INSTITUTO POLITÉCNICO NACIONAL

ESCUELA SUPERIOR DE CÓMPUTO

Espectro de Frecuencias

Evidencia 1.5

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Asignatura:

Teoría de Comunicaciones y Señales

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Grupo:

3CV17

Fecha:

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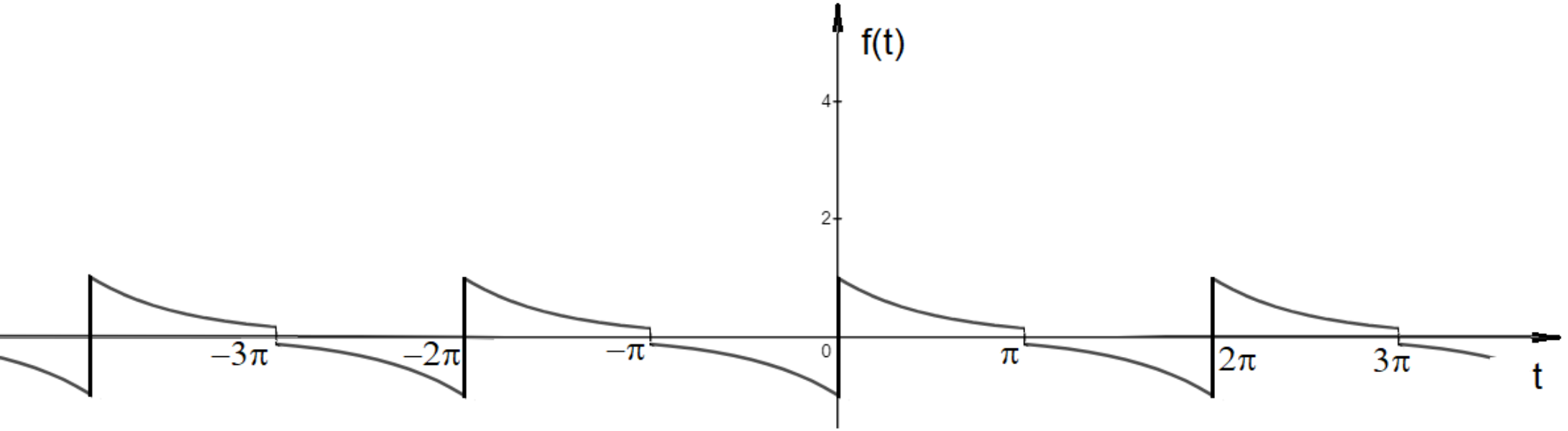
Evidencia 1.5 Grafique el espectro de frecuencias de *f(t)*

$$f(t) = \begin{cases} e^{-t} & 0 < t < \pi \\ -e^{t} & -\pi < t < 0 \end{cases}$$

$$f(t) = f(t + 2\pi)$$



Resendiz Chavez Luis Fernando.

$$C_n = \frac{1}{2}(a_n - jb_n)$$

$$b_n = \frac{4}{T}\int_0^T f(t)\,\text{sen}(n\omega_0 t)\,dt$$

$$b_n = \frac{4}{2\pi}\int_0^{2\pi} e^{-t}\,\text{sen}(t)\,dt$$

En la evidencia 4 obtuvimos:

$$b_n = \frac{2n}{\pi(n^2+1)}\left(-e^{-\pi}(-1)^n + 1\right)$$

$$C_n = \frac{1}{2}\left(0 - j\frac{2n(-e^{-\pi}(-1)^n+1)}{\pi(n^2+1)}\right) - \frac{2n(-e^{-\pi}(-1)^n+1)}{2j\pi(n^2+1)}$$

$$C_n = -\frac{n(-e^{-\pi}(-1)^n+1)}{j\pi(n^2+1)} \rightarrow |C_n| = \left|\frac{-n(-e^{-\pi}(-1)^n+1)}{j\pi(n^2+1)}\right|$$

$$|C_n| = \sqrt{0 + \left[\frac{-n(-e^{-\pi}(-1)^n+1)}{\pi(n^2+1)}\right]^2} = \sqrt{\left(\frac{-n(-e^{-\pi}(-1)^n+1)}{\pi(n^2+1)}\right)^2}$$

$$|C_n| = \frac{-n(-e^{-\pi}(-1)^n+1)}{\pi(n^2+1)} \quad \forall n \neq 0 \qquad \theta = \tan^{-1}\left(\frac{\text{img}}{\text{real}}\right) = \tan^{-1}\infty = 90°$$

$$|C_{-5}| = \left|\frac{5(e^{-\pi}(-1)^{-5}+1)}{\pi(26)}\right| = \left|\frac{5e^{-\pi}}{26\pi}\right| = 0.063$$

$$|C_{-4}| = \left|\frac{-(-4(-e^{-\pi}(-1)^{-4}+1))}{\pi(17)}\right| = \frac{4e^{-\pi}-4}{17\pi} = 0.071$$

$$= \left|\frac{4(e^{-\pi}-1)}{17\pi}\right| = \left|\frac{4e^{-\pi}-4}{17\pi}\right| = 0.071$$

$$|C_{-3}| = \left|\frac{-(-3(-e^{-\pi}(-1)^{-3}+1))}{\pi((-3)^2+1)}\right| = 0.0996$$

$$|C_{-3}| = \left|\frac{-(-2(-e^{-\pi}(-1)^{-2}+1))}{\pi(5)}\right| = 0.1218$$

$$|C_{-1}| = \left|\frac{-(-1(-e^{-\pi}(-1)^{-1}+1))}{2\pi}\right| = 0.166$$

$$|C_0| = \left|\frac{0(-e^{-\pi}(-1)^0+0)}{\pi(0^2+1)}\right| = \frac{0}{\pi} = \emptyset$$

$$|C_1| = \left| \frac{-(1(-e^{-\pi}(-1)^1+1))}{2\pi} \right| = 0.166$$

$$|C_2| = \left| \frac{-(2(-e^{+\pi}(-1)^2+1))}{5\pi} \right| = 0.1328$$

$$|C_3| = \left| \frac{-(3(-e^{\pi}(-1)^3+1))}{10\pi} \right| = \left| \frac{-(3(e^{-\pi}+1))}{10\pi} \right| = 0.099$$

$$|C_4| = \left| \frac{-(4(-e^{-\pi}(-1)^4+1))}{17\pi} \right| = 0.071$$

$$|C_5| = \left| \frac{-(5(-e^{-\pi}(-1)^5+1))}{26\pi} \right| = 0.063$$

$$|C_6| = \left| \frac{-(6(-e^{-\pi}(-1)^6+1))}{37\pi} \right| = 0.049$$