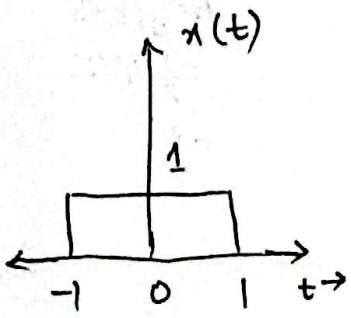
Assingment # 02

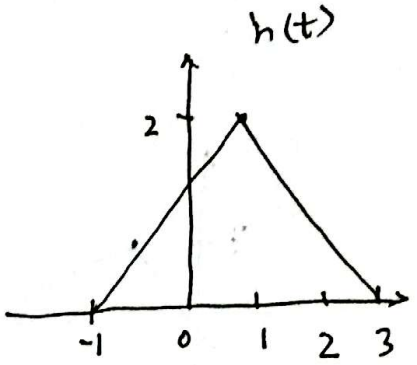
Signals & Systems

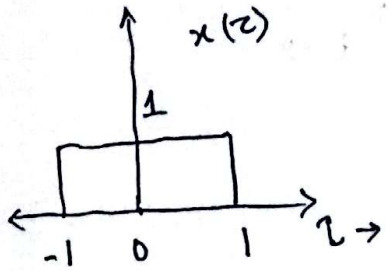
Name: Mudassar Hussain

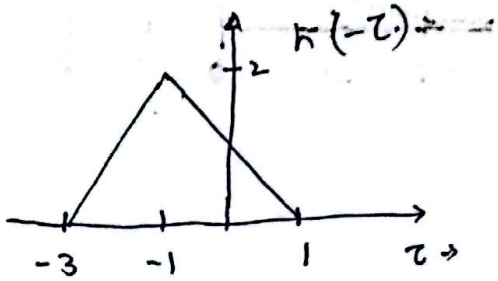
RollnO: 23L-6006 , 4B

Q1. $y(t) = x(t) * h(t)$

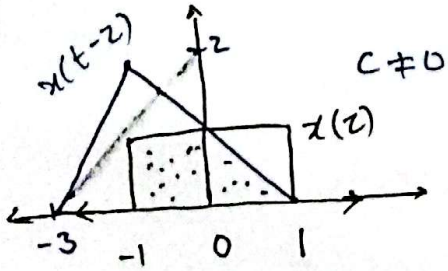




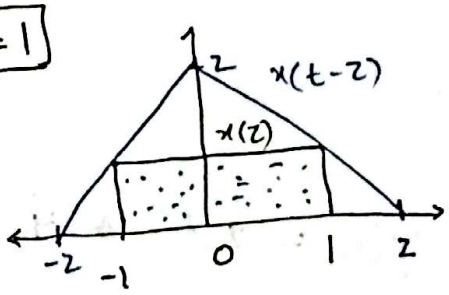




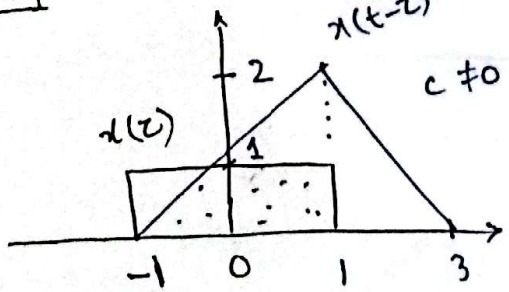
