

## Math 250b (Spring '08) - Homework 12

1. Consider

$$t^2x'' - 2tx' + 2x = t^2\ln(t)$$

(a) Find two solutions of the homogeneous equation. Hint: try a solution of the form  $x^p$ .

(b) Use your two solutions from (a) and variation of parameters to find a particular solution of the inhomogeneous equation.

2. Consider the homogeneous second order equation

$$a_2(t)x'' + a_1(t)x' + a_0(t)x = 0$$

Let  $a, b, c, d$  be real numbers. Let  $x_1(t)$  be the solution with

$$x_1(0) = a, \quad x_1'(0) = b \tag{1}$$

Let  $x_2(t)$  be the solution with

$$x_2(0) = c, \quad x_2'(0) = d \tag{2}$$

Show that  $x_1$  and  $x_2$  are linearly independent if and only if the determinant of the following matrix is not zero:

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}$$