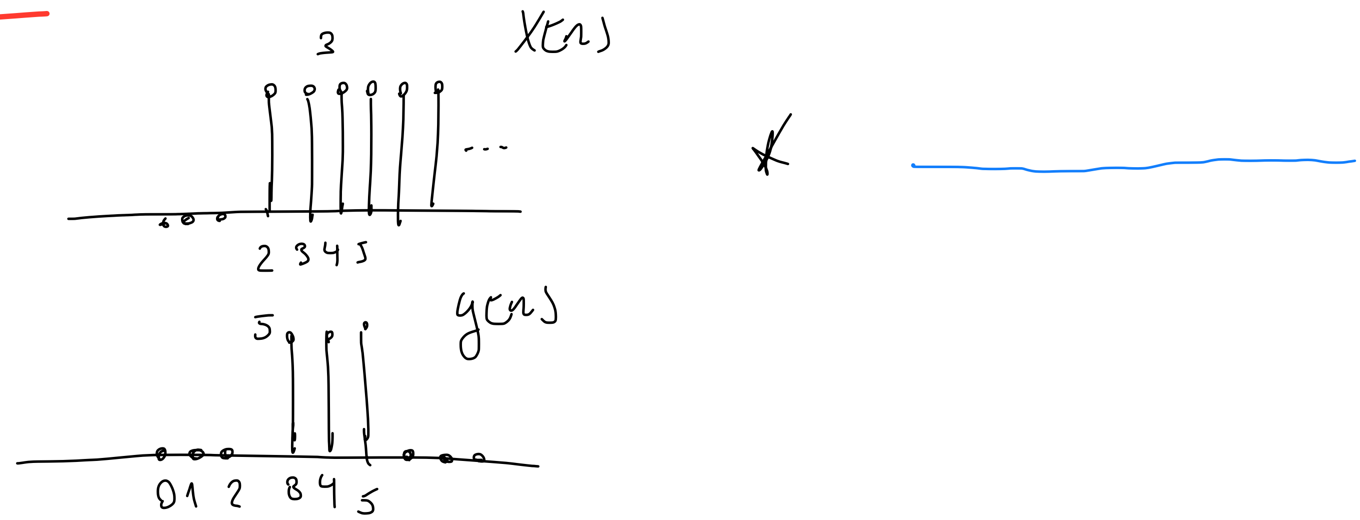
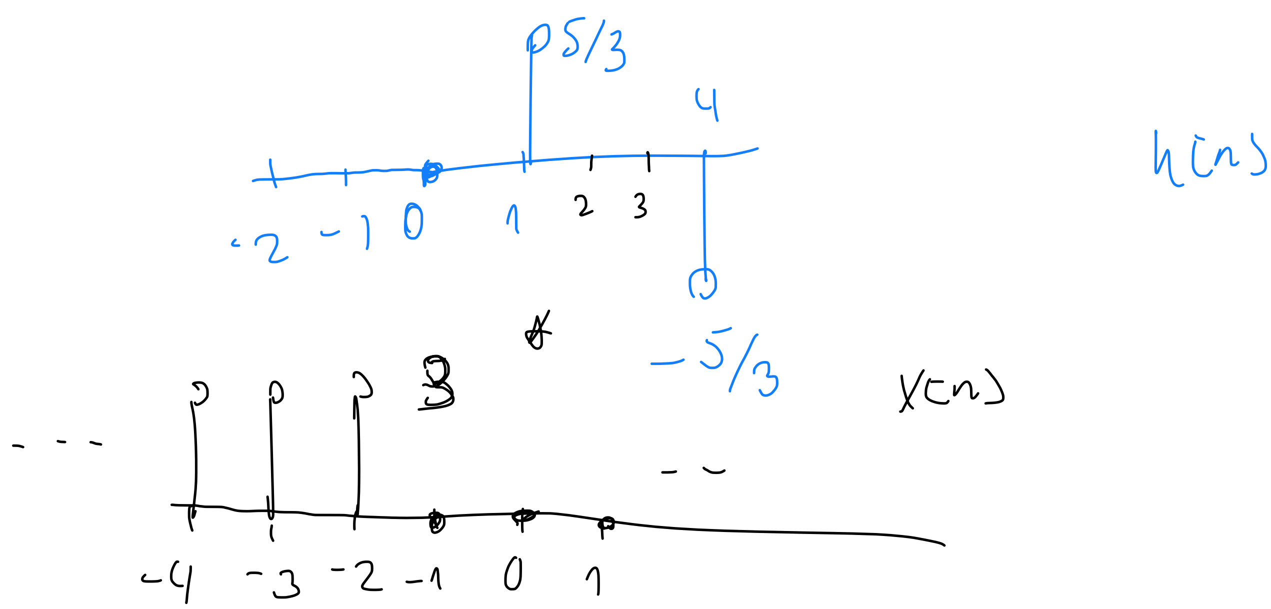
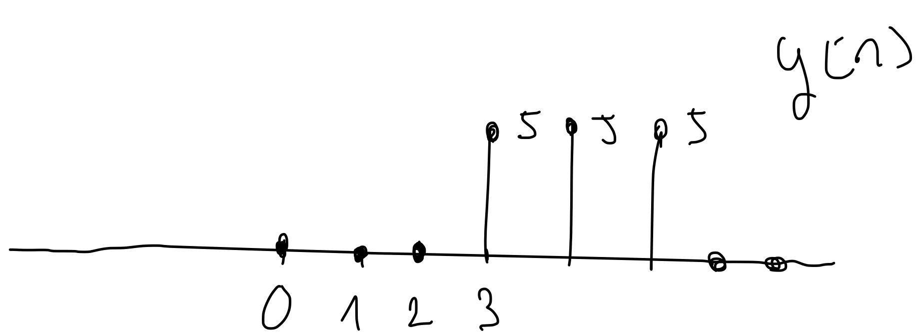
EXAMEN FINAL ASS JUNIO 2017

