Show Code

Computational and Numerical Methods

Group 16

Set 5 (20-08-2018): The Secant Method

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Parth Shah 201601086

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

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Opposite Side
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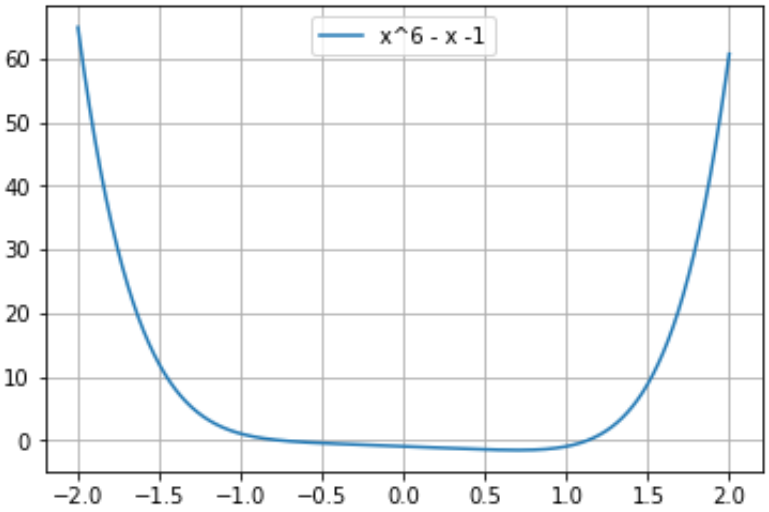

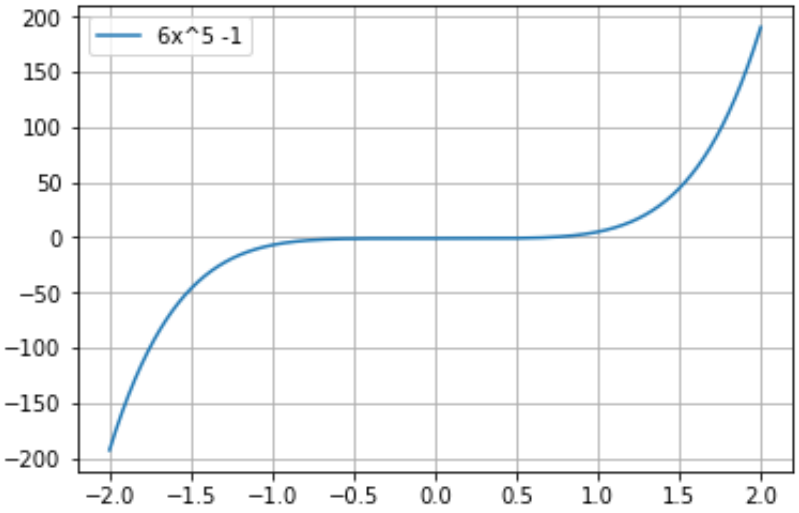

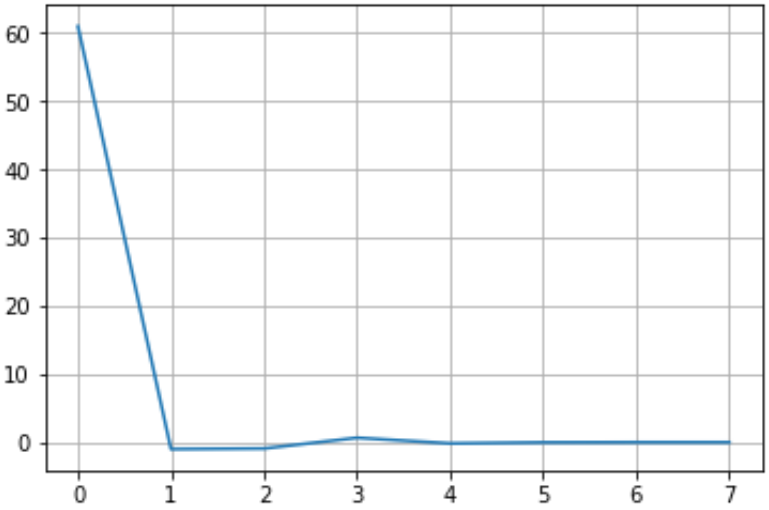


```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 6
Steps taken to converge in Secant Method are 8
```

Out[3]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	2	61	0	0
1	1	1	-1	-1	1.01613
2	2	1.01613	-0.915368	0.016129	1.19058
3	3	1.19058	0.657466	0.174449	1.11766
4	4	1.11766	-0.168491	-0.0729219	1.13253
5	5	1.13253	-0.0224373	0.0148757	1.13482
6	6	1.13482	0.000953564	0.00228526	1.13472
7	7	1.13472	-5.06617e-06	-9.31621e-05	1.13472

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Same Side
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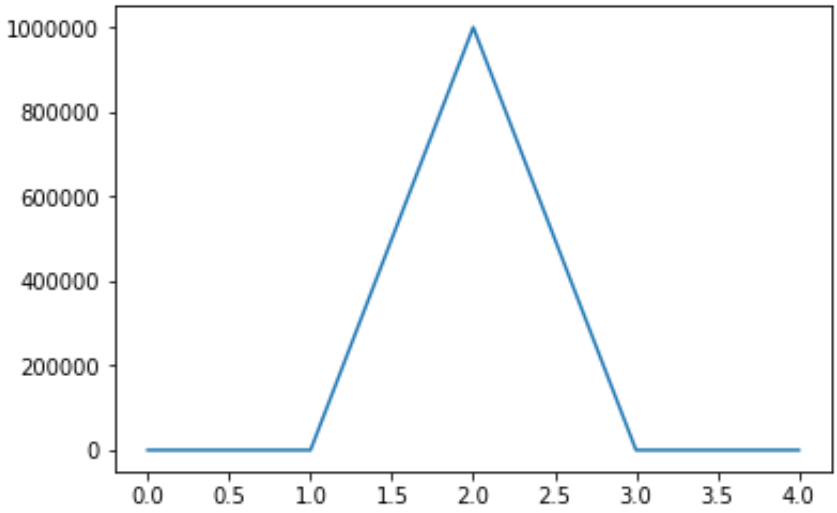
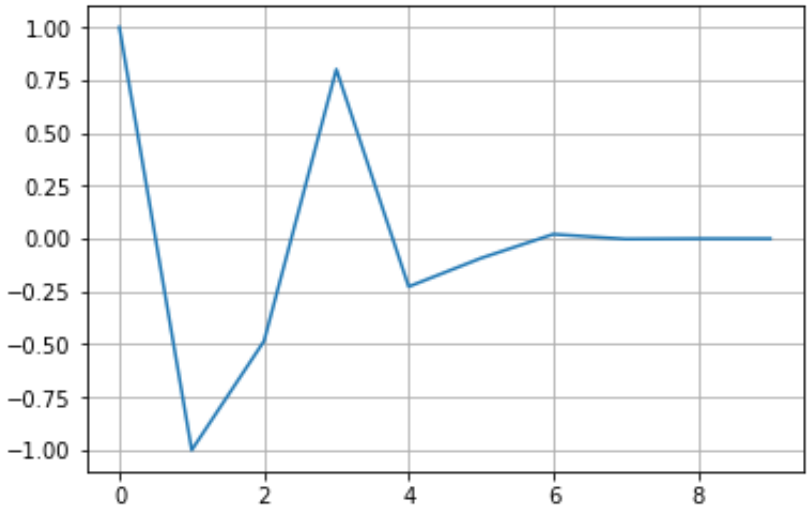



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 6
Steps taken to converge in Secant Method are 5
```

Out[4]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	0.100000	-1.099999e+00	0.000000	0.000000
1	1.0	1.000000	-1.000000e+00	0.900000	10.000090
2	2.0	10.000090	1.000043e+06	9.000090	1.000009
3	3.0	1.000009	-9.999550e-01	-9.000081	1.000018
4	4.0	1.000018	-9.999100e-01	0.000009	1.199984

```
Opposite Side
```

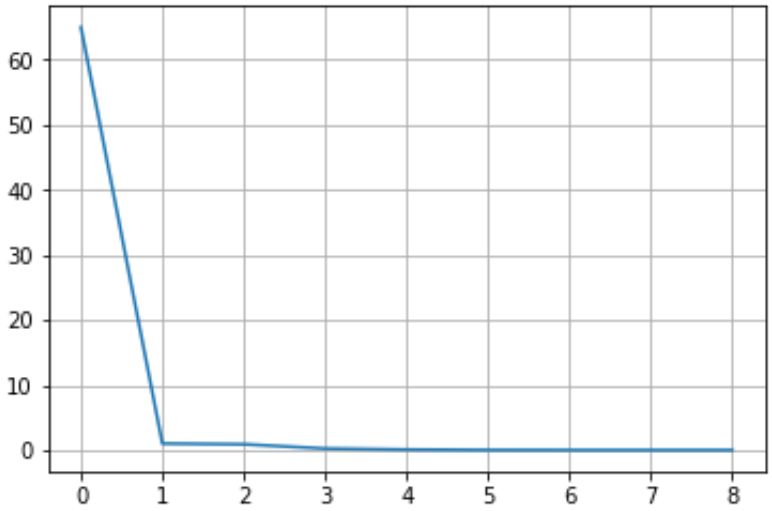



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 6
Steps taken to converge in Secant Method are 10
```

Out[5]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	-1	1	0	0
1	1	0	-1	1	-0.5
2	2	-0.5	-0.484375	-0.5	-0.969697
3	3	-0.969697	0.801109	-0.469697	-0.676984
4	4	-0.676984	-0.226751	0.292713	-0.741558
5	5	-0.741558	-0.092151	-0.0645741	-0.785767
6	6	-0.785767	0.0211428	-0.0442092	-0.777517
7	7	-0.777517	-0.00155185	0.00825029	-0.778081
8	8	-0.778081	-2.41324e-05	-0.000564151	-0.77809
9	9	-0.77809	2.80499e-08	-8.91153e-06	-0.77809

Same Side



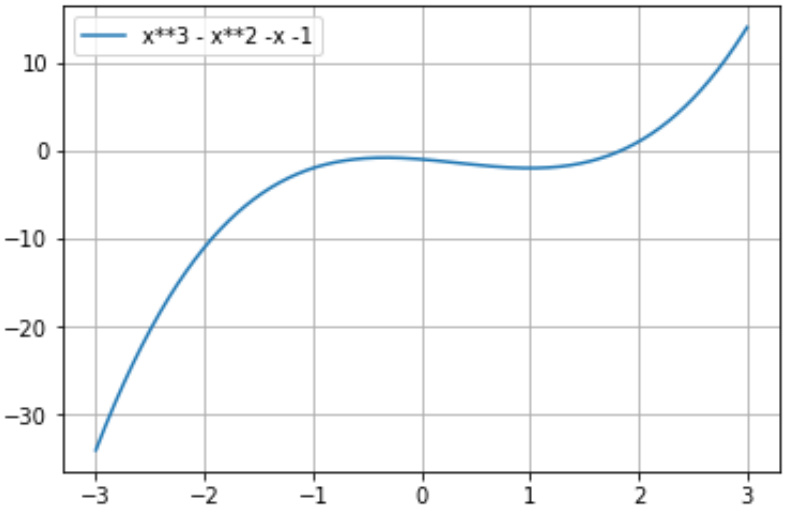
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 6
Steps taken to converge in Secant Method are 9

