

EE 320

Engineering Electronics I

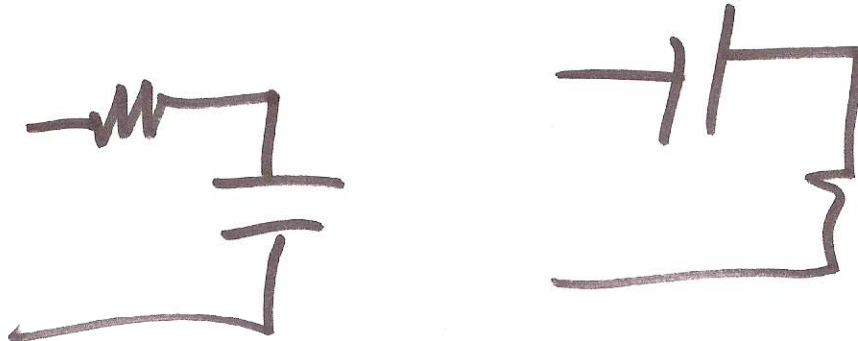
April 6, 2015

Lecture 20

Review for Mid term

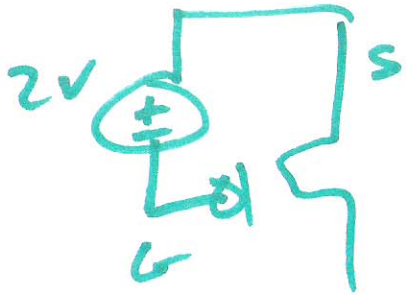
Quizzes & H.W.

RC circuit



$$V_{SL} = V_S - V_C$$
$$V_{GS} = V_G - V_S$$

$V_{th} = -1$

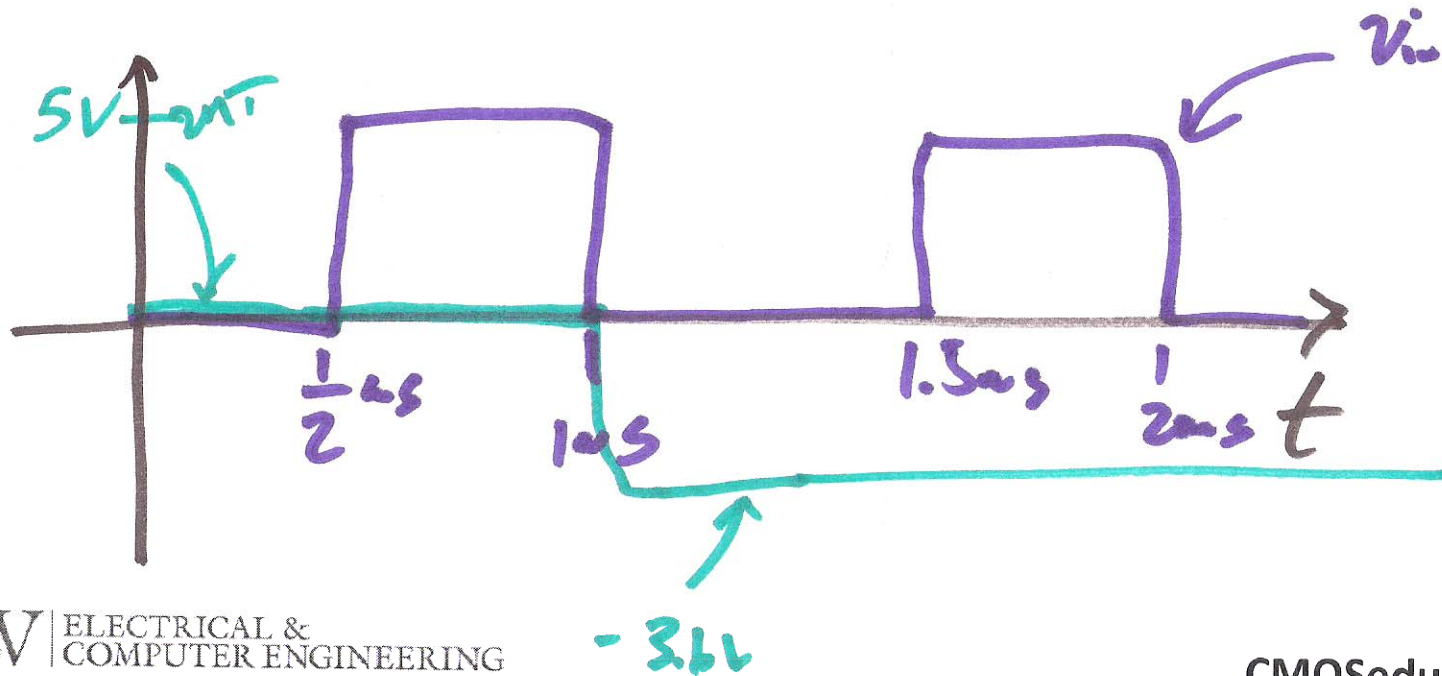
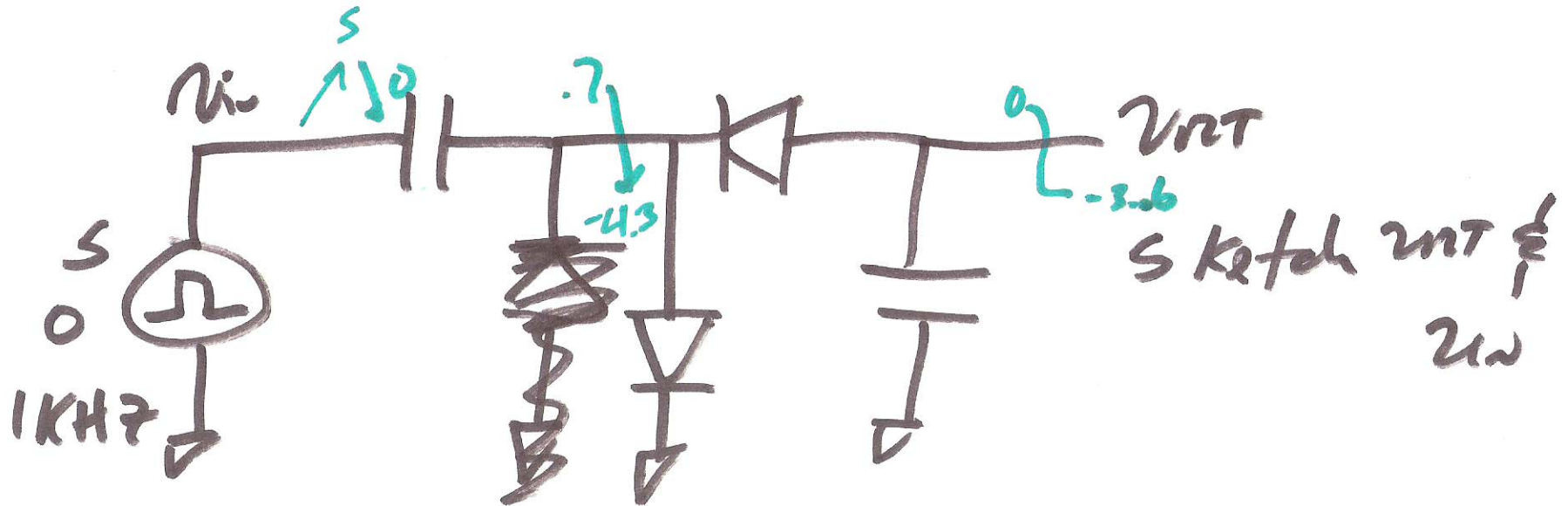


