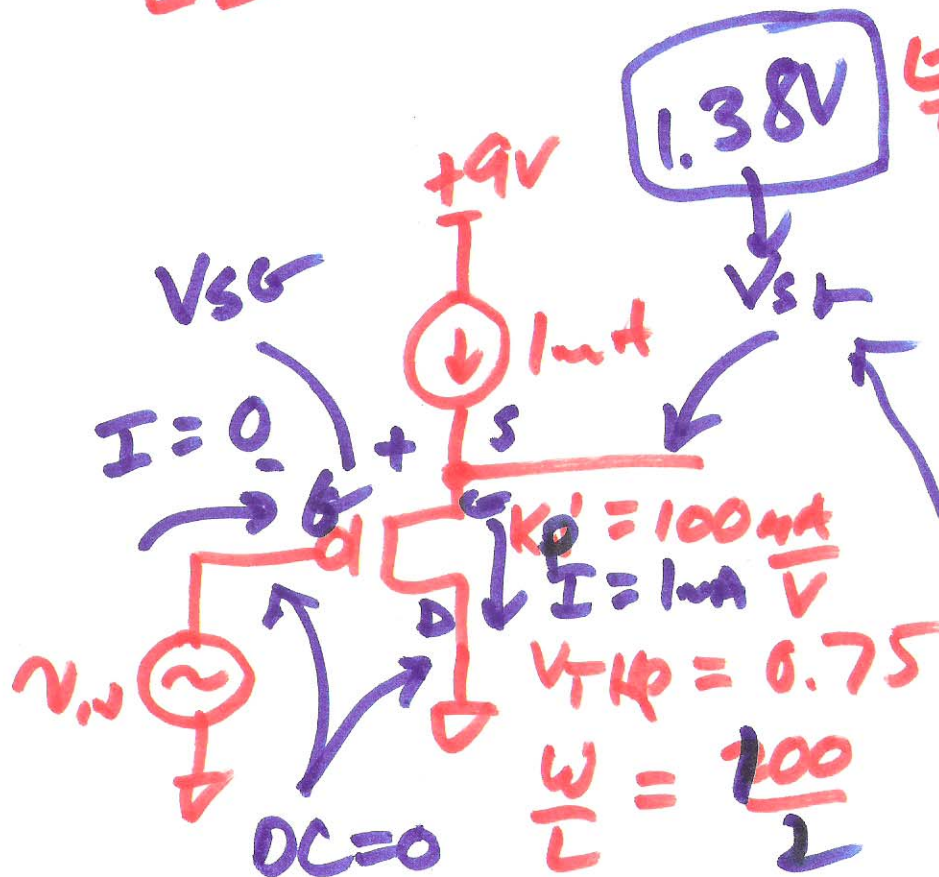


EE 320

Electronics

4/17/13



1.38V

$$I_0 = \frac{K_p'}{2} \cdot \frac{W}{L} (V_{SG} - V_{thp})^2$$

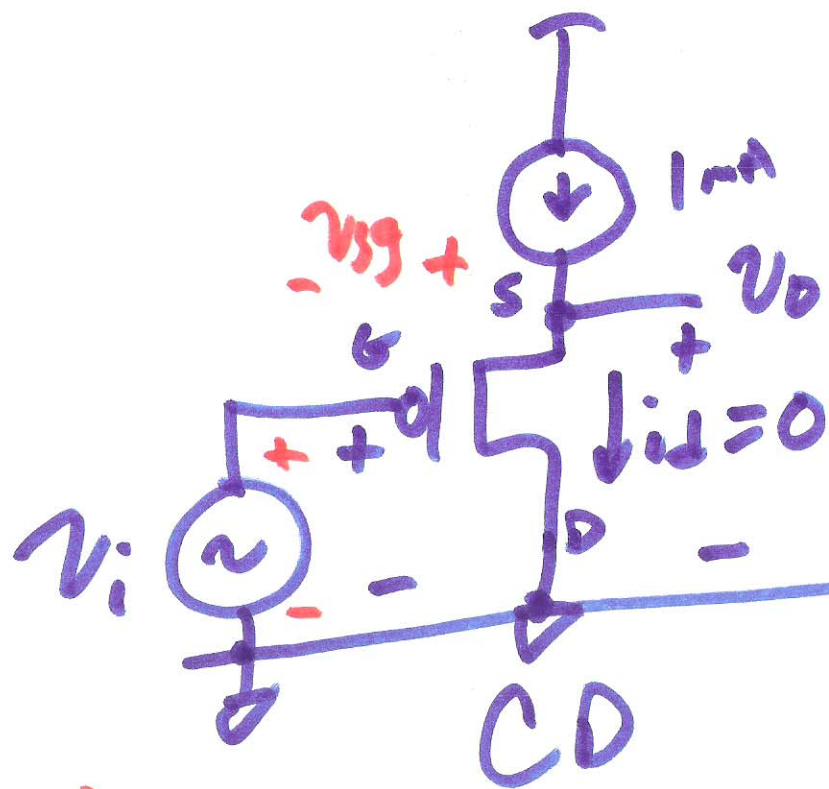
$$V_{SG} = \sqrt{\frac{2I_0 \cdot L}{K_p' \cdot W}} + V_{thp}$$

$$= \sqrt{\frac{2 \cdot 1 \mu A \cdot 2}{100 \frac{\mu A}{V^2} \cdot 100}} + 0.75$$

