Homework 5

Ch En 263 – Numerical Tools

Due date: 7 May 2020

Instructions

- For the problems in Excel, submit a workbook named "LastName_FirstName_HW5.xlsx" where each worksheet tab is named "Problem_1", "Problem_2", etc.
- For the problems in Python, submit a separate file for each problem named "LastName_FirstName_HW5_ProblemXX.py" where XX is the problem number.
- For your convenience, optional Excel and Python template files are available on the course website.
- If needed, a supplementary handwritten or typed document can be submitted via pdf on Learning Suite with the name "LastName_FirstName_HW5.pdf".
- **Please report how long it took you to complete the assignment (in hours) in the "Notes" section on Learning Suite.**

Problems

1. Do the following in an Excel Workbook. The data in the table below shows the opening stock price for Google from several days in August and September in 2016. Use conditional functions to calculate (a) the number of days where the price was greater than $770 and (b) the average price on those days.

Date	Price ($)	Date	Price ($)
19-Sep-16	772.42	31-Aug-16	767.01
16-Sep-16	769.75	30-Aug-16	769.33
15-Sep-16	762.89	29-Aug-16	768.74
14-Sep-16	759.61	26-Aug-16	769.00
13-Sep-16	764.48	25-Aug-16	767.00
12-Sep-16	755.13	24-Aug-16	770.58
9-Sep-16	770.10	23-Aug-16	775.48
8-Sep-16	778.59	22-Aug-16	773.27
7-Sep-16	780.00	19-Aug-16	775.00
6-Sep-16	773.45		
2-Sep-16	773.01		
1-Sep-16	769.25		

   Hint: We used this data on the last HW, so you can just copy and paste the table.

2. Do the following in a Python file.
   (a) Define `x = 4`. Write an `if` statement that will print the value of `x` if it is less than 7.
   (b) Using `x = 4`, write an `if` statement that will add 4 to the value of `x` if it is less than 2 and subtract 2 if the value is greater than or equal to 4. Then print `x` to the console.

(c) Let `a` be your age (in years). If `a` is less than 20, the print `'you are younger than 20'`. If `a` is between 20 and 25 (inclusive), print `'you are between 20 and 25'`. If `a` is greater than 25, print `'you are older than 25'`.

(d) Define a piecewise function $f(t) = \sin(2\pi t)$ when $-1 \leq t < 1$ and 0 for all other t. Evaluate the function at $f(-1.5)$, $f(-0.99)$, $f(0.2)$ and $f(1.1)$ and print each value to the console.

3. Write a function in a Python program called `uc` ("uc" for unit "conversion") that takes a string as an argument and returns a factor for a unit conversion. The value the string should determine the unit conversion factor. For example, If I have a variable `x` in units of meters, and I want to convert it to feet and store that value in variable `y`, I would call it using:

```
y = x*uc('m_to_ft').
```

Set up the function to allow conversion from: `m_to_ft`, `hr_to_s`, `kg_to_slug`, `K_to_degR` and the inverse for each. Use your function to convert: (a) 8.3 m to ft, (b) 9700 s to hr, (c) 3.4 slug to kg, and (d) 270 K to °R. Print each value to the console.

4. 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 global variables defined before the function. Evaluate $y(11.0)$, $y(11.4)$, $y(11.8)$, $y(12.2)$, $y(12.6)$, $y(13.0)$ when $\theta = 12$ and $\tau = 1.8$ and print the values to the console. Use the `numpy` module to import the necessary math functions.