Teoría de Comunicaciones y Señales

Evidencia 1.4

Nombre: Luis Fernando Ramírez Cotonieto

Fecha de entrega: 3 de septiembre del 2021

Grupo: 3CV16

INSTITUTO POLITÉCNICO NACIONAL

ESCOM

Evidencia 1.4

$$f(t) = \begin{cases} e^{-t} & 0 < t < \pi \\ -e^{t} & -\pi < t < 0 \end{cases} \qquad T = 2\pi \qquad \omega_0 = \frac{2\pi}{T} = 1$$

$$f(t) = \sum_{n=-\infty}^{\infty} C_n e^{in\omega_0 t}$$

$$C_n = \frac{1}{T}\int_{t_0}^{t_0+T} f(t) e^{-in\omega_0 t} = \frac{1}{T}\left[-\int_{-\pi}^{0} e^{t}\, e^{-in\omega_0 t} dt + \int_0^{\pi} e^{-t} \cdot e^{-in\omega_0 t} dt \right]$$

$$= \frac{1}{T}\left[-\int_{-\pi}^{0} e^{(in\omega_0+1)t} dt + \int_0^{\pi} e^{(in\omega_0-1)t} dt \right] = \frac{1}{T}\left\{ \frac{-1}{(in\omega_0+1)} e^{(in\omega_0+1)t}\Big|_{-\pi}^{0} + \frac{1}{(in\omega_0-1)} e^{(in\omega_0-1)t}\Big|_0^{\pi} \right\}$$

$$= \frac{1}{T}\left\{ \frac{-1}{(in\omega_0+1)}\left(e^{-(in\omega_0+1)\pi} - e^{0}\right) + \frac{1}{(in\omega_0-1)}\left(e^{0} - e^{(in\omega_0-1)\pi}\right) \right\}$$

$$= \frac{1}{T}\left[\frac{1-e^{-\pi(in\omega_0+1)}}{in\omega_0+1} + \frac{1-e^{\pi(1-in\omega_0)}}{in\omega_0-1} \right] = \frac{1}{T}\left[\frac{1-e^{-\pi}\cdot e^{-\pi n\omega_0}}{in\omega_0+1} + \frac{1-e^{-\pi}\cdot e^{\pi in\omega_0}}{in\omega_0-1} \right]$$

$$= \frac{1}{2\pi}\left[\frac{1-e^{-\pi-in\pi}}{in+1} + \frac{1-e^{-\pi}\cdot e^{in\pi}}{in-1} \right] = \frac{1}{2\pi}\left[\frac{1-e^{-\pi}(\overbrace{\cos n\pi}^{(-1)^n} + \cancel{i\,\mathrm{sen}\, n\pi}^{0})}{in+1} + \frac{1-e^{-\pi}(\cos n\pi + \cancel{i\,\mathrm{sen}\, n\pi}^{0})}{in-1} \right]$$

$$= \frac{1}{2\pi}\left[\frac{1-e^{-\pi}(-1)^n}{in+1} + \frac{1+e^{-\pi}(-1)^n}{in-1} \right] = \frac{1}{2\pi}\left[\frac{in-1-e^{-\pi}(-1)^n(in-1)+in+1-e^{-\pi}(-1)^n(in+1)}{i^2n^2-1} \right]$$

$$= \frac{-1}{2\pi}\left[\frac{2in - e^{-\pi}(1)^n(in-\cancel{1}+in+\cancel{1})}{n^2+1} \right] = \frac{-1}{2\pi}\left[\frac{\cancel{2}in - e^{-\pi}(-1)^n(\cancel{2}in)}{n^2+1} \right]$$

$$= \frac{-1}{\pi}\left[\frac{in(1-e^{-\pi}(-1)^n)}{n^2+1} \right] = -\frac{in}{\pi}\cdot\frac{1-e^{-\pi}(1)^n}{n^2+1}$$

