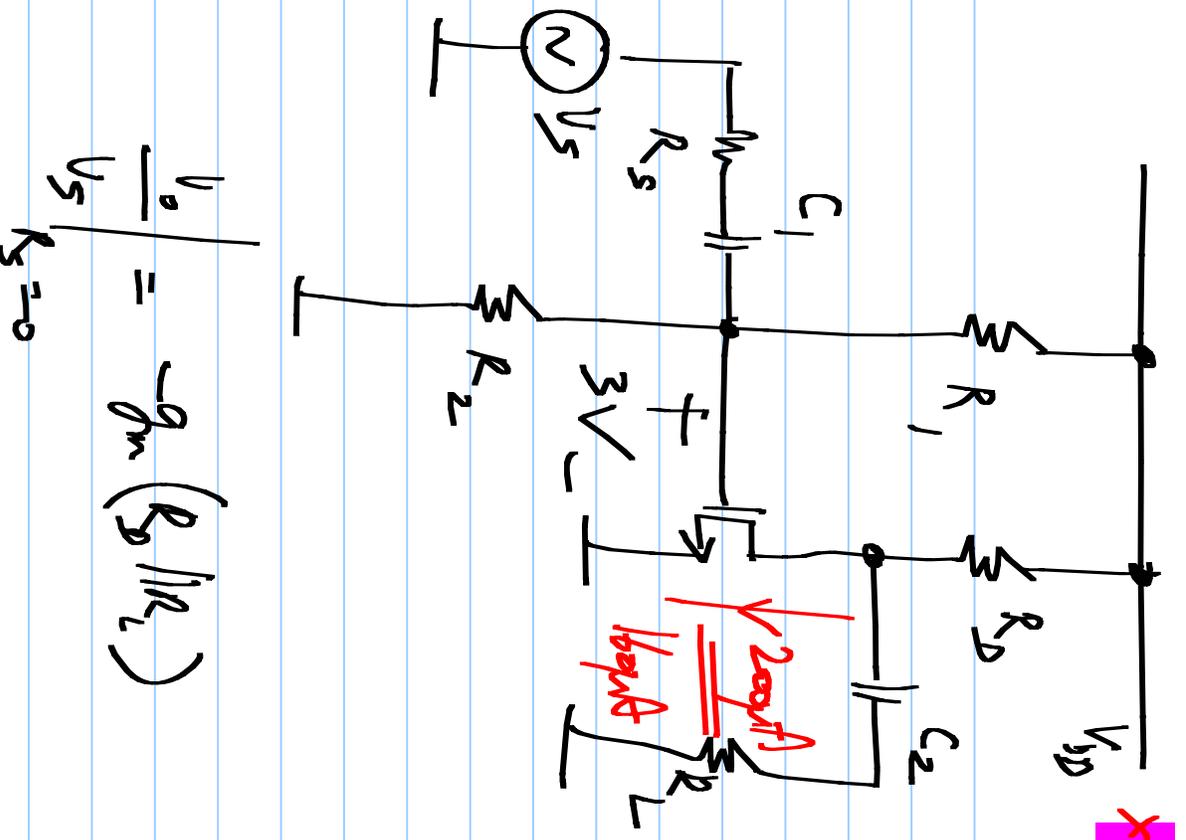


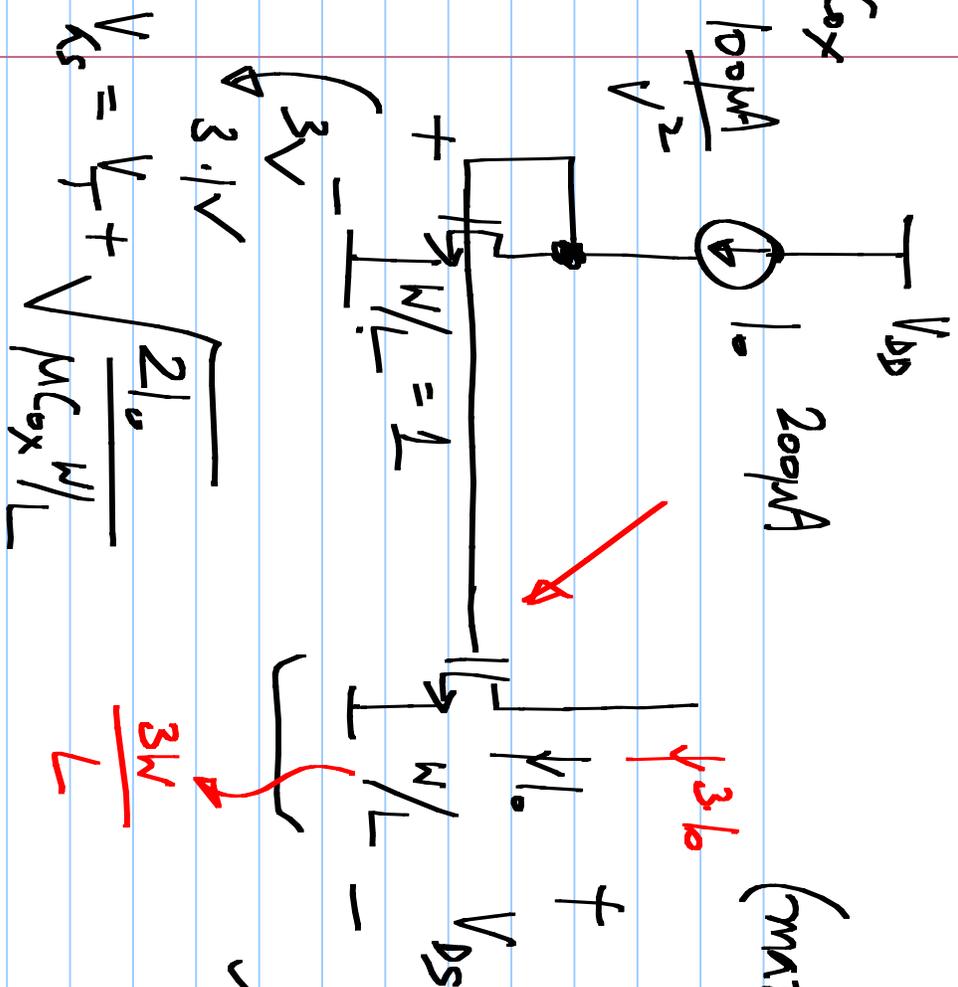
$$\left. \frac{V_o}{V_s} \right|_{R_s=0} = - \frac{g_m R_L - R_L/R_c}{1 + R_L/R_c}$$

