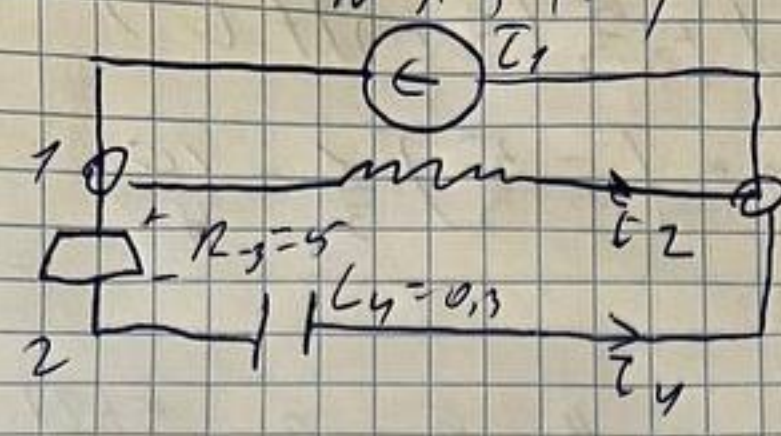
№3.5 (14)



$I_1 = 10\cos(t+48^\circ)$

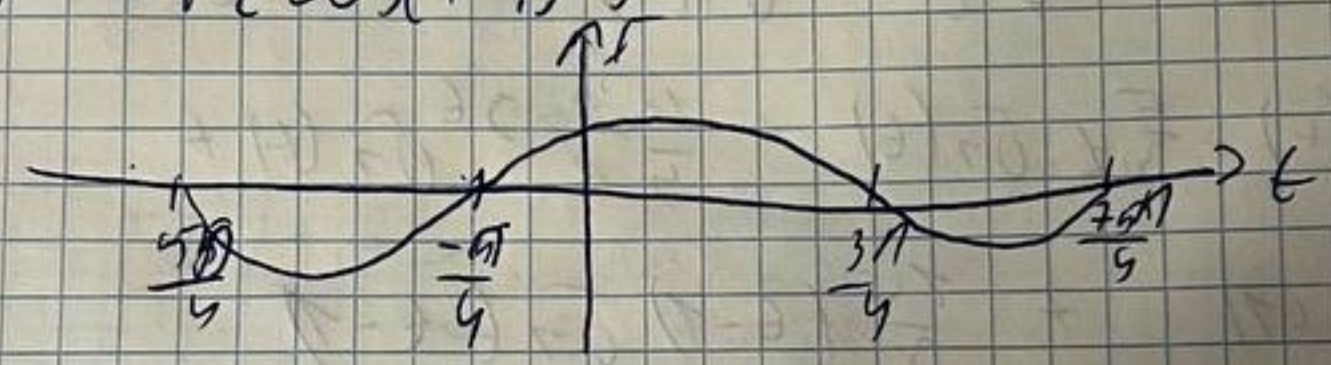
$i_4(t)$

$\dot{I}_{1m} = 10$

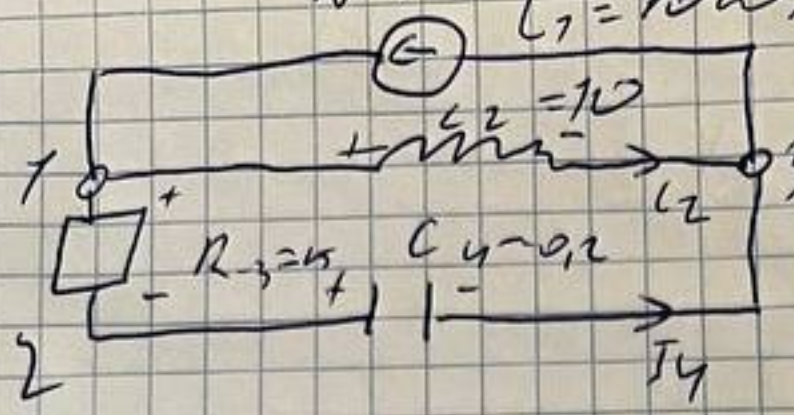
$\dot{I}_{4m} = \dot{I}_{1m} \frac{j\omega L_2}{R_3 - j\frac{1}{\omega C_4}} = -10 \cdot \frac{10j}{5-5j} =$

