

Criteria #1:

```
Command Window
>> test_secant
Enter 1 to use true error. Enter 2 to use absolute approximate error. Enter 3 to use relative approximate error:1
Iteration#    x0        x1        f(x0)        f(x1)
0            -7.0000    -5.0000    -2.3142      0.9162
1            -5.0000    -5.5672     0.9162      0.3117
2            -5.5672    -5.8598     0.3117     -0.1790
3            -5.8598    -5.7531    -0.1790      0.0105
4            -5.7531    -5.7590     0.0105      0.0003
5            -5.7590    -5.7591     0.0003     -0.0000

ans =

-5.7591

Iteration#    x0        x1        f(x0)        f(x1)
0            -3.0000    -5.0000    -1.2947      0.9162
1            -5.0000    -4.1712     0.9162      0.7103
2            -4.1712    -1.3108     0.7103     -3.0002
3            -1.3108    -3.6236    -3.0002     -0.0795
4            -3.6236    -3.6866    -0.0795      0.0306
5            -3.6866    -3.6691     0.0306      0.0004
6            -3.6691    -3.6689     0.0004     -0.0000
7            -3.6689    -3.6689    -0.0000      0.0000

ans =

-3.6689
```

Criteria #2:

```
>> test_secant
Enter 1 to use true error. Enter 2 to use absolute approximate error. Enter 3 to use relative approximate error:2
Iteration#    x0        x1        f(x0)        f(x1)
0            -7.0000    -5.0000    -2.3142      0.9162
1            -5.0000    -5.5672     0.9162      0.3117
2            -5.5672    -5.8598     0.3117     -0.1790
3            -5.8598    -5.7531    -0.1790      0.0105
4            -5.7531    -5.7590     0.0105      0.0003
5            -5.7590    -5.7591     0.0003     -0.0000
6            -5.7591    -5.7591    -0.0000      0.0000

ans =

-5.7591

Iteration#    x0        x1        f(x0)        f(x1)
0            -3.0000    -5.0000    -1.2947      0.9162
1            -5.0000    -4.1712     0.9162      0.7103
2            -4.1712    -1.3108     0.7103     -3.0002
3            -1.3108    -3.6236    -3.0002     -0.0795
4            -3.6236    -3.6866    -0.0795      0.0306
5            -3.6866    -3.6691     0.0306      0.0004
6            -3.6691    -3.6689     0.0004     -0.0000
7            -3.6689    -3.6689    -0.0000      0.0000
8            -3.6689    -3.6689     0.0000      0.0000

ans =

-3.6689
```

