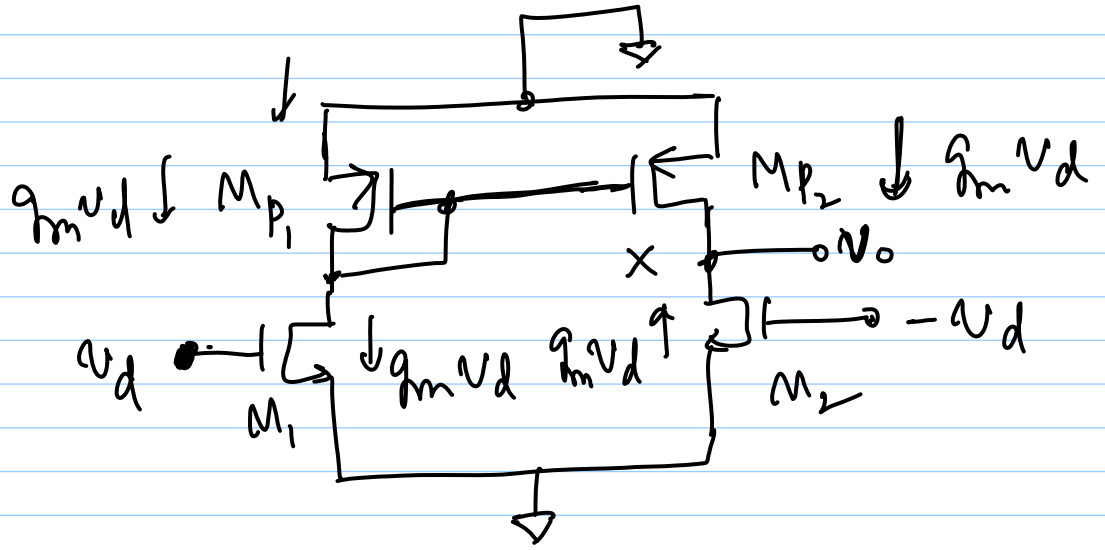
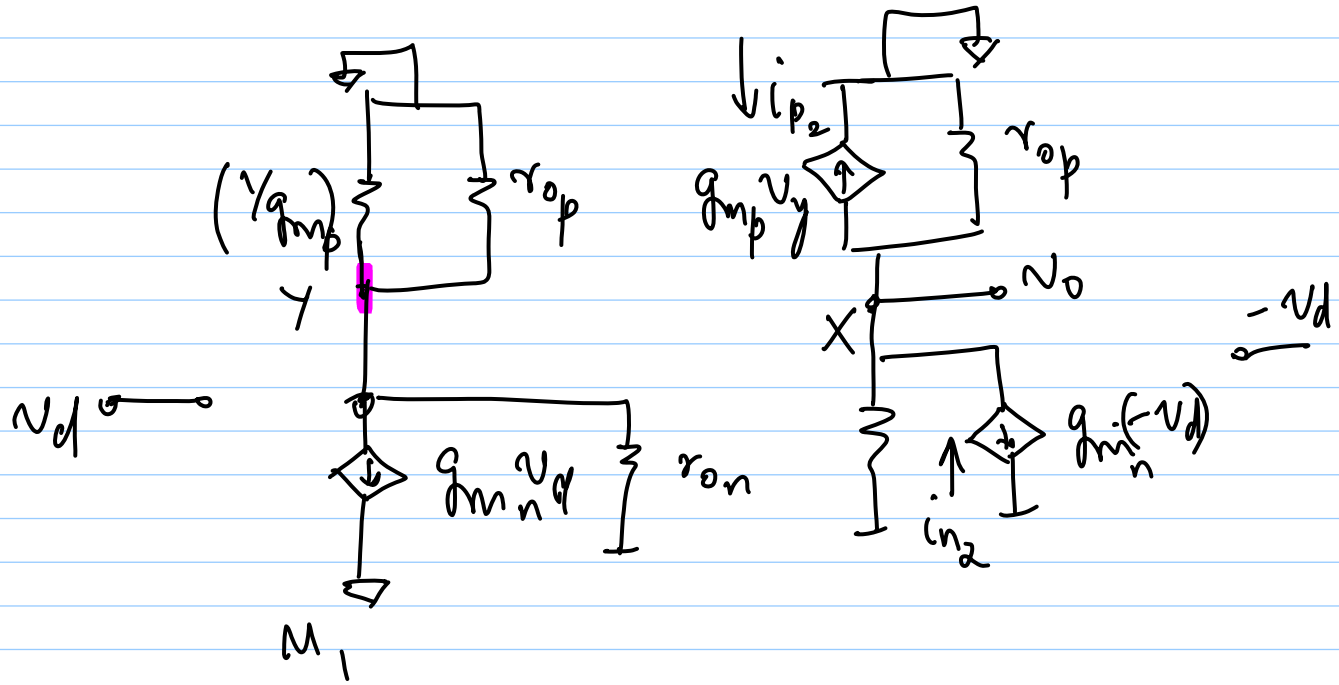
19-10-12