$$V_{SG} = V_S - V_G^0 = V_S \sqrt{\frac{4 \mu A}{100 \frac{\mu A}{V^2}}} + 0.75$$

$$V_{SG} = 0.63 + 0.75$$

$$V_{SG} = 1.38V$$



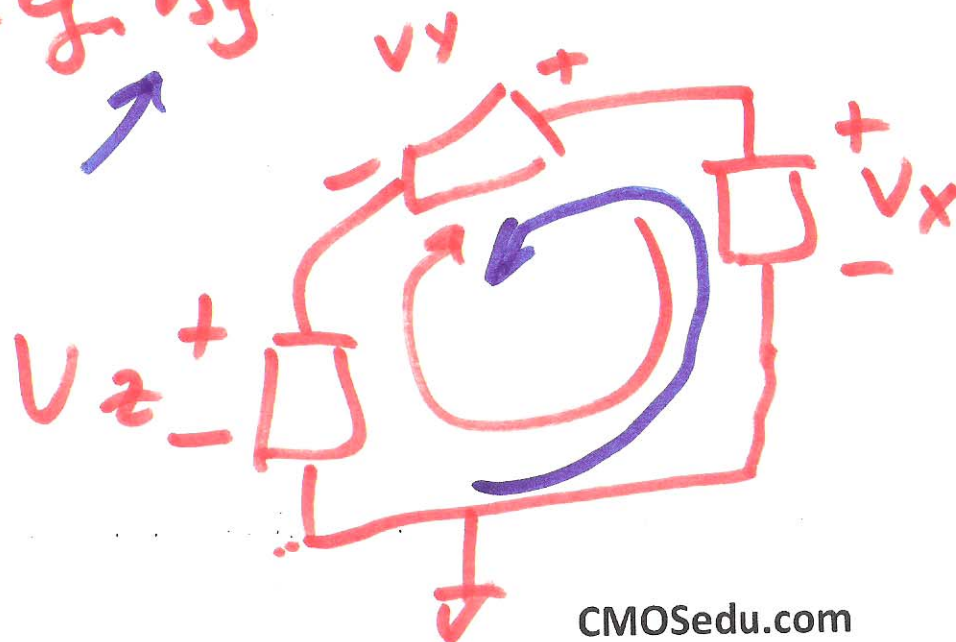
$$\frac{v_o}{v_i}$$

$$v_o = v_{sg} + v_i$$

$$v_i = -v_{sg} + v_o$$

$$v_i = -\frac{v_o}{g_m} + v_o$$

$$i_d = g_m v_{sg}$$

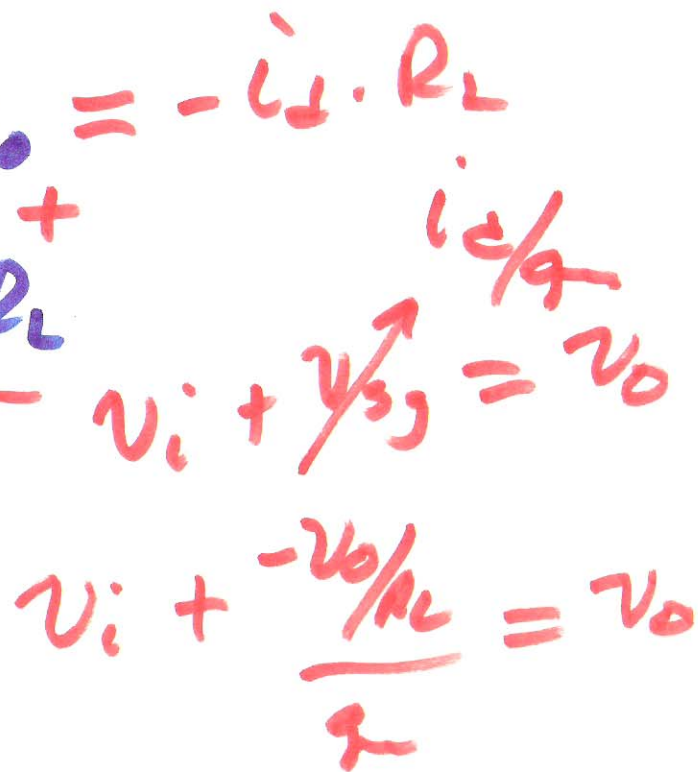


$$v_z + v_y - v_x = 0$$

$$v_x - v_y - v_z = 0$$

$$v_o = v_i \frac{1}{1 + \frac{1}{g_m R}}$$

2)



