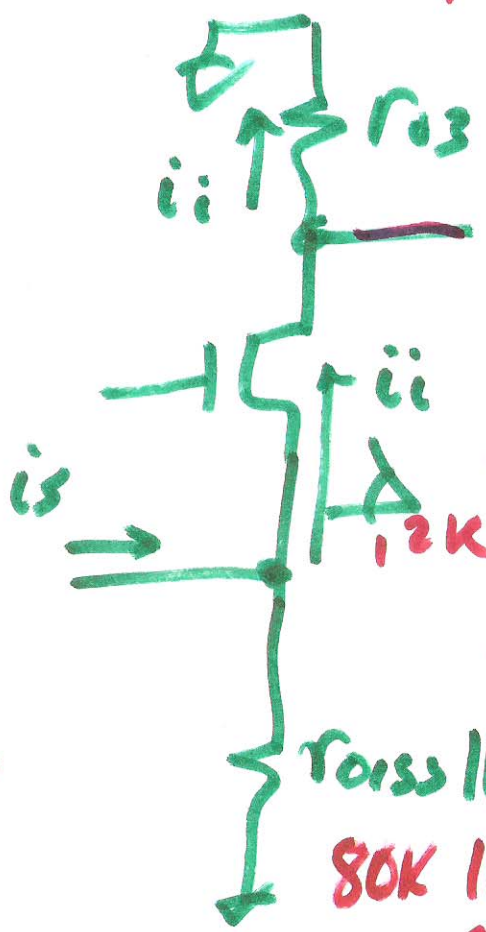
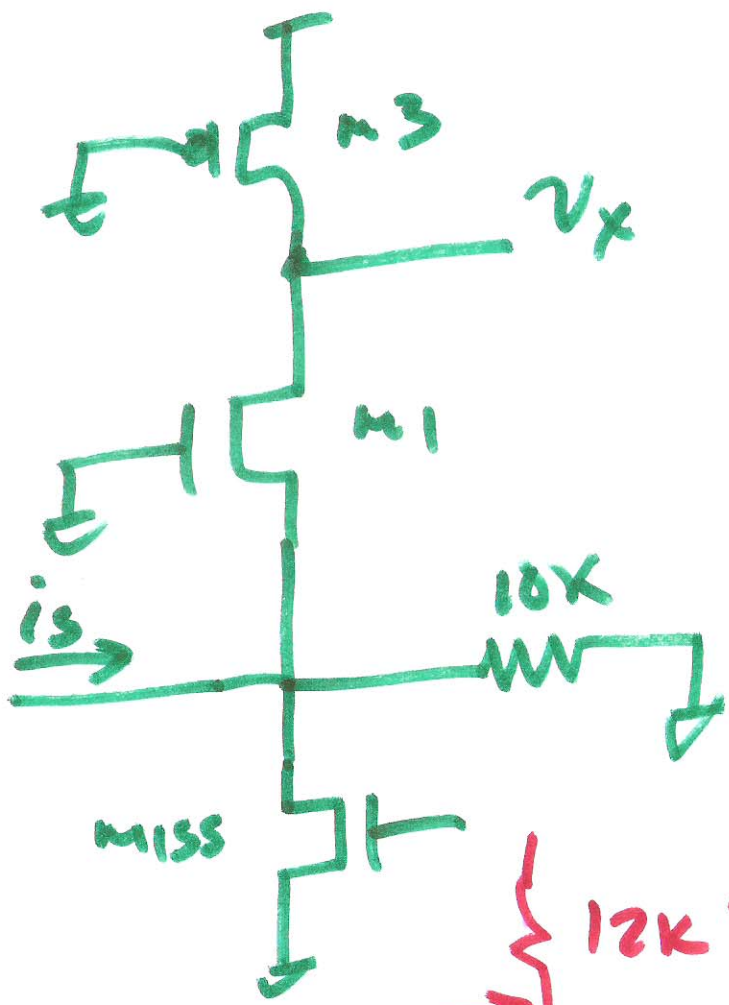


3.1.5 discussion



$$v_x = i_s \cdot 300K \approx 150K$$

$$r_{o3} = R_3 \approx 300K$$

$$v_x = R_3 \cdot i_i$$

$$1 + \frac{R_3}{r_{o1}} = 1 + \frac{300K}{180K}$$

$$\frac{1}{\frac{1}{r_{o1}} + \frac{1}{12K}} \approx \frac{1}{\frac{1}{180K} + \frac{1}{12K}} \approx \frac{1}{\frac{1}{9K}} = 9K$$