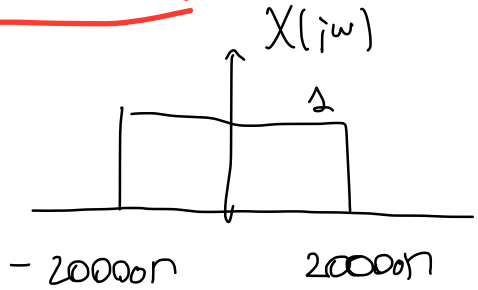
Ejercicio 1







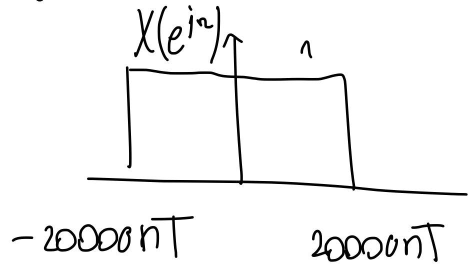
Ejercicio 2



$f(x) = 3 + x + 0,5x^2 + 0,1x^3$

$y(t) = 3 + x(t) + 0,5\,x(t)^2 + 0,1\,x(t)^3$

a) Periódo máximo de muestreo.



$\longrightarrow$ siguiente réplica en 2π

$20000\cancel{\pi}T < \cancel{\pi}$

$20000T < 1$

$$\boxed{T < \frac{1}{20000}}$$

b) $X(j\omega) \rightarrow \boxed{LTI} \rightarrow Y(j\omega)$

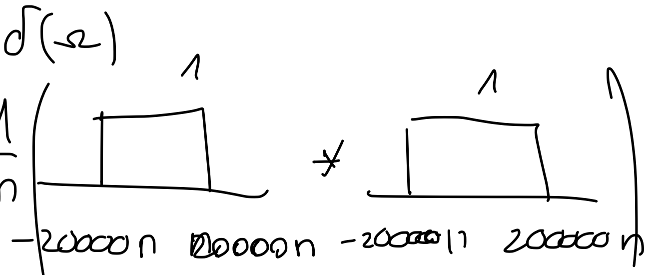
$y(t) = 3x(t) + 0,5\,x(t)^2 + 0,1\,x(t)^3$

$Y(j\omega) = 3 + X(j\omega) + [0,5X(j\omega) * 0,5X(j\omega)] + 0,1 * X(j\omega)^3$