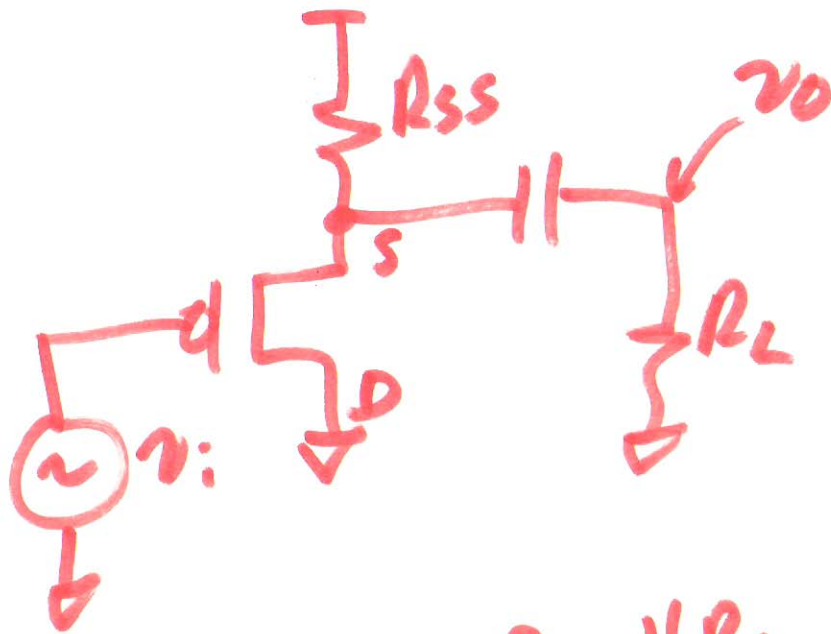
$$v_{sg} = \frac{1d}{q_n}$$

$$V_{THP} = 0.75$$

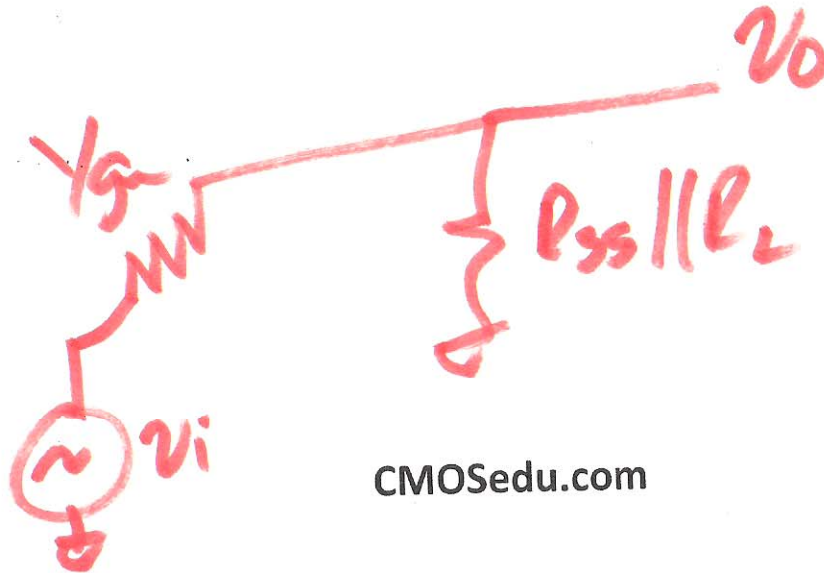
$$v_o = v_i \cdot \frac{R_L}{R_L + \frac{1}{g_m}} \quad v_i = v_o \left(1 + \frac{1}{g_m R_L} \right)$$

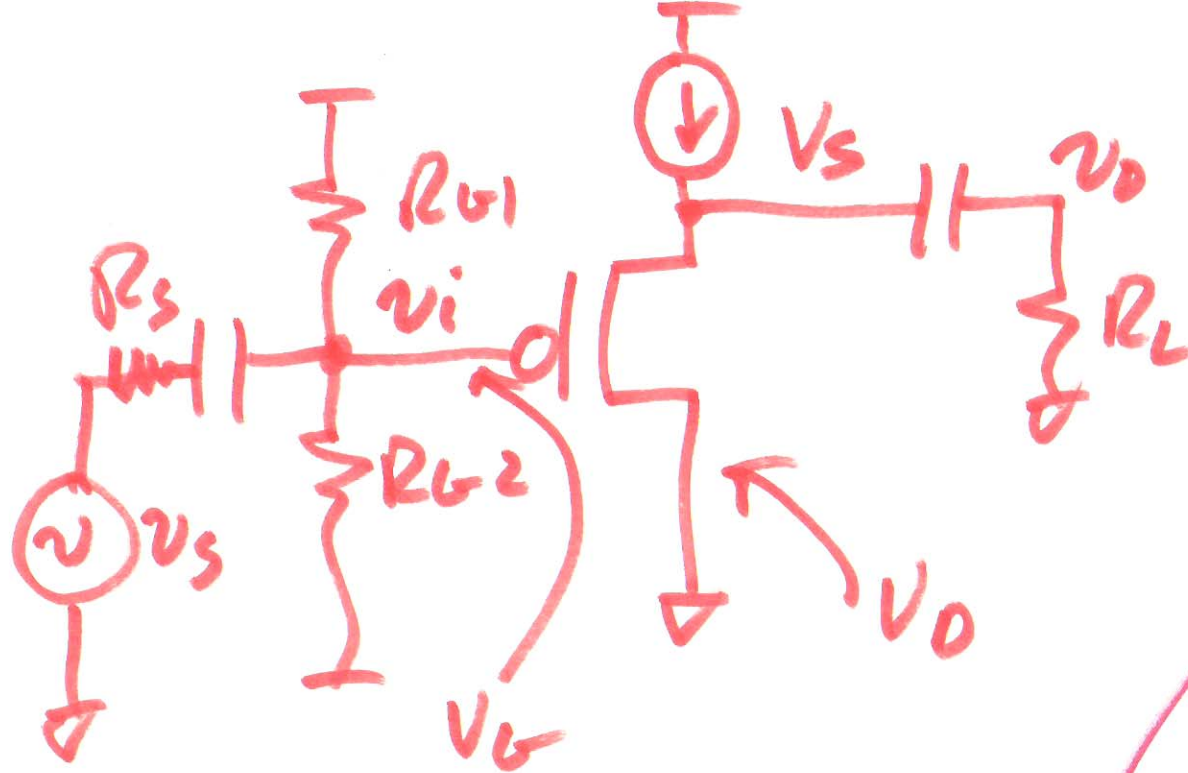
$$\frac{v_o}{v_i} = \frac{1}{1 + \frac{1}{g_m R_L}} = \frac{R_L}{R_L + 1/g_m}$$





