

16-10-12

Lec 32

V_x, V_y

$$V_{Dp} = V_{Gp} + V_{Tp}$$

$$V_x = V_B + V_{Tp}$$

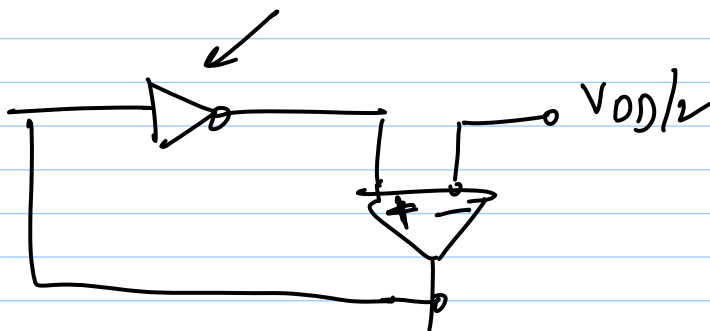
PMOS triode limit

$$V_{Dn} = V_{Gn} - V_{Tn}$$

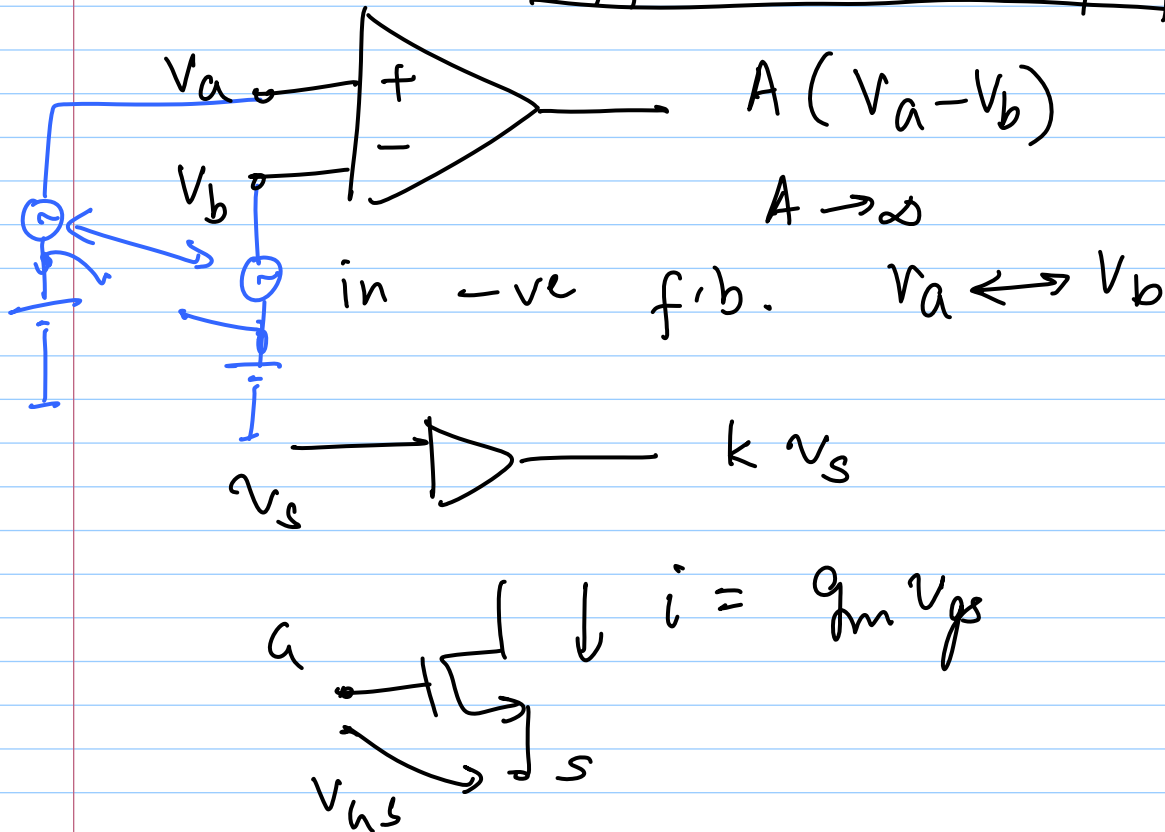
$$V_y = V_B - V_{Tn}$$

NMOS triode limit

* Bias output $V_{DD}/2$



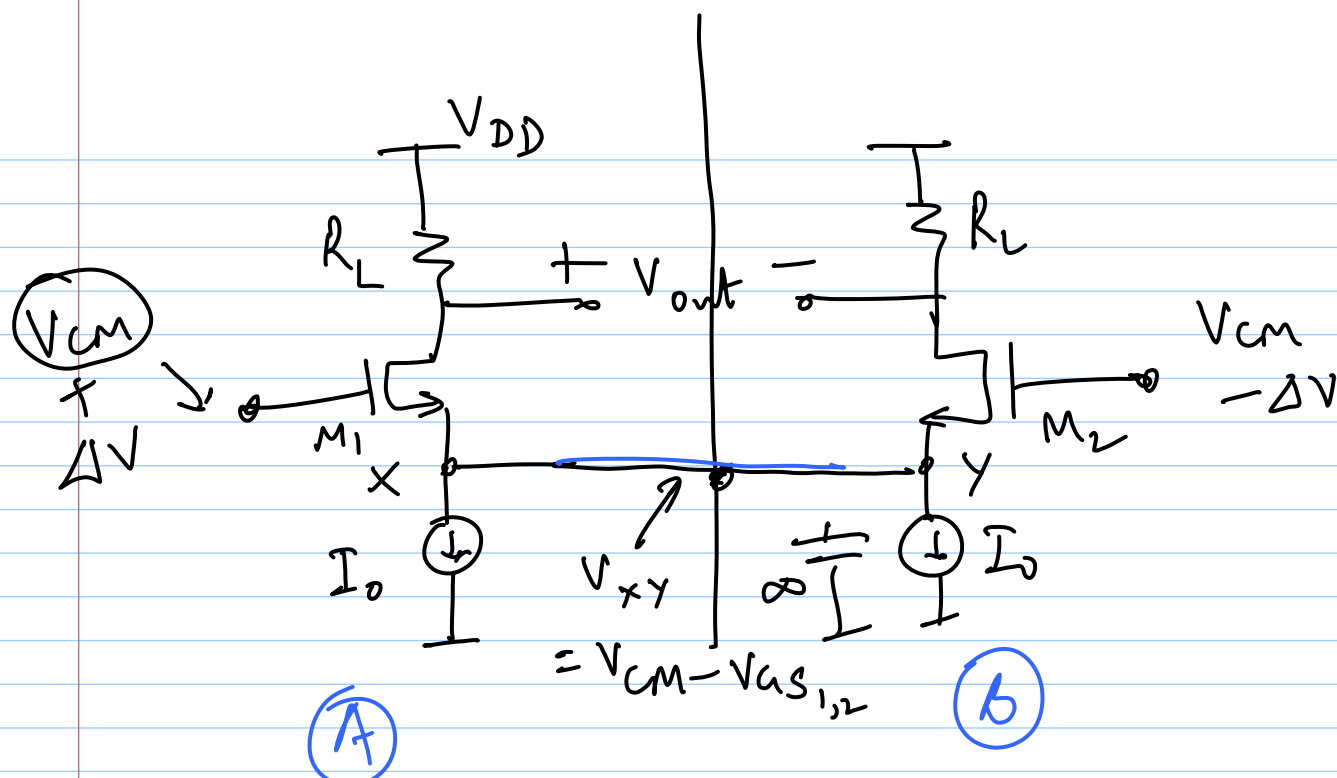
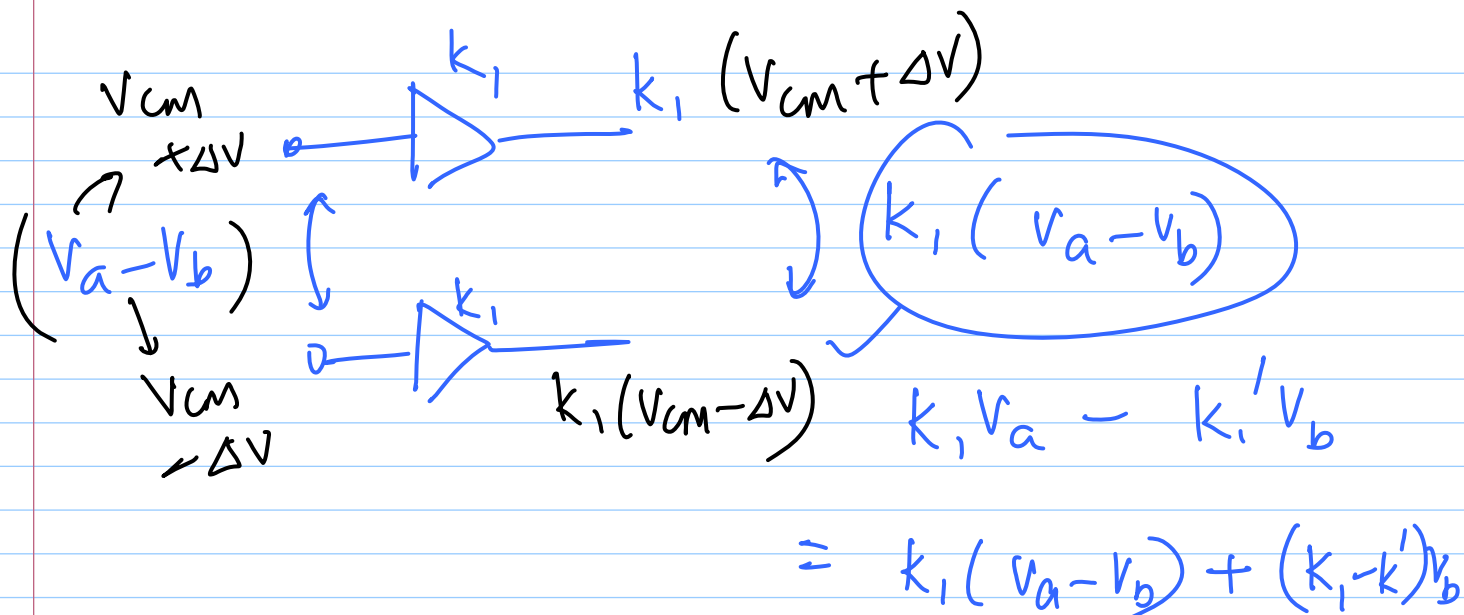
Differential Amplifiers



$$V_a = \left(\frac{V_a + V_b}{2} + \frac{V_a - V_b}{2} \right) k_1$$

$$V_b = \left(\underbrace{\frac{V_a + V_b}{2}}_{\text{Common-mode voltage } \underline{v_{cm}}} - \underbrace{\frac{V_a - V_b}{2}}_{\text{differential mode voltage } \underline{v_{dm}}} \right) k'_1$$

$$V_a = v_{cm} + v_{dm} ; V_b = v_{cm} - v_{dm}$$



$$\left. \begin{aligned} V_x &= V_{cm} - V_{as1} \\ V_y &= V_{cm} - V_{as2} \end{aligned} \right) \quad \underline{\underline{V_x = V_y}}$$