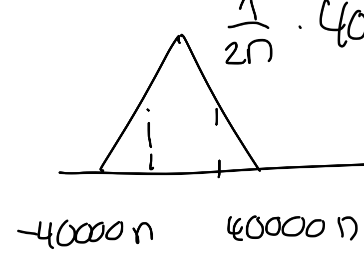
$\rightarrow$ altura. base

$TF\{3\} = 3 \cdot 2\pi\,\delta(\Omega)$

$TF\{0,5X(j\omega)\}\ \frac{1}{2\pi}$



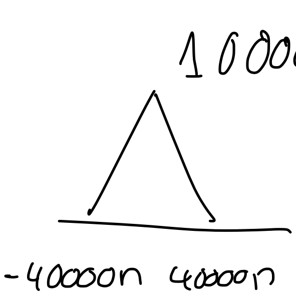
$=$



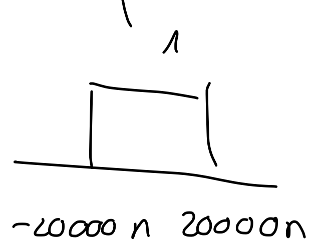
$\frac{1}{2\pi} \cdot 40000\pi = 20000$

$0,5 \cdot$ "

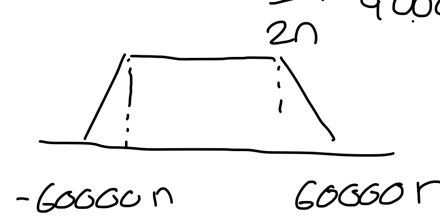
$\underline{10000}$



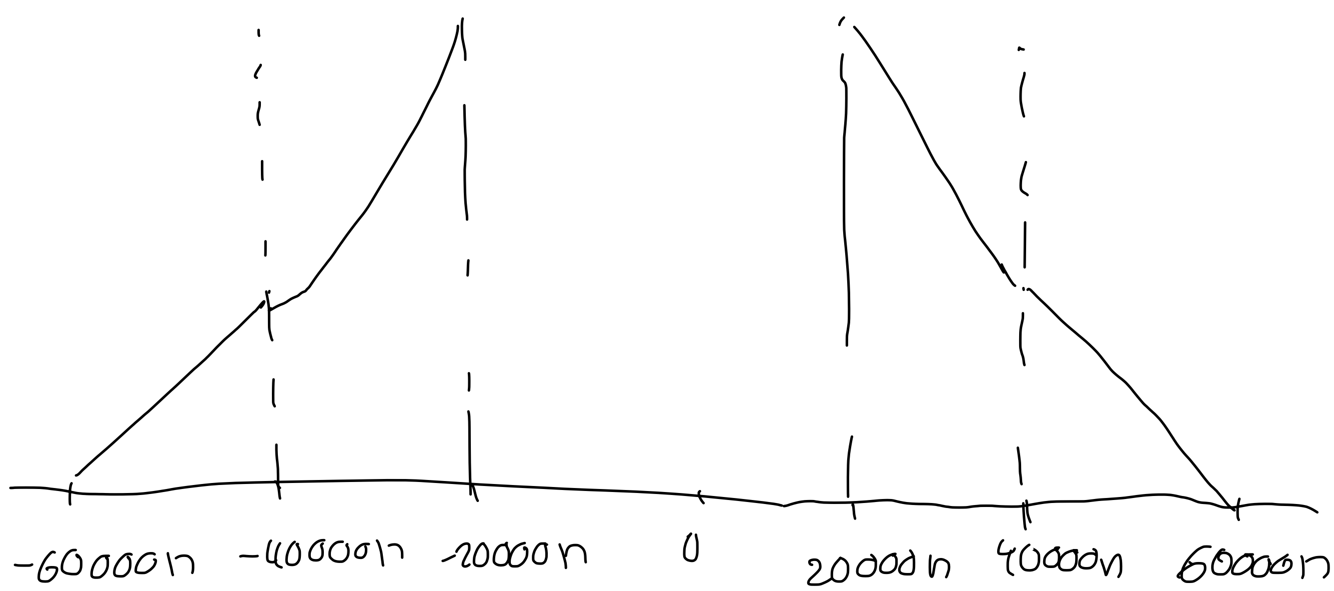
$*$



$=$



$\frac{1}{2\pi}\, 40000\pi\, 1 = \underbrace{20000 \cdot 0,1}_{\underline{\underline{2000}}}$