$$\frac{v_o}{v_i} = \frac{R_{SS} \parallel R_L}{R_{SS} \parallel R_L + 1/g_m}$$





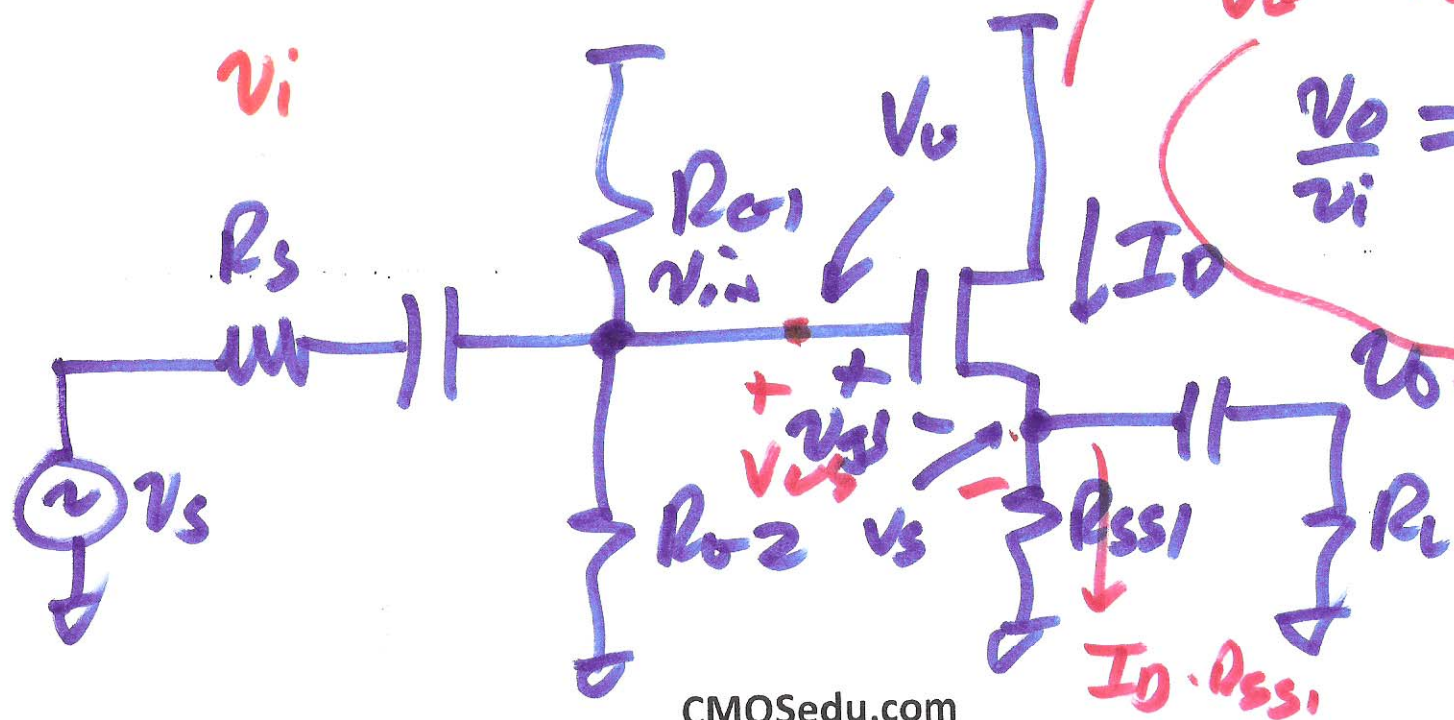
study these

Calculate I_D

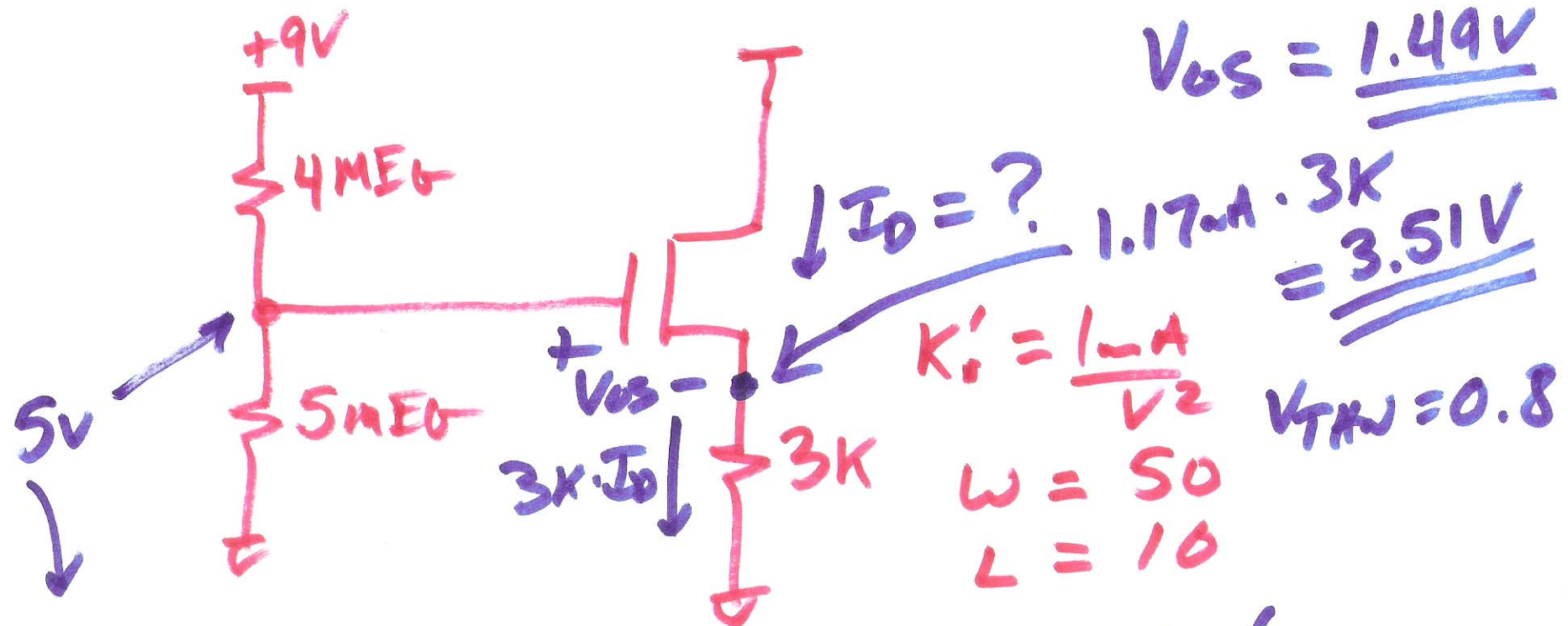
1. calculate V_G
2. write KVL

$$V_G = V_{GS} + I_D \cdot R_{SS1}$$

$$\frac{v_o}{v_i} = \frac{R_{SS1} \parallel R_L}{\frac{1}{g_m} + R_{SS1} \parallel R_L}$$



$$I_D = \frac{k_n}{2} \frac{W}{L} (V_{GS} - V_{THN})^2$$



