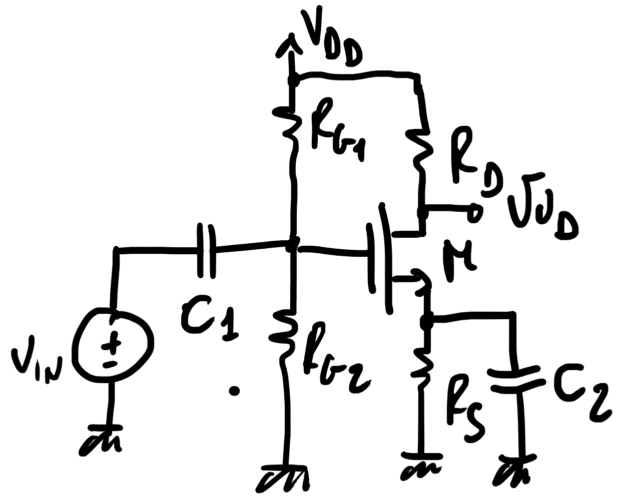
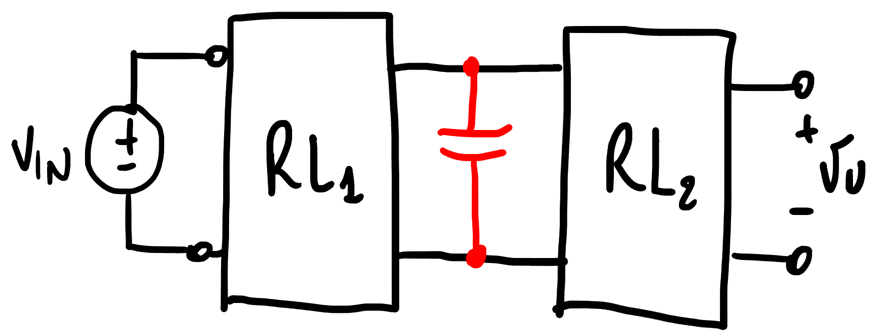
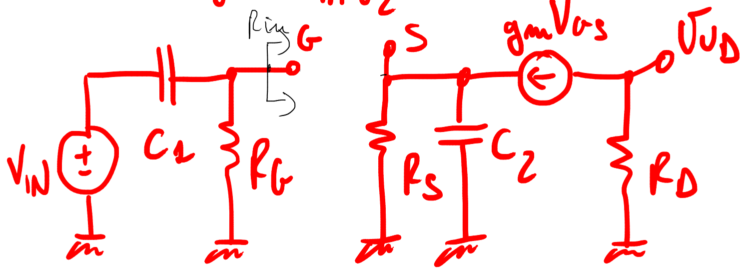


$$A_{VD} = -\frac{g_m R_D}{1+\underbrace{g_m R_S}_{=0}} \rightarrow A'_{VD} \rightarrow -g_m R_D > A_{VD}$$



$R_G = R_{G1} // R_{G2}$



$$\omega_{p1} = \frac{1}{R_{vc1} C_1}$$

$$R_{vc1} = R_G$$

$R_{in} \to +\infty$

$$\omega_{p2} = \frac{1}{R_{vc2} C_2}$$

$$A_{V_D}(s) = \frac{V_{UD}}{V_{IN}} = \frac{A_{D\infty} s (s+\omega_0)}{(s+\omega_{p1})(s+\omega_{p2})}$$

$$R_{vc2} = R_S // \frac{1}{g_m}$$

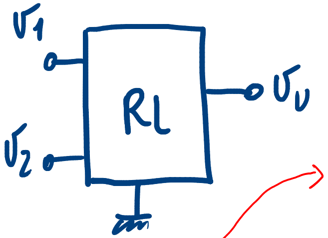
$A_{V_{D\infty}} = -g_m R_D \neq 0 \Rightarrow$ grado num = grado den. $= 2$

$$V_{GS} = V_G - V_S \qquad V_S = g_m \cdot \left(R_S // \frac{1}{C_2 s}\right) V_{GS} \triangleq g_m Z_S V_{GS}$$

$$V_{GS} = V_G - g_m Z_S V_{GS}$$

$$V_{GS} = \frac{V_G}{1 + g_m Z_S} \qquad V_{UD} = -g_m R_D V_{GS}$$

$$\omega_0 = \frac{1}{R_S C_2}$$



$$V_u = A_d(V_1 - V_2)$$

$$V_u = A_1 V_1 + A_2 V_2$$

$$V_d = V_1 - V_2$$

$$V_c = \frac{V_1 + V_2}{2}$$

$$\begin{cases} V_d + V_2 = V_1 \\ V_c = \dfrac{V_1 + V_2}{2} \end{cases} \Rightarrow V_c = \frac{V_d + V_2 + V_2}{2} = \frac{V_d}{2} + V_2$$

