PRINT Your Name:_____

Quiz for March 18, 2010

The quiz is worth 5 points. **Remove EVERYTHING from your desk except this quiz and a pen or pencil. SHOW every step**. Express your work in a neat and coherent manner. BOX your answer.

Find a particular solution of $y'' - y' - 6y = 2\sin 3x$.

ANSWER: We look for a solution of the form $y = A\sin 3x + B\cos 3x$. We compute

$$y' = 3A\cos 3x - 3B\sin 3x$$
$$y'' = -9A\sin 3x - 9B\cos 3x.$$

Plug our candidate into the DE to get

$$\left.\begin{array}{l} -9A\sin 3x - 9B\cos 3x - (-3B\sin 3x + 3A\cos 3x) \\ -6(A\sin 3x + B\cos 3x) \end{array}\right\} = 2\sin 3x.$$

We want

$$(-9A + 3B - 6A)\sin 3x + (-9B - 3A - 6B)\cos 3x = 2\sin 3x.$$

We want

$$-15A + 3B = 2$$
$$-3A - 15B = 0.$$

We want

$$-5A + B = 2/3$$
$$-A - 5B = 0.$$

We want

$$\begin{bmatrix} -5 & 1 \\ -1 & -5 \end{bmatrix}\begin{bmatrix} A \\ B \end{bmatrix} = [\,2/3//0\,].$$

Multiply both sides of the equation on the left by $\begin{bmatrix} -5 & -1 \\ 1 & -5 \end{bmatrix}$. We want

$$\begin{bmatrix} -5 & -1 \\ 1 & -5 \end{bmatrix}\begin{bmatrix} -5 & 1 \\ -1 & -5 \end{bmatrix}\begin{bmatrix} A \\ B \end{bmatrix} = \begin{bmatrix} -5 & -1 \\ 1 & -5 \end{bmatrix}\begin{bmatrix} 2/3 \\ 0 \end{bmatrix}.$$

We want

$$\begin{bmatrix} 26 & 0 \\ 0 & 26 \end{bmatrix}\begin{bmatrix} A \\ B \end{bmatrix} = \begin{bmatrix} -10/3 \\ 2/3 \end{bmatrix}.$$

Take $A = \frac{-10}{3}\frac{1}{26} = \frac{-5}{39}$ and $B = \frac{2}{3}\frac{1}{26} = \frac{1}{39}$. Our answer is

$$\boxed{y = \tfrac{-5}{39}\sin 3x + \tfrac{1}{39}\cos 3x}.$$