FINAL ASS DICIEMBRE 2015

Ejercicio 1

a) No es simétrica $\Rightarrow$ no proviene de una señal real.

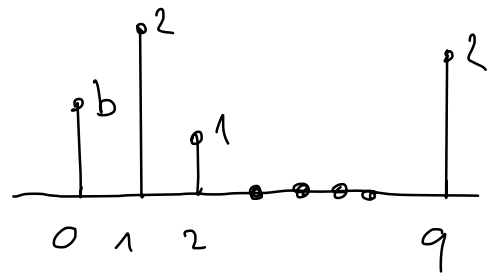
b) $P_{xx} = \sum_{x=<N>} |a_n|^2 = \frac{1}{N} \sum_{n=<N>} |X[n]|^2 = 9$

$$b^2 + 2^2 + 1^2 + 2^2 = 9 \Rightarrow b^2 = 9 - 9 = 0 \Rightarrow \boxed{b = 0}$$

c) $y[n] = x[n] * w[n]$

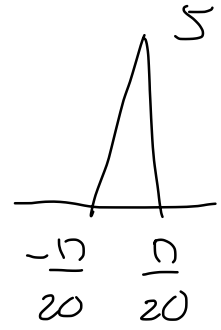
$\Downarrow$

Cte. $y[n] = 10$



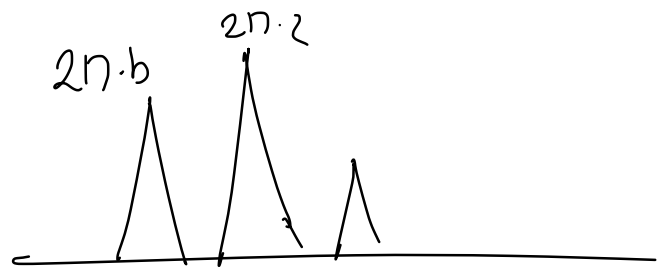
$TF = 2\pi a_n$

$Y(e^{j\Omega}) = 2\pi \cdot 10\, \delta(\Omega)$



