

Math 355/655: Introduction to Numerical Methods

Homework #7

Due: October 26, 2012 (not collected)

Read Section 4.1.

1. Let $f(x) = \sin(x)$. Use the two-point forward-difference formula to approximate $f'(\pi/3) = 0.5$ using $h = 0.1, 0.01, 0.001, 0.0001$. Repeat this using the two-point backward-difference formula and the three-point midpoint formula. Record your values into a table with three columns: h , the approximation, the absolute value of the error of this approximation. Use a calculator or MATLAB to help you compute the approximations and report results with at least 6 digits of precision. Comment on the results.
2. Chapter 4.1 #9
3. Derive the 5-point endpoint formula given in equation (4.7) on p. 178.
4. Use Taylor series to derive the error term for the approximation

$$f'(x) = \frac{1}{2h}[-3f(x) + 4f(x+h) - f(x+2h)].$$

5. Chapter 4.1 #21