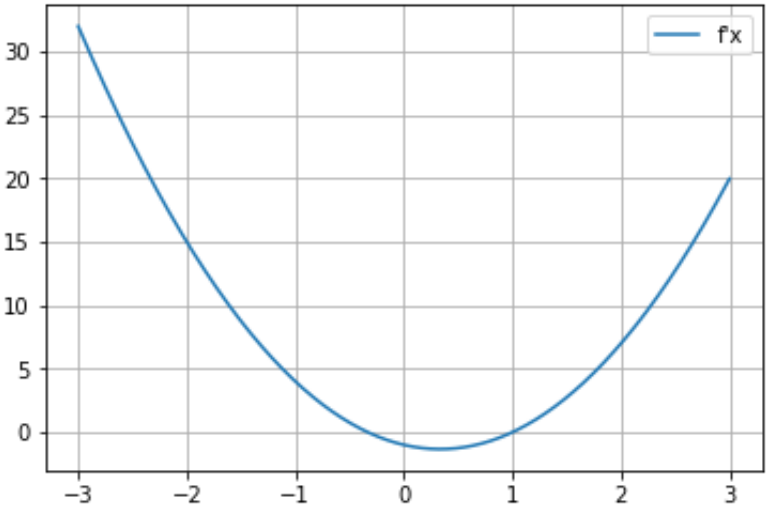
Out[6]:

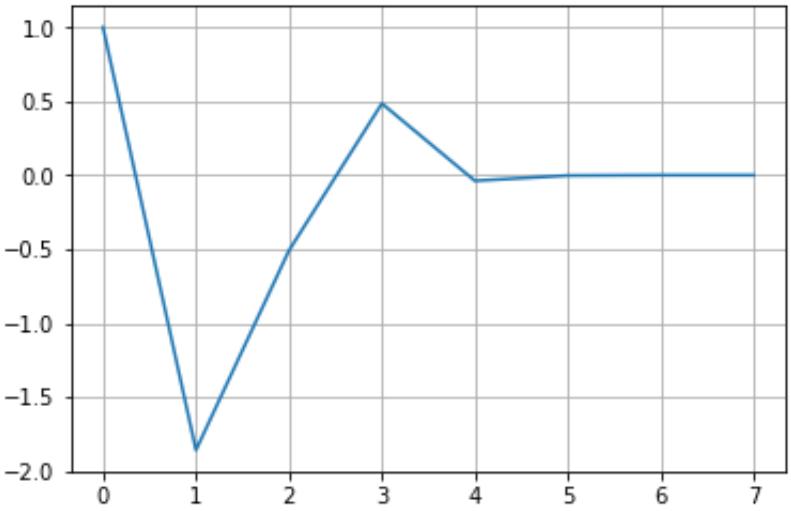
	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	-2	65	0	0
1	1	-1	1	1	-0.984375
2	2	-0.984375	0.894212	0.015625	-0.852299
3	3	-0.852299	0.235612	0.132076	-0.80505
4	4	-0.80505	0.0772799	0.0472496	-0.781988
5	5	-0.781988	0.0106528	0.023062	-0.7783
6	6	-0.7783	0.000571935	0.0036873	-0.778091
7	7	-0.778091	4.51339e-06	0.000209198	-0.77809
8	8	-0.77809	1.92984e-09	1.66401e-06	-0.77809

$$A.\, x^3 - x^2 - x - 1 = 0$$

Opposite Side





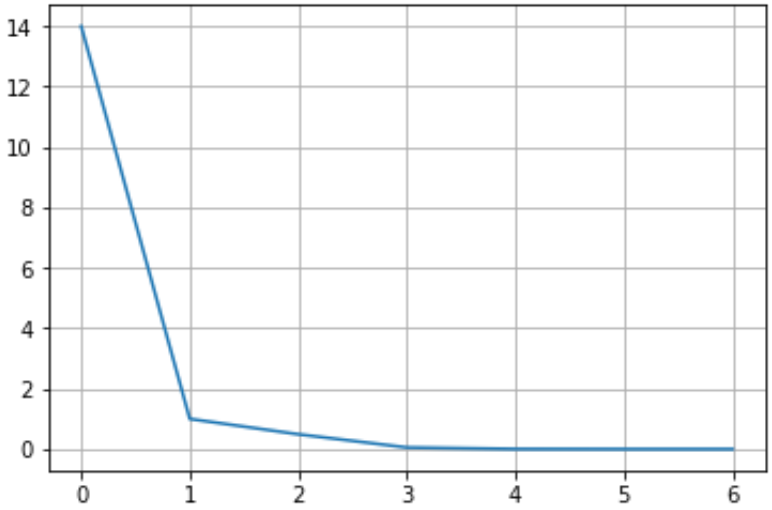



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 7
Steps taken to converge in Secant Method are 8
```

Out[7]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	2	1	0	0
1	1	1.25	-1.85938	-0.75	1.7377
2	2	1.7377	-0.510118	0.487705	1.92209
3	3	1.92209	0.484525	0.184388	1.83227
4	4	1.83227	-0.0381561	-0.0898218	1.83883
5	5	1.83883	-0.00250775	0.00655706	1.83929
6	6	1.83929	1.46016e-05	0.000461269	1.83929
7	7	1.83929	-5.53187e-09	-2.67024e-06	1.83929

```
Opposite Side
```




```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 7
Steps taken to converge in Secant Method are 7
```

Out[8]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	3	14	0	0
1	1	2	1	-1	1.92308
2	2	1.92308	0.490669	-0.0769231	1.84897
3	3	1.84897	0.0534081	-0.0741046	1.83992
4	4	1.83992	0.00347129	-0.00905131	1.83929
5	5	1.83929	2.75806e-05	-0.00062919	1.83929
6	6	1.83929	1.44411e-08	-5.03917e-06	1.83929

$$B.\ x = 1 + 0.3cosx$$

```
Opposite Side
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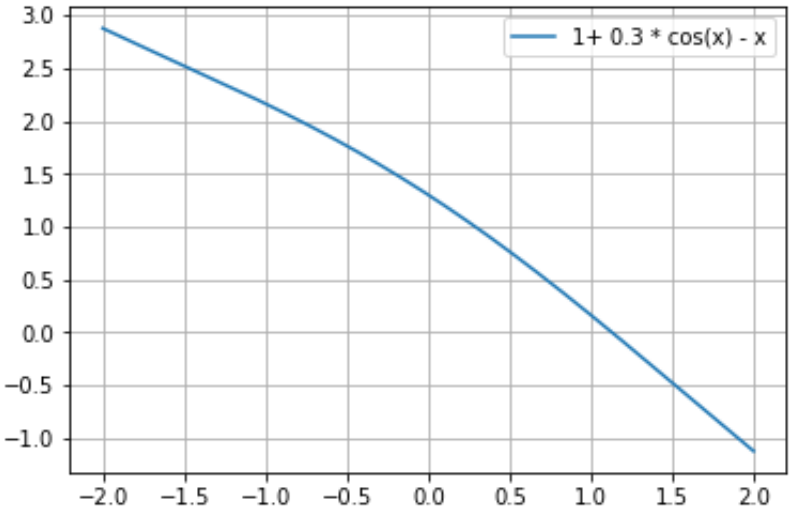

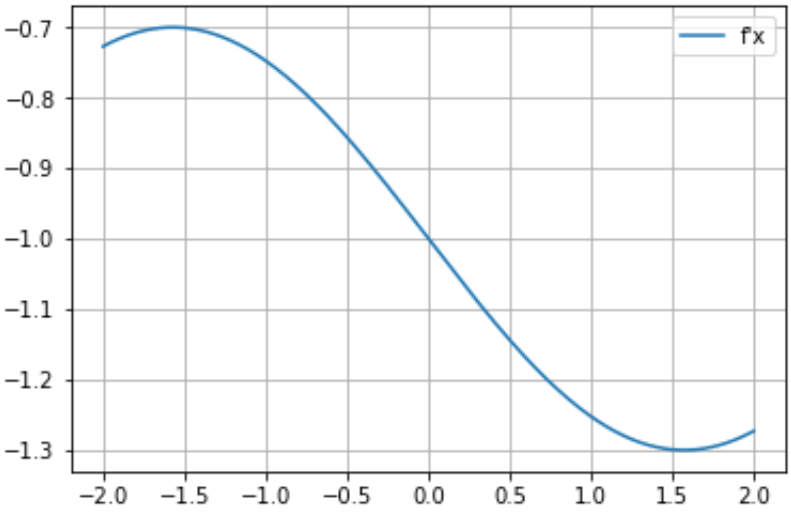

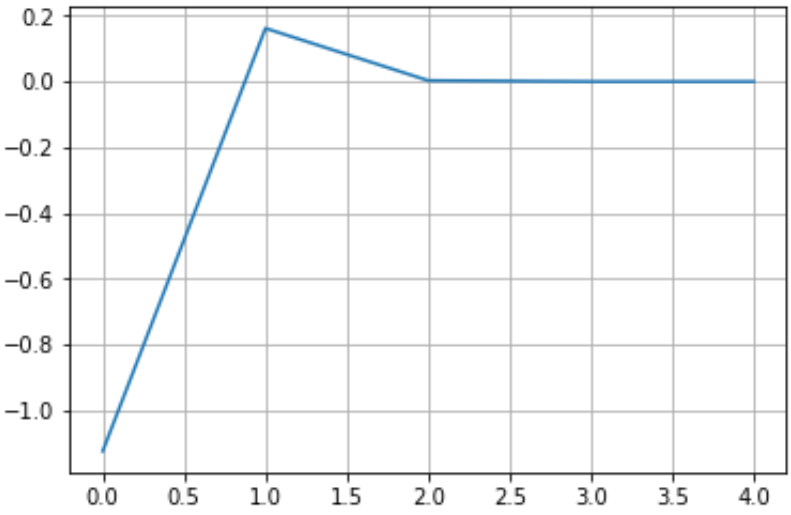


```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 4
Steps taken to converge in Secant Method are 5
```

Out[9]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	2.000000	-1.124844e+00	0.000000	0.000000
1	1.0	1.000000	1.620907e-01	-1.000000	1.125951
2	2.0	1.125951	3.144505e-03	0.125951	1.128443
3	3.0	1.128443	-2.241347e-05	0.002492	1.128425
4	4.0	1.128425	2.806499e-09	-0.000018	1.128425

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Same Side
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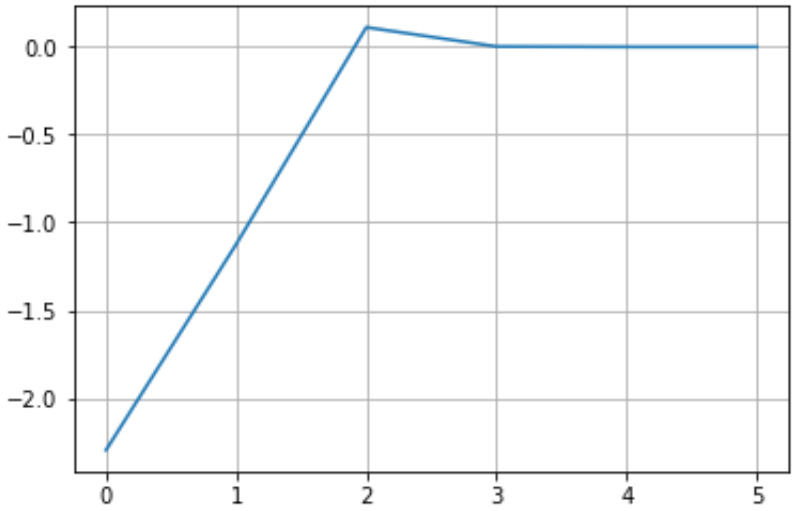


```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 4
Steps taken to converge in Secant Method are 6
```