t=0



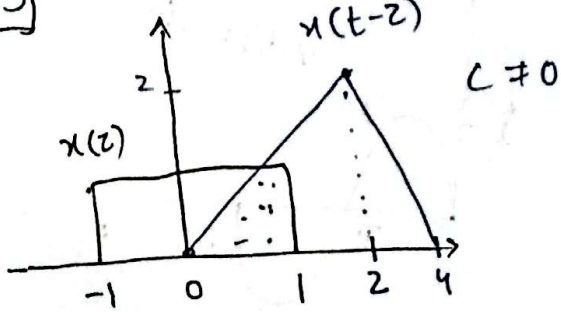
t=1



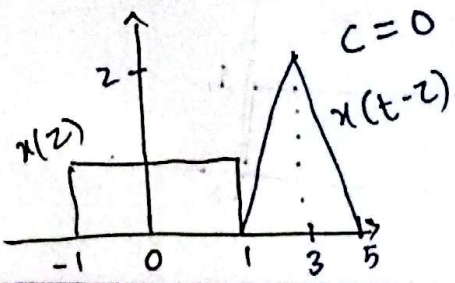
t=2



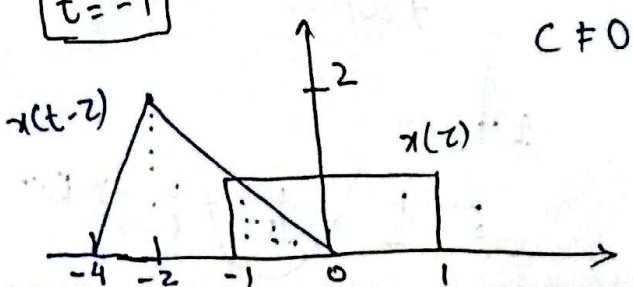
t=3



t=4

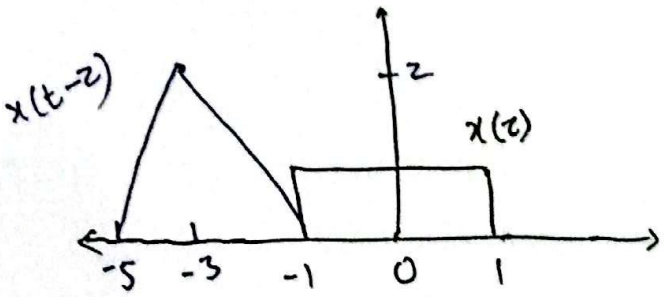


t=-1



$t = -2$

$c = 0$

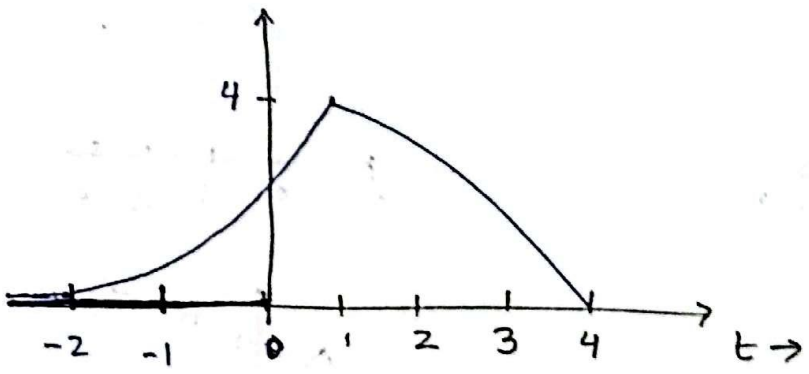


$A = \frac{1}{2}(b)(h)$

$= \frac{1}{2}(4)(2)$

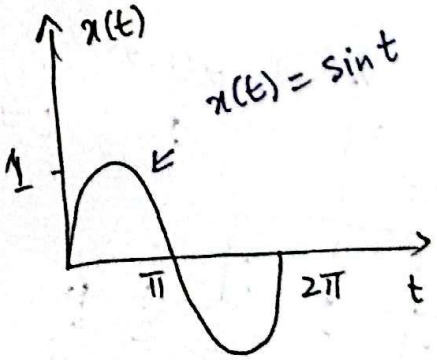
$= 4.$

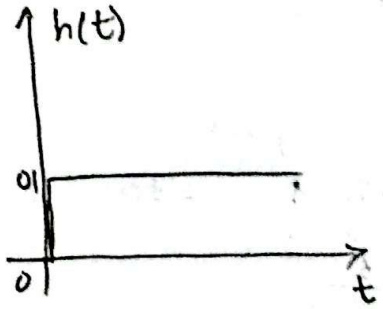