$$\approx -g_m R_L$$



$$\left. \frac{V_o}{V_s} \right|_{R_s=0} = -g_m (R_c || R_L)$$

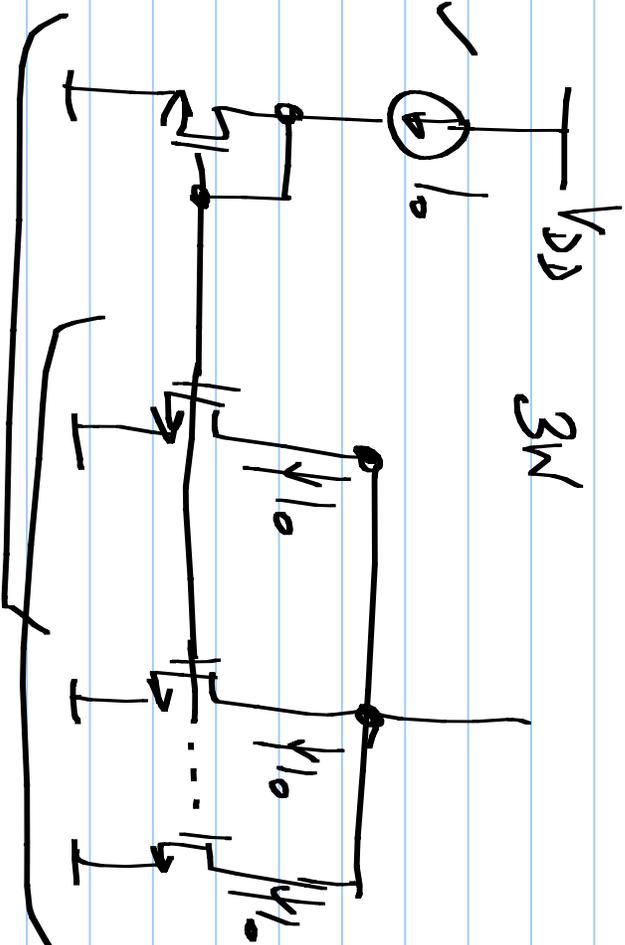
$$\mu C_{ox} = 100 \mu A/V^2$$

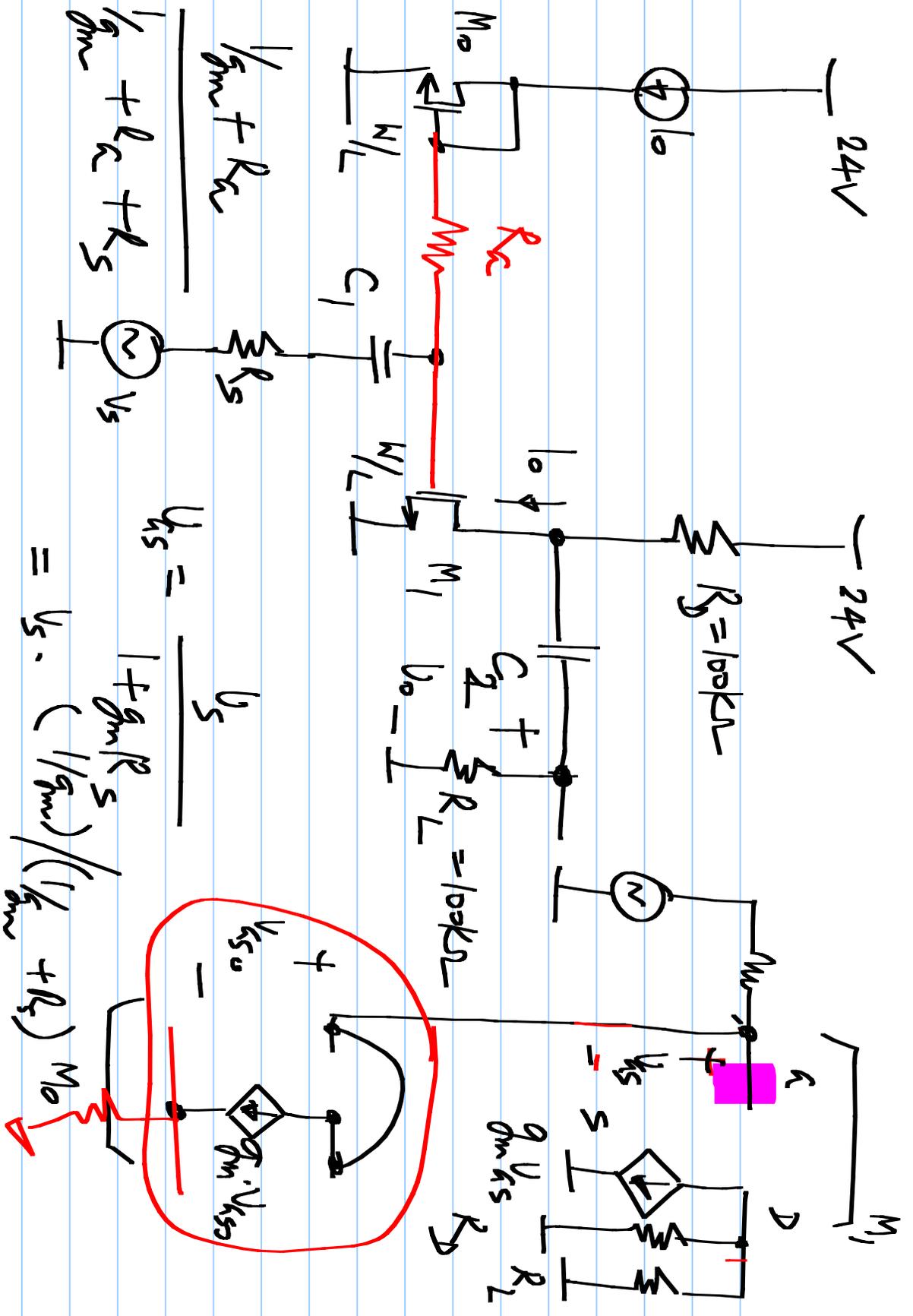


$$V_{GS} = V_T + \sqrt{\frac{2I_D}{\mu C_{ox} W/L}}$$

Current mirror

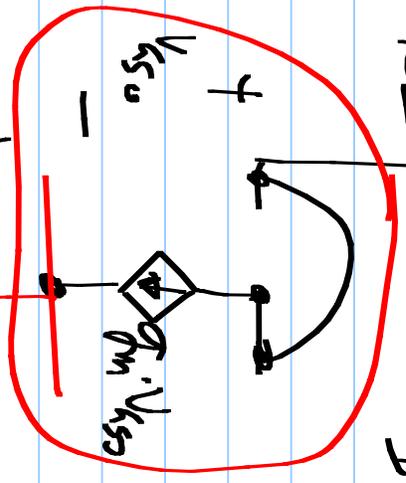
* On an integrated circuit, (matched) MOS transistors will be identical to each other

