Computational and Numerical Methods
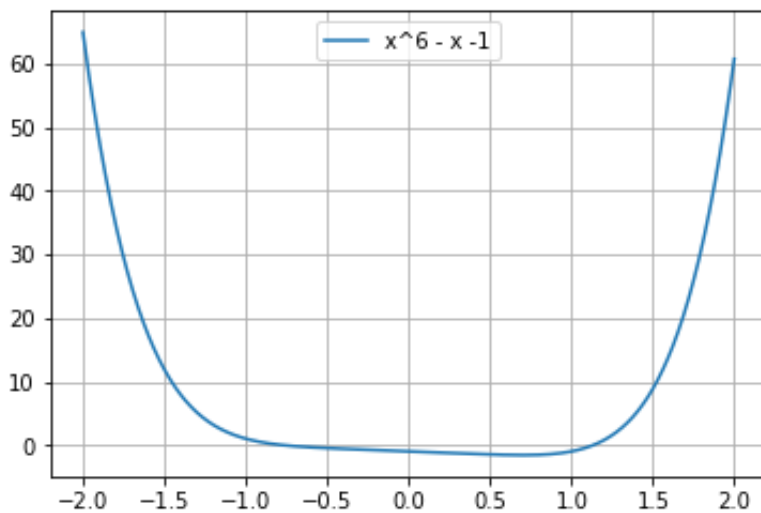
Group 16

Set 3 (13-08-2018): The Bisection Method
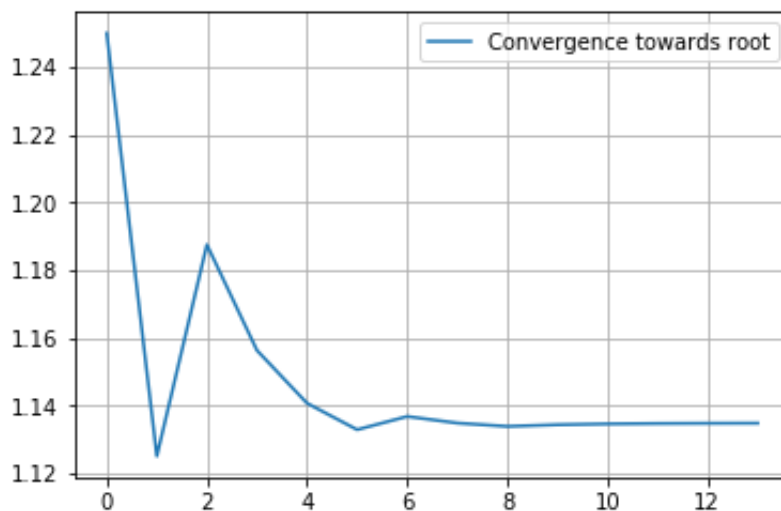
Vidhin Parmar 201601003

Parth Shah 201601086

Show Code


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1.1347
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	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	1.000000	1.500000	1.250000	1.564697	0.250000	Negative	b
2	1.000000	1.250000	1.125000	-0.097713	0.125000	Negative	b
3	1.125000	1.250000	1.187500	0.616653	0.062500	Positive	a
4	1.125000	1.187500	1.156250	0.233269	0.031250	Negative	b
5	1.125000	1.156250	1.140625	0.061578	0.015625	Negative	b
6	1.125000	1.140625	1.132812	-0.019576	0.007812	Negative	b
7	1.132812	1.140625	1.136719	0.020619	0.003906	Positive	a
8	1.132812	1.136719	1.134766	0.000427	0.001953	Negative	b
9	1.132812	1.134766	1.133789	-0.009598	0.000977	Negative	b
10	1.133789	1.134766	1.134277	-0.004591	0.000488	Positive	a
11	1.134277	1.134766	1.134521	-0.002084	0.000244	Positive	a
12	1.134521	1.134766	1.134644	-0.000829	0.000122	Positive	a
13	1.134644	1.134766	1.134705	-0.000201	0.000061	Positive	a
14	1.134705	1.134766	1.134735	0.000113	0.000031	Positive	a
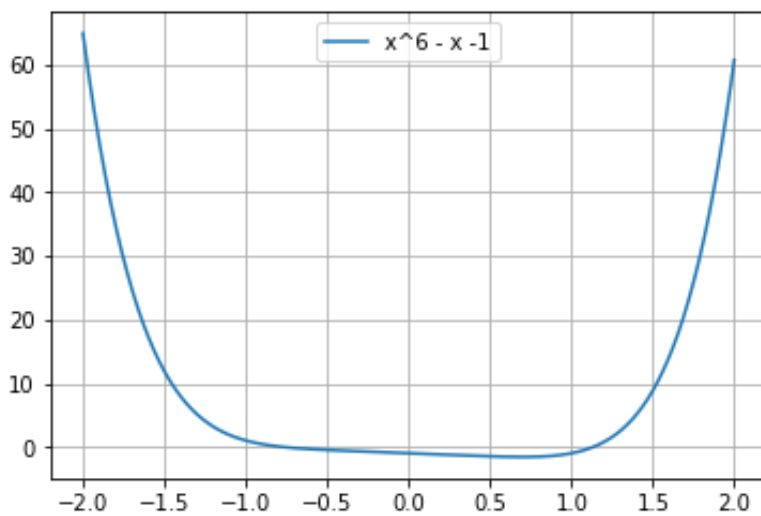
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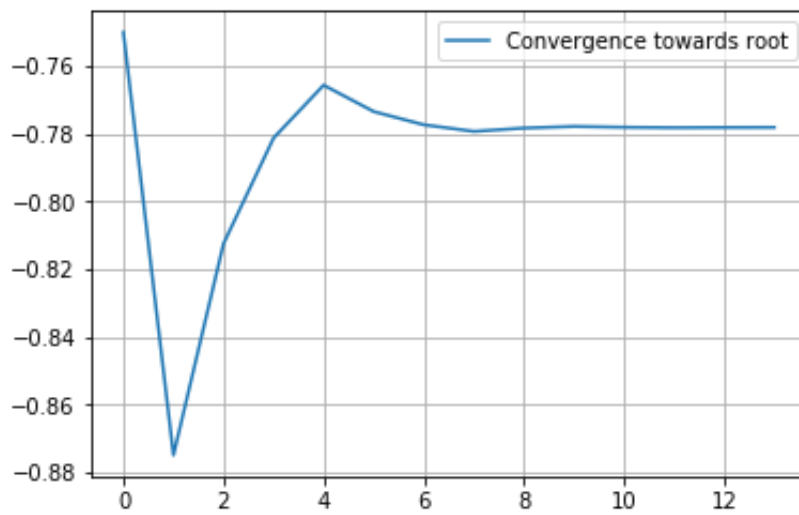
Out[4]:

	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	-1.000000	-0.500000	-0.750000	-0.072021	0.250000	Negative	b
2	-1.000000	-0.750000	-0.875000	0.323795	0.125000	Negative	b
3	-0.875000	-0.750000	-0.812500	0.100200	0.062500	Positive	a
4	-0.812500	-0.750000	-0.781250	0.008624	0.031250	Positive	a
5	-0.781250	-0.750000	-0.765625	-0.032958	0.015625	Positive	a
6	-0.781250	-0.765625	-0.773438	-0.012495	0.007812	Negative	b
7	-0.781250	-0.773438	-0.777344	-0.002019	0.003906	Negative	b
8	-0.781250	-0.777344	-0.779297	0.003281	0.001953	Negative	b
9	-0.779297	-0.777344	-0.778320	0.000626	0.000977	Positive	a
10	-0.778320	-0.777344	-0.777832	-0.000698	0.000488	Positive	a
11	-0.778320	-0.777832	-0.778076	-0.000036	0.000244	Negative	b
12	-0.778320	-0.778076	-0.778198	0.000295	0.000122	Negative	b
13	-0.778198	-0.778076	-0.778137	0.000129	0.000061	Positive	a
14	-0.778137	-0.778076	-0.778107	0.000046	0.000031	Positive	a
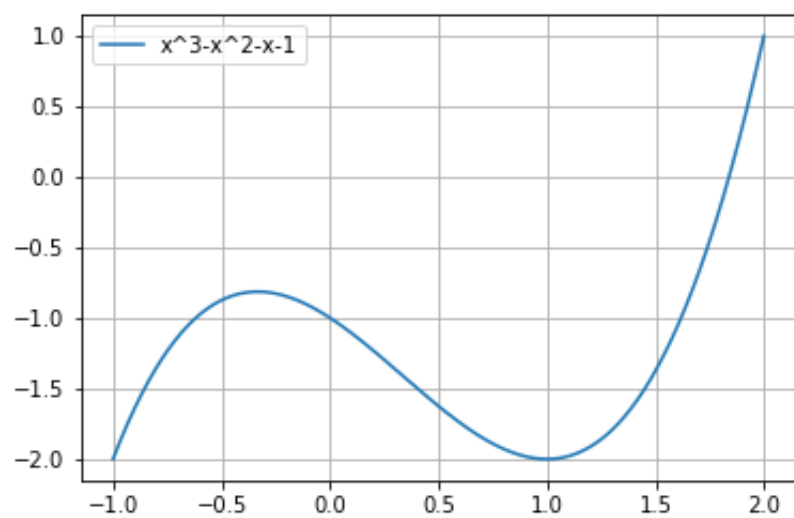
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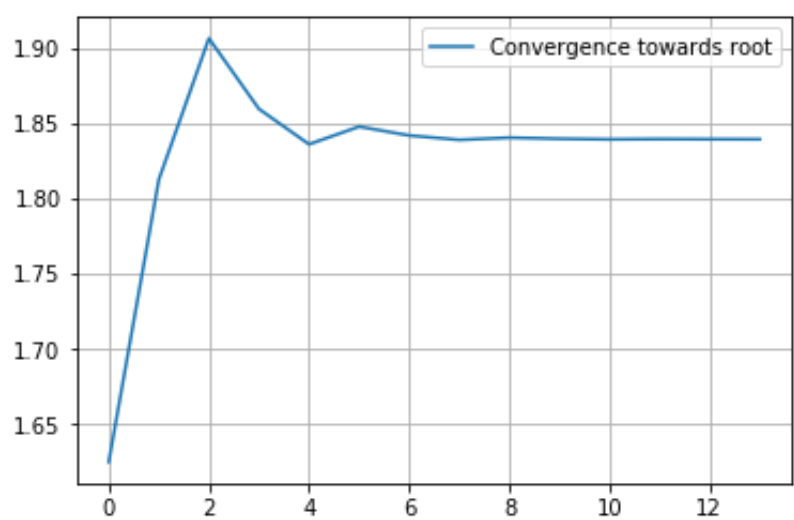
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Out[5]:
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	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	1.250000	2.000000	1.625000	-0.974609	0.375000	Positive	a
2	1.625000	2.000000	1.812500	-0.143311	0.187500	Positive	a
3	1.812500	2.000000	1.906250	0.386871	0.093750	Positive	a
4	1.812500	1.906250	1.859375	0.111721	0.046875	Negative	b
5	1.812500	1.859375	1.835938	-0.018271	0.023438	Negative	b
6	1.835938	1.859375	1.847656	0.046101	0.011719	Positive	a
7	1.835938	1.847656	1.841797	0.013760	0.005859	Negative	b
8	1.835938	1.841797	1.838867	-0.002294	0.002930	Negative	b
9	1.838867	1.841797	1.840332	0.005723	0.001465	Positive	a
10	1.838867	1.840332	1.839600	0.001712	0.000732	Negative	b
11	1.838867	1.839600	1.839233	-0.000292	0.000366	Negative	b
12	1.839233	1.839600	1.839417	0.000710	0.000183	Positive	a
13	1.839233	1.839417	1.839325	0.000209	0.000092	Negative	b
14	1.839233	1.839325	1.839279	-0.000041	0.000046	Negative	b
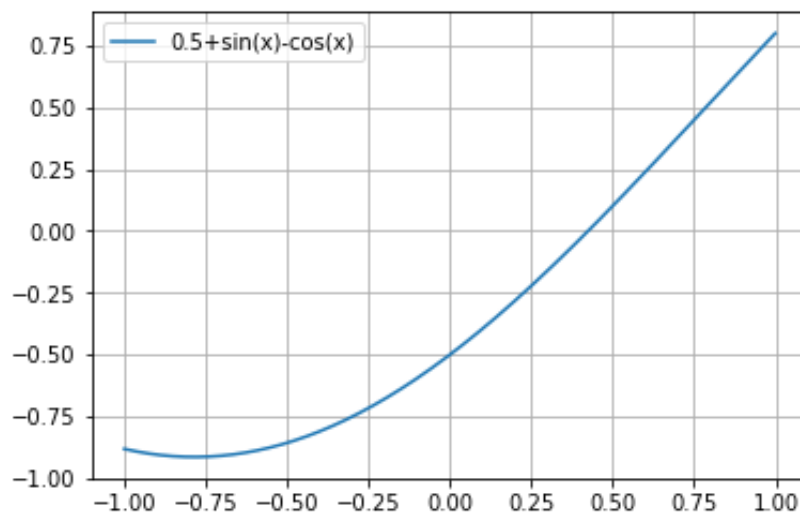

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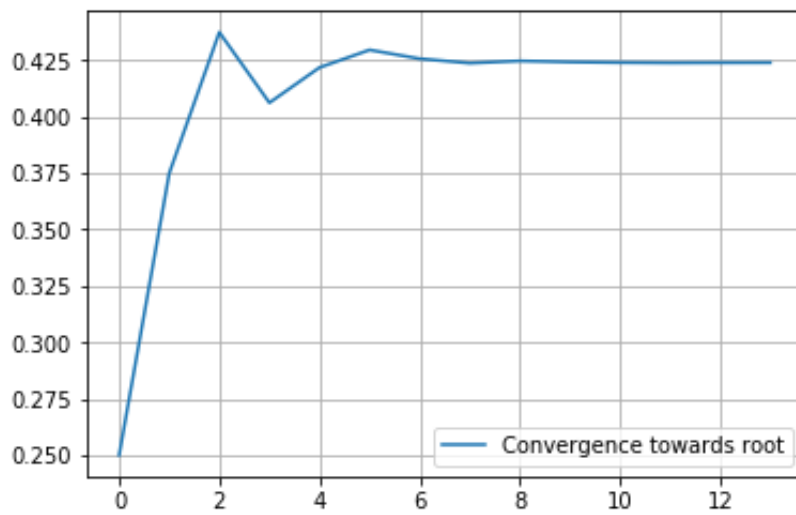
Out[6]:

	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	0.000000	0.500000	0.250000	-0.221508	0.250000	Negative	b
2	0.250000	0.500000	0.375000	-0.064235	0.125000	Positive	a
3	0.375000	0.500000	0.437500	0.017863	0.062500	Positive	a
4	0.375000	0.437500	0.406250	-0.023442	0.031250	Negative	b
5	0.406250	0.437500	0.421875	-0.002851	0.015625	Positive	a
6	0.421875	0.437500	0.429688	0.007491	0.007812	Positive	a
7	0.421875	0.429688	0.425781	0.002316	0.003906	Negative	b
8	0.421875	0.425781	0.423828	-0.000268	0.001953	Negative	b
9	0.423828	0.425781	0.424805	0.001024	0.000977	Positive	a
10	0.423828	0.424805	0.424316	0.000378	0.000488	Negative	b
11	0.423828	0.424316	0.424072	0.000055	0.000244	Negative	b
12	0.423828	0.424072	0.423950	-0.000107	0.000122	Negative	b
13	0.423950	0.424072	0.424011	-0.000026	0.000061	Positive	a
14	0.424011	0.424072	0.424042	0.000014	0.000031	Positive	a
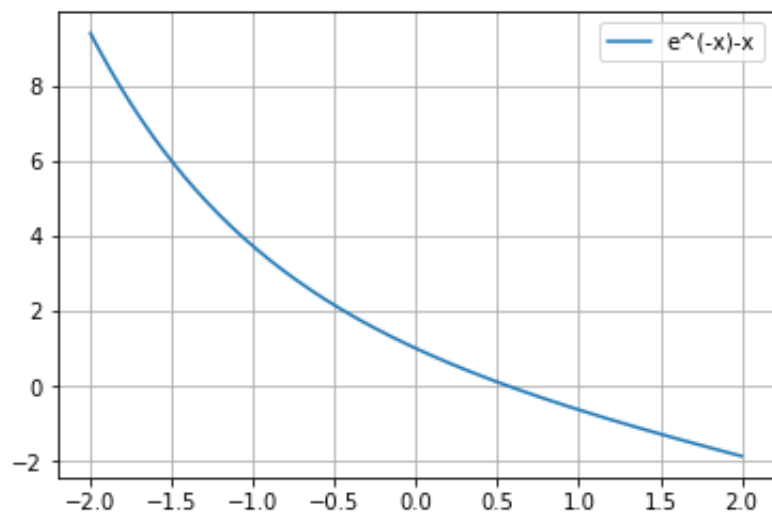
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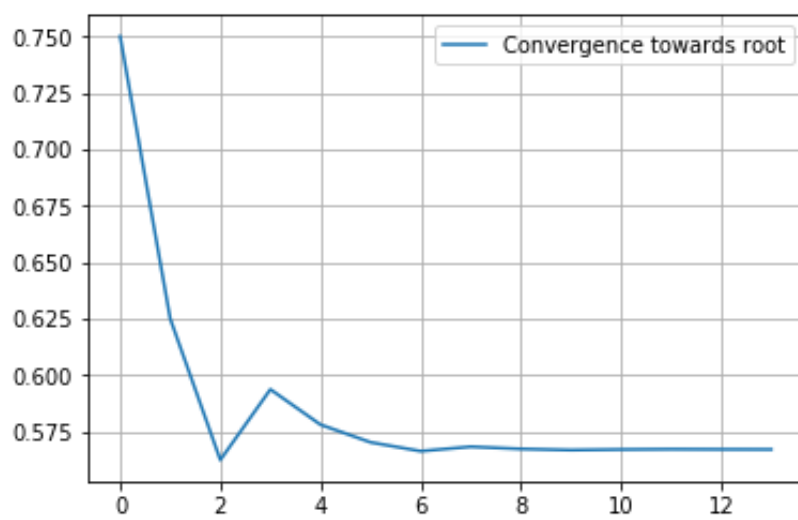
	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	0.500000	1.000000	0.750000	-0.277633	0.250000	Positive	a
2	0.500000	0.750000	0.625000	-0.089739	0.125000	Negative	b
3	0.500000	0.625000	0.562500	0.007283	0.062500	Negative	b
4	0.562500	0.625000	0.593750	-0.041498	0.031250	Positive	a
5	0.562500	0.593750	0.578125	-0.017176	0.015625	Negative	b
6	0.562500	0.578125	0.570312	-0.004964	0.007812	Negative	b
7	0.562500	0.570312	0.566406	0.001155	0.003906	Negative	b
8	0.566406	0.570312	0.568359	-0.001905	0.001953	Positive	a
9	0.566406	0.568359	0.567383	-0.000375	0.000977	Negative	b
10	0.566406	0.567383	0.566895	0.000390	0.000488	Negative	b
11	0.566895	0.567383	0.567139	0.000007	0.000244	Positive	a
12	0.567139	0.567383	0.567261	-0.000184	0.000122	Positive	a
13	0.567139	0.567261	0.567200	-0.000088	0.000061	Negative	b
14	0.567139	0.567200	0.567169	-0.000041	0.000031	Negative	b
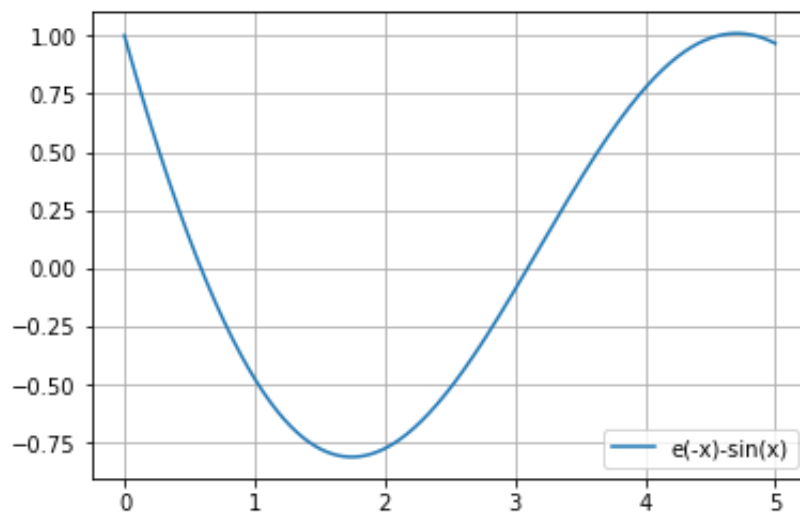
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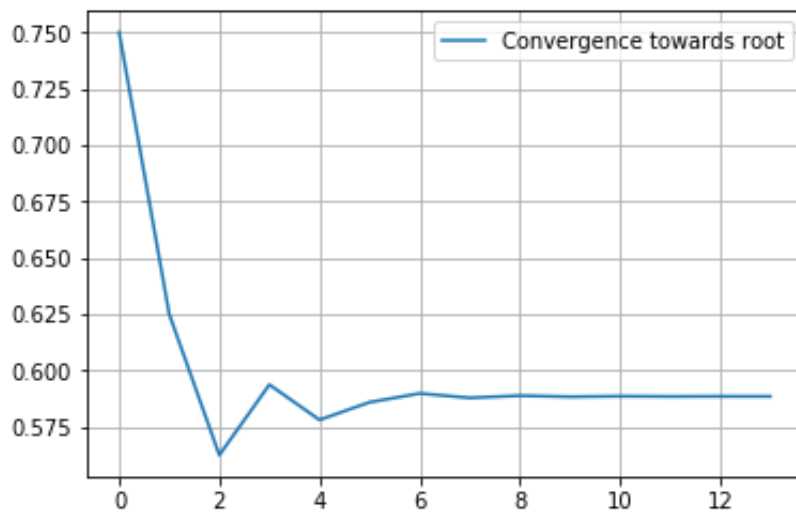
Out[8]:

	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	0.500000	1.000000	0.750000	-0.209272	0.250000	Positive	a
2	0.500000	0.750000	0.625000	-0.049836	0.125000	Negative	b
3	0.500000	0.625000	0.562500	0.036480	0.062500	Negative	b
4	0.562500	0.625000	0.593750	-0.007221	0.031250	Positive	a
5	0.562500	0.593750	0.578125	0.014495	0.015625	Negative	b
6	0.578125	0.593750	0.585938	0.003603	0.007812	Positive	a
7	0.585938	0.593750	0.589844	-0.001817	0.003906	Positive	a
8	0.585938	0.589844	0.587891	0.000891	0.001953	Negative	b
9	0.587891	0.589844	0.588867	-0.000464	0.000977	Positive	a
10	0.587891	0.588867	0.588379	0.000213	0.000488	Negative	b
11	0.588379	0.588867	0.588623	-0.000125	0.000244	Positive	a
12	0.588379	0.588623	0.588501	0.000044	0.000122	Negative	b
13	0.588501	0.588623	0.588562	-0.000041	0.000061	Positive	a
14	0.588501	0.588562	0.588531	0.000002	0.000031	Negative	b
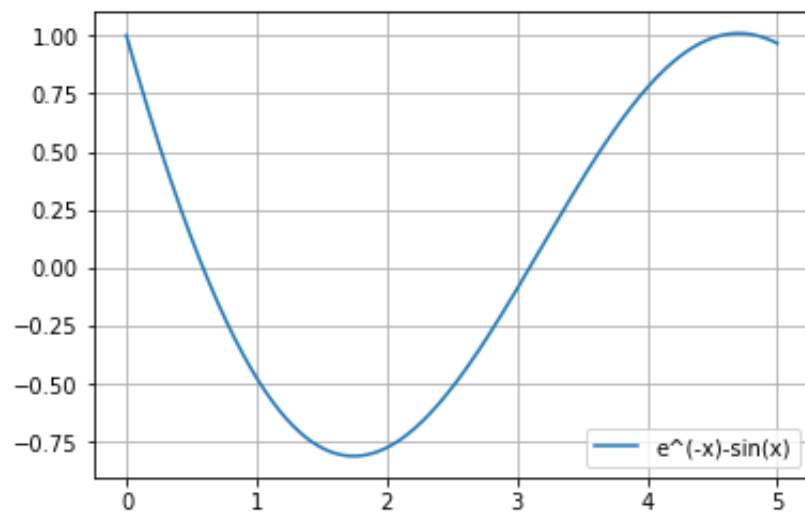
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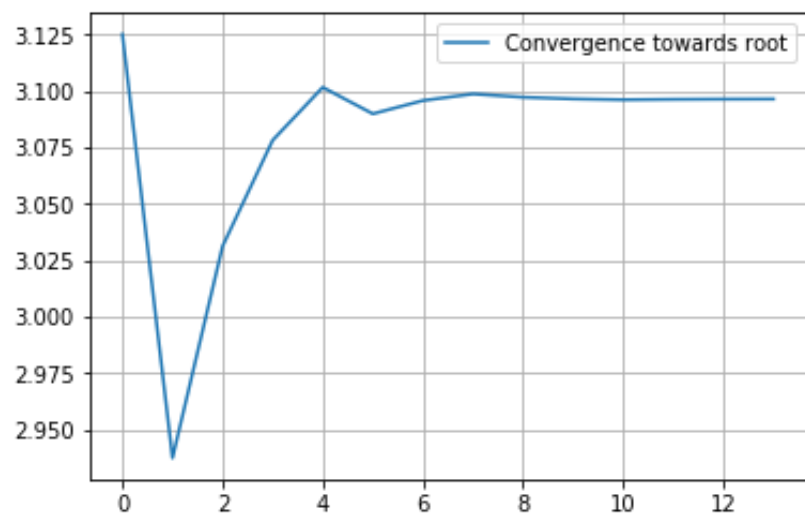
	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	2.750000	3.500000	3.125000	0.027345	0.375000	Positive	a
2	2.750000	3.125000	2.937500	-0.149681	0.187500	Negative	b
3	2.937500	3.125000	3.031250	-0.061864	0.093750	Positive	a
4	3.031250	3.125000	3.078125	-0.017380	0.046875	Positive	a
5	3.078125	3.125000	3.101562	0.004959	0.023438	Positive	a
6	3.078125	3.101562	3.089844	-0.006217	0.011719	Negative	b
7	3.089844	3.101562	3.095703	-0.000630	0.005859	Positive	a
8	3.095703	3.101562	3.098633	0.002164	0.002930	Positive	a
9	3.095703	3.098633	3.097168	0.000767	0.001465	Negative	b
10	3.095703	3.097168	3.096436	0.000068	0.000732	Negative	b
11	3.095703	3.096436	3.096069	-0.000281	0.000366	Negative	b
12	3.096069	3.096436	3.096252	-0.000106	0.000183	Positive	a
13	3.096252	3.096436	3.096344	-0.000019	0.000092	Positive	a
14	3.096344	3.096436	3.096390	0.000025	0.000046	Positive	a
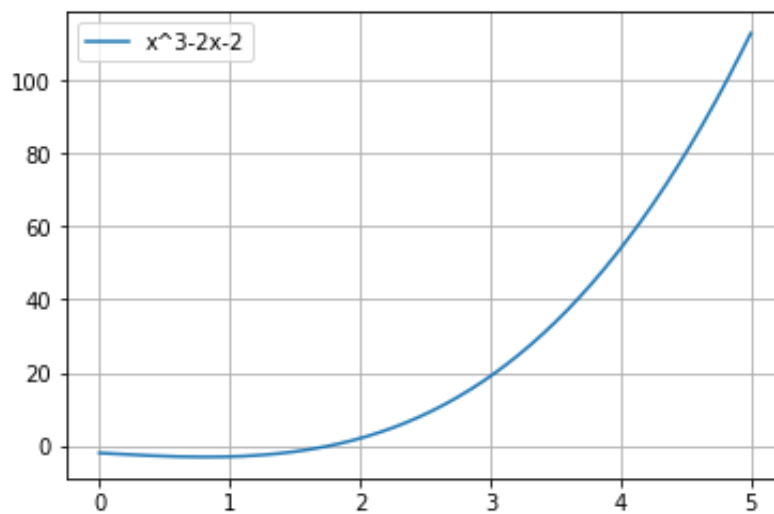
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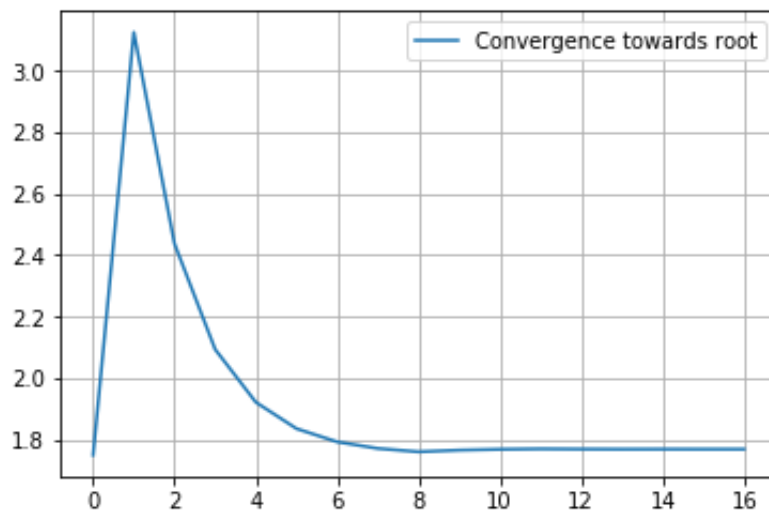
Out[10]:

	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	-1.000000	4.500000	1.750000	-0.140625	2.750000	Negative	b
2	1.750000	4.500000	3.125000	22.267578	1.375000	Positive	a
3	1.750000	3.125000	2.437500	7.607178	0.687500	Negative	b
4	1.750000	2.437500	2.093750	2.991058	0.343750	Negative	b
5	1.750000	2.093750	1.921875	1.254894	0.171875	Negative	b
6	1.750000	1.921875	1.835938	0.516458	0.085938	Negative	b
7	1.750000	1.835938	1.792969	0.177985	0.042969	Negative	b
8	1.750000	1.792969	1.771484	0.016227	0.021484	Negative	b
9	1.750000	1.771484	1.760742	-0.062808	0.010742	Negative	b
10	1.760742	1.771484	1.766113	-0.023444	0.005371	Positive	a
11	1.766113	1.771484	1.768799	-0.003646	0.002686	Positive	a
12	1.768799	1.771484	1.770142	0.006281	0.001343	Positive	a
13	1.768799	1.770142	1.769470	0.001315	0.000671	Negative	b
14	1.768799	1.769470	1.769135	-0.001166	0.000336	Negative	b
15	1.769135	1.769470	1.769302	0.000074	0.000168	Positive	a
16	1.769135	1.769302	1.769218	-0.000546	0.000084	Negative	b
17	1.769218	1.769302	1.769260	-0.000236	0.000042	Positive	a
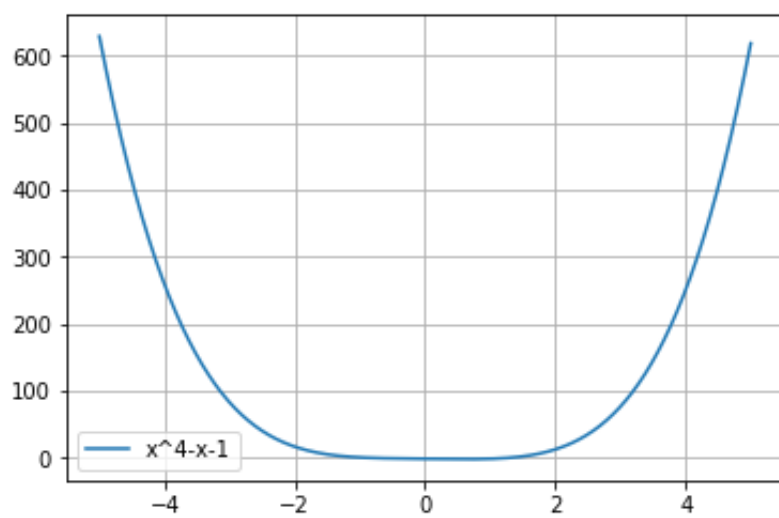
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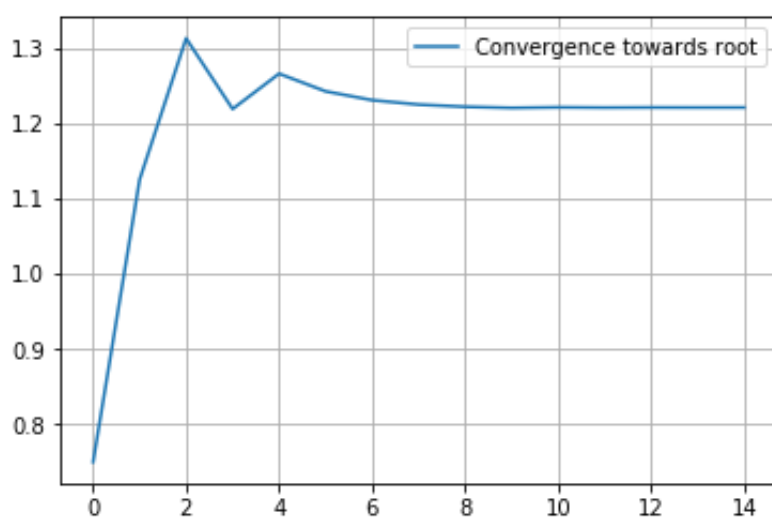
	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	0.000000	1.500000	0.750000	-1.433594	0.750000	Negative	b
2	0.750000	1.500000	1.125000	-0.523193	0.375000	Positive	a
3	1.125000	1.500000	1.312500	0.655045	0.187500	Positive	a
4	1.125000	1.312500	1.218750	-0.012481	0.093750	Negative	b
5	1.218750	1.312500	1.265625	0.300160	0.046875	Positive	a
6	1.218750	1.265625	1.242188	0.138753	0.023438	Negative	b
7	1.218750	1.242188	1.230469	0.061889	0.011719	Negative	b
8	1.218750	1.230469	1.224609	0.024395	0.005859	Negative	b
9	1.218750	1.224609	1.221680	0.005880	0.002930	Negative	b
10	1.218750	1.221680	1.220215	-0.003319	0.001465	Negative	b
11	1.220215	1.221680	1.220947	0.001276	0.000732	Positive	a
12	1.220215	1.220947	1.220581	-0.001023	0.000366	Negative	b
13	1.220581	1.220947	1.220764	0.000126	0.000183	Positive	a
14	1.220581	1.220764	1.220673	-0.000449	0.000092	Negative	b
15	1.220673	1.220764	1.220718	-0.000161	0.000046	Positive	a
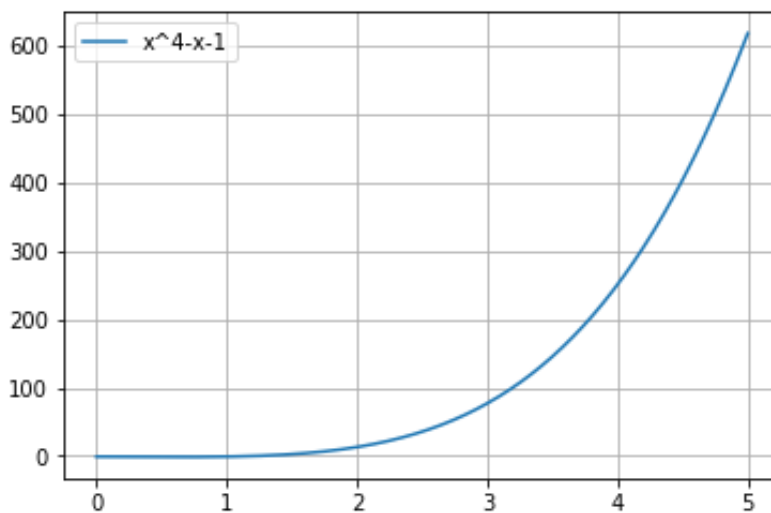
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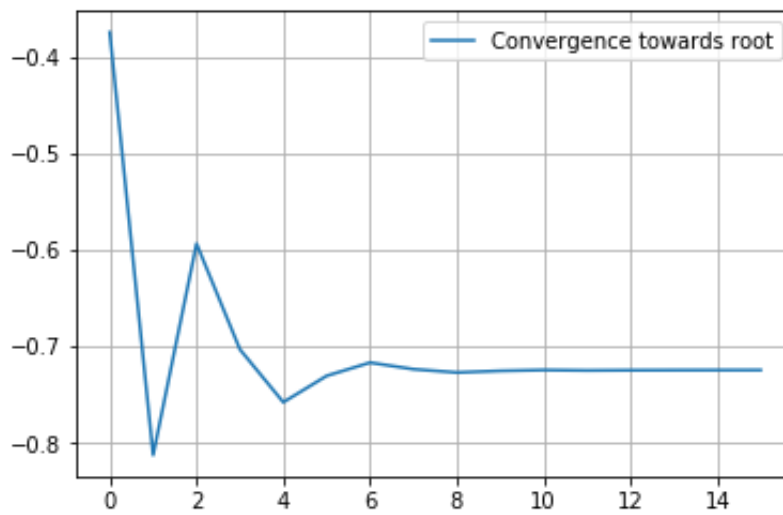
Out[12]:

	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	-1.250000	0.500000	-0.375000	-0.605225	0.875000	Positive	a
2	-1.250000	-0.375000	-0.812500	0.248306	0.437500	Negative	b
3	-0.812500	-0.375000	-0.593750	-0.281966	0.218750	Positive	a
4	-0.812500	-0.593750	-0.703125	-0.052459	0.109375	Negative	b
5	-0.812500	-0.703125	-0.757812	0.087610	0.054688	Negative	b
6	-0.757812	-0.703125	-0.730469	0.015181	0.027344	Positive	a
7	-0.730469	-0.703125	-0.716797	-0.019215	0.013672	Positive	a
8	-0.730469	-0.716797	-0.723633	-0.002164	0.006836	Negative	b
9	-0.730469	-0.723633	-0.727051	0.006472	0.003418	Negative	b
10	-0.727051	-0.723633	-0.725342	0.002145	0.001709	Positive	a
11	-0.725342	-0.723633	-0.724487	-0.000012	0.000854	Positive	a
12	-0.725342	-0.724487	-0.724915	0.001066	0.000427	Negative	b
13	-0.724915	-0.724487	-0.724701	0.000527	0.000214	Positive	a
14	-0.724701	-0.724487	-0.724594	0.000258	0.000107	Positive	a
15	-0.724594	-0.724487	-0.724541	0.000123	0.000053	Positive	a
16	-0.724541	-0.724487	-0.724514	0.000056	0.000027	Positive	a

