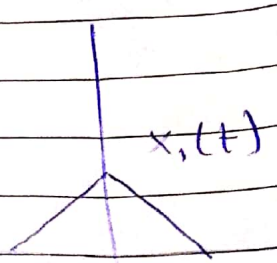
Even or odd signals

even $x(t) = +x(-t)$

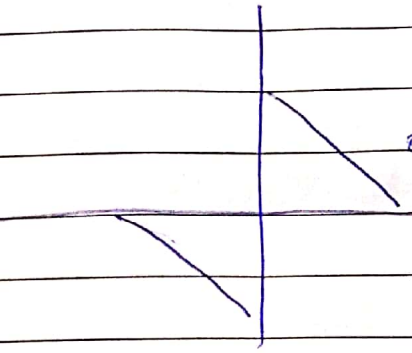
odd $x(t) = -x(-t)$



even

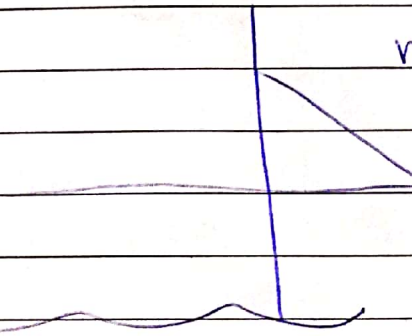
to make any signal even

$$ev|x(t)| = (x(t) + x(-t)) * \frac{1}{2}$$



$$odd|x(t)| = (x(t) - x(-t)) * \frac{1}{2}$$

$$x(t) = ev|x(t)| + od|x(t)|$$



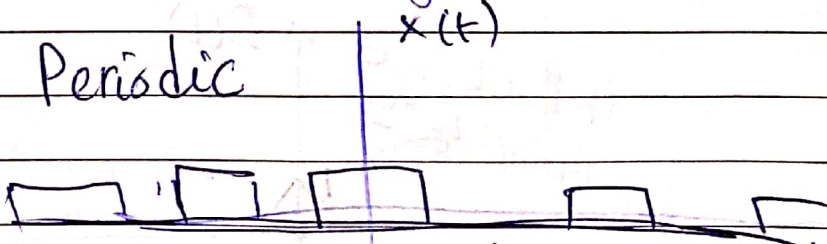
Periodic signals

$x(t) = x(t+T)$

T is the Period

