MATH 250 ODE Practice Exam II

1. (30 points) Given the second order linear nonhomogeneous DE

$$y'' + 9y = \cos(3t) + 2te^{2t},$$

(a) Find the solution to the homogeneous equation $y'' + 9y = 0$.

(b) Find a particular solution to the nonhomogeneous DE using the method of undetermined coefficients.

(c) Find the general solution to the nonhomogeneous DE.

(d) Give the form of a particular solution to

$$y'' + 9y = e^{2t}\sin(3t) - 4 + (t^2 + 1)\cos(2t).$$

DO NOT attempt to solve it.

2. (25 points) Find the general solution of the equation

$$y'' + 4y' + 4y = \frac{e^{-2t}}{1 - t^2}, \quad -1 < t < 1.$$

3. (a) (10 points) Find the general solution of $y^{(4)} + y' = 0$.

(b) (10 points) Find the general solution of $y^{(4)} - 4y'' + 4y = 0$.

4. (a) (10 points) Find the Laplace transform of $t - \cos(3t) + 5e^{2t}$.

(b) (15 points) Let y be the solution of the initial value problem

$$y'' + 2y' + 3y = t - \cos(3t) + 5e^{2t}, \qquad y(0) = 1, \quad y'(0) = -2.$$

Find the Laplace transform of y without finding y.