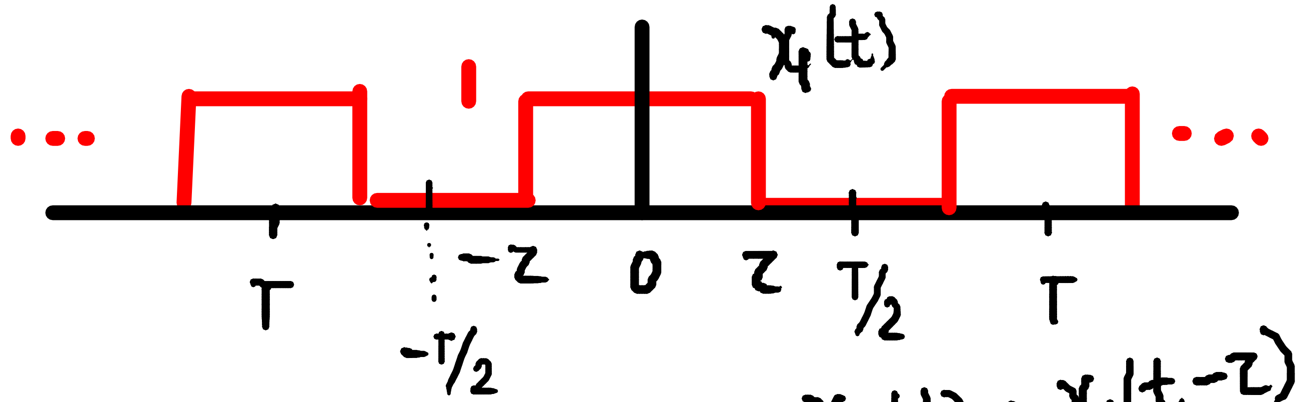
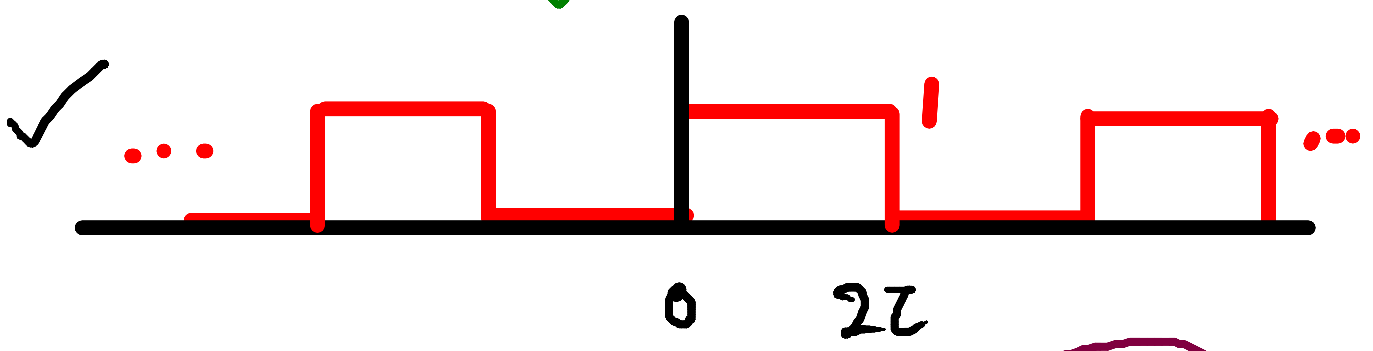