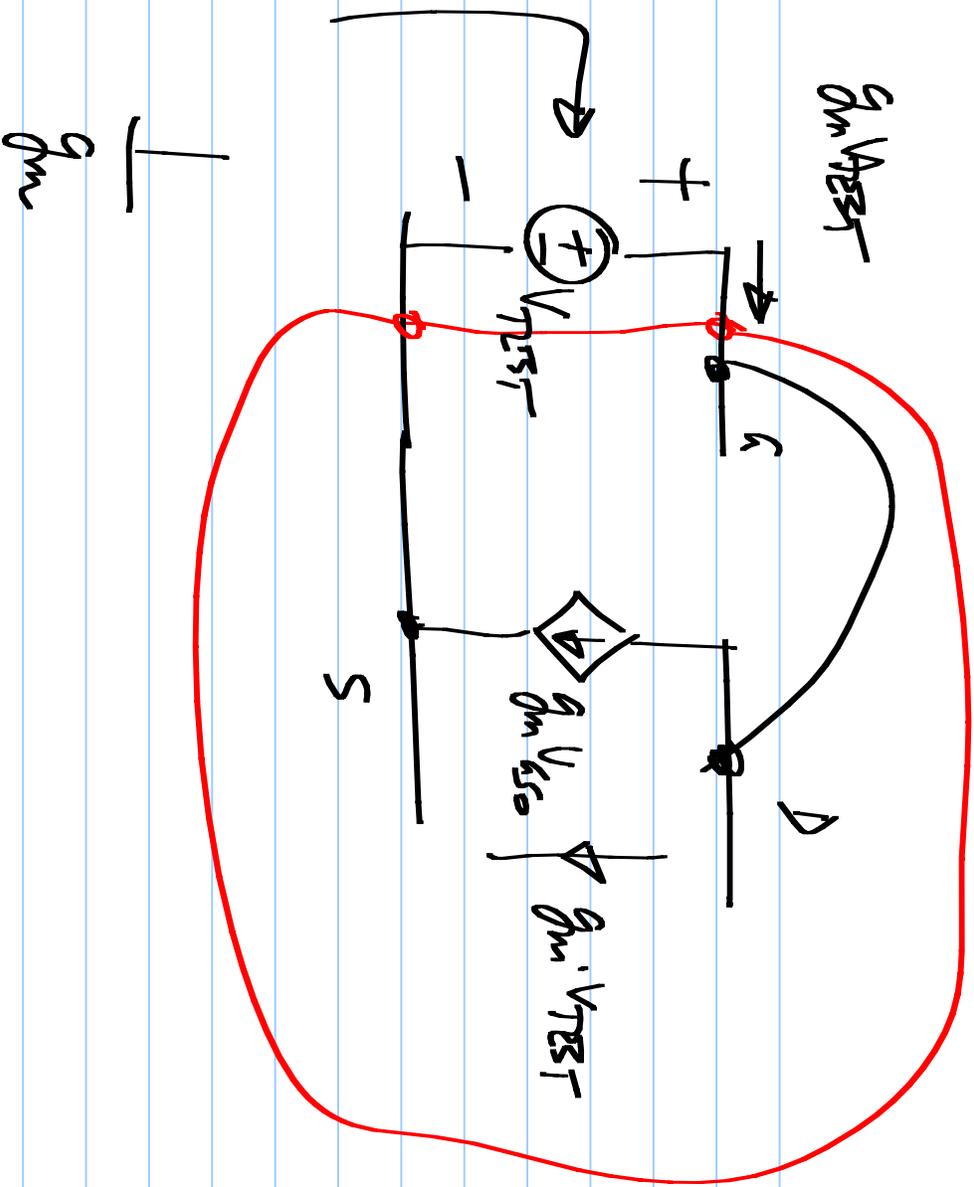




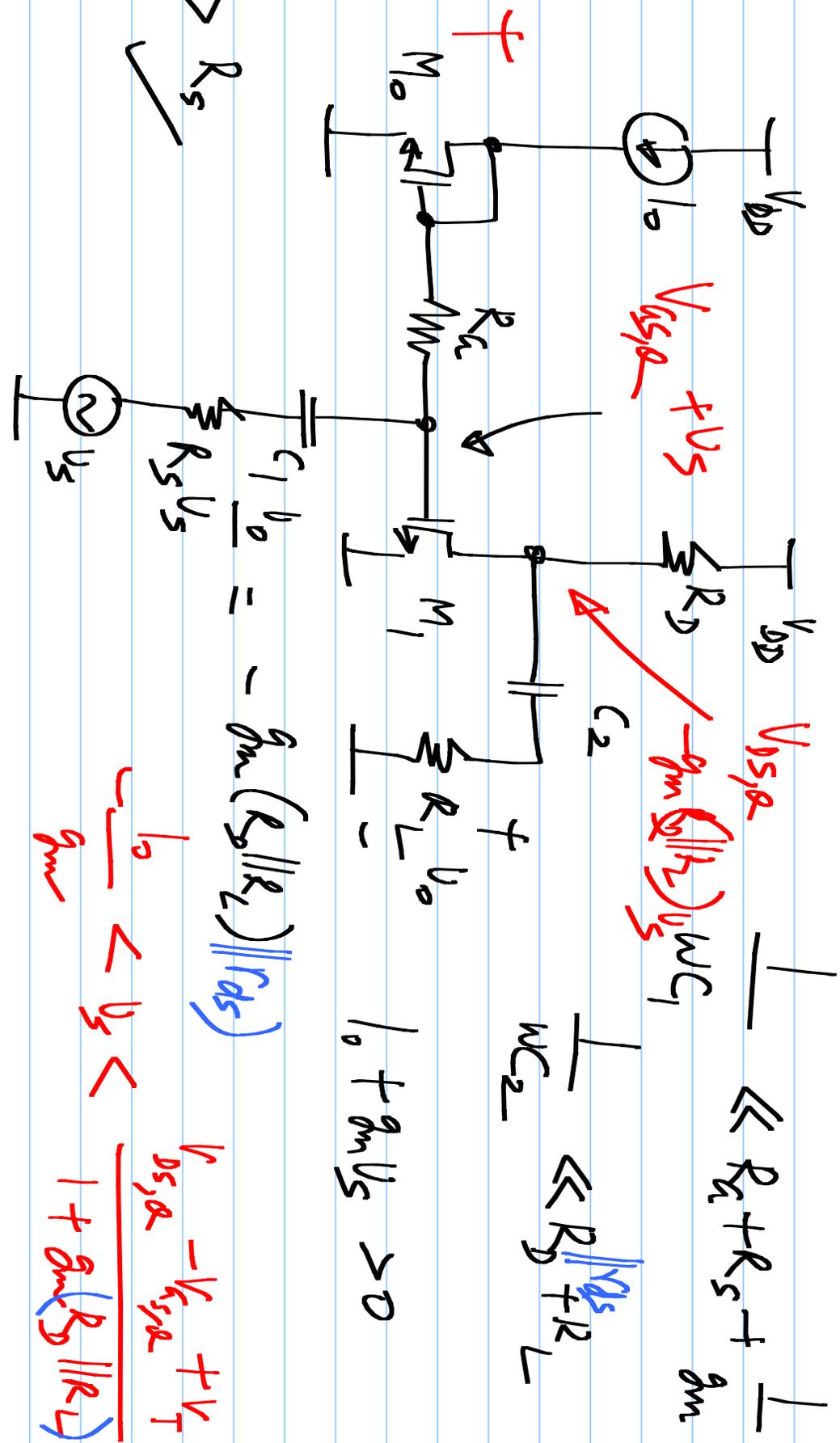
$$V_{GS} = V_S \cdot \frac{1/g_m + R_c}{1/g_m + R_c + R_S}$$

