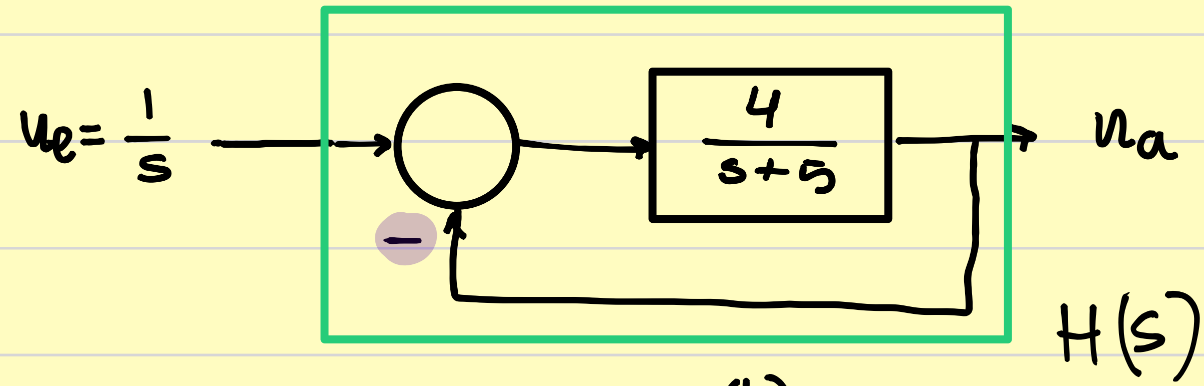
20241218_Mock_up

4.



$u_a(t)$?

$$u_e(t) = \begin{cases} 1 & t > 0 \\ 0 & t \leq 0 \end{cases}$$

$$u_a(s) = u_e(s) \cdot H(s)$$

$$H(s) = \frac{\frac{4}{s+5}}{1 + \frac{4}{s+5}} \overset{(\cdot)}{=} \frac{\frac{4}{\cancel{s+5}}}{\frac{s+5+4}{\cancel{s+5}}} = \frac{4}{s+9}$$

$$\boxed{u_a(s) = \frac{1}{s} \cdot \frac{4}{s+9}}$$

$$(\cdot) \quad \boxed{1 + \frac{7}{3} = \frac{3}{3} + \frac{7}{3} = \frac{3+7}{3}}$$

$$u_a(s) = \frac{1}{s} \cdot \frac{4}{s+9} = \frac{A}{s} + \frac{B}{s+9}$$

$$\overset{(\cdot\cdot)}{=} \frac{A(s+9) + Bs}{s\,(s+9)}$$

$$(\cdot\cdot) \quad \frac{3}{2} + \frac{1}{7} = \frac{3.7 + 1.2}{2.7}$$

$$1.4 = A(s+9) + Bs$$

$$s=0 \rightarrow 4 = 9A \longrightarrow A = \frac{4}{9}$$

$$s=-9 \rightarrow 4 = -9B \longrightarrow B = \frac{-4}{9}$$

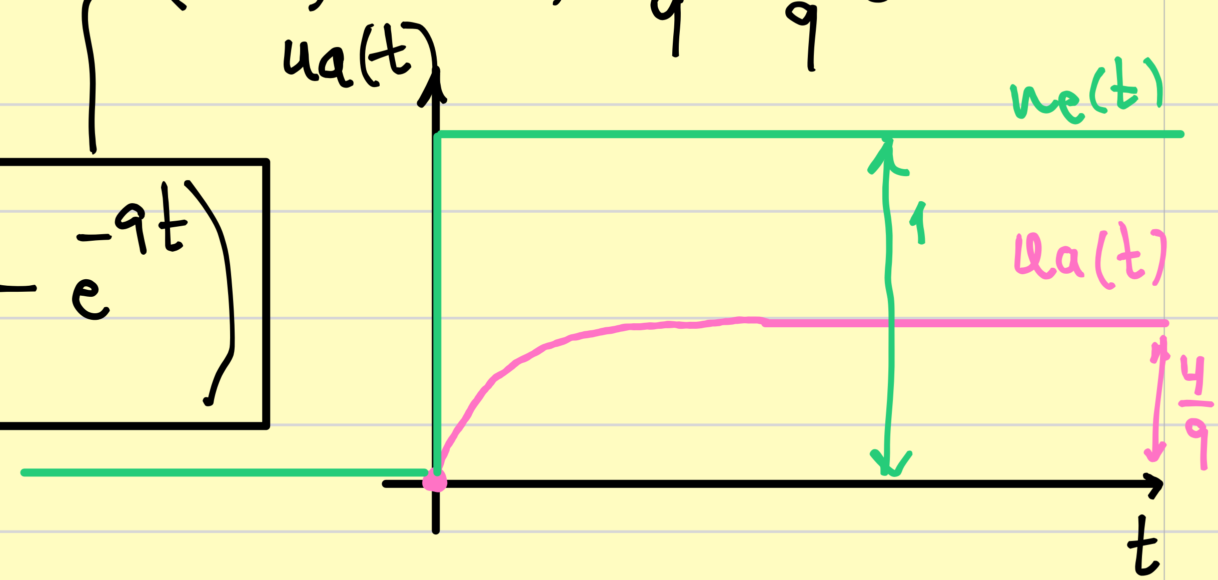
$$u_a(s) = \frac{4}{9} \cdot \frac{1}{s} - \frac{4}{9} \cdot \frac{1}{s+9}$$

$$\mathcal{L}^{-1}\left(\frac{1}{s}\right) = 1 = 1 \cdot e^{-0 \cdot t}$$

$$\mathcal{L}^{-1}\left(\frac{1}{s+k}\right) = e^{-kt}$$

$$\mathcal{L}^{-1}(u_a(s)) = u_a(t) = \frac{4}{9} - \frac{4}{9} e^{-9t}$$

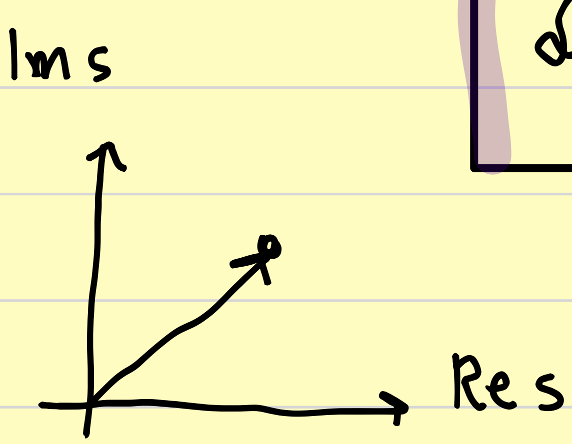
$$\boxed{u_a(t) = \frac{4}{9}\left(1 - e^{-9t}\right)}$$



$$u(s) = \frac{K_1}{s+K_2} \xrightarrow{\mathcal{L}^{-1}} u(t)$$

$$s = a + bi$$

$$\boxed{\mathcal{L}^{-1}\left(u(s) = \frac{K_1}{s+K_2}\right) = K_1 e^{-K_2 t}}$$



$\longrightarrow t$

$y = f(x)$

$$\longrightarrow x \xrightarrow{f} \longrightarrow y$$

i.e.