Section 4.9 ***Solving Systems of Linear DE by Elimination Method***

System of DEs:

$$\frac{dx_1}{dt} = a_{11}(t)x_1(t) + a_{12}(t)x_2(t) + \ldots + a_{1n}(t)x_n(t) + F_1(t)$$

$$\frac{dx_2}{dt} = a_{21}(t)x_1(t) + a_{22}(t)x_2(t) + \ldots + a_{1n}(t)x_n(t) + F_2(t)$$

...

$$\frac{dx_n}{dt} = a_{n1}(t)x_1(t) + a_{12}(t)x_2(t) + \ldots + a_{1n}(t)x_n(t) + F_n(t)$$

Ex: Solve by method of elimination:

a) $\begin{cases} \dfrac{dx_1}{dt} = x_1 + 2x_2 \\ \dfrac{dx_2}{dt} = 2x_1 - 2x_2 \end{cases}$ subject to initial values: $x_1(0) = 1;\ x_2(0) = 0$

b)

$$\begin{cases} \dfrac{dx}{dt} = 2x + 4y \\ \dfrac{dy}{dt} = -4x - 6y \end{cases}$$

c)
$$\begin{cases} \dfrac{dx_1}{dt} = x_1 + x_2 + e^{2t} \\ \dfrac{dx_2}{dt} = 3x_1 - x_2 + 5e^{2t} \end{cases}$$

d) $$\begin{cases} \left(2D^2 - D - 1\right)x - \left(2D + 1\right)y = 1 \\ \left(D - 1\right)x + Dy = -1 \end{cases}$$