

Daily Laplace - 4/5

$$f(t) = \begin{cases} 2t, & \text{if } 0 \leq t < 3 \\ 4, & \text{if } t \geq 3 \end{cases} \quad \mathcal{L}\{f(t)\} = ?$$

$$\begin{aligned} f(t) &= 2t(1 - u_3(t)) + 4u_3(t) \\ &= 2t - (2t - 4)u_3(t) \\ &= 2t - (2t - 6 + 2)u_3(t) \\ &= 2t - [2(t - 3) + 2]u_3(t) \end{aligned}$$

$$\begin{aligned} \Rightarrow \mathcal{L}\{f(t)\} &= 2 \cdot \frac{1}{s^2} - e^{-3s} \mathcal{L}\{2t + 2\} \\ &= \frac{2}{s^2} - e^{-3s} \left(\frac{2}{s^2} + \frac{2}{s} \right) \quad (s > 0) \end{aligned}$$