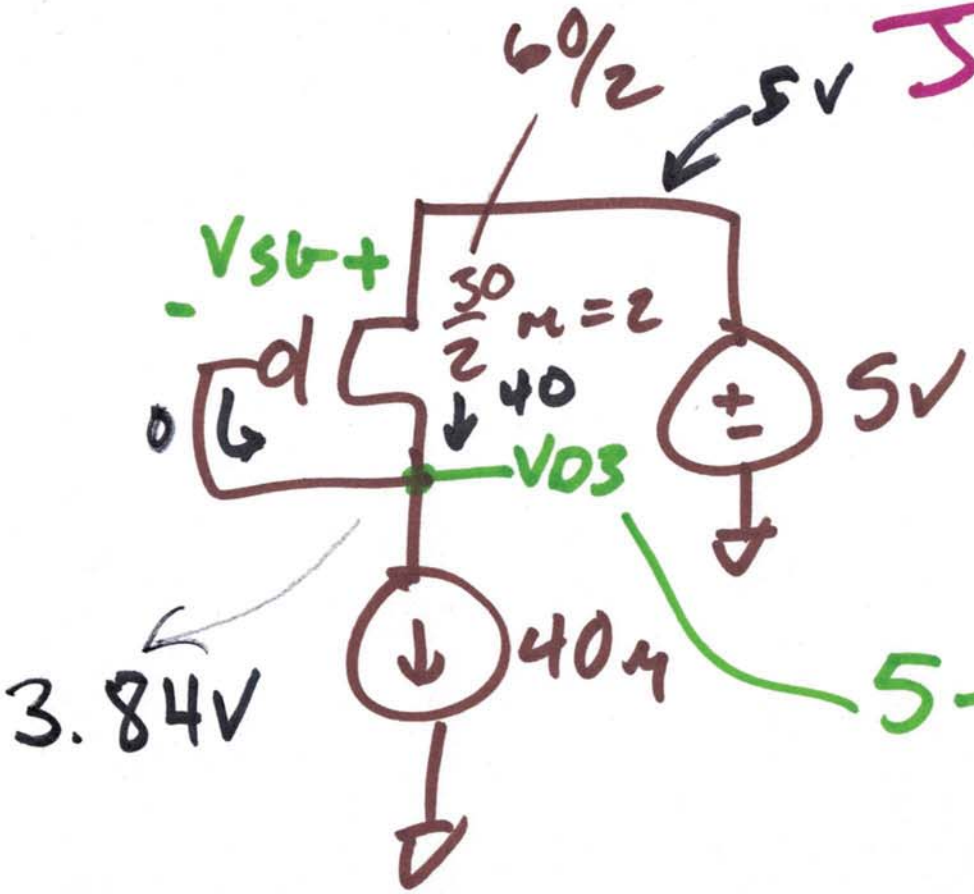
EE 420/ECE 620
Analog IC Design
Lecture 2
Jan. 27, 2020



