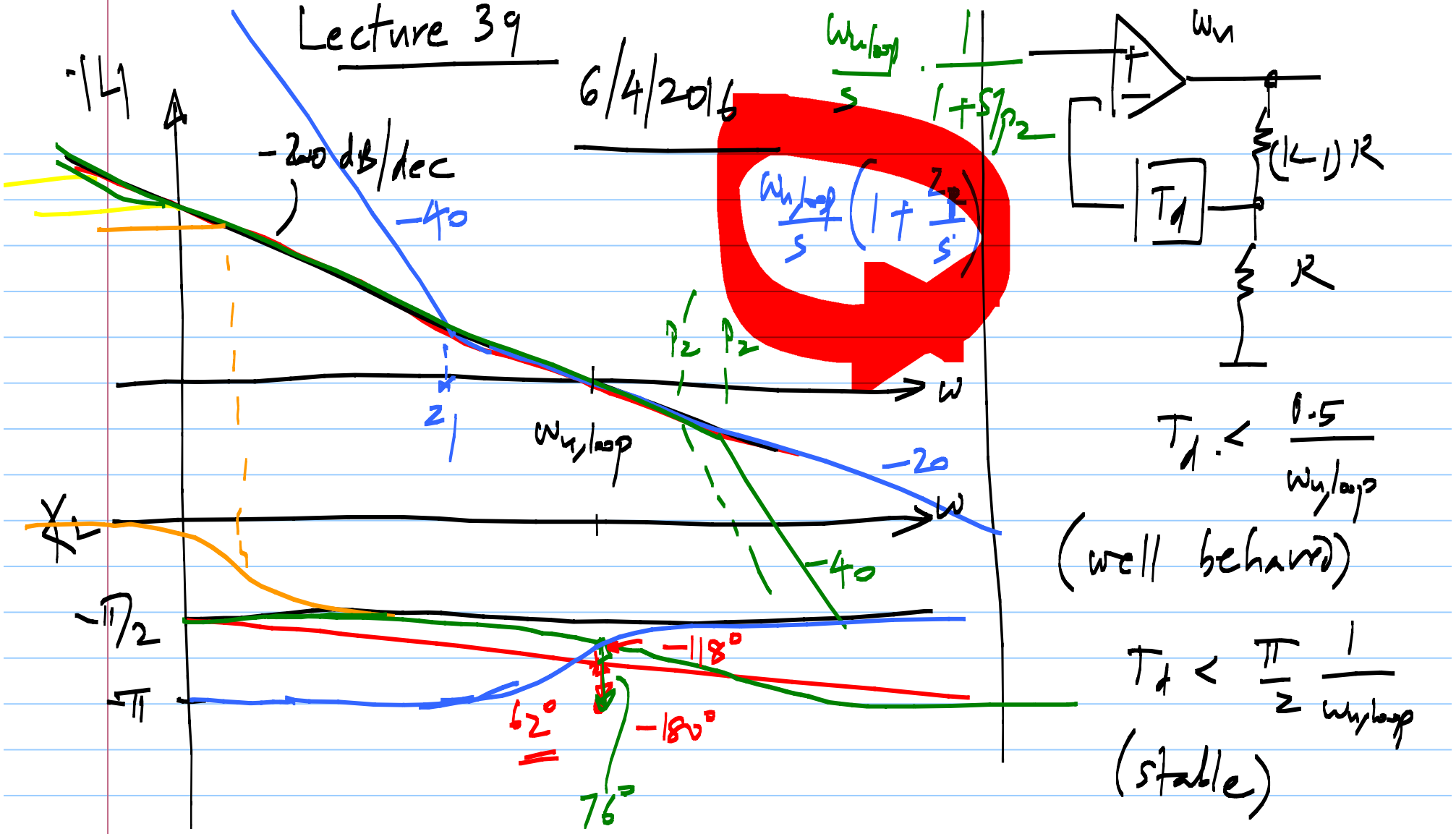
Lecture 39

6/4/2016



$$T_1 < \frac{0.5}{\omega_{u,loop}}$$

(well behaved)

$$T_1 < \frac{\pi}{2}\frac{1}{\omega_{u,loop}}$$

(stable)

