MATH 3043, Numerical Analysis I
Fall 2018

Lab 1

This lab will have you implementing the Bisection method to approximate solutions for several problems.

Solutions must be submitted on Canvas and are due **September 17** at the beginning of lab. Please submit a single script file `Lab1Lastname.m` and the corresponding published file `Lab1Lastname.pdf` (for example, my submitted files would be `Lab1Zumbrum.m` and `Lab1Zumbrum.pdf`). Each solution should

- be contained in a separate cell which includes the problem number and short problem description,
- run independent of other cells,
- be adequately commented.

As part of your solution for each problem, output the number of iterations required, the approximation, and the error tolerance using the `fprintf` function; for a solution accurate to within 10^{-k}, include at least k digits in the approximation output.

1. Use the Bisection method to find a solution accurate to within $\epsilon = 10^{-8}$ for $x - 2^{-x} = 0$ on the interval $[0, 1]$. Set the maximum number of iterations to be 30, and use the stopping criteria
$$\frac{b_n - a_n}{2} < \epsilon.$$
2. Repeat Problem 1 using $\epsilon = 10^{-12}$.
3. Plot the graphs of $y = x$ and $y = 2\sin x$. Use the Bisection method to find an approximation to within $\epsilon = 10^{-8}$ to the first positive value of x with $x = 2\sin x$. Use the stopping criteria
$$\left|\frac{p_n - p_{n-1}}{p_n}\right| < \epsilon.$$
4. Find an approximation to $\sqrt[3]{25}$ correct to within $\epsilon = 10^{-10}$ using the Bisection method. **Hint:** Consider $f(x) = x^3 - 25$. Use the stopping criteria
$$\left|\frac{p_n - p_{n-1}}{p_n}\right| < \epsilon.$$