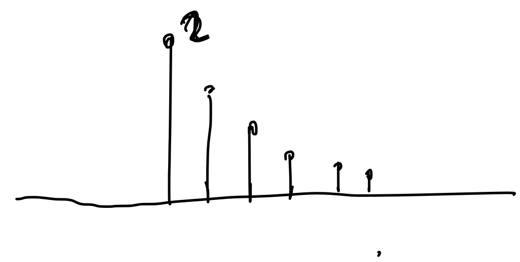
Final ASS Diciembre 2017

Ejercicio 1

$$h[n] = a\left(\frac{1}{b}\right)^n u[n]$$



a) $x[n] = 2\cos\left(\frac{3\pi}{8}n\right)$ ¿Puede obtener la salida?

Para sacar a y b uso que son autovalores.

$x_1[n]$ se representa como $e^{j\pi}$ $(o\ e^{-j\pi})$

$x_2[n]$ $e^{j2\pi}$

$$x[n] \to \boxed{LTI} \to y[n]$$

$$e^{j\Omega_1} \qquad H(e^{j\Omega}) \qquad e^{j\Omega_1} \cdot H(e^{j\Omega})\Big|_{\Omega=\Omega_1}$$

$y_1[n]$ es $\frac{3}{2}e^{j\pi}$

$y_2[n]$ es $3e^{j2\pi}$

Entonces:

$$\frac{3}{2}\cancel{e^{j\pi}} = \cancel{e^{j\pi}} \cdot H\Big|_{\Omega=\pi}$$

$$3\cancel{e^{j\pi\cdot 2}} = \cancel{e^{j2\pi}} \cdot H\Big|_{\Omega=2\pi}$$

TF de $h[n]$

$$\frac{3}{2} = \frac{a}{1-\frac{1}{b}e^{-j\pi}}$$

$$3 = \frac{a}{1-\frac{1}{b}e^{-j2\pi}}$$

$$\boxed{a=2}$$

$$\boxed{b=3}$$

Quiero saber la de $2\cos\left(\frac{3\pi}{8}n\right)$

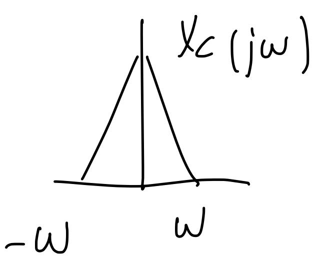
Lo puedes escribir como $\frac{1}{\cancel{2}}\cdot\cancel{2}\left(e^{j\frac{3\pi}{8}}+e^{-j\frac{3\pi}{8}}\right)$

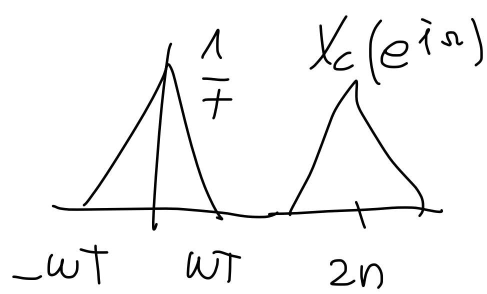
$$e^{j\frac{3\pi}{8}}\cdot H(e^{j\Omega})+e^{-j\frac{3\pi}{8}}\cdot H(e^{j\Omega})$$

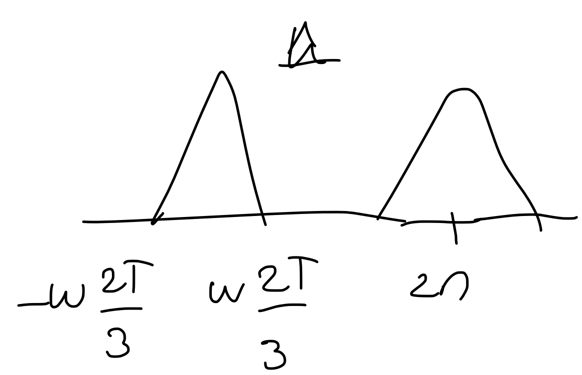
$$\left[e^{j\frac{3\pi}{8}}\cdot\frac{2}{1-\frac{1}{3}e^{-j\frac{3\pi}{8}}}+e^{-j\frac{3\pi}{8}}\cdot\frac{2}{1-\frac{1}{3}e^{+j\frac{3\pi}{8}}}\right]=y(n)$$

del coseno

Ejercicio 2







$\omega T < \pi$

$\omega\frac{2T}{3} < \pi$

$$W < \frac{\pi}{T}$$

$$W < \frac{1000\pi}{5} \quad ; \quad \boxed{W < 200\pi}$$

$$\frac{W\cdot 2\cdot 5}{3\cdot 1000}=\frac{10W}{3000}<\pi$$

$$W < \frac{300\cancel{0}\pi}{1\cancel{0}} \quad ; \quad \boxed{W < 300\pi}$$

muestreo [illegible] [illegible]

interpolador → [illegible] [illegible]

[illegible]