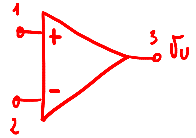
$$\begin{cases} V_2 = V_c - \dfrac{V_d}{2} \\ V_1 = V_c + \dfrac{V_d}{2} \end{cases}$$

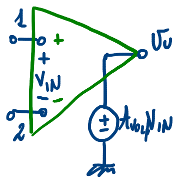
$$V_u = A_1\left(V_c + \frac{V_d}{2}\right) + A_2\left(V_c - \frac{V_d}{2}\right) =$$

$$= \underbrace{\frac{A_1 - A_2}{2}}_{A_d} V_d + \underbrace{(A_1 + A_2)}_{A_c} V_c =$$

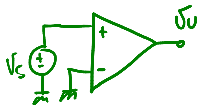
$$V_u = A_d V_d + A_c V_c$$

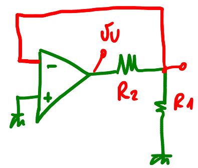
$$CMRR = \frac{A_d}{A_c}$$

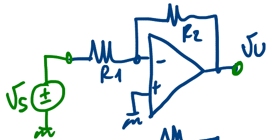


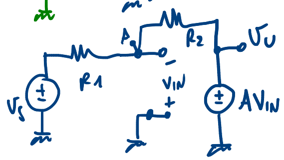


$A_{VOL}\,\phi$









$$V_U = A V_{IN}$$

$$V_{IN} = -V_A$$

$$V_A = \frac{R_2}{R_1+R_2} V_S + \frac{R_1}{R_1+R_2} V_U$$

$$V_U = -\frac{AR_2}{R_1+R_2} V_S - \frac{AR_1}{R_1+R_2} V_U$$

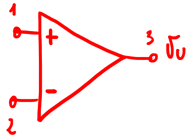
$$V_U \left[1 + \frac{AR_1}{R_1+R_2}\right] = -\frac{AR_2}{R_1+R_2} V_S$$

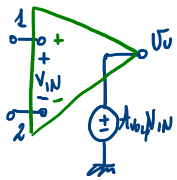
$$A_V = \frac{V_U}{V_S} = \frac{-\frac{AR_2}{R_1+R_2}}{1 + \frac{AR_1}{R_1+R_2}}$$

$A \gg 1$

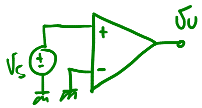
$A \to +\infty$

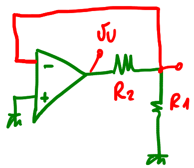
$$\boxed{A_V = \frac{-\frac{\cancel{A} R_2}{\cancel{R_1+R_2}}}{\frac{\cancel{A} R_1}{\cancel{R_1+R_2}}} = -\frac{R_2}{R_1}}$$

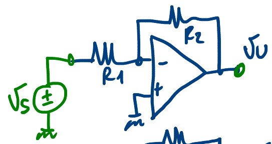


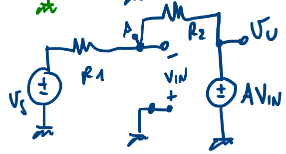


$A_{VOL}\phi$









$V_U = AV_{IN}$

$V_{IN} = -V_A$

$V_A = \frac{R_2}{R_1+R_2}V_S + \frac{R_1}{R_1+R_2}V_U$

$V_U = -\frac{AR_2}{R_1+R_2}V_S - \frac{AR_1}{R_1+R_2}V_U$

$V_U\left[1+\frac{AR_1}{R_1+R_2}\right] = -\frac{AR_2}{R_1+R_2}V_S$

$A_V = \frac{V_U}{V_S} = \frac{-\frac{AR_2}{R_1+R_2}}{1+\underbrace{\frac{AR_1}{R_1+R_2}}}$

$A \gg 1$

$A \to +\infty$

$\boxed{A_V = \frac{-\frac{\cancel{A}R_2}{\cancel{R_1+R_2}}}{\frac{\cancel{A}R_1}{\cancel{R_1+R_2}}} = -\frac{R_2}{R_1}}$