Name:________________________

640:244–02 SPRING 2007 | Quiz 7 | March 21,2007

1. Solve the IVP: $x^2y'' - 6y = 0$; $y(1) = 3$, $y'(1) = 0$.

Look for solutions of the form $y = x^r \left(\rightarrow y' = rx^{r-1},\ y'' = r(r-1)x^{r-2}\right)$

$$\Rightarrow r(r-1) - 6 = 0$$
$$r^2 - r - 6 = 0 \Rightarrow (r-3)(r+2) = 0 \qquad 2$$

So $y = c_1x^3 + c_2x^{-2}$ $\left(y' = 3c_1x^2 - 2c_2x^{-3}\right)$ $\quad 2$

Find c_1, c_2:

$$\begin{cases} c_1 + c_2 = 3 \\ 3c_1 - 2c_2 = 0 \end{cases}$$

$$\Rightarrow c_1 = \frac{6}{5} \quad c_2 = \frac{9}{5} \qquad 1$$

Thus, $y = \frac{6}{5}x^3 + \frac{9}{5}x^{-2}$

2. Suppose that $A = \begin{pmatrix} 1 & 0 \\ 2 & 3 \\ -1 & -3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 & -1 & 0 \\ -1 & 0 & 2 & 5 \\ 1 & 3 & 0 & -2 \end{pmatrix}$

(a) Circle the matrix products which are well defined: AB, BA^T, A^TA, A^2.

(b) Choose one of the matrix products that you have circled and compute it.

$$A^TA = \begin{pmatrix} 1 & 2 & -1 \\ 0 & 3 & -3 \end{pmatrix}\begin{pmatrix} 1 & 0 \\ 2 & 3 \\ -1 & -3 \end{pmatrix} = \begin{pmatrix} 6 & 9 \\ 9 & 18 \end{pmatrix}$$