Physics 3513, Homework #8 (due 11/5)

The numbers in parentheses after the problem number indicate points for each problem.

P1(10) (Boas 2.5) Solve by separating variables: $xy' - xy = y$, $y(1) = 1$

P2(10) (Boas 3.8) Solve $(x \ln x)y' + y = \ln x$

P3(10) Solve $xy' + y \ln x = y(1 + \ln y)$ (hint: this equation is homogeneous).

P4(10) Solve $y' = \cos(y - x)$ (hint: try $u = y - x$).

P5(10) (Boas 5.12) Solve $2y'' + y' - y = 0$

P6(10) (Boas 6.6) Solve $y'' + 6y' + 9y = 12e^{-x}$

P7(10) (Boas 7.3) Solve $2yy'' = y^2$

P8(10) (Boas 9.8) Solve by using Laplace transform: $y'' + 16y = 8 \cos 4t$, $y(0) = y'(0) = 0$

P9(10) (Boas 11.10) Solve $y'' - 9y = \delta(t - t_0)$

P10(10) Let $y_1(x), y_2(x)$ be two solutions of $y'' + p(x)y' + q(x)y = 0$. Show that their Wronskian

$$W = \begin{vmatrix} y_1 & y_2 \\ y'_1 & y'_2 \end{vmatrix} = Ce^{-\int p \, dx},$$

where $C$ is a constant. Hint: show that $W' = -pW$. 
