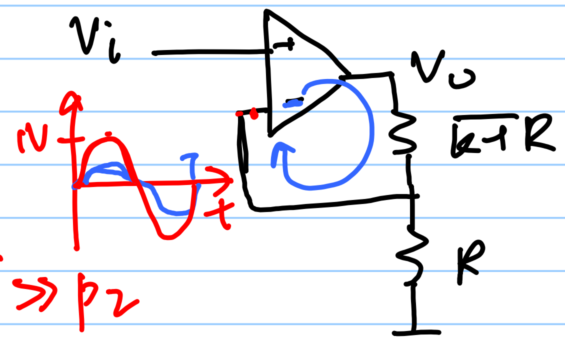
Note Title 26-02-2020

Lecture #20

Loop Gain, $L(s) = \dfrac{A_0/K}{\left(1+\frac{s}{p_1}\right)\left(1+\frac{s}{p_2}\right)\left(1+\frac{s}{p_3}\right)}$



$H(s) = \dfrac{V_o}{V_i} = K \quad \dfrac{LG(s)}{1+LG(s)}$

$D(s) = \underline{1+LG(s)} = 0$

if $p_1, p_2 > 0$

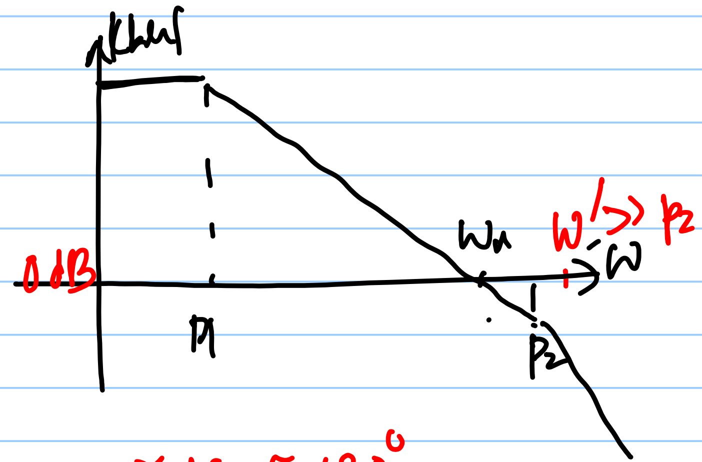
For second order, poles will be in L.H.P ✓

3rd order, poles in R.H.P

$1 + LG(s) = 0 \Rightarrow$ poles

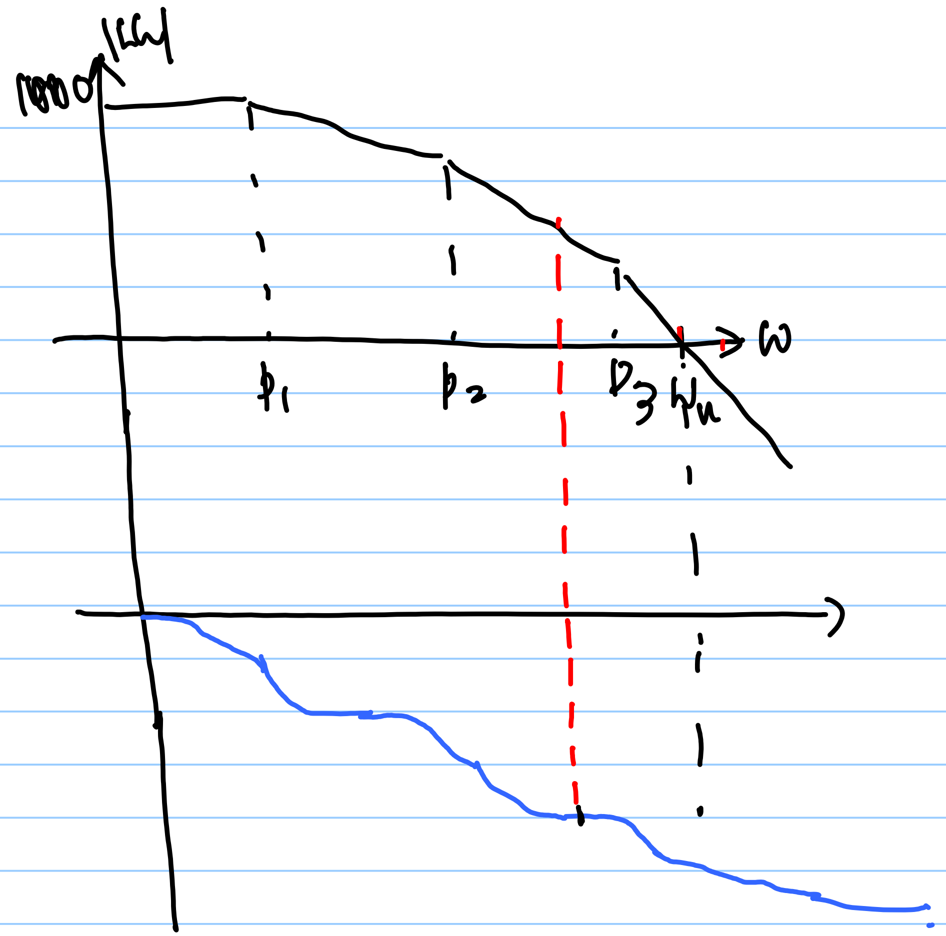
$LG(s) = -1 \Rightarrow |LG| = 1$, $\measuredangle LG = 180^\circ$ ✓ $(2K\pi)$

