Name: _____ PID: _____

- Print your *NAME* on every page and write your *PID* in the space provided above.
- Show all of your work in the spaces provided. No credit will be given for unsupported answers, even if correct.
- No calculators, tablets, phones, or other electronic devices are allowed during this exam. You may use one page of handwritten notes, but no books or other assistance.

(1 pt) 0. Follow the instructions on this exam and any additional instructions given during the exam.

(6 pt) 1. Solve the initial value problem: $4y'' - 12y' + 9y = 0, \quad y(0) = 4, \quad y'(0) = 1.$

(6 pt)   2. Find the general solution to the differential equation $y'' - 2y' - 3y = 2e^{3t}$.

(6 pt)   3. Solve the following linear differential system using the "eigenvalue" method. Give the general solution. You may leave your answer in vector form.

$$\begin{cases} x_1' = 2x_2 \\ x_2' = 3x_1 + x_2 \end{cases}$$

NAME:

(6 pt)   4. The matrix A has eigenvector $\begin{bmatrix} 1 - 4i \\ 3 \end{bmatrix}$ with corresponding eigenvalue $3 + 2i$. Solve the initial value problem $\mathbf{x}' = A\mathbf{x}$, $\mathbf{x}(0) = \begin{bmatrix} 1 \\ 6 \end{bmatrix}$.