

# CMPE-242

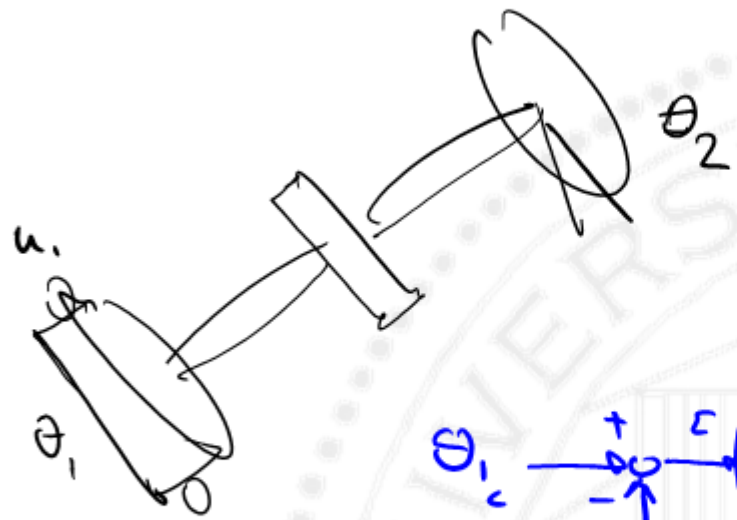
## Applied Feedback Control

Gabriel Hugh Elkaim



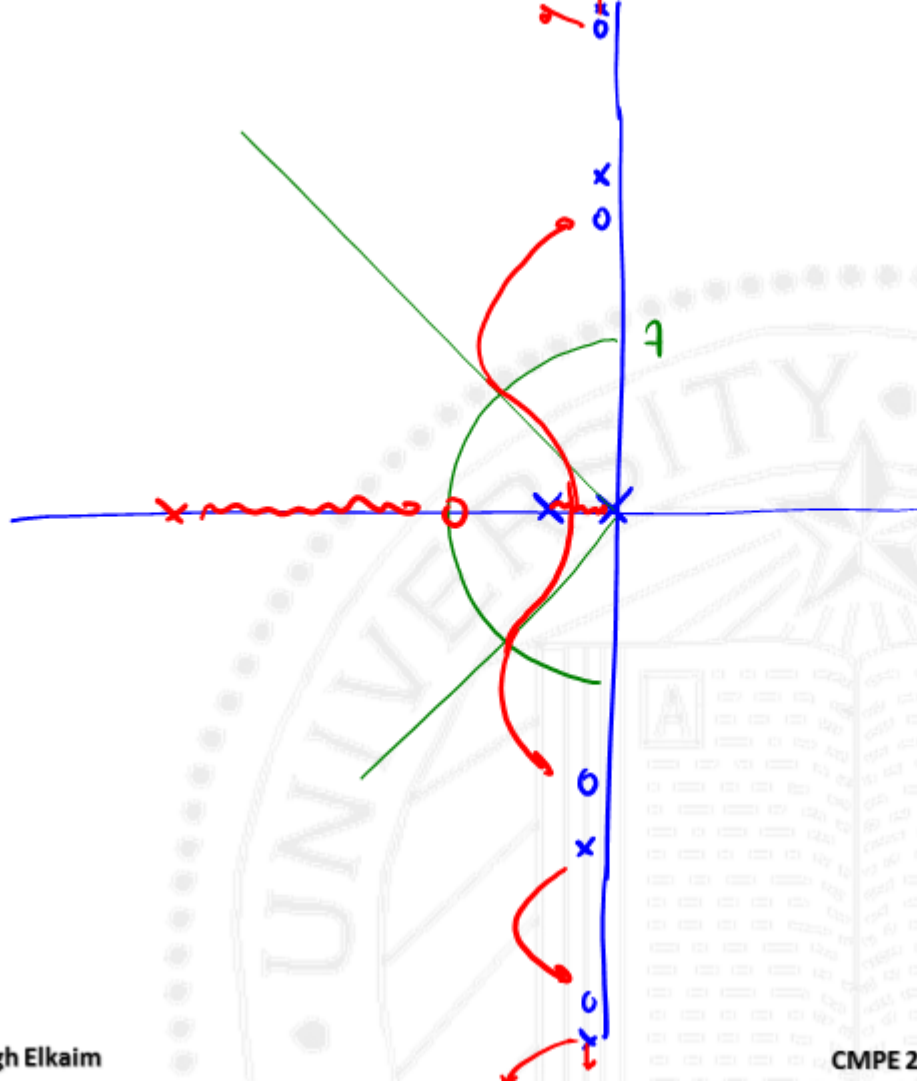