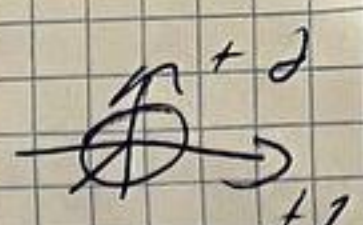
$= -10(1-j^0) = 10\sqrt{2}e^{-j^0 45^0}$

$i_4(t) = 10\sqrt{2}\cos(t - 45^\circ)$



№ 3.6





$\dot{E}_3' = \dot{I}_4 = 1 \quad U_3 = R_3 \dot{I}_3 = 5 \quad U_4 = I_4 \cdot \frac{1}{j\omega C} = -5j$

$U_2 = U_3 = U_4 = 5 - 5j = 5\sqrt{2} e^{-j45°} \quad \varphi = 0$

$\dot{I}_2' = \frac{U_2}{j\omega C} = \frac{5 - 5j}{10j} = -\frac{1}{2} - \frac{1}{2}j = \frac{\sqrt{2}}{2} e^{-j135°}$

$\dot{I}_1' = \dot{I}_2' + \dot{I}_3' = \frac{1}{2} - \frac{1}{2}j = \frac{\sqrt{2}}{2} e^{-j45°}$

$k = \frac{\dot{I}_1}{\dot{I}_1'} = 10 e^{-j135°}$

$\dot{I}_3 = k \dot{I}_3' = 10 e^{-j135°} \quad \dot{I}_4 = k \dot{I}_4' = 10 e^{-j135°}$

$U_3 = k U_3' = 50 e^{-j135°} \quad U_4 = 50 e^{j135°}$

$\dot{I}_2 = k \dot{I}_2' = 5\sqrt{2} e^{-j90°} = 5\sqrt{2} j \quad U_2 = 50\sqrt{2} e^{-j90°} = -50\sqrt{2} j$

$P = U_1 I_1 \cos\varphi \quad \varphi = 0; \quad P = 50\sqrt{2} \cdot 5\sqrt{2} = 500$

