SDSU
COMP521 Fall 2023

Homework 03 - Due Date: Friday 09/29/2022

September 18, 2023

Problem

Calculate finite difference approximation of $u''(x)$ for the function $u(x) = x^2 - cos(10x)$ on the interval $x \in [0.4, 1]$. You have to implement the following finite difference approximation:

$$\frac{-u_{i+2} + 16u_{i+1} - 30u_i + 16u_{i-1} - u_{i-2}}{12\Delta x^2}$$

You have to determine the order of accuracy of this approximation. Follow the instructions below.

Instructions

1. You have to work on your solution using the following MATLAB files:
   - **main.m**
   - **Fx.m**
   - **secderivativeactual.m**
   - **secderivativeapprox.m**

   The MATLAB files have comments that will guide you. Read them carefully.
2. Show the *loglog* plots with the error metrics versus the grid sizes.
3. Fit the *loglog* plots to a straight line. Use the fit to determine the order of accuracy. Explain.
4. Discuss the differences from using different metrics. Do they lead to the same conclusion about the order of accuracy?

Deliverable: Submit a .PDF file with your report. Submit all the code files with your modifications.