Criteria #3:

```
>> test_secant
Enter 1 to use true error. Enter 2 to use absolute approximate error. Enter 3 to use relative approximate error:3
Iteration#    x0        x1        f(x0)        f(x1)
0            -7.0000    -5.0000    -2.3142      0.9162
1            -5.0000    -5.5672     0.9162      0.3117
2            -5.5672    -5.8598    -0.1790     -0.1790
3            -5.8598    -5.7531    -0.1790      0.0105
4            -5.7531    -5.7590     0.0105      0.0003
5            -5.7590    -5.7591     0.0003     -0.0000
6            -5.7591    -5.7591    -0.0000      0.0000

ans =

-5.7591

Iteration#    x0        x1        f(x0)        f(x1)
0            -3.0000    -5.0000    -1.2947      0.9162
1            -5.0000    -4.1712     0.9162      0.7103
2            -4.1712    -1.3108     0.7103     -3.0002
3            -1.3108    -3.6236    -3.0002     -0.0795
4            -3.6236    -3.6866    -0.0795      0.0306
5            -3.6866    -3.6691     0.0306      0.0004
6            -3.6691    -3.6689     0.0004     -0.0000
7            -3.6689    -3.6689    -0.0000      0.0000

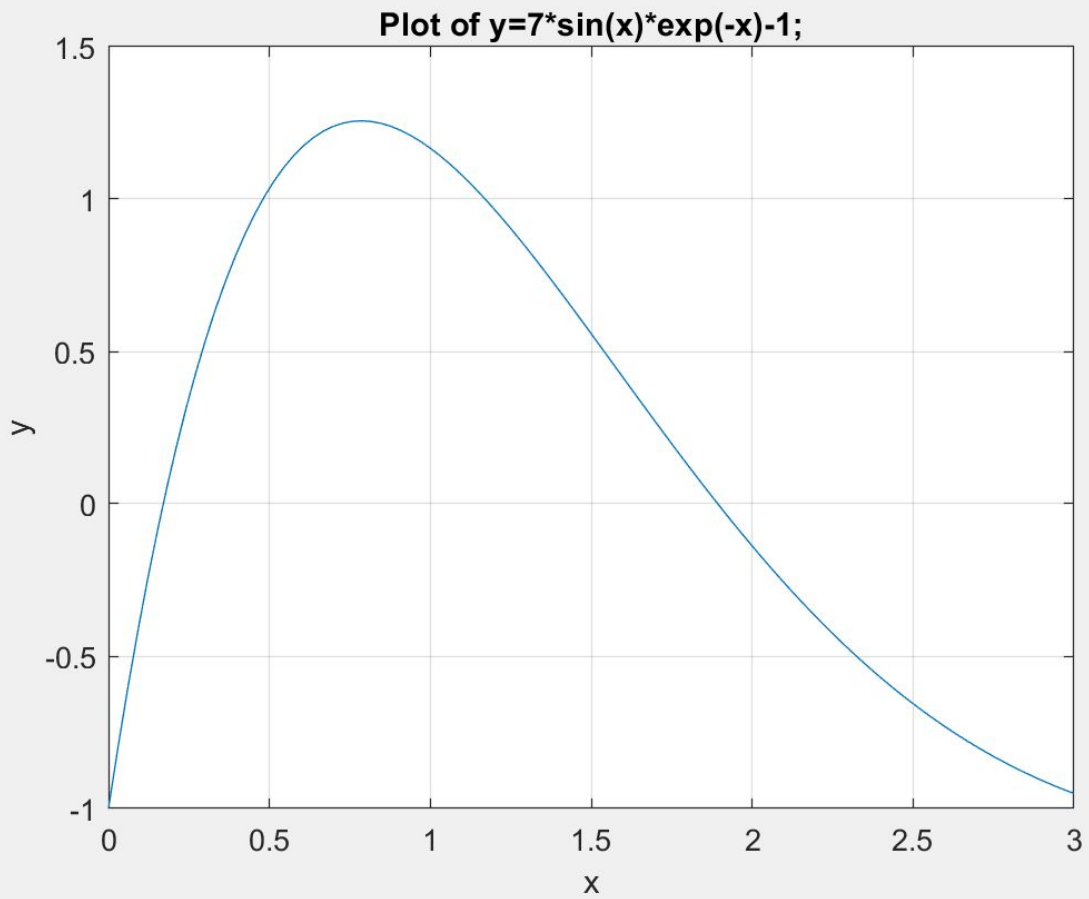
ans =

-3.6689
```

Both methods lead to the same results. The value for the first root is -5.7591 and the value for the second root is -3.6689. Compared to the results from HW#3, the secant method seems to provide less iterations for all 3 criterias compared to using the false position method.

Figure 1

File Edit View Insert Tools Desktop Window Help



Command Window

```
>> Q2
```

```
Newton-Raphson method for root#1
```

Iteration#	xr	f(xr)
0	0.1000	-0.3677
Iteration#	xr	f(xr)
1	0.1648	-0.0259
Iteration#	xr	f(xr)
2	0.1701	-0.0002
Iteration#	xr	f(xr)
3	0.1702	-0.0000
Iteration#	xr	f(xr)
4	0.1702	-0.0000

```
Newton-Raphson method for root#2
```

Iteration#	xr	f(xr)
0	1.8000	0.1268
Iteration#	xr	f(xr)
1	1.8913	0.0024
Iteration#	xr	f(xr)
2	1.8931	0.0000
Iteration#	xr	f(xr)
3	1.8931	0.0000

```
Secant method for root#1
```

Iteration#	x0	x1	f(x0)	f(x1)
0	0.4000	0.3000	0.8272	0.5325
1	0.3000	0.1193	0.5325	-0.2603
2	0.1193	0.1787	-0.2603	0.0405
3	0.1787	0.1707	0.0405	0.0024
4	0.1707	0.1702	0.0024	-0.0000
5	0.1702	0.1702	-0.0000	0.0000

```
Secant method for root#2
```

Iteration#	x0	x1	f(x0)	f(x1)
0	2.1000	2.0000	-0.2601	-0.1386
1	2.0000	1.8859	-0.1386	0.0095
2	1.8859	1.8933	0.0095	-0.0003
3	1.8933	1.8931	-0.0003	-0.0000

fx >> |

Both, the Newton-Raphson method, as well as the Secant method provide the same results. The two positive roots of $f(x)=7*\sin(x)*\exp(-x)-1$ are 0.1702 and 1.8931 as can be seen from both methods. Both methods determine these two roots with relatively the same number of iterations.