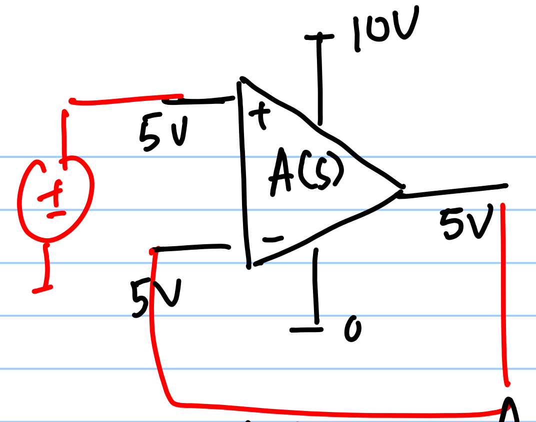
$|LG| = 1$, $\measuredangle LG < 180^\circ$



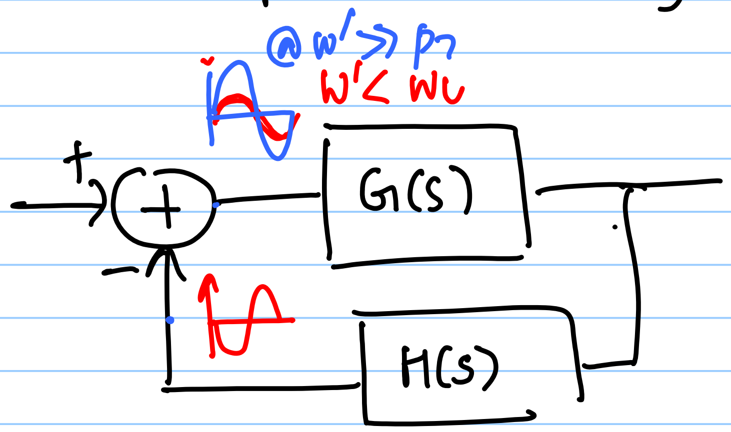
$\measuredangle LG \approx 180^\circ$

$|LG| = \dfrac{1}{X}$





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



$1 + \frac{1}{x} + \frac{1}{x^2} + \frac{1}{x^3} + \ldots$

at $t = 0$: 1

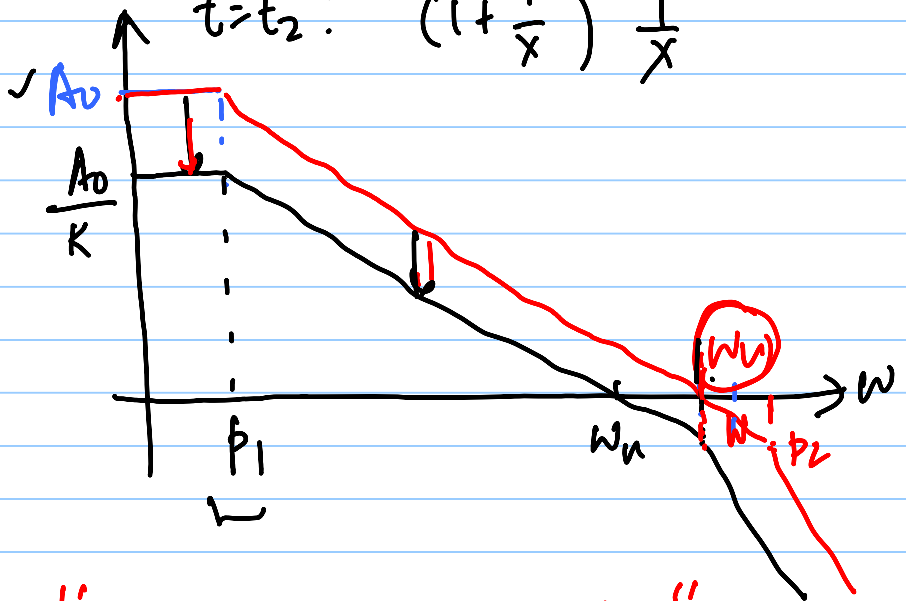
$t = t_1$: $1/x$

$t = t_2$: $1/x^2$

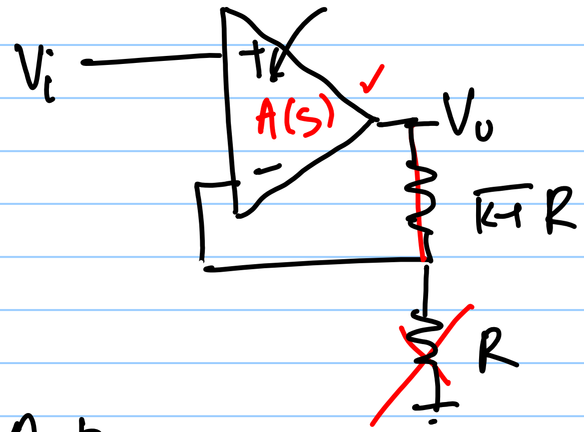
at $t=0$: 1