$$V_{GS} = -2$$

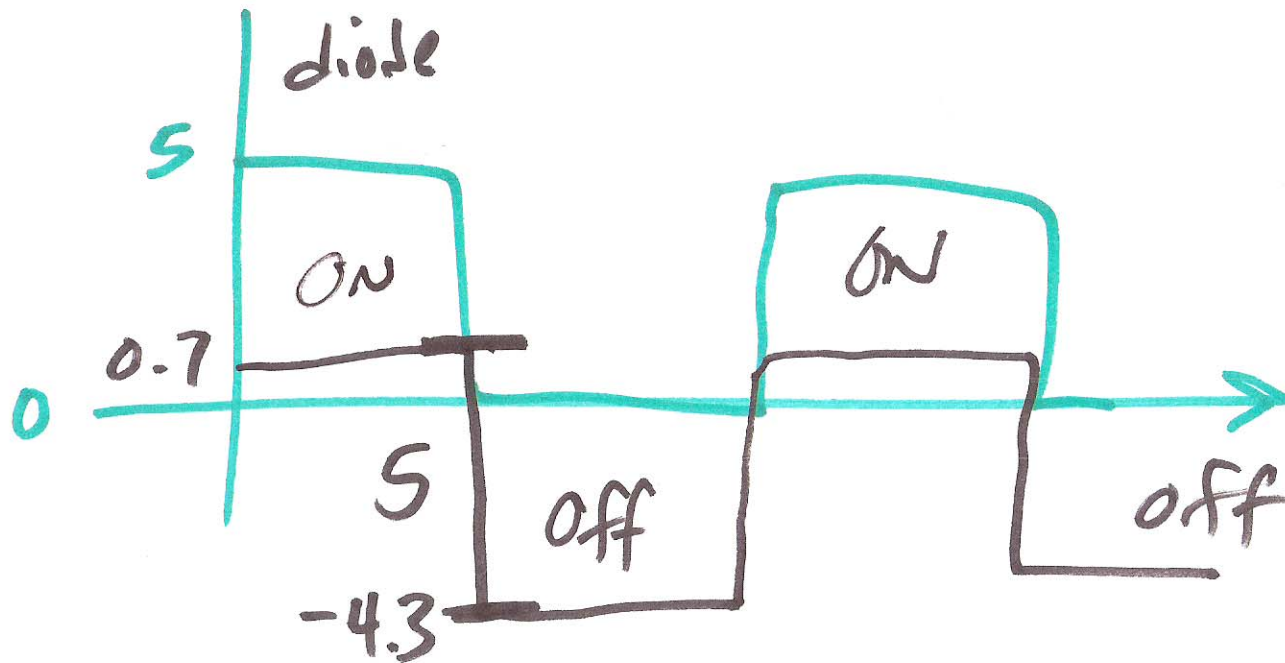
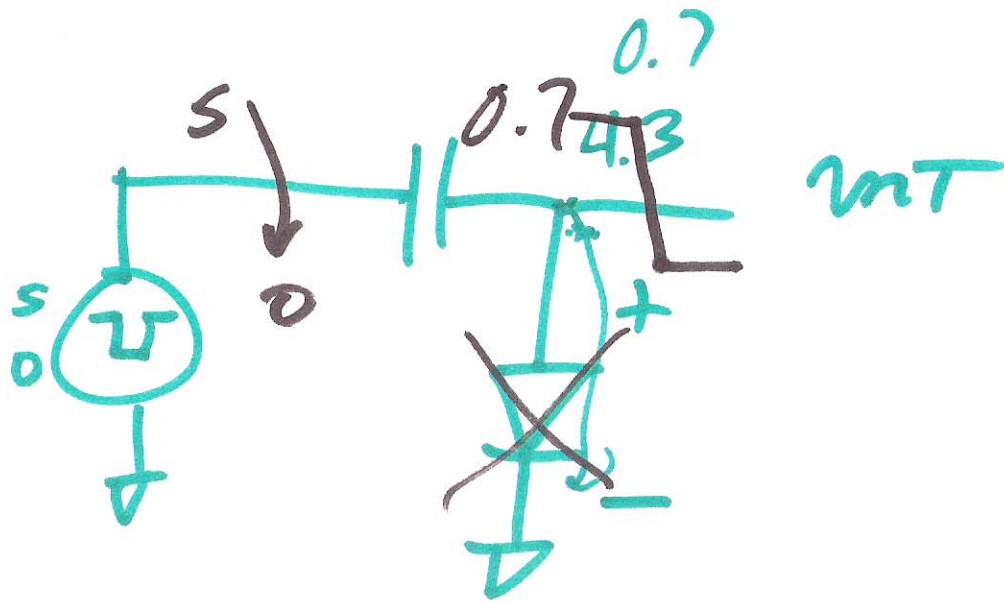
$$V_{th} = -1$$

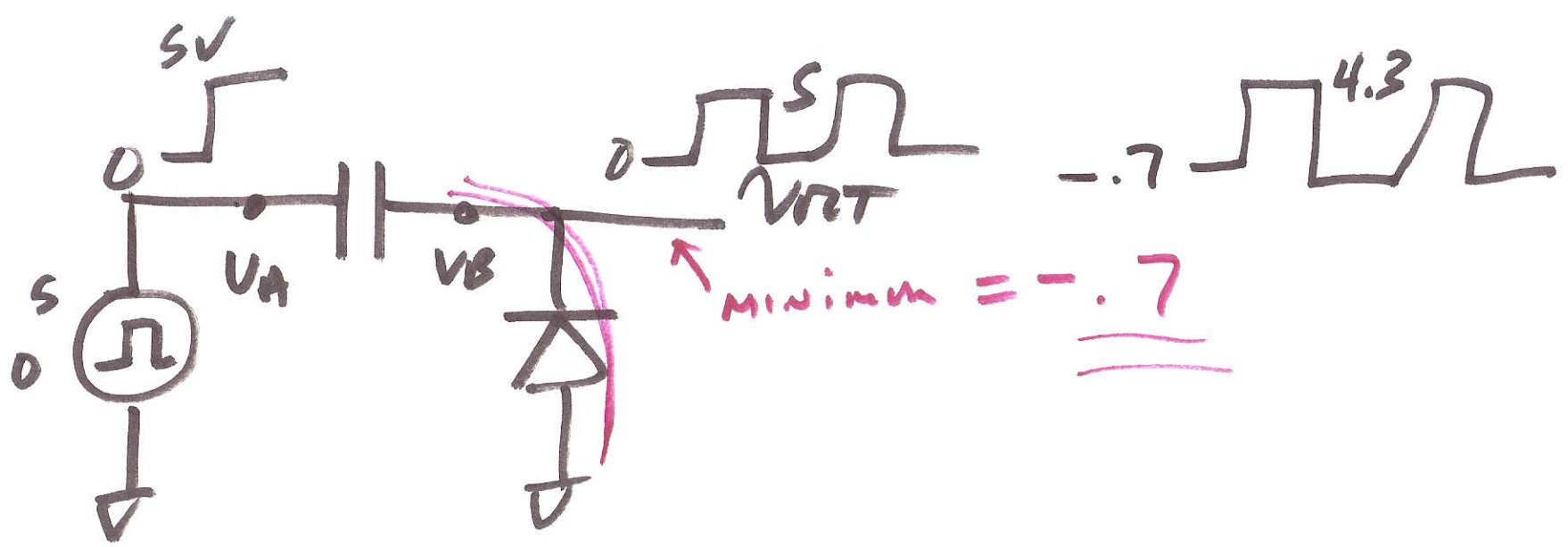
1)