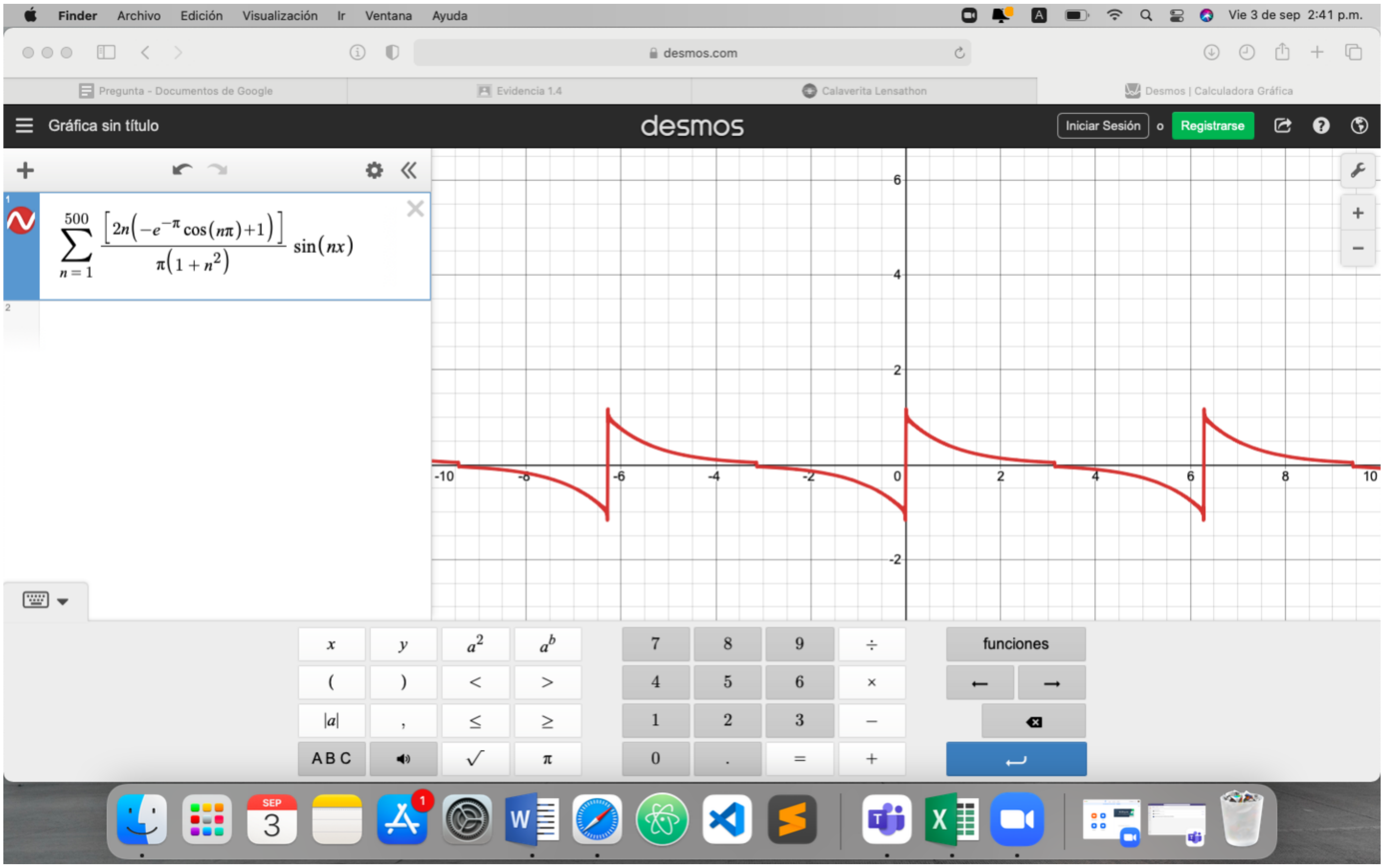
$$a_n = 0$$

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

$$C_n = \frac{-in(1-e^{-\pi}(-1)^n]}{\pi(n^2+1)}$$

$$f(t) = \sum_{n=-\infty}^{\infty} \left(\frac{-in(1-e^{-\pi}(-1))^n}{\pi(n^2+1)} \right) e^{int}$$

Gráfica:


Finder Archivo Edición Visualización Ir Ventana Ayuda
Vie 3 de sep 2:41 p.m.
desmos.com
Pregunta - Documentos de Google
Evidencia 1.4
Calaverita Lensathon
Desmos | Calculadora Gráfica
Gráfica sin título
desmos
Iniciar Sesión
o
Registrarse
$\sum_{n=1}^{500} \frac{\left[2n\left(-e^{-\pi}\cos(n\pi)+1\right)\right]}{\pi\left(1+n^2\right)}\sin(nx)$
funciones
ABC