001e-02
5                       -3.392167e-01 + i4.464985e-01   9.680636e-03
6                       -3.390930e-01 + i4.466301e-01   1.806506e-04
7                       -3.390928e-01 + i4.466301e-01   1.569372e-07

The required root is: -3.390928e-01 + i4.466301e-01
The number of iterations performed: 7
```

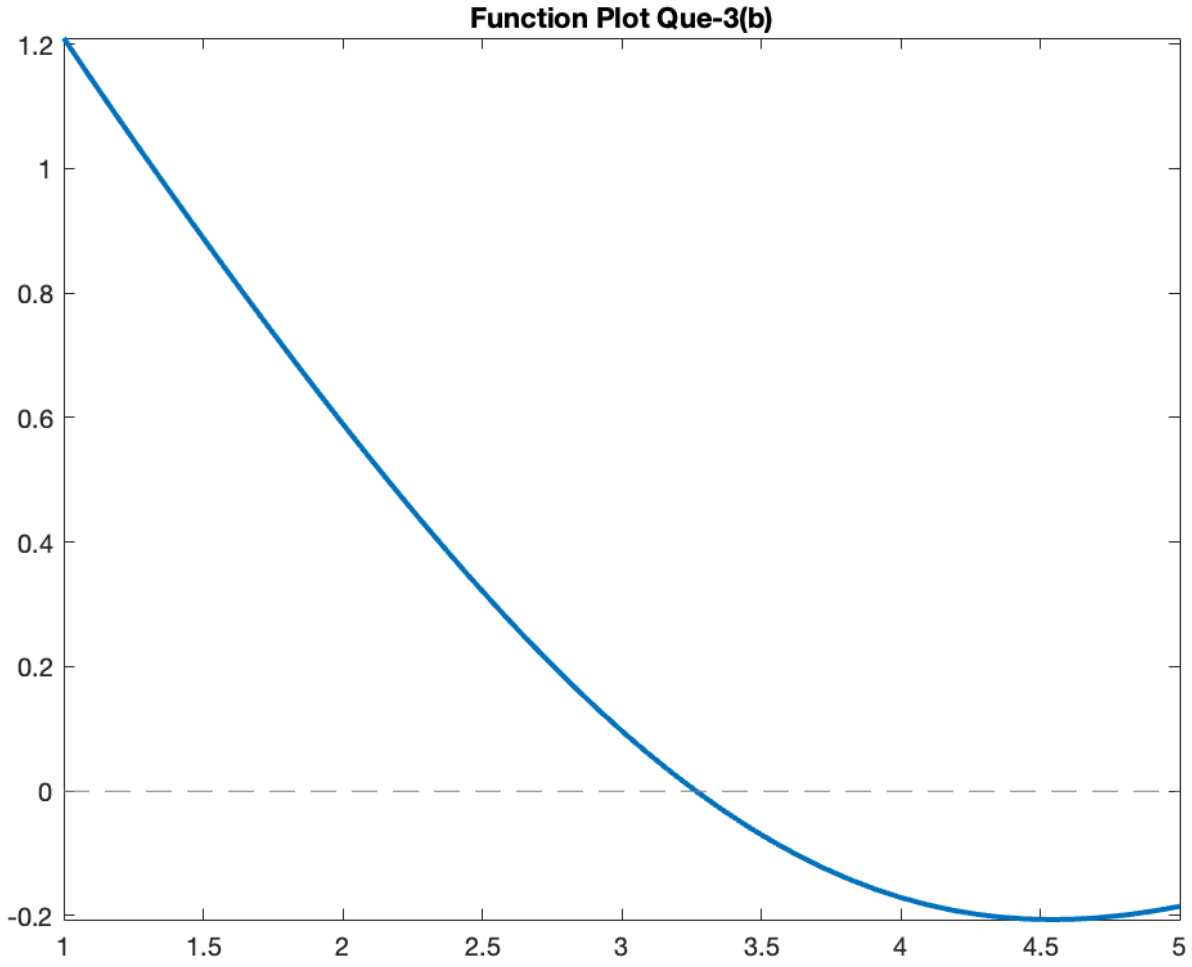

Function Plot Que-3(a)
40
35
30
25
20
15
10
5
0
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2

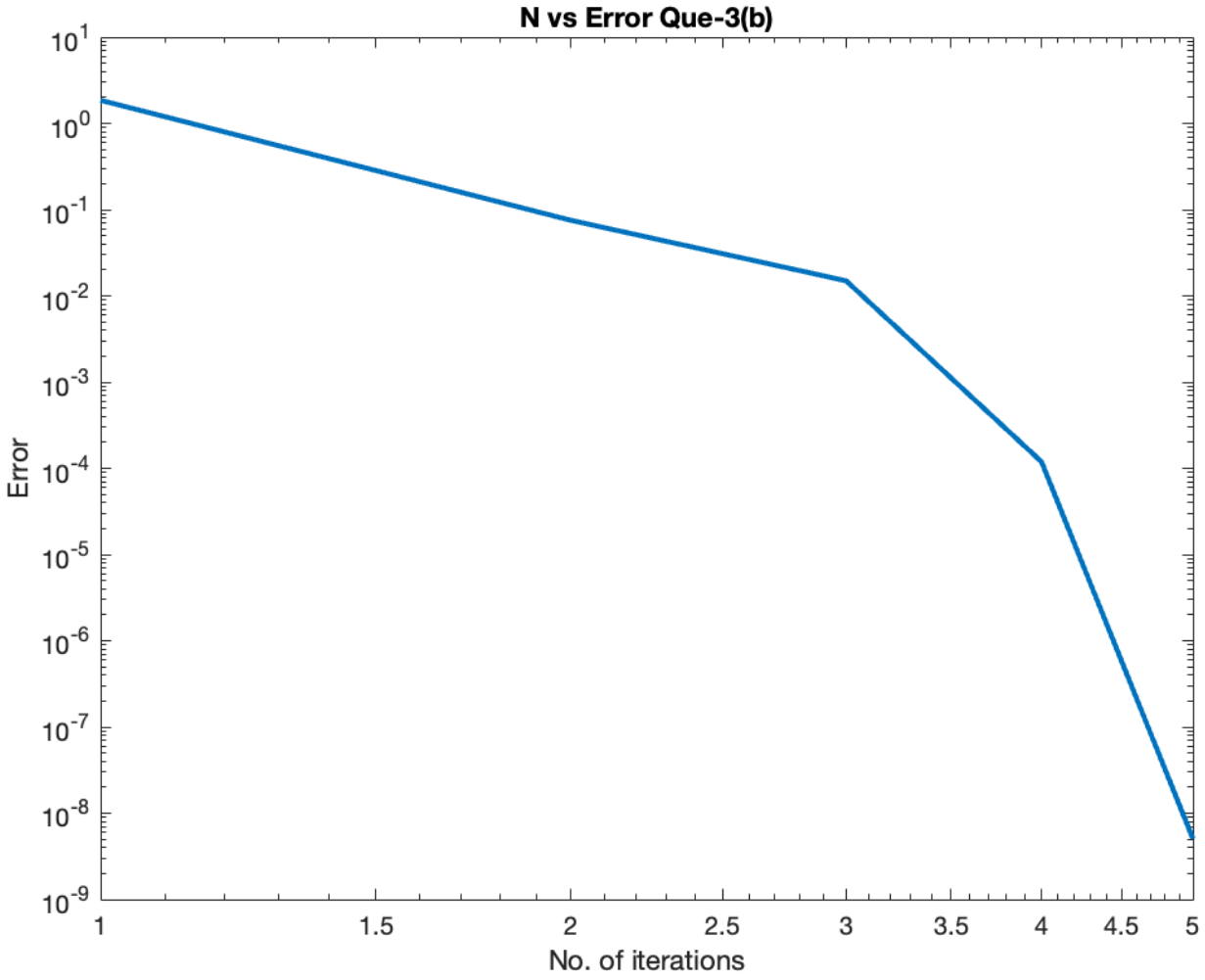

N vs Error Que-3(a)
Error
No. of iterations
1
2
3
4
5
6
7

(b)