# Diode circuits



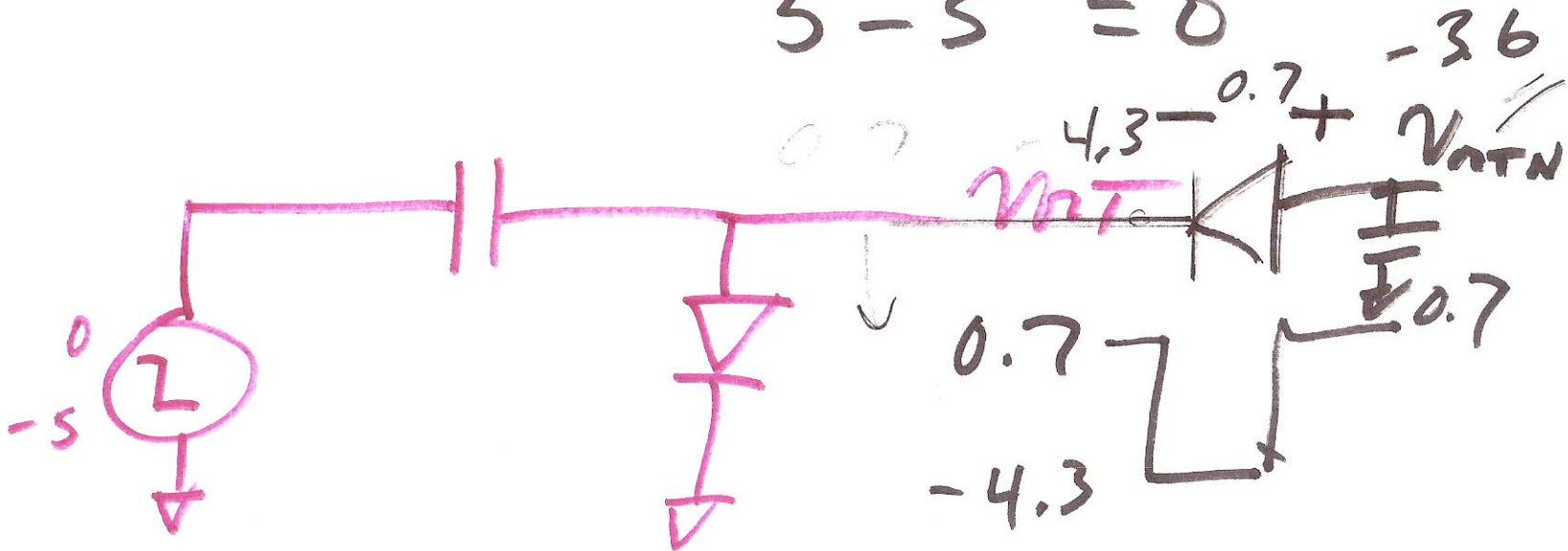
2)

