MA/CSC 427-001: Linear Programming
Homework 5
Instructor: *Dr. Kartik Sivaramakrishnan*

INSTRUCTIONS

Due in class on Wednesday November 28, 2007. No late homeworks will be accepted without prior instructor approval. All problems are the 8th edition of Burden and Faires unless otherwise specified.

1. Consider the initial value problem

$$\frac{dy}{dt} = -1.2y + 7e^{-0.3t}, \;\; 0 \leq t \leq 2.5, \;\; y(0) = 3.$$

with $N = 5$. Solve this initial value problem by hand using

   (a) Euler's method (see equation 5.8 on page 257).

   (b) Modified Euler's method (see page 277).

   Compare your results with the exact analytical solution $y(t) = \frac{70}{9}e^{-0.3t} - \frac{43}{9}e^{-1.2t}$ to the initial value problem.

2. Develop your MATLAB implementation for the fourth order Runge Kutta method (Algorithm 5.2 on page 278) for solving initial value problems. Please follow these instructions:

   (a) The calling sequence for the program will be

$$[t, w] \;\; = \;\; \text{runge\_kutta}(\text{myfunc}, a, b, N, \alpha)$$

   where the input parameters are: (a) myfunc is the file containing the function $f(t, y)$; (b) a and b are the end points of the time interval; (c) N is the number of intervals chosen between a and b; and (d) α is the initial condition. The output variables are the vectors t and w of length $(N + 1)$.

   (b) Test your algorithm on problem 1. You should include your MATLAB program with the assignment and also enclose a plot containing both your solution w and the exact solution y versus time t.