$$I_D = \frac{K_{PP}}{2}\frac{W}{L}\left(V_{SG}-V_{THP}\right)^2$$

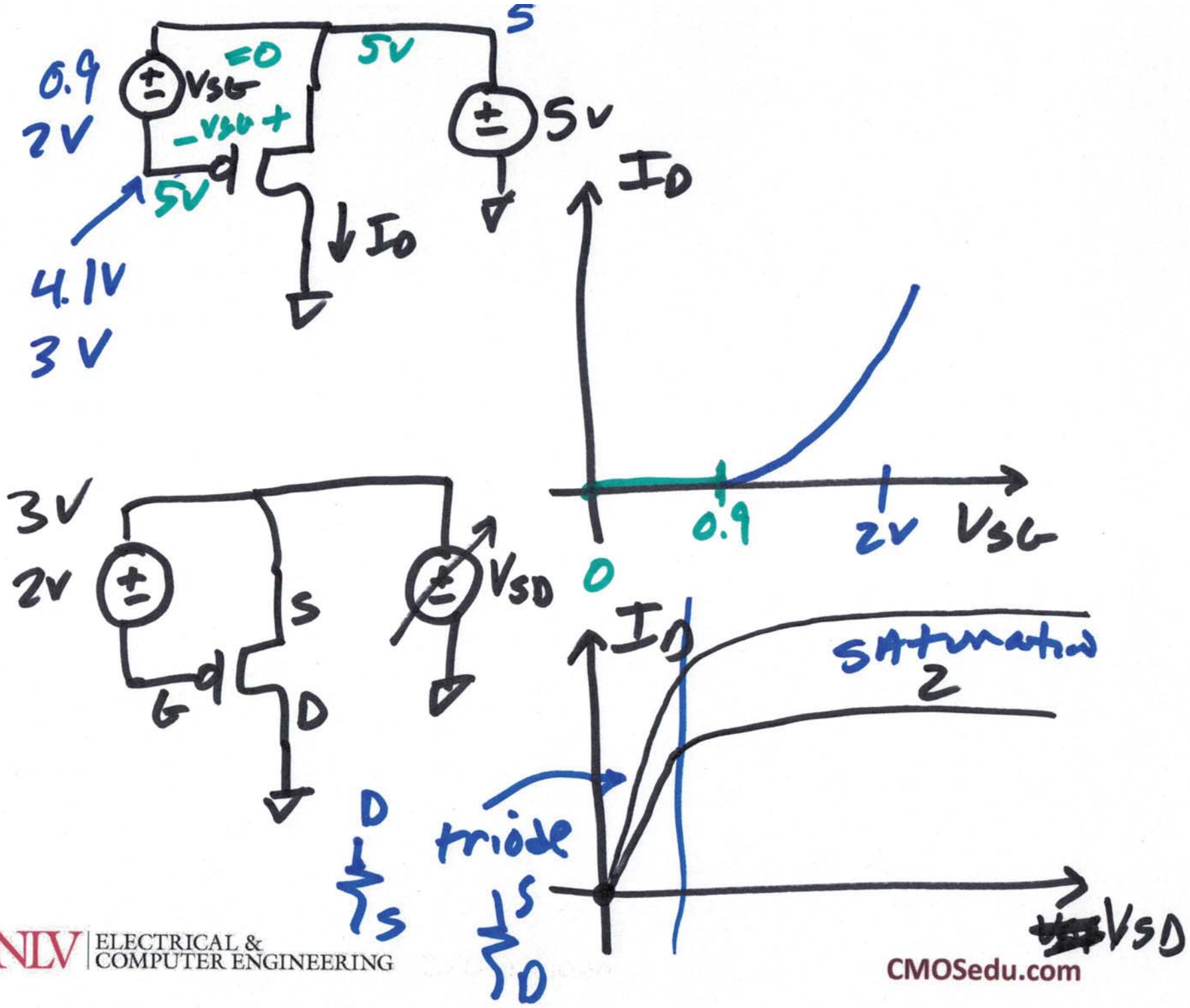
$$V_{SG} = V_{THP} + \sqrt{\frac{2I_D}{K_{P'}\cdot\frac{W}{L}}}$$

$$0.9 + \sqrt{\frac{2\cdot 40\mu}{40\mu\cdot\frac{60}{2}}}$$

$$0.9 + \sqrt{\frac{4}{60}}$$

$$0.9 + \frac{1}{\sqrt{15}}$$

$$\simeq 0.9 + .26 = 1.16V$$



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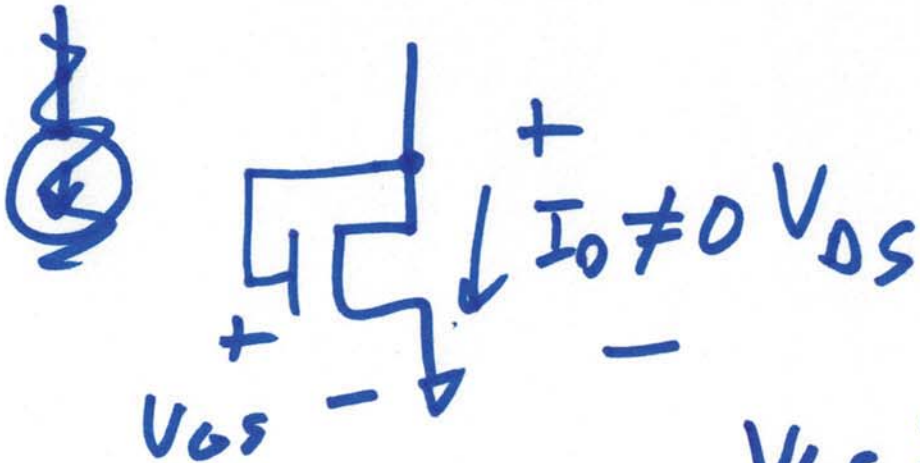


