Calcular E_x y P_x

$\forall t \in [-\pi/2, \pi/2]$

* $x(t) = 3t^2$

$$E_x = \int_{-\pi/2}^{\pi/2} |3t^2|^2 \, dt = \int_{-\pi/2}^{\pi/2} (3t^2)(3t^2) \, dt$$

$$= \int_{-\pi/2}^{\pi/2} 9t^4 \, dt$$

$$= \left. \frac{9t^5}{5} \right|_{-\pi/2}^{\pi/2}$$

$$= \frac{9(\pi/2)^5}{5} - \frac{9(-\pi/2)^5}{5}$$

$$= 34.43$$

$$P_x = \frac{1}{t_f - t_i} E_x$$

$$= \frac{1}{\pi}(34.43)$$

$$= 10.96$$

* $x(t) = 5t - j\cos(3t)$

$$E_x = \int_{-\pi/2}^{\pi/2} |5t - j\cos(3t)|^2 \, dt = \int_{-\pi/2}^{\pi/2} (5t - j\cos(3t))(5t + j\cos(3t)) \, dt$$

$$= \int_{-\pi/2}^{\pi/2} 25t^2 + \cancel{5tj\cos(3t)} - \cancel{5tj\cos(3t)} - j^2\cos(3t)^2 \, dt$$

$$= \int_{-\pi/2}^{\pi/2} 25t^2 - j^2\cos(3t)^2 \, dt$$

$$= \int_{-\pi/2}^{\pi/2} 25t^2 - (-1)\cos(3t)^2 \, dt$$

$$= \int_{-\pi/2}^{\pi/2} 25t^2 + \cos(3t)^2 \, dt$$

$$= \int_{-\pi/2}^{\pi/2} 25t^2 \, dt + \int_{-\pi/2}^{\pi/2} \cos(3t)^2 \, dt$$

$$= \frac{25t^3}{3} + \frac{t}{2} + \frac{\operatorname{Sen}(6t)}{12} \Bigg|_{-\pi/2}^{\pi/2}$$

$$= 66.17$$

$$P_x = \frac{1}{t_f - t_i} E_x$$

$$= \frac{1}{\pi} (66.17)$$

$$= 21.06$$

- $e^{(3+j10\pi)t}$

$$E_x = \int_{-\pi/2}^{\pi/2} |e^{(3t+j10\pi t)}|^2 \, dt = \int_{-\pi/2}^{\pi/2} e^{(3t+j10\pi t)} e^{(3t-j10\pi t)} \, dt$$

$$= \int_{-\pi/2}^{\pi/2} e^{(3t + \cancel{j10\pi t} + 3t - \cancel{j10\pi t})} \, dt$$

$$= \int_{-\pi/2}^{\pi/2} e^{6t} \, dt$$

$$= \int_{-\pi/2}^{\pi/2} \frac{1}{6} e^{6t}$$

$$= \frac{e^{6t}}{6} \Bigg|_{-\pi/2}^{\pi/2}$$

$$= \frac{e^{6(\pi/2)}}{6} - \frac{e^{6(-\pi/2)}}{6}$$

$$= 2065.27$$

$$P_x = \frac{1}{t_f - t_i} E_x$$

$$= \frac{1}{\pi} (2065.27)$$

$$= 657.4$$

Determinar si x(t) de Ex o Px ó Ninguna

• $x(t) = A e^{-Kt} u(t), \forall A, K \in R^+$

$$E = \int_{-\infty}^{\infty} |x(t)|^2 dt = \int_{-\infty}^{\infty} A^2 e^{-2Kt} dt$$

$$= A^2 \int_{-\infty}^{\infty} e^{-2Kt} dt$$

$$= A^2 \left[-\frac{1}{2K} e^{-2Kt} \right]_0^{\infty}$$

$\lim_{t \to \infty} e^{-2Kt} = 0$, y en $t = 0, e^{-2K(0)} = 1$

$E = A^2 \cdot \frac{1}{2K}$ Es de energía

• $x(t) = A \cos(Bt), A, B \in R$

$$P = \lim_{T \to \infty} \frac{1}{2T} \int_{-T}^{T} |x(t)|^2 dt$$

$$= \lim_{T \to \infty} \frac{1}{2T} \int_{-T}^{T} A^2 \left(\frac{1}{2} + \frac{1}{2} \cos(2Bt) \right) dt$$

$$= \frac{A^2}{2} \lim_{T \to \infty} \frac{1}{2T} \int_{-T}^{T} 1 \, dt + \frac{A^2}{2} \lim_{T \to \infty} \frac{1}{2T} \int_{-T}^{T} \cos(2Bt) \, dt$$

Primera Integral:

$$\frac{1}{2T} \int_{-T}^{T} 1 \, dt = \frac{1}{2T} \cdot 2T = 1$$

Segunda Integral

$$\frac{1}{2T}\int_{-T}^{T} \cos(2Bt)\,dt = \frac{1}{2T}\cdot 0 = 0$$

$$P = \frac{A^2}{2}$$