EGR 265, Math Tools for Engineering Problem Solving
March 5, 2012, 50 minutes

Name: .....

TEST II

Problem 1	
Problem 2	
Problem 3	
Problem 4	
Problem 5	
Problem 6	
Total	

Problem 1 (20 points)

Solve the initial value problem

$$y'' + 4y' + 4y = 0, \quad y(0) = -3, \quad y'(0) = 1.$$

Problem 2 (20 points)

Find the general solution of

$$y'' - 2y' + 5y = 5x.$$

Problem 3 (20 points)

Find the general solution of

$$y'' + y' - 2y = 2e^x.$$

Problem 4 (20 points)

An 8 pound weight stretches an undamped spring by 6 inches.
(a) Working in English units, find the value of the spring constant k in lb/ft and the mass m of the weight in slugs.
(b) Find the equation of motion if the mass is released from the equilibrium position at an upwards velocity of 2 ft/sec. Assume here that the positive x-direction is oriented downwards.

Problem 5 (10 points)

Suppose that a damping force is added to the spring-mass system in Problem 4 which is proportional to the instantaneous velocity with damping coefficient $\beta = 4$ pd-sec/ft. Does the resulting system become underdamped, critically damped, or overdamped? Justify your answer.

Problem 6 (10 points)

Find the general solution of the 3rd order linear DE

$$y''' - y'' - 2y' = 0.$$