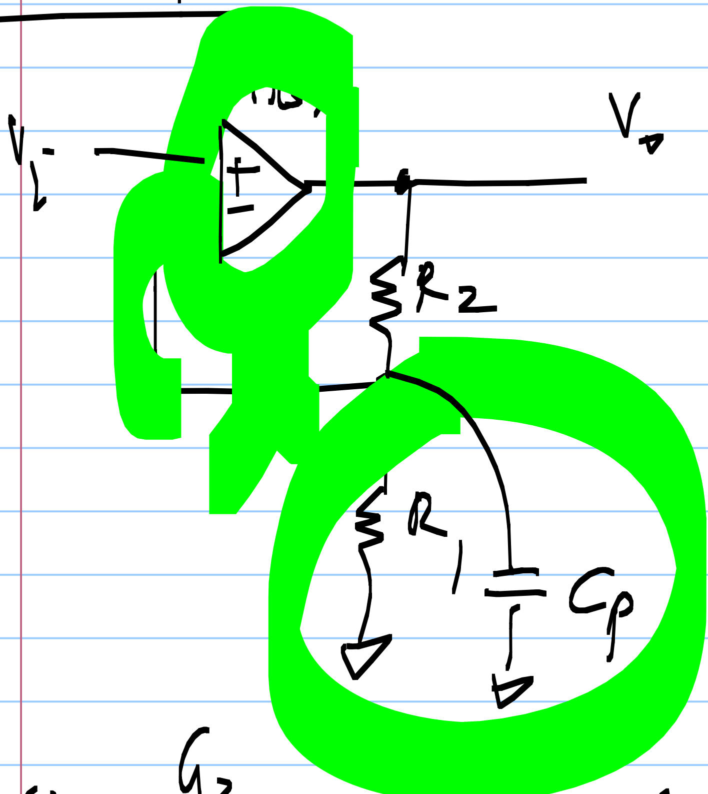
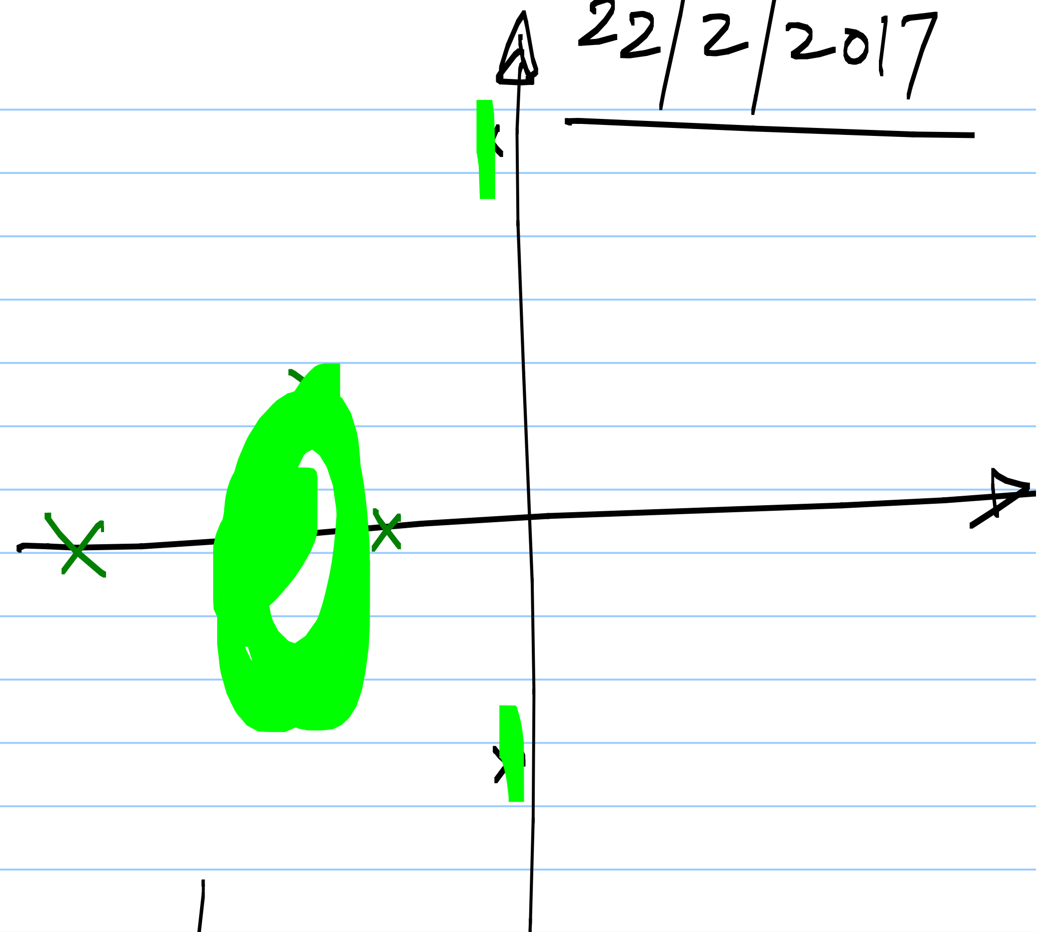
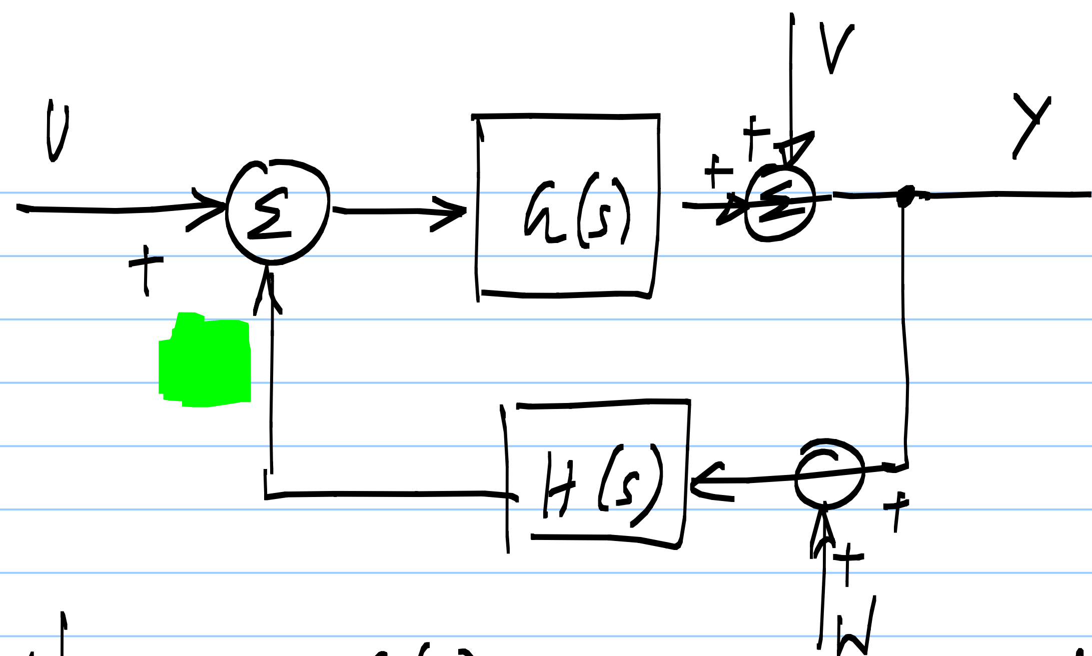