$$r_{o1ss} || 10K$$

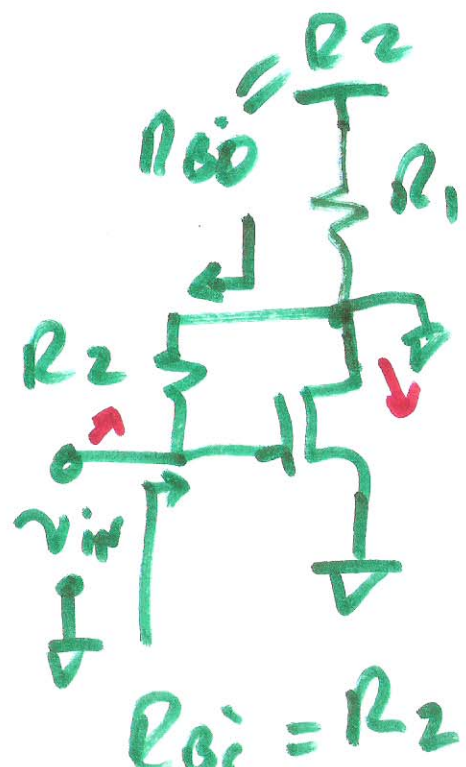
$$80K || 10K$$

$$9K$$

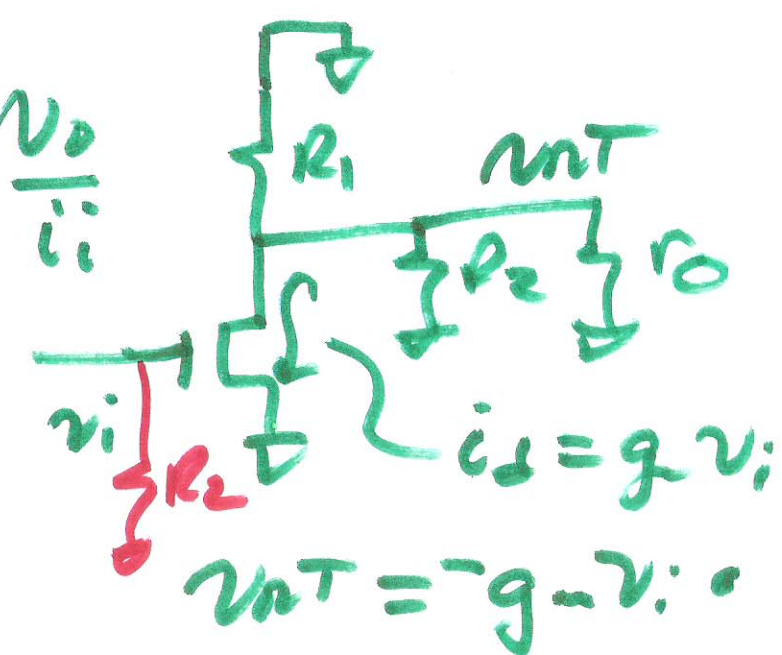
$$i_i = i_s \cdot \frac{9K}{9K + 12K} \approx \frac{i_s}{2}$$

1)

3.5.1 Shunt-shunt



$A_{OL} \rightarrow \frac{v_o}{i_i}$
 $\beta = \frac{1}{R_2}$



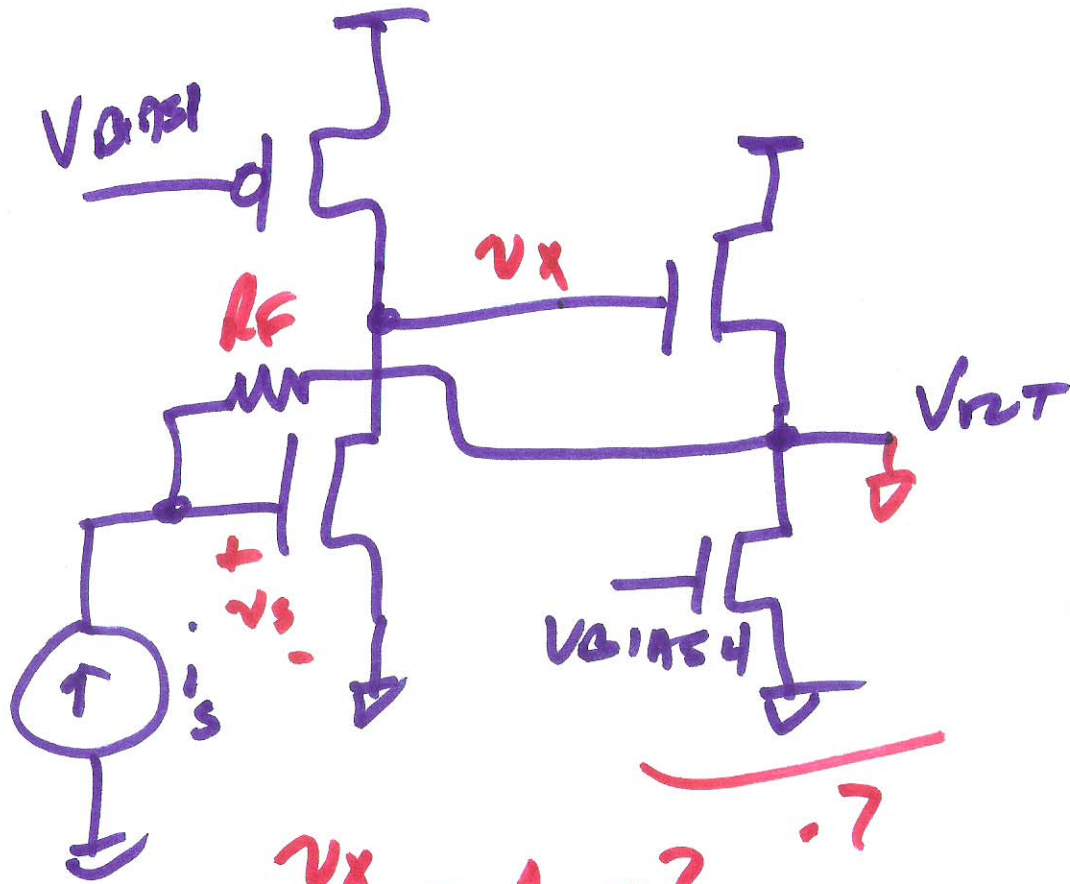
$$R_{if} = \frac{R_2}{1 + \beta \cdot A_{OL}}$$

