NUMERICAL ANALYSIS 141044093
HOMEWORK 1
JAMES JOSHUA MSUYA

SOLUTIONS

1.0
Bisection Method

a.

1	1.5	0	0
2	1.75	0.25	0.142857
3	1.625	0.125	0.0769231
4	1.5625	0.0625	0.04
5	1.53125	0.03125	0.0204082
6	1.54688	0.015625	0.010101
7	1.53906	0.0078125	0.00507614
8	1.54297	0.00390625	0.00253165
9	1.54102	0.00195312	0.00126743
10	1.54199	0.000976562	0.000633312
11	1.54248	0.000488281	0.000316556
12	1.54224	0.000244141	0.000158303
13	1.54236	0.00012207	7.91452e-05
14	1.5423	6.10352e-05	3.95742e-05

Root: 1.5423, iterations :15, Iterations(Theory) : 14

b.

1	0.5	0	0
2	0.75	0.25	0.333333
3	0.875	0.125	0.142857
4	0.9375	0.0625	0.0666667
5	0.96875	0.03125	0.0322581
6	0.984375	0.015625	0.015873
7	0.992188	0.0078125	0.00787402
8	0.996094	0.00390625	0.00392157
9	0.998047	0.00195312	0.00195695
10	0.999023	0.000976562	0.000977517
11	0.999512	0.000488281	0.00048852
12	0.999756	0.000244141	0.0002442
13	0.999878	0.00012207	0.000122085
14	0.999939	6.10352e-05	6.10389e-05
15	0.999969	3.05176e-05	3.05185e-05
16	0.999985	1.52588e-05	1.5259e-05
17	0.999992	7.62939e-06	7.62945e-06
18	0.999996	3.8147e-06	3.81471e-06
19	0.999998	1.90735e-06	1.90735e-06
20	0.999999	9.53674e-07	9.53675e-07
21	1	4.76837e-07	4.76837e-07
22	1	2.38419e-07	2.38419e-07
23	1	1.19209e-07	1.19209e-07
24	1	5.96046e-08	5.96046e-08

25	1	2.98023e-08	2.98023e-08
26	1	1.49012e-08	1.49012e-08
27	1	7.45058e-09	7.45058e-09
28	1	3.72529e-09	3.72529e-09
29	1	1.86265e-09	1.86265e-09
30	1	9.31323e-10	9.31323e-10
31	1	4.65661e-10	4.65661e-10
32	1	2.32831e-10	2.32831e-10
33	1	1.16415e-10	1.16415e-10
34	1	5.82077e-11	5.82077e-11
35	1	2.91038e-11	2.91038e-11
36	1	1.45519e-11	1.45519e-11
37	1	7.27596e-12	7.27596e-12
38	1	3.63798e-12	3.63798e-12
39	1	1.81899e-12	1.81899e-12
40	1	9.09495e-13	9.09495e-13
41	1	4.54747e-13	4.54747e-13
42	1	2.27374e-13	2.27374e-13
43	1	1.13687e-13	1.13687e-13
44	1	5.68434e-14	5.68434e-14
45	1	2.84217e-14	2.84217e-14
46	1	1.42109e-14	1.42109e-14
47	1	7.10543e-15	7.10543e-15
48	1	3.55271e-15	3.55271e-15
49	1	1.77636e-15	1.77636e-15
50	1	8.88178e-16	8.88178e-16
51	1	4.44089e-16	4.44089e-16
52	1	2.22045e-16	2.22045e-16
53	1	1.11022e-16	1.11022e-16
54	1	1.11022e-16	1.11022e-16
55	1	0	0
56	1	0	0
57	1	0	0
58	1	0	0
..	..	..	..
..	..	..	..
100	1	0	0

Error NO root.

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c. for $1 \leq x \leq 2$

1	1.5	0	0
2	1.75	0.25	0.142857
3	1.875	0.125	0.0666667
4	1.9375	0.0625	0.0322581
5	1.96875	0.03125	0.015873
6	1.98438	0.015625	0.00787402
7	1.99219	0.0078125	0.00392157
8	1.99609	0.00390625	0.00195695
9	1.99805	0.00195312	0.000977517
10	1.99902	0.000976562	0.00048852
11	1.99951	0.000488281	0.0002442
12	1.99976	0.000244141	0.000122085
13	1.99988	0.00012207	6.10389e-05
14	1.99994	6.10352e-05	3.05185e-05
15	1.99997	3.05176e-05	1.5259e-05
16	1.99998	1.52588e-05	7.62945e-06
17	1.99999	7.62939e-06	3.81471e-06
18	2	3.8147e-06	1.90735e-06
19	2	1.90735e-06	9.53675e-07
20	2	9.53674e-07	4.76837e-07
21	2	4.76837e-07	2.38419e-07
22	2	2.38419e-07	1.19209e-07
23	2	1.19209e-07	5.96046e-08
24	2	5.96046e-08	2.98023e-08
25	2	2.98023e-08	1.49012e-08
26	2	1.49012e-08	7.45058e-09
27	2	7.45058e-09	3.72529e-09
28	2	3.72529e-09	1.86265e-09
29	2	1.86265e-09	9.31323e-10
30	2	9.31323e-10	4.65661e-10
31	2	4.65661e-10	2.32831e-10
32	2	2.32831e-10	1.16415e-10
33	2	1.16415e-10	5.82077e-11
34	2	5.82077e-11	2.91038e-11
35	2	2.91038e-11	1.45519e-11
36	2	1.45519e-11	7.27596e-12
37	2	7.27596e-12	3.63798e-12
38	2	3.63798e-12	1.81899e-12
39	2	1.81899e-12	9.09495e-13
40	2	9.09495e-13	4.54747e-13
41	2	4.54747e-13	2.27374e-13
42	2	2.27374e-13	1.13687e-13
43	2	1.13687e-13	5.68434e-14
44	2	5.68434e-14	2.84217e-14
45	2	2.84217e-14	1.42109e-14

