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