$$i_i = \frac{v_i}{R_2}$$

$$r_o \parallel R_2 \parallel R_1$$

$$A_{OL} = \frac{v_{out}}{i_i} = R_2 \left(-g_m r_o \parallel R_1 \parallel R_2 \right) \frac{v_i}{i_i \cdot R_2} = -g_m r_o \parallel R_1 \parallel R_2$$

2)



$$660 \cdot 10^6 \cdot 166 \frac{\mu A}{V}$$

$$660 \cdot 16.6$$

$$\approx \underline{\underline{70K}}$$

$$\frac{V_{out}}{i_s} \approx -0.7 R_F \cdot g_m \quad (r_{op} || r_{on})$$

$$66k \cdot 10k$$

$$\frac{v_x}{i_s} = A_{ol} = ?$$

$$v_s = i_s \cdot R_F$$

$$v_x = -(r_{op} || r_{on}) \cdot (g_m \cdot v_s)$$

$$\frac{v_x}{i_s} = - R_F \cdot (r_{op} || r_{on})$$

$$660 \cdot 10^6$$

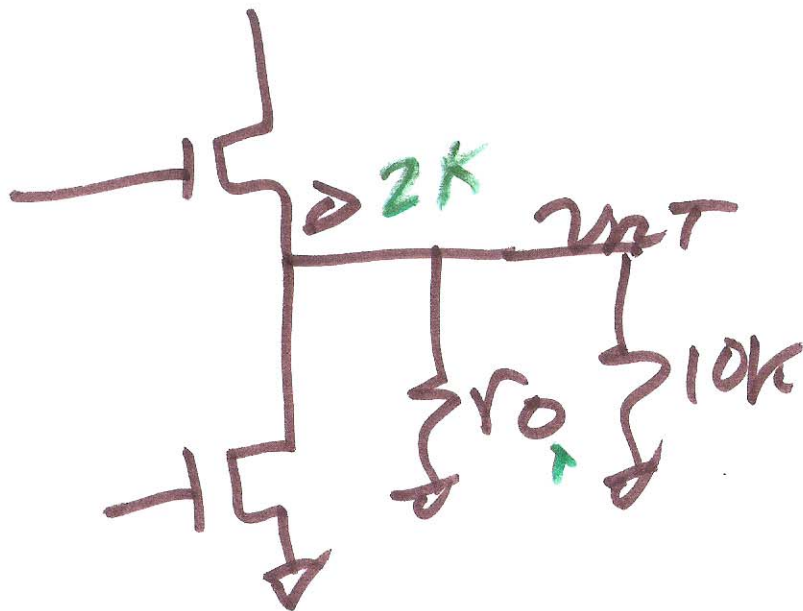
$$\approx 500$$

$$\underline{\underline{e-6}}$$

3)

$$A_{CL} = \frac{70,000}{1 + \frac{70K}{10K}} = \frac{70,000}{8} \approx \underline{\underline{8.75K}}$$

$$= R_{if} = \frac{10K}{1 + \frac{70K}{10K}} = \frac{10K}{8} = 1.25K$$



$$R_o = 2K \parallel 10K \parallel 10K \parallel r_o$$

$$\approx 1.5K$$

$$R_{of} = \frac{1.5K}{1 + \frac{70K}{10K}}$$

$$\approx 200$$