$W(e^{j\Omega})$

$2\pi \cdot 10\, \delta(\Omega) = 2\pi a_n \cdot W(e^{j\Omega})$

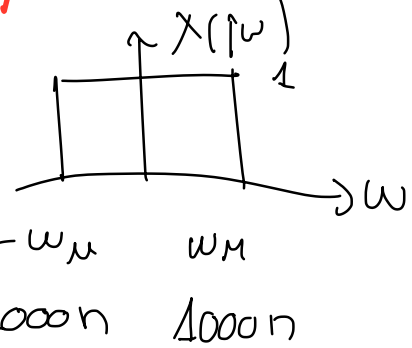


$2\pi \cdot b \cdot 5 = 20\pi$

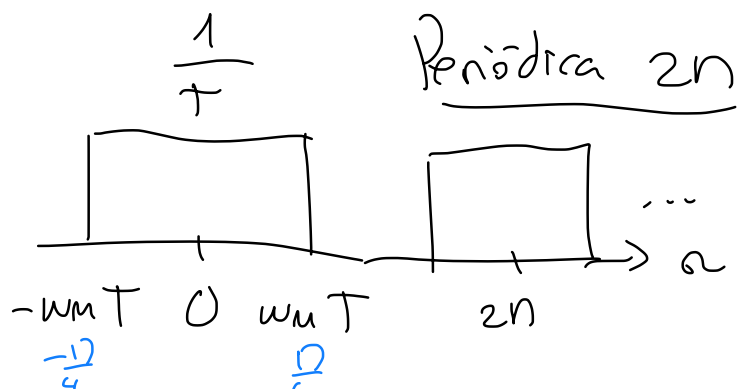
$10b = 20$

$\boxed{b = 2}$

Ejercicio 2



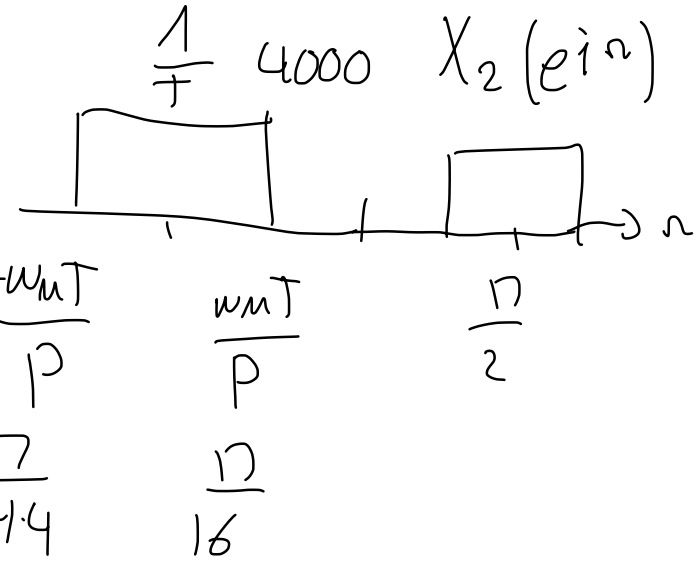
$\Rightarrow$



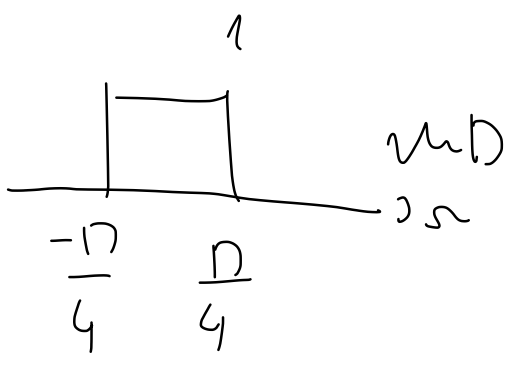
$T = \frac{1}{4000}$ $\quad 1000\pi \cdot \frac{1}{4000} = \frac{\pi}{4}$

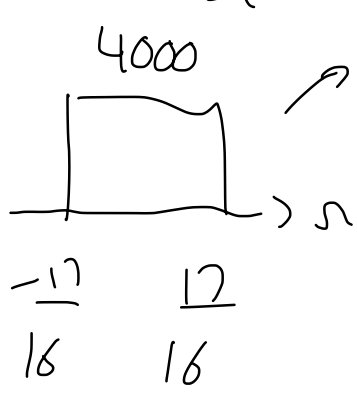
No hay solape $\frac{\pi}{4} < \frac{\pi}{2}$

