$$\frac{dx_1}{dt} = 2x_1 - 7x_2 \qquad x_1(0) = -1$$

$$\frac{dx_2}{dt} = 3x_1 + 6x_2 \qquad x_2(0) = 6$$

$$\frac{d}{dt}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 2 & -7 \\ 3 & 6 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \qquad \bar{x}(0) = \begin{bmatrix} -1 \\ 6 \end{bmatrix}$$

$$\frac{d}{dt}\bar{x} = A\bar{x} \qquad \bar{x}(0)$$

$$\bar{x} = e^{At}\bar{x}(0)$$

$$\overline{X}(0) = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \quad \frac{d}{dt}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -2 & -5 \\ 0 & 1 & 2 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 3 \\ 0 \end{bmatrix}$$

$$\frac{dX_1}{dt} = X_2 \qquad X_1(0) = 0$$

$$\frac{dX_2}{dt} = -2X_2 - 5X_3 + 3 \qquad X_2(0) = 0$$

$$\frac{dX_3}{dt} = X_2 + 2X_3 \qquad X_3(0) = 1$$

$$\frac{d}{dt}\bar{x} = A\bar{x} + \bar{b}(t) \qquad \bar{x}(0)$$

$$\bar{x} = e^{At}\bar{x}(0) + \underbrace{\int_0^t e^{A(t-\tau)}\bar{b}(\tau)\,d\tau}_{t=0 \;\rightarrow\; =0}.$$

$$\frac{dx_1}{dt} = x_1 + 2x_2 + 3e^{t} \qquad \bar{x}_1(0) = c_1$$

$$\frac{dx_2}{dt} = 2x_1 + 4x_2 + 4e^{-t} \qquad \bar{x}_2(0) = c_2$$

$$\frac{d}{dt}\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 3e^{t} \\ 4e^{-t} \end{bmatrix} \qquad \bar{x}(0) = \begin{bmatrix} c_1 \\ c_2 \end{bmatrix}$$

$$e^{At} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} e^{4t} \cos(4{,}12t) + \begin{bmatrix} -0{,}486 & -1{,}70 \\ 0{,}725 & 0{,}486 \end{bmatrix} e^{4t} \operatorname{sen}(4{,}12t)$$

$$e^{At}\Big|_{t=0} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\left[e^{At}\right]^{-1} = e^{A(-t)}$$

$$\frac{d}{dt}\left[e^{At}\right] = Ae^{At}$$