

EECE 233 Fall 2014 Lec. # 18

Announcement

Quiz, MATLAB this Friday.

Supplemental lecture " "

1. 9:30-10:45

2. 15:30-16:30 ←

Review

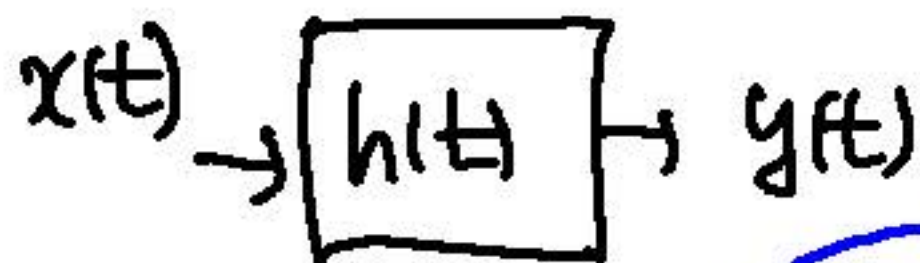


$$x(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} X(j\omega) \boxed{e^{j\omega t}} d\omega$$

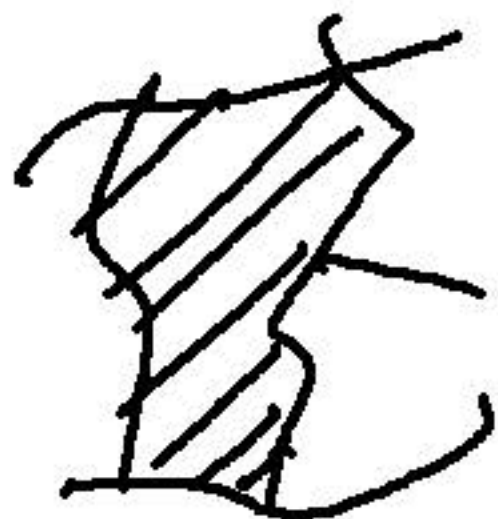
$$\begin{aligned} y(t) &= \frac{1}{2\pi} \int_{-\infty}^{\infty} X(j\omega) \boxed{H(j\omega) e^{j\omega t}} d\omega \\ &= \frac{1}{2\pi} \int_{-\infty}^{\infty} Y(j\omega) e^{j\omega t} d\omega \end{aligned}$$

$$Y(j\omega) = X(j\omega) H(j\omega)$$

$$y(t) = x(t) * h(t)$$

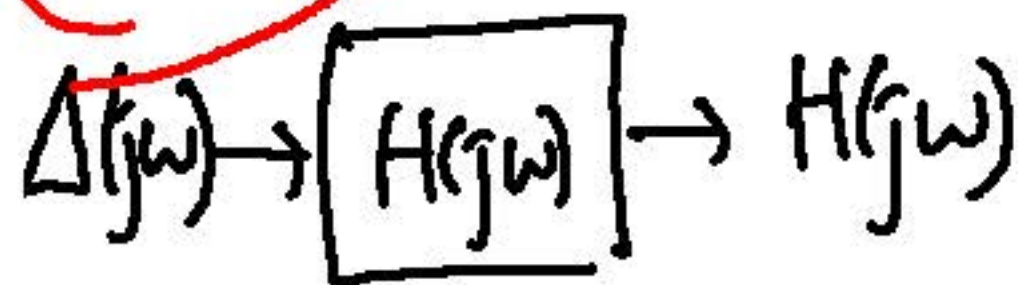


Block diagram showing an input signal $X(j\omega)$ entering a block labeled $H(j\omega)$, which produces an output signal $Y(j\omega) = X(j\omega) H(j\omega)$.



Block diagram showing an input signal $\delta(t - t_0)$ entering a block labeled $h(t)$, which produces an output signal $h(t - t_0)$.

Block diagram showing an input signal $\delta(t - t_0)$ entering a block labeled $h(t)$, which produces an output signal $h(t - t_0)$.



Fourier Transform (FT) relationship between the time domain signal $\delta(t)$ and the frequency domain signal $1, \forall \omega$.

Fourier Transform (FT) relationship between the time domain signal $\delta(t - t_0)$ and the frequency domain signal $H(j\omega) e^{-j\omega t_0}$.

Fourier Transform (FT) relationship between the time domain signal $\delta(t - t_0)$ and the frequency domain signal $H(j\omega) e^{-j\omega t_0}$.

- Synthesis eq. $x(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} X(j\omega) e^{j\omega t} d\omega$

$$x(0) = \frac{1}{2\pi} \int_{-\infty}^{\infty} X(j\omega) d\omega$$

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

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

duality
상대성

$$\left[\begin{aligned} f_X(x) &= \frac{1}{\sqrt{2\pi}\sigma} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right) \\ \Phi_X(\omega) &= \exp(j\omega\mu - \frac{\sigma^2\omega^2}{2}) \end{aligned} \right] \leftarrow \begin{aligned} &\text{CLT} \\ &(\text{central} \\ &\text{limit} \\ &\text{theorem}) \end{aligned}$$

Q. $x(t) \leftrightarrow X(j\omega)$

Find CTFT of $x(-t)$.

$$(ab)^* = a^* b^*$$

$$\begin{aligned}
 X(j\omega) &= \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt \\
 X^*(j\omega) &= \left(\int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt \right)^* = \int_{-\infty}^{\infty} (x(t) e^{-j\omega t})^* dt \\
 &= \int_{-\infty}^{\infty} x^*(t) e^{j\omega t} dt = X(j(-\omega))
 \end{aligned}$$

$\int_{-\infty}^{\infty} x(-t) e^{-j\omega t} dt$
 $= \int_{-\infty}^{\infty} x(t') e^{-j\omega t'} dt' \quad (t' = -t)$
 $= \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt = X(j\omega)$