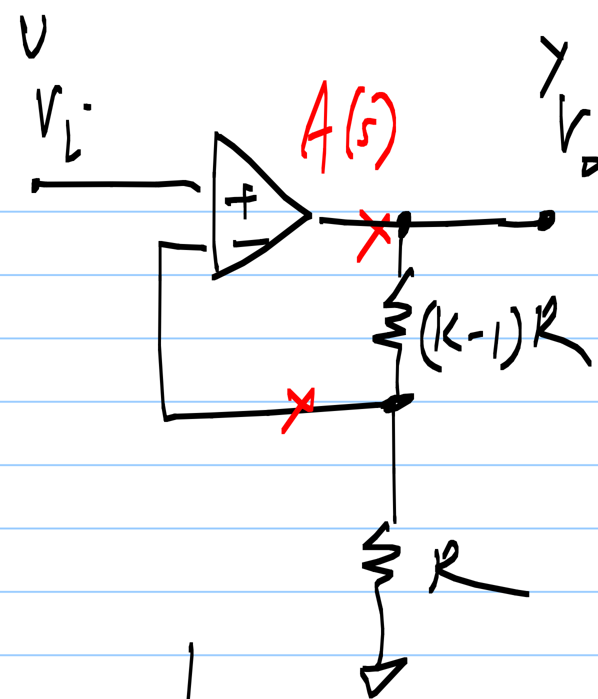
EE2019 $\qquad \dfrac{V_o}{V_i}$ $\qquad$ 22/2/2017





