

# HOMework 1

## Basic Numpy Commands and Plotting Functions

MATH 210-010  $\diamond$  FALL 2024

September 5, 2024

DUE: FRIDAY, SEPTEMBER 6, 2024

**Instructions:** To complete a problem set, you must submit a zip file labeled `Yourlastname_HW#` to Dropbox no later than 11:59 PM on the due date above. For example, if I were to complete this assignment, my folder would be named `Emerick_HW1`. In this folder, a `py` file is to be submitted for each problem such that when the `py` file is executed, the output (as presented in Python) is the solution to the problem. Each `py` file must be saved as `Yourlastname_HW#_No#.py`. For example, if I were submitting the answer to Question Number 1 on Homework 1, the `py` file for that problem would be saved as `Emerick_HW1_No1.py`. Each `py` file should be well commented and be free of extraneous lines and commands. Also, each `py` file must output only what the problem asked to be outputted. Failure to abide by these simple homework submission guidelines may result in a deduction of points at my discretion.

Name:

Score:

For each problem below submit a separate `py` file with an initial comment that describes the objective of the `py` file. Always remember to begin your `py` file with `import numpy as np` and `import matplotlib.pyplot as plt`. Also, for any problems that require a plot, the title size, label size, etc should follow the default figure settings discussed in class and on the handout.

- 1.] Create an `py` file that defines the following variables:

a.)  $a = 10$

b.)  $b = 2.5 \times 10^{23}$

c.)  $c = \log_{10}(2)$

d.)  $d = \log_2(10)$

e.)  $e = |\sin^{-1}(-1/2)|$

f.)  $f =$  the largest prime factor of 208301123  
(Hint: import the `sympy` package and find a known function.) Your code should print the values of each variable in the command window.

- 2.] Create an `py` file that outputs the graph of

$$y = \frac{x}{30} - e^{-\frac{x}{6}} \cos(x)$$

over the interval  $x \in [-5, 20]$ . The graph should be black, solid, and have line width 3. The title should be **Homework 1, Plot 1**. Use `plt.xlim` and `plt.ylim` to create a “tight” window, i.e., the  $x$ -axis should span from  $-5$  to  $20$  and the  $y$ -axis should span from the minimum value of  $y$  to the maximum value of  $y$ . Your code should save this plot as a high resolution `eps` file. (Hint: consider the commands `np.min()` and `np.max()`.)

- 3.] Create an `py` file that outputs the plot of  $y = x^3 - 7x^2 + 10x$  over the interval  $x \in [-1, 6]$  in solid black with line width 3 with title **Homework 1, Plot 2**. Plot on this same graph the tangent lines to the curve at  $x = 1$ ,  $x = 3$ , and  $x = 5$  in red, green, and blue lines, respectively. Your code should save this plot as a high resolution `eps` file. (Hint: find the equation for these lines using pencil and paper, and define three new arrays for these lines to be plotted.)