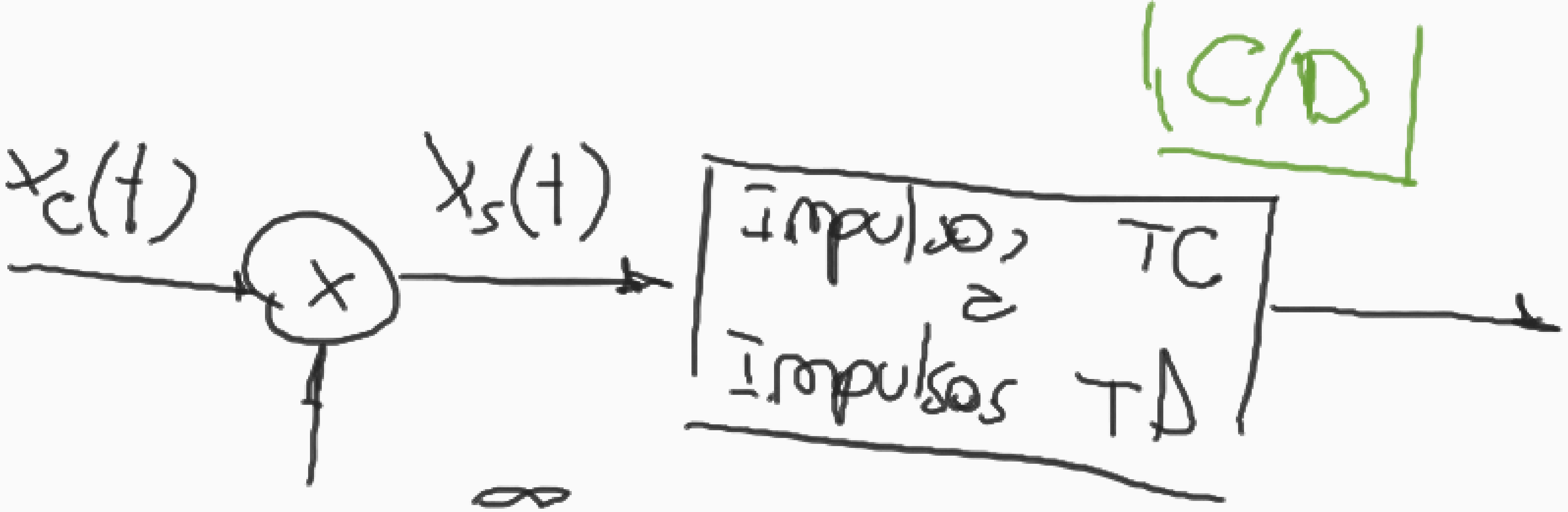
$x_c(t)$ $\frac{1}{T}$

$x_c(t) \longrightarrow \boxed{C/D} \longrightarrow x[n] = x_c(nT)$

$\uparrow T$

$\boxed{ADC}$ → Discretización en tiempo y en amplitud

$\boxed{C/D}$ → Discret. en tiempo

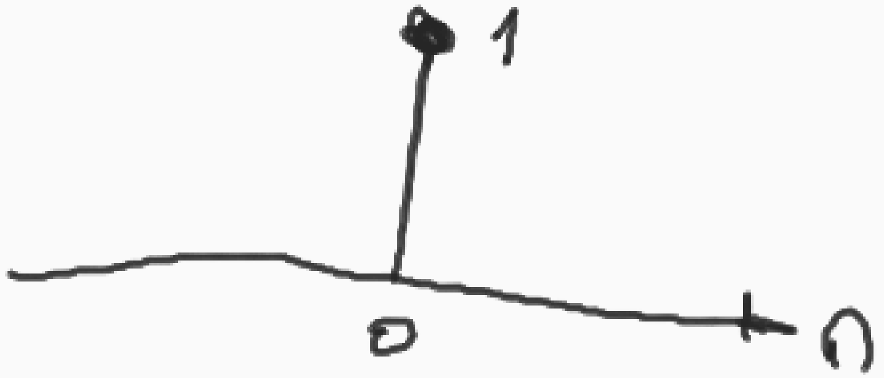


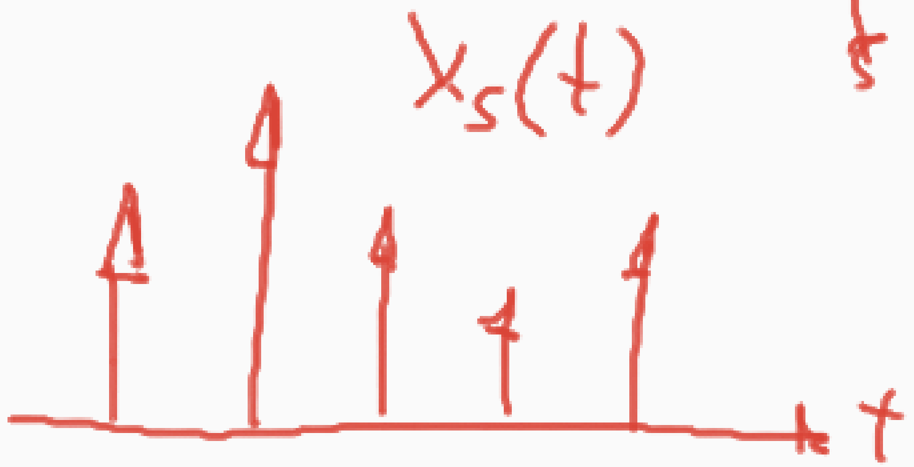
$x[n] = x_c(nT)$

$$s(t) = \sum_{n=-\infty}^{\infty} \delta(t - nT)$$

$$\delta(t) = \begin{cases} 0 & t \neq 0 \\ \int_{-\infty}^{\infty} \delta(t)\, dt = 1 \end{cases}$$

$\delta[n]$





$$x_s(t) = x_c(t) \sum_{n=-\infty}^{\infty} \delta(t - nT) = \sum_{n=-\infty}^{\infty} x_c(t)\, \delta(t - nT)$$

$$x(t)\, \delta(t - t_0) = x(t_0)\, \delta(t - t_0)$$

