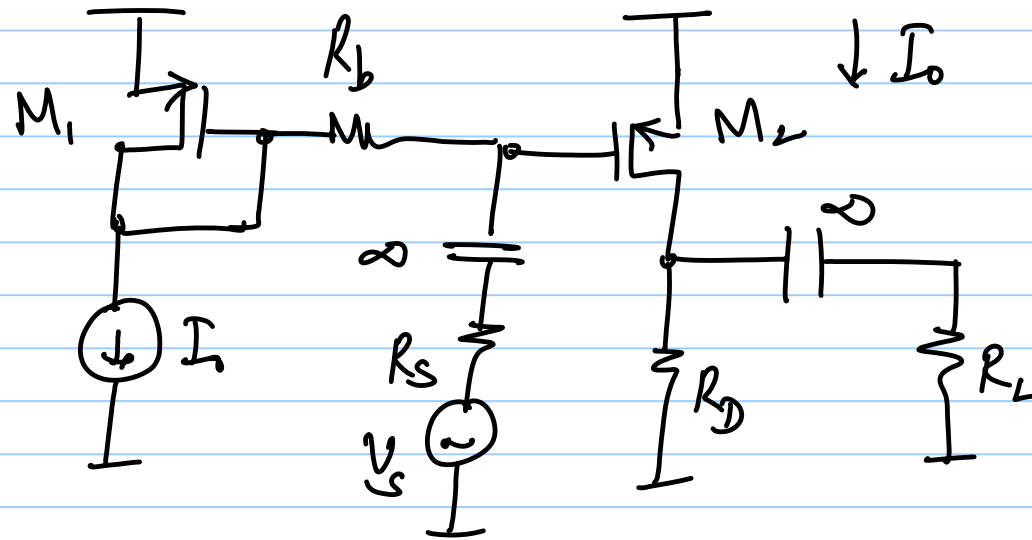


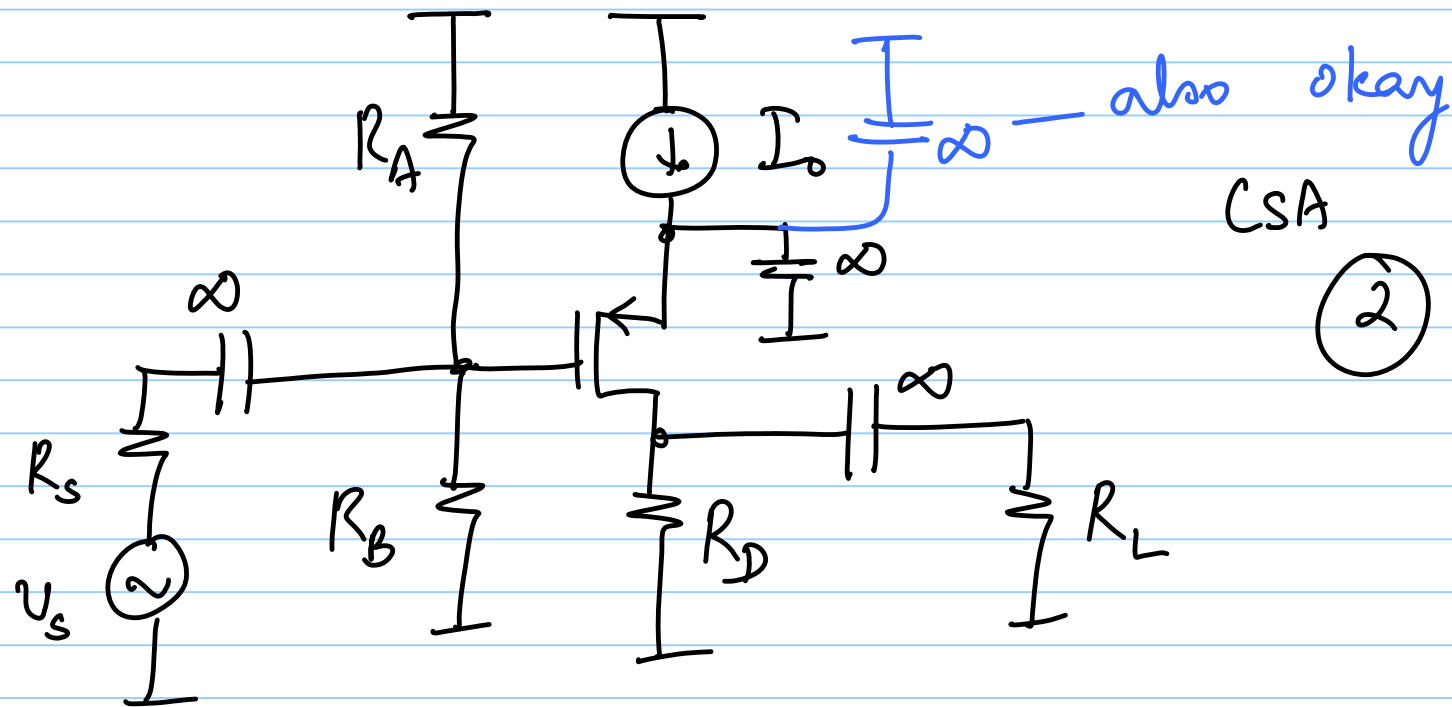
12/9/19

Lec 19



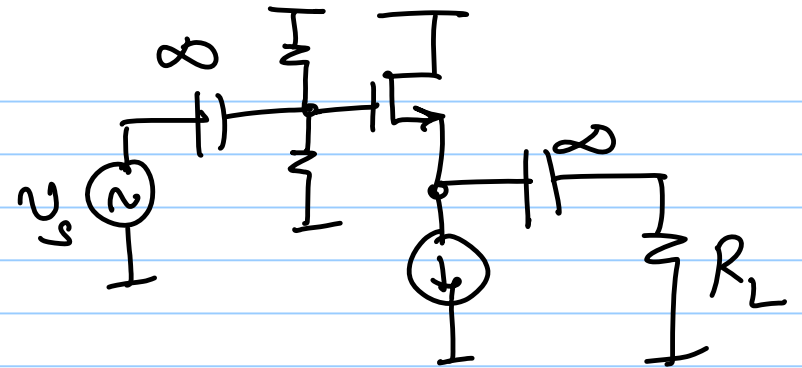
