$$e^{At} \quad \begin{cases} \frac{d}{dt} e^{At} = A e^{At} \\ e^{A(0)} = I. \end{cases}$$

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

$$\frac{d}{dt}\bar{x} = A\bar{x}$$

$$\frac{d}{dt} e^{At} - A e^{At} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

$$\bar{x} = e^{At}\bar{x}_0$$

$$\bar{x} = e^{A(t-a)} x_a$$

$$x(t) = \frac{2}{3} C_1 e^t + \frac{1}{3} C_1 e^{7t} + \frac{2}{3} C_2 e^{7t} - \frac{2}{3} C_2 e^t$$

$$y(t) = \frac{1}{3} C_1 e^{7t} - \frac{1}{3} C_1 e^t + \frac{1}{3} C_2 e^t + \frac{2}{3} C_2 e^{7t}$$

$$x(t) = \left(\frac{2}{3} c_1 - \frac{2}{3} c_2\right) e^t + \left(\frac{1}{3} c_1 + \frac{2}{3} c_2\right) e^{7t}$$

$$y(t) = \left(\frac{-1}{3} c_1 + \frac{1}{3} c_2\right) e^t + \left(\frac{1}{3} c_1 + \frac{2}{3} c_2\right) e^{7t}$$

$$c_{10} = -\frac{1}{3} c_1 + \frac{1}{3} c_2 \qquad c_{20} = \frac{1}{3} c_1 + \frac{2}{3} c_2$$

$$x(t) = -2 c_{10} e^t + c_{20} e^{7t}$$

$$y(t) = c_{10} e^t + c_{20} e^{7t}$$

$$\begin{cases} \frac{dx}{dt} = 3x + 4y \\ \frac{dy}{dt} = 2x + 5y \end{cases}$$

$$\frac{dx}{dt} = -2c_{10} e^t + 7 c_{20} e^{7t} \qquad \frac{dy}{dt} = c_{10} e^t + 7 c_{20} e^{7t}$$

$$=$$

$$3x = -6c_{10} e^t + 3c_{20} e^{7t} \qquad 2x = -4c_{10} e^t + 2c_{20} e^{7t}$$

$$+$$

$$4y = 4c_{10} e^t + 4c_{20} e^{7t} \qquad 5y = 5c_{10} e^t + 5c_{20} e^{7t}$$