Lab Sheet 4

Report

Q2.

Below are some of the values observed in the output to give an idea:

x0	x1	Value of Root
1.95	2.05	2
1.951	2.05	NaN
1.95	2.049	1.9929
1.951	2.049	NaN
1.952	2.049	NaN
1.951	2.048	2.048
1.997	2.003	2
1.998	2.003	1.9981
1.997	2.002	1.9998
1.998	2.002	2
1.999	2.002	NaN
1.998	2.001	NaN
1.999	2.001	2
2	2.001	2.001
1.999	2	1.9993

- I returned NaN from my bisect function whenever $f(x_0)$ and $f(x_1)$ are of the same size. Even though in all these cases $x_0 <= 2$ and $x_1 >= 2$, making $f(x_0)$ and $f(x_1)$ to be of different sign, we still get a lot of NaN values for the root.
- We get wrong answers even at very low tolerance values.

Q3.
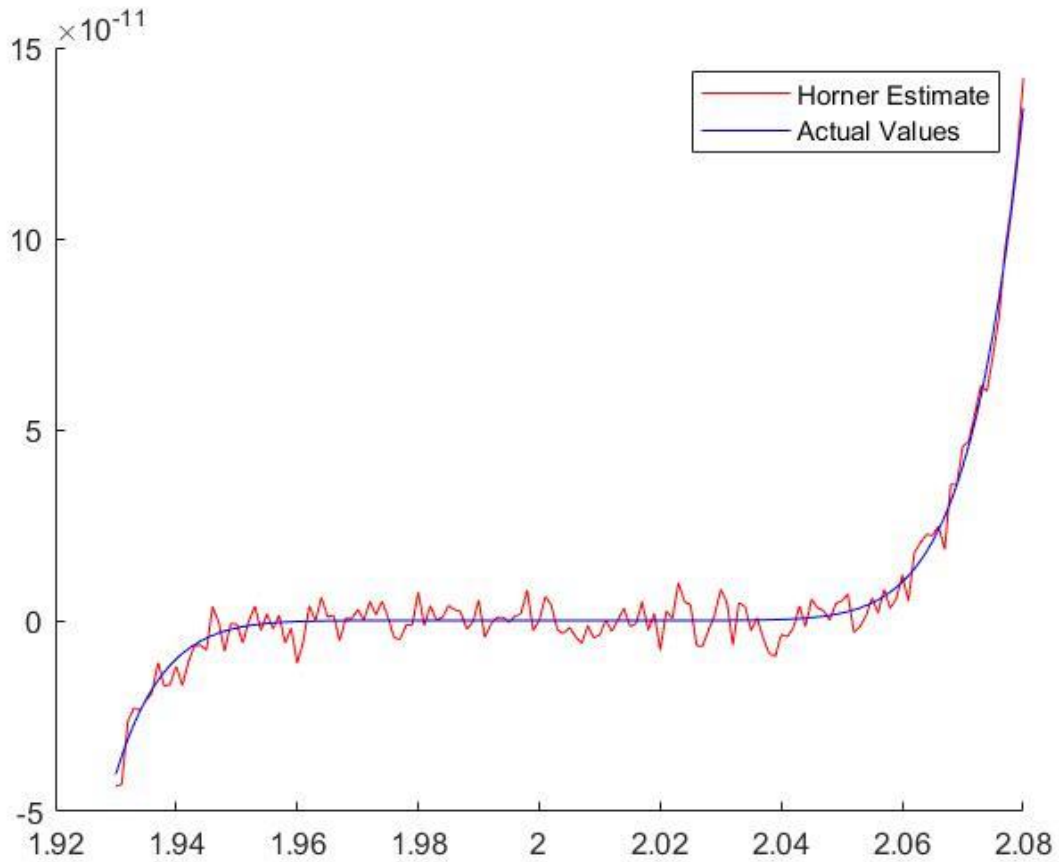
- The plots differ from one another. The plot using Horner's rule has a lot of noise.
- When we use Horner's rule, we have to deal with large coefficients and many addition and subtraction operations between these numbers causing rounding errors.
- Since the values of function at root is zero, these values being computed are small and prone to errors due to catastrophic cancelling.
- We see that the actual curve is largely flat around x=2, this causes the noisy Horner estimate to cross y=0 many times, which is the reason for the various NaN values observed in Q2.
- As a result of all these factors, we get wrong answers in Q2.