$c(t) = y(t)$

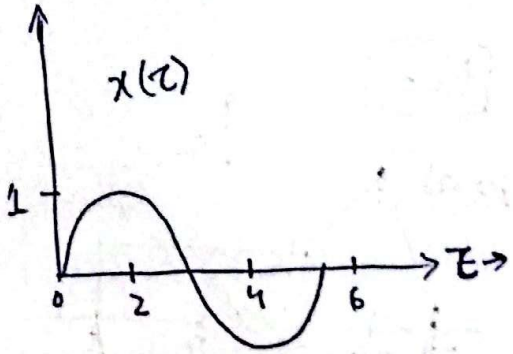


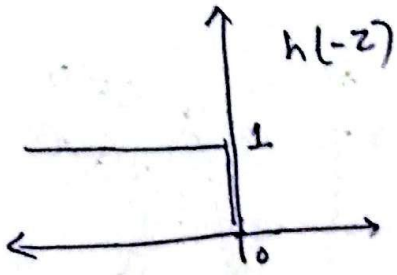
Q3

$$y(t) = x(t) * h(t)$$









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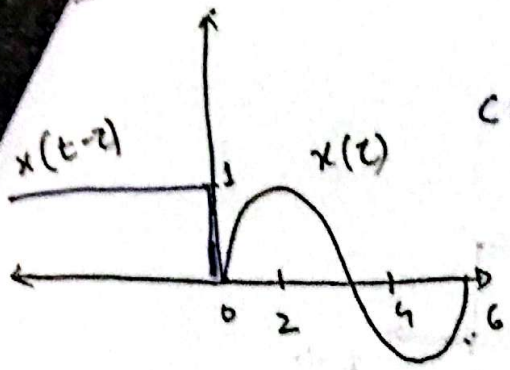
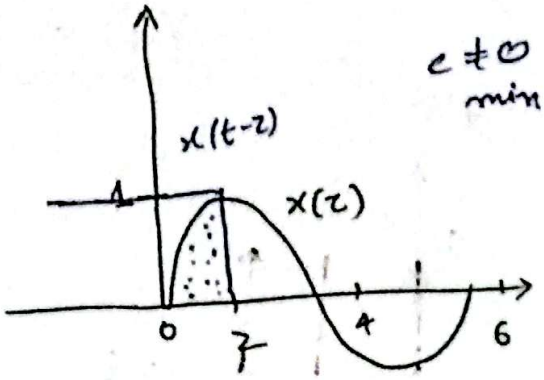
$t = 0$



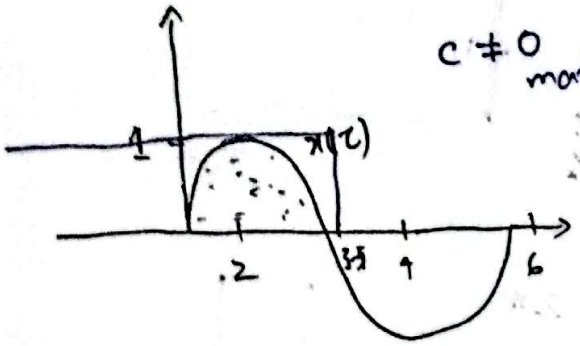
$c = 0$

$t = 2$



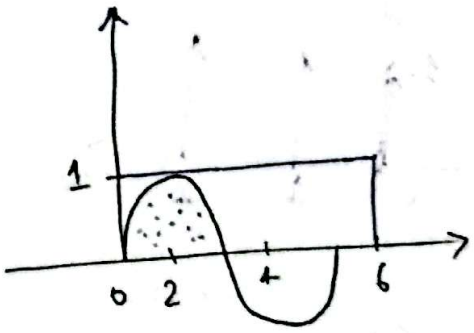
$c \neq 0$ min.