$P_Q = U_2 I_1 \sin\varphi = 0$

$P_R = U_3 I_3 = 50 \cdot 10 = 500$

$P_{QL} = U_2 I_2 = 50\sqrt{2} \cdot 5\sqrt{2} = 500$

$P_{QC} = U_4 I_4 = 50 \cdot 10 = 500$

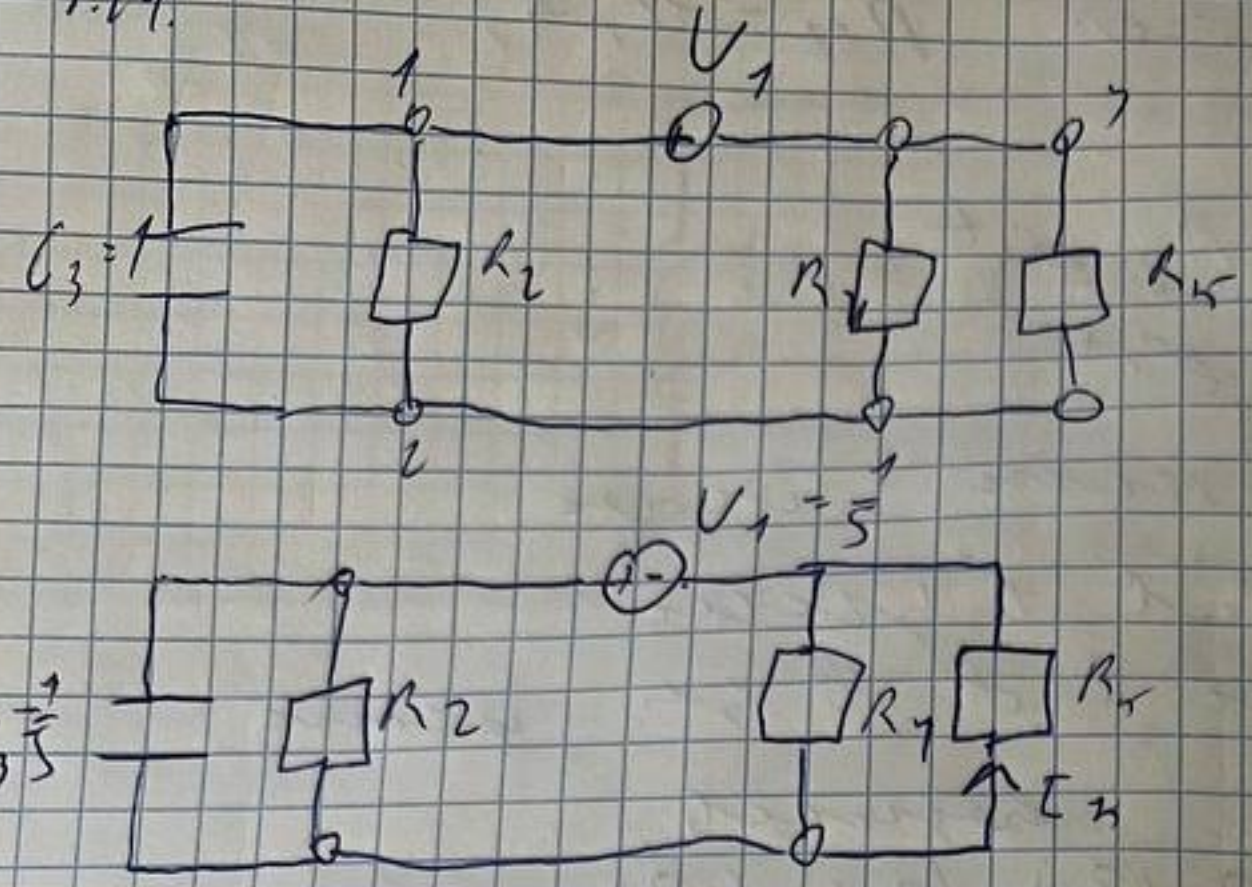
$P_{QL} = P_{QC} = 0 = P_4$

$P_S = U_2 \dot{I}_1 = 500$

$P_S = U_2 \dot{I}_1^* = 50\sqrt{2} e^{-j90°} \cdot 5\sqrt{2} e^{j90°} = 500 - 500j =$

$= P + jR_Q$

1.24.



$$L_5 = \frac{U_1}{\frac{R_2 \frac{1}{5C_3}}{R_2 + \frac{1}{5C_3}} + \frac{R_4 R_5}{R_4 + R_5}} \cdot \frac{R_4}{R_4 + R_5} = \frac{1}{\frac{\frac{1}{5}}{1 + \frac{1}{5}} + \frac{1}{2}} \cdot \frac{1}{2} = \frac{1}{11} + \frac{2}{3} \frac{1}{5C_3}$$

$$h_1(t) = \frac{1}{3} \delta_1(t) + \frac{2}{3} e^{-3t} \delta_2(t)$$

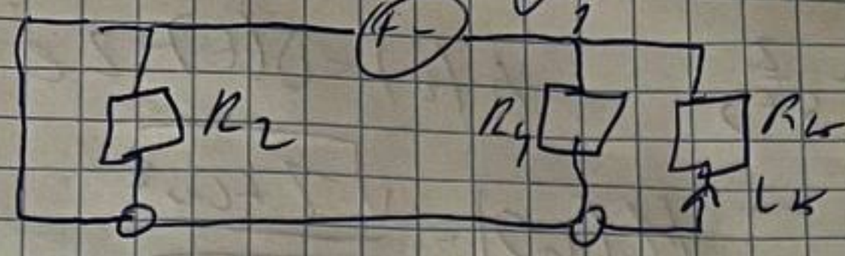
$$H_1(s) = \frac{s+1}{s(s+3)} \qquad H(s) = S\{h_1(t)\} = \frac{s+1}{s+3}$$

