

Name:

Section:

**21D EXAM PROBLEMS**

The last time I taught this class we did not cover Chapter 7. These are the problems related to Chapter 3 that I used on the midterms and final that year. Problems 1 and 3 should be considered to be extra credit level problems. To study for Chapter 7 I recommend doing some homework problems from each of the sections we've covered.

1. Find the general solution to the second order differential equation  $y'' - \frac{3}{t}y' + \frac{4}{t^2}y = 0$ .

Hint: Start by computing  $(D - \frac{1}{t})(D - \frac{2}{t})[y]$ .

2.a. Solve the initial value problem  $y'' + y = \cos(bt)$ ,  $y(0) = 1$ ,  $y'(0) = 0$ , for  $b \neq 1$ .

b. Solve the same initial value problem for  $b = 1$ .

c. Plot the solutions to this initial value problem for  $b = 0$  and  $b = 1$ .

3. Consider the homogeneous second order differential equation

$$(x^2 - 1)y'' - 2xy' + 2y = 0.$$

a. Check that  $y_1(x) = x$  is a solution to this equation.

b. Find the general solution to this equation.

c. Solve the inhomogenous equation  $(x^2 - 1)y'' - 2xy' + 2y = (x^2 - 1)^2$ .