PRINT Your Name:____________________________________

Quiz 7, Fall, 2012 – October 23

The quiz is worth 5 points. **Remove EVERYTHING from your desk except this quiz and a pen or pencil.** SHOW your work. Express your work in a neat and coherent manner. $\boxed{\text{BOX}}$ your answer.

1. Find the solution of the Initial Value Problem $y'' + y = 3x$, $y(0) = 2$, $y'(0) = -2$. Of course you know that the general solution of $y'' + y = 0$ is $y = c_1 \cos x + c_2 \sin x$. Also, it is easy to see that $y_{\text{particular}} = 3x$ is a particular solution of the given DE.

Answer. We are told that the general solution of the DE $y'' + y = 3x$ is $y = c_1 \cos x + c_2 \sin x + 3x$. We must find c_1 and c_2 so that the Initial Conditions $y(0) = 2$ and $y'(0) = -2$ are also satisfied. We compute $y' = -c_1 \sin x + c_2 \cos x + 3$. Plug $x = 0$ into y and y' to obtain:

$$2 = y(0) = c_1 \quad \text{and} \quad -2 = y'(0) = c_2 + 3.$$

We conclude that $c_1 = 2$ and $c_2 = -5$. Thus the answer is

$$\boxed{y = 2\cos x - 5\sin x + 3x.}$$

Check. We take derivatives of $y = 2\cos x - 5\sin x + 3x$ to obtain $y' = -2\sin x - 5\cos x + 3$ and $y'' = -2\sin x + 5\cos x$. It is clear that $y'' + y = 3x$. We plug 0 in for x to see that $y(0) = 2$ and $y'(0) = -5 + 3 = -2$. ✓