

Giliam

$$\begin{aligned} 1. a) \mathcal{L}\{f(t)\} &= \cos t - 2e^{3t}t \\ &= \mathcal{L}\{\cos t\} - 2\mathcal{L}\{e^{3t}t\} \\ &= \frac{s}{s^2+1} - 2\frac{1}{(s-3)^2} \end{aligned}$$

$$\begin{aligned} b) \mathcal{L}^{-1}(F(s)) &= \frac{1}{s-2} + \frac{3}{s^2+3^2} \\ &= e^{2t} + \sin(3t) \end{aligned}$$

$$2. x'' - x' - 2x = 12e^t$$

$$[s^2 \underline{X}(s) - s\underline{x}(0) - \underline{x}'(0)] - [s \underline{X}(s) - \underline{x}(0)] - 2\underline{X}(s) = 12 \frac{1}{s-1}$$

$$s^2 \underline{X}(s) - s \underline{X}(s) - 2 \underline{X}(s) = \frac{12}{s-1}$$

$$\underline{X}(s) = \frac{12}{(s-1)(s^2-s-2)}$$

$$= \frac{12}{(s-1)(s-2)(s+1)}$$

$$12 = A(s-2)(s+1) + B(s-1)(s+1) + C(s-1)(s-2)$$

$$A = -6, B = 4, C = 2$$

$$\therefore \underline{X}(s) = -\frac{6}{s-1} + \frac{4}{s-2} + \frac{2}{s+1}$$

$$x(t) = -6e^t + 4e^{2t} + 2e^{-t}$$