Printed NAME:

- You have 15 min to complete your quiz.

- Please show all your work neatly and indicate your final answers clearly. If you simply write down the final answer without appropriate intermediate steps, you may not get full credit for that problem.

- The quiz is closed book and notes. **Calculators are not allowed.**

GOOD LUCK :)

1. Solve the following initial value problem.

$$y'' + 2y' - 8y = 0; \qquad y(0) = 3 \quad y'(0) = 0$$

2. Determine the general solutions of the following differential equations

   (a)
   $$y'' + 4y' + 8y = 0$$

   (b)
   $$y'' + 8y' + 16y = 0$$

#1 $\quad R^2 + 2R - 8 = 0 \quad \Rightarrow (R+4)(R-2) = 0 \quad \Rightarrow R_1 = -4, \; R_2 = 2$

G-S · $\quad y = c_1 e^{-4x} + c_2 e^{2x}$

solve for IC $\quad \begin{cases} y(0) = 3 = c_1 + c_2 \\ y'(0) = 0 = -4c_1 + 2c_2 \end{cases}$ $\qquad y' = -4c_1 e^{-4x} + 2c_2 e^{2x}$

$\begin{cases} c_1 + c_2 = 3 \\ c_2 = 2c_1 \end{cases} \Rightarrow \begin{cases} 2c_1 + c_1 = 3 \\ - \end{cases} \Rightarrow \begin{cases} c_1 = 1 \\ c_2 = 2 \end{cases}$

solution to IVP: $\boxed{y = e^{-4x} + 2e^{2x}}$

#2 a) $\quad R^2 + 4R + 8 = 0 \quad \Rightarrow (R+2)^2 + 4 = 0 \Rightarrow R = -2 \pm 2i$

$\boxed{y = c_1 e^{-2x} \cos 2x + c_2 e^{-2x} \sin 2x}$

b) $R^2 + 8R + 16 = (R+4)^2 = 0 \quad \Rightarrow R = -4 \text{ repeated} \quad \Rightarrow y = (c_1 x + c_2) e^{-4x}$