$$L(s) \approx \frac{\omega_{u,loop}}{s} \cdot \frac{1}{1+s/p_2}$$

$$\frac{L(s)}{1+L(s)} = \frac{1}{1+1/L(s)}$$

$\zeta = 1 \ (Q = 1/2)$: $p_2 = 4\omega_{u,loop}$

$$= \frac{1}{2}\sqrt{\frac{p_2}{\omega_{u,loop}}}$$

$$\angle L(j\omega_{u,loop}) = -104^\circ$$

PM: $180^\circ + \angle L(j\omega_{u,loop}) = 76^\circ$

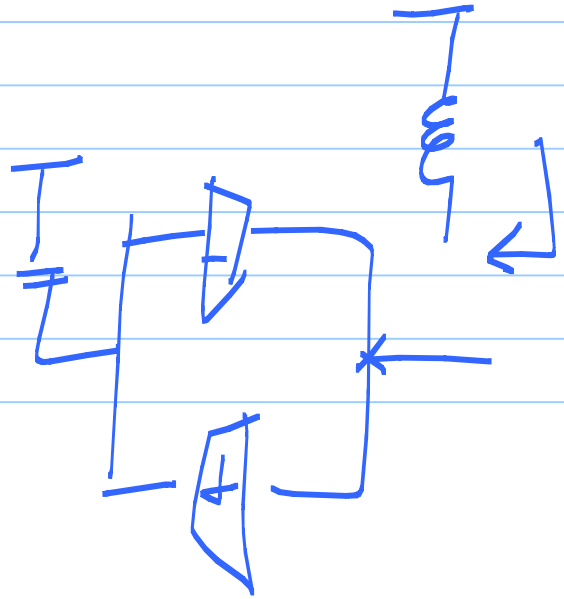
$$L(s) = \frac{\omega_{u,loop}}{s} \cdot \left(1 + \frac{z_1}{s}\right)$$

$$\zeta = \frac{1}{2}\sqrt{\frac{\omega_{u,loop}}{z_1}}$$

$\zeta = 1 \ (Q = 1/2)$

$$z_1 = \frac{1}{4}\omega_{u,loop}$$

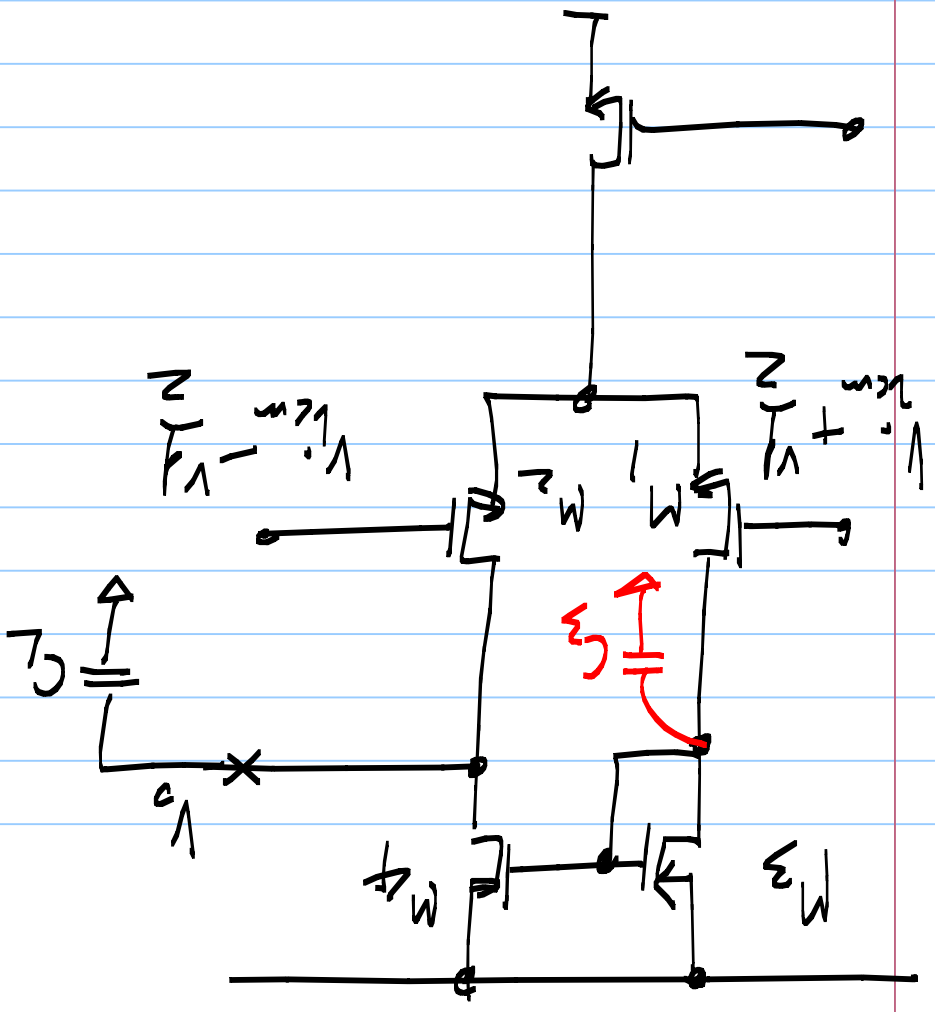
$$\angle L(j\omega_{u,loop}) = -104^\circ$$