$$x_s(t) = \sum_{n=-\infty}^{\infty} x_c(nT)\, \delta(t - nT)$$

$$x_s(t) = \sum_{n=-\infty}^{\infty} x[n]\, \delta(t - nT)$$

$$S(t) = \sum_{n=-\infty}^{\infty} \delta(t - nT) \longrightarrow \text{Representar en SF}$$

$$S(t) = \sum_{k=-\infty}^{\infty} a_k \, e^{jk\frac{2\pi}{T}t}$$

$$S(t) = S(t+T) = S(t+2T)$$

$$a_k = \frac{1}{T} \int_T S(t) \, e^{-jk\frac{2\pi}{T}t} \, dt$$

$$\omega = k\frac{2\pi}{T}$$

$$a_k = \frac{1}{T} S(j\omega) \Big|_{\omega = k\frac{2\pi}{T}}$$

$$a_k = \frac{1}{T}$$

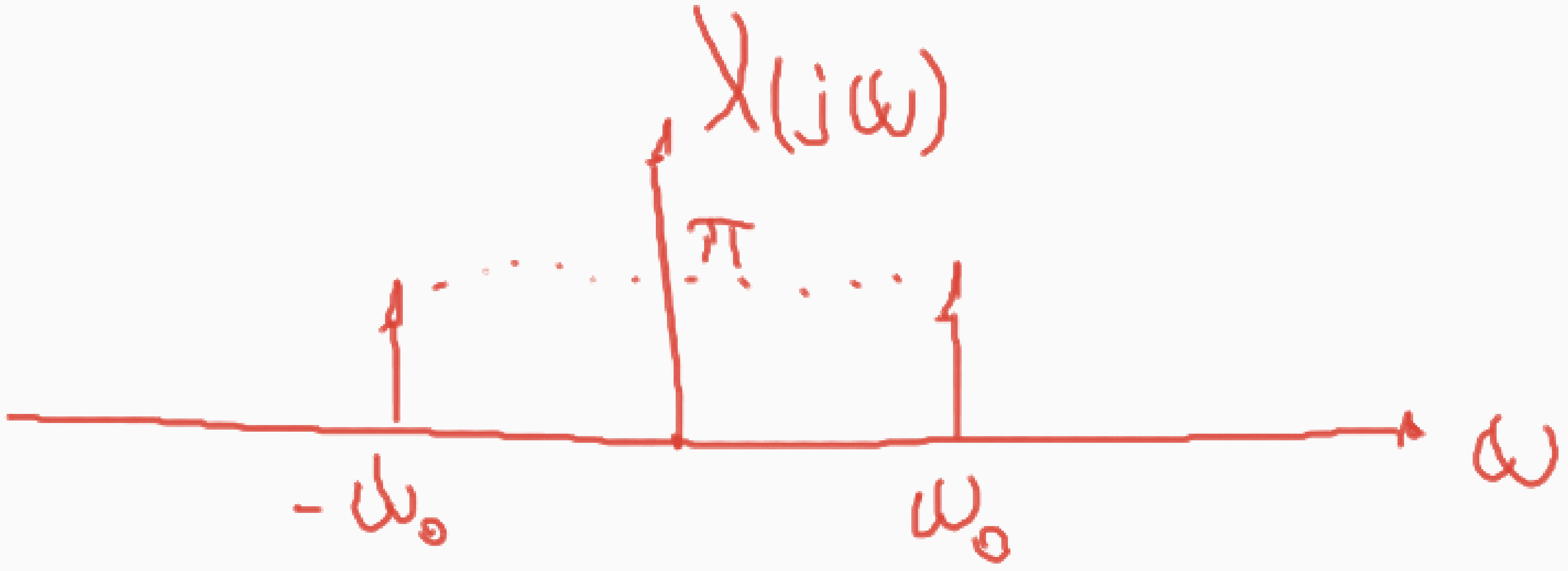
$$s(t) = \sum_{k=-\infty}^{\infty} a_k e^{jk\frac{2\pi}{T}t} = \frac{1}{T} \sum_{k=-\infty}^{\infty} e^{jk\frac{2\pi}{T}t}$$

