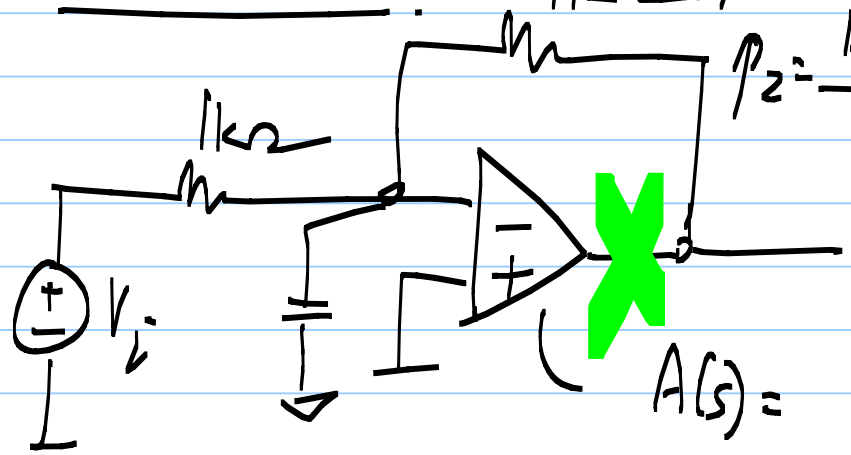
Tutorial 6

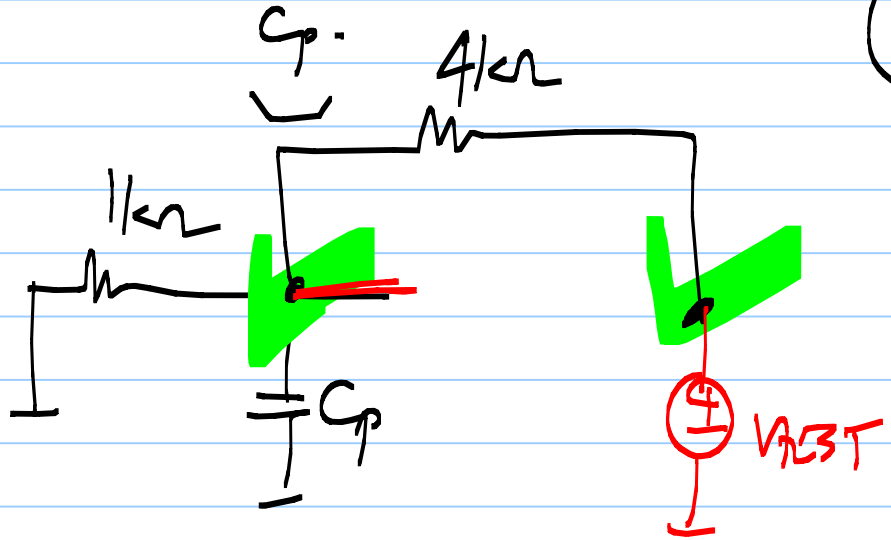
$A_0 = 4000$; $L(s) = \frac{A(s)}{5}$; $\frac{V_o}{V_i} = -4(\ldots)$