$t = 3.9$



$c \neq 0$ maximum

$t = 6$



For $0 \leq t \leq 2\pi$

$$c(t) = \int_0^t x(\tau)\, h(t-\tau)\, d\tau$$

$$= \int_0^t \sin(\tau)\, d\tau$$

$$= \left[-\cos(x)\right]_0^t$$

$$c(t) = 1 - \cos(t)$$

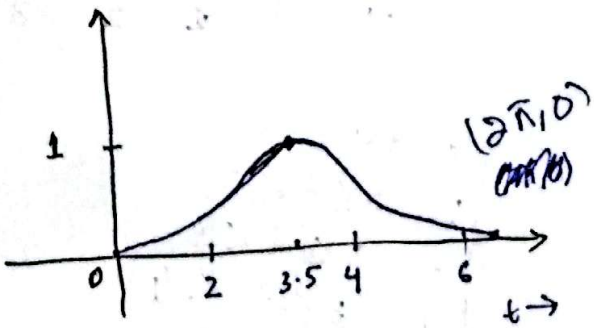
For $t \geq 2\pi$

$$c(t) = \int_0^{2\pi} \sin(\tau)\, d\tau$$

$$= \left[-\cos(x)\right]_0^{2\pi}$$

$$= 0$$

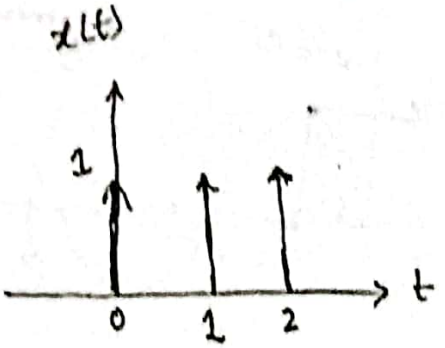
$c(t) = Y(t)$

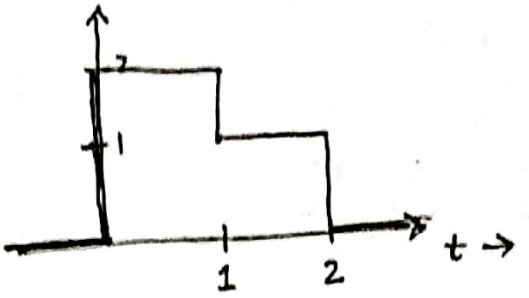


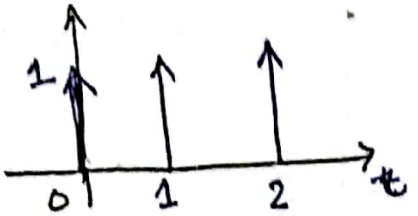
$$c(t) = \begin{cases} 1 - \cos(t) & 0 \leq t \leq 2\pi \end{cases}$$