Out[10]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	3.000000	-2.296998e+00	0.000000	0.000000
1	1.0	2.000000	-1.124844e+00	-1.000000	1.040361
2	2.0	1.040361	1.114113e-01	-0.959639	1.126844
3	3.0	1.126844	2.009717e-03	0.086483	1.128433
4	4.0	1.128433	-9.545113e-06	0.001589	1.128425
5	5.0	1.128425	7.633283e-10	-0.000008	1.128425

$$C.\ cosx = 0.5 + sinx$$

```
Opposite Side
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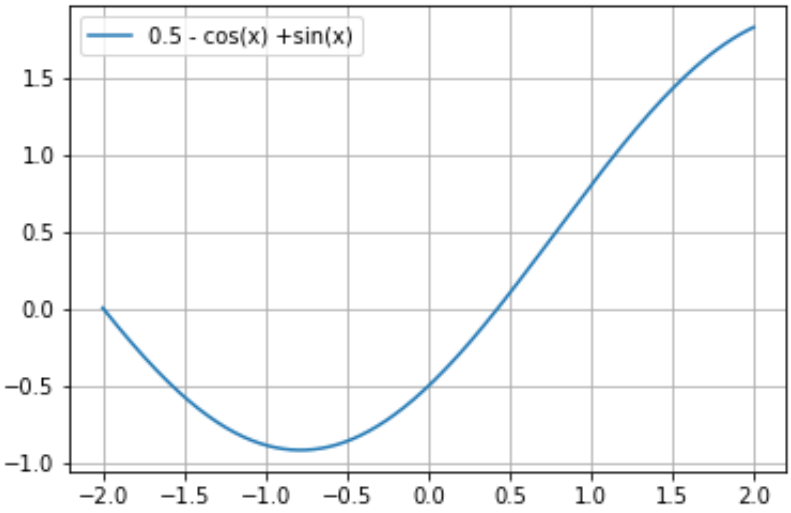

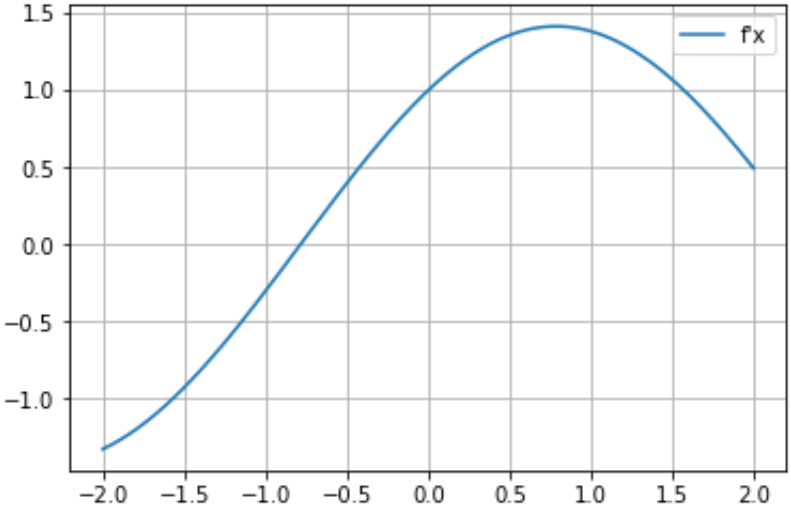

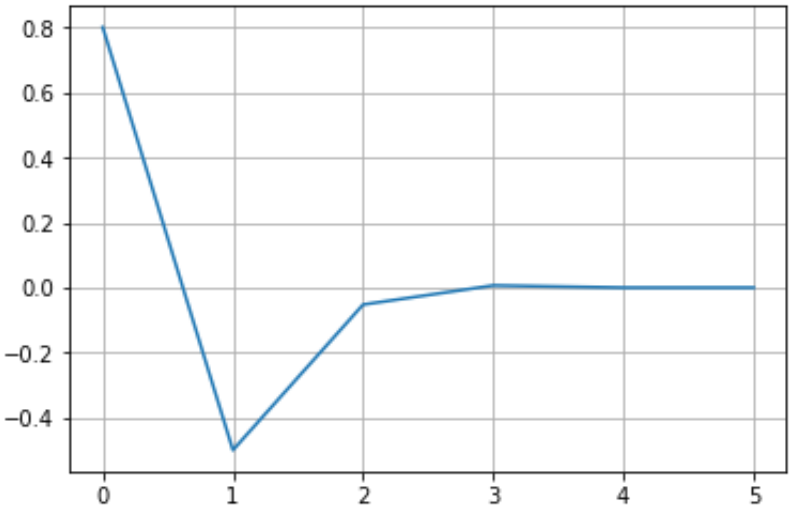


```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 6
```

Out[11]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	1.000000	8.011687e-01	0.000000	0.000000
1	1.0	0.000000	-5.000000e-01	-1.000000	0.384270
2	2.0	0.384270	-5.218996e-02	0.384270	0.429055
3	3.0	0.429055	6.651850e-03	0.044785	0.423992
4	4.0	0.423992	-5.181144e-05	-0.005063	0.424031
5	5.0	0.424031	-4.892623e-08	0.000039	0.424031

```
Same Side
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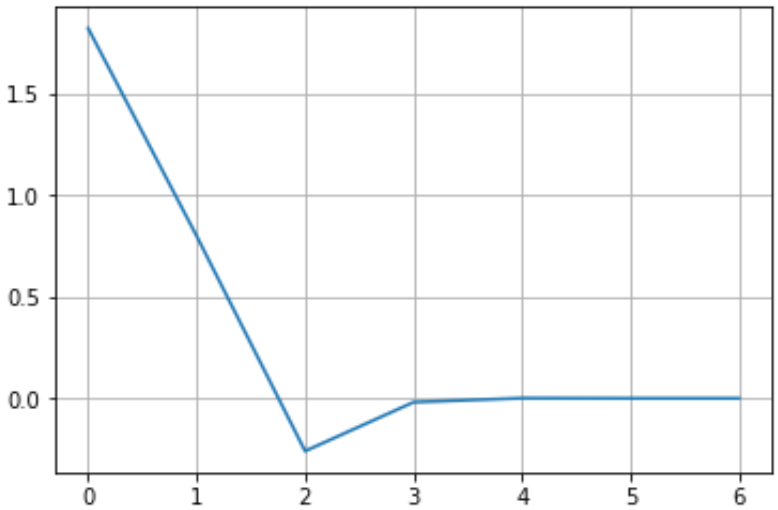


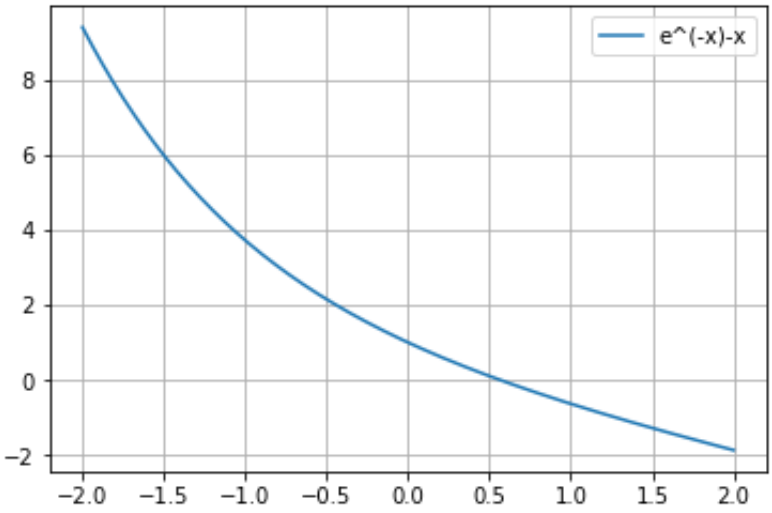

```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 7
```

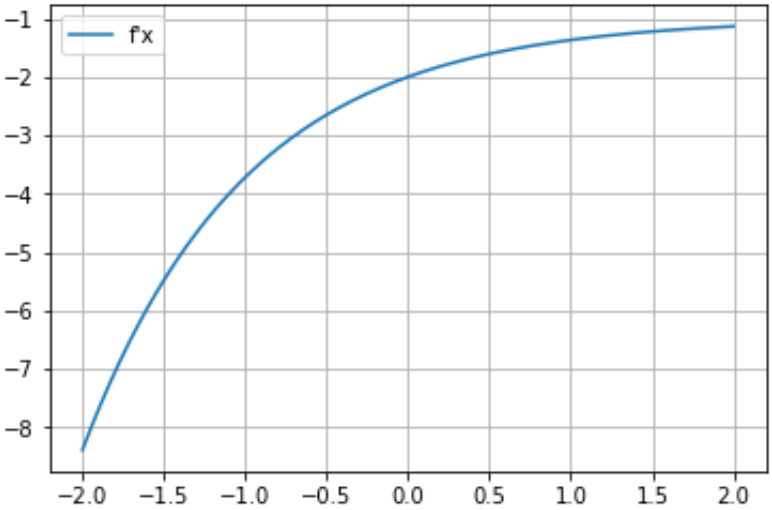
Out[12]:

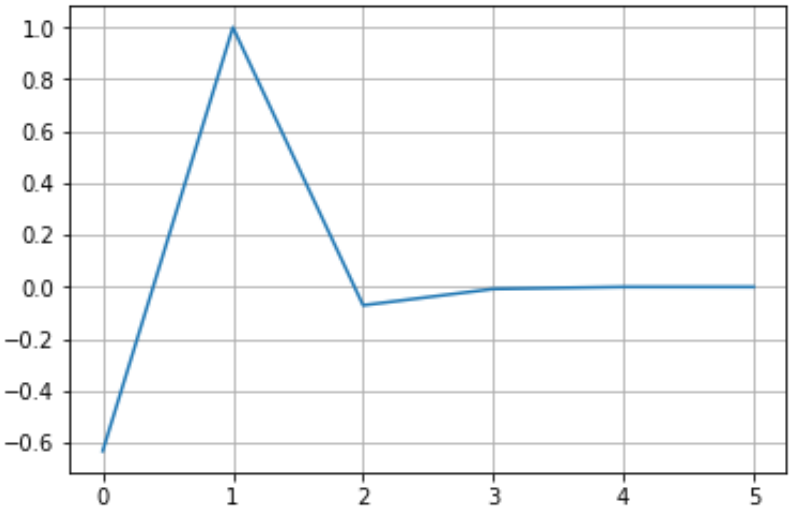
	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	2.000000	1.825444e+00	0.000000	0.000000
1	1.0	1.000000	8.011687e-01	-1.000000	0.217819
2	2.0	0.217819	-2.602702e-01	-0.782181	0.409614
3	3.0	0.409614	-1.901947e-02	0.191795	0.424734
4	4.0	0.424734	9.305833e-04	0.015121	0.424029
5	5.0	0.424029	-2.572486e-06	-0.000705	0.424031
6	6.0	0.424031	-3.416855e-10	0.000002	0.424031

