3) $H(z)$, mag. y respuesta en modulo y fase

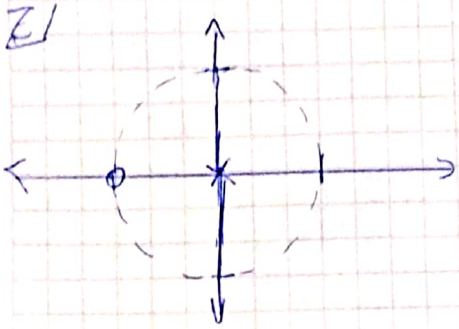
a) Media movil

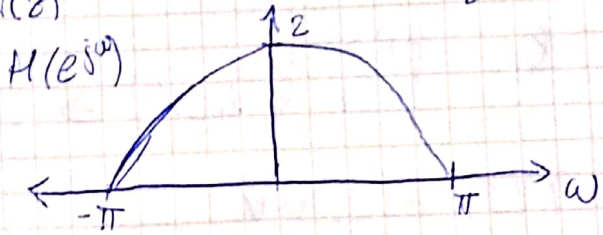
$h_1(k) = (1,1) \rightarrow y(k) = \overbrace{x[k]}^{x[k]} + \overbrace{x[k-1]}^{x[k-1]}$

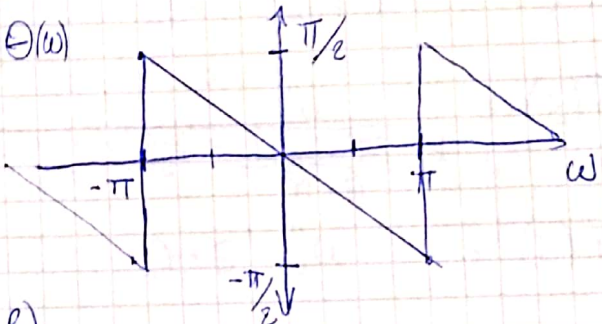
$Y(z) = X(z) + z^{-1} X(z)$

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

2/







$|H(e^{j\omega})| = \frac{\prod |e^{j\omega} - z_i|}{\prod |e^{j\omega} - p_i|}$

$\Phi(e^{j\omega}) = \sum \Theta(e^{j\omega} - z_i) - \sum \Theta(e^{j\omega} - p_i)$

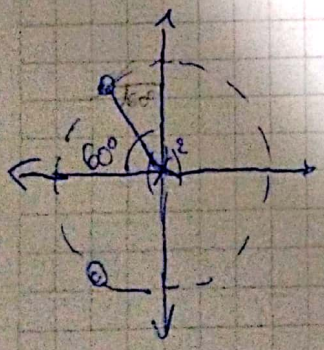
$h_2[k] = (1,1,1)$

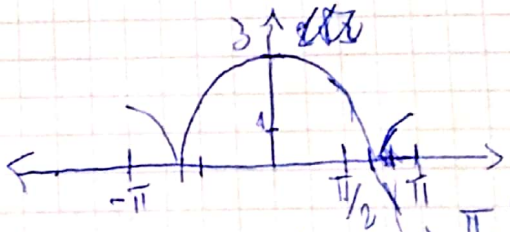
$\hookrightarrow Y(z) = X(z) + z^{-1} X(z) + X(z) z^{-2}$

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

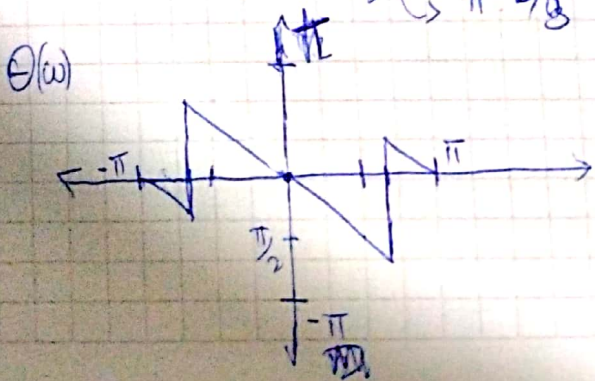
Ceros: $-0,5 \pm j\frac{\sqrt{3}}{2}$

Polos: 2 en 0





π E/3



90° en $\frac{\pi}{2}$

360° en π

Mostrar el corte

Escaneado con CamScanner

a) para que sean mediciones aritméticas debemos dividir por el número de muestras

