Quiz 9, Section 007 + 004

$$\begin{cases} x' = x - 2y \\ y' = 2x - 3y \end{cases}$$

$$\begin{aligned} (D-1)x + 2y &= 0 \\ -2x + (D+3)y &= 0 \end{aligned} \quad \Rightarrow \quad \begin{aligned} 2(D-1)x + 4y &= 0 \\ -2(D-1)x + (D-1)(D+3)y &= 0 \end{aligned}$$

$$(D-1)(D+3)y + 4y = 0$$

$$\Rightarrow \quad (D^2 + 2D + 1)y = 0$$

$$(D+1)^2 y = 0$$

char. eqtn: $(r+1)^2 = 0$, $r = -1$ double root

$$\Rightarrow \quad y = e^{-t}(c_1 + c_2 t)$$

then $$x = \frac{1}{2}y' + \frac{3}{2}y = \frac{1}{2}\left[-e^{-t}(c_1 + c_2 t) + e^{-t}(c_2)\right] + \frac{3}{2}e^{-t}(c_1 + c_2 t)$$

$$\boxed{\begin{aligned} x &= e^{-t}\left(c_1 + \tfrac{1}{2}c_2 + c_2 t\right) \\ y &= e^{-t}(c_1 + c_2 t) \end{aligned}}$$