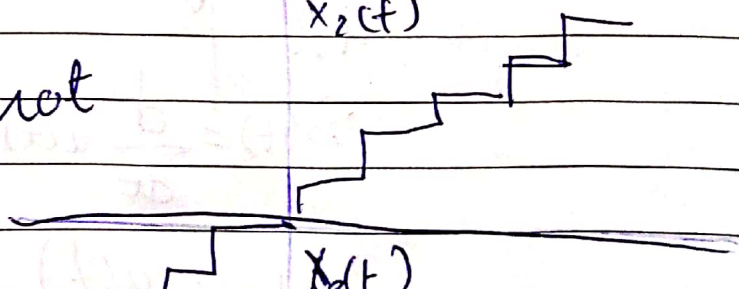
$-\infty \leq t \leq \infty$

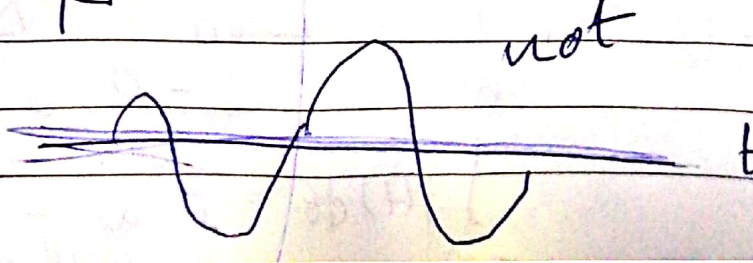
↳ repeat yourself forever



Periodic

not



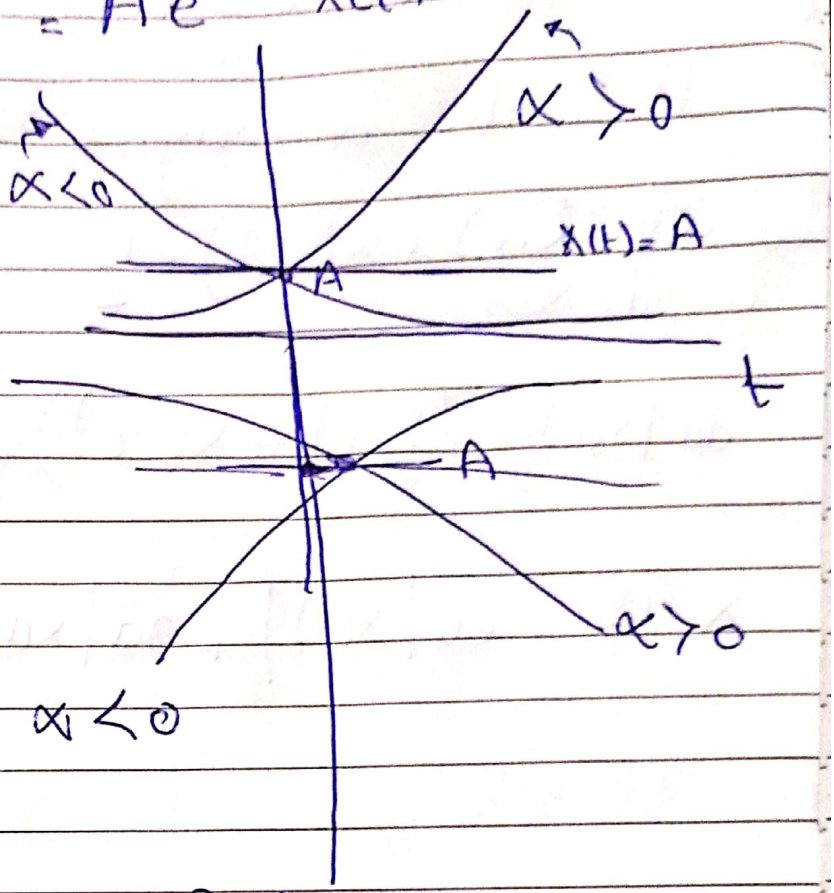


exponential signals

$$x(t) = Ae^{\alpha t}$$

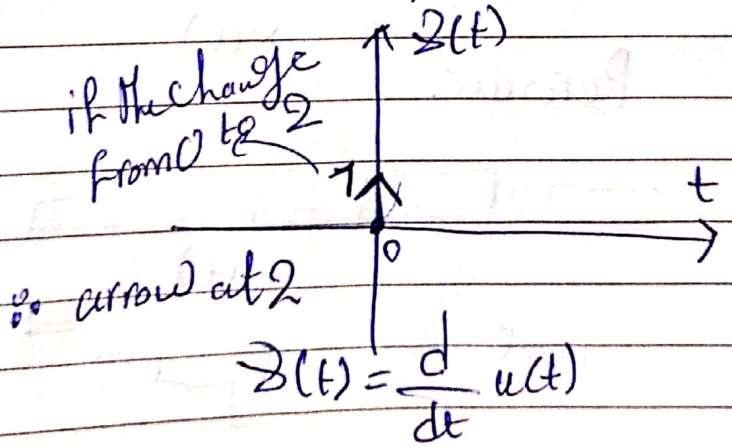
x(t)

A > 0



unit step function

unit impulse



$$\delta(t) = \frac{d}{dt} u(t)$$

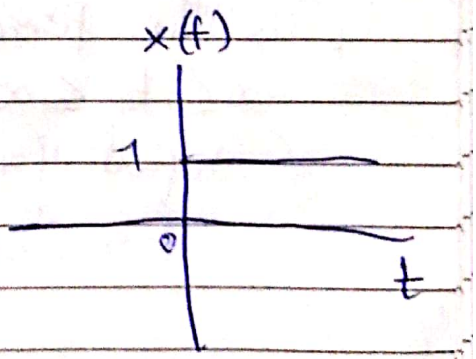
$$= \lim_{\Delta \to 0} \frac{u(t) - u(t-\Delta)}{\Delta}$$

