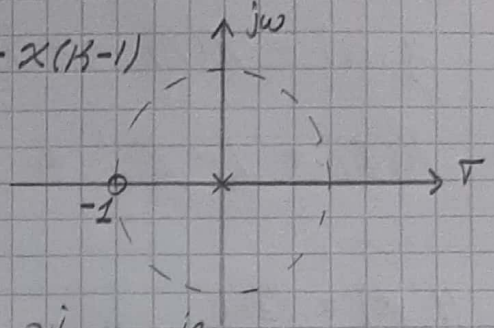
3) • $h(k) = [1, 1] \Rightarrow y(k) = x(k) + x(k-1)$

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

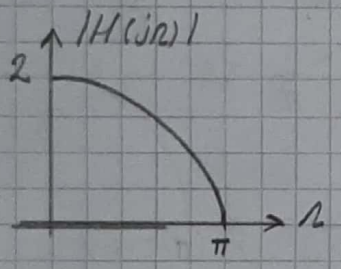


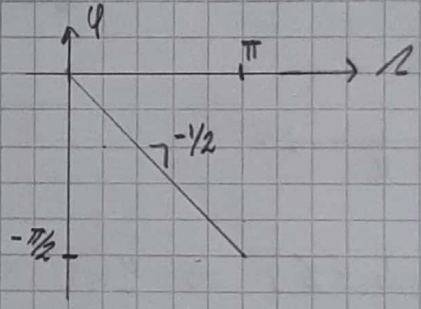
$H(j\Omega) = H(z)\Big|_{z=1e^{j\Omega}}$

$H(j\Omega) = \frac{e^{j\Omega}+1}{e^{j\Omega}} = 1 + e^{-j\Omega} = e^{0j} + e^{-j\Omega}$

$= e^{-j\Omega/2}\left(e^{j\Omega/2} + e^{-j\Omega/2}\right)$

$\Rightarrow H(j\Omega) = \underbrace{2\cos(\Omega/2)}_{|H|} \cdot \underbrace{e^{-j\Omega/2}}_{\varphi}$

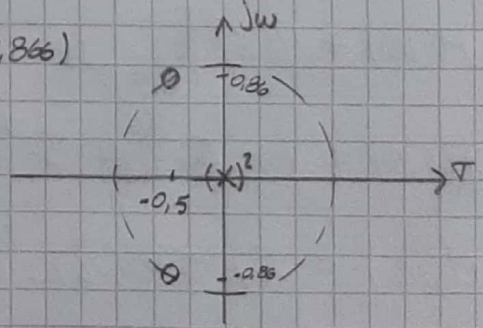




• $h(k) = [1, 1, 1] \Rightarrow y(k) = x(k) + x(k-1) + x(k-2)$

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

$H(z) = \frac{z^2 + z + 1}{z^2} \Rightarrow ceros = (-0{,}5 \pm j0{,}866)$

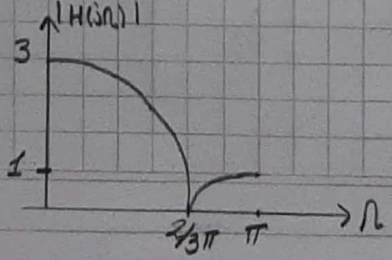


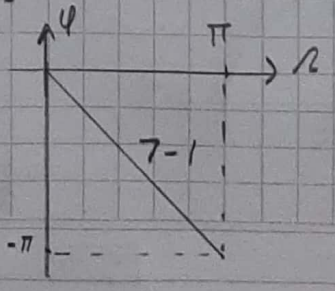
$H(j\Omega) = H(z)\Big|_{z=1e^{j\Omega}}$

$H(j\Omega) = 1 + e^{-j\Omega} + e^{-2j\Omega}$

$= e^{-j\Omega}\left(1 + e^{j\Omega} + e^{-j\Omega}\right)$

$H(j\Omega) = (2\cos(\Omega) + 1)\, e^{-j\Omega}$





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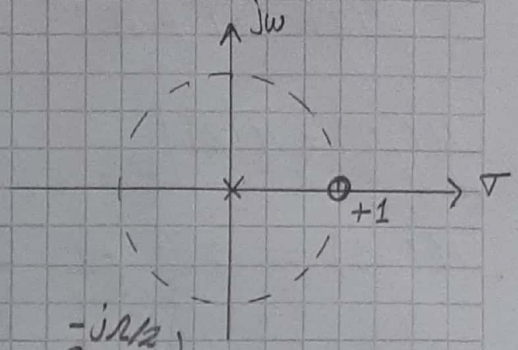
b) Filtro diferenciador