Lec 35



i_x = total current flowing into (X)

$= 2 g_m v_d$ ✓



$$v_y \simeq -g_{mn} v_d \cdot \frac{1}{g_{mp}}$$

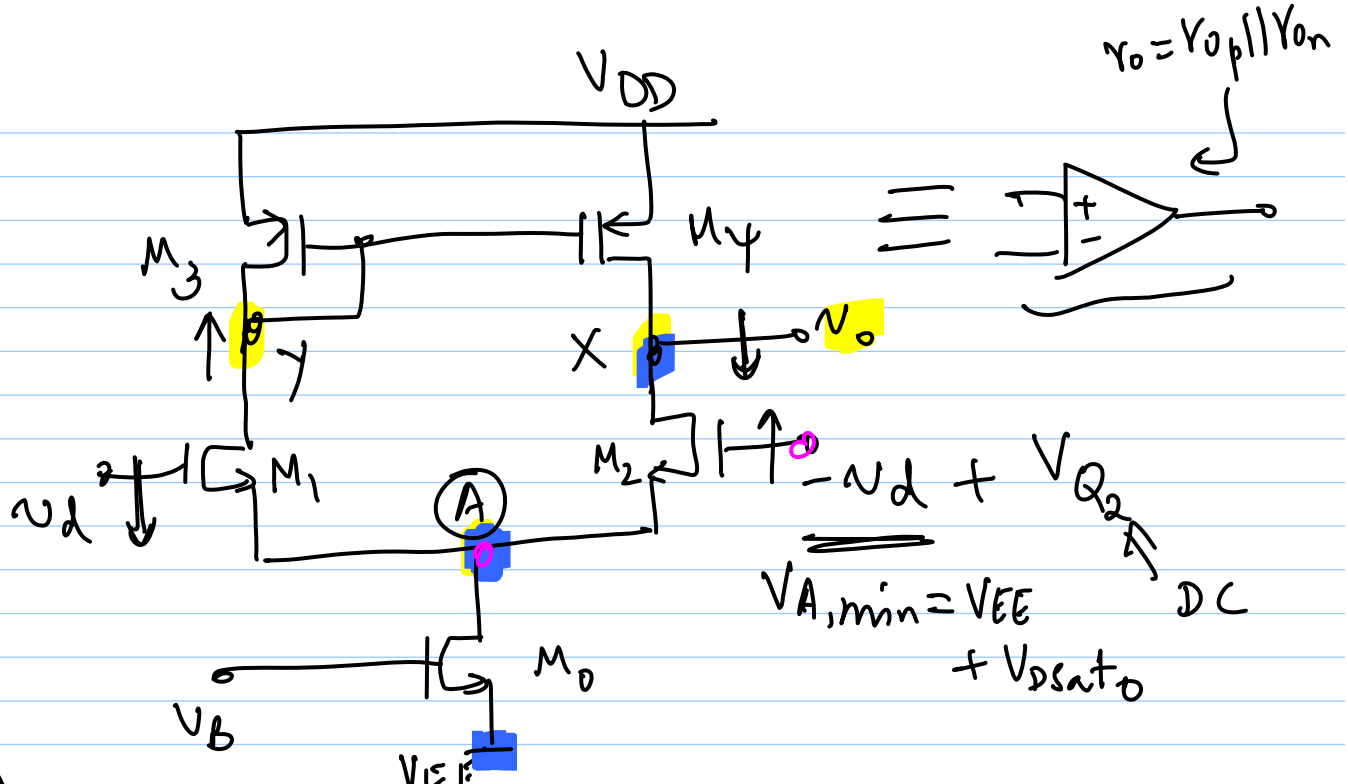
$$i_{p_2} = (-1) \times \left(-g_{m_n} v_d \cdot \frac{1}{g_{o_n} + g_{o_p}}\right)$$