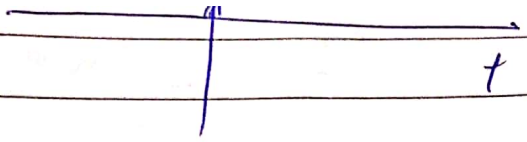
$$= \frac{1-0}{0} = \infty$$

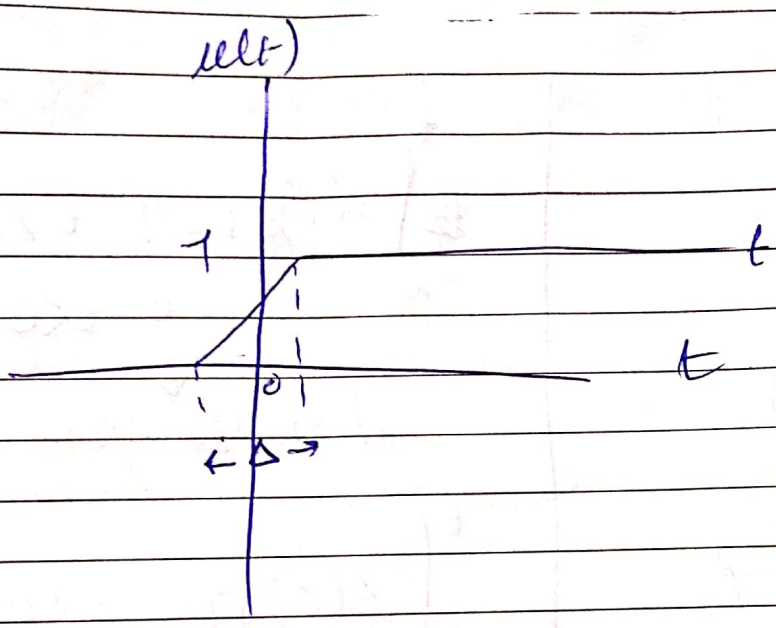
$$\int_{-\infty}^{\infty} f(t)\,dt = 0 \cdot \infty = \text{undefined}$$

for this graph

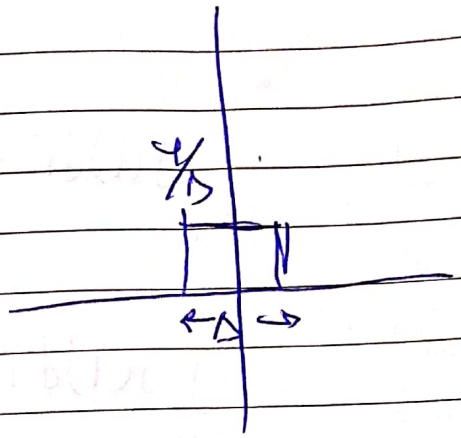
$$u(t) = 1 \quad t \geq 0$$
$$= 0 \quad t < 0$$







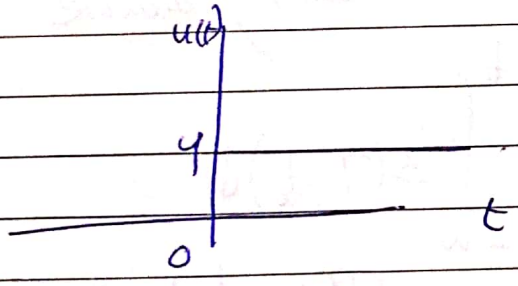
Actual $\delta(t)$



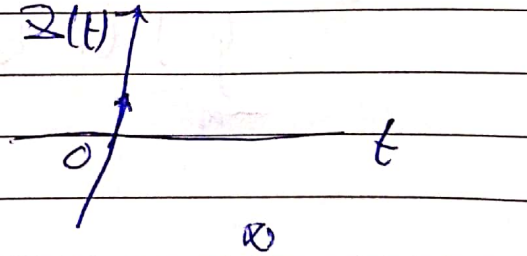
$$\delta(t) = \frac{d}{dt}\, u(t) = \lim \frac{u(t) - u(t-\Delta)}{\Delta}$$

$$\int_{-\infty}^{\infty} \delta(t)\,dt = \frac{1}{\Delta} \cdot \Delta = 1$$

Approximate $u(t)$



Approximate $\delta(t)$

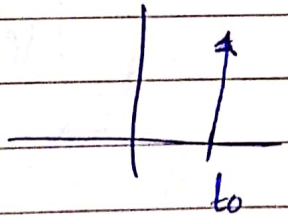


$$\int_{-\infty}^{\infty} \delta(t)\,dt = 1 = \int_{-\infty}^{\infty} \delta(\tau)\,d\tau = 1$$

