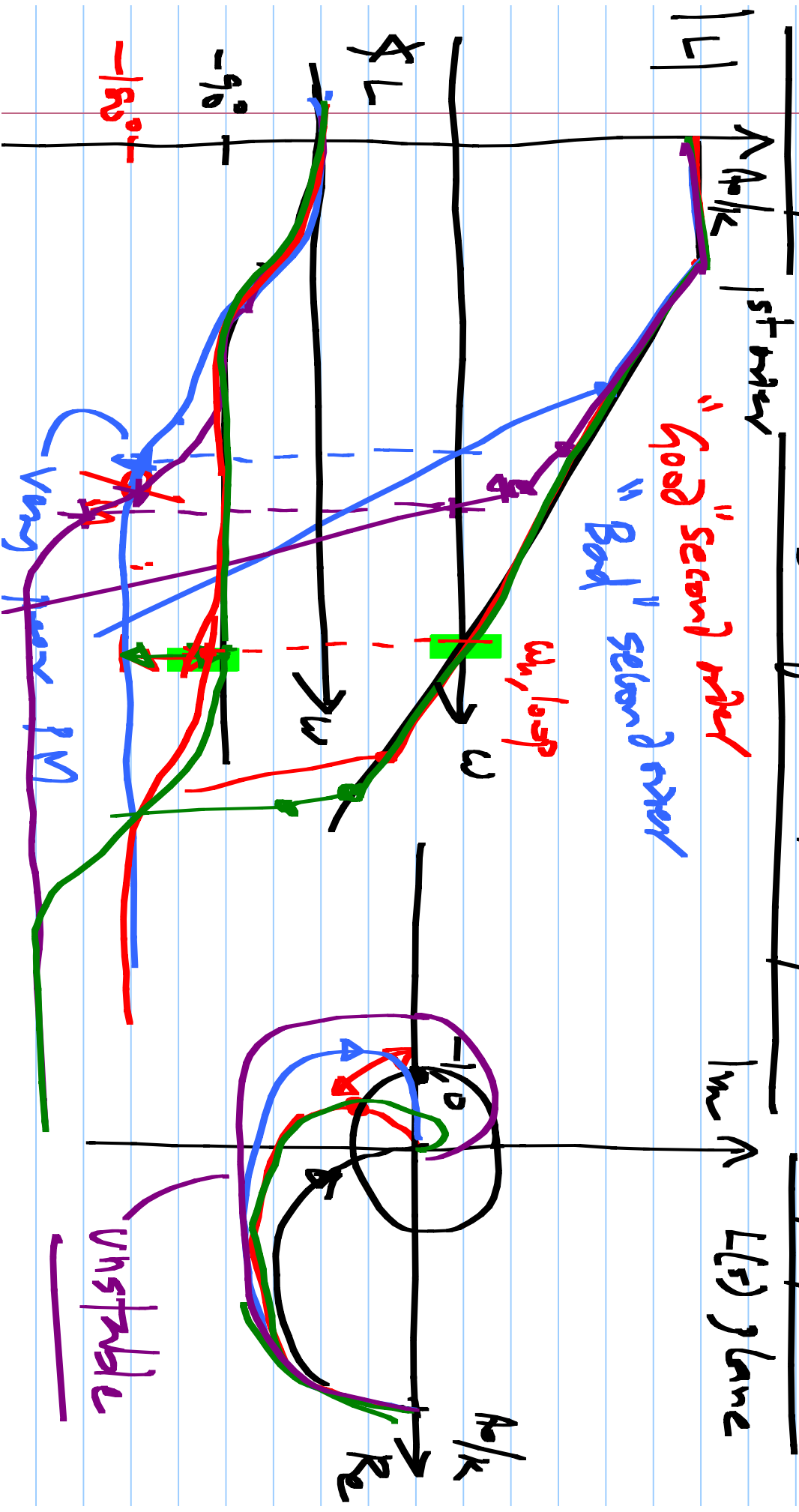


EE 2019

Stability

