# 7.2 Exercises

**Problem 1** Given the system of DEQs below, given in matrix form: $x' = \mathbf{A}\vec{x}$. Verify that the given vector functions are solutions to that system. Then, use the Wronskian to show that the solutions are linearly independent. Finally, write the general solution to the system. $\vec{x}' = \begin{bmatrix} -8 & -11 & -2 \\ 6 & 9 & 2 \\ -6 & -6 & 1 \end{bmatrix}\vec{x}$;

Possible Solutions: $\vec{y}_1 = \begin{bmatrix} 3e^{-2t} \\ -2e^{-2t} \\ 2e^{-2t} \end{bmatrix}$, $\vec{y}_2 = \begin{bmatrix} e^{t} \\ -e^{t} \\ e^{t} \end{bmatrix}$, $\vec{y}_3 = \begin{bmatrix} e^{3t} \\ -e^{3t} \\ 0 \end{bmatrix}$.

**Problem 2** Find a particular solution to the system in the previous problem that satisfies the following initial conditions. $x_1(0) = 1,\ x_2(0) = 2,\ x_3(0) = 3$

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**Problem 3** Suppose that one of the following vector functions is a constant multiple of the other on an open interval $I$: $\vec{x}_1(t) = \begin{bmatrix} x_{11}(t) \\ x_{21}(t) \end{bmatrix}$ and $\vec{x}_2(t) = \begin{bmatrix} x_{12}(t) \\ x_{22}(t) \end{bmatrix}$.

Show that their Wronskian $W(t) = |x_{ij}(t)|$ must vanish identically on $I$.