AMSC/CMSC 460 Dr. Wolfe ASSIGNMENT #6 Due July 24, 2009

1. Write a function m-file **myrk.m** along the lines of the m-file **myeuler.m** which I have posted. It should implement the classical fourth order Runge-Kutta method with y and f vectors. Try your code with various step sizes on the example

$$y'' + 2y' + y = 3e^t, \quad y(0) = 1, \quad y'(0) = 2, \quad 0 \le t \le 2$$

whose exact solution is $y(t) = .25e^{-t} + 1.5te^{-t} + .75e^t$.

2. We again consider the nonlinear two-point boundary value problem

$$y'' = e^y - 1, \quad y(0) = 0, \quad y(1) = 3$$

We are going to find the missing initial value $y'(0)$ by using the *shooting method.* We denote the solution of

$$y'' = e^y - 1, \quad y(0) = 0, \quad y'(0) = s$$

by $y(t; s)$. The problem is to find s so that $y(1; s) = 3$. For each value of s, we can use **ode45** to find $y(1, s)$. We then use **fzero** to find the root of $G(s) = y(1; s) - 3 = 0$. (You should compare your answer with the answer to Assignment#5, problem 6.) Once you have found $y'(0)$, use **ode45** to plot the solution.

3. Ex. 7.6 p.221 *Numerical Computing with MATLAB.*

4. Ex. 7.16 p.223 *Numerical Computing with MATLAB.*

5. Ex. 7.17 p.225 *Numerical Computing with MATLAB.* In part (b), take $K_2 = 20$ instead of the value given.