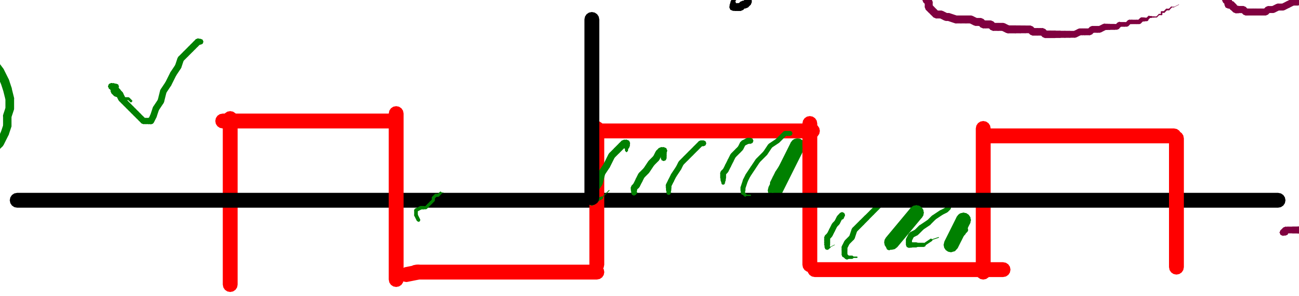
$x_2(t) = x_1(t-\tau)$

A

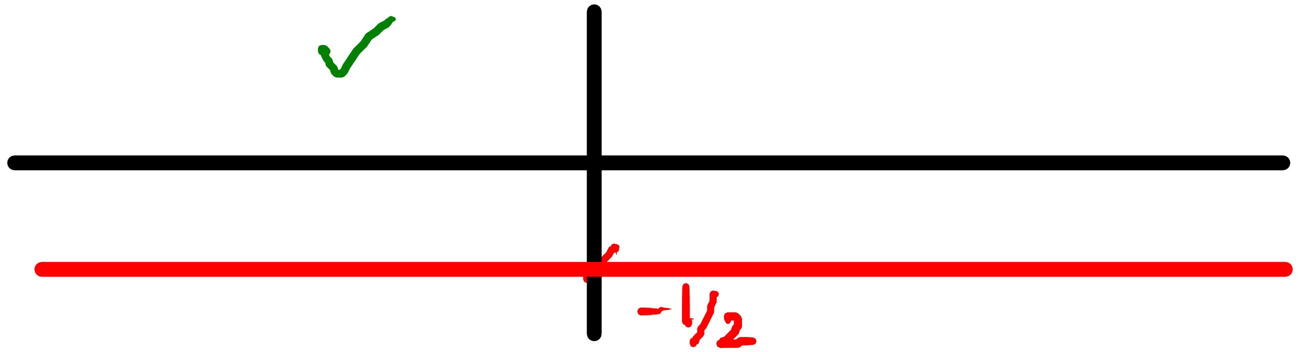


$x_3(t) = x_1(t-\tau) - \frac{1}{2}$

C



B



$a_0 = \frac{2\tau}{T}$ $\qquad a_k = \frac{\sin(\omega_0 k\tau)}{k\pi}$

a_k $\qquad x(t) \xleftrightarrow{FS} a_k$

$x(t-t_0) \longleftrightarrow (e^{-j\omega_0 k\tau})\, a_k$

$\tau = \frac{T}{4}$ $\qquad a_0 = \frac{2\tau}{T}$ $\qquad k = 0$

$c_0 = a_0 + b_0$

$c_k = a_k + b_k$ $\qquad c_k = a_k + b_k$

$k \neq 0$

$c_k = (e^{-j\omega_0 k\tau})\left(\frac{\sin \omega_0 k\tau}{k\pi}\right)$

$b_k \Rightarrow b_0 = \frac{-1}{2}$

Discrete-time Fourier Series :

<u>CTFS</u>

$$x(t) = \sum_{k=-\infty}^{\infty} a_k e^{j\omega_0 k t}$$

$$a_k = \frac{1}{T} \int_{\langle T \rangle} x(t) e^{-j\omega_0 k t} \, dt$$

$$\omega_0 = \frac{2\pi}{T}$$

<u>Not Periodic</u>

<u>DTFS</u>

$$x[n] = \sum_{k=\langle N \rangle} a_k e^{j\omega_0 k n}$$

$$a_k = \frac{1}{N} \sum_{n=\langle N \rangle} x[n] e^{-j\omega_0 k n}$$

<u>Periodic</u>

$$\boxed{a_k = a_{k+N}}$$

e.g

CT

$$x(t) = \cos\left(\frac{2\pi}{5}t\right)$$

$$x(t) = \sum_{\langle k \rangle} a_k e^{j\omega_0 k t}$$

$$= a_0 e^{j\omega_0 0 t} + a_1 e^{j\omega_0 1 t} + a_{-1} e^{j\omega_0 (-1) t}$$

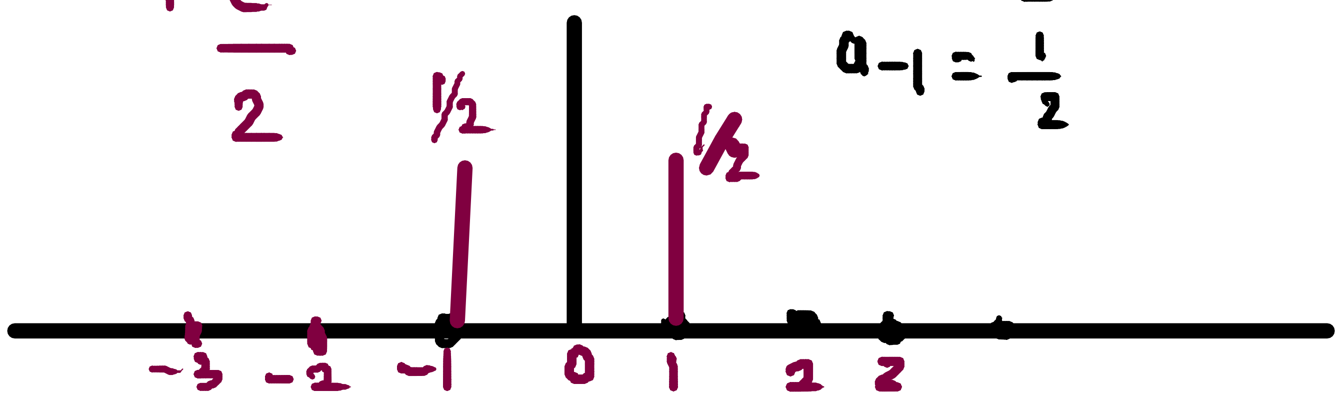
$$+ a_2 e^{j\omega_0 2 t} + a_{-2} e^{j\omega_0 (-2) t}$$

