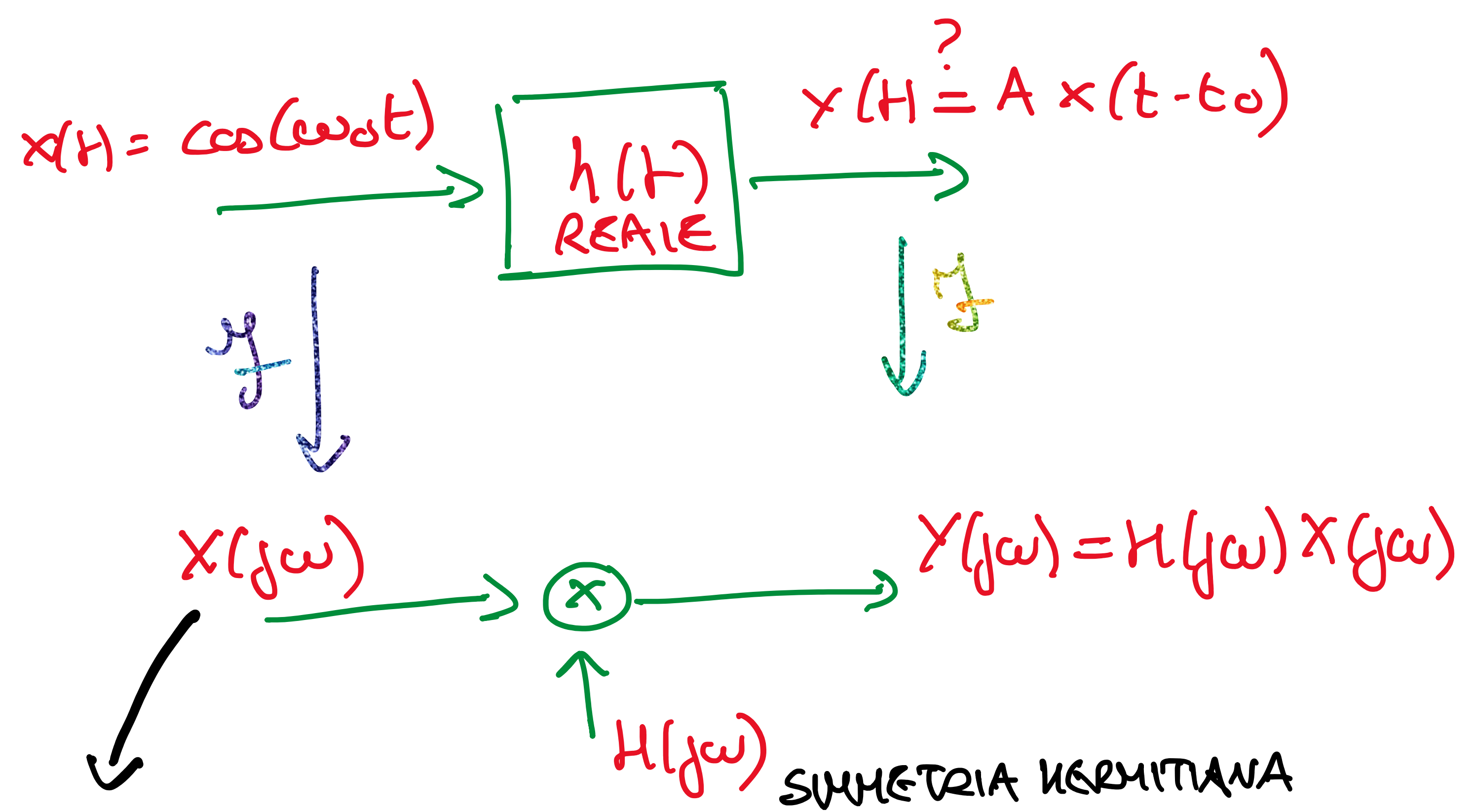
Le20

mercoledì 3 maggio 2023 21:54

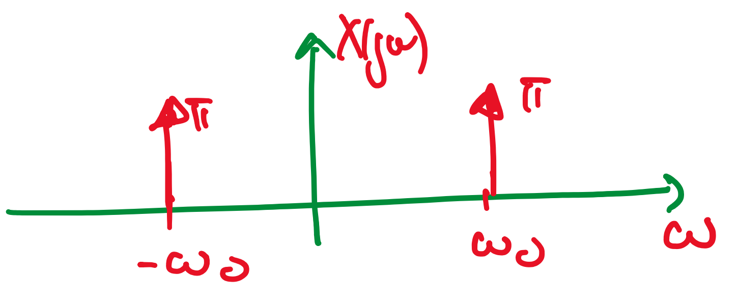
ES1

FILTRO REALE $h(t)$ DISTORCE $x(t) = \cos(2\pi f_0 t)$?
$= \cos(\omega_0 t)$



SIMMETRIA HERMITIANA
$H(-j\omega) = H^*(j\omega)$

$$X(j\omega) = \pi\delta(\omega - \omega_0) + \pi\delta(\omega + \omega_0)$$



$$Y(j\omega) = H(j\omega)\left[\pi\delta(\omega - \omega_0) + \pi\delta(\omega + \omega_0)\right]$$