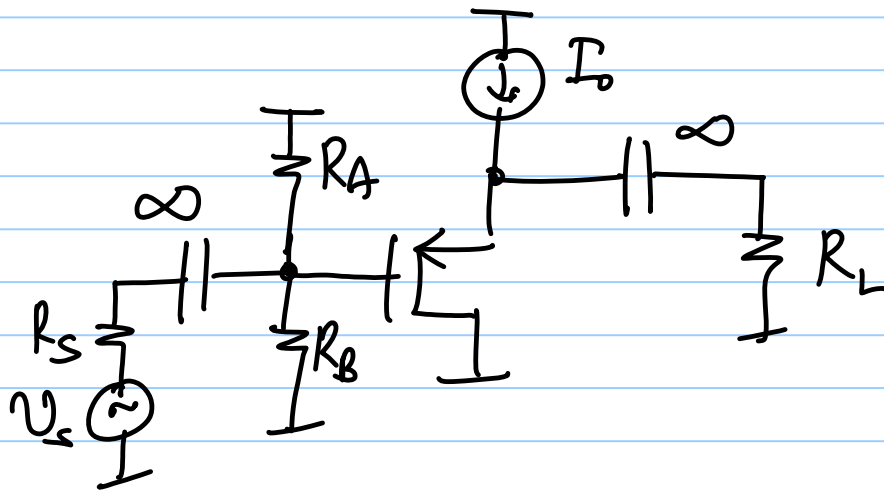
bias
stabilized
CSA (pmos)

①

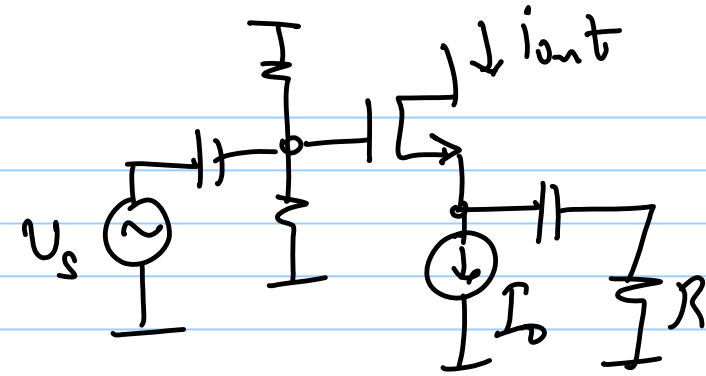
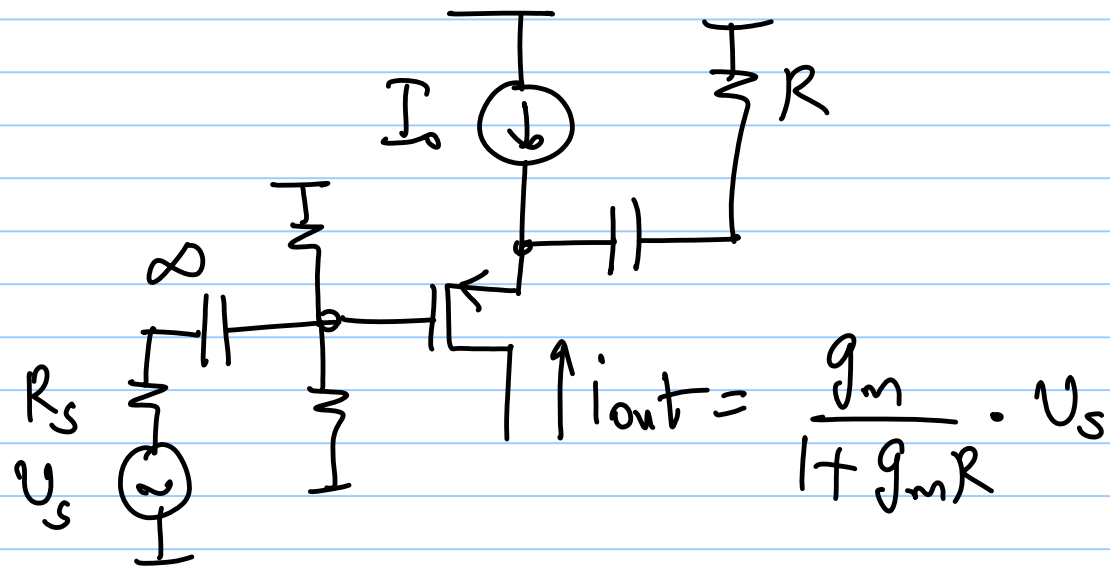