$$D.\, x = e^{-x}$$

Opposite Side





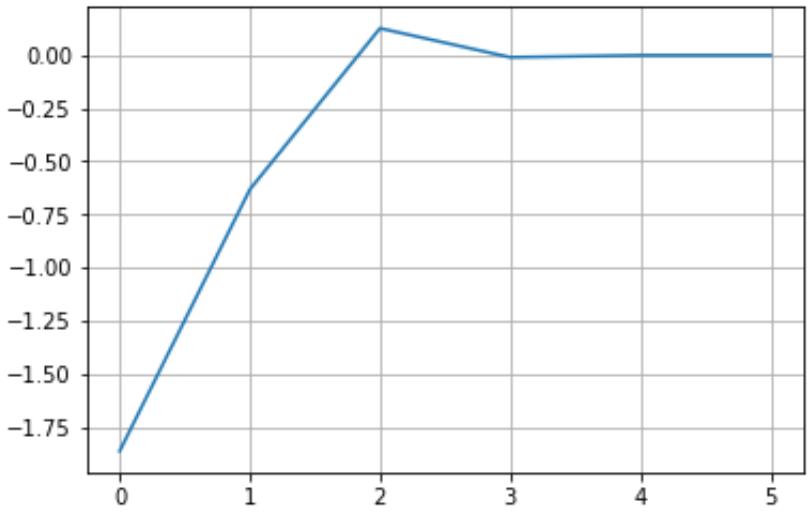


Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 6

Out[13]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	1.000000	-6.321206e-01	0.000000	0.000000
1	1.0	0.000000	1.000000e+00	-1.000000	0.612700
2	2.0	0.612700	-7.081395e-02	0.612700	0.572181
3	3.0	0.572181	-7.888273e-03	-0.040518	0.567102
4	4.0	0.567102	6.458283e-05	-0.005079	0.567143
5	5.0	0.567143	-5.883093e-08	0.000041	0.567143

```
Same Side
```




```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 6
Steps taken to converge in Secant Method are 6
```

Out[14]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	2.000000	-1.864665e+00	0.000000	0.000000
1	1.0	1.000000	-6.321206e-01	-1.000000	0.487142
2	2.0	0.487142	1.272383e-01	-0.512858	0.573076
3	3.0	0.573076	-9.287930e-03	0.085935	0.567230
4	4.0	0.567230	-1.361124e-04	-0.005846	0.567143
5	5.0	0.567143	1.459943e-07	-0.000087	0.567143

E. The two smallest positive roots of $e^{-x} = sinx$

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Opposite Side
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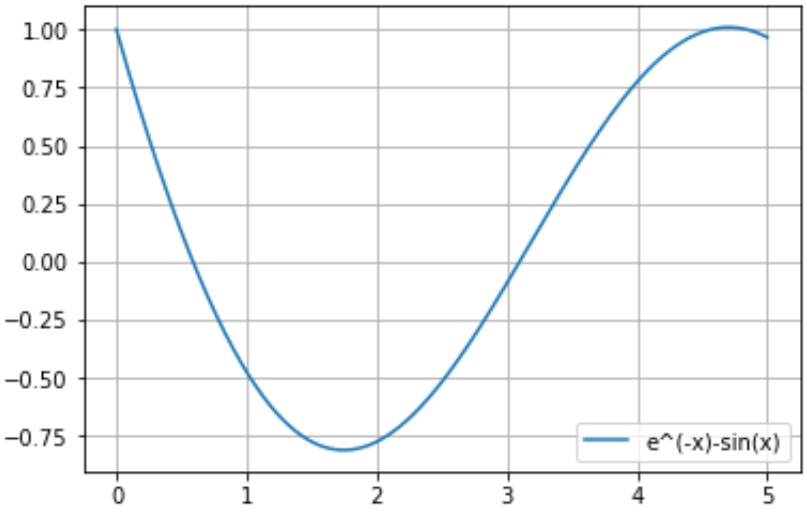
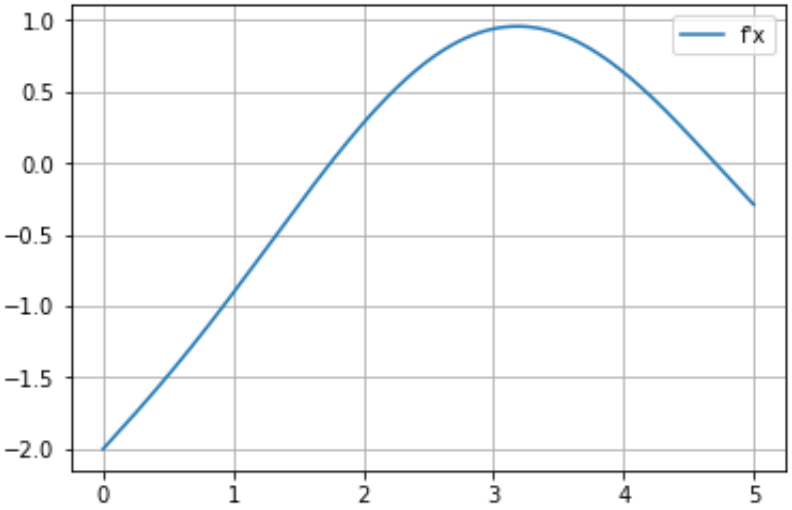
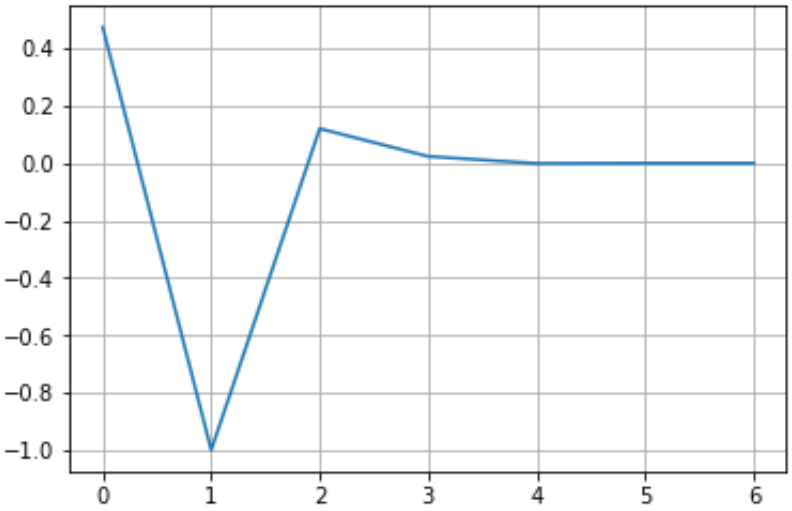




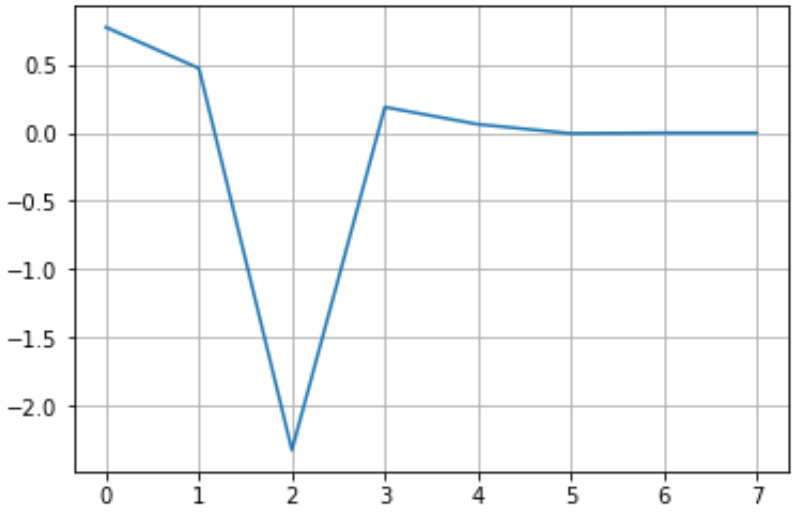



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 7
```

Out[15]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	1.000000	4.735915e-01	0.000000	0.000000
1	1.0	0.000000	-1.000000e+00	-1.000000	0.678614
2	2.0	0.678614	1.203952e-01	0.678614	0.605692
3	3.0	0.605692	2.363407e-02	-0.072922	0.587880
4	4.0	0.587880	-9.050872e-04	-0.017811	0.588537
5	5.0	0.588537	6.264769e-06	0.000657	0.588533
6	6.0	0.588533	1.635542e-09	-0.000005	0.588533

```
Same Side
```

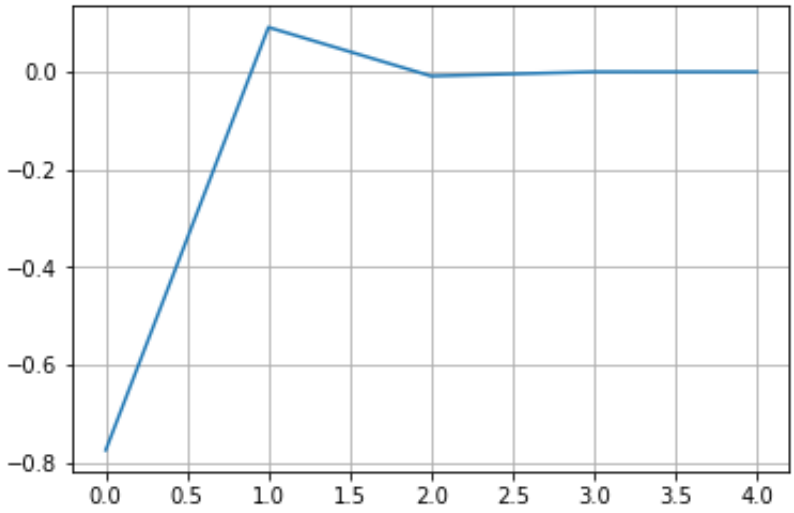



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 8
```

Out[16]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	2.000000	7.739621e-01	0.000000	0.000000
1	1.0	1.000000	4.735915e-01	-1.000000	-0.576691
2	2.0	-0.576691	-2.325391e+00	-1.576691	0.733222
3	3.0	0.733222	1.889081e-01	1.309913	0.634803
4	4.0	0.634803	6.297963e-02	-0.098418	0.585582
5	5.0	0.585582	-4.096841e-03	-0.049221	0.588589
6	6.0	0.588589	7.740651e-05	0.003006	0.588533
7	7.0	0.588533	9.129174e-08	-0.000056	0.588533

```
Opposite Side
```

