Lab 18

Ch En 263 – Numerical Tools

Due: 18 Nov. 2025

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_Lab18.pdf`

  - Excel portion: submit a workbook named `LastName_FirstName_Lab18.xlsx` where each worksheet tab is named "Problem_1", "Problem_2", etc.

  - Python portion: submit a separate file for each problem named `LastName_FirstName_Lab18_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. In this problem, we are going to explore how well an interpolation approximates a function. Use the data in the table to the right to answer the questions in this problem.

   (a) Use Excel to calculate the linear interpolate y_{linear} at $x = 0.54$.

   (b) Use Python to generate a cubic spline interpolation y_{cubic} at $x = 0.54$. Print the value of y_{cubic} to the console.

   (c) The data in the table to the right comes from the function $y = \exp(4x)$. The relative error of an interpolation is given by $\epsilon = |(y_{\text{interpolate}} - y_{\text{exact}})/y_{\text{exact}}|$. Find the relative error between your interpolates and the exact value (from the function). How accurate is the linear interpolation compared to the cubic spline?

x	y
0	1.0
0.2	2.2255409
0.4	4.9530324
0.6	11.0231764
0.8	24.5325302
1.0	54.5981500