

Q14:

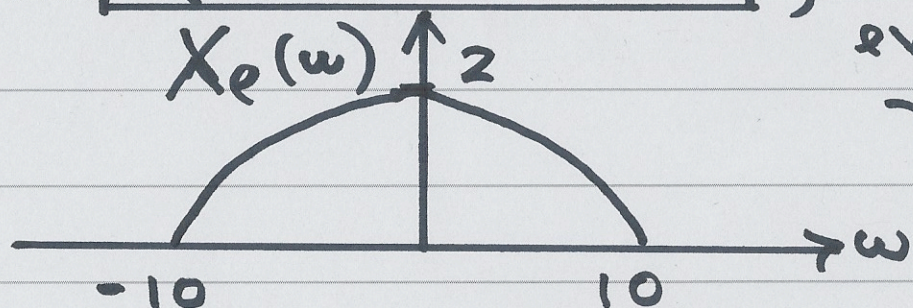
$$x_e(t) = \frac{\sin\left(10\left(t - \frac{\pi}{20}\right)\right)}{\pi\left(t - \frac{\pi}{20}\right)} + \frac{\sin\left(10\left(t + \frac{\pi}{20}\right)\right)}{\pi\left(t + \frac{\pi}{20}\right)}$$

$$t_0 = \frac{\pi}{2W}$$

$$W = 10$$

$$x_e(-t) = x_e(t)$$

} real-valued and even-symmetric



} $X_e(\omega)$ real-valued
even-symmetric
purely non-negative

• Then: $x(t) = x_e\left(t - \frac{\pi}{20}\right) \Rightarrow X(\omega) = X_e(\omega) e^{-j\frac{\omega\pi}{20}}$

$$= \frac{\sin\left(10\left(t - \frac{\pi}{20} - \frac{\pi}{20}\right)\right)}{\pi\left(t - \frac{\pi}{20} - \frac{\pi}{20}\right)} + \frac{\sin\left(10\left(t - \frac{\pi}{20} + \frac{\pi}{20}\right)\right)}{\pi\left(t - \frac{\pi}{20} + \frac{\pi}{20}\right)}$$

$$= \frac{\sin\left(10\left(t - \frac{\pi}{10}\right)\right)}{\pi\left(t - \frac{\pi}{10}\right)} + \frac{\sin(10t)}{\pi t}$$

$\angle X(\omega) = -\frac{\pi}{20} \omega$