$x[n] \rightarrow \boxed{C/D} \rightarrow \boxed{P\uparrow} \rightarrow \boxed{\downarrow I} \rightarrow \boxed{D/C} \rightarrow y[n]$

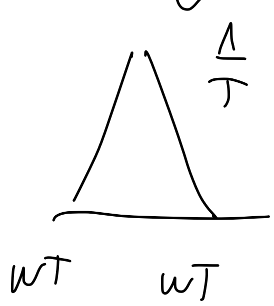
T $\quad P = 3 \quad I = 2$

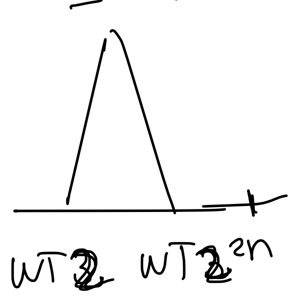
$P \geq 2 \Rightarrow$ No hay solape

Entonces se tiene que cumplir la condición de $w \leq 200\pi$ (la del muestreador)

$x[n] \rightarrow \boxed{C/D} \rightarrow \boxed{\downarrow I} \rightarrow \boxed{P\uparrow} \rightarrow \boxed{D/C}$

$I = 2 \quad P = 3$





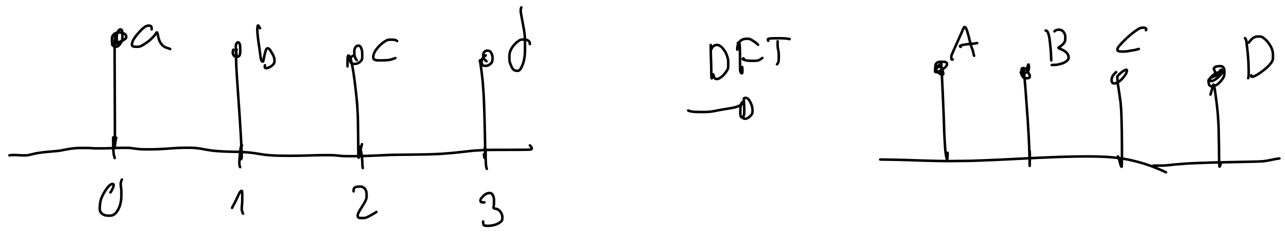
$\frac{P}{I} \quad \frac{3}{2}$

$wT2 > \pi$

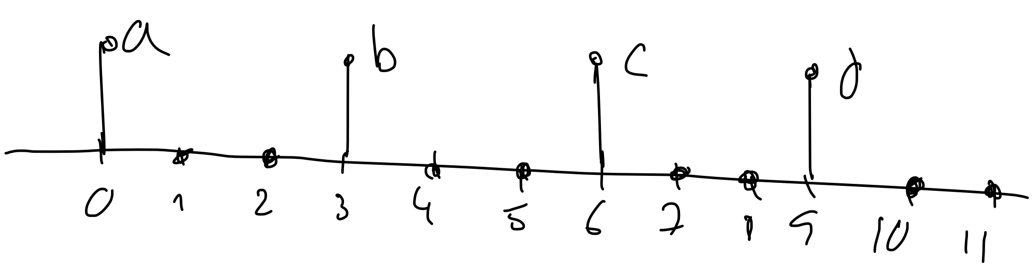
$\boxed{w > 100\pi} \rightarrow$ Restricción

¿

Ejercicio 3



Determina la DFT de 12 puntos:



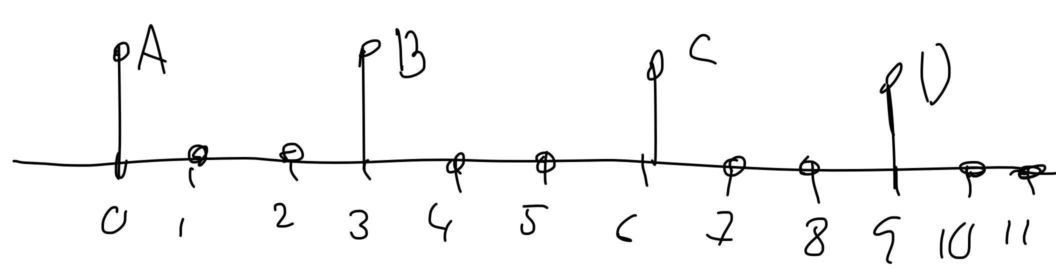
$$X_4[k] = \underbrace{a\cdot e^0}_{A} + \underbrace{b\cdot e^{\frac{2\pi}{4} j\cdot k}}_{B} + \underbrace{c\cdot e^{j\frac{2\pi}{4}\cdot 2\cdot k}}_{C} + \underbrace{d e^{j\frac{2\pi}{4}\cdot 3k}}_{D}$$

$\frac{3\pi}{2}k$

Entonces:

$$y_{12}[k] = a\cdot e^0 + 0 + 0 + b\cdot e^{j\frac{2\pi}{12}\cdot 3\cdot k} + 0 + 0 + c\cdot e^{j\frac{2\pi}{12}\cdot 6\cdot k} + 0 + 0 + \underbrace{c\cdot e^{j\frac{2\pi}{12}\cdot 9}}_{D} + 0 + 0$$