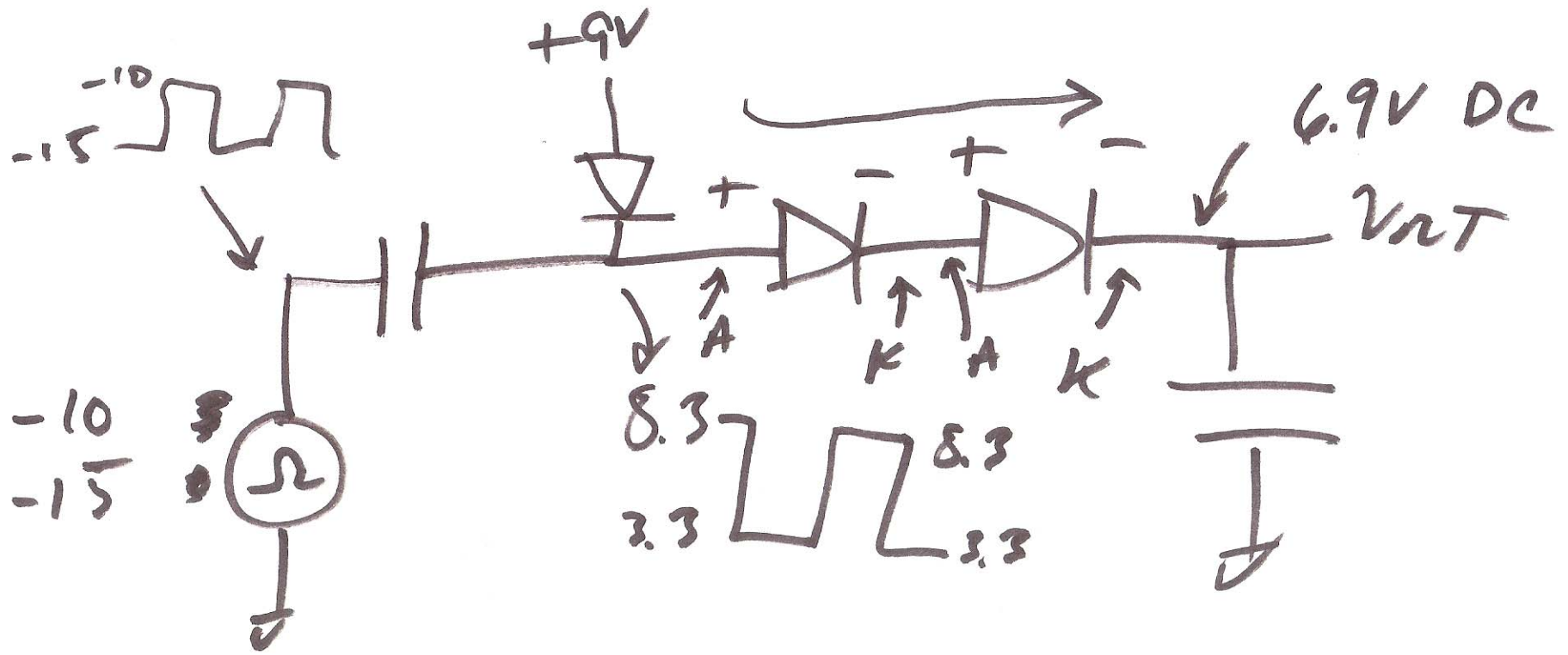




$$V_A - V_B = 0 - 0 = 0$$

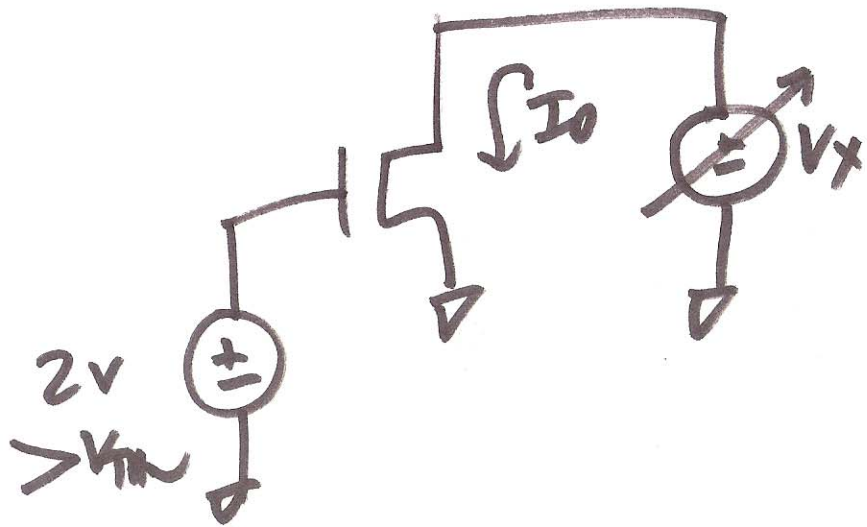
$$5 - 5 = 0$$



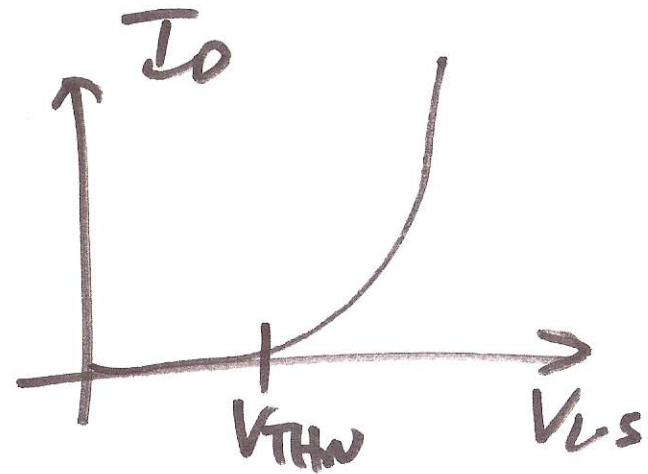
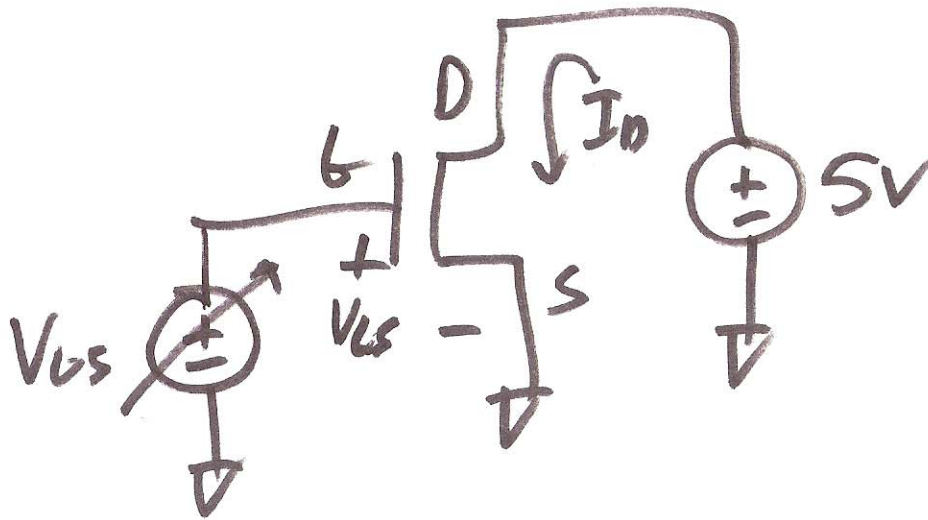
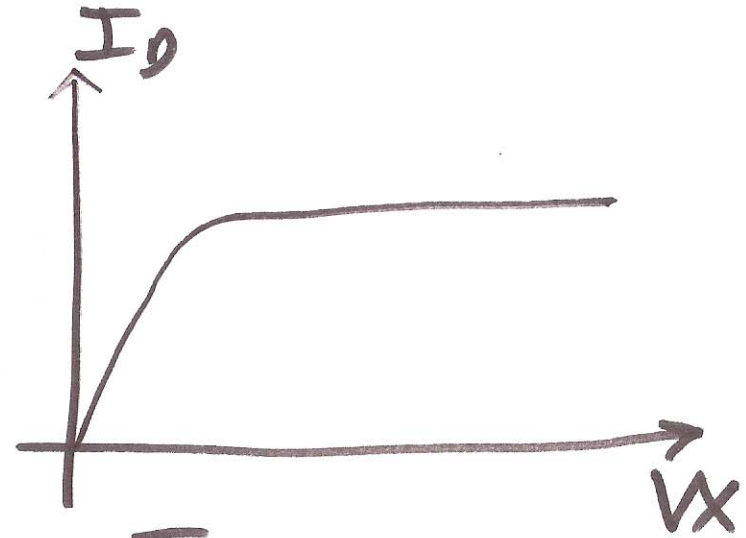