46	2	1.42109e-14	7.10543e-15
47	2	7.10543e-15	3.55271e-15
48	2	3.55271e-15	1.77636e-15
49	2	1.77636e-15	8.88178e-16
50	2	8.88178e-16	4.44089e-16
51	2	4.44089e-16	2.22045e-16
52	2	2.22045e-16	1.11022e-16
53	2	2.22045e-16	1.11022e-16
54	2	0	0
55	2	0	0
56	2	0	0
57	2	0	0
..	..	..	..
..	..	..	..
100	2	0	0

Error root not found

c. for $2 \leq x \leq 4$

1	3	0	0
2	3.5	0.5	0.142857
3	3.75	0.25	0.0666667
4	3.875	0.125	0.0322581
5	3.9375	0.0625	0.015873
6	3.96875	0.03125	0.00787402
7	3.98438	0.015625	0.00392157
8	3.99219	0.0078125	0.00195695
9	3.99609	0.00390625	0.000977517
10	3.99805	0.00195312	0.00048852
11	3.99902	0.000976562	0.0002442
12	3.99951	0.000488281	0.000122085
13	3.99976	0.000244141	6.10389e-05
14	3.99988	0.00012207	3.05185e-05
15	3.99994	6.10352e-05	1.5259e-05
16	3.99997	3.05176e-05	7.62945e-06
17	3.99998	1.52588e-05	3.81471e-06
18	3.99999	7.62939e-06	1.90735e-06
19	4	3.8147e-06	9.53675e-07
20	4	1.90735e-06	4.76837e-07
21	4	9.53674e-07	2.38419e-07
22	4	4.76837e-07	1.19209e-07
23	4	2.38419e-07	5.96046e-08
24	4	1.19209e-07	2.98023e-08
25	4	5.96046e-08	1.49012e-08
26	4	2.98023e-08	7.45058e-09
27	4	1.49012e-08	3.72529e-09
28	4	7.45058e-09	1.86265e-09

29	4	3.72529e-09	9.31323e-10
30	4	1.86265e-09	4.65661e-10
31	4	9.31323e-10	2.32831e-10
32	4	4.65661e-10	1.16415e-10
33	4	2.32831e-10	5.82077e-11
34	4	1.16415e-10	2.91038e-11
35	4	5.82077e-11	1.45519e-11
36	4	2.91038e-11	7.27596e-12
37	4	1.45519e-11	3.63798e-12
38	4	7.27596e-12	1.81899e-12
39	4	3.63798e-12	9.09495e-13
40	4	1.81899e-12	4.54747e-13
41	4	9.09495e-13	2.27374e-13
42	4	4.54747e-13	1.13687e-13
43	4	2.27374e-13	5.68434e-14
44	4	1.13687e-13	2.84217e-14
45	4	5.68434e-14	1.42109e-14
46	4	2.84217e-14	7.10543e-15
47	4	1.42109e-14	3.55271e-15
48	4	7.10543e-15	1.77636e-15
49	4	3.55271e-15	8.88178e-16
50	4	1.77636e-15	4.44089e-16
51	4	8.88178e-16	2.22045e-16
52	4	4.44089e-16	1.11022e-16
53	4	4.44089e-16	1.11022e-16
54	4	0	0
55	4	0	0
56	4	0	0
57	4	0	0
..	..	..	..
..	..	..	..
99	4	0	0
100	4	0	0

Error root not found

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d. for $0 \leq x \leq 0.5$

1	0.25	0	0
2	0.125	0.125	1
3	0.1875	0.0625	0.333333
4	0.21875	0.03125	0.142857
5	0.203125	0.015625	0.0769231
6	0.210938	0.0078125	0.037037
7	0.207031	0.00390625	0.0188679
8	0.205078	0.00195312	0.00952381
9	0.206055	0.000976562	0.00473934
10	0.206543	0.000488281	0.00236407
11	0.206299	0.000244141	0.00118343
12	0.206177	0.00012207	0.000592066
13	0.206116	6.10352e-05	0.000296121
14	0.206146	3.05176e-05	0.000148038
15	0.206161	1.52588e-05	7.40138e-05

Root: 0.206161, iterations :16, Iterations(Theory) : 13

d. for $0.5 \leq x \leq 1$

1	0.75	0	0
2	0.625	0.125	0.2
3	0.6875	0.0625	0.0909091
4	0.65625	0.03125	0.047619
5	0.671875	0.015625	0.0232558
6	0.679688	0.0078125	0.0114943
7	0.683594	0.00390625	0.00571429
8	0.681641	0.00195312	0.00286533
9	0.682617	0.000976562	0.00143062
10	0.682129	0.000488281	0.00071582
11	0.682373	0.000244141	0.000357782
12	0.682251	0.00012207	0.000178923
13	0.68219	6.10352e-05	8.94694e-05
14	0.68222	3.05176e-05	4.47327e-05

Root: 0.68222, iterations :15, Iterations(Theory) : 13