Lab 8

Ch En 263 – Numerical Tools

Due: 6 Feb. 2024

Instructions

- Complete the exercise(s) below, and submit the following files to Learning Suite:
 - Handwritten portion: scan each page (or take a picture) and combine them into a single pdf named: LastName_FirstName_Lab8.pdf
 - Excel portion: submit a workbook named LastName_FirstName_Lab8.xlsx where each worksheet tab is named "Problem_1", "Problem_2", etc.
 - Python portion: submit a separate file for each problem named LastName_FirstName_ Lab8_ProblemXX.py where XX is the problem number.
- Warning: the LS assignment will close promptly at 11:59 pm and late assignments will only receive 50% credit.

Lab Exercises

- 1. Do the following using both an Excel sheet and a Python file.
 - (a) In an Excel sheet, make a column called n that ranges from 0 to 100, another column where t that ranges from 0 to 10 with increments of $\Delta t = 0.1$ and a third column called A which obeys the formula

$$A_{n+1} = A_n + \Delta t \left[\frac{A_{in} - A_n}{\tau} - kA_n^2 \right]$$

where $A_{in} = 1$, $\tau = 2$, k = 0.1, $\Delta t = 0.1$ and $A_0 = A(t = 0) = 0$. Hint: Set $A_0 = 0$ in the first cell. Plug in n = 0 into the equation above to find a formula for the next cell, A_1 that references the cell above (A_0) . Then copy and paste down the column.

- (b) Plot A versus t in Excel. Clean up the plot. Format it with labels for the x- and y- axes and increase the font size of the labels and tick marks to at least size 14.
- (c) Export the t and A as columns to a text file called EEsoln.csv. (Remember to turn this file in too.)
- (d) Import the data into a Python file and plot A versus t. Format the plot with labels for the x- and y-axis and make the font size 16. Show the plot, but do not save it to disk.