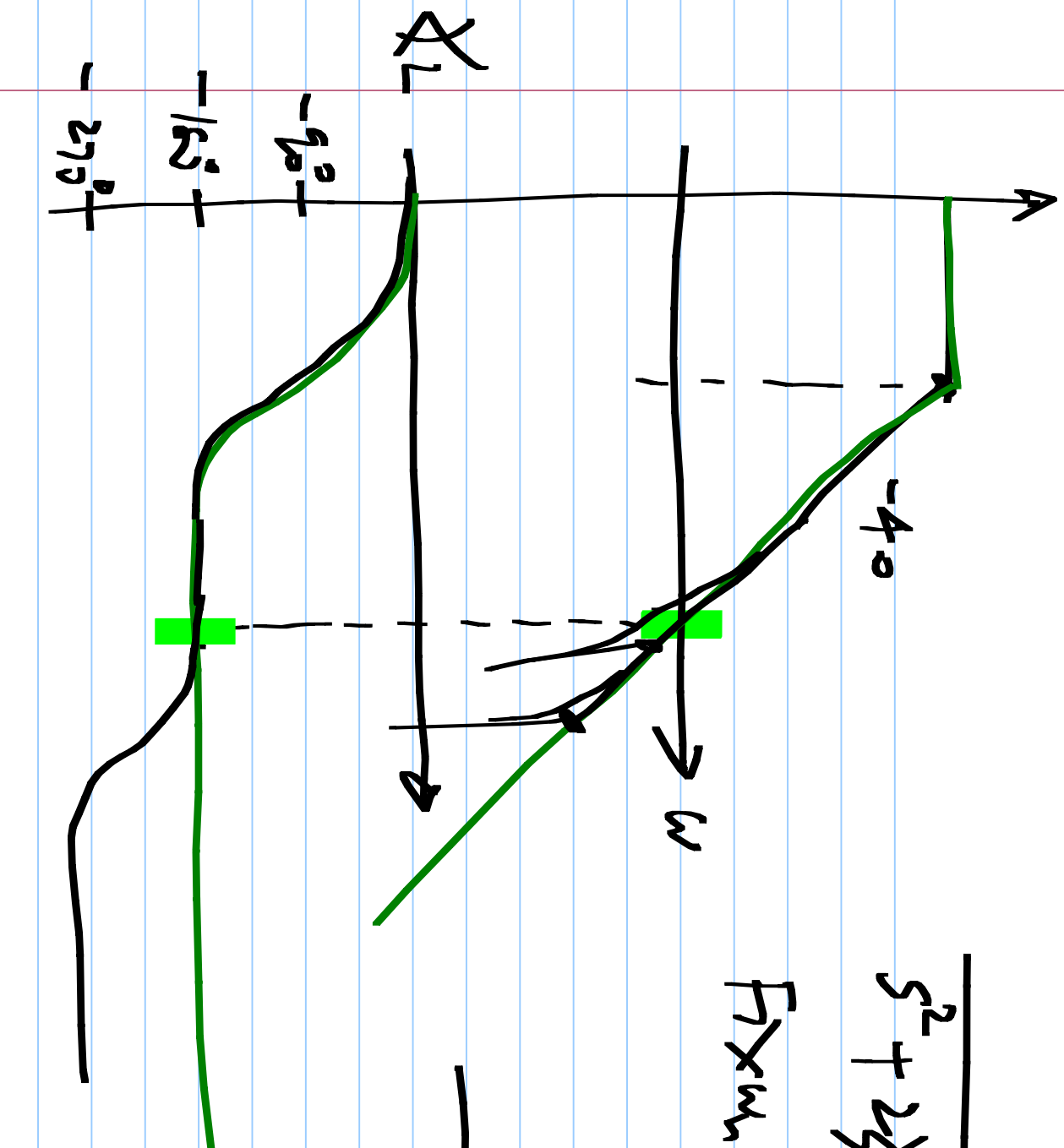
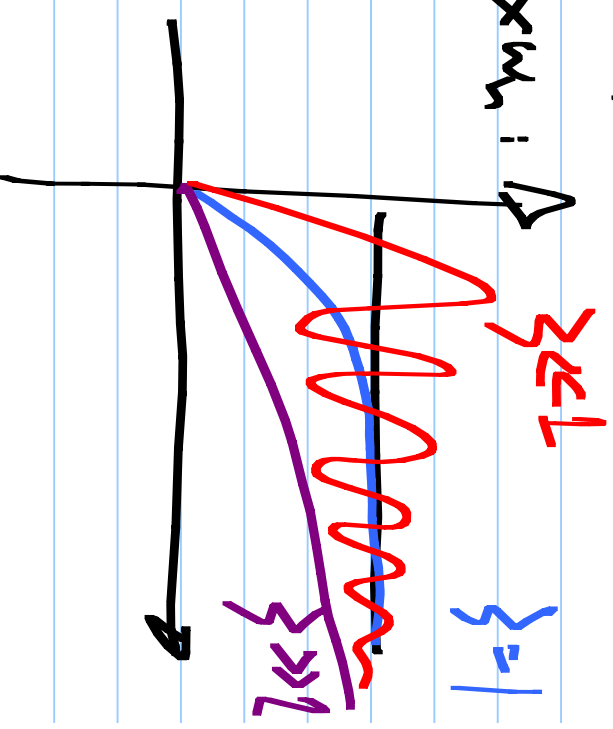
of -ve fb systems

