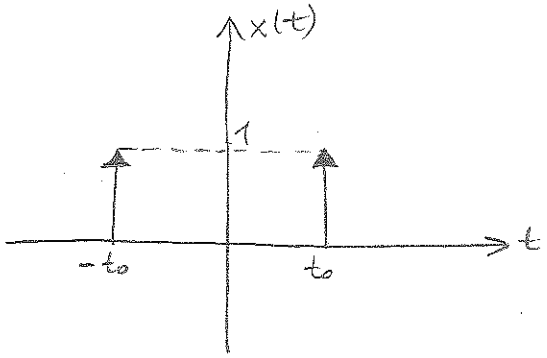
Example



$X(\omega) = ?$

$x(t) = \delta(t-t_o) + \delta(t+t_o)$

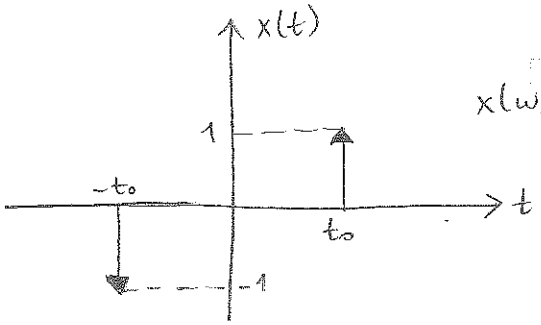
$X(\omega) = \int_{-\infty}^{\infty} x(t)\, e^{-j\omega t}\, dt$

$= \int_{-\infty}^{\infty} [\delta(t+t_o) + \delta(t-t_o)] e^{-j\omega t}\, dt$

$= e^{j\omega t_o} + e^{-j\omega t_o}$

$= \boxed{2\cos(\omega t_o)}$

Example



$X(\omega) = ?$

$X(\omega) = \int_{-\infty}^{\infty} x(t)\, e^{-j\omega t}\, dt$

$= \int_{-\infty}^{\infty} [\delta(t-t_o) - \delta(t+t_o)] e^{-j\omega t}\, dt$

$= e^{-j\omega t_o} - e^{j\omega t_o} = \boxed{-2j\sin(\omega t_o)}$

Example

$x(t) \longrightarrow$ periodic with T

$y(t) \longrightarrow$ periodic with T

Show that

$x(t).y(t) \xleftrightarrow{FSC} x[k] * y[k]$

$z(t) = x(t).y(t)$

$z[k] = \frac{1}{T}\int_T z(t)\, e^{-jk\frac{2\pi}{T}t}\, dt = \frac{1}{T}\int \underbrace{x(t)\, y(t)}\, e^{-jk\frac{2\pi}{T}t}\, dt$

$\left(\sum_m x[m]\, e^{jm\frac{2\pi}{T}t}\right)$

$= \sum_m x[m] \underbrace{\frac{1}{T}\int_T y(t)\, e^{-j(k-m)\frac{2\pi}{T}t}\, dt}_{y[k-m]}$

$= \sum_m x[m]\, y[k-m] = x[k] * y[k]$