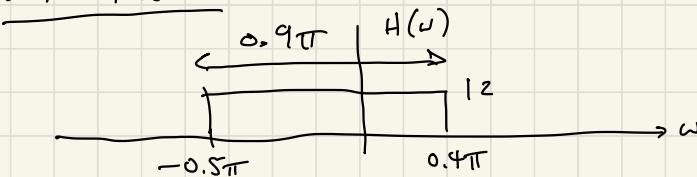
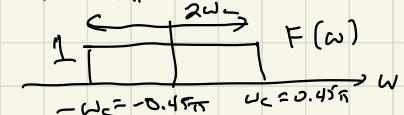


2024 Nov 6



$$h[n] = f[n]g[n] \longleftrightarrow H(w) = \frac{1}{2\pi} F(w) * G(w)$$

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



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

$$G(w) = 2\pi A \delta(w - \omega_0) \quad \boxed{\begin{array}{l} 2\pi A = 24\pi \\ \omega_0 = -0.05\pi \end{array}}$$

What are A , ω_c , and ω_0 ?

$$S(w - \omega_0) * F(w) = F(w - \omega_0)$$

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

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

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

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

EXAMPLE

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

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

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

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

$\pi A e^{-j\theta} \uparrow$ $\pi A e^{j\theta} \downarrow$ $X(\omega)$ $\frac{1}{2} A e^{-j\theta} L \uparrow$ $\frac{1}{2} A e^{j\theta} L \downarrow$
 ω_0 ω_0 w $-\omega_0$ ω_0

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