$$\vdots$$

$$0 + \frac{e^{j\frac{2\pi}{5}t}}{2} + \frac{e^{-j\frac{2\pi}{5}t}}{2}$$

$$a_1 = \frac{1}{2}$$

$$a_{-1} = \frac{1}{2}$$



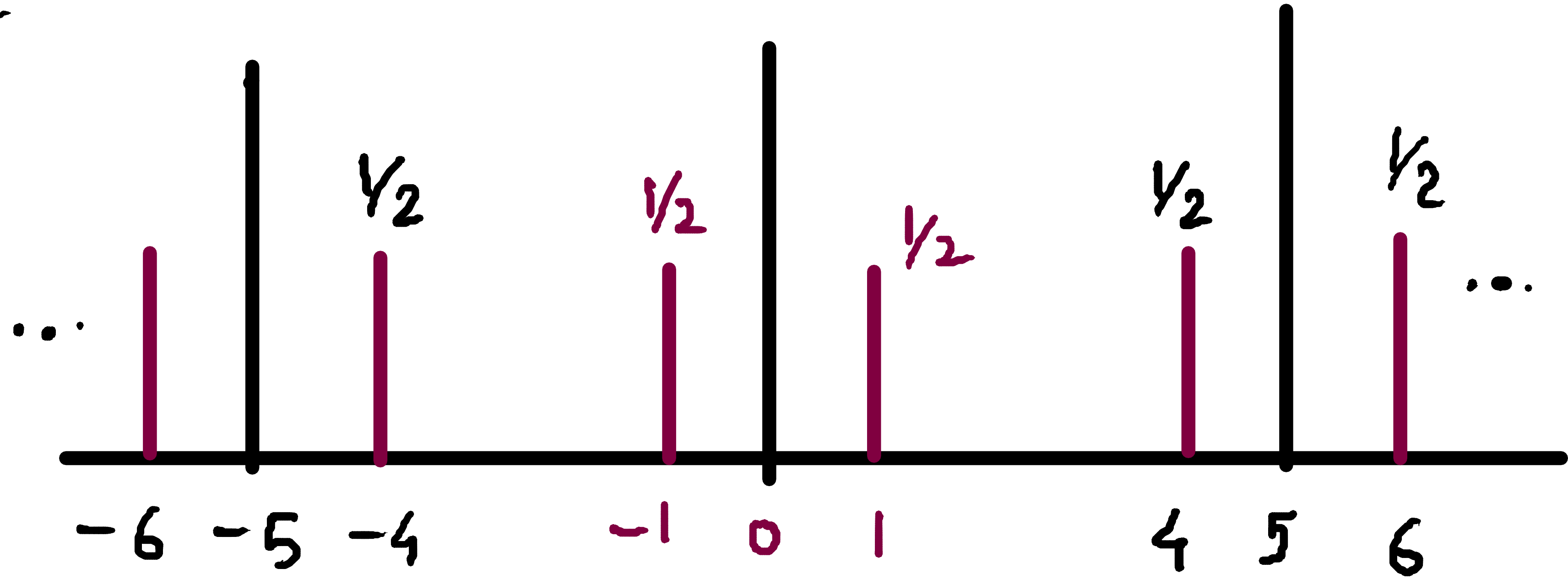
DT

$$\omega_0 = \frac{2\pi}{N}$$

$$x[n] = \cos\left(\frac{2\pi}{5}n\right)$$

$$N = 5$$

$$x[n] = \frac{e^{j\frac{2\pi}{5}n}}{2} + \frac{e^{-j\frac{2\pi}{5}n}}{2}$$



0 to 5

$$e^{j\frac{2\pi}{5}n}$$

$$e^{j\frac{2\pi}{5}6}$$

$$e^{j\frac{2\pi}{5}} = e^{j\frac{2\pi}{5}(5+1)} = e^{j\frac{2\pi}{} + \frac{2\pi}{5}} = e^{j\frac{2\pi}{5}}$$

Parseval's Theorem :

$$\boxed{\frac{1}{T}\int_{\langle T\rangle} |x(t)|^2\,dt = \sum_{\langle k\rangle} |a_k|^2}$$