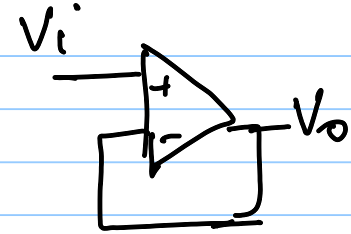
$t=t_1$: $\left(1+\frac{1}{x}\right)$

$t=t_2$: $\left(1+\frac{1}{x}\right)\frac{1}{x}$



"Unity gain compensated" amplifier

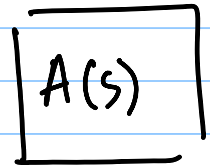


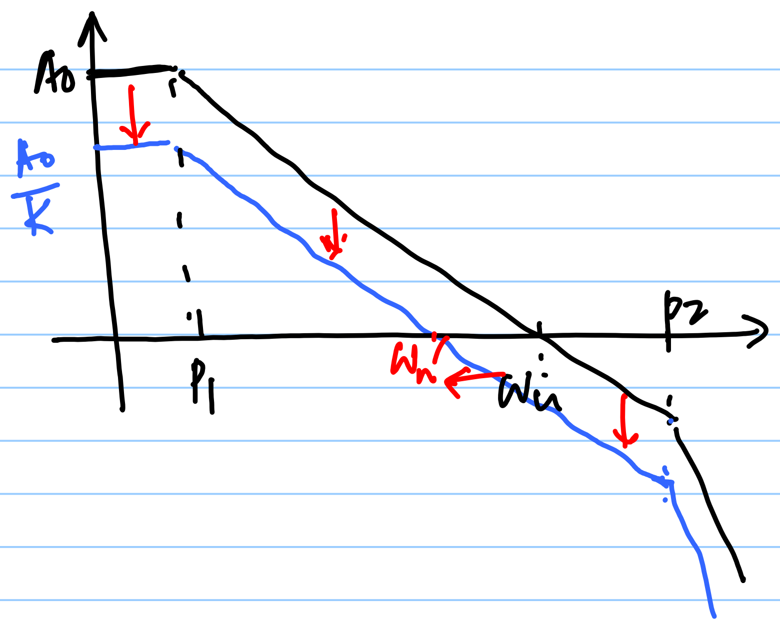


$$w_u = \frac{A_0 p_1}{K}$$

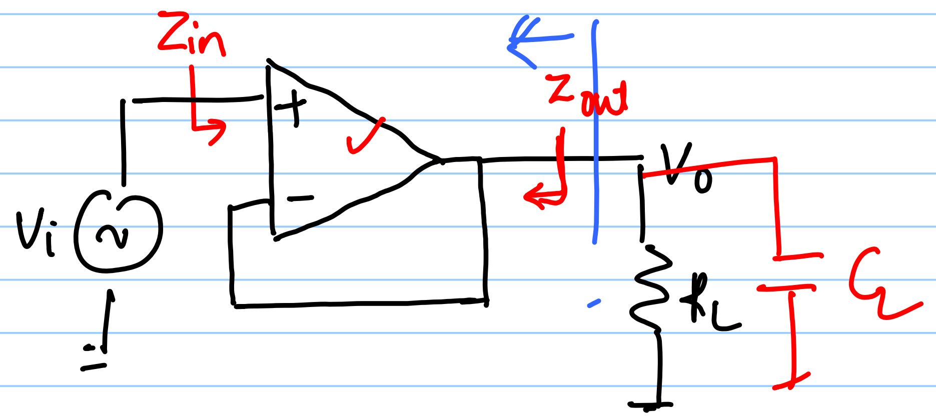
$$w_u = A_0 p_1$$

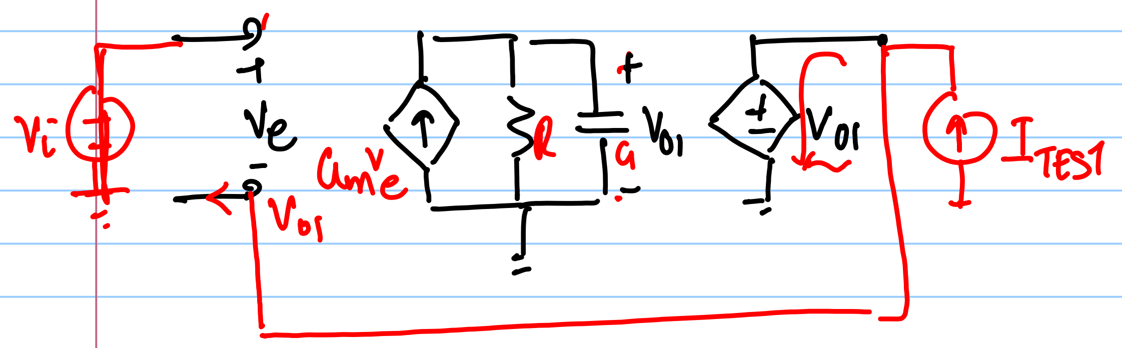
$$A(s) = \frac{A_0}{\left(1+\frac{s}{p_1}\right)\left(1+\frac{s}{p_2}\right)}$$

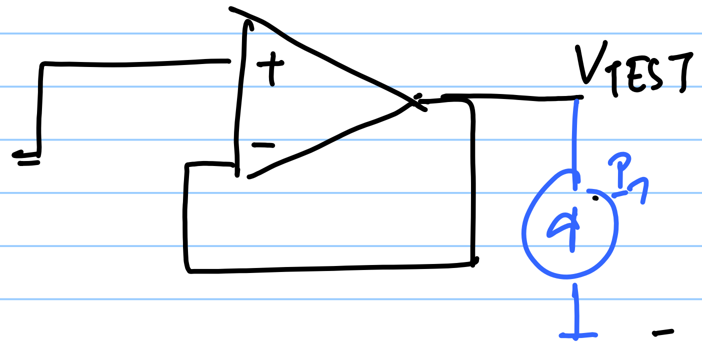




