① $2e^{-t} * 3 \xrightarrow{L} \frac{2}{s+1}\left(\frac{3}{s}\right)$

$x/ \Rightarrow 6\left[\frac{1}{s} - \frac{1}{s+1}\right] \rightarrow 6(1-e^{-t})\,u(t)$.

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad \parallel$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad y(t)$

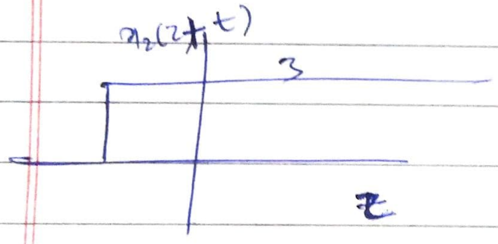
$$y(t) = \begin{cases} 0 & t<0 \\ 6(1-e^{-t}) & t \geq 0 \end{cases}$$

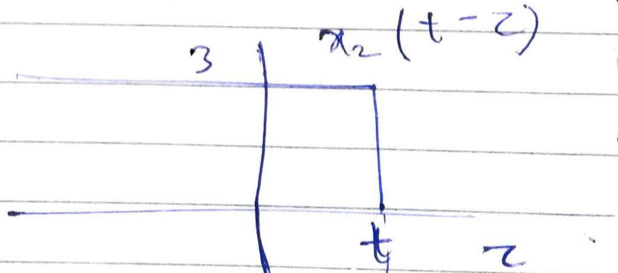
$$\int_{-\infty}^{\infty} x_1(\tau)\, x_2(t-\tau)\, d\tau = y(t).$$

$x_1(\tau) = 2e^{-\tau} \qquad x_2(\tau) = 3$

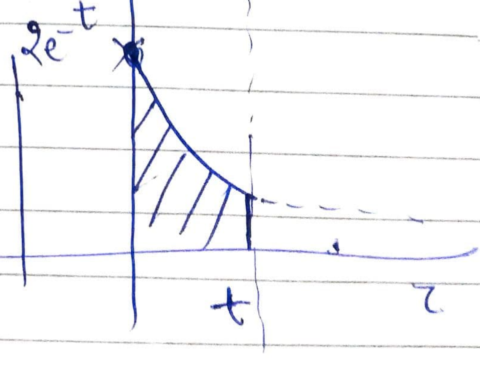
$x_2(\tau + t)$

$t > 0$





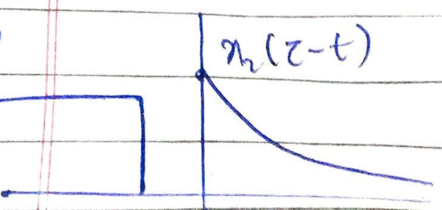
$$\int_0^t 6e^{-t}\, dt \Leftarrow$$



$\parallel$

$6(1-e^{-t}) \quad t \geq 0$

$t < 0$



$\frac{2}{s(s^2+1)}$, $\int_{-\infty}^{\infty} 2e^{-\tau} \sin(t-\tau)\,d\tau$ or,

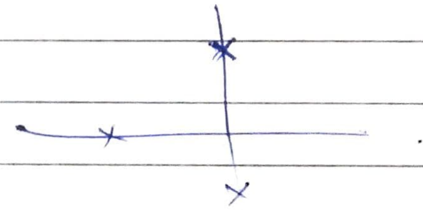
$\sin\tau = \frac{e^{j\tau} - e^{-j\tau}}{2j}$

$\sin(t-\tau) = \frac{e^{j(t-\tau)} - e^{-j(t-\tau)}}{2j}$

$\frac{1}{j}\left\{ \int_{0}^{t} e^{j(t-\tau)-\tau}\, d\tau - \int_{0}^{t} e^{-j(t-\tau)-\tau}\, d\tau \right.$

