

# CMPE-242

## Applied Feedback Control

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Office Work

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NW # 6

$$G(s) = \frac{1}{s^2 + \frac{1}{5}s + 1} \quad \Delta T_s = 0.2 \text{ sec}$$

$$\Delta_{cl} = -1, -1 \quad \leftarrow s_{dom}$$

$$z_{dom} = e^{sT} = e^{-T} = e^{-0.2} = 0.8187$$



$$G(s) \rightarrow G(z) \quad G(z) = \frac{z^{-1}}{z} \approx \left\{ \frac{G(s)}{s} \right\}$$

#22 in table:  $\frac{1}{s(\underbrace{s^2 + 0.2s + 1})} = \frac{(0.995)^2 + (-1)^2}{s[(s+0.1)^2 + (0.995)^2]}$

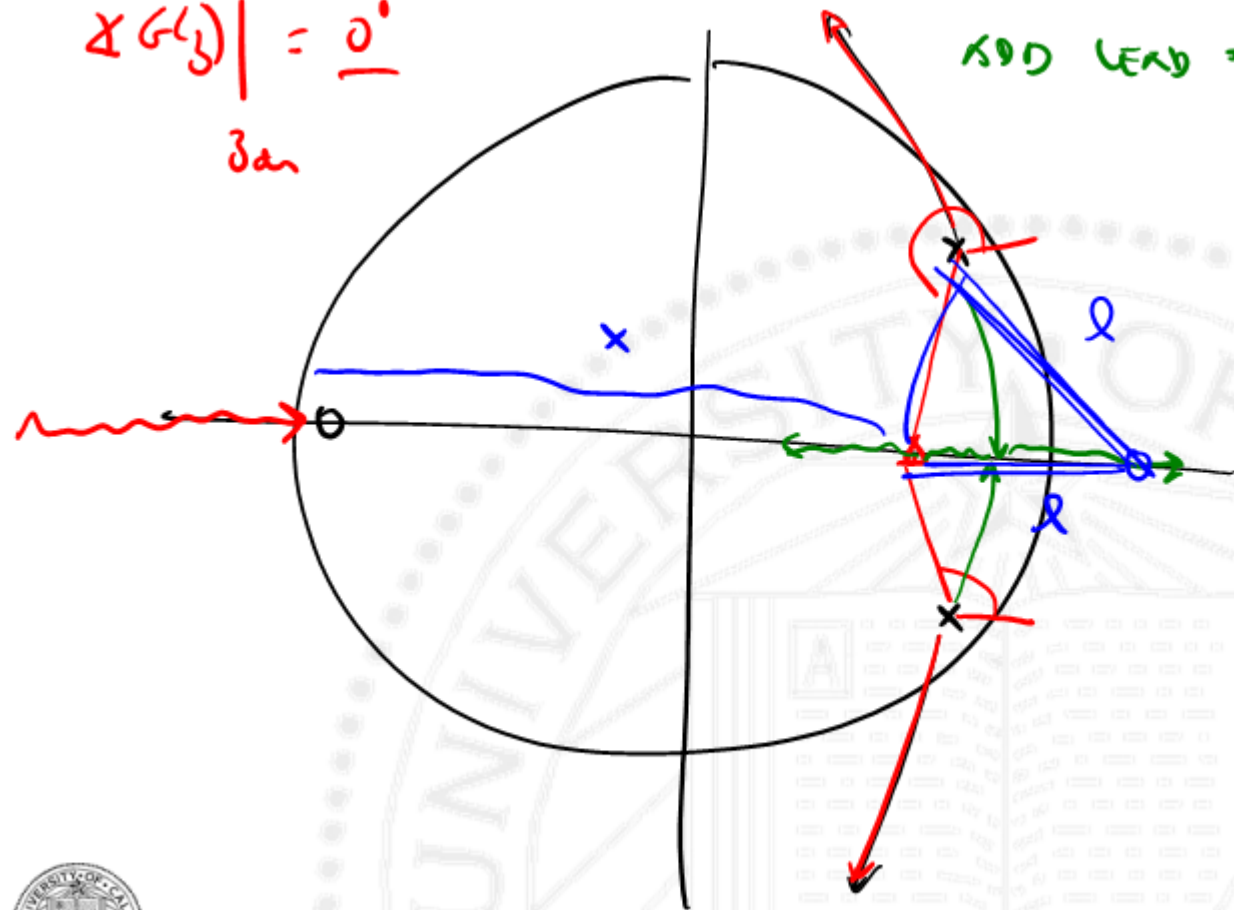
cmd (Gs, 0.2, 'tbl')