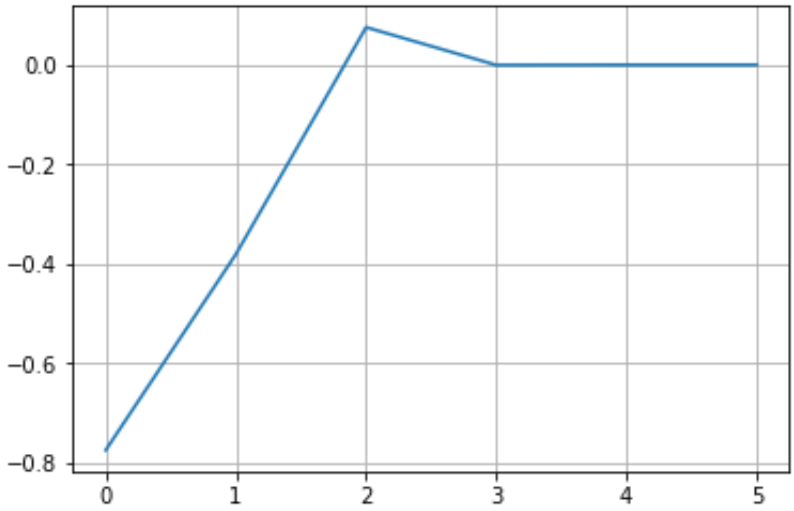



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 5
```

Out[17]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	4.000000	-7.751181e-01	0.000000	0.000000
1	1.0	3.000000	9.133294e-02	-1.000000	3.105410
2	2.0	3.105410	-8.631751e-03	0.105410	3.096308
3	3.0	3.096308	5.295739e-05	-0.009102	3.096364
4	4.0	3.096364	2.191577e-08	0.000056	3.096364

```
Same Side
```



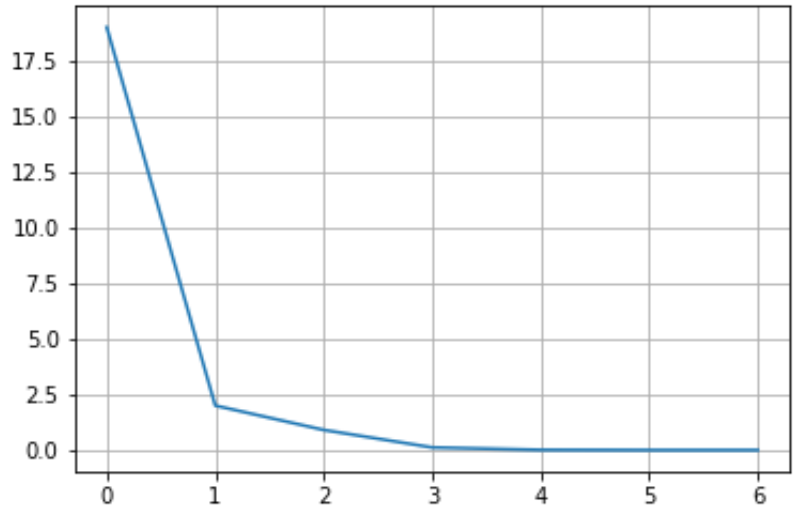

```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 6
```

Out[18]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	4.000000	-7.751181e-01	0.000000	0.000000
1	1.0	3.500000	-3.809806e-01	-0.500000	3.016691
2	2.0	3.016691	7.561441e-02	-0.483309	3.096729
3	3.0	3.096729	-3.483647e-04	0.080038	3.096362
4	4.0	3.096362	1.725728e-06	-0.000367	3.096364
5	5.0	3.096364	2.983775e-11	0.000002	3.096364

$$F.x^3 - 2x - 2 = 0$$

```
Same Side
```

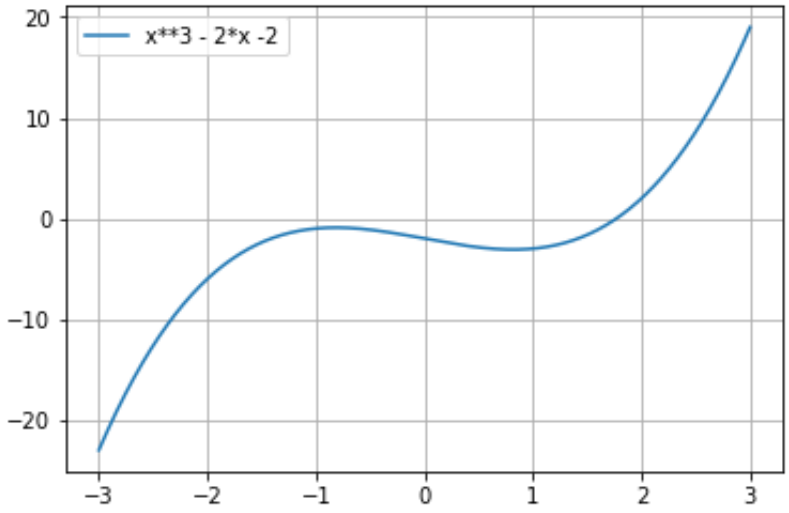


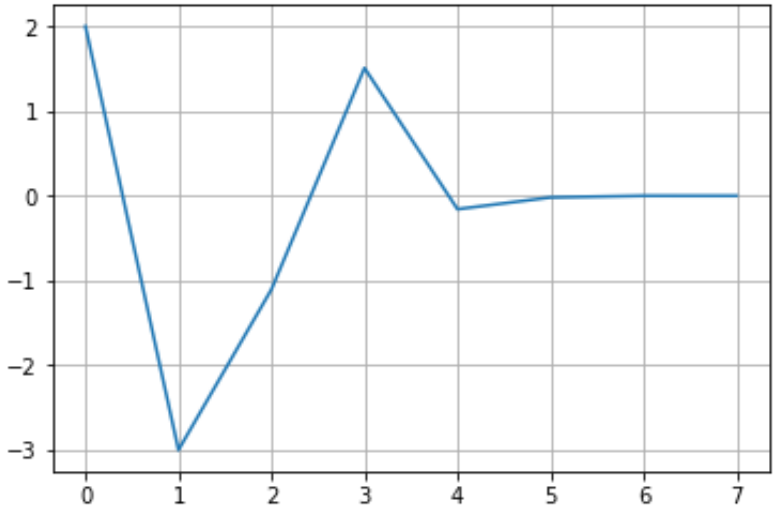

```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 7
```

Out[19]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	3	19	0	0
1	1	2	2	-1	1.88235
2	2	1.88235	0.904946	-0.117647	1.78513
3	3	1.78513	0.118395	-0.0972228	1.7705
4	4	1.7705	0.00890179	-0.0146344	1.76931
5	5	1.76931	0.000100254	-0.00118977	1.76929
6	6	1.76929	8.65786e-08	-1.35521e-05	1.76929

```
Opposite Side
```



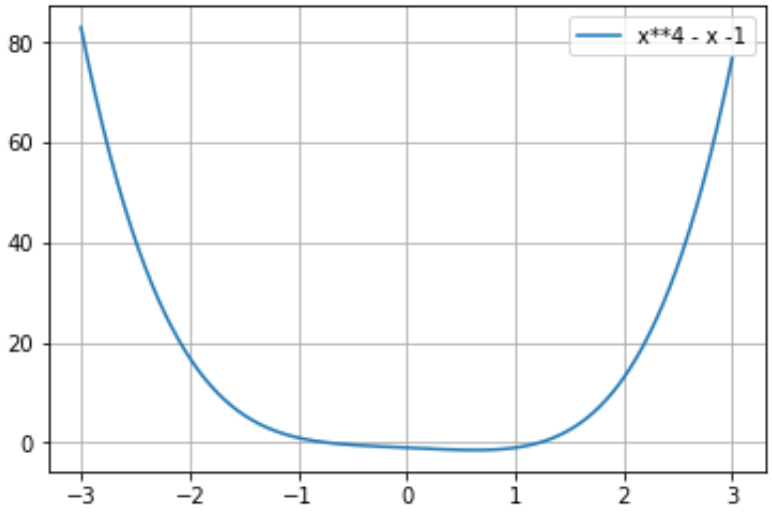


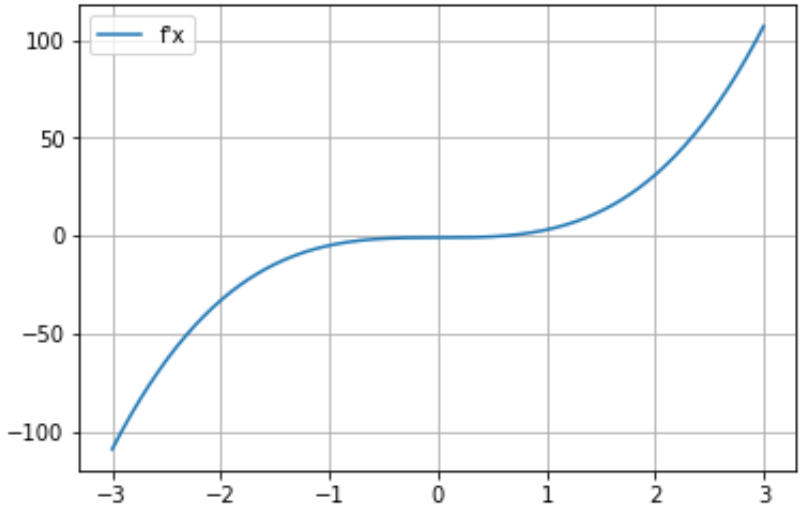

```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 8
```

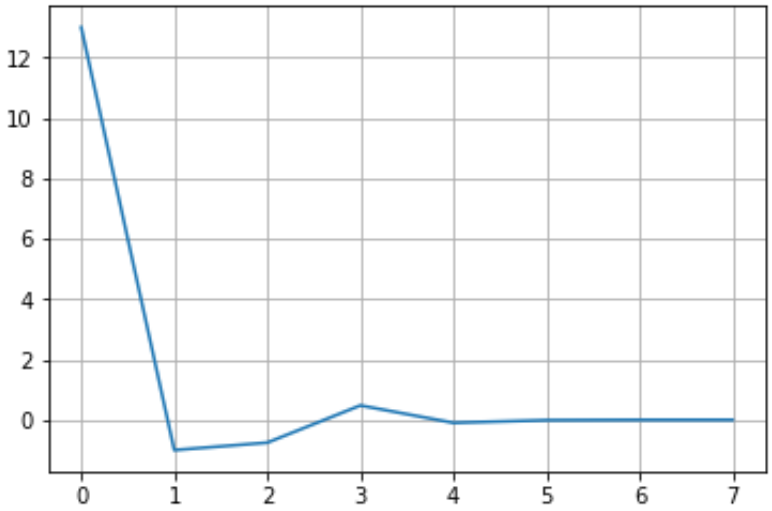
Out[20]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	2	2	0	0
1	1	1	-3	-1	1.6
2	2	1.6	-1.104	0.6	1.94937
3	3	1.94937	1.50892	0.349367	1.74761
4	4	1.74761	-0.157752	-0.201754	1.76671
5	5	1.76671	-0.0190577	0.0190962	1.76933
6	6	1.76933	0.000301132	0.00262397	1.76929
7	7	1.76929	-5.5937e-07	-4.08165e-05	1.76929