Controlled sources

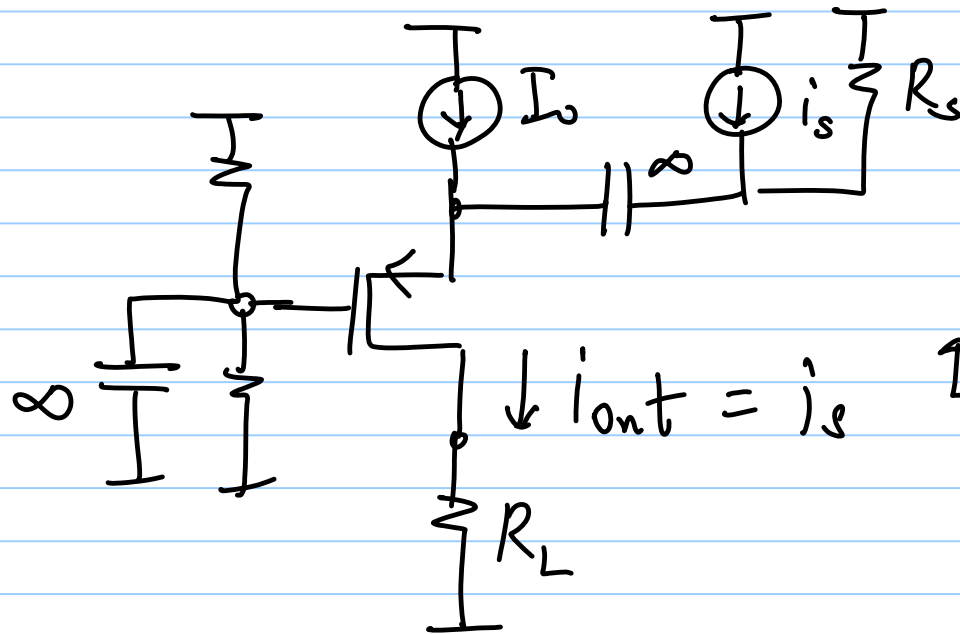
1) VCVS of gain 1
CDA



a) VCLS of gain $1/R$ (TCA)

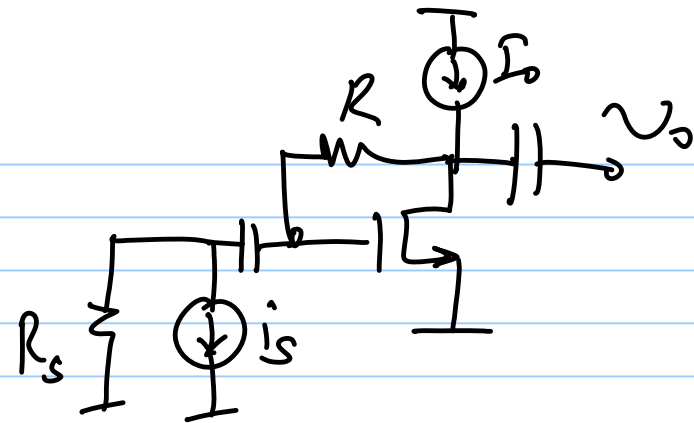
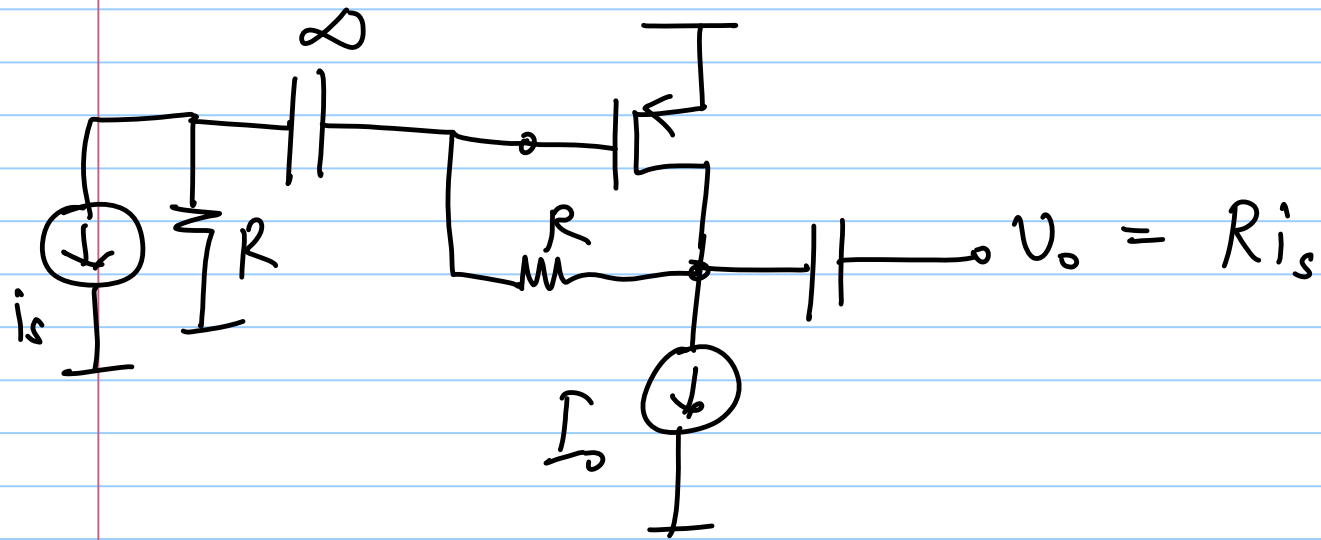


