Juan David Gallego Rangel
Estefania Nieto Velez

1 Taller

$$v(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos(n\omega_0 t) + b_n \operatorname{Sen}(n\omega_0 t)$$

$$x(t) = v(t+2) + 2 = \frac{a_0}{2} + 2 + \sum_{n=1}^{\infty} a_n \cos(n\omega_0 (t+2)) + b_n \operatorname{Sen}(n\omega_0 (t+2))$$

$$\frac{a_0}{2} = \frac{1}{T}\int_{-T/2}^{T/2} v(t)\,dt = \frac{1}{6}\int_{-3}^{3} v(t)\,dt =$$

$$2\cdot\frac{1}{6}\int_{0}^{3} v(t)\,dt = 2\,\frac{1}{6}\int_{0}^{1}(3-3t)\,dt = \frac{3}{3}\left(t - \frac{t^2}{2}\right)\Big|_0^1 = \frac{1}{2}$$

Area bajo la curva $= \frac{a_0}{2} = \frac{A}{T} = \frac{2\cdot 3/2}{6} = \boxed{\frac{1}{2}}$

$$b_n = \frac{2}{T}\int_{-T/2}^{T/2} v(t)\operatorname{Sen}(n\omega_0 t)\,dt = 0 \quad \rightarrow \text{función impar} = \emptyset$$

$$a_n = \frac{2}{T}\int_{-T/2}^{T/2} v(t)\cos(n\omega_0 t)\,dt$$

$$2\,\frac{2}{6}\int_0^1 (3-3t)\cos(n\omega_0 t)\,dt = 2\int_0^1 \cos(n\omega_0 t) - t\cos(n\omega_0 t)\,dt +$$

$$= 2\left(\frac{\operatorname{Sen}(n\omega_0 t)}{n\omega_0} - \frac{\cos(n\omega_0 t)}{(n\omega_0)^2} - t\,\frac{\operatorname{sen}(n\omega_0 t)}{n\omega_0}\right)\Big|_0^1 =$$

$$= 2\left(\frac{\operatorname{Sen}(n\pi/3)}{n\pi/3} - \frac{\cos(n\pi/3)}{(n\pi/3)^2} - \frac{\operatorname{Sen}(n\pi/3)}{n\pi/3} - 0 + \frac{1}{(n\pi/3)^2} + 0\right)$$

$$= 2\frac{1-\cos\left(\frac{n\pi}{3}\right)}{\left(\frac{n\pi}{3}\right)^2} = 2\frac{2\operatorname{sen}\left(\frac{n\pi}{6}\right)}{\left(\frac{n\pi}{3}\right)^2} =$$

$$\frac{\operatorname{sen}^2\left(\frac{n\pi}{6}\right)}{\left(\frac{n\pi}{6}\right)^2} = \operatorname{sinc}^2\left(\frac{n\pi}{6}\right)$$

- $\omega_0 = \frac{2\pi}{T} = \pi/3$
- $1-\cos(2\alpha) = 2\operatorname{sen}^2(\alpha)$
- $\frac{\operatorname{sen}(\alpha)}{\alpha} = \operatorname{sinc}(\alpha)$

Representación Serie Trigonometrica de Fourier

$$v(t) = \frac{1}{2} + \sum_{n=1}^{\infty} \operatorname{sinc}^2\left(\frac{n\pi}{6}\right)\cos\left(n\frac{\pi}{3}t\right)$$

$$x(t) = v(t+2)+2 = \frac{1}{2}+2+\sum_{n=1}^{\infty}\operatorname{sinc}^2\left(\frac{n\pi}{6}\right)\cos\left(n\frac{\pi}{3}(t+2)\right)$$

$$= \frac{5}{2} + \sum_{n=1}^{\infty}\underbrace{\operatorname{sinc}^2\left(\frac{n\pi}{6}\right)\cos\left(\frac{2n\pi}{3}\right)}_{a_n}\cos\left(\frac{n\pi}{3}t\right)$$

$$-\underbrace{\operatorname{sinc}^2\left(\frac{n\pi}{6}\right)\operatorname{sen}\left(\frac{2n\pi}{3}\right)}_{b_n}\operatorname{sen}\left(\frac{n\pi}{3}t\right)$$

$a_0/2$
Valor medio $x(t)$
equivalencia trigonometrica - $\cos(\alpha+\beta) = \cos(\alpha)\cos(\beta) - \operatorname{sen}(\alpha)\operatorname{sen}(\beta)$
$\alpha = \frac{2n\pi}{3}$ $\beta = \frac{n\pi}{3}t$