

FPS 10DEC 2021

TP class

Ex 01

$$y[m] = x[m] + C x[m-2] - D y[m-2], \text{ causal}$$

$$H(z) = \frac{Y(z)}{X(z)} = \frac{1 + C z^{-2}}{1 + D z^{-2}} \equiv \frac{\text{"b"}}{\text{"a"}}$$

$$b = [1 \ 0 \ C];$$

$$a = [1 \ 0 \ D];$$

⋮

$$h = \text{impz}(b, a, NT);$$

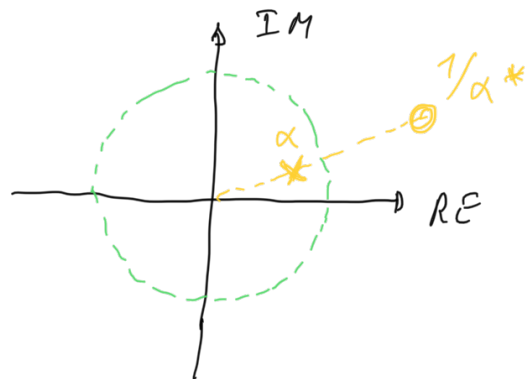
$$[H \ w] = \text{freqz}(b, a, NF, \text{'whole'});$$

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Ex 02

pole:  $\alpha$

zero:  $1/\alpha^*$



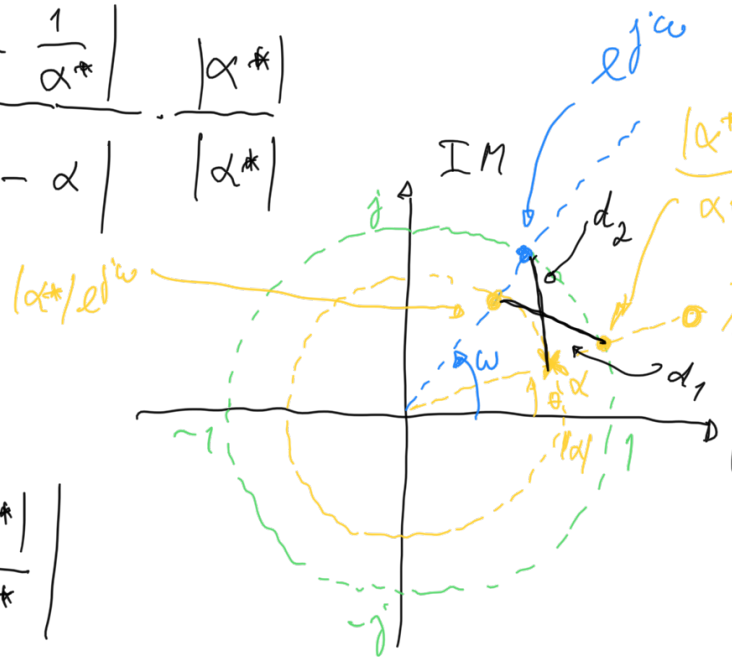
$$\alpha = r e^{j\theta}$$

$$1/\alpha^* = \frac{1}{r} e^{j\theta}$$

... z - 1/\alpha\*

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

$$|H(e^{j\omega})| = \frac{\left| e^{j\omega} - \frac{1}{\alpha^*} \right| \cdot |\alpha^*|}{|e^{j\omega} - \alpha| \cdot |\alpha^*|}$$



$$= \frac{1}{|\alpha^*|} \frac{\left| |\alpha^*| e^{j\omega} - \frac{|\alpha^*|}{\alpha^*} \right|}{|e^{j\omega} - \alpha|}$$

$$= \frac{1}{|\alpha^*|} \frac{d_1}{d_2} = \frac{1}{|\alpha^*|} \quad , \quad \forall \omega$$