Mathematics 3113-005 Name (please print) ______________________

Quiz 3 Form B

February 25, 2011

Instructions: Give concise answers, but clearly indicate your reasoning.

I. Two linearly independent solutions of the DE $y'' - 3y' + 2y = 0$ are e^x and e^{2x} (do not check these).
(6)

(a) Write a general solution of $y'' - 3y' + 2y = 0$.

(b) Find the solution that satisfies $y(1) = 1$, $y'(1) = 0$.

II. This problem concerns the DE $y'' + 2y' + 2 = -2x$.
(3)

(a) Write the associated homogeneous equation of $y'' + 2y' + 2 = -2x$.

(b) A solution of $y'' + 2y' + 2 = -2x$ is $1 - x$ (do not check this). Given that $e^{-x}\cos(x)$ and $e^{-x}\sin(x)$ are linearly independent solutions of the associated homogeneous equation, write a general solution of $y'' + 2y' + 2 = -2x$.

III. For the DE $9y'' + 9y' + y = 0$, the characteristic equation is $9r^2 + 9r + 1 = (3r + 1)^2$. Since it has repeated
(4) roots $-1/3$ and $-1/3$, two solutions of the DE are $e^{-x/3}$ and $xe^{-x/3}$ (do not check that they are solutions). Compute the Wronskian of $e^{-x/3}$ and $xe^{-x/3}$.

IV. This problem concerns the DE $y'' + y + x = 0$. The function $\sin(x) - x$ is a solution, but $2(\sin(x) - x)$ is
(2) not. Why does this not violate the Principle of Superposition?