$$9. \frac{5}{4+5} = 5V$$

$$I_D = \frac{1\mu A}{V^2} \cdot \frac{1}{2} \cdot \frac{50}{10} \left(5 - I_D \cdot 3k - 0.8 \right)^2$$

$$I_D = 2.5\mu A \left(4.2^2 - I_D \cdot 3k \right)^2$$

$$I_D = 2.5\mu A \left(17.64 - I_D \cdot 2.7k \cdot 4.2 + I_D^2 \cdot 9.06 \right)$$

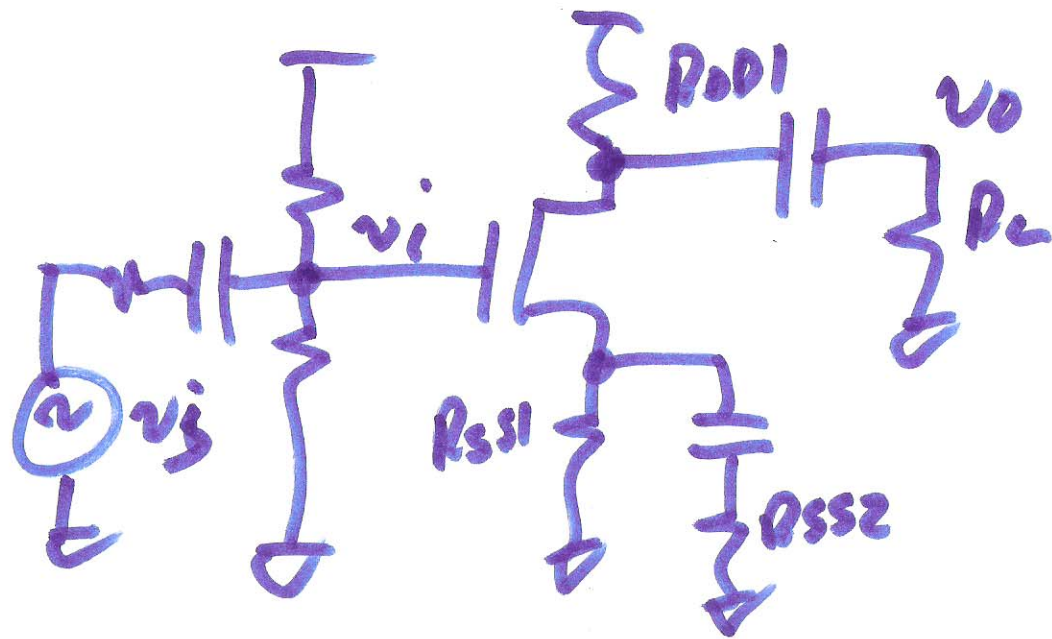
$$I_D = 44.1 \mu - 63 I_D + 22.5 K I_D^2$$