```
Opposite Side
```







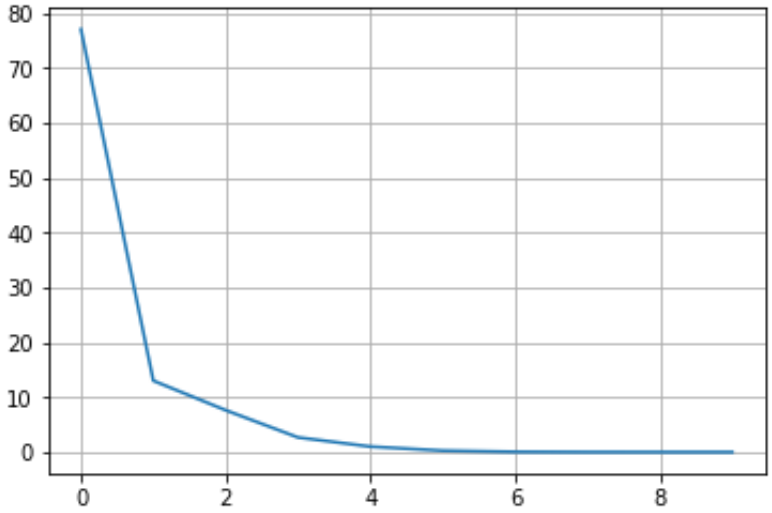

```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 8
Steps taken to converge in Secant Method are 8
```

Out[21]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	2	13	0	0
1	1	1	-1	-1	1.07143
2	2	1.07143	-0.753618	0.0714286	1.28991
3	3	1.28991	0.478548	0.218482	1.20506
4	4	1.20506	-0.0962846	-0.0848537	1.21927
5	5	1.21927	-0.00923606	0.014213	1.22078
6	6	1.22078	0.000210003	0.00150804	1.22074
7	7	1.22074	-4.41665e-07	-3.35264e-05	1.22074

G. All real roots of $x^4 - x - 1 = 0$

```
Same Side
```

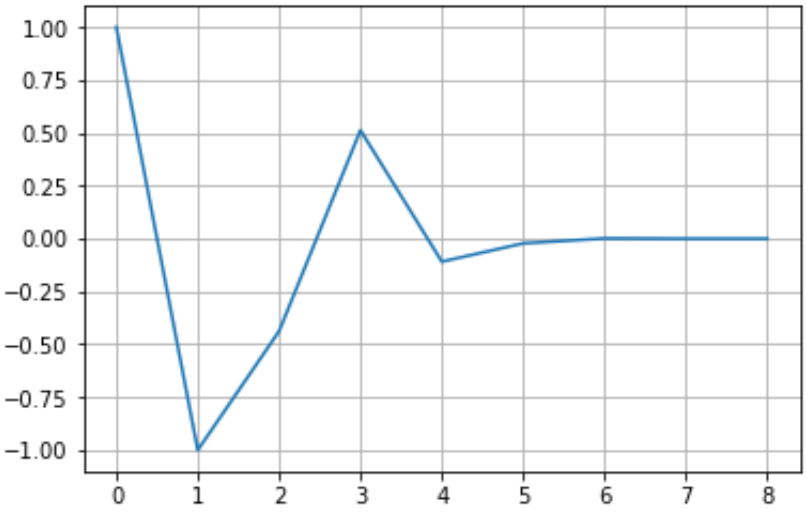



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 8
Steps taken to converge in Secant Method are 10
```

Out[22]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	3	77	0	0
1	1	2	13	-1	1.79688
2	2	1.79688	7.62801	-0.203125	1.50845
3	3	1.50845	2.66903	-0.28843	1.35321
4	4	1.35321	0.999965	-0.155239	1.2602
5	5	1.2602	0.261873	-0.0930064	1.2272
6	6	1.2272	0.0409049	-0.0329983	1.22109
7	7	1.22109	0.00219036	-0.00610855	1.22075
8	8	1.22075	2.00186e-05	-0.000345605	1.22074
9	9	1.22074	9.94345e-09	-3.18776e-06	1.22074

```
Opposite Side
```

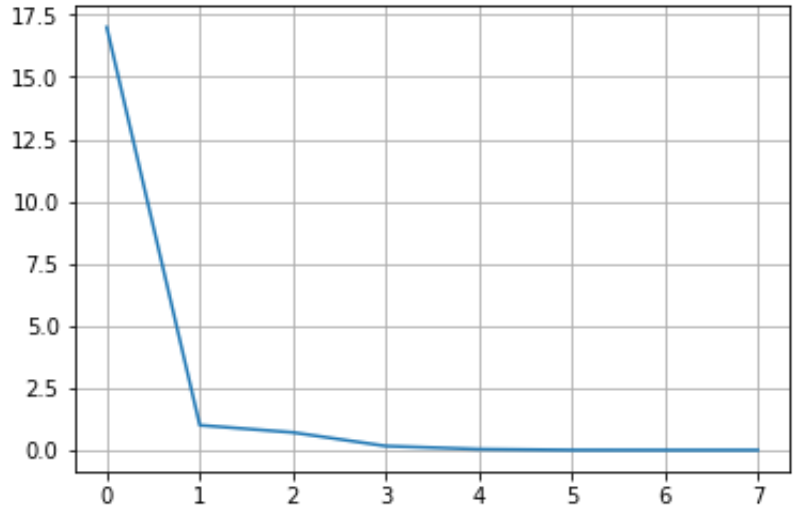



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 8
Steps taken to converge in Secant Method are 9
```

Out[23]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	-1	1	0	0
1	1	0	-1	1	-0.5
2	2	-0.5	-0.4375	-0.5	-0.888889
3	3	-0.888889	0.513184	-0.388889	-0.678965
4	4	-0.678965	-0.108521	0.209924	-0.715608
5	5	-0.715608	-0.0221517	-0.036643	-0.725006
6	6	-0.725006	0.00129622	-0.00939808	-0.724486
7	7	-0.724486	-1.44153e-05	0.000519533	-0.724492
8	8	-0.724492	-9.25098e-09	-5.71421e-06	-0.724492

```
Same Side
```



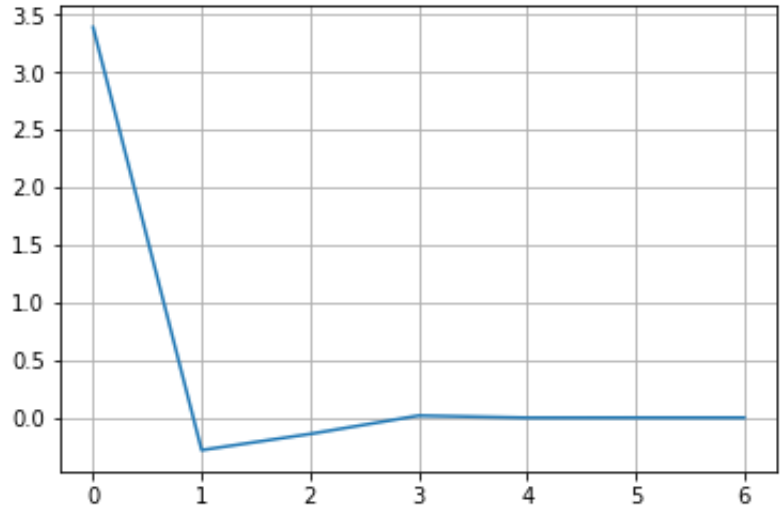

```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 8
Steps taken to converge in Secant Method are 8
```

Out[24]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0	-2	17	0	0
1	1	-1	1	1	-0.9375
2	2	-0.9375	0.709976	0.0625	-0.7845
3	3	-0.7845	0.163268	0.153	-0.738809
4	4	-0.738809	0.0367487	0.0456915	-0.725537
5	5	-0.725537	0.00263908	0.0132715	-0.724511
6	6	-0.724511	4.68959e-05	0.00102683	-0.724492
7	7	-0.724492	6.12199e-08	1.85766e-05	-0.724492

2. Find the largest root of $f(x) = e^x - x - 2 = 0$, with $\epsilon = 0.0001$.

Opposite Side

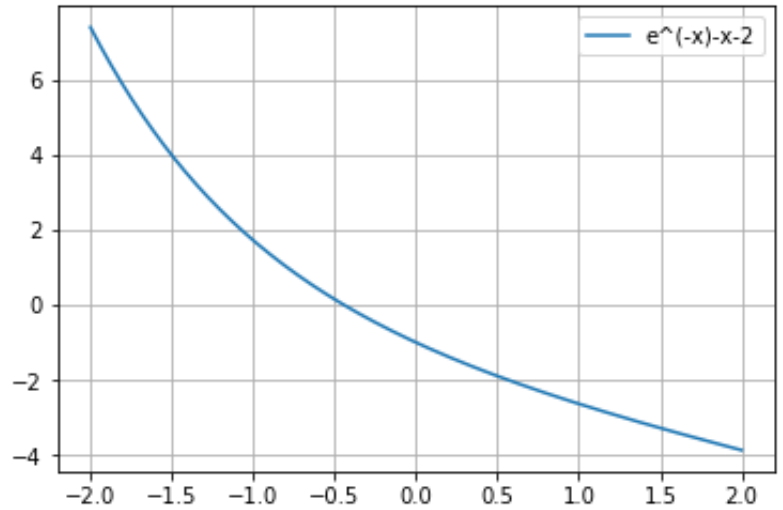


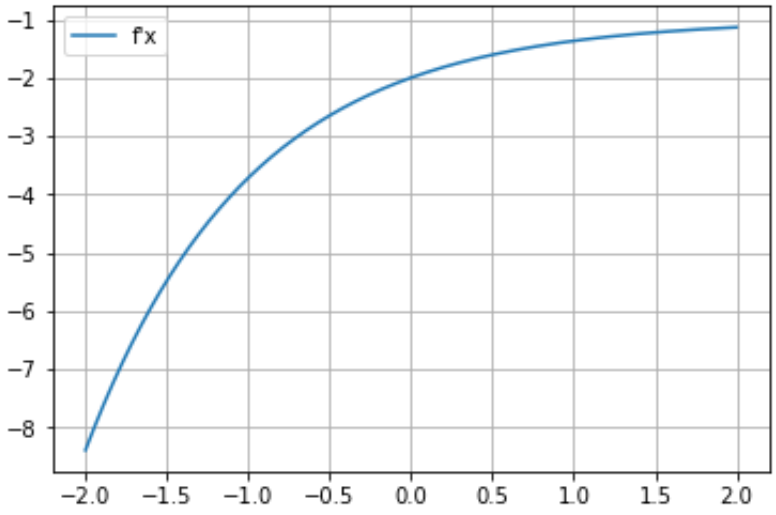
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 7

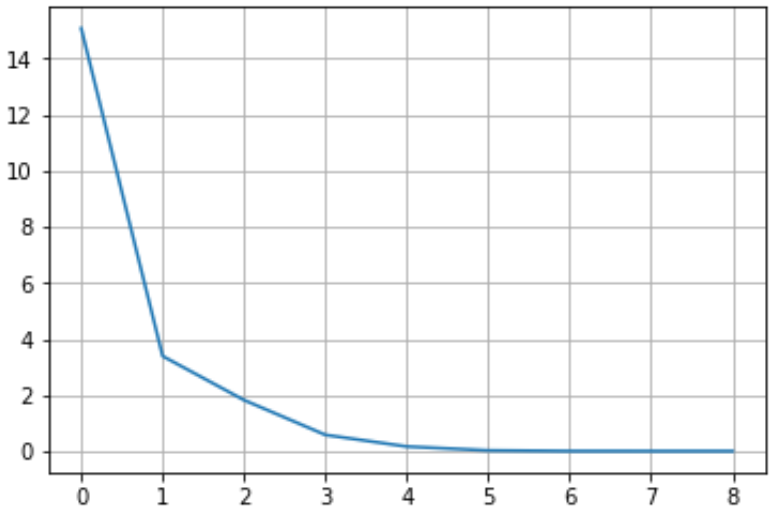
Out[25]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	2.000000	3.389056e+00	0.000000	0.000000
1	1.0	1.000000	-2.817182e-01	-1.000000	1.076746
2	2.0	1.076746	-1.416324e-01	0.076746	1.154340
3	3.0	1.154340	1.758882e-02	0.077594	1.145768
4	4.0	1.145768	-9.118716e-04	-0.008572	1.146191
5	5.0	1.146191	-5.429890e-06	0.000422	1.146193
6	6.0	1.146193	1.691815e-09	0.000003	1.146193

Same Side







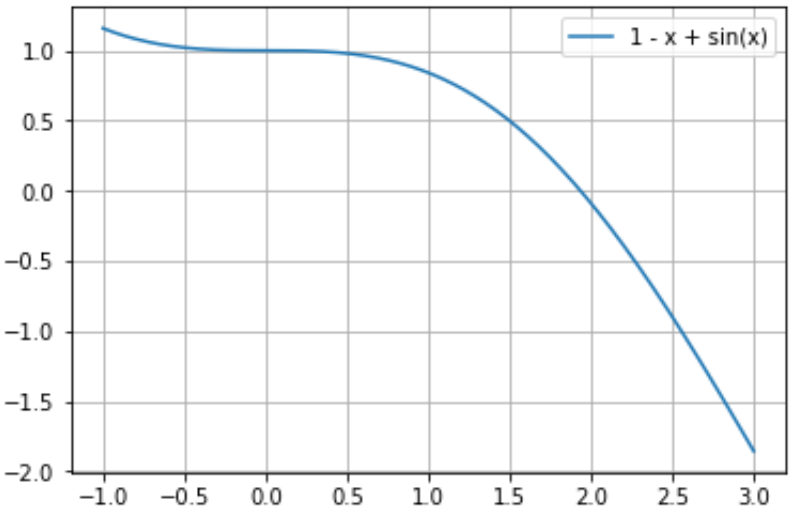