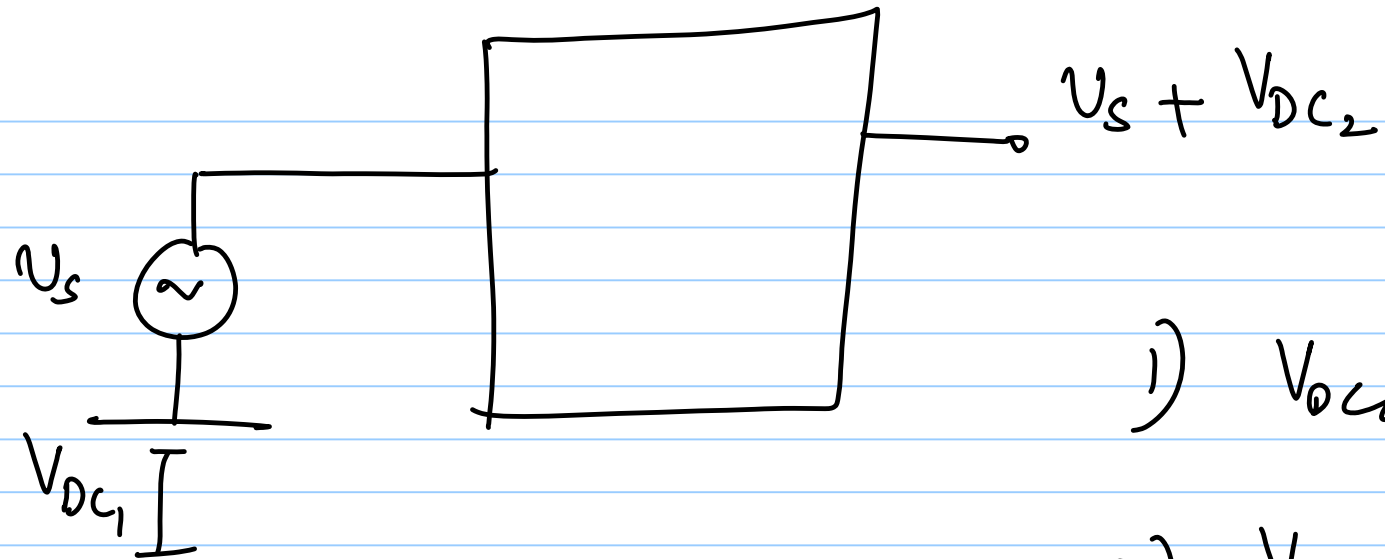
3) CCCS of gain = 1 (CGA)