$$0 = 44.1 \mu - 64 I_D + 22.5 K I_D^2$$

$$I_D = \frac{64 \pm \sqrt{64^2 - 4 \cdot 22.5 K \cdot 44.1}}{2 \cdot 22.5 K}$$

$$I_D = \frac{64 \pm 11.27}{44 K}$$

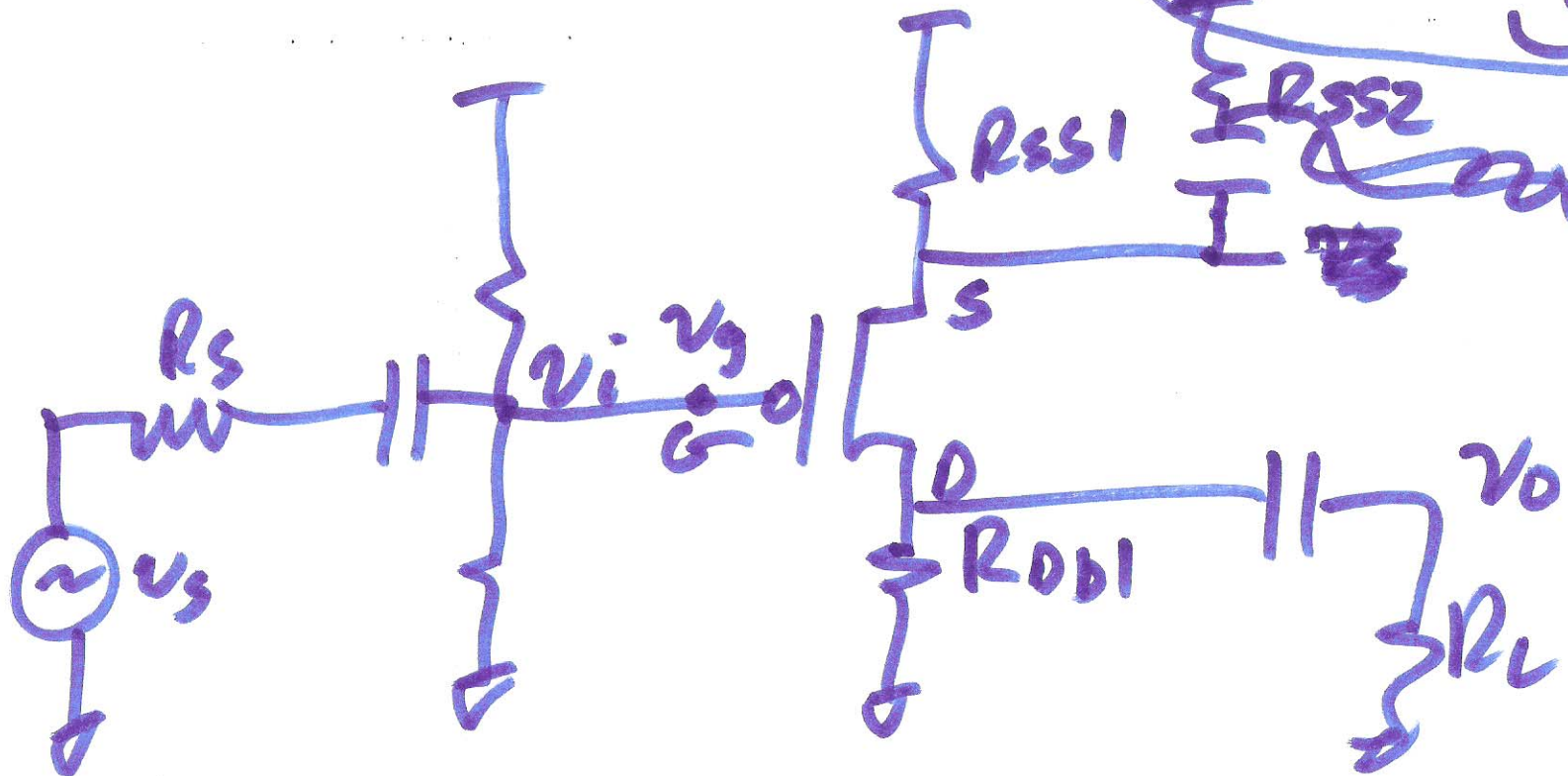
$$= 1.67 \mu A \text{ or } \underline{\underline{1.17 \mu A}}$$



