Homework #1

Problem 1

Write a MatLab function to explore trunctation eror in the series expansion of $\sin(x)$:

$$\sin(x) \approx \sum_{k=0}^{N} \frac{(-1)^k}{(2k+1)!} x^{2k+1} \cdots.$$

Have the function take x and N as input arguments, and return the approximation for $\sin(x)$.

Explore the error behavior for this approximation for a range of values for x and N. You might consider plotting the approximation as a function of x for various values of N. You might consider plotting the error, or an L_2-norm. Be creative!

Use MatLab's feature of creating an `html` file that includes your code and plots to turn in your homework. Make sure your plots have axis labels and titles and such so that I know what they are!

Problem 2

Use Heaviside calculus to derive the second approximation for a numerical derivative that we explored in class:

$$\frac{df(x)}{dx} = Af(x + h/2) + Bf(x - h/2) + \mathrm{Err}[f(x)].$$

Make sure to determine the leading order error term.