Exercise Set for a Double Eigenvalue

1. For each matrix below, solve $\mathbf{x}' = A\mathbf{x}$. If $\mathbf{x}(0)$ is not indicated, assume a general initial condition, (x_0, y_0).

   (a) $\mathbf{x}' = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix} \mathbf{x}, \qquad \mathbf{x}(0) = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$

   (b) $\mathbf{x}' = \begin{bmatrix} 1 & -4 \\ 4 & -7 \end{bmatrix} \mathbf{x}$

   (c) $\mathbf{x}' = \begin{bmatrix} 1 & -1 \\ 1 & 3 \end{bmatrix} \mathbf{x}, \qquad \mathbf{x}(0) = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$

2. Review questions from Chapter 3. For each second order differential equation, first convert it into an equivalent system of first order, then go back to the second order equation and give the general solution (using techniques from Ch 3).

   (a) $y'' + 2y' - 3y = 0$

   (b) $y'' + 2y' + 5y = 0$

   (c) $y'' + 6y' + 9y = 0$