Name: _____ PID: _____

1. Write your *NAME* on every page and your *PID* in the space provided above.
2. No calculators, tablets, phones, or other electronic devices are allowed during this exam.
3. You may use one page of handwritten notes, but no books or other assistance during this exam.
4. Write your solutions clearly in the spaces provided.
5. Show all of your work; no credit will be given for unsupported answers.

(1 points)   0. Carefully read and complete the instructions at the top of this exam sheet and any additional instructions written on the chalkboard during the exam.

(4 points)   1. Transform the given system with initial conditions into a single equation of second order with corresponding initial conditions:

$$\begin{cases} x_1' = 3x_1 - x_2 & x_1(0) = 3 \\ x_2' = 2x_1 - x_2 & x_2(0) = 1 \end{cases}$$

NAME:

(9 points)   2. Find the general solution using the method of undetermined coefficients:

$$y'' - 6y' + 9y = 5e^{3t}$$

(7 points)   3. Find the general solution using the method of variation of parameters, if y_1 and y_2 are solutions
to the corresponding homogeneous differential equation. Assume $t > 0$.

$$ty'' - (1+t)y' + y = t^2 e^t, \quad y_1 = 1 + t, \quad y_2 = e^t.$$

(9 points)   4. Find the general solution of the given system of equations:

$$\mathbf{x}' = \begin{pmatrix} 3 & 5 \\ 1 & -1 \end{pmatrix} \mathbf{x}$$