Homework 9

Ch En 263 – Numerical Tools
Due date: 14 May 2020

Instructions

- There are four python files posted on the course website inside "HW09Data.zip". Each is named "HW09_ProblemXX.py" where "XX" is the problem number. Your homework is to debug these codes.
- For each problem, you will also need to document your debugging process in an Excel sheet. For each bug (a problem can have multiple bugs), record your (1) observation, (2) hypothesis and (3) experiment loop in a text box in your worksheet. Record each step in the loop. After you find and fix the bug, identify whether it was a syntax error, an execution error or a logical error.
- In the end, you should submit 5 files:
  - A fully debugged problem 1 named "LastName_FirstName_HW9_Problem01.py"
  - A fully debugged problem 2 named "LastName_FirstName_HW9_Problem02.py"
  - A fully debugged problem 3 named "LastName_FirstName_HW9_Problem03.py"
  - A fully debugged problem 4 named "LastName_FirstName_HW9_Problem04.py"
  - A workbook named "LastName_FirstName_HW9.xlsx" with tabs "Problem_1", "Problem_2", etc. with your written answers (and the survey tab below).
- **Please report how long it took you to complete the assignment (in hours) in the "Notes" section on Learning Suite.**

Problems

1. Define a function called `degF_to_degC` that takes an argument in degrees Farenheit and returns one in degrees Celcius. Test it by printing: `degF_to_degC(32)` to the screen.
2. Write a function in a Python program that can evaluate the following formula,

$$y(t) = 5\left[1 - \exp\left(-\frac{(t-\theta)}{\tau}\right)\right] S(t)$$

$$S(t) = \begin{cases} 0 & \text{when } t < \theta \\ 1 & \text{when } t \geq \theta \end{cases}$$

   where t is an argument to the function, but θ and τ are variables defined inside the function. Plot y versus t for $t \in [0, 15]$ when $\theta = 5$ and $\tau = 1.8$.
3. In a Python file, write a function called `dot` that takes two 1D numpy arrays as arguments and returns dot product. Your function should use a loop and should work for arrays of any length. Demonstrate that your function works, by printing the dot product of $[4, -2, -8, 1]$ and $[-3, 8, -1, -4]$.
4. Write a Python code that reads the file `XOM.csv` (which contains the stock price of Exxon Mobile for the last several months) and plots the "High" price and the "Close" price versus "Day". Format your plot with the high price as a blue curve, the closing price as a red curve, axes labels and a legend.