$$= \pi H(j\omega_0)\delta(\omega - \underline{\omega_0}) + \pi H(j\omega_0)\delta(\omega + \underset{-\omega_0}{\underline{\omega_0}})$$

SIMM. HERMIT.
$H^*(j\omega_0)$

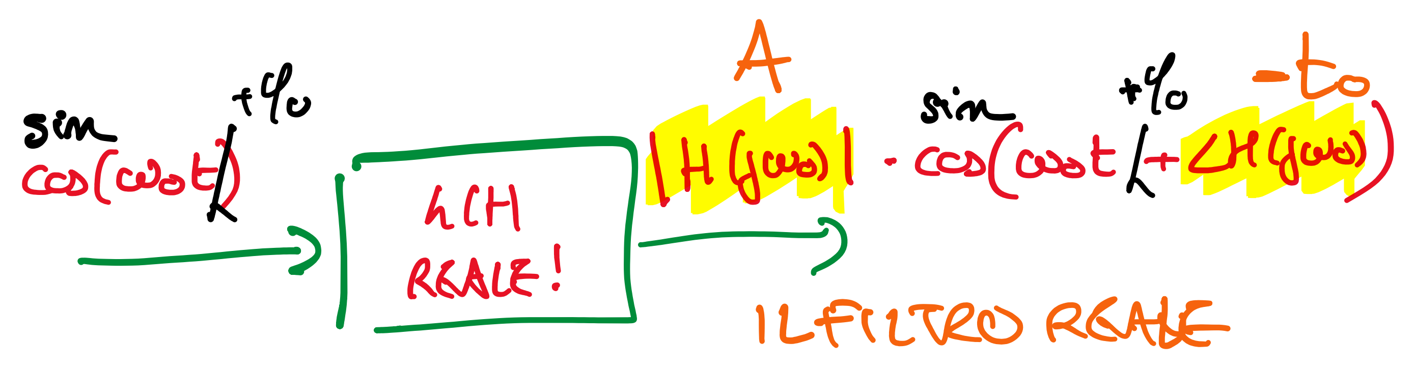
$$Y(j\omega) = \pi H(j\omega_0)\delta(\omega - \omega_0) + \pi H^*(j\omega_0)\delta(\omega + \omega_0)$$

$$Y(t) = \frac{1}{2}H(j\omega_0)e^{j\omega_0 t} + \frac{1}{2}H^*(j\omega_0)e^{-j\omega_0 t}$$

$$= \mathrm{Re}\Big[\underbrace{H(j\omega_0)}_{|H(j\omega_0)|\,e^{j\angle H(j\omega_0)}}e^{j\omega_0 t}\Big]$$

$$= |H(j\omega_0)|\,\mathrm{Re}\left[e^{j(\omega_0 t + \angle H(j\omega_0))}\right]$$

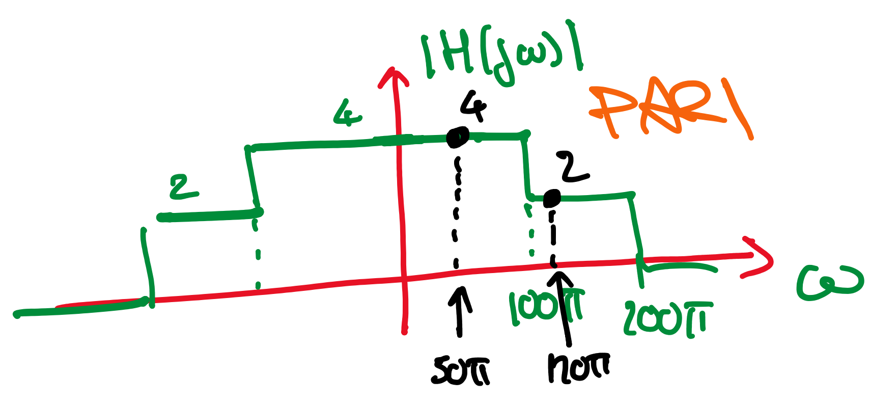
$$\boxed{y(t) = |H(j\omega_0)|\cos(\omega_0 t + \angle H(j\omega_0))}$$