$$= g_{m_n} \cdot v_d$$

$$i_{n_2} = g_{m_n} \cdot v_d$$

$$v_o = (i_{p_2} + i_{n_2})(r_{op} \| r_{on})$$

$$\frac{v_o}{v_d} = 2 g_{m_n} (r_{op} \| r_{on})$$

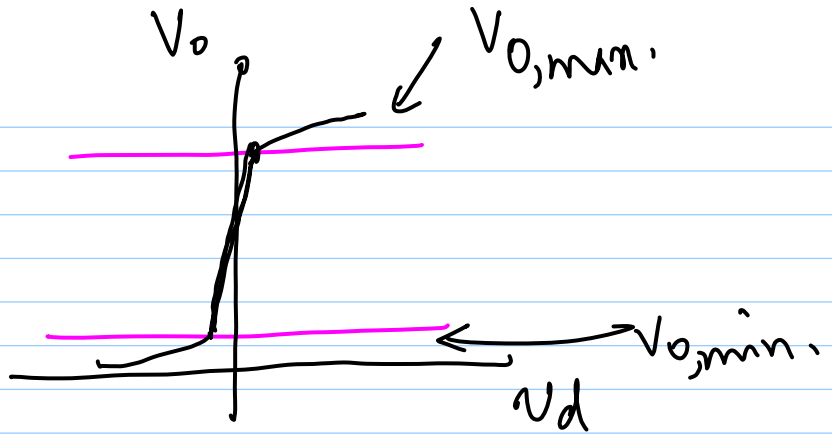


$v_d \uparrow$

$V_{o,max.} = V_{DD} - V_{DSat_4}$ (M_4 in triode)

$v_d \downarrow$

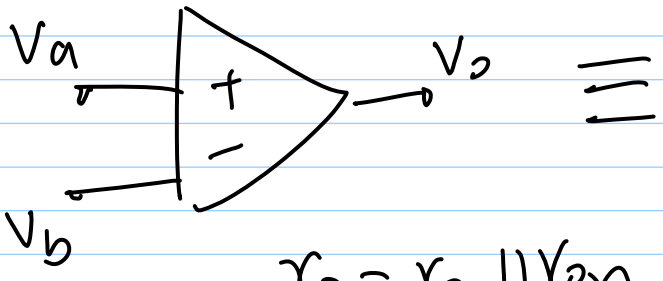
$V_{o,min} = V_{Q_2} - V_T$ (M_2 in triode)



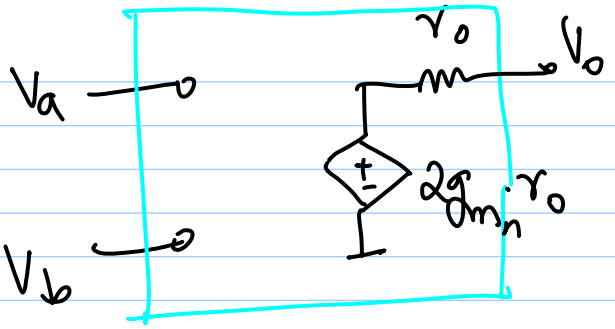
$$V_{Q_2,min} = V_{EE} + V_{DsatO} + V_{GS_2}$$