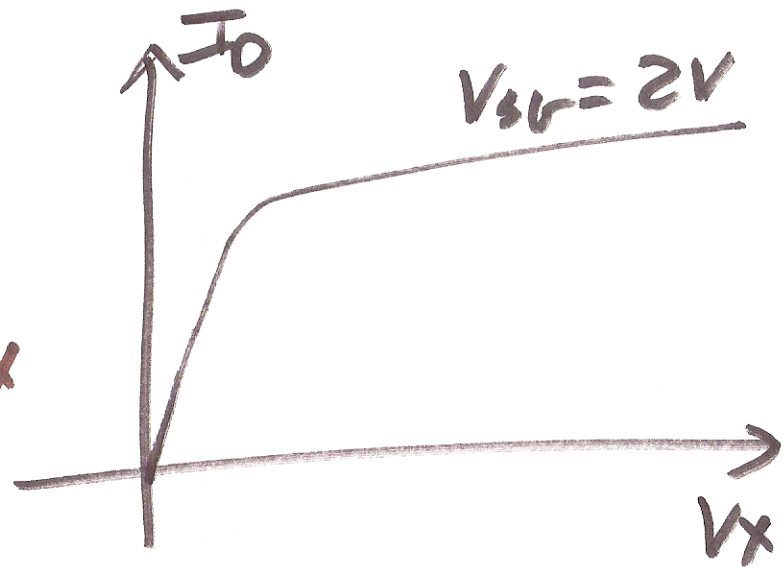
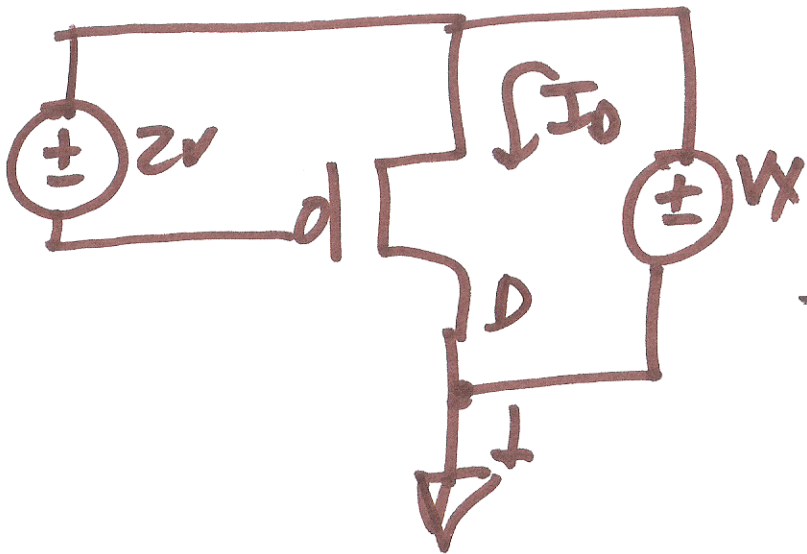
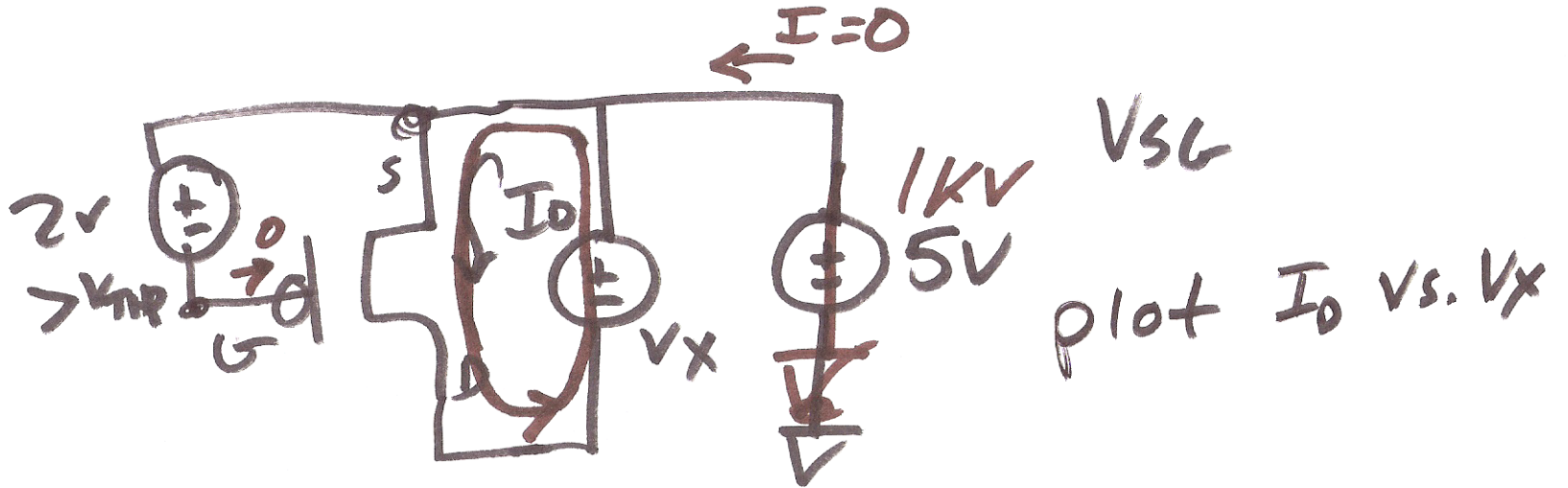
5)

# MOSFETS

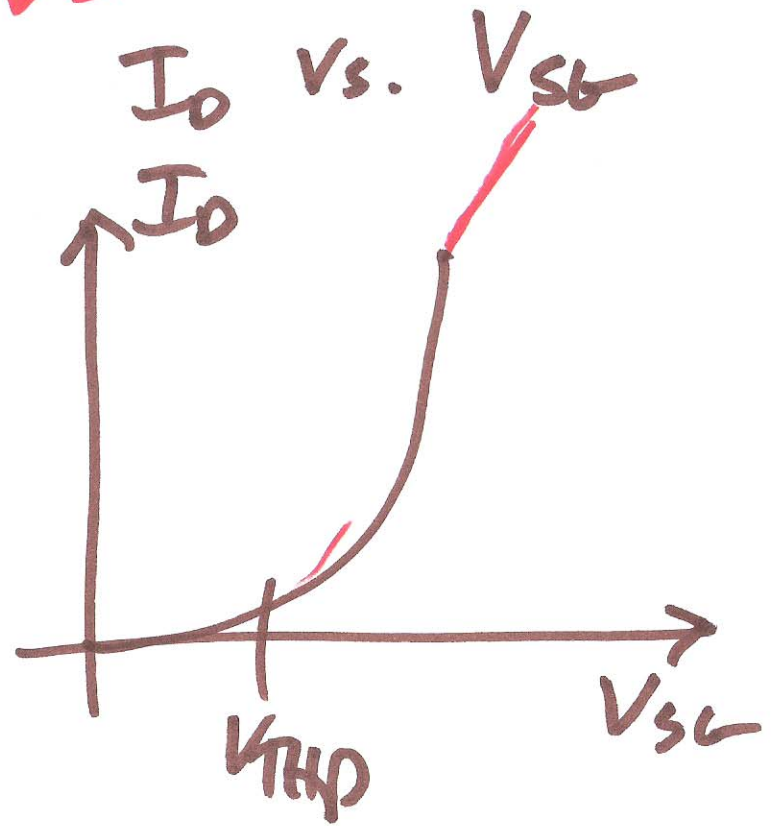
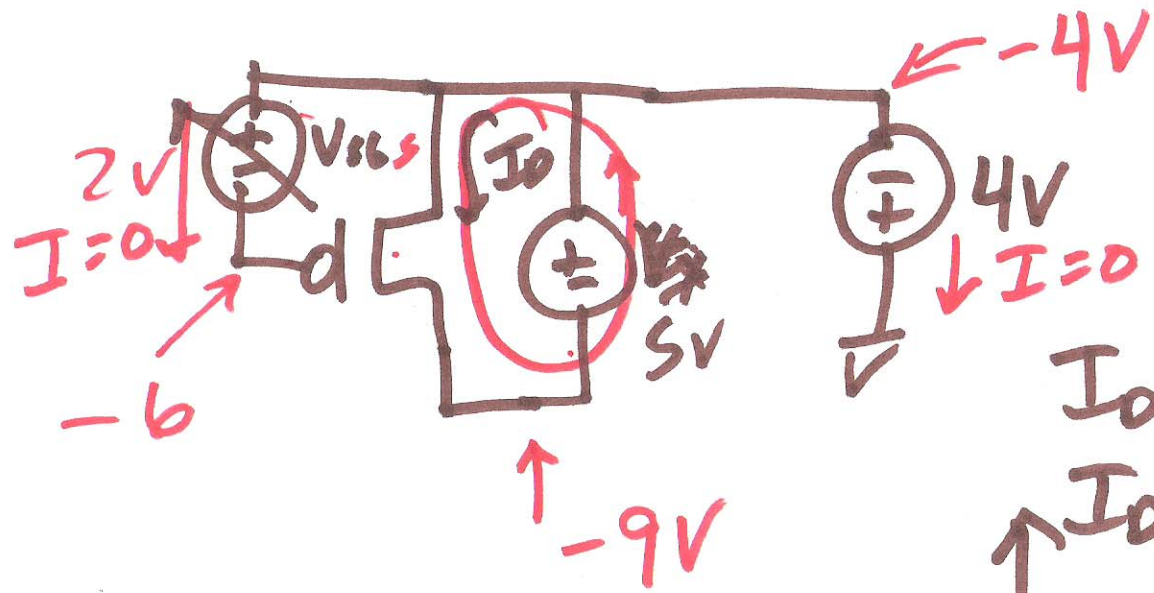