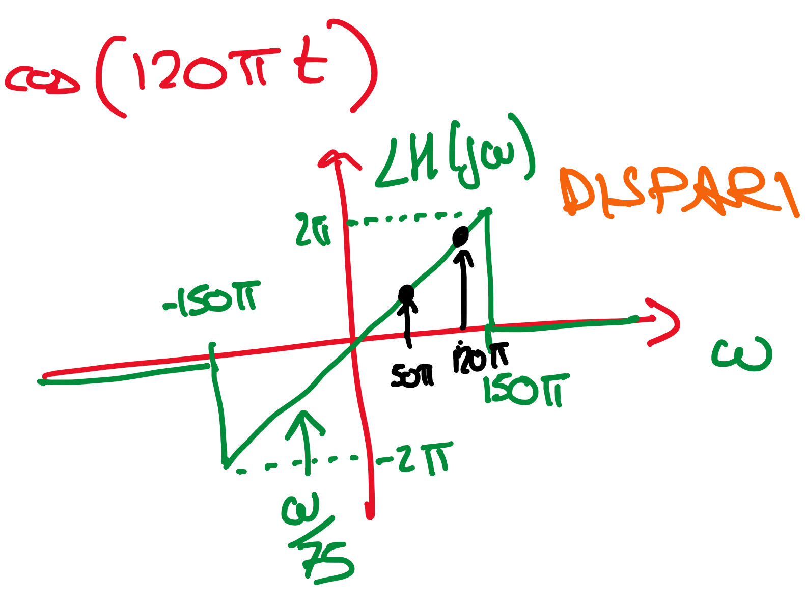


IL FILTRO REALE
NON DISTORCE
LA SINUSOIDE

ES2

$$x(t) = \cos(50\pi t) + 5\cos(120\pi t)$$





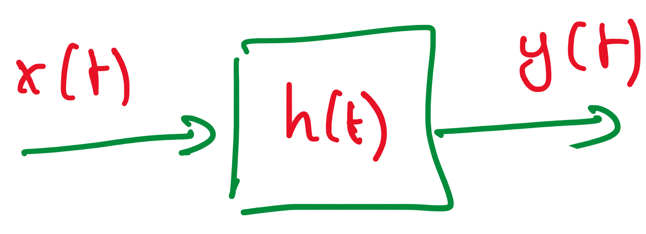
IL FILTRO DISTORCE IL SEGNALE? SI

$$y(t) = 4\cos\left(50\pi t + \frac{50\pi}{75}\right) + 5 \cdot 2\cos\left(120\pi t + \frac{120\pi}{75}\right)$$

$$= 4\cos\left(50\pi\left(t + \frac{1}{75}\right)\right) + 5 \cdot 2\cos\left(120\pi\left(t + \frac{1}{75}\right)\right)$$

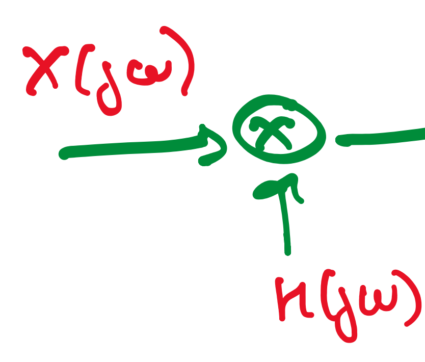
MI DISTORCE IL SEGNALE

ES3



$x(t) = \mathrm{triangle}(t/3)$
$y(t) = \mathrm{triangle}\left(\frac{t+2}{3}\right) + 2\,\mathrm{triangle}\left(\frac{t}{3}\right) + 4\,\mathrm{triangle}\left(\frac{t-1}{3}\right)$

1) $H(j\omega) = ?$
2) $h(t) = ?$ → DECONVOLUZIONE
3) BIBO STABILE?
4) $z(t) = h * 1(t) = ?$



$Y(j\omega) = X(j\omega)\overset{?}{H(j\omega)}$

$$H(j\omega) = \frac{Y(j\omega)}{X(j\omega)} = \frac{\cancel{3\,\mathrm{sinc}^2\left(\frac{3\omega}{2\pi}\right)}\left[e^{j2\omega} + 2 + 4e^{-j\omega}\right]}{\cancel{3\,\mathrm{sinc}^2\left(\frac{3\omega}{2\pi}\right)}}$$

$$= 2 + e^{j2\omega} + 4e^{-j\omega}$$

$$h(t) = 2\delta(t) + \delta(t+2) + 4\delta(t-1)$$