$$V_{O,min} = V_{Q_2,min.} - V_T$$

$$= V_{EE} + V_{Dsat_O} + \underbrace{V_{GS_2} - V_T}_{V_{Dsat_2}}$$

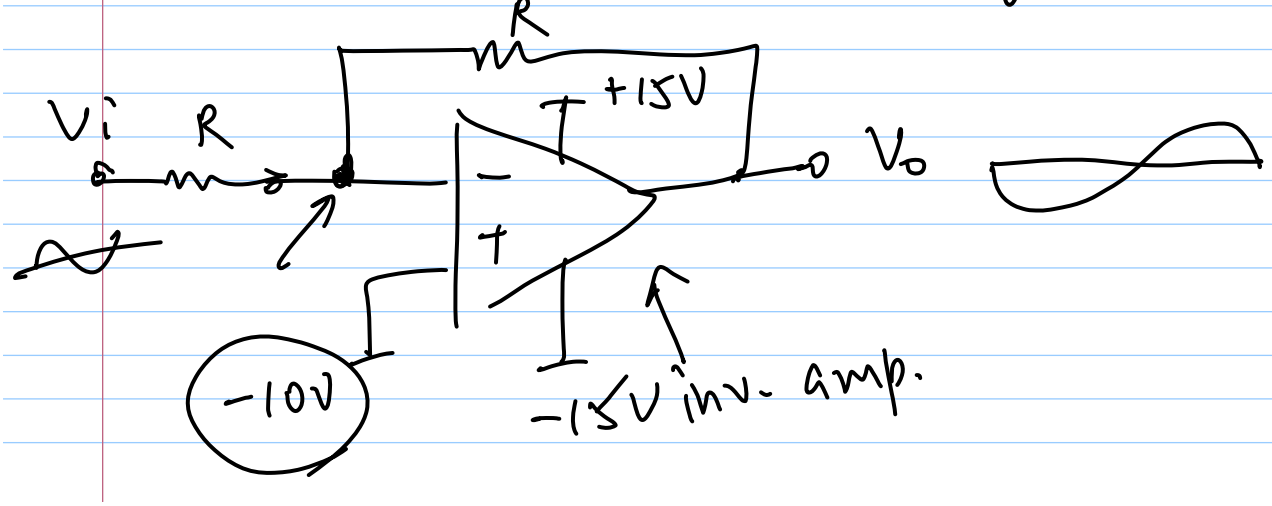


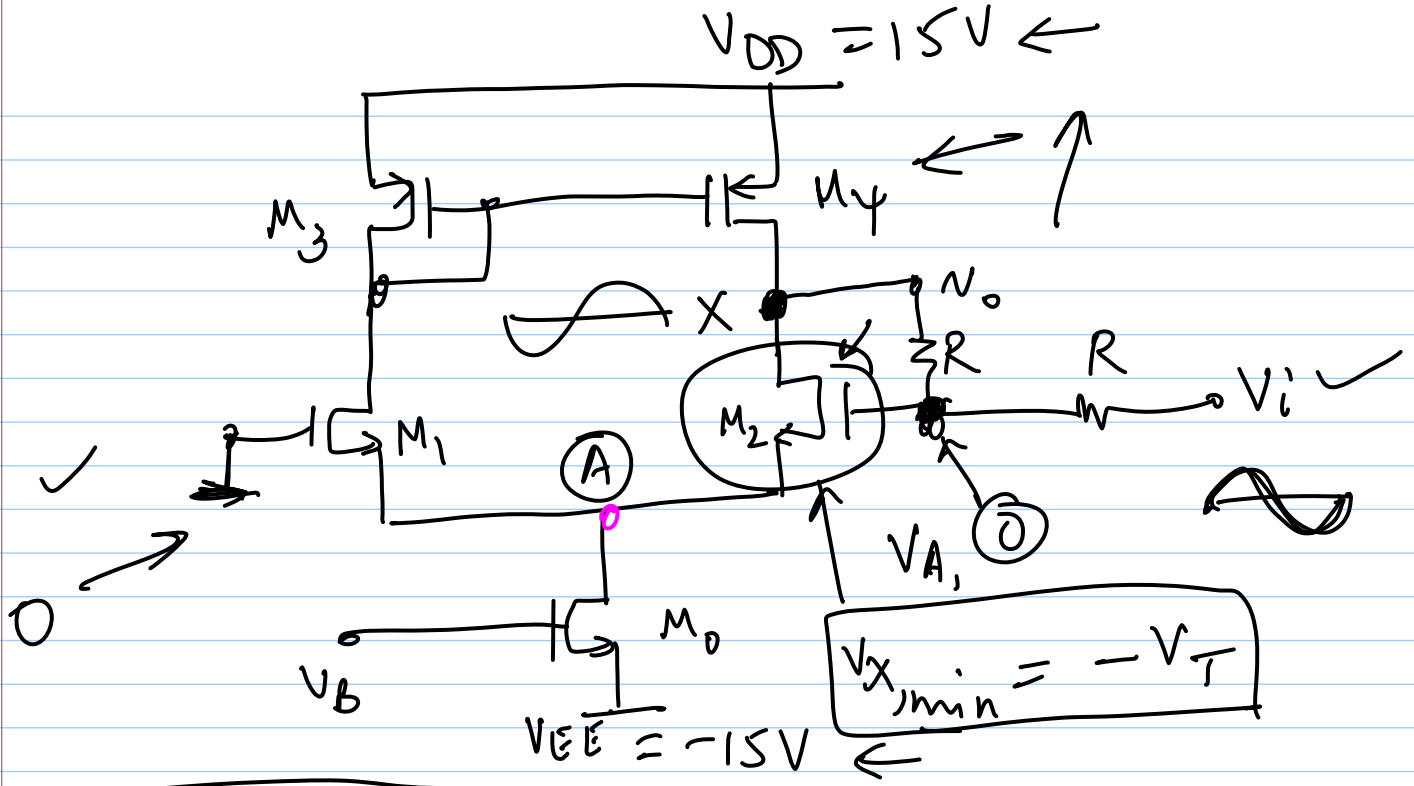
$\equiv$



$r_o = r_{op} \| r_{on}$

A problem! : finite gain (~ 100)





V_o swing is tied to $V_{cm,in}$