Plot  $V_x$  vs.  $I_D$





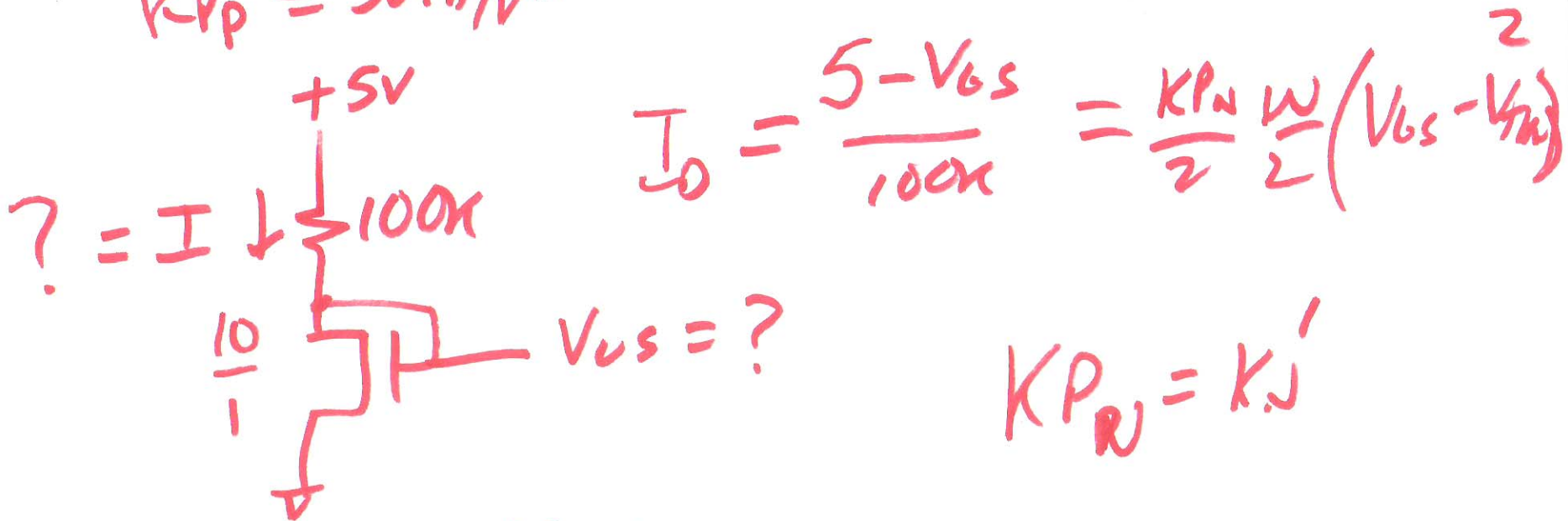
7)





$\mu \Rightarrow K_{PN} = 100 \mu A/V^2 \quad V_{THN} = 1, V_{THP} = 1$

$K_{PP} = 50 \mu A/V^2$



$V_{DS} \geq V_{GS} - V_{THN}$

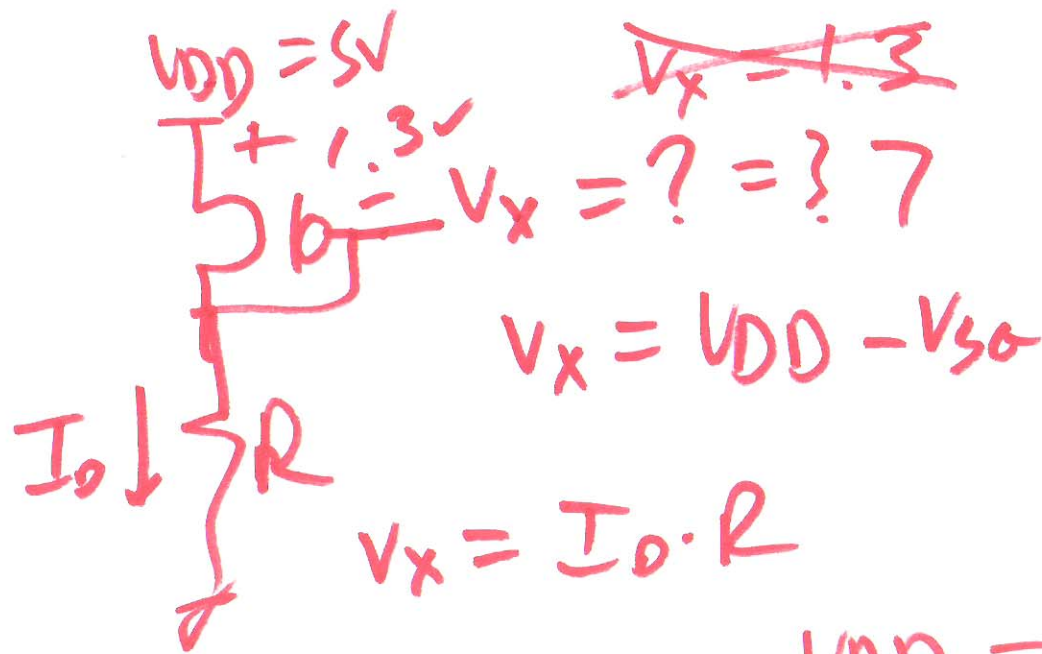
$V_D - \frac{V_S}{10} \geq V_{GS} - \frac{V_S}{10} - V_{THN}$

$V_D = V_G$

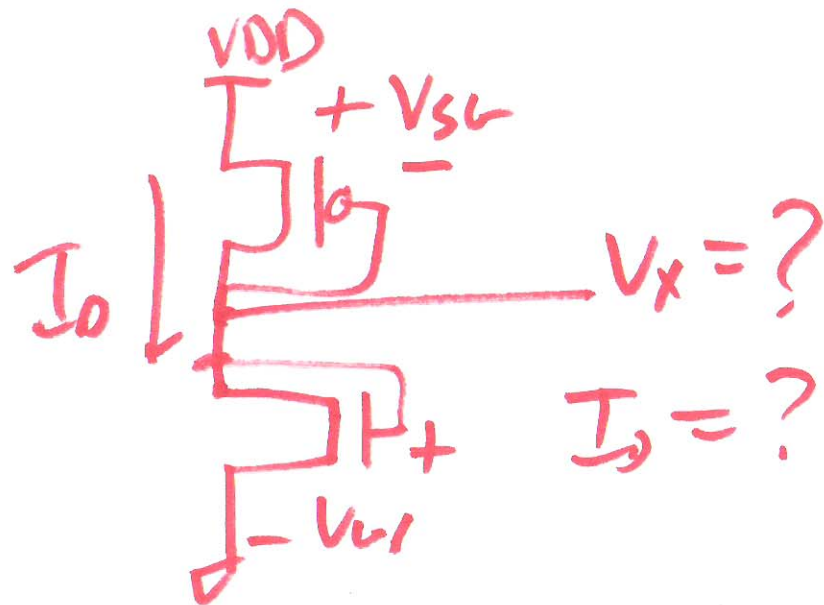
$0 \geq -V_{THN}$

yes in SAT!