Office Hours

28/FEB/2017



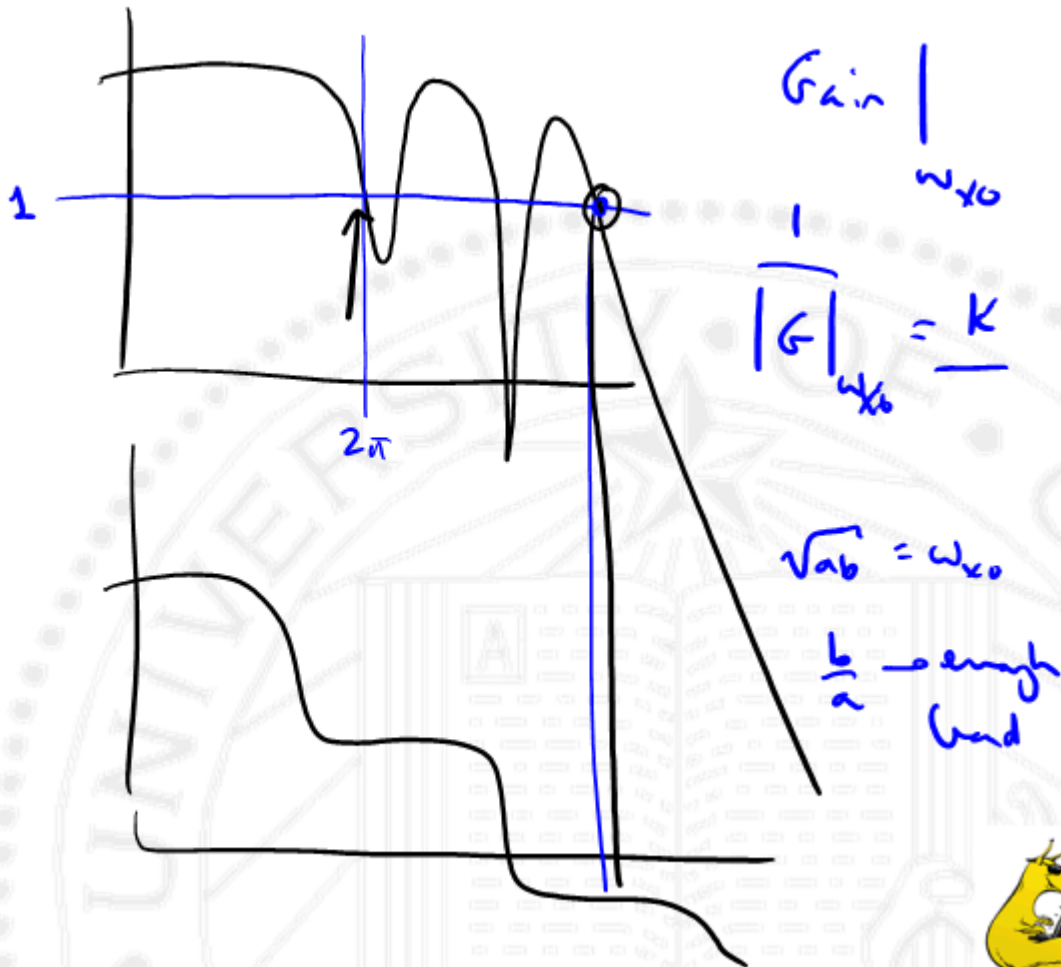
$$\frac{\theta_1}{\theta_1^c}$$





Bode

(xxx 00)