```
Muller method for Q-3(b)
No. Of Iterations       Approx. Soln.                    Error
1                       3.356443e+00 + i0       1.856443e+00
2                       3.281317e+00 + i0       7.512584e-02
3                       3.266381e+00 + i0       1.493551e-02
4                       3.266500e+00 + i0       1.191208e-04
5                       3.266500e+00 + i0       5.044036e-09

The required root is: 3.266500e+00 + i0
The number of iterations performed: 5
```



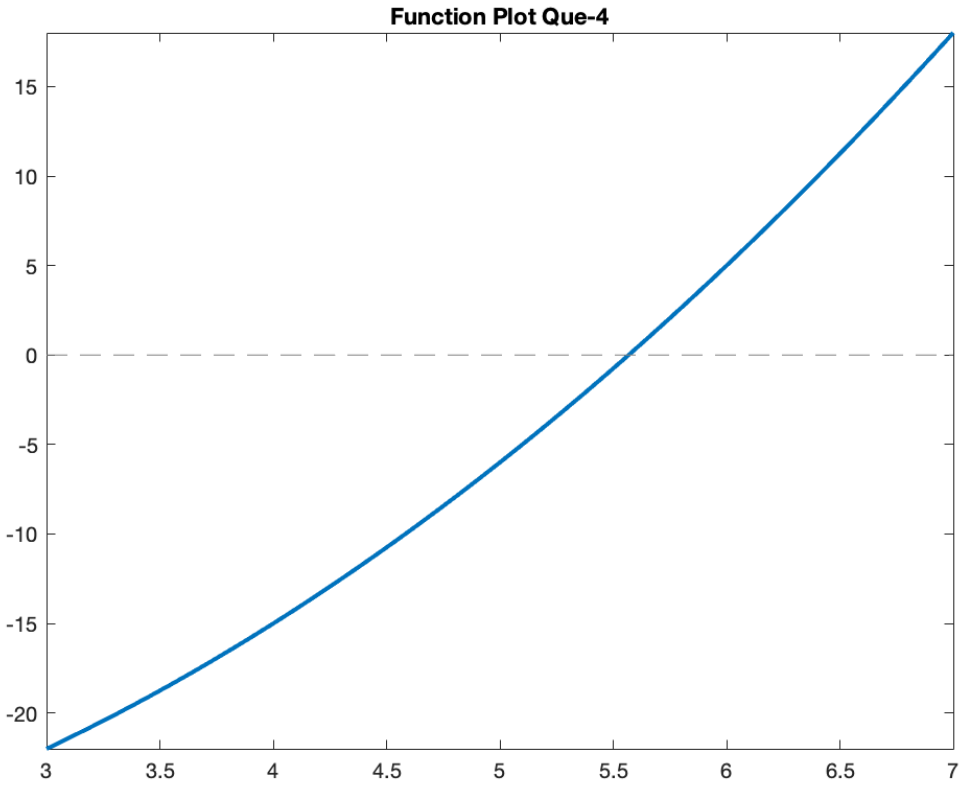


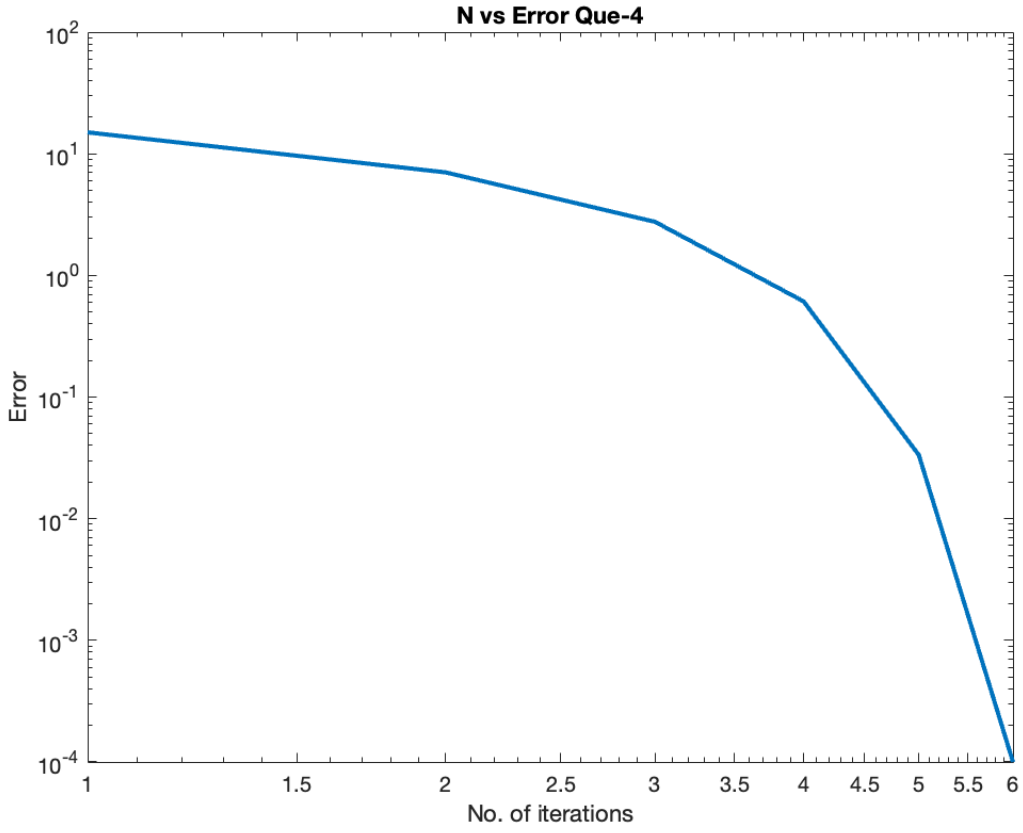
Ques – 4

Function Taken => $f(x) = x^2 - 31$ and $g(x) = ½(x + 31/x)$.

```
Fixed Point Iteration method for Q-4
No. Of Iterations       Approx. Soln.           Error
1                       16.000000000000000      15
2                       8.968750000000000       7.031250e+00
3                       6.212597996515679       2.756152e+00
4                       5.601229461921051       6.113685e-01
5                       5.567864333101262       3.336513e-02
6                       5.567764363727498       9.996937e-05

The required root is: 5.567764
The number of iterations performed: 6
```


Function Plot Que-4
15
10
5
0
-5
-10
-15
-20
3
3.5
4
4.5
5
5.5
6
6.5
7


N vs Error Que-4
Error
No. of iterations
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6