$$\int_{-\infty}^{\infty} \delta(\tau)\,d\tau = 1$$

$$\int_{-\infty}^{t} \delta(\tau)\,d\tau = u(t)$$

$$\int_{-\infty}^{\infty} \delta(t-t_0)\,dt = 1$$



$$\int_{-\infty}^{\infty} \delta(\tau-t_0)\,d\tau = 1$$

$$\int_{-\infty}^{t} \delta(\tau)\,d\tau = 1 \quad t>0$$

$$= 0 \quad t<0$$

unit step function

$$\int_{-\infty}^{t} \delta(\tau)\,d\tau = u(t)$$

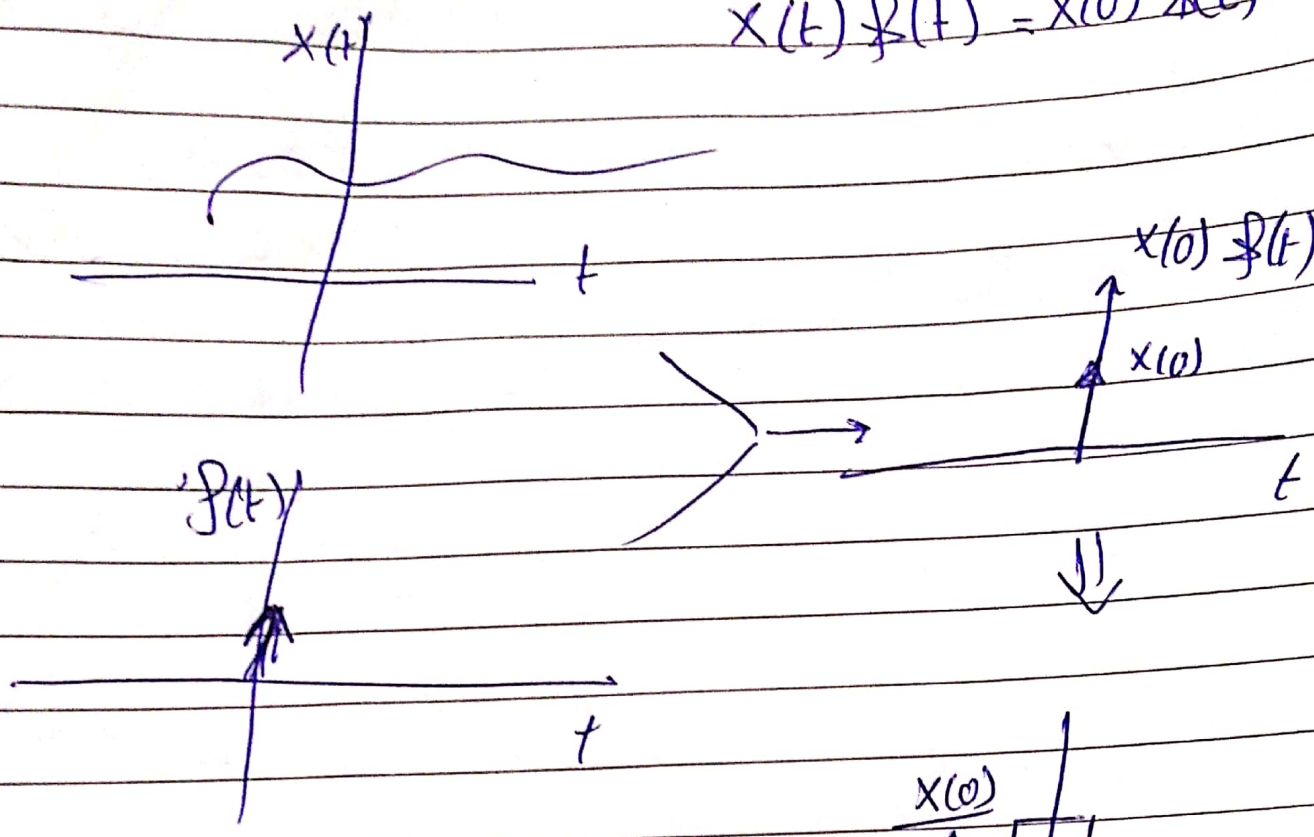
dummy variable

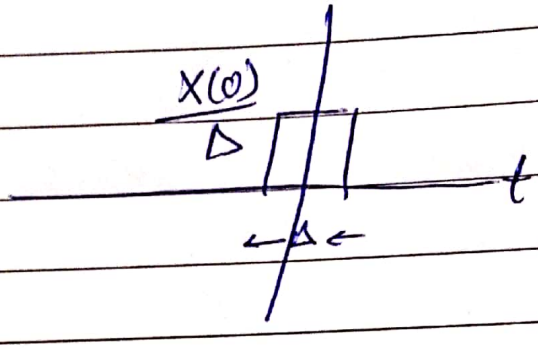
$$\int_{-\infty}^{t} \delta(\tau-t_0)\,d\tau =$$

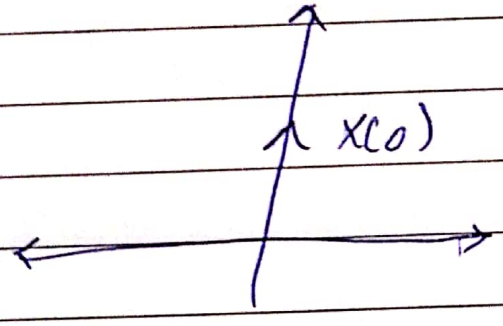
$$u(t-t_0) = 1 \quad t>t_0$$

$$= 0 \quad t<t_0$$

$x(t)\,\delta(t) = x(0)\,\delta(t)$







$$\int_{-\infty}^{\infty} x(0)\,\delta(t)\,dt = x(0)\int_{-\infty}^{\infty} \delta(t)$$

$$= x(0) \times 1$$

$$\int_{-\infty}^{\infty} x(\tau)\,\delta(t)\,d\tau$$

$$= x(0)$$