$$R_{out} = R_s + r_{ds} + g_m R_s r_{ds} \approx (g_m r_{ds}) R_s$$

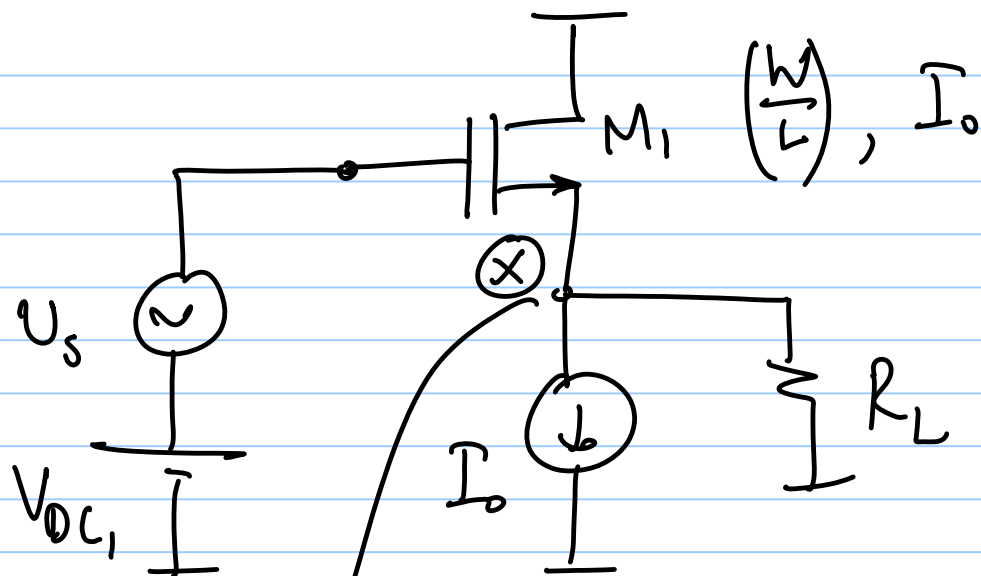
4) CCVS of gain R (TIA)



