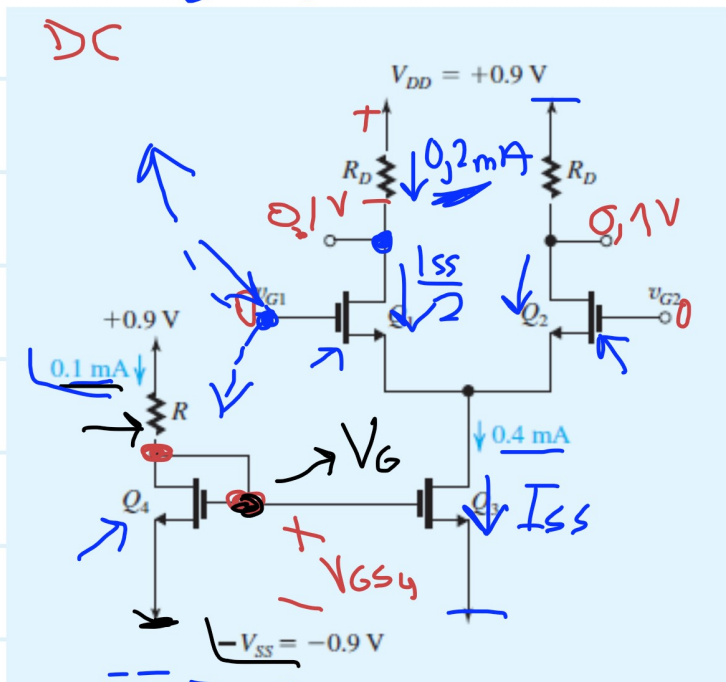


Eq.

DC



10 Pensar!

$$V_{cm} = 0V$$

$$R_D = \frac{V_{DD} - 0,1}{0,2mA} = 4K\Omega$$

?

$$V_G = V_{GS4} - 0,9 \rightarrow V_{GS4} = ?$$

$$R = \frac{V_{DD} - V_G}{0,1mA}$$

$$I_{D4} = 0,1mA = \frac{1}{2} \mu_n C_{ox} \frac{W}{L} (V_{GS4} - V_{TH})^2$$

!!

$$V_{OV} = 0,15V$$

$$V_{GS} - V_{TH} = 0,15$$

$$V_{GS4} = 0,55V = all$$

↓

$$R = \frac{1,25}{0,1mA}$$

$$= 12,5 K\Omega$$

$$V_{G4} = -0,35V$$

$$\alpha = \frac{1}{2} \mu_n C_{ox}$$

$$I_{D4} = 0,1 \text{ mA} = \alpha \cdot \frac{W}{L_4} \times 0,15^2 \leftarrow$$

