APPM 5600 — Flipped day: Bisection

For this assignment, we will consider $f(x)$ smooth for all $x \in \mathbb{R}$.

- How can you determine if there is a root in the interval? Does the technique you came up with always work?

- Come up with an an algebraic expression for determining if there is root in the interval.

- Write down a pseudocode for the bissection method; include input, output and steps.

- If the method is going to succeed, what is the maximum number of iterations it will take to find the root to an accuracy of ϵ?

- Write a code for the bissection method.

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- Apply it to some functions listed below. You should set your desired accuracy to $\epsilon = 10^{-5}$.

  (a) $f(x) = (x-1)(x-3)(x-5)$ with $a = 0$ and $b = 2.4$.
  (b) $f(x) = (x-1)^2(x-3)$ with $a = 0$ and $b = 2$.
  (c) $f(x) = \sin(x)$ with $a = 0$, $b = 0.1$. What about $a = 0.5$ and $b = \frac{3\pi}{4}$

  Is the behavior what you expect? Was your code successful? Did it achieve at least the desired accuracy?