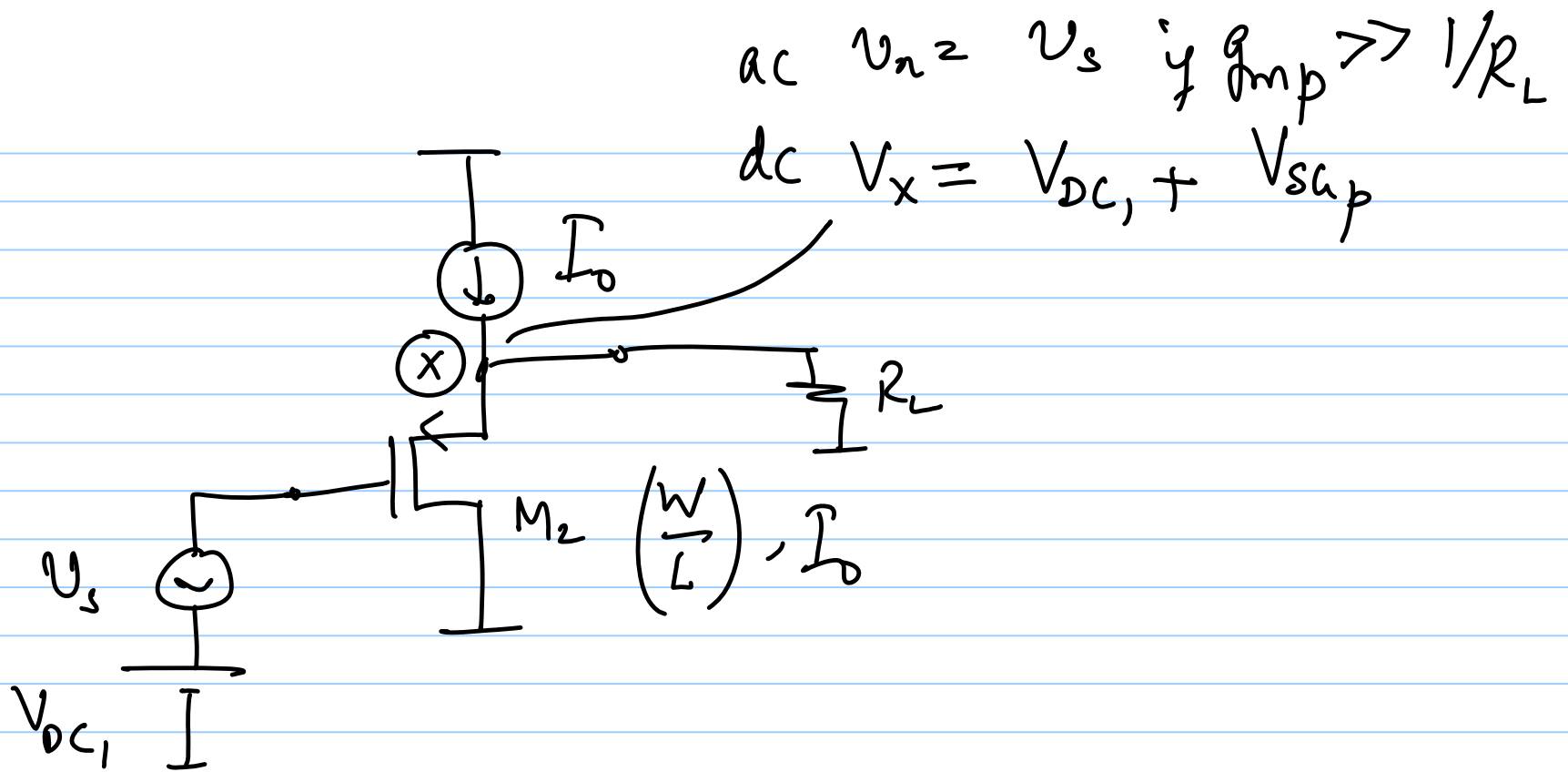


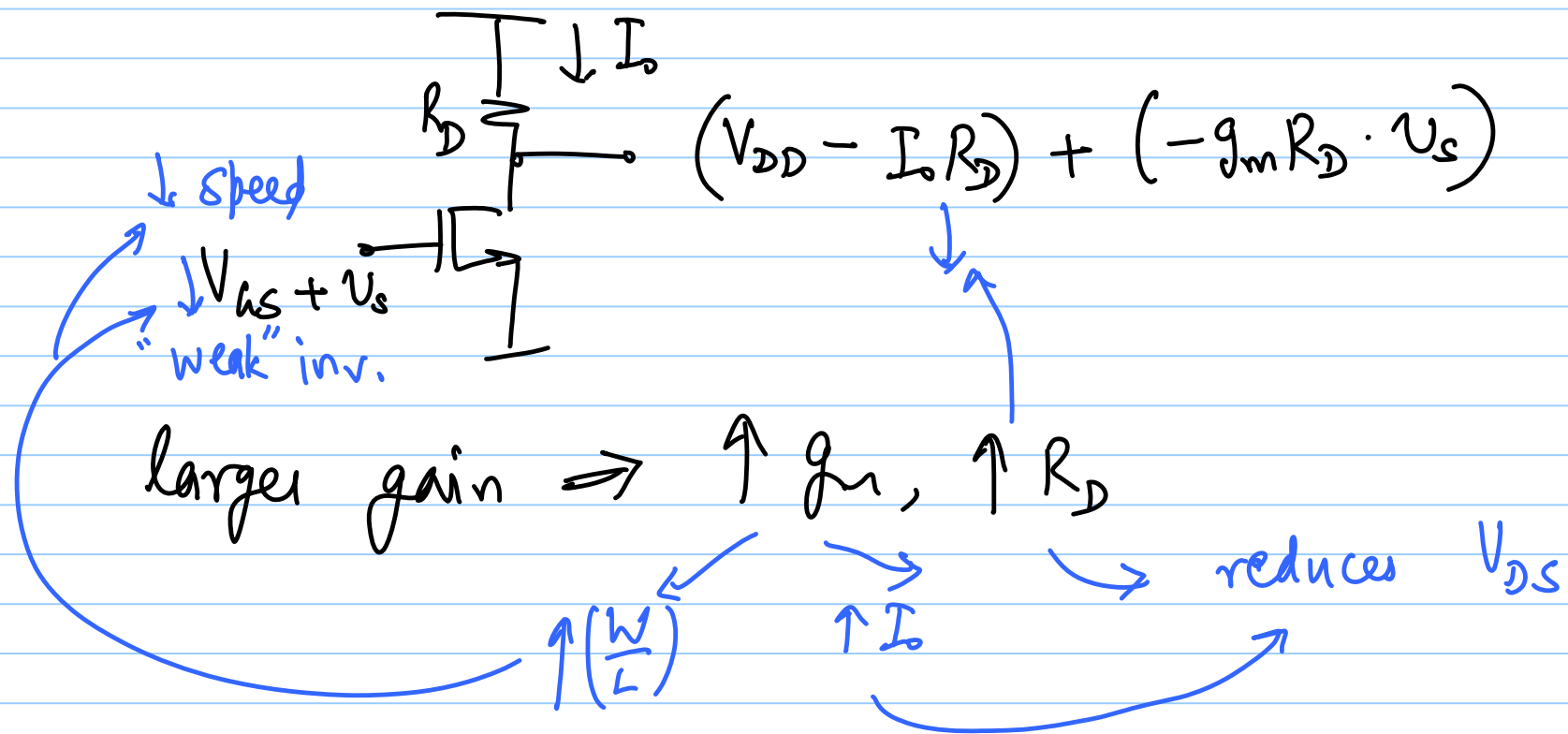
1) $V_{DC2} < V_{DC1}$

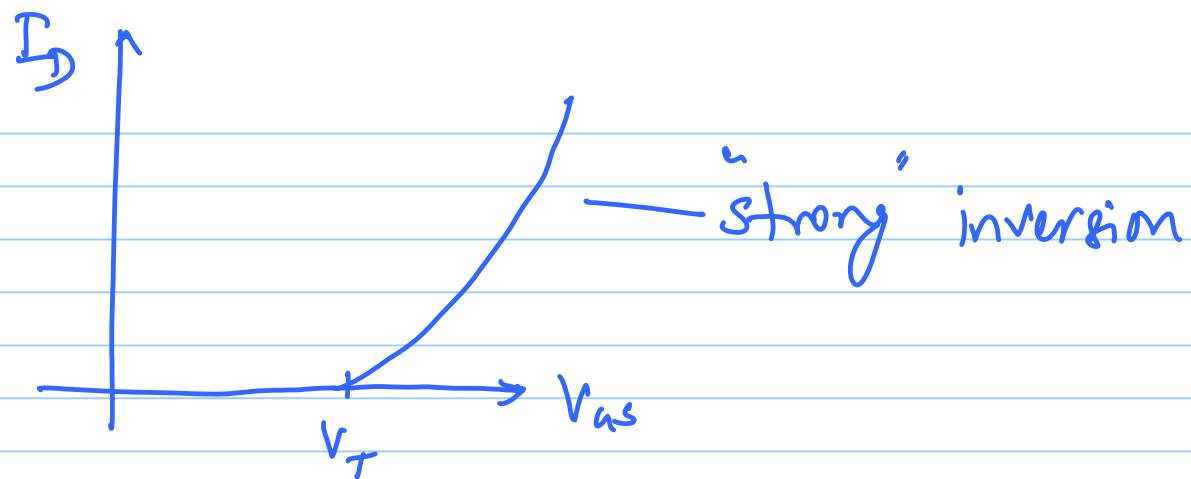
2) $V_{DC2} > V_{DC1}$

