Math 240 Summer 2014
Exam 2

Jul. 11, 2014

Student Name: _____

Instructor: _____

Class time: _____

	Score
1	
2	
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6	
Total	

Problem 1. (18 points) Write down the general solution of each of the following differential equations:

a $y'' - 13y' + 40y = 0$.

b $y'' + 5y' + 10y = 0$.

c $y'' + 10y' + 25y = 0$

Problem 2. (12 points) The amplitude of an underdamped spring-mass system is $Ae^{-\frac{ct}{2m}}$, which decays exponentially. Suppose an underdamped system has mass $250g$ and the amplitude has a half-life of 5 seconds. What is the damping constant of the system? (**You must have the unit**)

Problem 3. (20 points) Find the general solution of the following differential equation:

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

Problem 4. (16 points) Find the general solution of the following differential equation:

$$y'' - 3y' + 2y = 2e^{-x}$$

Problem 5. (16 points) Use Laplace transform to solve the initial value problem:

$$x''(t) + x(t) = e^{t^2}, \quad x(0) = x'(0) = 0.$$

You may leave your answer expressed as definite integral.

Problem 6. (18 points) If we have the general solution of the homogeneous equation

$$x^2 y'' - 2xy' + 2y = 0$$

is

$$y_h = Ax + Bx^2,$$

where A and B are constant numbers. Use variation of parameters to get the general solution of the inhomogeneous equation:

$$x^2 y'' - 2xy' + 2y = x^2$$