AMSC/CMSC 660 Quiz 8 , Fall 2008

Show all work. You may leave arithmetic expressions in any form that a calculator could evaluate. By putting your name on this paper, you agree to abide by the university's code of academic integrity in completing the quiz. Use no books, calculators, cellphones, other electronic devices, communication with others, scratchpaper, etc.

Name _____

1. Suppose we have used a PECE algorithm with the formulas:

$$y_{n+1} = y_n + \tfrac{h}{12}(23f_n - 16f_{n-1} + 5f_{n-2}) \qquad error : \frac{3h^4}{8}y^{(4)}(\xi)$$

$$y_{n+1} = y_n + \tfrac{h}{12}(5f_{n+1} + 8f_n - f_{n-1}) \qquad error : -\frac{h^4}{24}y^{(4)}(\eta)$$

Assuming that $f_{n-2}$, $f_{n-1}$, and $f_n$ are correct, give a computable estimate of the local error in using the corrector as an approximation to the true solution.

2. Write MATLAB code to estimate $\boldsymbol{y}(1)$ using Euler's method with stepsize $h = 0.1$, given

$$\begin{aligned} \boldsymbol{y}'(t) &= \begin{bmatrix} 2ty_{(1)}(t) + y_{(2)}^2(t) \\ y_{(1)}(t)\cos(y_{(2)}(t)) \end{bmatrix}, \\ \boldsymbol{y}(0) &= \begin{bmatrix} 1 \\ 2 \end{bmatrix}. \end{aligned}$$

Notation:

$$\boldsymbol{y}(t) = \begin{bmatrix} y_{(1)}(t) \\ y_{(2)}(t) \end{bmatrix}.$$