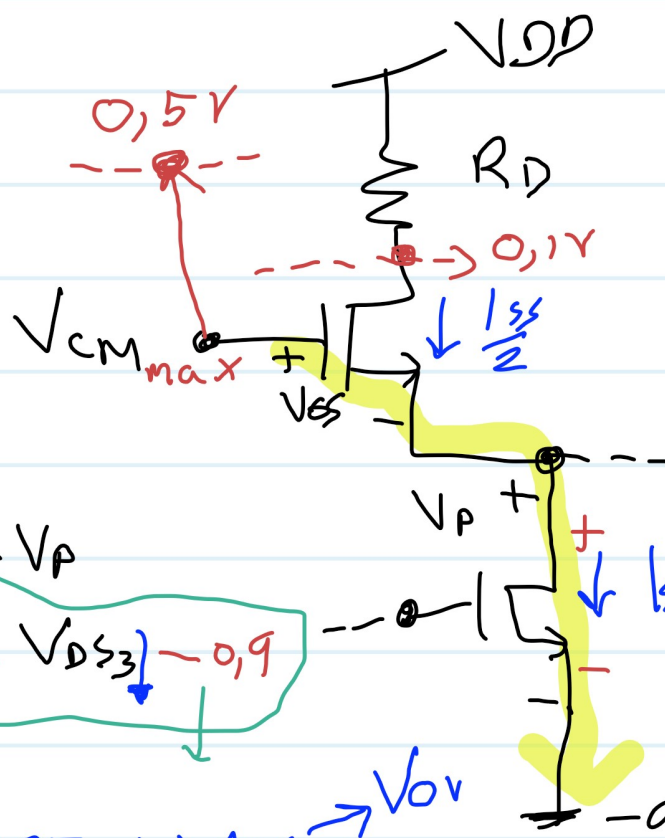
$$\frac{W}{L_4} = 22,22$$

$$\frac{W}{L_3} = 88,9$$

$$\frac{20 \mu}{0,5 \mu} \rightarrow 40$$

$$I_{D1} \rightarrow I_{D2} \rightarrow \frac{W}{L}_{1,2} \equiv 44,44$$

ICMR =



$$V_D = V_G - V_{TH}$$

V_{CM}

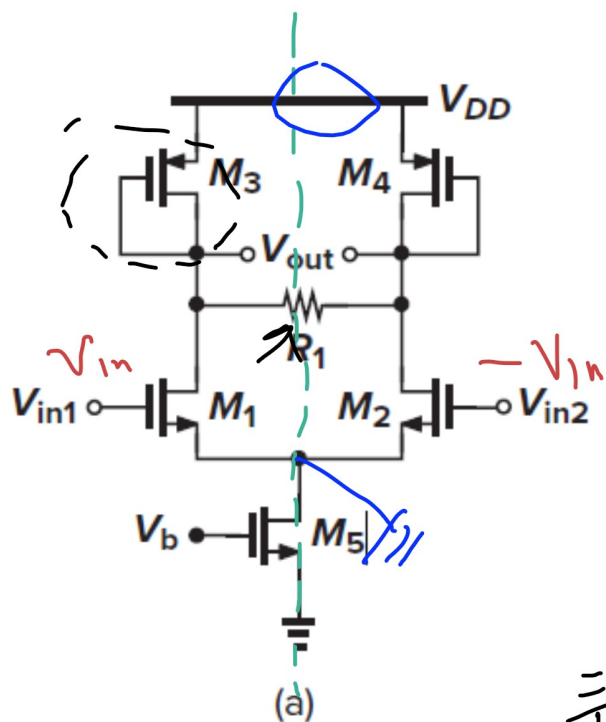
$$V_{CM} = V_{GS} + V_P$$

$$V_{CM} = 0,55 + V_{DS3} - 0,9$$

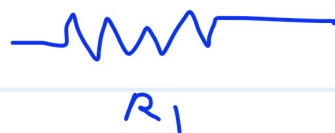
$$V_P = V_{DS3} - 0,9$$

$$V_{CMmin} = -0,35 + V_{DSmin}$$

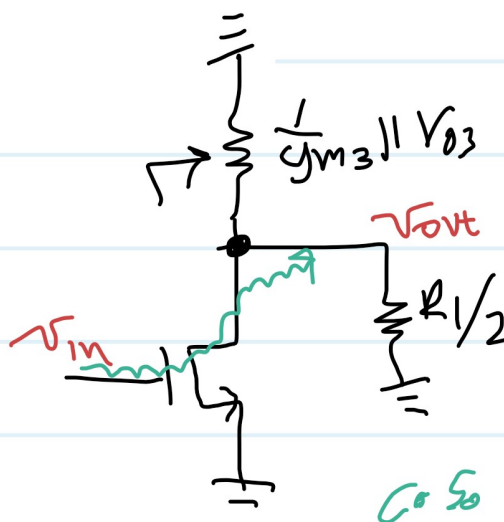
$$V_{CMmin} = -0,2 \text{ V} \rightarrow \text{ICMR} = [-0,2 : 0,5] \text{ V}$$