$\frac{12}{2}$, $\frac{3\pi}{2}$



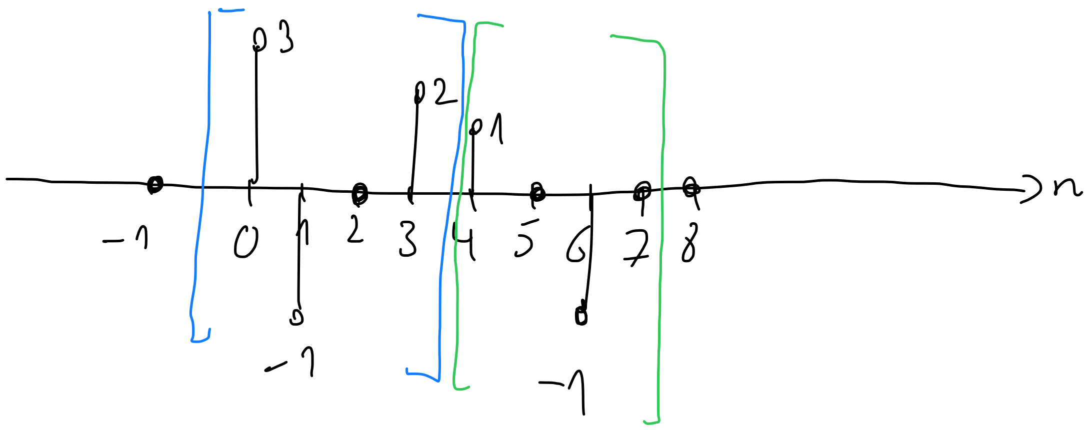
Otra manera:

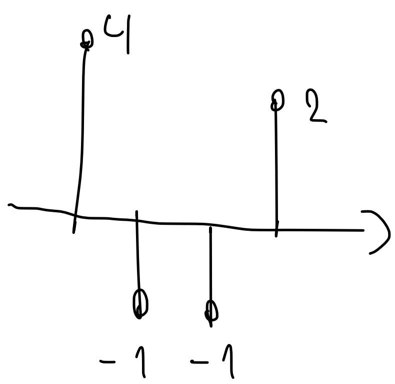
$y[n] = x[\frac{n}{3}]$ → Inserta ceros.

$Y[k] = X[\frac{k}{3}]$

$X[k] = [A, 0, 0, B, 0, 0, C, 0, 0, D]$

b)





Ejercicio 4

a) ¿$H(z)$? $\quad H(z) = \frac{Y(z)}{X(z)} = \frac{(z-j)(z+j)}{(z-\frac{1}{2})(z-2)} = \frac{(1-jz^{-1})(1+jz^{-1})}{(1-\frac{1}{2}z^{-1})(1-2z^{-1})} =$

$$= \frac{1+jz^{-1}-jz^{-1}-\overset{-1}{\cancel{j^2}}z^{-2}}{(\ )(\ )} = \boxed{\frac{1+z^{-2}}{(1-\frac{1}{2}z^{-1})(1-2z^{-1})} = H(z)}$$

b) No, no todos los polos son menores que 1.

c) Sí es estable, incluiría la circunferencia unidad.
Tendría que ser una secuencia bilateral.

Ejercicio 5

a) Polos no tiene

$$\left(1-(1+j)z^{-1}\right)\left(1-(1-j)z^{-1}\right)$$

$$1-(1-j)z^{-1}-(1+j)z^{-1}+(1+j)(1-j)z^{-2}$$

$$\left(1-\cancel{j}+\cancel{j}-j^2\right)z^{-2} \qquad j^2=-1$$

$$(1+1)z^{-2}$$

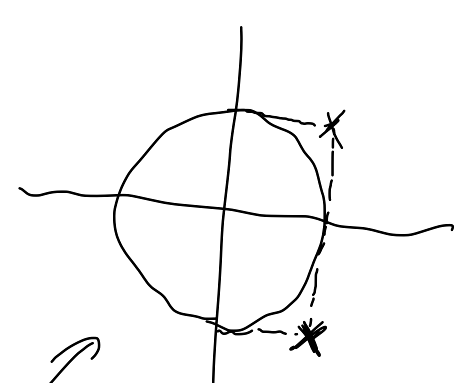
$$H(z)=1-z^{-1}+\cancel{jz^{-1}}-z^{-1}-\cancel{jz^{-1}}+2z^{-2}$$

$$\boxed{H(z)=1-2z^{-1}+2z^{-2}}$$

Ceros:

$$\frac{2\pm\sqrt{4-4\cdot 2}}{2\cdot 1}=\frac{2\pm\sqrt{4}\,j}{2} \rightarrow \boxed{X=1+j},\ \boxed{X=1-j}$$

b) Para ser de fase mínima todos los polos y ceros han de estar dentro de la circunferencia unidad



No lo es