Lab #1

Instructor: Dr. Ha Viet Uyen Synh.

Duration: 3 hours

Theoretical Models for Computing

Report Submission:

Submit a single .docx or .pdf file containing:

1. **Source Code:**
o Code from Part 1 (computing e^x).
o Code from Part 2 (computing and plotting sin(x)).
o Code from Part 3 (error analysis and computing cos(x)).

2. **Results Obtained:**
o Approximation and actual values of e^x, sin(x), and cos(x) at x=1.
o Three plots: sin_taylor.png, sin_error.png, cos_taylor.png.
o Error analysis for sin(x) (location of largest error and explanation).
o A short paragraph comparing the convergence of sin(x) and cos(x).

Lab Procedure

Part 1:
• Compute the first 4 terms of the Taylor Series for e^x around x=0.
• Run the code and record the output (approximation and actual value) in your report.

Part 2:
• Write a function to compute the Taylor Series approximation of sin(x).
• Run the code and copy the results into your report.
• Plot the actual sin(x) against its Taylor approximations with 1, 3, and 5 terms.
• Save the plot as sin_taylor.png and include it in your report.

Part 3:
• Compute and plot the absolute error of the Taylor approximation for sin(x) with 5 terms.
• Save the plot as sin_error.png and include it in your report.
• Where is the error largest? Why?
• Implement the Taylor Series for cos(x) with 4 terms around x=0.
• Run the code, record the results in your report, and save the plot as cos_taylor.png for inclusion.
• Write a short paragraph (5-7 sentences) in your report: Compare the convergence of the Taylor Series for sin(x) and cos(x).