

MATH 170C ASSIGNMENT 5

(1) (§8.5, 1) Discuss these multistep methods in light of Theorem 1 (p. 558), on multistep method stability and consistency:

(a) $x_n - x_{n-2} = 2hf_{n-1}$

(b) $x_n - x_{n-2} = h \left[\frac{7}{3}f_{n-1} - \frac{2}{3}f_{n-2} + \frac{1}{3}f_{n-3} \right]$

(c) $x_n - x_{n-1} = h \left[\frac{3}{8}f_n + \frac{19}{24}f_{n-1} - \frac{5}{24}f_{n-2} + \frac{1}{24}f_{n-3} \right]$

(2) (§8.5, 3) Show that every multistep method in which $p(z) = z^k - z^{k-1}$ (such as the Adams methods) and $\sum_{i=0}^k b_i = 1$ is stable, consistent, and convergent.

(3) (§8.6, 3) Write the third-order ordinary differential equation

$$\begin{cases} x''' + 2x'' - x' - 2x = e^t \\ x(8) = 3, \quad x'(8) = 2, \quad x''(8) = 1 \end{cases}$$

as an autonomous (time-independent) system of first-order equations.