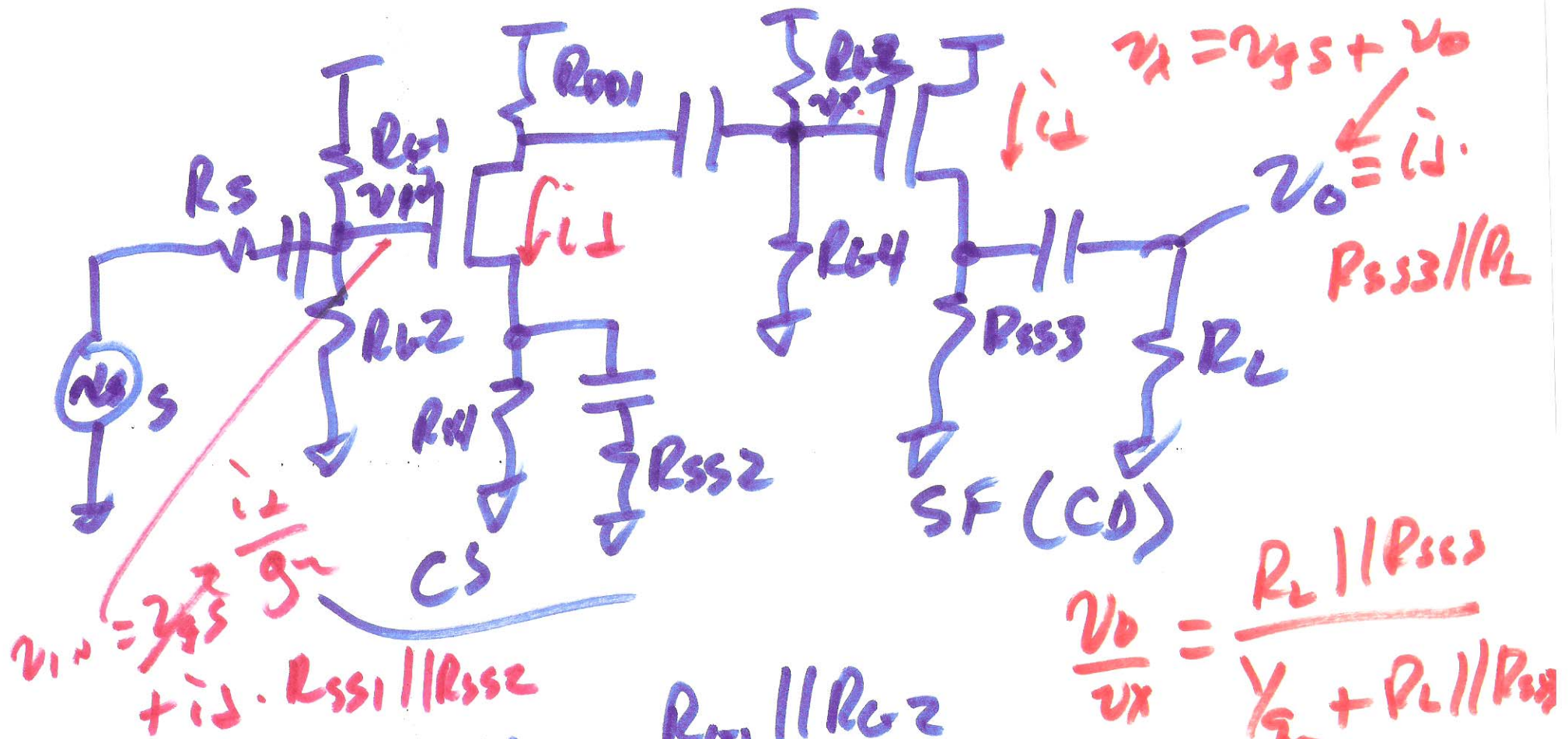
CS

$$\frac{v_o}{v_i} = \frac{-R_{OD1} \parallel R_L}{\frac{1}{g_m} + R_{SS1} \parallel R_{SS2}}$$