$\Rightarrow$

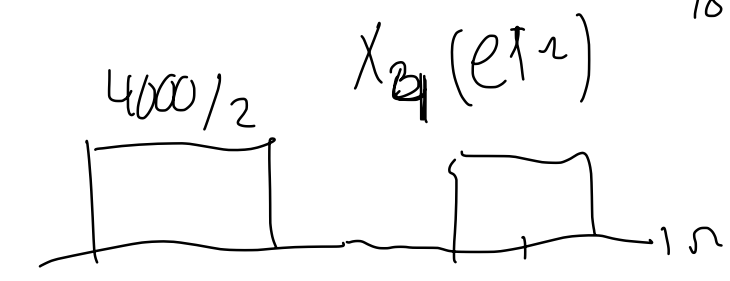


Periódica con periodo $\frac{\pi}{2}$





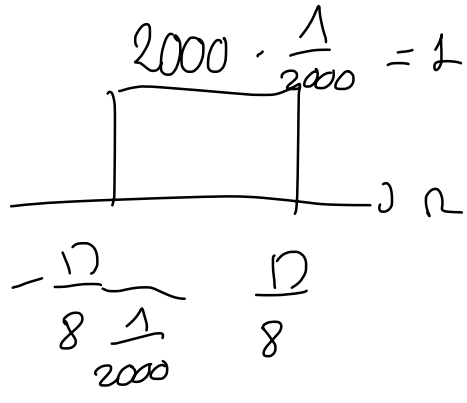
Periódica 2π



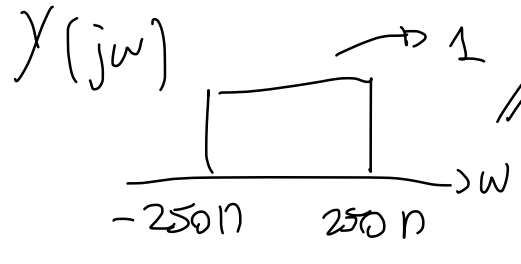
Periódica 2π

$\frac{2\pi}{16} = \frac{\pi}{8}$

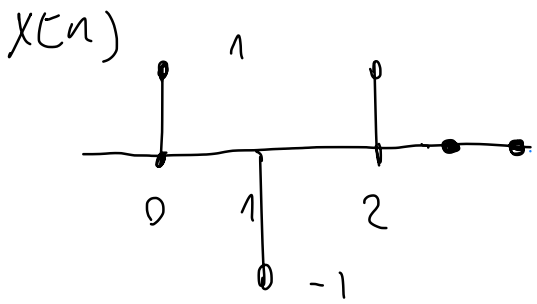
$\Rightarrow$

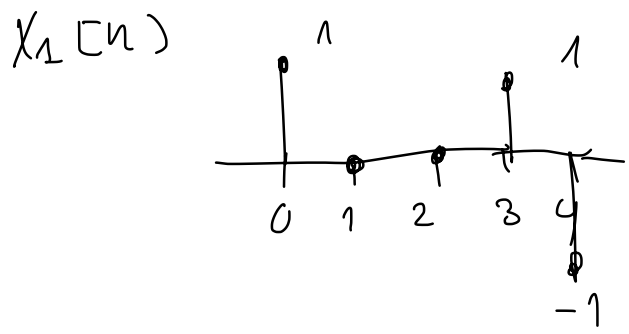


No per



Ejercicio 3





N tiene que ser igual a 5 (única)

$$x_1[n] = x(n-3)_5$$
$$x_1[n] = x(n+2)_5$$

} Dos posibles desplazamientos

(Desplazamiento hacia la derecha es −)

Ejercicio 4

1617

$$x_1[n] = \cos\left(\frac{17n}{4}\right) + \sin\left(\frac{17\pi}{64}n\right) \Rightarrow \frac{17\pi}{64} - \frac{16\pi}{4} = \frac{\pi}{64}$$

$$x_2[n] = \sin\left(\frac{17n}{4}\right) + 0{,}8\left(\frac{21\pi n}{64}\right) \Rightarrow \frac{21\pi}{64} - \frac{16\pi}{64}n = \frac{5\pi}{64}$$

$N = 64$

↳

$\Delta\Omega = 2\cdot\frac{2\pi}{64}$

Cada cuanto toma muestras en un periodo

Entonces $\frac{\pi}{64} \not> 2\cdot\frac{2\pi}{64}$ No se distinguen

$\frac{5\pi}{64} > 2\cdot\frac{2\pi}{64}$ Se distinguen

Si toma muchas más grandes que la diferencia no se distinguen.