$$U_1(s) = \frac{s+1}{s(s+3)} ; \quad H(s) = S\{h_1(t)\} \quad s = \frac{s+1}{s+3}$$

$$U_1(s) = \frac{4}{s+4} \qquad I_5(s) = U_1(s) H(s) = \frac{4(s+1)}{(s+3)(s+4)} =$$

$$= \frac{-8}{s+3} + \frac{12}{s+4}$$

$t = 0^+$



$i_6(0^+) = h_1 1^{0^+} = \frac{v_1}{R_5} = 1$

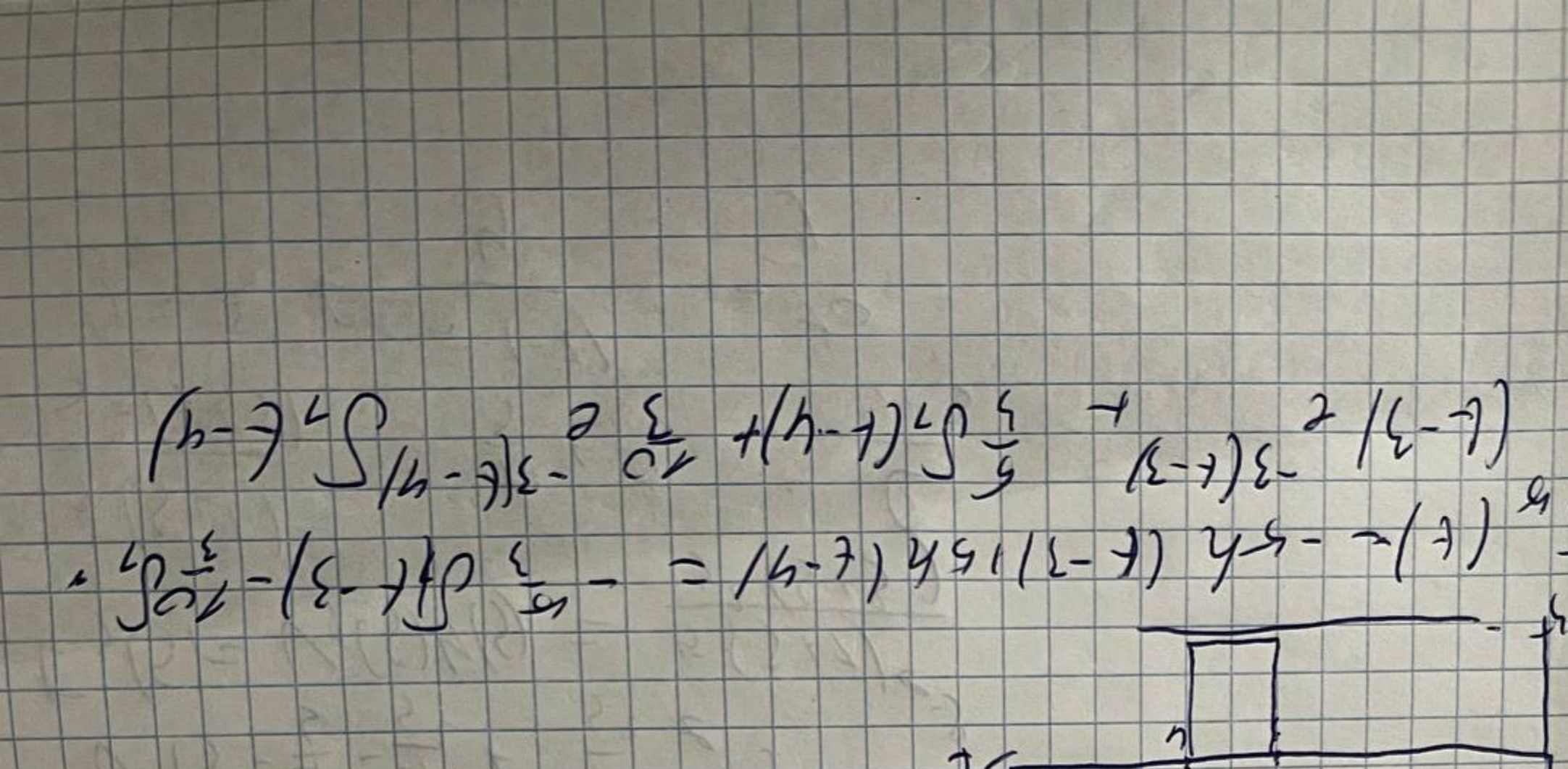
$0 < t < \infty$

$\frac{1}{R_3} = \frac{1}{R_2} + \frac{1}{R_4} + \frac{1}{R_5} = 3 \qquad \tau = CR_3 = \frac{1}{3}$

