Elementary Differential Equations-Math 240
Exam 3 – Summer 2005
July 15, 2005

Name:

Instructor:

Please show all work. Answers with no work will receive non credit. No calculatrs or notes are allowed on this exam

1. (15 pts) Solve the following system of differential equations:

$$\frac{dy}{dt} = 4x - 3y \quad x(0) = 2$$

$$\frac{dx}{dt} = x - y \quad y(0) = 1$$

2. (5 pts) Convert the following differential equation into a system of first-order linear equations:

$$x'' + 2x' - 7x = 0$$

3. (10 pts) Using the Improved Euler Method with a stepsize of $h = 0.1$ to approximate the vaule of $y(0.1)$ for the solution to the differential equation

$$\frac{dy}{dx} = 3x - 2y \quad y(0) = 1$$

4. (15 pts) Using Laplace Transforms to solve the following Initial Value Problem

$$x'' - 12x' + 36x = 0 \quad x(0) = 3 \quad x'(0) = 18$$

5. (15 pts) Using Laplace Transforms to solve the following differential equation

$$x'' - 4x' + 5x = 5cos2t \quad x(0) = 2 \quad x'(0) = 1$$

6. (15 pts) Using Laplace Transforms to solve the following Initial Value Problem:

$$x'' + 5x' + 6x = \delta(t) + u(t-1) \quad x(0) = 0 \quad x'(0) = 0$$

7. (10 pts) A mass of $2kg$ is attached to an undamped spring. The spring has spring constant of $3kg/sec^2$ and is at rest. At time $t = 1$, the spring is hit with a hammer, imparting a unit impulse force. Find the equation of the resulting motion and solve it.

8. (15 pts) Using Laplace Transforms to solve the following Initial Value Problem:

$$x'' - 8x' + 12x = e^t tant \quad x(0) = 3; x'(0) = 5$$