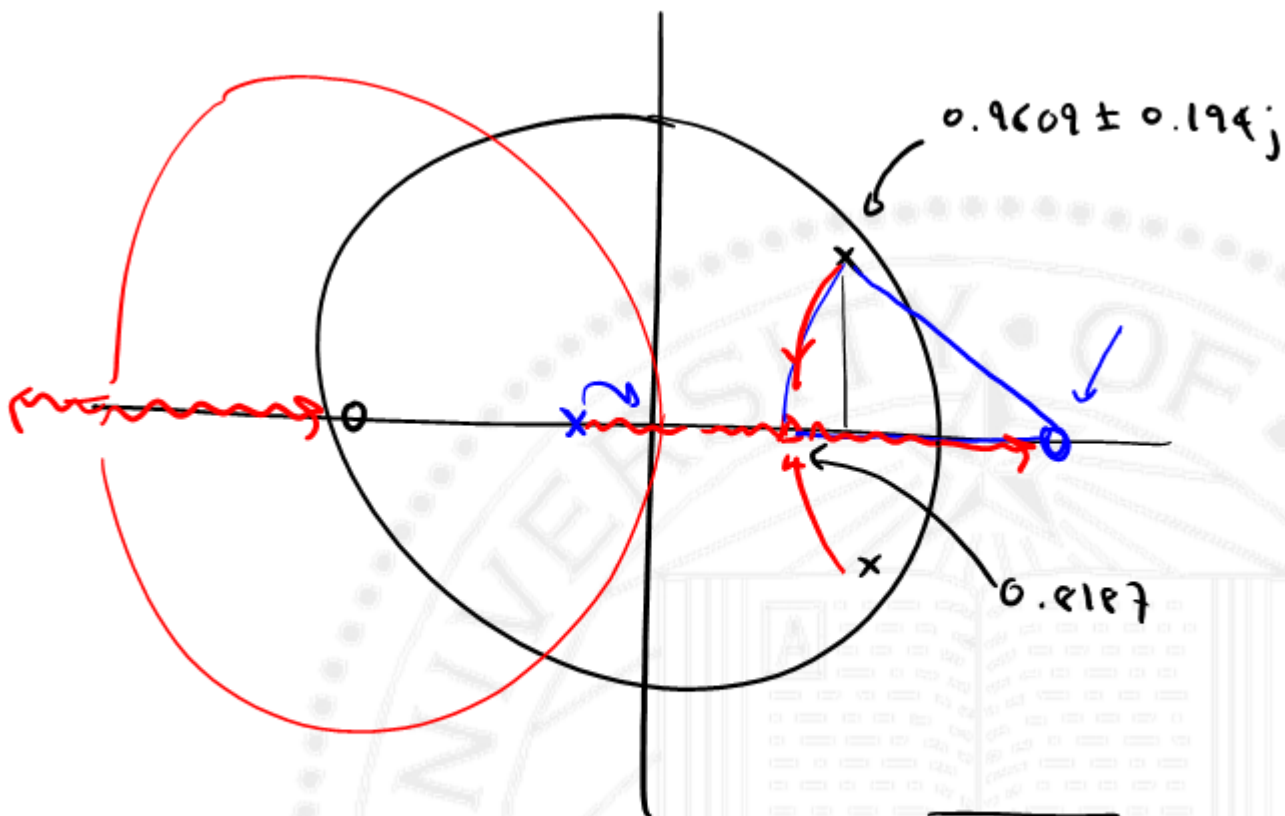
$$G(z) = \frac{0.01967 [z + 0.9867]}{z^2 - 1.922z + 0.9608} \leftarrow 0.9609 \pm 0.194j$$