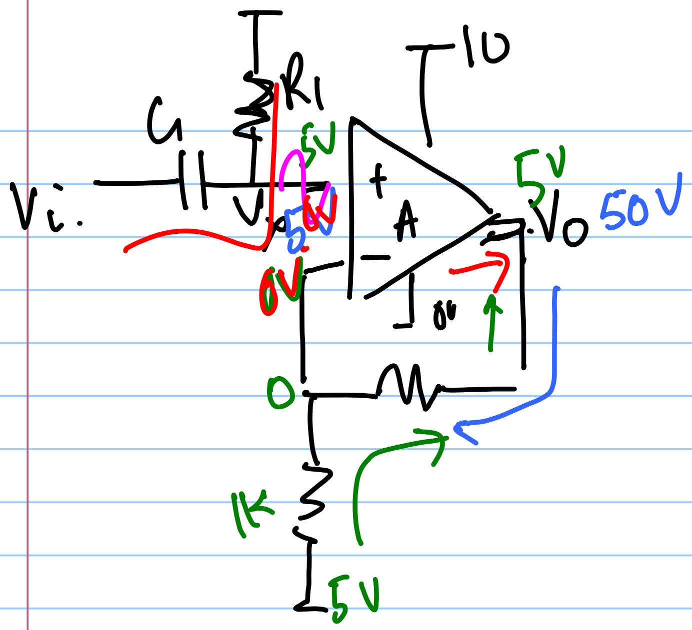
$$LG = \frac{A_0/K}{(1+s/p_1)(1+s/p_2)}$$



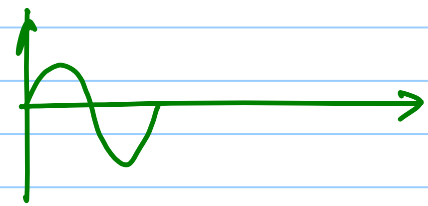




$$G_m(-V_{o1})\left(R \parallel \frac{1}{sC_1}\right) = V_{o1} \Rightarrow V_{o1}\left(1 + G_m\left(R \parallel \frac{1}{sC_1}\right)\right) = 0$$



$$\frac{V_o}{V_i} = \frac{V_o}{V_x} \cdot \underbrace{\frac{V_x}{V_i}}_{\approx 1}$$



$$V_x = \frac{R_1 V_i}{R_1 + \frac{1}{sC_1}} = \frac{sC_1R_1}{1 + sC_1R_1} V_i$$

$C_1 \gg 10\,nF$