$$s = 2\pi j$$

$$| \cdot | = 0.294 \quad \angle = -173^\circ$$

$$K_o = \frac{1}{0.294} = \underline{3.402}$$

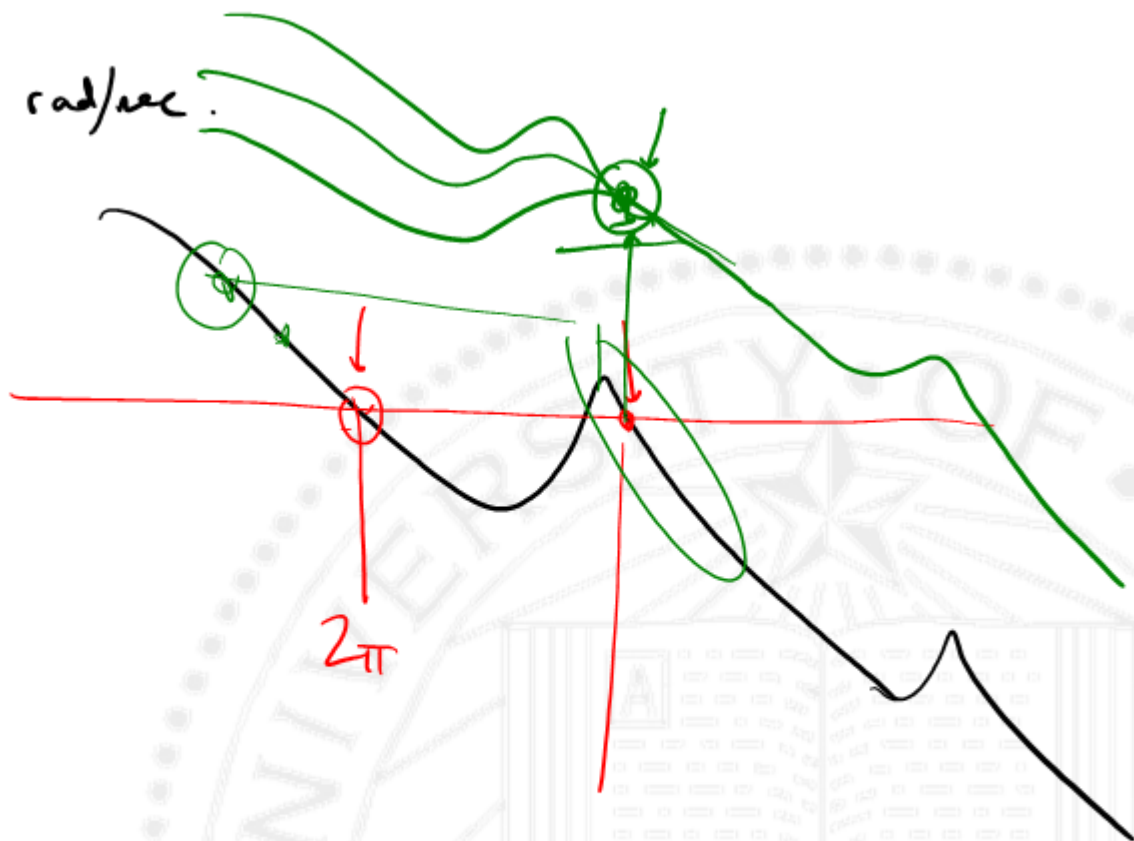
need to add  $50^\circ$  of phase

$$\frac{b}{a} = 10 \quad \sqrt{ab'} = 2\pi \quad \alpha = \frac{2\pi}{\sqrt{10}} \quad b = 2\pi\sqrt{10}$$

