Lecture 14:

when $\zeta = 1$, critical damp, two poles at exact same point on real axis

Non minimal phase zeros:

like if $s+2$ instead of $s-2$

$$H_1(s) = \frac{s+2}{s+1} \qquad H_2(s) = \frac{s-2}{s+1}$$

No changes for mag plot

phase = $-90°$

$$\frac{1+\frac{j\omega}{2}}{j\omega+1} \qquad \frac{-\left(\frac{j\omega}{2}\right)+1}{j\omega+1}$$

$\tau > 0$ $\qquad$ $\tau < 0$

Lecture 15:

routh → test stability
root locus → test stability

$$\begin{cases} |KL(j\omega)| = 1 \\ \angle KL(j\omega) = 180° \end{cases} \rightarrow \text{stability MARGINAL}$$

K does not affect phase, K raises the graph of bode magnitude

$$\begin{cases} \text{stable} & \text{gain margin} > 0 \\ \text{unstable} & \text{gain margin} < 0 \end{cases}$$

gain margin = amt. you raise the dB level

phase margin (if top holds) bottom does not hold.

stable : phase margin > 0
unstable phase margin < 0.

40-60
50
increasing gain

models stuff