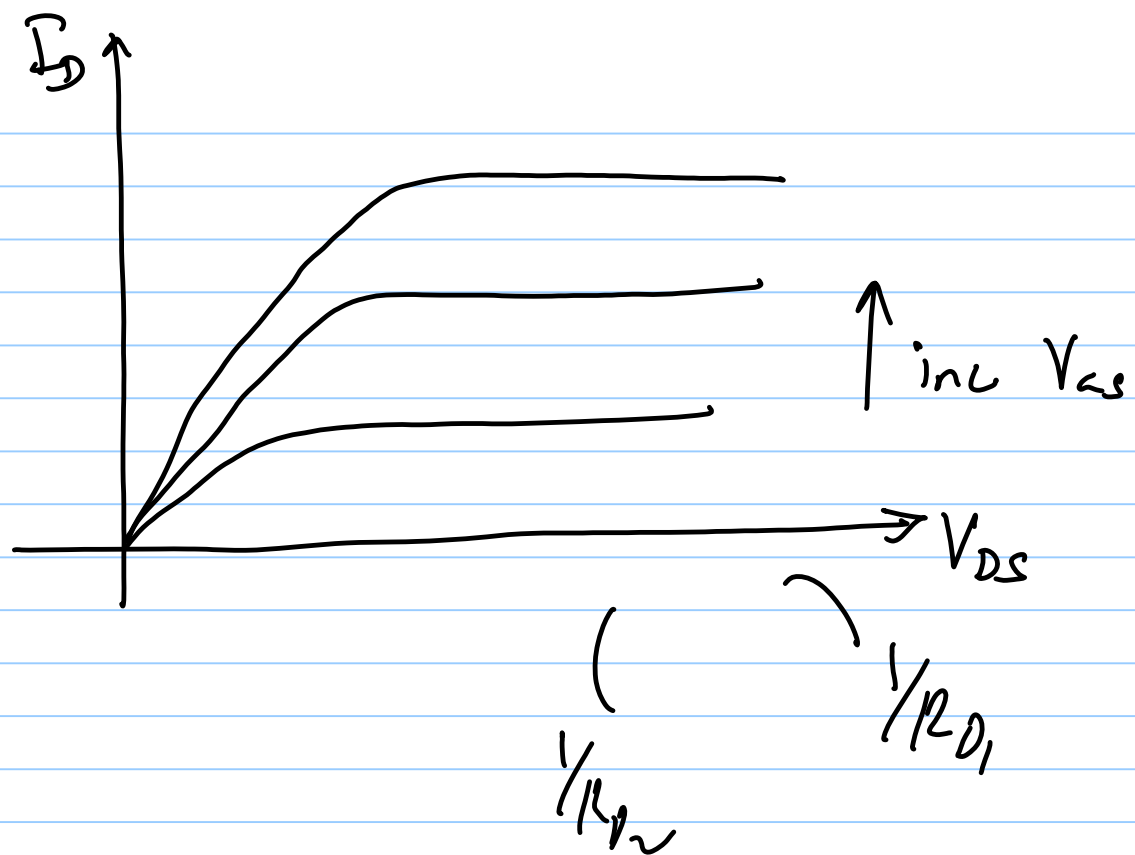


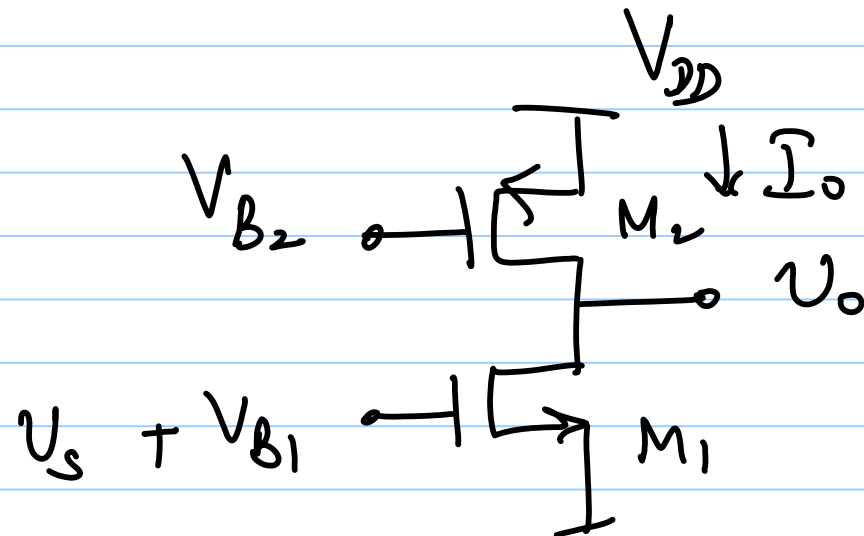
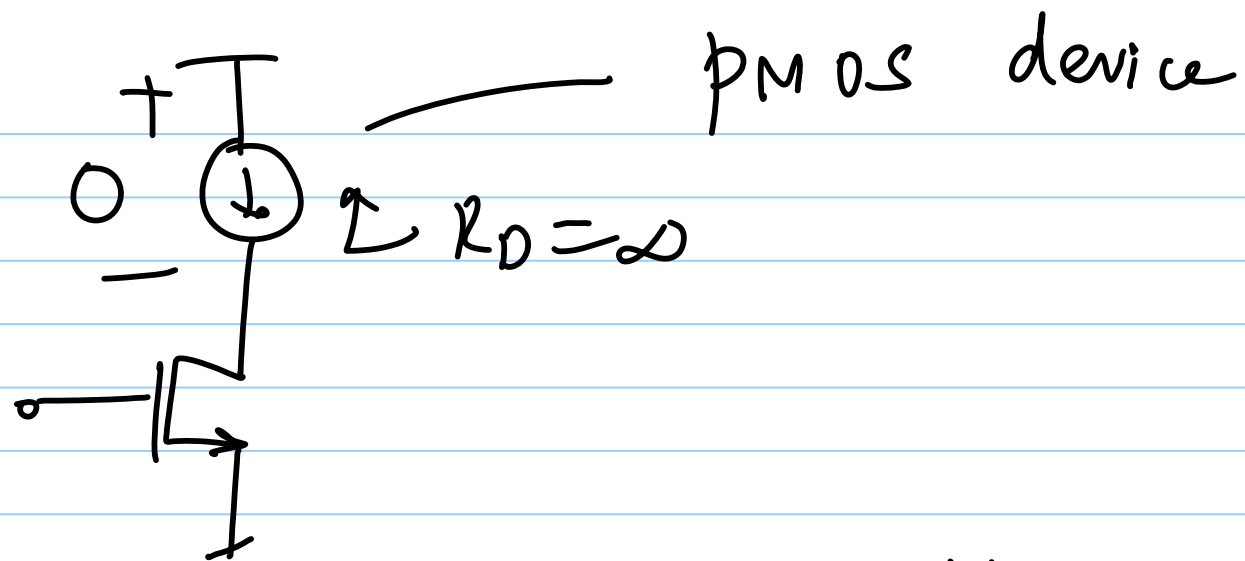
(dc) $V_x = V_{DC1} - V_{ASn} = V_{DC2}$
 (ac) $u_x = u_s$, $g_m \gg 1/R_L$