$t \to +\infty$

$i_6 \infty = h_1(\infty) = \frac{v_1}{R_7 + \frac{R_4 R_5}{R_4 + R_5}} \cdot \frac{R_4}{R_4 + R_5} = \frac{1}{\frac{3}{2}} \cdot \frac{1}{2} = \frac{1}{3}$

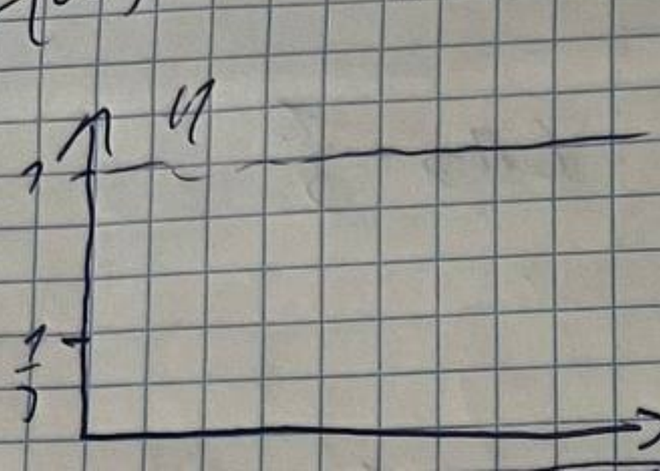
$i_5 \infty = h_2(\infty) = \frac{4}{R_2 \frac{R_4 R_5}{R_4 + R_5}} \cdot \frac{R_4}{R_6 + R_5} = \frac{1}{3}$

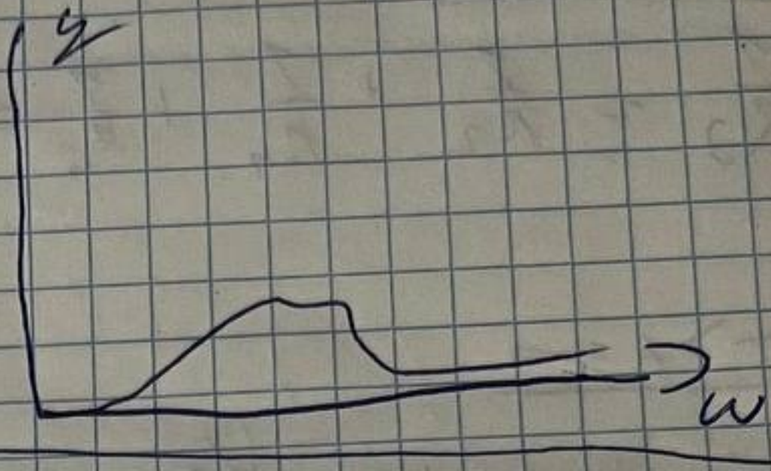

t
t

$$H(s) = \frac{s+1}{s+3} = 1 - \frac{2}{s+3} \qquad h(t) = \delta(t) - 2e^{-3t}\delta_1(t)$$

$$H(j\omega) = \frac{j\omega+1}{j\omega+3} \qquad |H(\omega)| = \frac{\sqrt{1+\omega^2}}{\sqrt{9+\omega^2}}$$