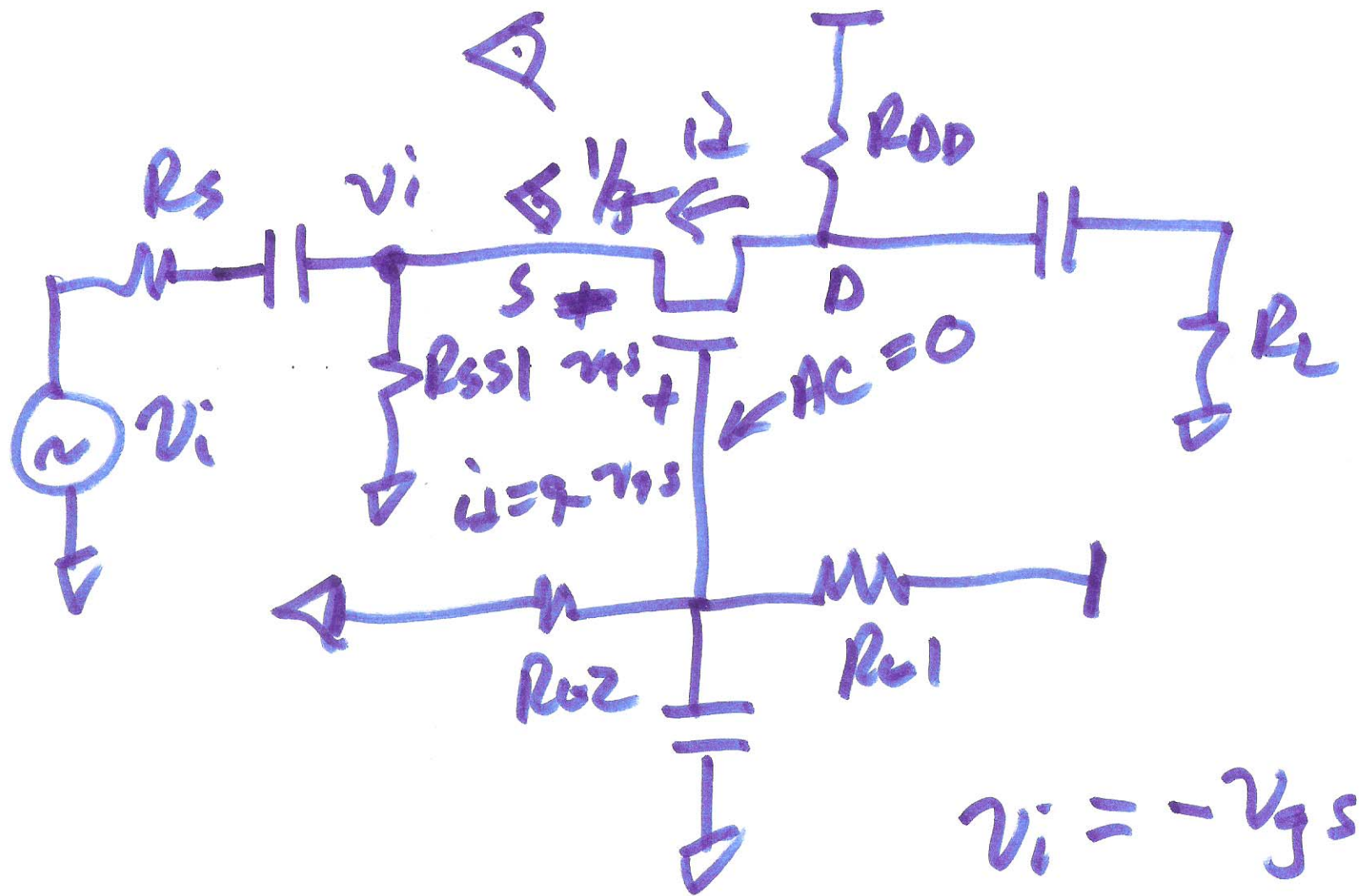
study these
😊



8)



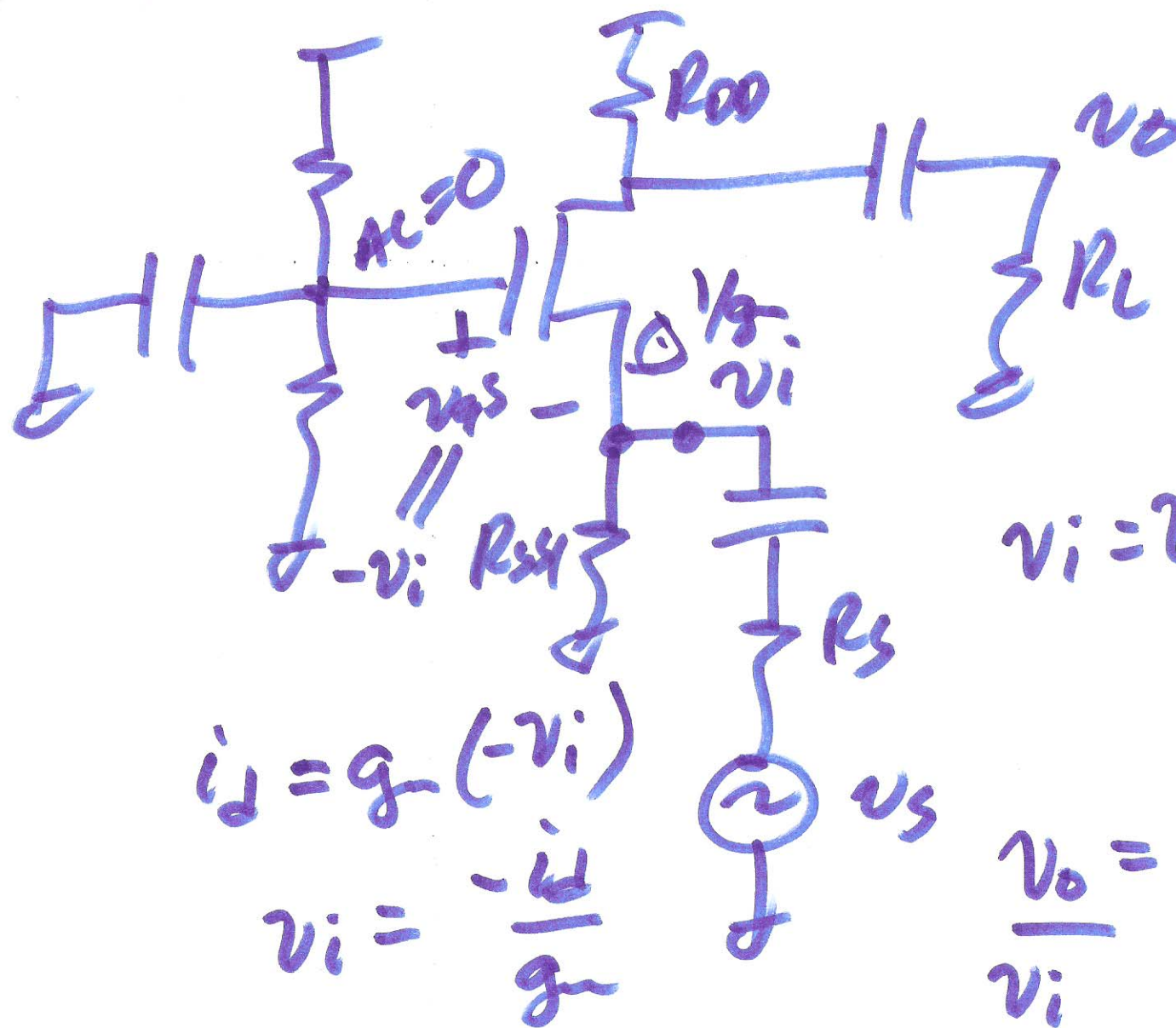
9)



C.G.

$$v_i = -v_{gs}$$

10)



Study these
😊

$$V_i = V_s \cdot \frac{R_{SS} \parallel \frac{1}{g_m}}{R_{SS} \parallel \frac{1}{g_m} + R_S}$$

$$\frac{V_o}{V_i} = \frac{-i_d \cdot R_L \parallel R_{SD}}{-i_d \cdot \frac{1}{g_m}}$$

$$i_d = g_m(-V_i)$$

$$V_i = -\frac{i_d}{g_m}$$

C.B

11)

pmos C.G