```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 5
Steps taken to converge in Secant Method are 9
```

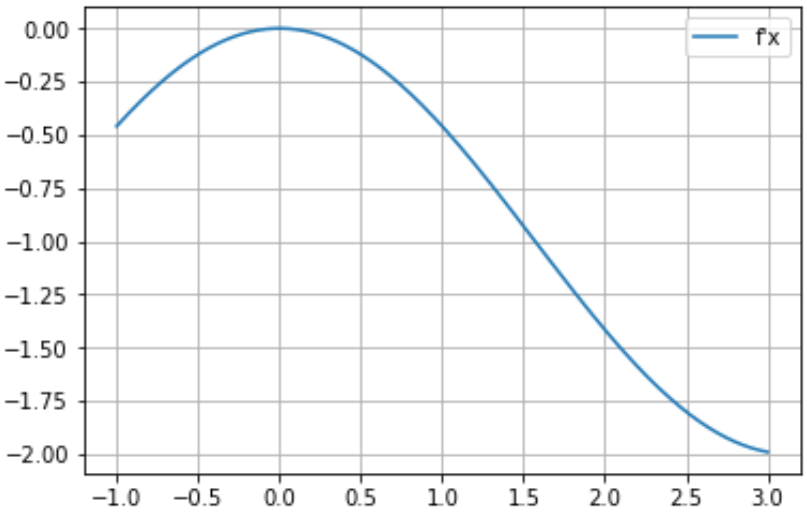
Out[26]:

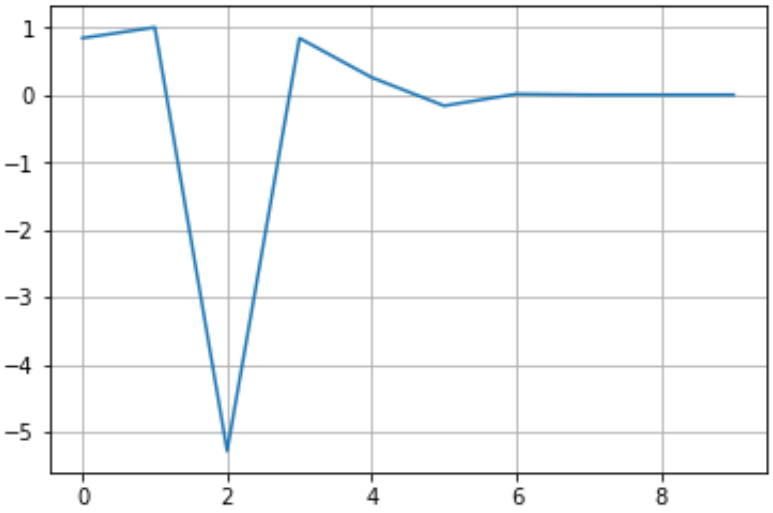
	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	3.000000	1.508554e+01	0.000000	0.000000
1	1.0	2.000000	3.389056e+00	-1.000000	1.710250
2	2.0	1.710250	1.820094e+00	-0.289750	1.374122
3	3.0	1.374122	5.774835e-01	-0.336128	1.217912
4	4.0	1.217912	1.622100e-01	-0.156210	1.156894
5	5.0	1.156894	2.314768e-02	-0.061017	1.146738
6	6.0	1.146738	1.169207e-03	-0.010157	1.146197
7	7.0	1.146197	9.126217e-06	-0.000540	1.146193
8	8.0	1.146193	3.641917e-09	-0.000004	1.146193

Find the smallest positive root of
$f(x) = 1 - x + sinx = 0$, **with** $\epsilon = 0.0001$.

```
Opposite Side
```





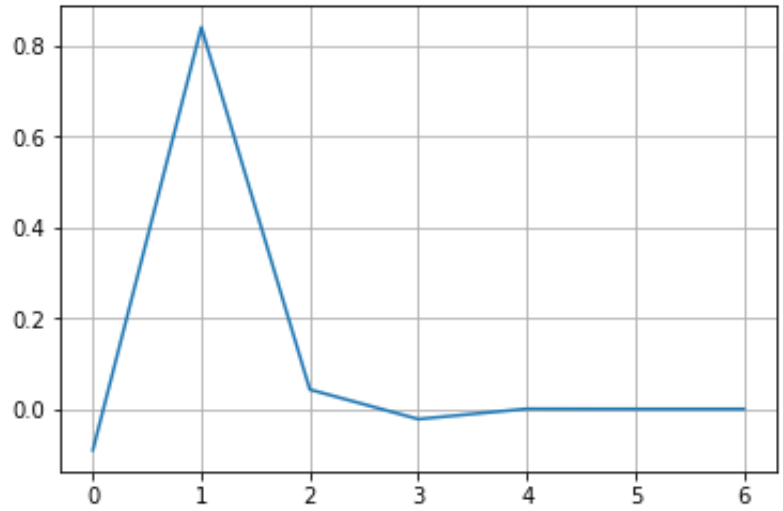


```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 6
Steps taken to converge in Secant Method are 10
```

Out[27]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	1.000000	8.414710e-01	0.000000e+00	0.000000
1	1.0	0.000000	1.000000e+00	-1.000000e+00	6.307994
2	2.0	6.307994	-5.283188e+00	6.307994e+00	1.003948
3	3.0	1.003948	8.396496e-01	-5.304046e+00	1.731313
4	4.0	1.731313	2.558315e-01	7.273653e-01	2.050048
5	5.0	2.050048	-1.627075e-01	3.187346e-01	1.926139
6	6.0	1.926139	1.138776e-02	-1.239084e-01	1.934244
7	7.0	1.934244	4.321935e-04	8.104986e-03	1.934564
8	8.0	1.934564	-1.260111e-06	3.197389e-04	1.934563
9	9.0	1.934563	1.384806e-10	-9.295262e-07	1.934563

```
Same Side
```



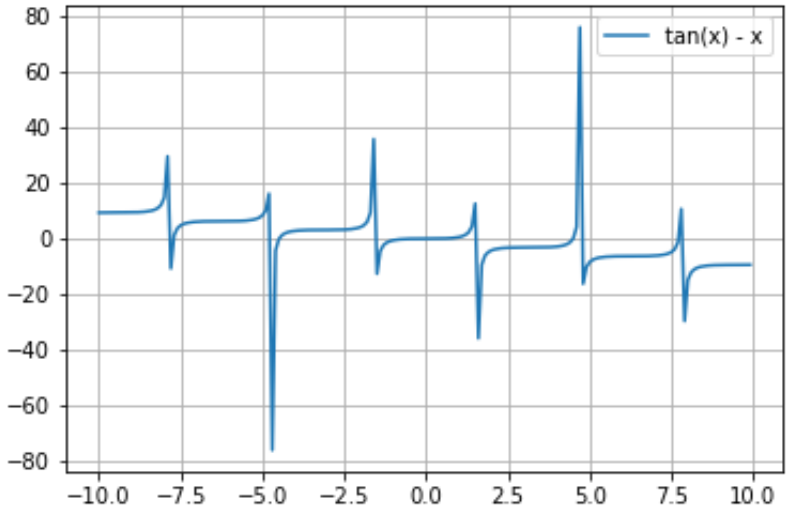

```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 7
Steps taken to converge in Secant Method are 7
```

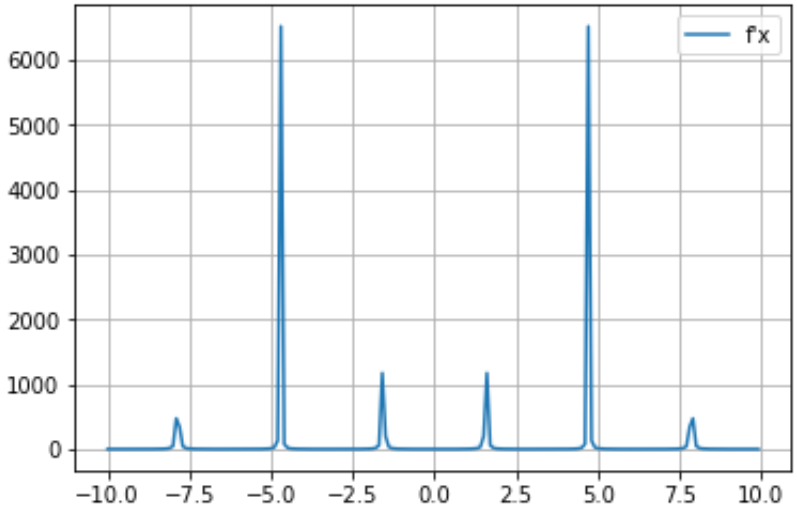
Out[28]:

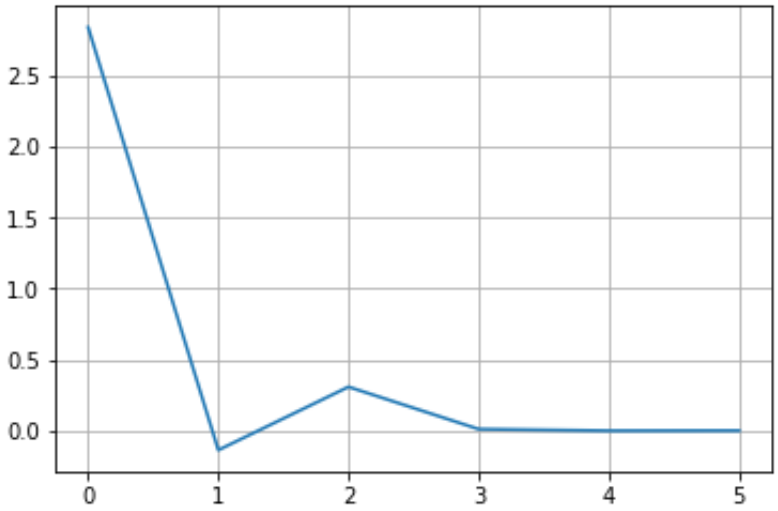
	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	2.000000	-9.070257e-02	0.000000	0.000000
1	1.0	1.000000	8.414710e-01	-1.000000	1.902698
2	2.0	1.902698	4.272672e-02	0.902698	1.950985
3	3.0	1.950985	-2.239065e-02	0.048287	1.934382
4	4.0	1.934382	2.462931e-04	-0.016604	1.934562
5	5.0	1.934562	1.383453e-06	0.000181	1.934563
6	6.0	1.934563	-8.663037e-11	0.000001	1.934563

4. Find the smallest non-zero positive root of $x = tanx$, with an accuracy of 0.0001. Further solve for the root that is closest to $x = 100$.