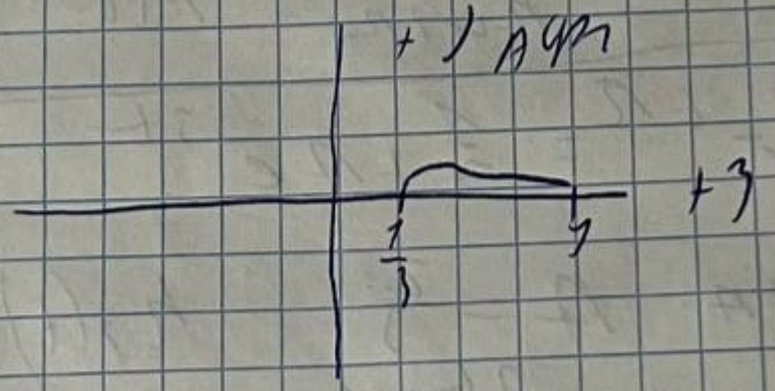
$$\varphi(\omega) = \operatorname{arctg}\omega - \operatorname{arctg}\frac{\omega}{3}$$

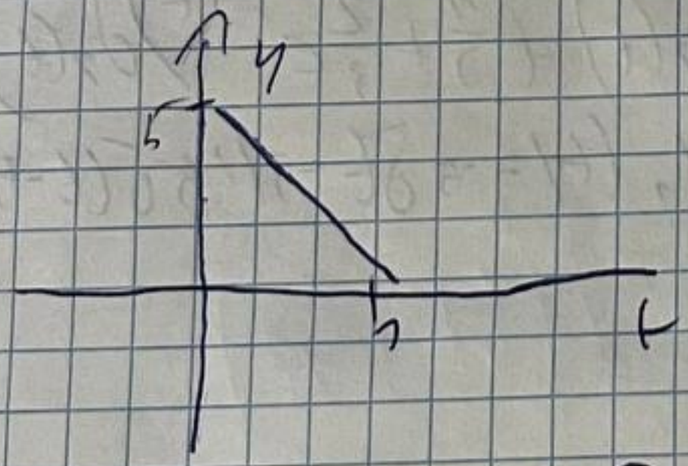




$$H(s) = \frac{s+1}{s+3} = 1 - \frac{2}{s+3}$$

$$h_2(t) = \delta(t) - 2e^{-3t}\delta_1(t)$$





$$y_1(t) = 5 - 5t\,\delta_1(t) + 5(t-1)\delta(t-1)$$

$$Y_1(s) = \frac{5}{s} - \frac{5}{s^2} + \frac{5}{s^2}e^{-s}$$

$$Y_2(s) = Y_1(s)H(s) = \frac{5(s+1)e^{-s}}{s^2(s+3)}$$

$$\frac{5(s+1)}{s^2(s+3)} = \frac{A}{s} + \frac{B}{s^2} + \frac{C}{s+3}$$

$$B = \frac{5}{3} \quad C = \frac{5(-2)}{4} = -\frac{10}{4}$$

$S_{S+5} = n \cdot S(S+3) + \frac{5}{3}(S+3)n C S^2$

$S = 3n + \frac{5}{3}$; $n = (5 - \frac{5}{3}) \cdot \frac{1}{3} = \frac{10}{9}$

$$\frac{5(s+1)}{s(s+3)} = \frac{A}{s} + \frac{B}{s+3} \qquad A = \frac{5}{3} \qquad B = \frac{5(-2)}{-3} = \frac{10}{3}$$

$$i_s(t) = \frac{5}{3}\delta_{-1}(t) + \frac{10}{3}e^{-3t}\delta_{-1}(t) - \frac{10}{4}\delta_{-1}(t) -$$

$$- \frac{5}{3}t\,\delta_{-1}(t) + \frac{10}{3}e^{-3t}\delta_{-1}(t) - \frac{10}{4}\delta_{-1}(t) -$$

$$- \frac{5}{3}t\,\delta_{-1}(t) + \frac{10}{4}e^{-3t}\delta_{-1}(t) + \frac{5}{3}\delta_{-1}(t-1) =$$

$$= \frac{5}{9}\delta_{-1}(t) - \frac{5}{3}t\,\delta_{-1}(t) + \frac{40}{9}e^{-3t}\delta_{-1}(t) +$$

$$+ \frac{5}{3}\delta_{-1}(t-1) + \frac{10}{3}(t-1)\delta_{-1}(t-1)$$