$$K(s) = \frac{3.402(\sqrt{10})(1 + 2\pi/\sqrt{10})}{(1 + 2\pi\sqrt{10})}$$

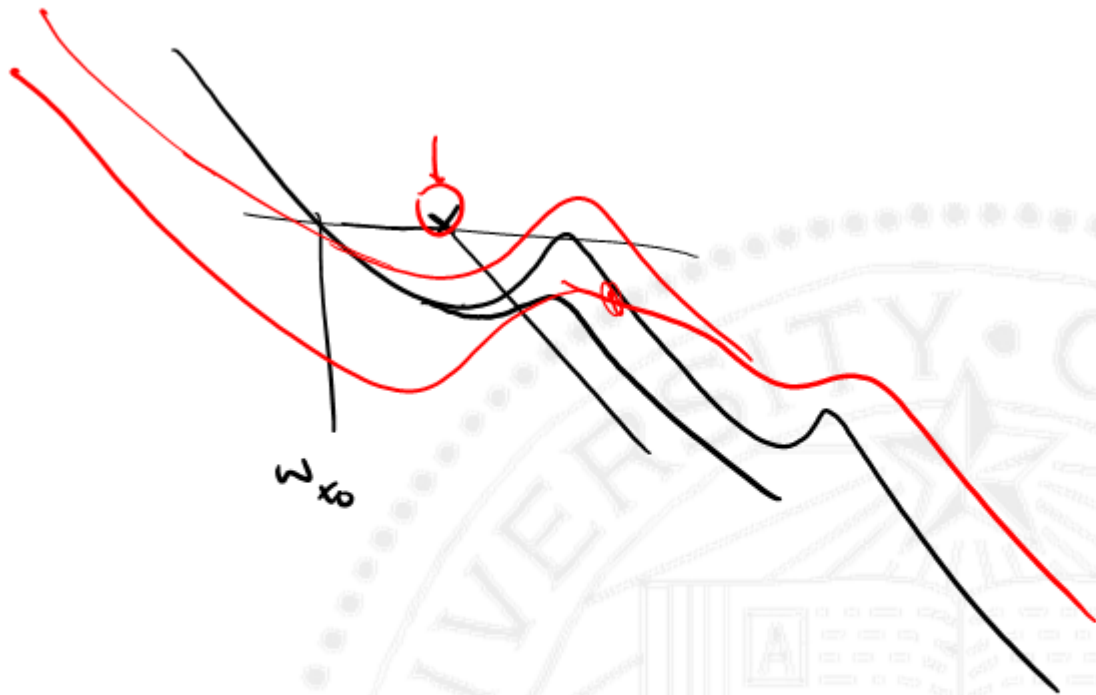


19.3 rad/sec.



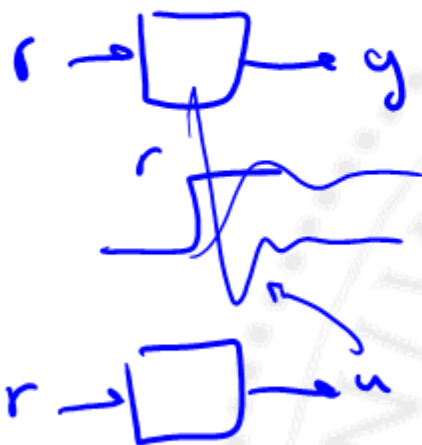
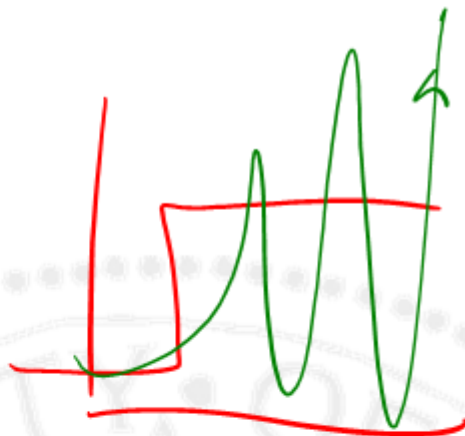
$2\pi$