Question 2
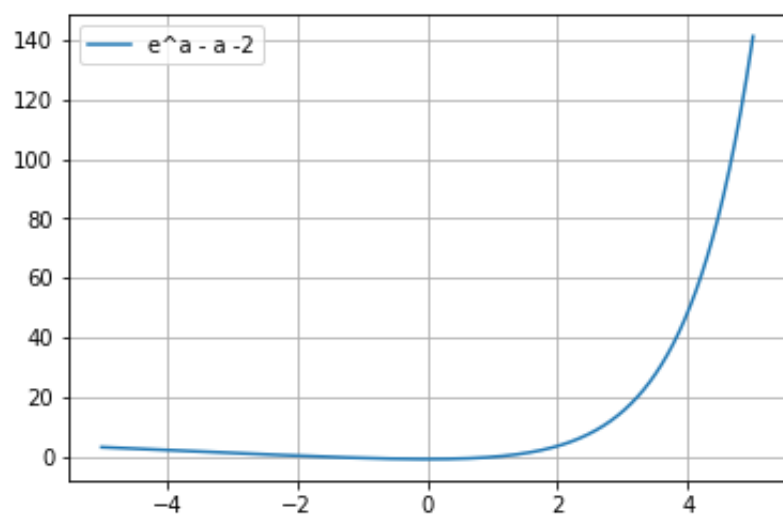
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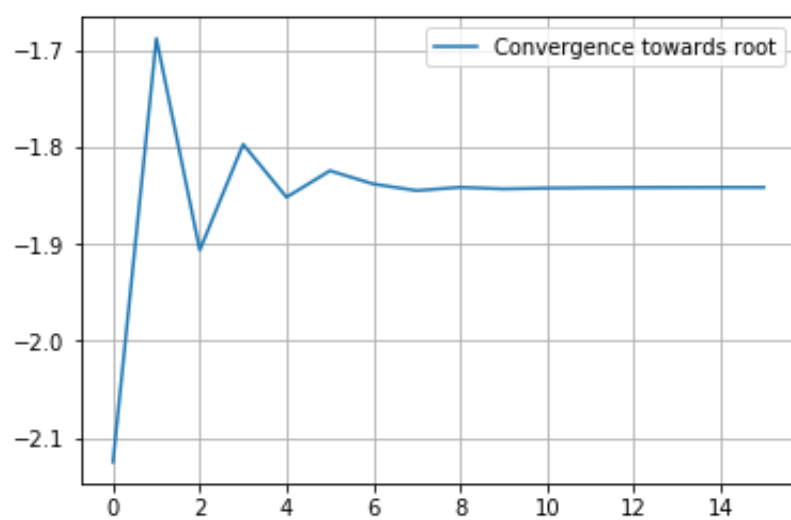
	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	-3.000000	-1.250000	-2.125000	0.244433	0.875000	Negative	b
2	-2.125000	-1.250000	-1.687500	-0.127519	0.437500	Positive	a
3	-2.125000	-1.687500	-1.906250	0.054887	0.218750	Negative	b
4	-1.906250	-1.687500	-1.796875	-0.037309	0.109375	Positive	a
5	-1.906250	-1.796875	-1.851562	0.008554	0.054688	Negative	b
6	-1.851562	-1.796875	-1.824219	-0.014438	0.027344	Positive	a
7	-1.851562	-1.824219	-1.837891	-0.002957	0.013672	Negative	b
8	-1.851562	-1.837891	-1.844727	0.002795	0.006836	Negative	b
9	-1.844727	-1.837891	-1.841309	-0.000082	0.003418	Positive	a
10	-1.844727	-1.841309	-1.843018	0.001356	0.001709	Negative	b
11	-1.843018	-1.841309	-1.842163	0.000637	0.000854	Positive	a
12	-1.842163	-1.841309	-1.841736	0.000278	0.000427	Positive	a
13	-1.841736	-1.841309	-1.841522	0.000098	0.000214	Positive	a
14	-1.841522	-1.841309	-1.841415	0.000008	0.000107	Positive	a
15	-1.841415	-1.841309	-1.841362	-0.000037	0.000053	Positive	a
16	-1.841415	-1.841362	-1.841389	-0.000014	0.000027	Negative	b
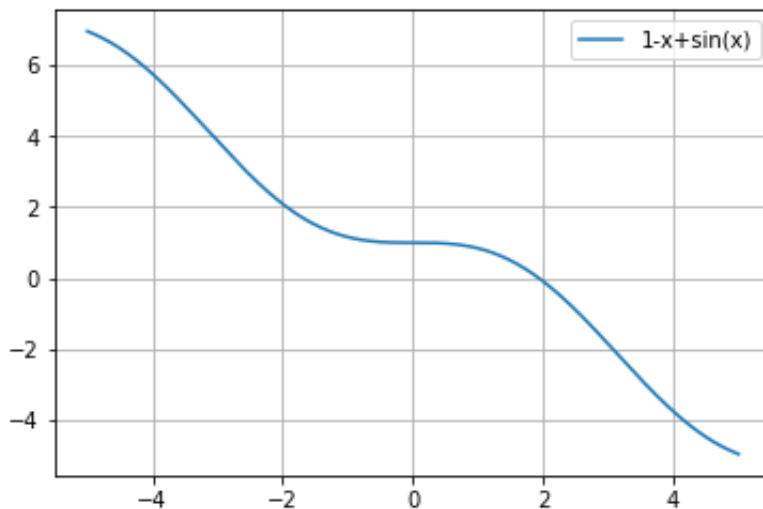
1.9345
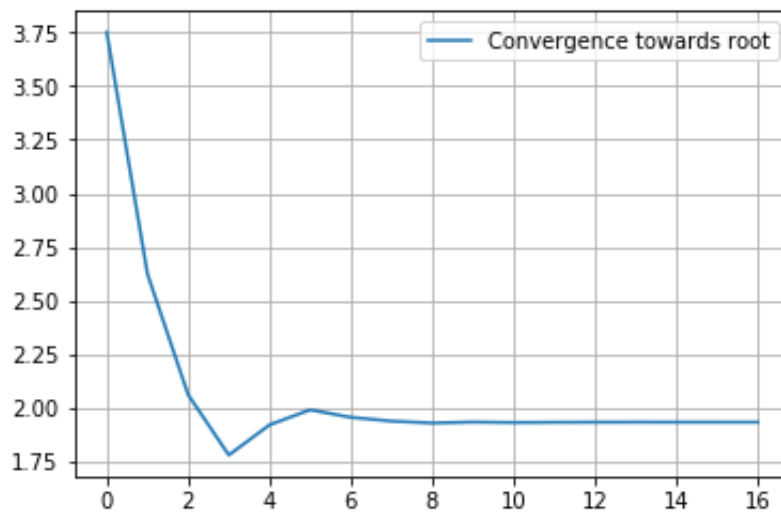
Out[14]:

	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	1.500000	6.000000	3.750000	-3.321561	2.250000	Positive	a
2	1.500000	3.750000	2.625000	-1.131080	1.125000	Negative	b
3	1.500000	2.625000	2.062500	-0.180970	0.562500	Negative	b
4	1.500000	2.062500	1.781250	0.196686	0.281250	Negative	b
5	1.781250	2.062500	1.921875	0.017127	0.140625	Positive	a
6	1.921875	2.062500	1.992188	-0.079667	0.070312	Positive	a
7	1.921875	1.992188	1.957031	-0.030697	0.035156	Negative	b
8	1.921875	1.957031	1.939453	-0.006641	0.017578	Negative	b
9	1.921875	1.939453	1.930664	0.005279	0.008789	Negative	b
10	1.930664	1.939453	1.935059	-0.000672	0.004395	Positive	a
11	1.930664	1.935059	1.932861	0.002306	0.002197	Negative	b
12	1.932861	1.935059	1.933960	0.000818	0.001099	Positive	a
13	1.933960	1.935059	1.934509	0.000073	0.000549	Positive	a
14	1.934509	1.935059	1.934784	-0.000299	0.000275	Positive	a
15	1.934509	1.934784	1.934647	-0.000113	0.000137	Negative	b
16	1.934509	1.934647	1.934578	-0.000020	0.000069	Negative	b
17	1.934509	1.934578	1.934544	0.000027	0.000034	Negative	b
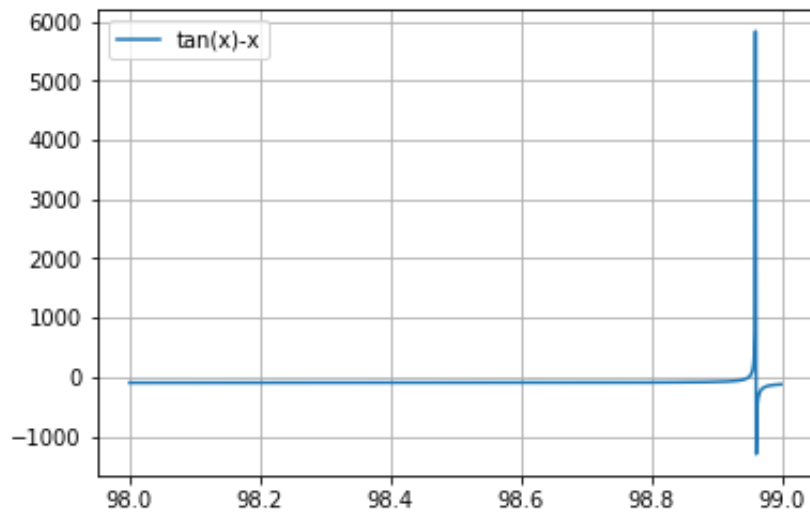
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4.4934
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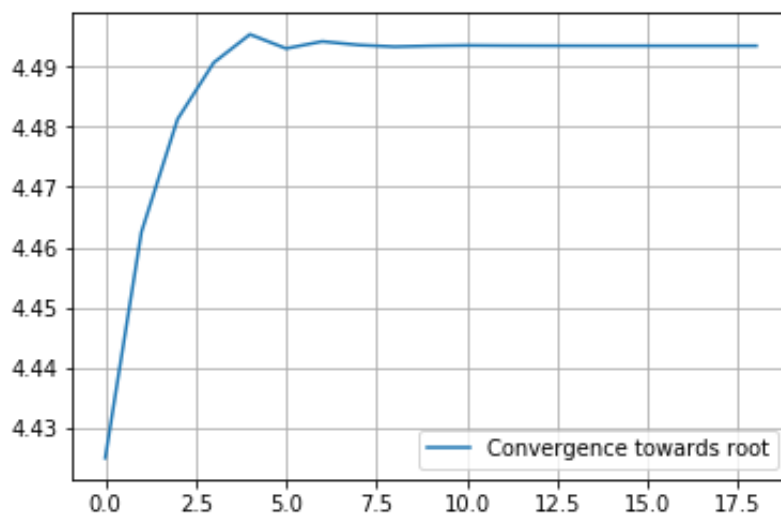

