AMATH 301
Homework 0 – Warm Up: Autumn 2021


**DUE: This is a practice exercise. Try to get done by 10/6**

I Install matlab or python on your computer. (Or find a lab on campus that you can use which has one or the other).

II Consider the function

$$f(x) = x\sin(3x) - \exp(x)$$

and solve for the x-value near $x \approx -0.5$ that satisfies $f(x) = 0$. In the first part, use the Newton-Raphson method with the initial guess $x(1) = -1.6$ to converge (in absolute value) to the solution to $10^{-6}$. Keep track of the number of iterations until convergence is achieved (NOTE: please check convergence with $f(x_n)$ not $f(x_{n+1})$). In the second part, use bisection with the initial end points $x = -0.7$ and $x = -0.4$. Keep track of the mid point values and number of iterations until an accuracy of $10^{-6}$ is achieved.


III Let the following be defined:

$$\mathbf{A} = \begin{bmatrix} 1 & 2 \\ -1 & 1 \end{bmatrix}, \mathbf{B} = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}, \mathbf{C} = \begin{bmatrix} 2 & 0 & -3 \\ 0 & 0 & -1 \end{bmatrix}, \mathbf{D} = \begin{bmatrix} 1 & 2 \\ 2 & 3 \\ -1 & 0 \end{bmatrix} \mathbf{x} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \mathbf{y} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, \mathbf{z} = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix},$$

Calculate the following:

(a) $\mathbf{A}+\mathbf{B}$, (b) 3$\mathbf{x}$ - 4$\mathbf{y}$, (c) $\mathbf{Ax}$, (d) $\mathbf{B}(\mathbf{x}\text{-}\mathbf{y})$, (e) $\mathbf{D}$ $\mathbf{x}$, (f) $\mathbf{D}$ $\mathbf{y}$ + $\mathbf{z}$, (g) $\mathbf{AB}$, (h) $\mathbf{BC}$, (i) $\mathbf{CD}$