TAM 470 / CSE 450

Homework 2

Problem 1 (10 points)

Consider the one-sided difference approximation for the **second** derivative f_j'' at a grid point x_j on a uniformly spaced grid with spacing h:

$$f_j'' = \frac{f_j - 2f_{j-1} + f_{j-2}}{h^2} + \tau$$

Determine the expression for the leading error term τ for this scheme, and state the order of the scheme.

Problem 2 (10 points)

Find the most accurate formula for the first derivative at x_i utilizing known values of f at x_{i-1}, x_i, x_{i+1}, and x_{i+2}. The points are uniformly spaced with spacing h. Find the expression for the leading error term and state the order of the method.

You can use a symbolic solver (e.g. `sympy` in Python) if you wish. If you do, include screenshots of the code/tool used to produce the solution.

Problem 3 (10 points): <u>4 credit-hour students only</u>

Solve Moin textbook Exercise 4 from Chapter 2. Complete both parts (a) and (b) (5 pts each).

You can use a symbolic solver (e.g. `sympy` in Python) if you wish. If you do, include screenshots of the code/tool used to produce the solution.