22/2/2018



$$\frac{s^2 + 2\zeta\omega_n s + \omega_n^2}{}$$

Fix $\omega_n : \Delta$



$$\rho_2 \gg \frac{A_0}{L} \cdot \rho_1$$

$$\rho_2 = A \frac{A_0}{L} \rho_1$$

$$\frac{A_0/k}{(1+s/\rho_1)(1+s/\rho_2)}$$

$$Z = \frac{1}{2} \left(\sqrt{\frac{\rho_2}{\rho_1}} + \sqrt{\frac{\rho_1}{\rho_2}} \right) \cdot \sqrt{\frac{k}{A_0}}$$

$$\omega_n = \sqrt{\rho_1 \rho_2} \sqrt{1 + \frac{A_0}{k}}$$

Calculate ϕ_m :

$$\zeta = 1$$

$$\zeta = 1/\sqrt{2}$$

$$\zeta = 1/2$$

$$A_0/k_c$$

$$\left(1 + \frac{\zeta}{\beta_1}\right) \left(1 + \frac{\zeta}{\beta_2}\right)^2$$

$$S = j\omega_n \tan^{-1}$$

$$-90^\circ$$

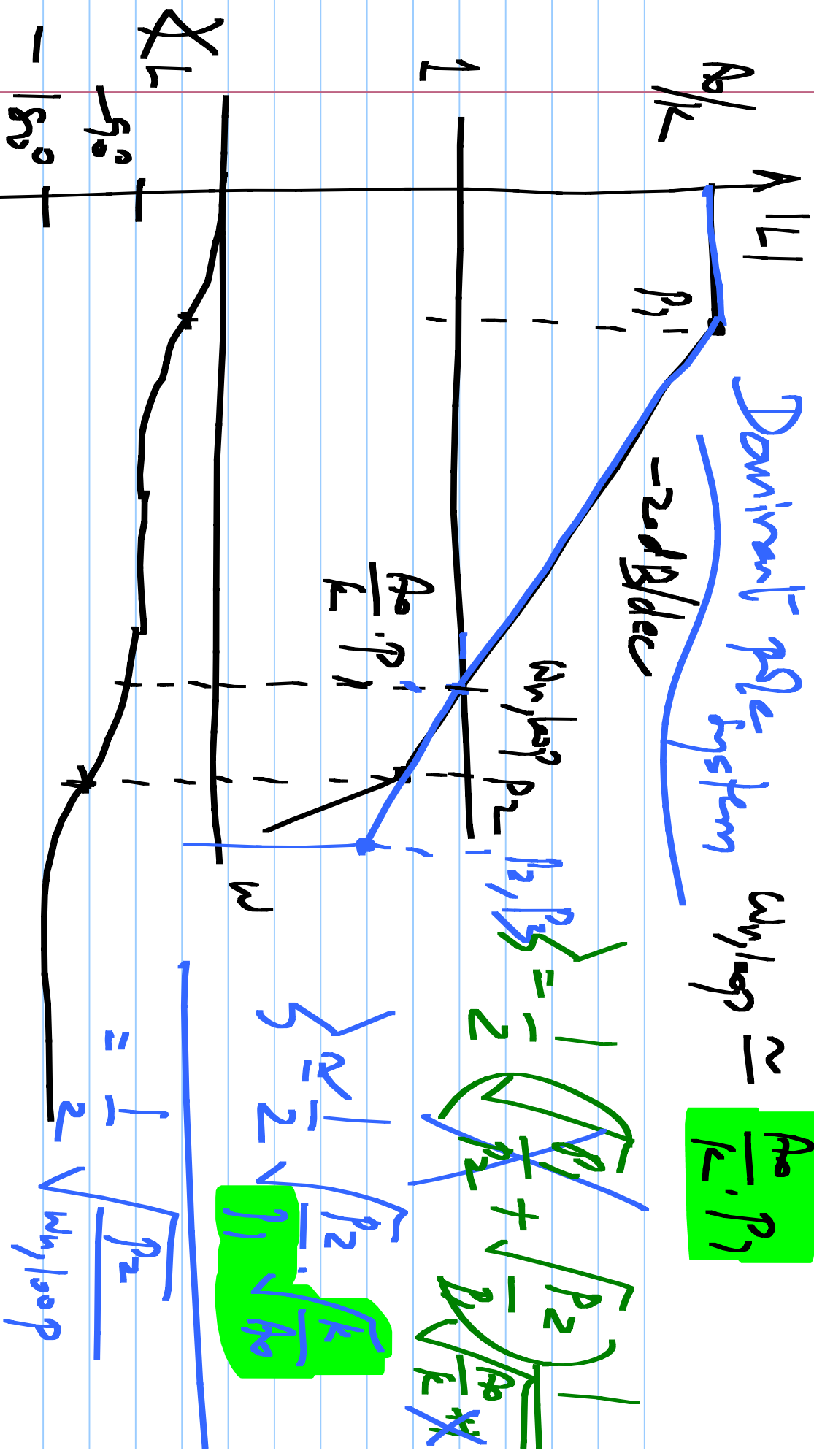
$$+ \tan^{-1}$$

$$- \tan^{-1}$$

$$- \frac{1}{2} \tan^{-1} \left(\frac{\omega_n / \omega_p}{\beta_2} \right)$$

Dominant pole system $\omega_{hloop} \approx \frac{A_0}{K \cdot P_1}$

$-20dB/dec$



$$\sqrt{\frac{P_1}{P_2} + \sqrt{\frac{P_2}{P_1} \frac{A_0}{K}}} \quad \text{and} \quad \sqrt{\frac{P_2}{P_1} \frac{A_0}{K}}$$

$$\sqrt{\frac{P_2}{P_1} \frac{A_0}{K}}$$

$$= \frac{1}{2} \sqrt{\frac{P_2}{\omega_{hloop}}}$$

3

 $P_2/m_1 \omega$

phase lag

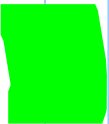
 ϕ_m

1

4

$$-\phi_0 - \tan^{-1}(1/4)$$

$$\tan^{-1} 4 = 76^\circ$$

 $1/\sqrt{2}$

2

$$-\phi_0 - \tan^{-1}(1/2)$$

$$\tan^{-1} 2 = 63^\circ$$

X

 $1/2$

1

$$-\phi_0 - \tan^{-1}(1)$$

$$\tan^{-1} 1 = 45^\circ$$

ans