

Read 4.3 (4.4.1-4.4.3)**HW** PS #20**Admin****Obj** Transfer functions

- Review
- Geometric interpretation
- BIBO stability

Transfer Function $H(e^{j\omega})$

1. How to find given:

$h[n]$ _____
 DE _____
 Block diagram _____
 Filter specs _____

2. Forms

	z^{-1}	z
Polynomial	$z^c) \frac{\sum_{k=0}^M b_k z^{-k}}{\sum_{k=0}^N a_k z^{-k}} \text{ eg } \underline{\hspace{2cm}}$	$z^c) \frac{\sum_{k=0}^M c_k z^k}{\sum_{k=0}^N d_k z^k} \text{ eg } \underline{\hspace{2cm}}$
Factored	$kz^c) \frac{\prod_{k=1}^M (1 - \xi_k z^{-1})}{\prod_{k=1}^N (1 - \lambda_k z^{-1})} \text{ eg } \underline{\hspace{2cm}}$	$kz^c) \frac{\prod_{k=1}^M (z - \xi_k)}{\prod_{k=1}^N (z - \lambda_k)} \text{ eg } \underline{\hspace{2cm}}$

3. Poles λ_k , zeros ξ_k $\lambda_k \xi_k$ may be complex

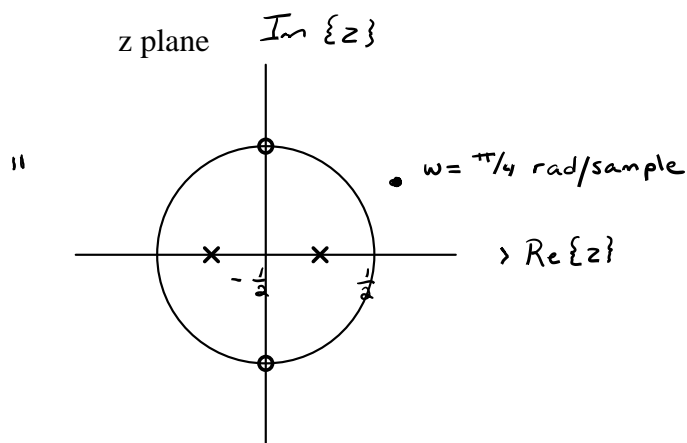
To plot: _____

4. Frequency Response from $H(z)$

Geometric Interpretation of $|H(e^{j\omega})|$

Derivation. E.g. $H(z) = \frac{(z+j)(z-j)}{(z+1/2)(z-1/2)}$

$$|H(e^{j\omega})| =$$



- Note:
- Symmetry around horizontal axis
 - What $\omega = 0, \pi$ geometrically means (low/high freq)
 - What a zero on unit circle does to frequency response
 - What a pole on unit circle does to frequency response

Demo

BIBO Stability

- $\sum_{n=-\infty}^{\infty} |h[n]| < \infty$
- ROC includes unit circle

Demo