$$V_{GS} = \frac{1 + g_m R_S}{V_S} = V_S \cdot (1/g_m) / (1/g_m + R_S)$$





Common source amplifier with current mirror bias



$$V_{ds} \ll R_k + R_s + \frac{1}{g_m}$$

$$\frac{1}{\omega C_1} \ll R_k \parallel R_L$$

$$\frac{1}{\omega C_2} \ll R_D \parallel R_L$$

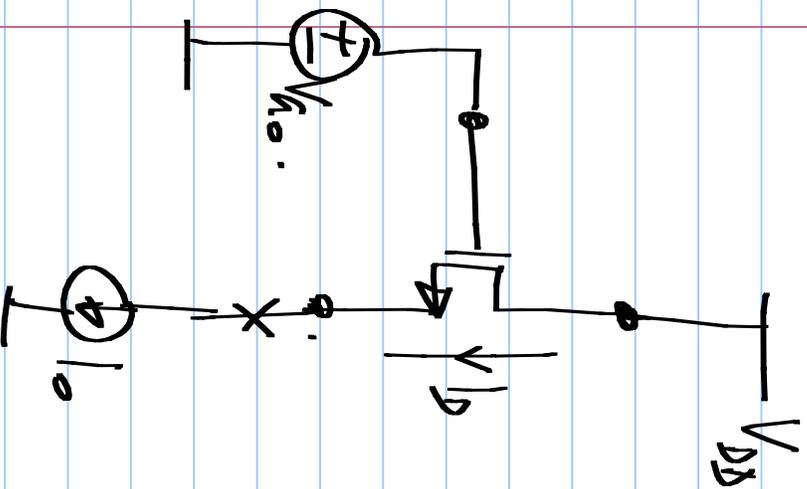
$$V_{ds} > 0$$

$$C_1 \frac{1}{\omega} = -g_m (R_D \parallel R_L) \parallel r_{ds}$$

$$\frac{1}{g_m} < V_{ds} < \frac{V_{ds} - V_{t,PMOS} + V_T}{1 + g_m (R_D \parallel R_L)}$$

$$R_k \gg R_s$$

Sense I_D @ drain; feedback to the gate ✓
Source I_D @ source; feedback to the source



$\left\{ \begin{array}{l} I_D < I_0 : V_S \text{ must decrease} \\ \cdot \end{array} \right.$ ($V_{GS} = V_{G0} - V_S \text{ must } \uparrow$)

If $I_D < I_0$, V_S will decrease