9)



$$V_{DD} = V_{SG} + V_{GS}$$



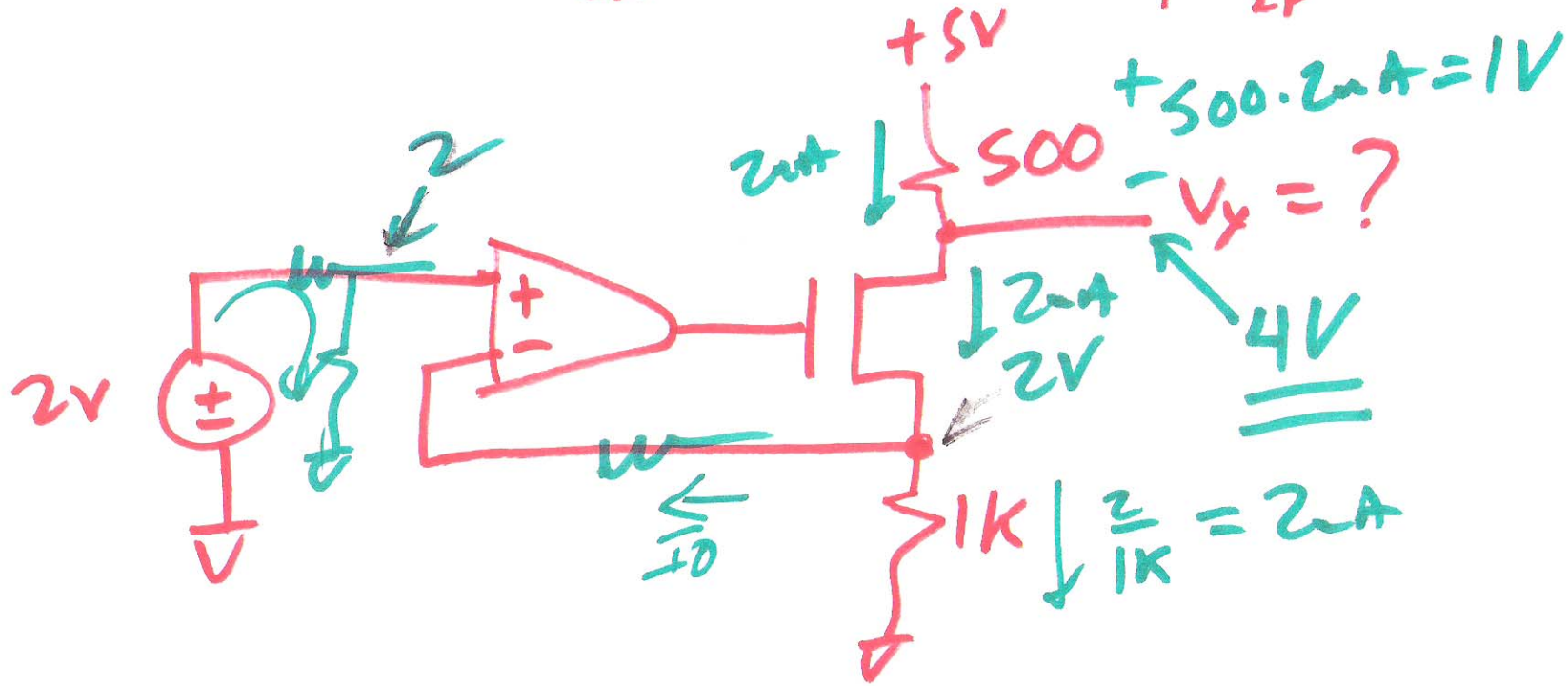
$$I_D = \frac{K_{PN}}{2} \frac{W_N}{L_N} (V_{GS} - V_{THN})^2$$

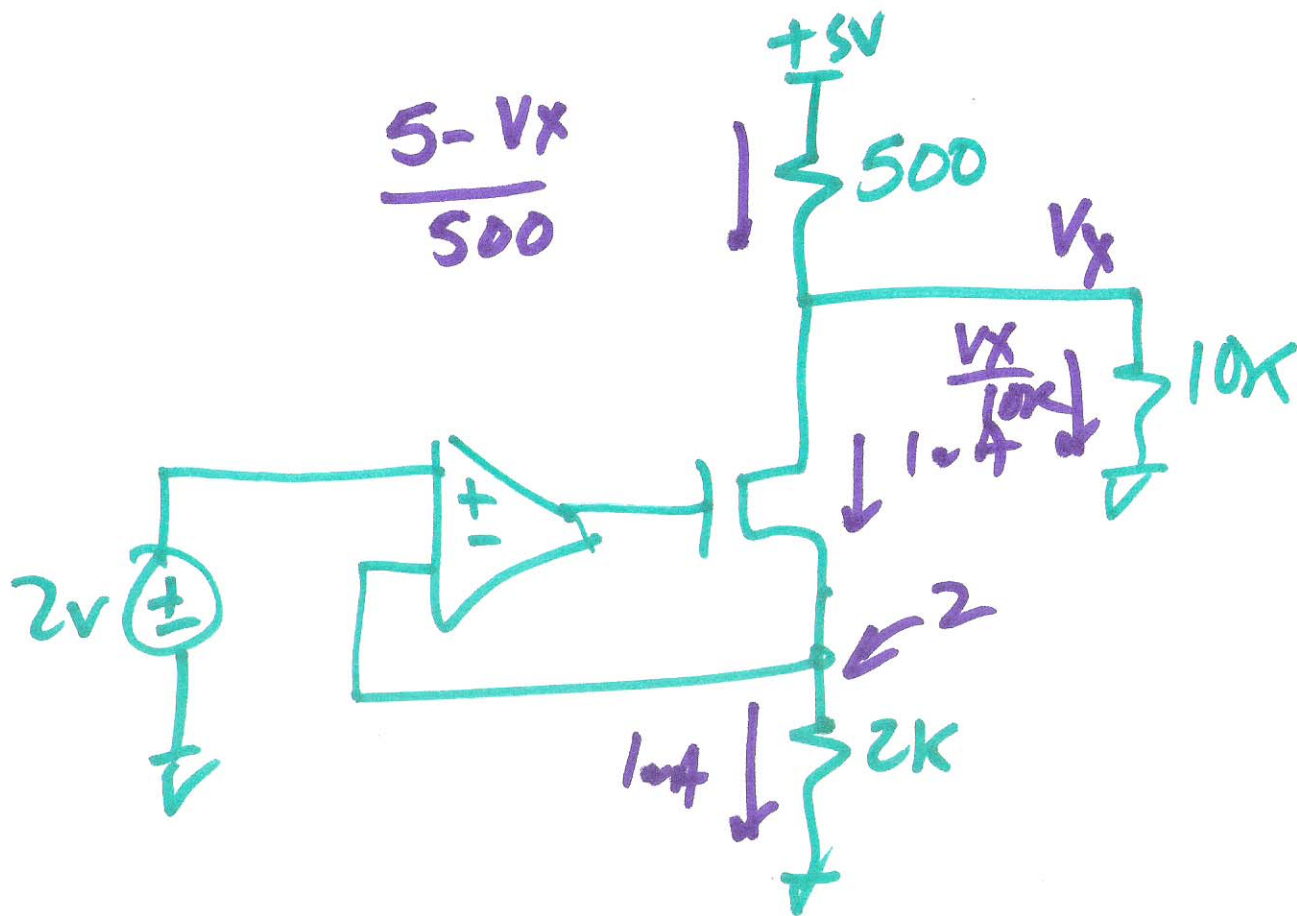
$$I_D = \frac{K_{PP}}{2} \frac{W_P}{L_P} (V_{SG} - V_{THP})^2$$