Out[15]:

	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	4.350000	4.500000	4.425000	-1.041723	7.500000e-02	Positive	a
2	4.425000	4.500000	4.462500	-0.544368	3.750000e-02	Positive	a
3	4.462500	4.500000	4.481250	-0.232171	1.875000e-02	Positive	a
4	4.481250	4.500000	4.490625	-0.055491	9.375000e-03	Positive	a
5	4.490625	4.500000	4.495312	0.038772	4.687500e-03	Positive	a
6	4.490625	4.495312	4.492969	-0.008880	2.343750e-03	Negative	b
7	4.492969	4.495312	4.494141	0.014814	1.171875e-03	Positive	a

8	4.492969	4.494141	4.493555	0.002934	5.859375e-04	Negative	b
9	4.492969	4.493555	4.493262	-0.002981	2.929688e-04	Negative	b
10	4.493262	4.493555	4.493408	-0.000025	1.464844e-04	Positive	a
11	4.493408	4.493555	4.493481	0.001454	7.324219e-05	Positive	a
12	4.493408	4.493481	4.493445	0.000714	3.662109e-05	Negative	b
13	4.493408	4.493445	4.493427	0.000344	1.831055e-05	Negative	b
14	4.493408	4.493427	4.493417	0.000160	9.155273e-06	Negative	b
15	4.493408	4.493417	4.493413	0.000067	4.577637e-06	Negative	b
16	4.493408	4.493413	4.493410	0.000021	2.288818e-06	Negative	b
17	4.493408	4.493410	4.493409	-0.000002	1.144409e-06	Negative	b
18	4.493409	4.493410	4.493410	0.000009	5.722046e-07	Positive	a
19	4.493409	4.493410	4.493410	0.000004	2.861023e-07	Negative	b
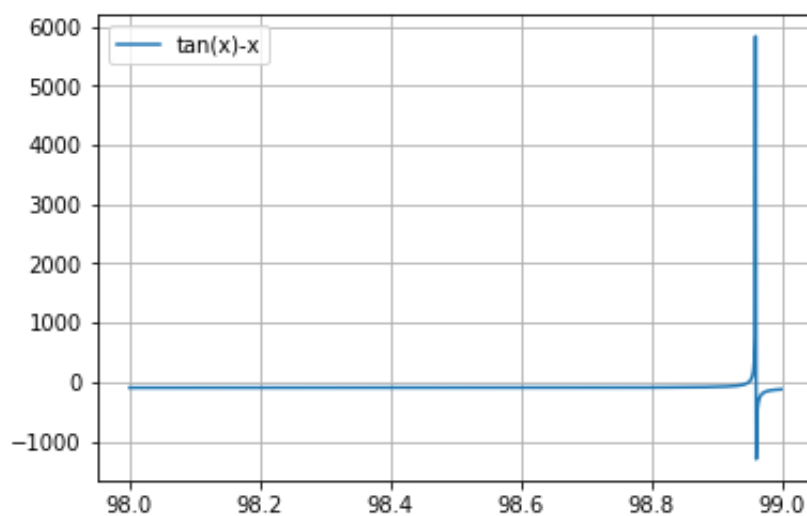
98.9501
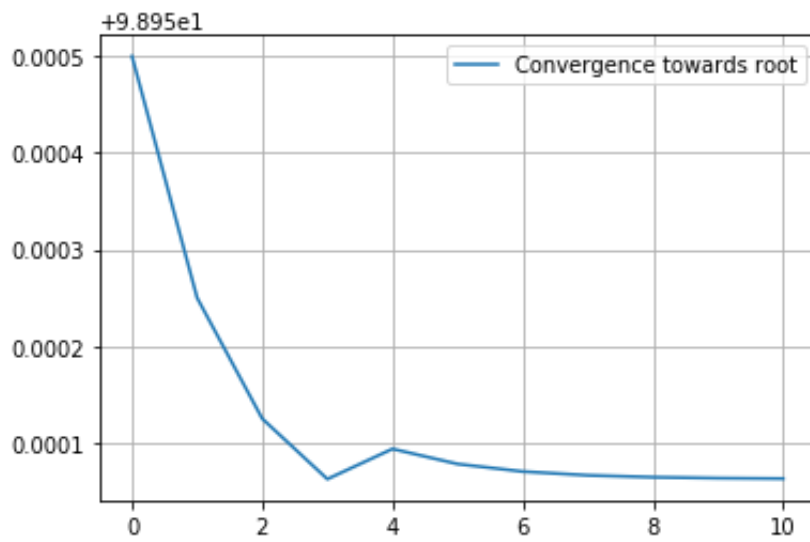
Out[16]:

	a	b	c = (a+b)/2	f(c)	b-c=c-a	Sign of f(a)f(c)	Assign c=
1	98.950000	98.951000	98.950500	4.473995	5.000000e-04	Positive	a
2	98.950000	98.950500	98.950250	1.867245	2.500000e-04	Negative	b
3	98.950000	98.950250	98.950125	0.612538	1.250000e-04	Negative	b
4	98.950000	98.950125	98.950062	-0.003175	6.250000e-05	Negative	b
5	98.950062	98.950125	98.950094	0.303726	3.125000e-05	Positive	a
6	98.950062	98.950094	98.950078	0.150038	1.562500e-05	Negative	b
7	98.950062	98.950078	98.950070	0.073372	7.812500e-06	Negative	b
8	98.950062	98.950070	98.950066	0.035083	3.906250e-06	Negative	b
9	98.950062	98.950066	98.950064	0.015950	1.953125e-06	Negative	b
10	98.950062	98.950064	98.950063	0.006386	9.765625e-07	Negative	b
11	98.950062	98.950063	98.950063	0.001605	4.882812e-07	Negative	b