Ejercicio 5

$$12y[n] + 5y[n-1] - 2y[n-2] = 36x[n] + 2x[n-1]$$

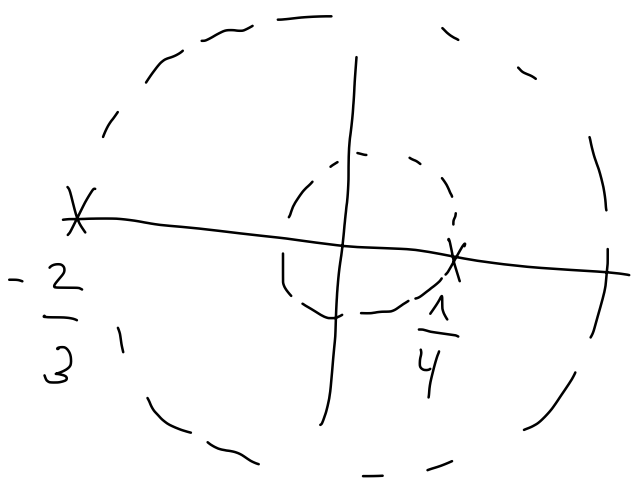
a) Determina $H(z)$

$$Y(z)\left(12 + 5z^{-1} - 2z^{-2}\right) = X(z)\left(36 + 2z^{-1}\right)$$

$$H(z) = \frac{Y(z)}{X(z)} = \frac{36 + 2z^{-1}}{12 + 5z^{-1} - 2z^{-2}}$$

Polos: $12 + 5z^{-1} - 2z^{-2} = 0$

$$\frac{-5 \pm \sqrt{25 + 4 \cdot 12 \cdot 2}}{24} = \frac{-5 \pm 11}{24} \rightarrow \boxed{z = \frac{1}{4}} \quad \rightarrow \boxed{-2/3 = z}$$



A no puede ser
B sí
C sí
D no
E sí

} No puede haber polos justo en la ROC

c) ROC: E

Sacar h[n]

$$\frac{36+2z^{-1}}{12+5z^{-1}-2z^{-2}} = \frac{A}{1+\frac{2}{3}z^{-1}} + \frac{B}{1-\frac{1}{4}z^{-1}}$$

$$36+2z^{-1} = A\left(1-\frac{1}{4}z^{-1}\right) + B\left(1+\frac{2}{3}z^{-1}\right)$$

Si $1-\frac{1}{4}z^{-1}=0$

$$1 = \frac{1}{4}z^{-1}$$

$$z^{-1} = \frac{1}{1/4} = 4$$

$$\boxed{z = \frac{1}{4}}$$

Si $z = \frac{-2}{3}$

$$\Rightarrow 36+2\cdot(+4) = B\left(1+\frac{2}{3}\cdot(+4)\right)$$

$$\boxed{B=12}$$

$$36+2\cdot\left(-\frac{3}{2}\right) = A\left(1-\frac{1}{4}\left(-\frac{3}{2}\right)\right)$$

$$33 = A\cdot\frac{11}{8}$$

$$\boxed{A=24}$$

$$\left[\frac{24}{1+\frac{2}{3}z^{-1}} + \frac{12}{1-\frac{1}{4}z^{-1}}\right] \Rightarrow$$

$$\frac{1}{4} < |z| < \frac{2}{3}$$

(12 sobre $\frac{1}{4}$, 24 sobre $\frac{2}{3}$)

$$12\cdot\left(\frac{1}{4}\right)^n u[n] - \left(\frac{-2}{3}\right)^n u[-n-1]$$

Diap. 25

d) $|z| > \frac{2}{3}$

$$\frac{24}{1+\frac{2}{3}z^{-1}} + \frac{12}{1-\frac{1}{4}z^{-1}} \Rightarrow h(n) = 24\left(\frac{-2}{3}\right)^n u(n) + 12\left(\frac{1}{4}\right)^n u(n)$$

Si fuera a izquierdas: $h(n) = -24\left(\frac{-2}{3}\right)^n u(-n-1) - 12\left(\frac{1}{4}\right)^n u(-n-1)$

e) Tiene que existir TF así que $|z| > \frac{2}{3}$: C

$$H(z) = H(e^{j\Omega})\Big|_{z=e^{j\Omega}} = \frac{24}{1+\frac{2}{3}e^{-j\Omega}} + \frac{12}{1-\frac{1}{4}e^{-j\Omega}}$$