$$V_{GS} = \sqrt{\frac{2I_D}{K_{PN} \cdot \frac{W_N}{L_N}}} + V_{THN}$$

$$V_{SG} = \sqrt{\frac{2I_D}{K_{PP} \cdot \frac{W_P}{L_P}}} + V_{THP}$$

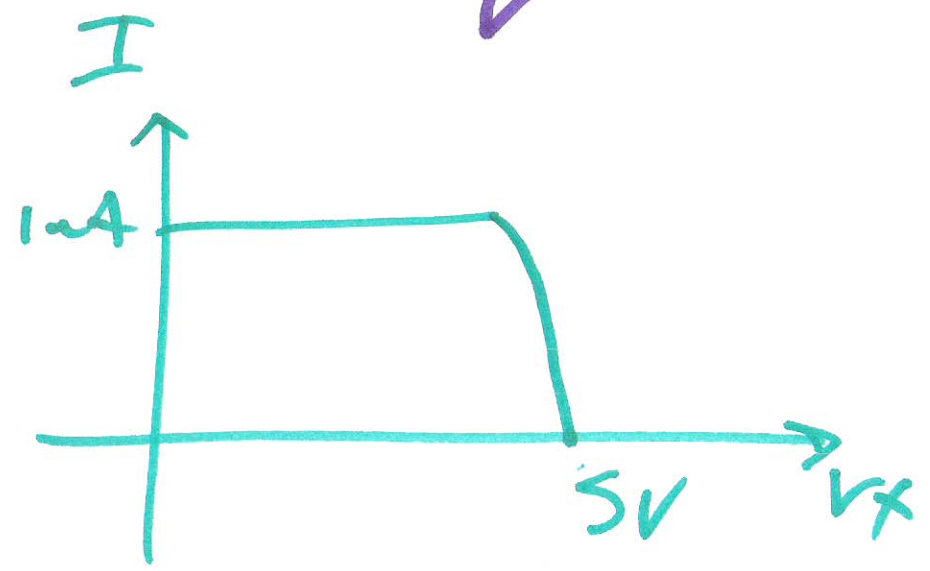
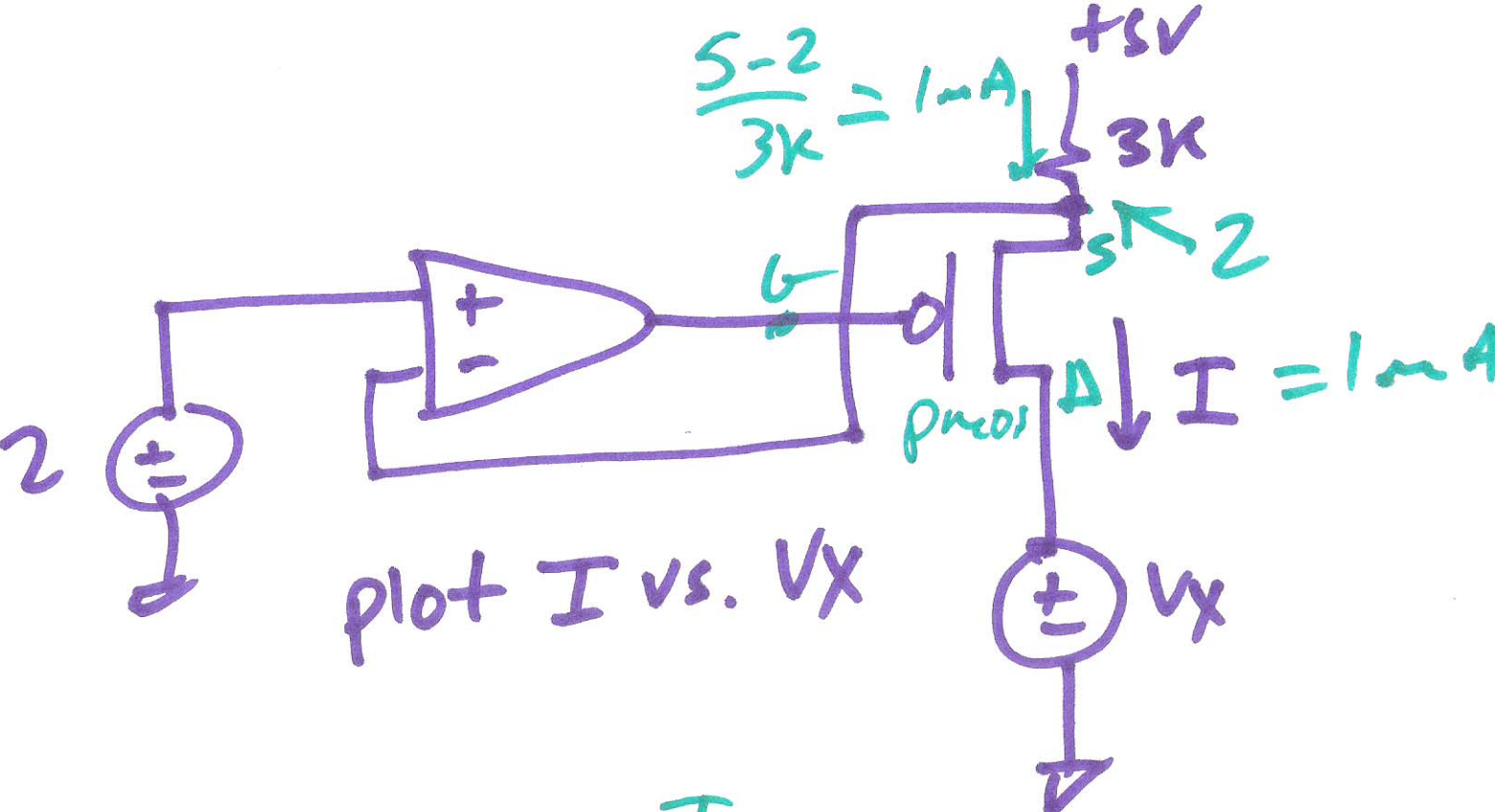
$$V_{DD} = \sqrt{\frac{2I_0}{k_{p,n} \frac{W_N}{L_N}}} + V_{TTHN} + \sqrt{\frac{2I_0}{k_{p,p} \frac{W_P}{L_P}}} + V_{TTHP}$$





$$1\text{mA} + \frac{V_x}{10\text{k}} = \frac{5-V_x}{500}$$

12)



(3)