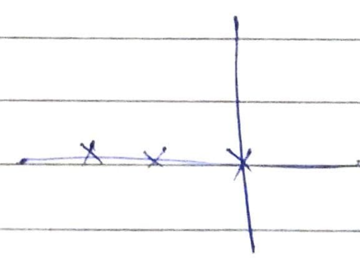
2). $\left(\frac{u}{y} = \frac{1}{s^3+6s^2+8s+K} \right)$

$(s+a)(s^2+b^2) = (\longleftarrow)$



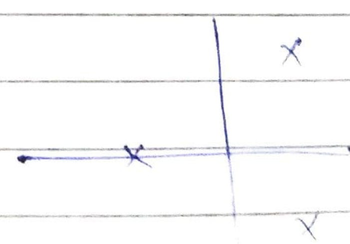
$\rightarrow \frac{y}{u} = \left(\frac{s-5}{s+3}\right)$ $\quad y = \left(\frac{s-5}{s+3}\right) c e^{3t} \Big|_{s=3}$

$-\frac{c}{3} e^{3t}$



$\frac{dy}{dt} + 3y = 3ce^{3t} - 5e^{3t}$

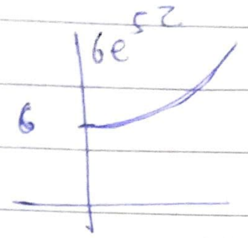
$\left(y = -\frac{c}{3} e^{3t} + K e^{-3t} \right)$

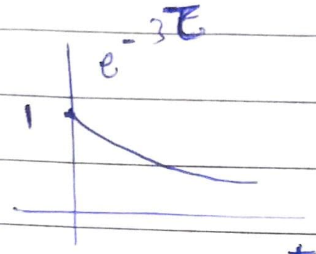


6). $C\dot{V}_C + V_C/R = 0$

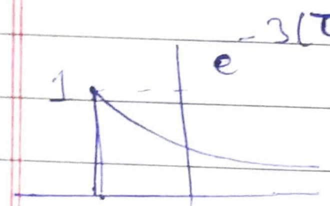
$C[sV_c(s) - V_0] + \frac{V_c(s)}{R} = 0$

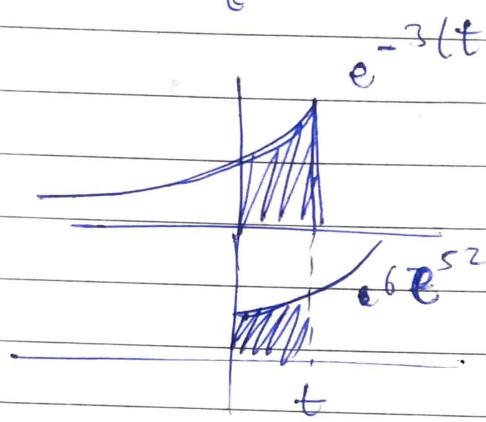
7). $\int_{-\infty}^{\infty} x_1(\tau)\, x_2(\tau - t)\, d\tau$





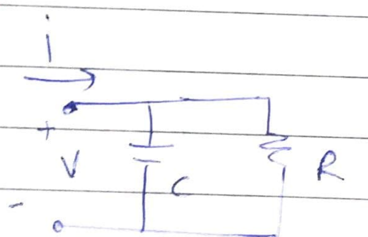
t>0





$$\int_{t=0}^{\tau=t} 6e^{5\tau}\, e^{-3(t-\tau)}\, d\tau$$

8).



$\rightarrow i = i_c + i_R$

$\rightarrow i = C\frac{dV}{dt} + \frac{V}{R}$

$\rightarrow i(s) = CsV_{(s)} + \frac{V(s)}{R}$

$\rightarrow \left(\frac{i(s)}{V(s)} = \frac{RCs + 1}{R}\right)$

$\frac{R}{1+RCs} = G(s)$

$|G(j\omega)| = \left|\left(\frac{R}{1+jRC\omega}\right)\right| = \frac{R}{\sqrt{1+R^2C^2\omega^2}}$