1. Let
\[ x = \begin{bmatrix} 3e^{2t} \\ 2e^{2t} \end{bmatrix} \quad \text{and} \quad y = \begin{bmatrix} e^{-5t} \\ 3e^{-5t} \end{bmatrix} \]

(a) Verify that \( x \) and \( y \) are linearly independent.

(b) Verify that \( x \) and \( y \) are solutions of
\[
\begin{align*}
x' &= 4x - 3y \\
y' &= 6x - 7y
\end{align*}
\]

2. Consider the initial value problem
\[
\frac{dx}{dt} = Px
\]
with
\[
P = \begin{bmatrix} 3 & -1 \\ 5 & -3 \end{bmatrix},
\]
and
\[
x_1(0) = 5 \quad x_2(0) = -3.
\]

(a) Verify that \( x_1 \) and \( x_2 \) are linearly independent, where
\[
x_1 = e^{2t} \begin{bmatrix} 1 \\ 1 \end{bmatrix} \quad \text{and} \quad x_2 = e^{-2t} \begin{bmatrix} 1 \\ 5 \end{bmatrix}
\]

(b) Verify that these values of \( x_1 \) and \( x_2 \) are solutions of the differential equation.

(c) Find the solution of the initial value problem.