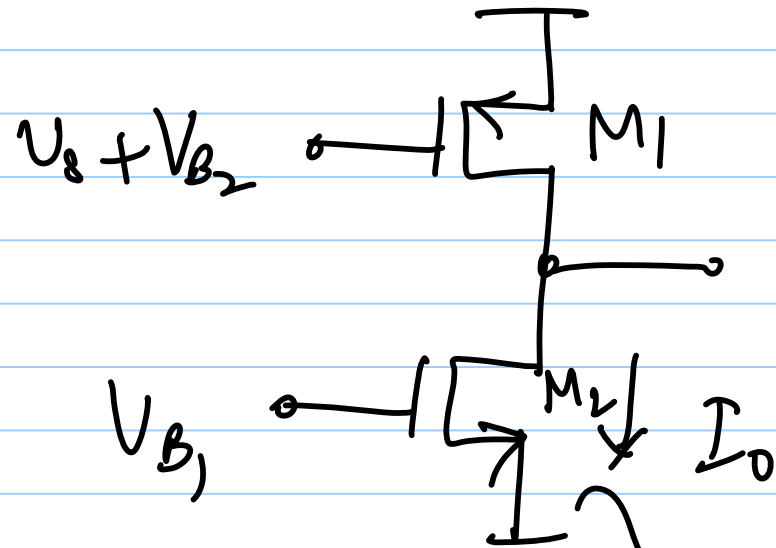






$$\text{gain} = -g_{m_1} (r_{ds_1} \parallel r_{ds_2})$$

pmos csa



$$gain = -g_{m1} (r_{ds1} || r_{ds2})$$

'active' load.