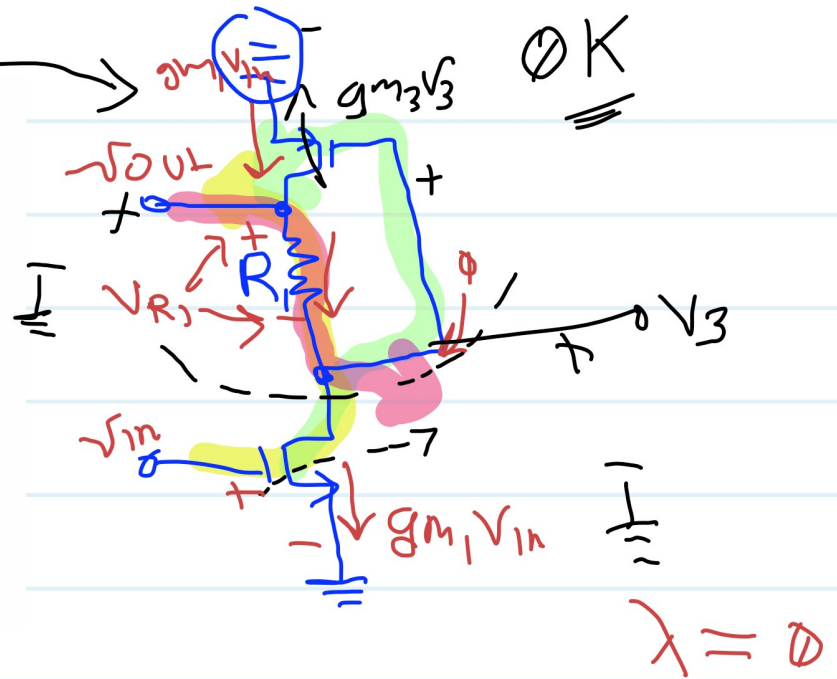
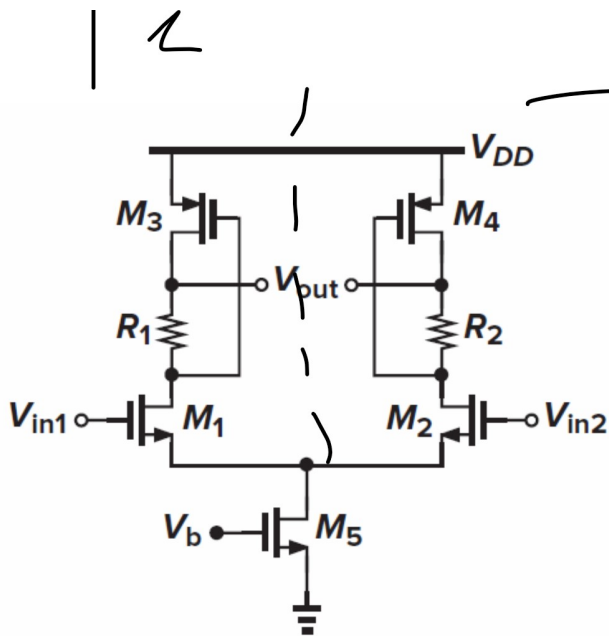
$$A_v = \frac{v_{out}}{v_{in}} \approx \frac{1}{2} g_{m1} R_1$$



Eq 1/2 par



$$A_v = \frac{v_{out}}{v_{in}} = -g_{m1} \left(\frac{1}{g_{m3}} \parallel \frac{R_1}{2} \right)$$



$$V_{R1} = g_{m1} V_{in} R_1$$

$$g_{m1} V_{in} = -g_{m3} V_3$$

$$V_3 = -\frac{g_{m1}}{g_{m3}} V_{in}$$

$$V_{out} = V_{R1} + V_3$$

$$V_{out} = \left(g_{m1} R_1 - \frac{g_m}{g_{m3}} \right) V_{in}$$

~~Differential mode~~