$$\angle G(s) \Big|_{\omega = \omega_{an}} = \underline{0^\circ}$$

ADD LEAD = 180°





$$z - 0.8187 = \sqrt{(z - 0.9609)^2 + (0.194)^2}$$



$$\underline{z = 1.0219}$$

x — anywhere in the LPI of 0.0187

$$K(z) = \frac{K_0 (z - 1.0219)}{z}$$





$$\frac{Y_k}{R_k} = \frac{GK}{1+GK}$$

$$\frac{Y_k}{R_k} = \frac{0.1289z^2 - 0.004531z - 0.13}{z^3 - 1.793z^2 + 0.9577z - 0.13}$$

$$\text{DC gain} \triangleq \lim_{z \rightarrow 1} \frac{Y_k}{R_k} = \boxed{-0.1679}$$





$$z^3 - 1.793z^2 + 0.9563z - 0.13 \left| \begin{array}{l} 0.1289z^{-1} + 0.2266z^{-2} + 0.1530z^{-3} \dots \\ 0.1289z^2 - 0.004531z - 0.13 \\ 0.1289z^2 + 0.2311z - 0.1233 + 0.0166z^{-1} \end{array} \right.$$

$$0.2266z + \dots$$

$$0.1530z$$



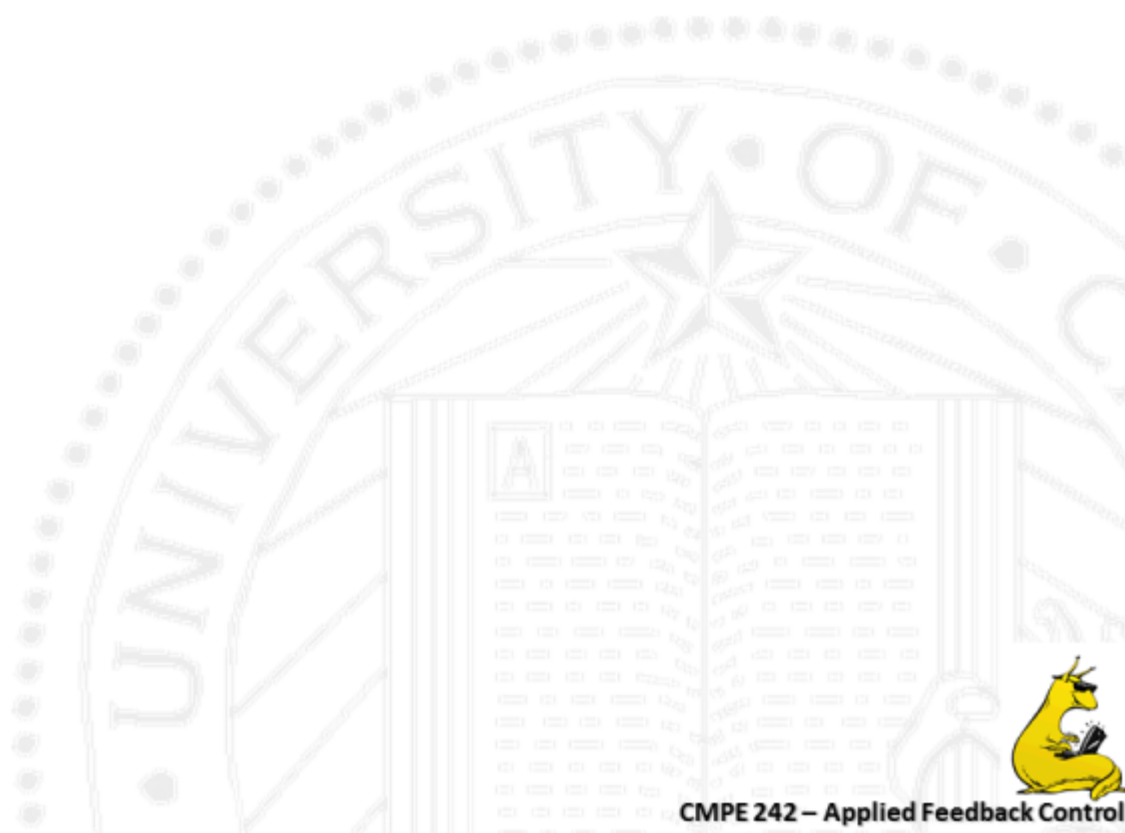




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