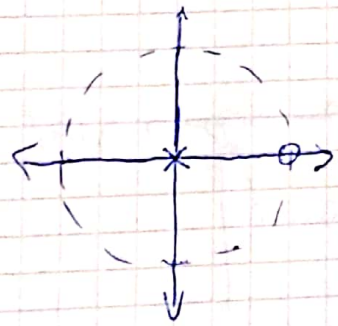
b) $\frac{f_s}{2}$ ___ 180°
50Hz ___ 120°

$120° = \frac{50Hz \cdot 180°}{f_s/2}$

$f_s = 150Hz$

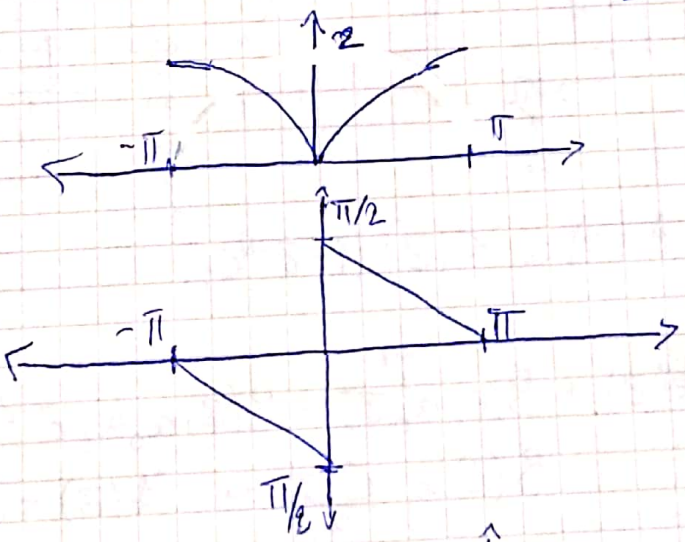
* Filtro diferenciador

$h(k) = (1, -1) \rightarrow y(k) = \delta[k] - \delta(k-1) \quad x(k) = \delta(k)$



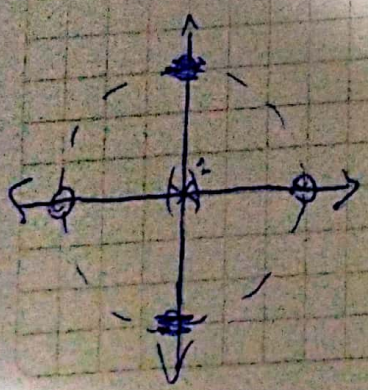
$Y(z) = X(z)(1 - z^{-1})$

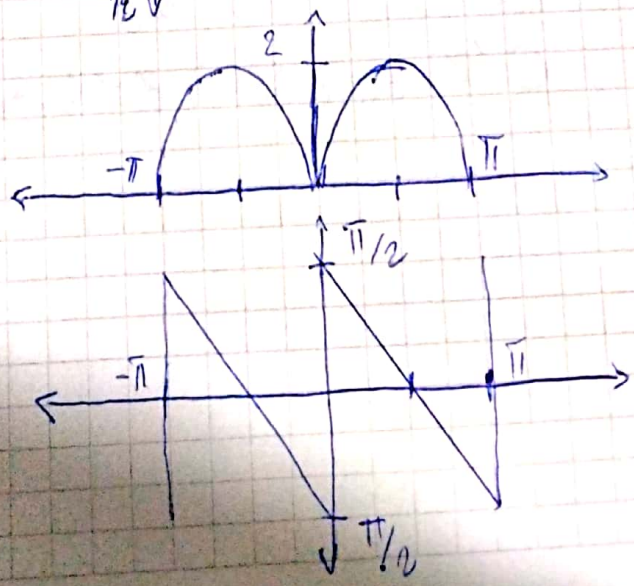
$H(z) = 1 - z^{-1} = \frac{z-1}{z}$



$h(k) = (1, 0, -1)$

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





Escaneado con CamScanner

a) Ambos introducen una demora igual al orden del filtro

b) $H(\Omega) = 1 - e^{-j\Omega} = e^{-j\frac{\Omega}{2}}\left(e^{j\frac{\Omega}{2}} - e^{-j\frac{\Omega}{2}}\right)$

$= e^{j\left(\frac{\pi}{2} - \frac{\Omega}{2}\right)} 2\,\mathrm{sen}(\Omega/2)$

$0{,}95 \leq \frac{2\,\mathrm{sen}(\Omega/2)}{\Omega} \leq 1{,}05$

$\Omega = 0 \Rightarrow \frac{|H(\Omega)|}{\Omega} = 1$

$\Omega = \pi \Rightarrow \frac{|H(\Omega)|}{\Omega} =$

$\frac{|H(\Omega)|}{\Omega} = 0{,}95 \Rightarrow \Omega = 1{,}1038$

Escaneado con CamScanner