$$A(s) = \frac{G_2}{G_1 + G_2 + sC_p} \qquad \frac{G_1 + G_2}{C_p} = \frac{1}{R_1 /\!/ R_2 \cdot C_p}$$





$$\left.\frac{Y}{U}\right|_{V=0} = \frac{G(s)}{[illegible]}$$

$$= \frac{A}{1 + A/k}$$

$$\left.\frac{Y}{V}\right|_{U=0} = \frac{1}{1+GH}$$

$$\frac{Y}{W} = \frac{-GH}{1+GH}$$

When loop gain magnitude [illegible]

$$\frac{Y}{U} \simeq \frac{G}{\cancel{1}+GH} = \frac{1}{H}$$

$$\frac{Y}{V} = \frac{1}{\cancel{1}+GH} = \frac{1}{GH}$$

$$\frac{Y}{W} = \frac{-GH}{\cancel{1}+GH} \simeq -1$$

$|GH| \ll 1$

$$\frac{Y}{U} \simeq G$$

$$\frac{Y}{V} \simeq 1$$

$$\frac{Y}{W} \simeq -GH$$

$1 + \underbrace{GH}_{L\text{: loop gain}}$ or $1+L$ will appear in the denominator of every -ve feedback system transfer fn

$$\boxed{\frac{Y}{U} = \frac{G}{1+GH}}$$

Loop gain $L(j\omega) = -1$

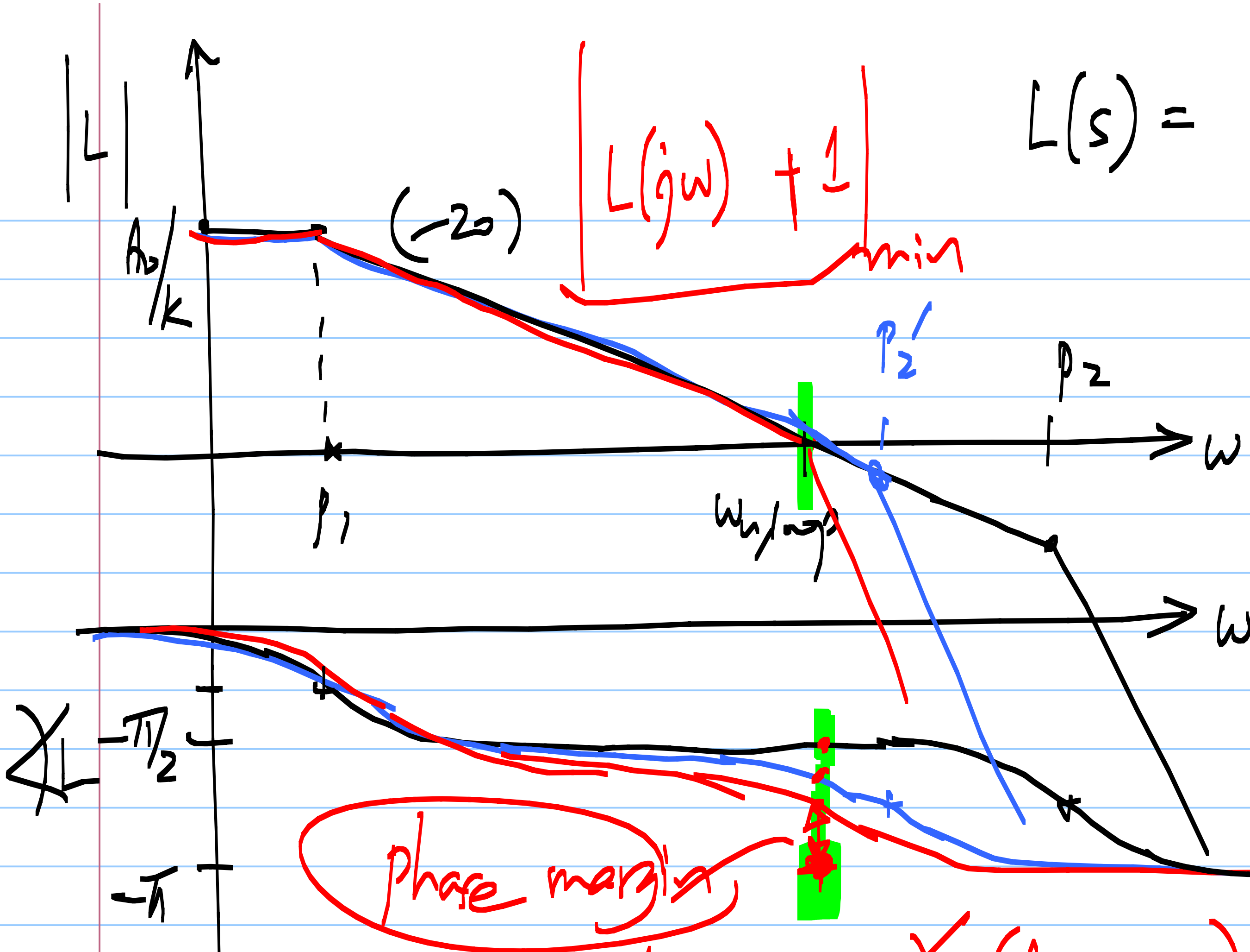
$\Rightarrow$

Closed loop system poles: on $j\omega$ axis

$$\frac{Y}{V} = \frac{G}{1+GH}$$ closed loop TF between input U & output Y

Loop gain:

Poles of the closed loop TF should be in the left half s-plane



Distance between $\angle L(j\omega_{n,loop})$ and $-\pi$

$$L(s) = \frac{A_0}{K} \cdot \frac{1}{\left(1+\frac{s}{p_1}\right)\left(1+\frac{s}{p_2}\right)}$$

$$\zeta\,(\text{closed loop}) = \frac{1}{2}\sqrt{\frac{K}{A_0}}\left(\sqrt{\frac{p_1}{p_2}} + \sqrt{\frac{p_2}{p_1}}\right)$$

$$-1 = 1\angle\pi$$

$\zeta = 1$

phase margin? $\qquad \frac{Q_0}{K} \gg 1$

$\zeta = 1, \ 1/2, \ 1/\sqrt{2}$] degree