MATH 435 **Homework #6**

Spring 2009 **Prof. Biswa Nath Datta**

1. (a) Determine an upper bound on the error for Euler's Method to solve the IVP:

$$y' = -6xy, \quad y(0) = 7$$

from $x = 0$ to $x = 1$, with $h = 0.25$.

(b) Solve the above equation at $x = 1$ using Euler's Method.

(c) Compare the bound obtained in (a) with the actual error obtained from (b). (Exact solution is $y(x) = 7e^{-3x^2}$).

2. Derive the following predictor-corrector formula:

$$y_1^{(0)} = y_0 + hf(t_0, y_0)$$

$$y_{i+1}^{(k)} = y_i + \frac{h}{2}[f(t_i, y_i) + f(t_{i+1}, y_{i+1}^{(k-1)}], \quad k = 1, 2, \cdots$$

Apply this formula to obtain an approximation of $y(0.2)$ of the IVP: $y' = t - \frac{1}{y}, \quad y(0) = 1, \quad h = 0.1$ with four digits accuracy.

3. Given

$$y' = -y^2$$

$$y(1) = 1$$

$$\text{and } h = 0.1$$

Apply Four-Step Adams-Bashforth formula to compute $y(1.4)$, $y(1.5)$ and $y(1.6)$. Tabulate the results with approximate and exact values and errors.
(**Exact solution**: $y(t) = \frac{1}{t}$)