Math 2243, Practice Final exam. You will need a photo ID for the final!!!

Name:_____ Instructor:_____

Remember to show all your work. Without it, a correct answer may be given no credit.

(1) **Problem 1**.

Find the general solution $y(t)$ to $ty' + 2y = 6t$.

(2) **Problem 2**.

Find the solution to the initial value problem $y'' - 4y' + 13y = 0$, $y(0) = 0$, $y'(0) = 1$.

(3) **Problem 3.**

Show that the polynomials $p_1 = t^2 + 2t + 3$, $p_2 = 4t^2 + 5t + 6$, $p_3 = 7t^2 + 8t + 9$ are not linearly independent.

(4) **Problem 4**.

Find the kernel and range of the linear transformation from $\mathbb{R}^3$ to $\mathbb{R}^3$ given by the matrix $A = \begin{bmatrix} 3 & 9 & 10 \\ 3 & -1 & 0 \\ -3 & -1 & -2 \end{bmatrix}$.

(5) **Problem 5**.

The matrix $B = \begin{bmatrix} 0 & 1 & -1 \\ 1 & 0 & -1 \\ -1 & 1 & 0 \end{bmatrix}$ has eigenvalues 0, 1, and -1, with respective eigenvectors v_0, v_1 and v_{-1}. What is the effect of multiplying those eigenvectors by the matrix $c = B^4 + I_3$ (where I_3 is the 3 by 3 identity matrix)?

(6) **Problem 6.**

Find the general solution to the linear system $x' = \begin{bmatrix} -2 & 2 \\ 0 & 1 \end{bmatrix} x$.