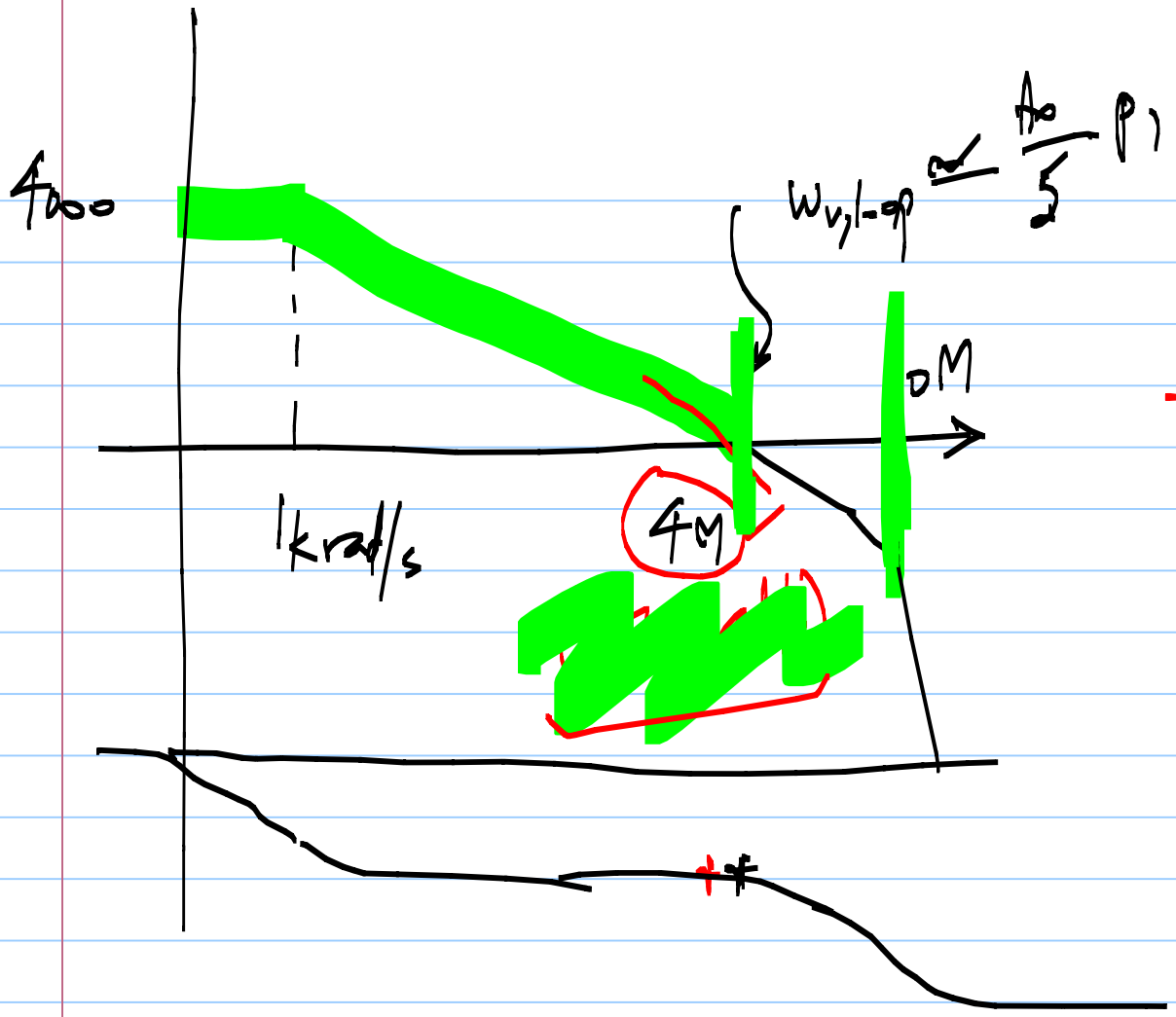
$p_1 = 1\text{krad/s}$

$p_2 = \frac{10\text{Mrad/s}}{\omega_{u,loop}} =$

$A(s) = \frac{A_0}{\left(1+\frac{s}{p_1}\right)\left(1+\frac{s}{p_2}\right)\left(1+s/p_3\right)}$



$\frac{1}{5} \cdot \frac{1}{1+sC_p(1k\Omega \| 4k\Omega)}$



$|L(j\omega)| = 1$

$-\tan^{-1}\frac{4M}{1k} - \tan^{-1}\frac{4M}{10M}$

$-\frac{\pi}{2}\,5^\circ - 21.8^\circ$

-111.8°

68.2°

$$\frac{V_o}{V_i} = -\frac{4}{D_2(s)} \rightarrow 1 + 2\zeta\frac{s}{\omega_n} + \frac{s^2}{\omega_n^2}$$

$$\left|\frac{V_o}{V_i}\right|_{s=j\omega_o} = \frac{4}{\sqrt{2}}$$

$BW \simeq \omega_{n,loop}$ 4 M rad/s

[Very close for 1 pole]