$\zeta$





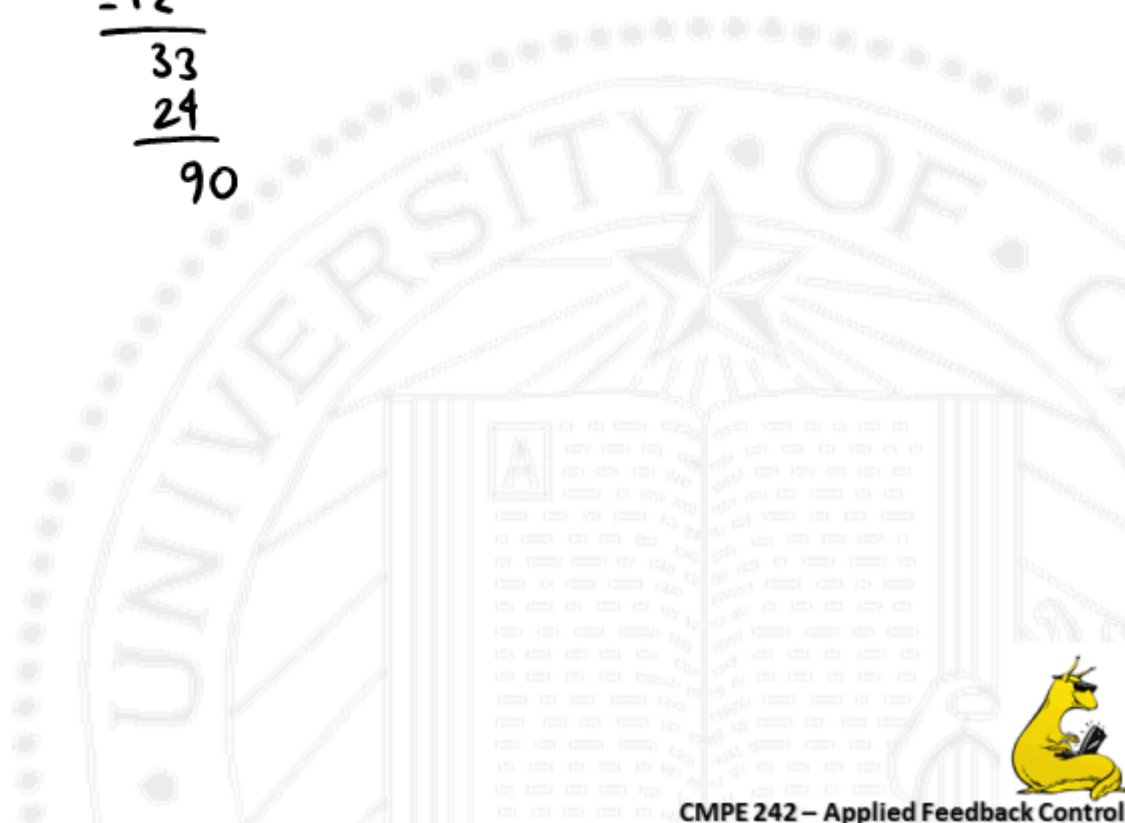


$$\frac{Y}{R} = \frac{0.1289z^2 - 0.004531z - 0.13}{z^3 - 1.793z^2 + 0.9563z - 0.13}$$

$$z^3 - 1.793z^2 + \dots \begin{array}{l} \text{\#1} \quad \text{\#2} \\ 0.1289z^{-1} + 0.226z^{-2} \\ \hline 0.1289z^2 - 0.004531z - 0.13 \\ - 0.1289z^2 + 0.2311z - 0.1233 + 0.0168z^{-1} \\ \hline 0 \quad 0.226z - \dots \end{array}$$



$$\begin{array}{r} 12 \\ 12 \overline{) 153} \\ \underline{-12} \phantom{0} \\ 33 \\ \underline{24} \\ 90 \end{array}$$