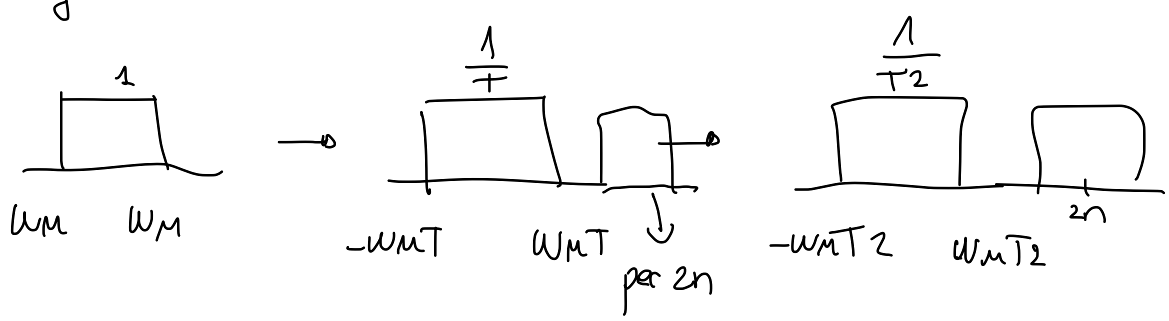

-60000m
-40000m
-20000m
0
20000m
40000m
60000m

Ejercicio 3

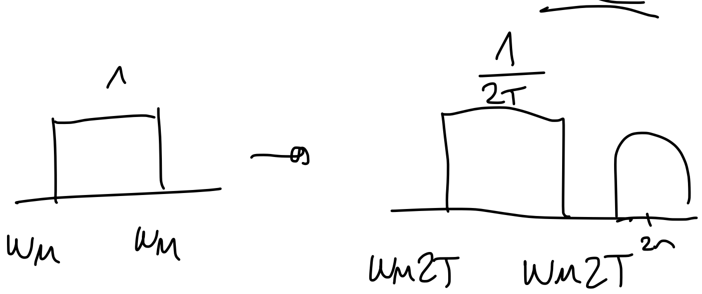
a) $x[n] = x(Tt)$ → muestreo

$y[n] = x[2n]$ → Diezmar.

¿ $y[n] = x(2Tt)$ es equivalente?



$w_MT < \pi$ ¿$w_MT < \pi$



$w_M2T < \pi$

Si hay solapamiento y no se cumple $w_MT < \pi$ no es equivalente.

b) Si no hay solapamiento:

Camino I: $y[n] = x[2n]$; $x[n] = x(Tt)$

$y[n] = x(2Tt)$

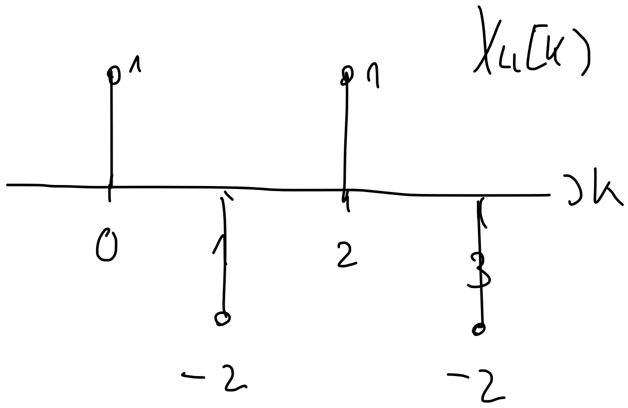
Camino II $y[n] = x(2Tt)$

} Cumpliendose Nyquist

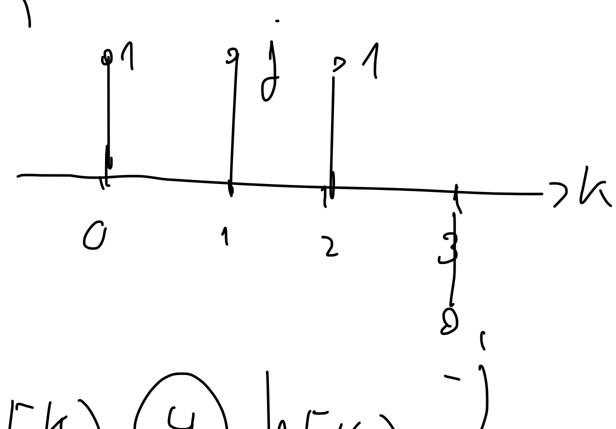
Ejercicio 4

DFTs

$X_4[k]$

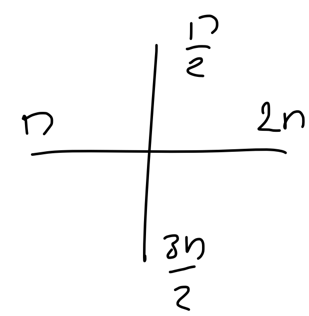


$H_4[k]$



$$y[n] = X[k] \; ④ \; h[k]$$

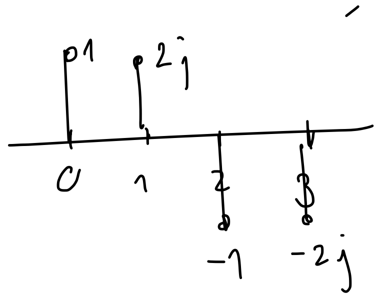
SIN CALCULAR LA DFT inversa:



a)

$$X[((n-1))_4] \longleftrightarrow X[k]\, e^{-j\frac{2\pi}{N} k n_0} = 1 \qquad N = 4$$

$1 \cdot e^0 = 1$; $-2\cancel{e^{-j\frac{2\pi}{4}1}} \to -j = +2j$; $\cancel{e^{-j\frac{2\pi}{4}2}} \to -1$; $-2\cancel{e^{-j\frac{2\pi}{4}3}} \to j$



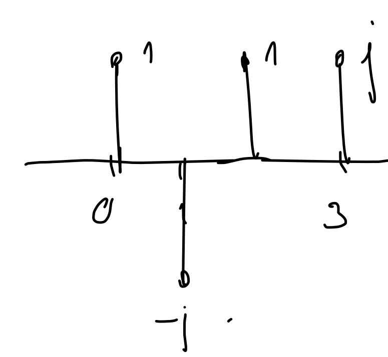
$$h[(n+2)_N] \longleftrightarrow H[k]\, e^{+j\frac{2\pi}{4}k\,2}$$

$1 \cdot e^0 = 1$

$j\cancel{e^{j\frac{2\pi}{4}\cdot 2}} \to -1 = -j$

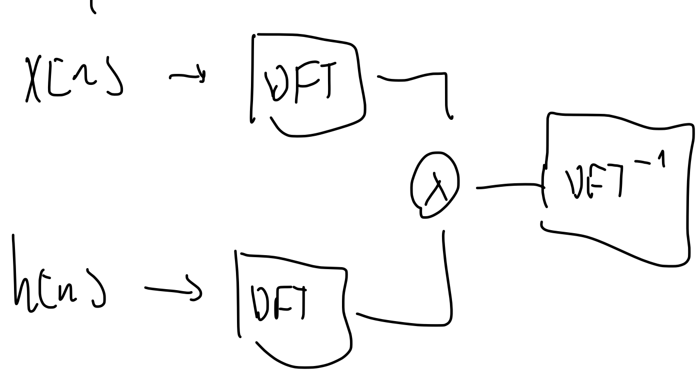
$1\cancel{e^{j\frac{2\pi}{4}2\cdot 2}} \to 1 = -j$

$-j\, e^{j\frac{2\pi}{4}3\cdot 2}$; $\frac{12\pi}{4} = \frac{6\pi}{2} = +j$



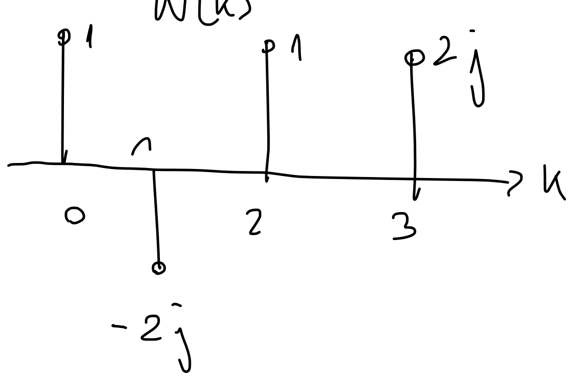
b) Determinar $y[0]$ e $y[1]$

Sé que

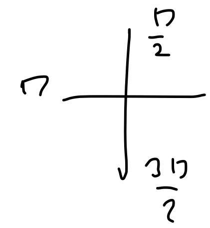


$$y[n] = x[n] \; ⓝ \; y[n]$$

Multiplico y hago su inversa:



$\xrightarrow{DFT^{-1}} y$



$$\frac{1}{4}\sum_{k=0}^{3} W(k)\, e^{j\frac{2\pi}{4}n\cdot k}$$

$$\frac{1}{4}\left(1 + (-2j)\cdot \cancel{e^{j\frac{2\pi}{4}n}} \rightarrow (j)^n + 1\cdot \cancel{e^{j\frac{4\pi}{4}n}} \rightarrow (-1)^n + 2j\,\cancel{e^{j\frac{2\pi}{4}\cdot 3n}} \rightarrow (-j)^n \right) \qquad \frac{6\pi}{4} = \frac{3\pi}{2}$$

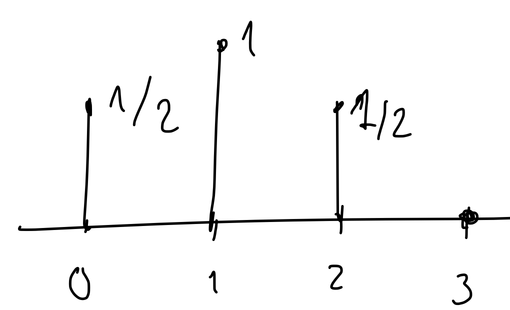
$$\frac{1}{4}\left(1 + (-2j)(j)^n + (-1)^n + 2j(-j)^n\right)$$ para $n = 0, 1, 2, 3$

$n=0$; $\frac{1}{4}\left(1 - \cancel{2j} + 1 + \cancel{2j}\right) = \frac{2}{4} = \frac{1}{2}$

$n=1$; $\frac{1}{4}\left(\cancel{1} + 2 - \cancel{1} + 2\right) = \frac{4}{4} = 1$

$n=2$; $\frac{1}{4}\left(1 + \cancel{2j} + 1 - \cancel{2j}\right) = \frac{1}{2}$

$n=3$; $\frac{1}{4}\left(\cancel{1} - \cancel{2} - \cancel{1} + \cancel{2}\right) = 0$



$y[0] = \frac{1}{2}$

$y[1] = 1$

Ejercicio 5

F_1: $x[n]-2x[n-1]+\frac{3}{4}x[n-2]=y[n]-\frac{1}{9}y[n-2]$

$$X(z)\left(1-2z^{-1}+\frac{3}{4}z^{-2}\right)=Y(z)\left(1-\frac{1}{9}z^{-2}\right)$$

$$H_1(z)=\frac{Y(z)}{X(z)}=\frac{1-2z^{-1}+3/4\,z^{-2}}{1-\frac{1}{9}z^{-2}}$$

F_2: $x[n]+\frac{1}{2}x[n-1]=y[n]-\frac{4}{3}y[n-1]$

$$X(z)\left(1+\frac{1}{2}z^{-1}\right)=Y(z)\left(1-\frac{4}{3}z^{-1}\right)$$

$$H_2(z)=\frac{Y(z)}{X(z)}=\frac{1+\frac{1}{2}z^{-1}}{1-\frac{4}{3}z^{-1}}$$

$$G(z)=H_1(z)H_2(z)=\frac{1-2z^{-1}+3/4\,z^{-2}}{1-\frac{1}{9}z^{-2}}\cdot\frac{1+\frac{1}{2}z^{-1}}{1-\frac{4}{3}z^{-1}}=$$

$$\left(1-2z^{-1}+\frac{3}{4}z^{-2}\right)\left(1+\frac{1}{2}z^{-1}\right)=1+\frac{1}{2}z^{-1}-2z^{-1}-z^{-2}+\frac{3}{4}z^{-2}+\frac{3}{8}z^{-3}$$

$$\left(1-\frac{1}{9}z^{-2}\right)\left(1-\frac{4}{3}z^{-1}\right)=1-\frac{4}{3}z^{-1}+\frac{4}{27}z^{-3}-\frac{1}{9}z^{-2}$$

$$\frac{1-\frac{3}{2}z^{-1}-\frac{1}{4}z^{-2}+\frac{3}{8}z^{-3}}{1-\frac{4}{3}z^{-1}-\frac{1}{9}z^{-2}+\frac{4}{27}z^{-3}}=H(z)$$

$$
\begin{array}{c|ccc|c}
 & 1 & -\frac{3}{2} & -\frac{1}{4} & \frac{3}{8} \\
1/2 & & 1/2 & & \\
\hline
 & 1 & & &
\end{array}
$$

$$-1/2, \ \frac{1}{2}, \ \frac{3}{2}$$

Ejercicio 6

a) Paso bajo, deja pasar frecuencias en torno a 0.

b) No es lineal, además, el retardo de grupo indica distorsión a la fase

c)