

Homework 8. (Due November 26, 2008)
Math 353 Section 12, Fall 2008, University of Delaware

MatLab Exercises

1. Use appropriate MatLab ODE solver to solve

$$y' = y + 8y^2 - 9y^3, \quad y(0) = 0.5, \quad 0 \leq t \leq 3.$$

Plot approximate solution.

2. Using the MatLab command ode45 solve the Lorenz equation

$$\begin{aligned} y_1' &= 10(y_2 - y_1) & y_1(0) &= 5 \\ y_2' &= 28y_1 - y_2 - y_1y_3 & y_2(0) &= 5 \\ y_3' &= y_1y_2 - \frac{8}{3}y_3 & y_3(0) &= 5, \quad 0 \leq t \leq 20. \end{aligned}$$

Plot the solutions and produce Figure 6.17 (text book).

3. Using a MatLab ODE solver solve

$$y'' - 2ty' + 2y = 0, \quad y(0) = y'(0) = 1, \quad 0 \leq t \leq 2.$$

Plot approximate solution.

Exercises

1. Given the initial value problem

$$y' = 1 + y/t, \quad y(1) = 2, \quad 1 \leq t \leq 2$$

with exact solution $y(t) = t \ln t + 2t$:

- (a) Use Euler method with $h = 0.25$ to approximate the solution, and compare it with the exact solution value of $y(t)$.
 - (b) Find a global error bound for Euler method.
 - (c) Use Explicit Trapezoid method with $h = 0.25$ to approximate the solution, and compare it with the exact solution value of $y(t)$.
2. Exercise 6.2.1 ((a) and (e)).
 3. Exercise 6.2.4 ((a) and (e)).
 4. Exercise 6.4.1 ((b) and (c)).
 5. Exercise 6.4.3 ((b) and (c)).