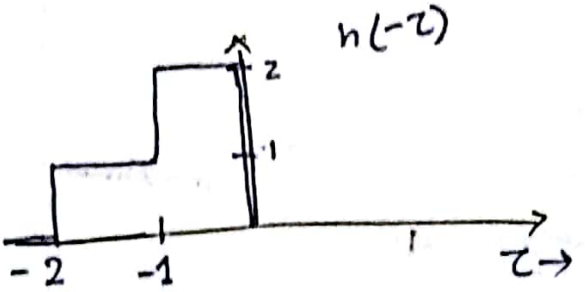
Q2

$$Y(t) = x(t) * h(t)$$



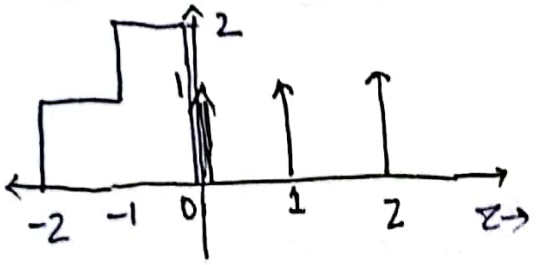




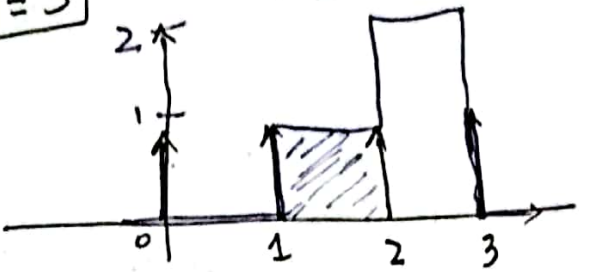


t = 0

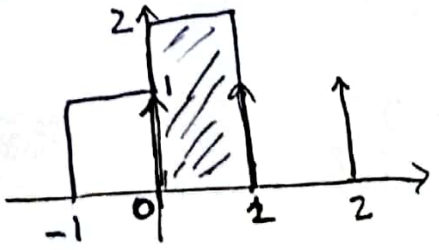
c = 0



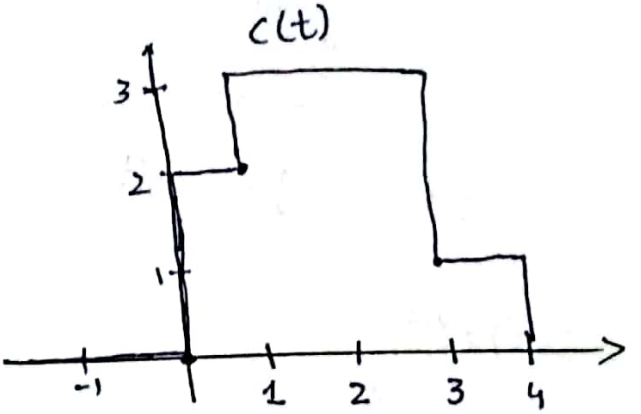
t = 3



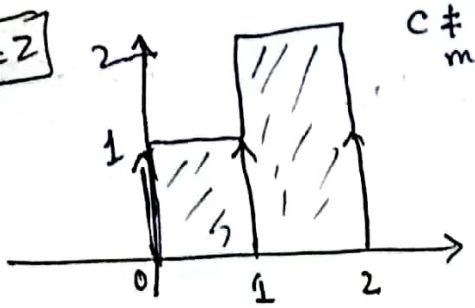
t = 1



At **t = 4**, c = 0



t = 2



$c \neq 0$ max

$$c(t) = \begin{cases} 0, & t < 0 \\ 2, & 0 \le t < 1 \\ 3, & 1 \le t < 3 \\ 1, & 3 \le t < 4 \\ 0, & t \ge 4 \end{cases}$$

Q4 Find mathematical Expression of $y(t) = x(t) * h(t)$.

Such that $x(t) = e^{2(t-3)}\,u(t)$ & $h(t) = e^{-t}\,u(t)$.

$$y(t) = \int_{-\infty}^{\infty} x(\tau)\, h(t-\tau)\, d\tau$$

$$= \int_{-\infty}^{\infty} e^{2(\tau-3)}\, u(\tau)\; e^{-(t-\tau)}\, u(t-\tau)\, d\tau$$

$$= \int_{0}^{t} e^{2(\tau-3)}\; e^{-(t-\tau)}\, d\tau \qquad \because u(t) = \begin{cases} 1 ; & t \geq 0 \\ 0 ; & t < 0 \end{cases}$$

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

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

$$= e^{-t-6} \left[\frac{e^{3\tau}}{3}\right]_0^t$$

$$= e^{-t-6} \left[\frac{e^{3t}-1}{3}\right]$$

$$y(t) = \frac{e^{2t-6} - e^{-t-6}}{3}, \quad t \geq 0$$