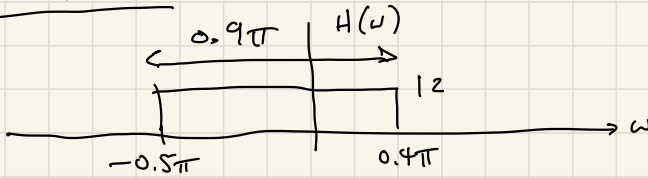


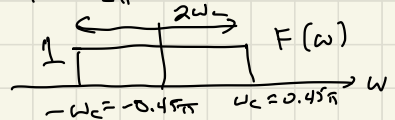
2024 Nov 6



$$h[n] = f[n] g[n]$$

$$\longleftrightarrow H(\omega) = \frac{1}{2\pi} F(\omega) * G(\omega)$$

$$f[n] = \left(\frac{\omega_c}{\pi}\right) \text{sinc}(\omega_c n)$$



$$g[n] = A e^{j\omega_0 n}$$

$$\longleftrightarrow$$

$$G(\omega) = 2\pi A \delta(\omega - \omega_0)$$

$\uparrow 2\pi A = 24\pi$
 $\omega_0 = -0.05\pi$

What are A , ω_c , and ω_0 ?

$$\delta(\omega - \omega_0) * F(\omega) = F(\omega - \omega_0)$$

$$2\pi A \delta(\omega - \omega_0) * F(\omega) = 2\pi A F(\omega - \omega_0)$$

$$H(\omega) = \frac{1}{2\pi} G(\omega) * F(\omega) = A F(\omega - \omega_0) \Rightarrow \boxed{A = 12}$$

$$2\omega_c = 0.9\pi \Rightarrow \boxed{\omega_c = 0.45\pi}$$

$$\boxed{\omega_0 = -0.05\pi}$$

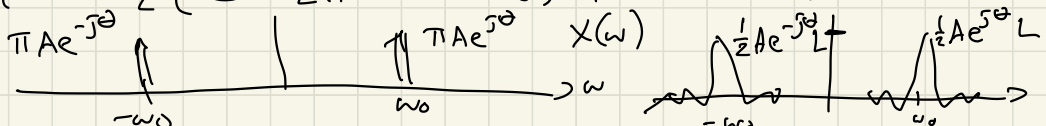
EXAMPLE

$$x[n] = A \cos(\omega_0 n + \theta) \longleftrightarrow X(\omega) = ?$$

$$y[n] = w[n] x[n] \longleftrightarrow Y(\omega) = ?$$

$$x[n] = \frac{A}{2} \left(e^{j\omega_0 n} e^{j\theta} + e^{-j\omega_0 n} e^{-j\theta} \right)$$

$$X(\omega) = \frac{A}{2} \left(e^{j\theta} 2\pi \delta(\omega - \omega_0) + e^{-j\theta} 2\pi \delta(\omega + \omega_0) \right)$$



$$Y(\omega) = \frac{A}{2} \left(e^{j\theta} w(\omega - \omega_0) + e^{-j\theta} w(\omega + \omega_0) \right)$$