$$\downarrow \mathcal{F}$$

$$S(j\omega) = \sum_{k=-\infty}^{\infty} 2\pi \, a_k \, \delta\left(\omega - \frac{2\pi}{T}k\right)$$

$$x(t) = \cos(\omega_0 t)$$

$$a_1 = \frac{1}{2} \qquad a_{-1} = \frac{1}{2}$$



$$S(j\omega) = \frac{2\pi}{T} \sum_{k=-\infty}^{\infty} \delta(\omega - k\omega_s) \qquad \omega_s = \frac{2\pi}{T}$$

$$x_s(t) = x_c(t)\, s(t)$$

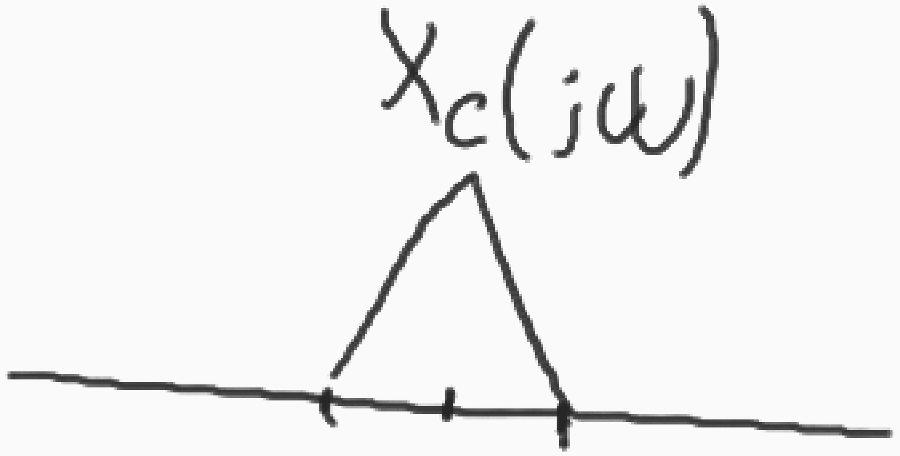
$$x(t) * h(t) \xrightarrow{\mathcal{F}} X(j\omega) H(j\omega)$$