$$\frac{Y}{R} = \frac{0.1289z^2 - 0.004531z - 0.13}{z^3 - 1.793z^2 + 0.9563z - 0.13}$$

$$y_{k+3} - 1.793y_{k+2} + 0.9563y_{k+1} - 0.13y_k = 0.1289u_{k+2} - 0.004531u_{k+1} - 0.13u_k$$

$$y_k = 1.793y_{k-1} - 0.9563y_{k-2} + 0.13y_{k-3} + 0.1289u_{k-1} - 0.004531u_{k-2} - 0.13u_{k-3}$$



k	y	u
-3	0	0
-2	0	0
-1	0	0
0	0	1
1	.1289	0
2	.1289	0
3	.	0

$$y_2 = (1.293)(.1289) - 0.009531$$

FVT

$$\delta \rightarrow 1 \quad \frac{z^{-1}}{z} [ \quad ]$$







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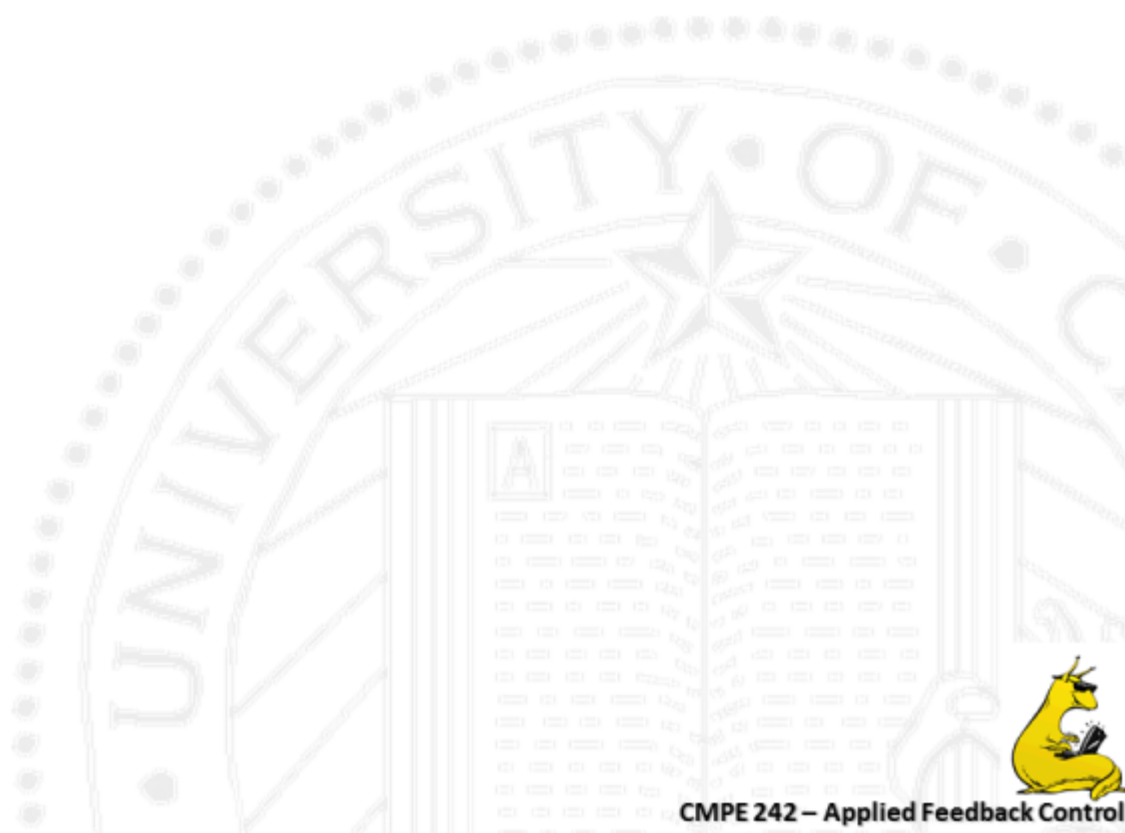




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