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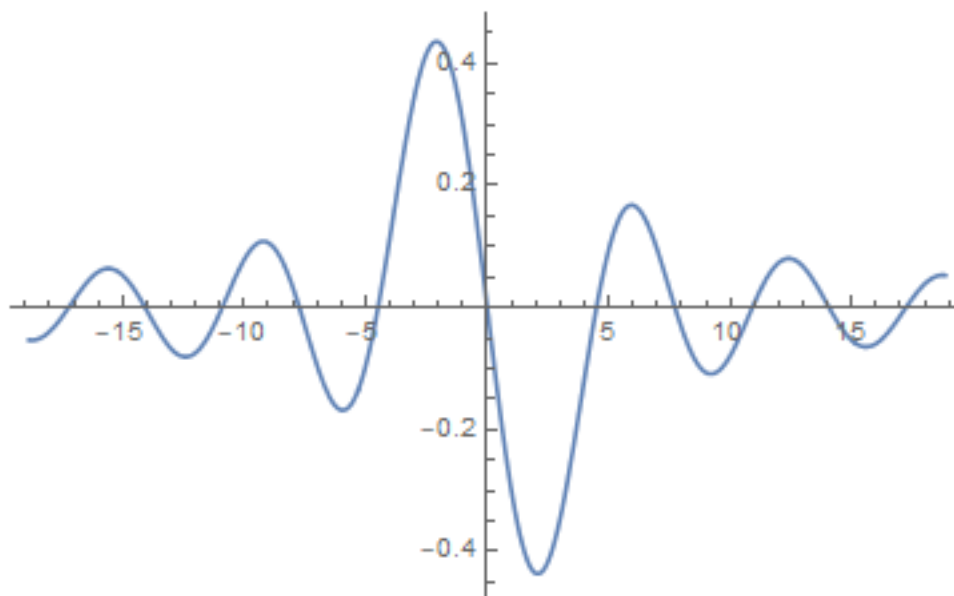AMS 326 Test 1
2/08/2018

Ti-j

Introduction

We wish to approximate the first five roots for the derivative of the sinc function. This is equivalent to

$$f(x) = \frac{1}{x}(\cos(x) - \sin(x)/x)$$

. This was plotting on Mathematica using the commands:
$f[x_] = 1/x(Cos[x] - Sinc[x])$
$\texttt{Plot}[f[x], x, -6\pi, 6\pi]$ The resulting graph is shown below:

Method

We see from the graph that the first root must be zero. Next, we see that by symmetry, for some root x_0, $-x_0$ must also be a root. Using the bisection method, we guess a point near the next root to be $x_0 = 4.49 \pm 0.005$. The next estimation is $x_0 = 7.7 \pm 0.05$.
We use the bisection method on these points, and there negative points to find the roots via Python.

Results

As stated previously, we can tell from the graph that there must be a root as x approaches 0. As can be seen by running the attached code, the other four roots found via Python are $x = \pm 4.493408203125$ following 9 iterations, and $x = \pm 7.725244140625$ after 10 iterations.

Conclusion

The code runs fast, and we see that these values are close to 0. It should be easy to transfer this to another computer, and simply making ϵ smaller will allow for closer approximations.