```
Opposite Side
```





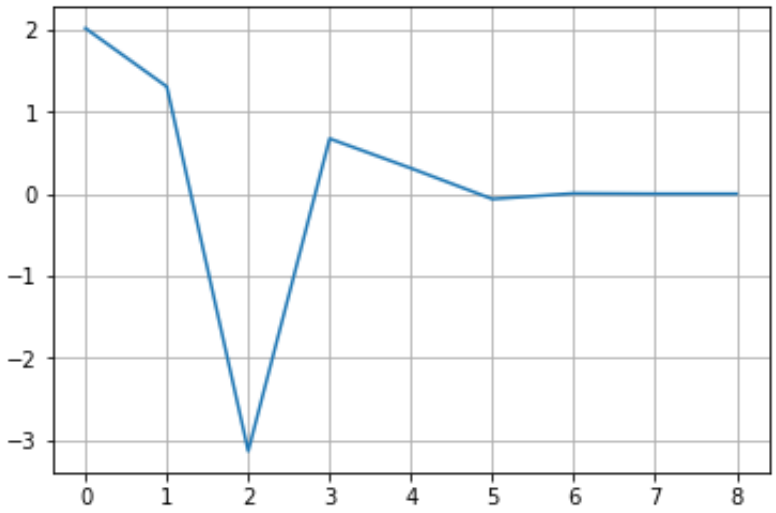



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 4
Steps taken to converge in Secant Method are 6
```

Out[29]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	4.000000	2.842179	0.000000	0.000000
1	1.0	4.500000	-0.137332	0.500000	4.476954
2	2.0	4.476954	0.308268	-0.023046	4.492897
3	3.0	4.492897	0.010316	0.015943	4.493449
4	4.0	4.493449	-0.000805	0.000552	4.493409
5	5.0	4.493409	0.000002	-0.000040	4.493409

```
Same Side
```

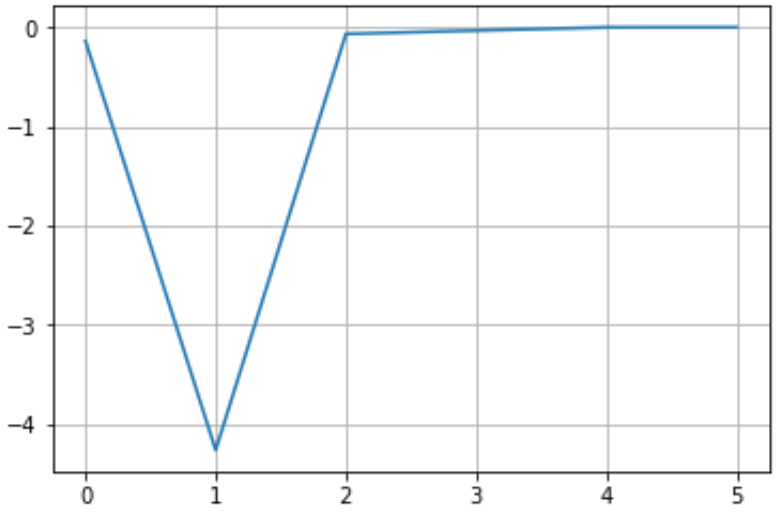



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 4
Steps taken to converge in Secant Method are 9
```

Out[30]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	4.300000	2.014152e+00	0.000000	0.000000
1	1.0	4.400000	1.303676e+00	0.100000	4.583493
2	2.0	4.583493	-3.131710e+00	0.183493	4.453934
3	3.0	4.453934	6.713330e-01	-0.129560	4.476804
4	4.0	4.476804	3.108701e-01	0.022871	4.496528
5	5.0	4.496528	-6.390743e-02	0.019724	4.493165
6	6.0	4.493165	4.935044e-03	-0.003363	4.493406
7	7.0	4.493406	7.263344e-05	0.000241	4.493409
8	8.0	4.493409	-8.382428e-08	0.000004	4.493409

```
Same Side
```

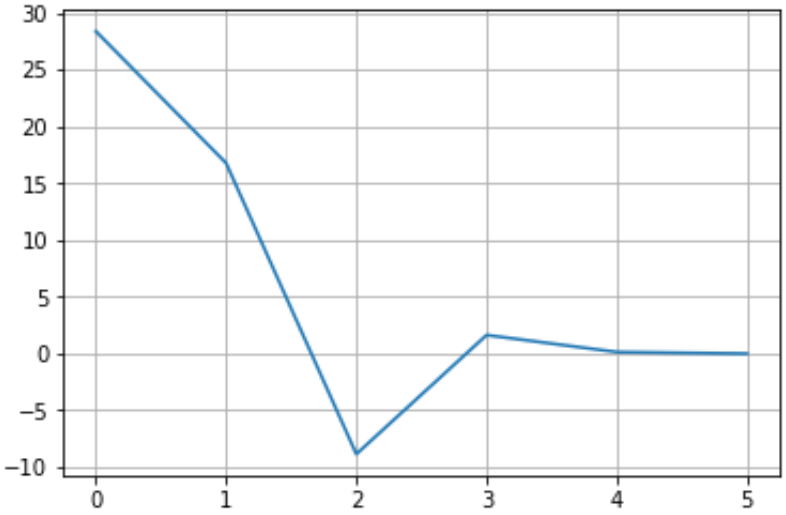



```
Steps taken to converge in Bisection Method are 14
Steps taken to converge in Newton Raphson are 4
Steps taken to converge in Secant Method are 6
```

Out[31]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	4.500000	-0.137332	0.000000	0.000000
1	1.0	4.600000	-4.260175	0.100000	4.496669
2	2.0	4.496669	-0.066839	-0.103331	4.495022
3	3.0	4.495022	-0.032807	-0.001647	4.493434
4	4.0	4.493434	-0.000500	-0.001588	4.493410
5	5.0	4.493410	-0.000004	-0.000025	4.493409

```
Same Side
```

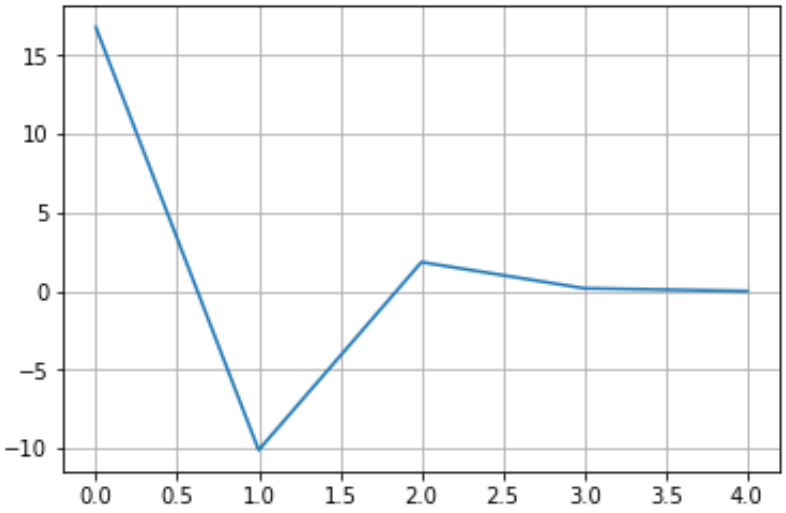



```
Steps taken to converge in Bisection Method are 17
Steps taken to converge in Newton Raphson are 2
Steps taken to converge in Secant Method are 6
```

Out[32]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	98.946000	28.372060	0.000000	0.000000
1	1.0	98.948000	16.773253	0.002000	98.950892
2	2.0	98.950892	-8.847033	0.002892	98.949894
3	3.0	98.949894	1.630469	-0.000999	98.950049
4	4.0	98.950049	0.135882	0.000155	98.950063
5	5.0	98.950063	-0.002280	0.000014	98.950063

```
Opposite Side
```

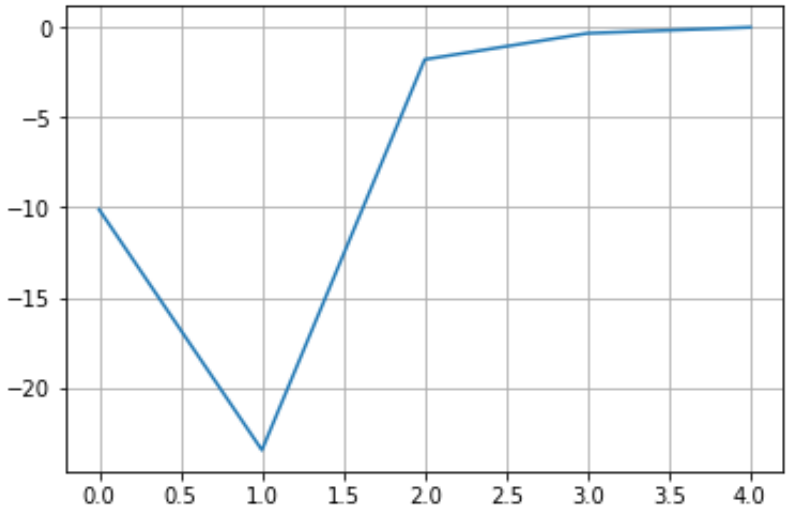



```
Steps taken to converge in Bisection Method are 17
Steps taken to converge in Newton Raphson are 2
Steps taken to converge in Secant Method are 5
```

Out[33]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	98.948000	16.773253	0.000000	0.000000
1	1.0	98.951000	-10.113991	0.003000	98.949872
2	2.0	98.949872	1.838371	-0.001128	98.950045
3	3.0	98.950045	0.173419	0.000174	98.950063
4	4.0	98.950063	-0.003289	0.000018	98.950063

```
Same Side
```




```
Steps taken to converge in Bisection Method are 17
Steps taken to converge in Newton Raphson are 2
Steps taken to converge in Secant Method are 5
```

Out[34]:

	n	x_(n)	f(x_n)	x_(n) - x_(n-1)	x_(n+1)
0	0.0	98.951000	-10.113991	0.000000	0.000000
1	1.0	98.952000	-23.465454	0.001000	98.950242
2	2.0	98.950242	-1.790876	-0.001758	98.950097
3	3.0	98.950097	-0.338361	-0.000145	98.950063
4	4.0	98.950063	-0.005996	-0.000034	98.950063