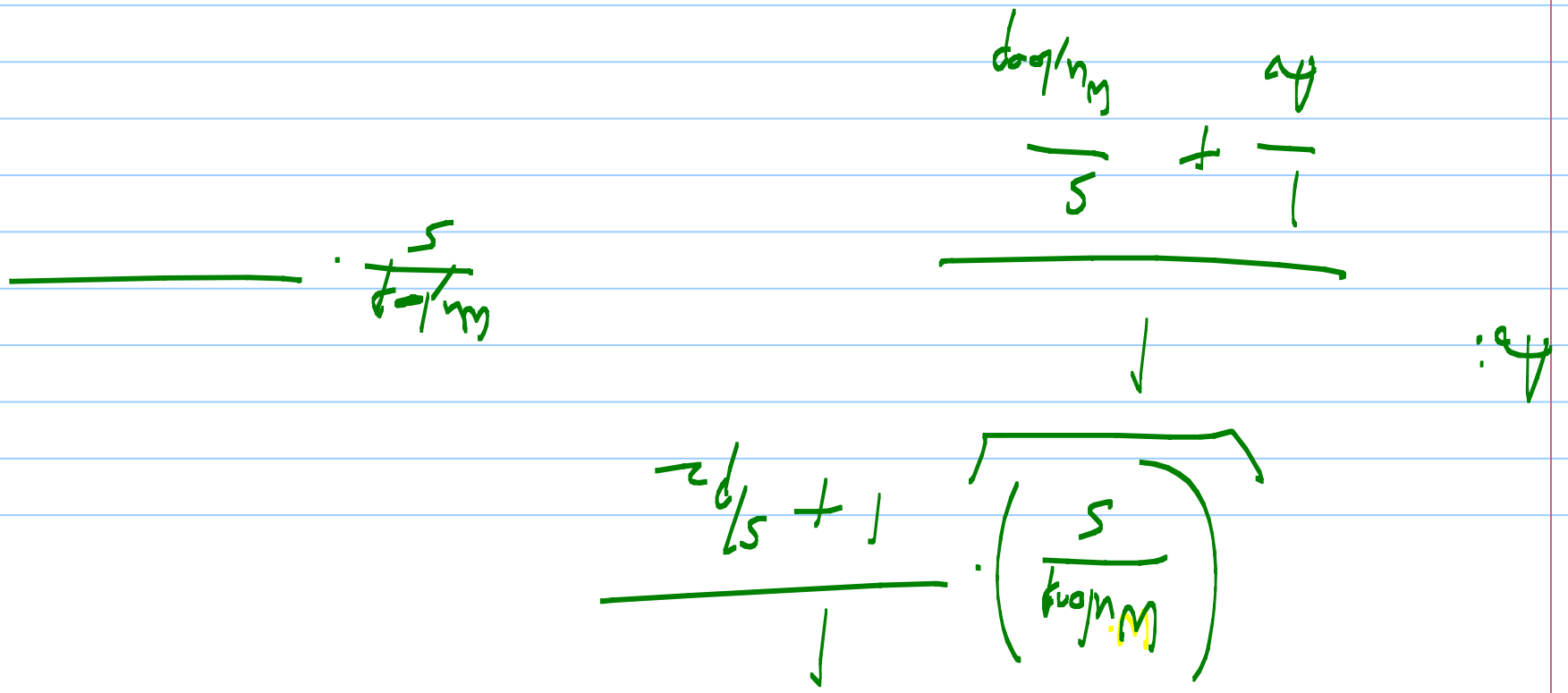


$$\frac{1 + \frac{\omega_M \alpha}{s} + \left(\frac{\omega_M}{s}\right)^2}{1}$$

$$\frac{\dfrac{1+s\,C_3/g_{m3}}{1+s\,C_3/2g_{m3}}\cdot\dfrac{sC_L}{g_{m1}}}{\dfrac{s}{W_1/W_3}} = \frac{V_o(s)}{V_d(s)}$$

$$\frac{sC_L}{g_{m1}} = \frac{V_o(s)}{V_d(s)}$$





$$\frac{\omega_{n/log}}{s} \cdot \frac{\prod (1 + s/z_k)}{\prod (1 + s/p_k)}$$

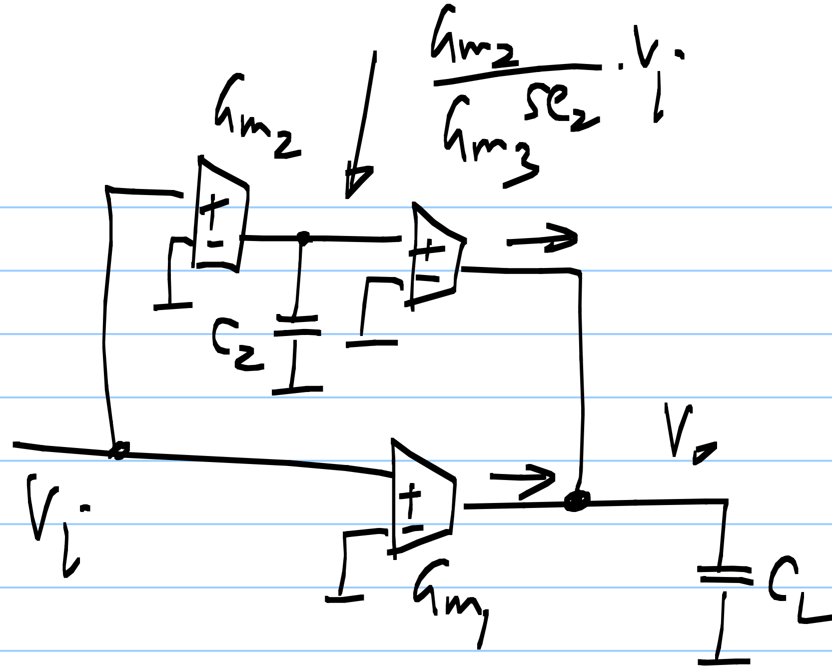
Low freq.

High freq

$\{ z_k \}, p_k > \omega_{n/log}$

Non-dominant poles & zeros

$$\sum \frac{1}{p_k} - \sum \frac{1}{z_k} < \frac{0.5}{\omega_{n/p}}$$



$$\frac{V_o}{V_i} = \frac{G_{m1} + \frac{G_{m2} G_{m3}}{sC_2}}{sC_L}$$

$$= \frac{G_{m1}}{sC_L}\left(1 + \frac{G_{m2}\, G_{m3}}{G_{m1} sC_2}\right)$$

$$\omega_{u,loop} = \frac{G_{m1}}{C_L} \qquad = \frac{\omega_{u,loop}}{s}\left(1 + \frac{z_1}{s}\right)$$

$$z_1 = \frac{G_{m2}\, G_{m3}}{G_{m1} \cdot C_2} \qquad \frac{G_{m2}\, G_{m3}}{G_{m1} C_2} < \frac{G_{m1}}{C_L}$$