- $h_1(k) = (1, -1)$ de 1° orden

$y(k) = x(k) - x(k-1) \rightarrow Y(z) = X(z)(1 - z^{-1})$

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

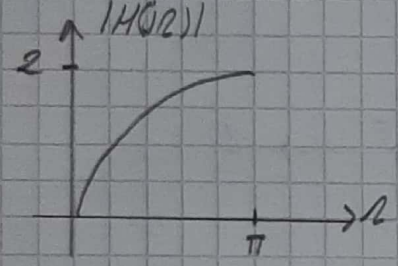


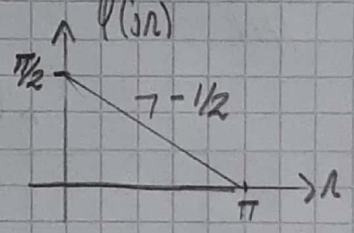
$H(j\Omega) = H(z)\big|_{z=e^{j\Omega}}$

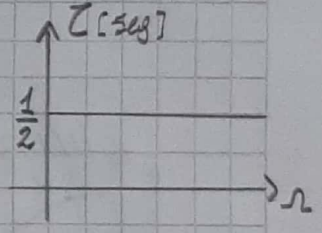
$\Rightarrow H(j\Omega) = 1 - e^{-j\Omega} = e^{-j\Omega/2}(e^{j\Omega/2} - e^{-j\Omega/2})$

$H(j\Omega) = 2j\,\mathrm{sen}(\Omega/2)\, e^{-j\Omega/2}$

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







- $h_2(k) = [1, 0, -1] \rightarrow y(k) = x(k) - x(k-2)$

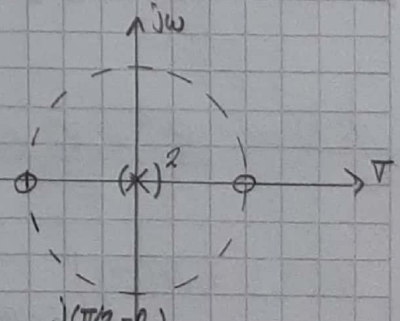
$Y(z) = X(z)(1 - z^{-2})$

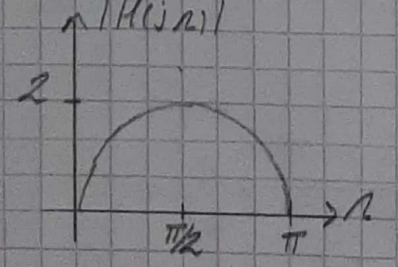
$H(z) = 1 - z^{-2} = \frac{z^2 - 1}{z^2}$

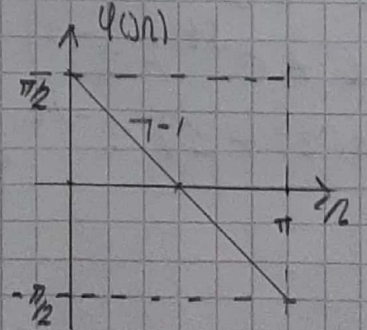
$H(j\Omega) = H(z)\big|_{z=e^{j\Omega}}$

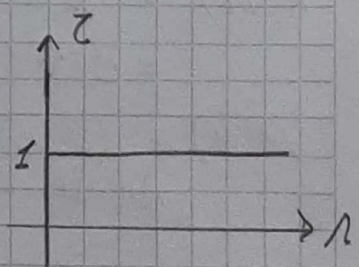
$H(j\Omega) = 1 - e^{-j2\Omega} = e^{-j\Omega}(e^{j\Omega} - e^{-j\Omega})$

$H(j\Omega) = 2j\,\mathrm{sen}(\Omega) \cdot e^{-j\Omega} = 2\,\mathrm{sen}(\Omega)\, e^{j(\pi/2 - \Omega)}$









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