2nd order $BW = \omega_n$

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

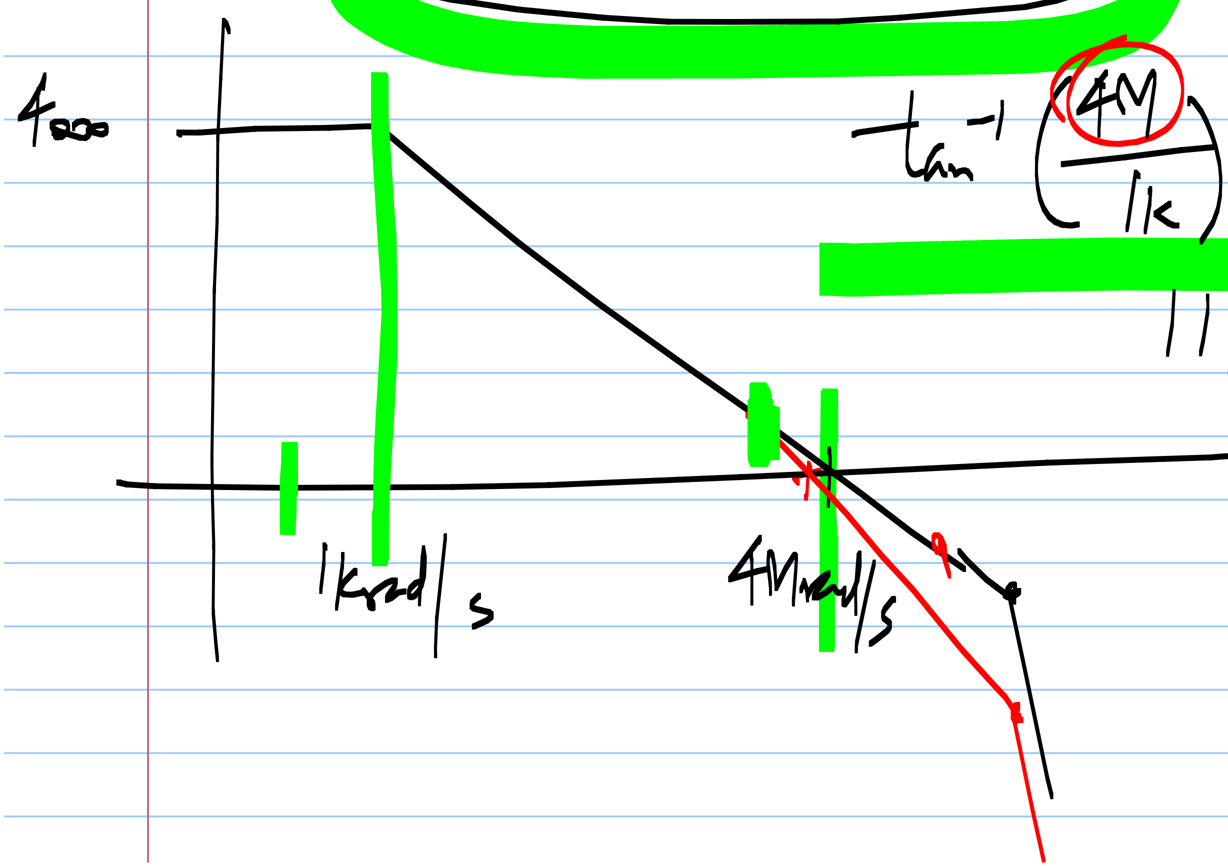
$\omega_n^2 = 6.3$ M rad/s

C_p : $\dfrac{4000}{\left(1+\frac{s}{p_1}\right)\left(1+\frac{s}{p_2}\right)\left(1+\frac{s}{p_3}\right)} = L(s)$

$p_3 \rightarrow C_p$

$\tan^{-1}\left(\frac{4M}{1k}\right) + \tan^{-1}\left(\frac{4M}{10M}\right) + \ldots$

111.8° $= 180°$



∇ 80pF

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

Newton Raphson
Fixed pt

$$\left(1+\frac{j\omega}{p_1}\right)\left(1+\frac{j\omega}{p_2}\right)\left(1+\frac{j\omega}{p_3}\right) = -4000$$

$$Re(\;) + Im(\;) = -4000 + j0$$

ω

$$\frac{V_o}{V_i} = -\frac{R_2}{R_1}$$

$$\beta_3 = \frac{1}{C_p(R_1 \| R_2)}$$