$$x(t)\, h(t) \xrightarrow{\mathcal{F}} \frac{1}{2\pi} X(j\omega) * H(j\omega)$$

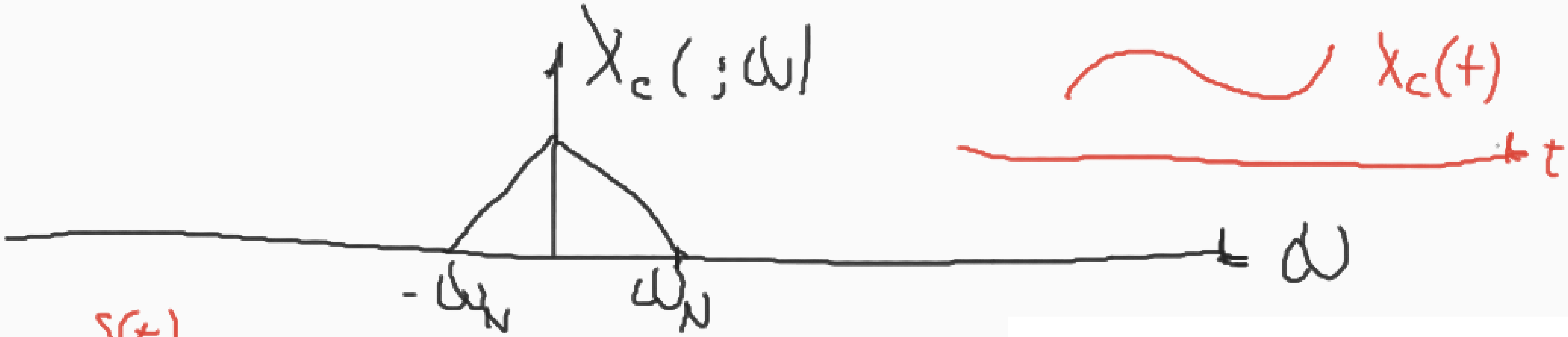
$$X_s(j\omega) = \frac{1}{2\pi} X_c(j\omega) * S(j\omega)$$

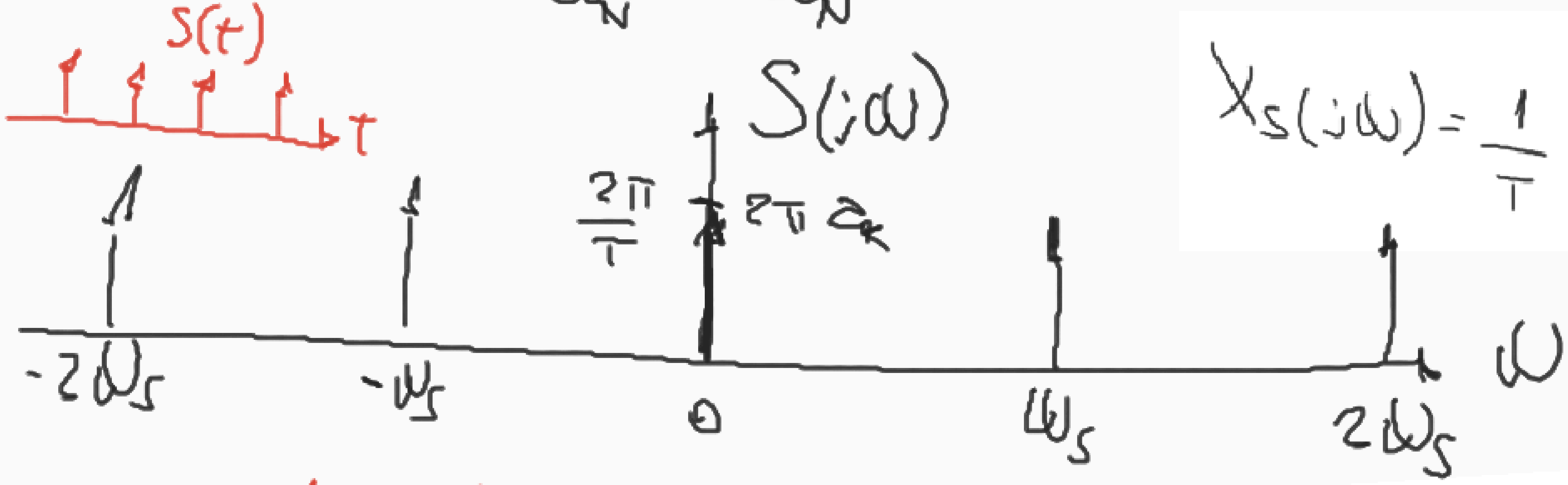
$$X_s(j\omega) = \frac{1}{\cancel{2\pi}} X_c(j\omega) * \frac{\cancel{2\pi}}{T} \sum_{k=-\infty}^{\infty} \delta(\omega - k\omega_s)$$

$$X_s(j\omega) = \frac{1}{T} \sum_{k=-\infty}^{\infty} X_c(j\omega) * \delta(\omega - k\omega_s)$$



$$X_s(j\omega) = \frac{1}{T} \sum_{k=-\infty}^{\infty} X_c(\omega - k\omega_s)$$





$$X_s(j\omega) = \frac{1}{T}\sum_{k=-\infty}^{\infty} X_c(\omega - k\omega_s)$$

$$S(j\omega) = \frac{2\pi}{T}\sum_{k=-\infty}^{\infty}\delta(\omega - k\omega_s)$$