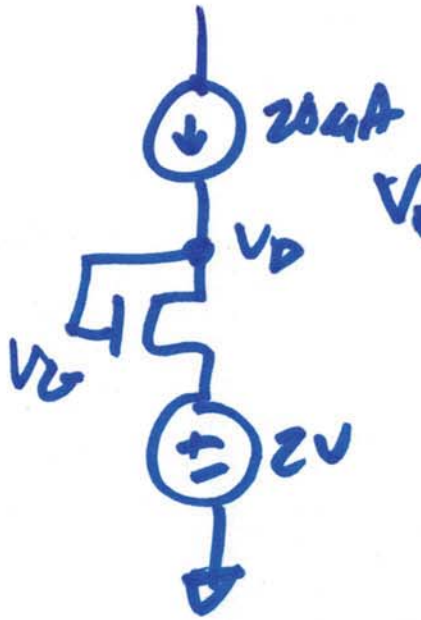
$V_{GS} > V_{THN}$

for sat. operation

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

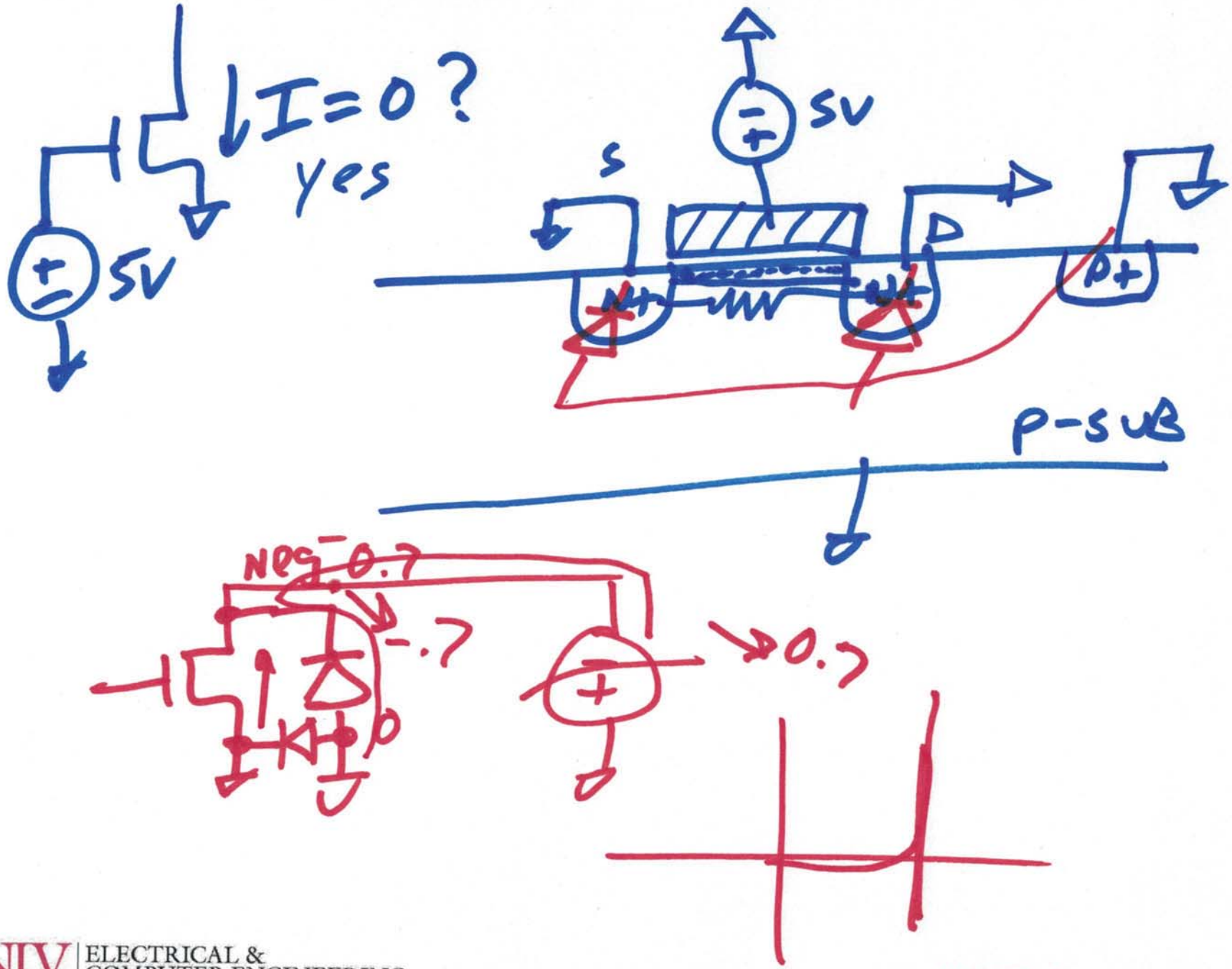
$0 \geq -V_{THN}$

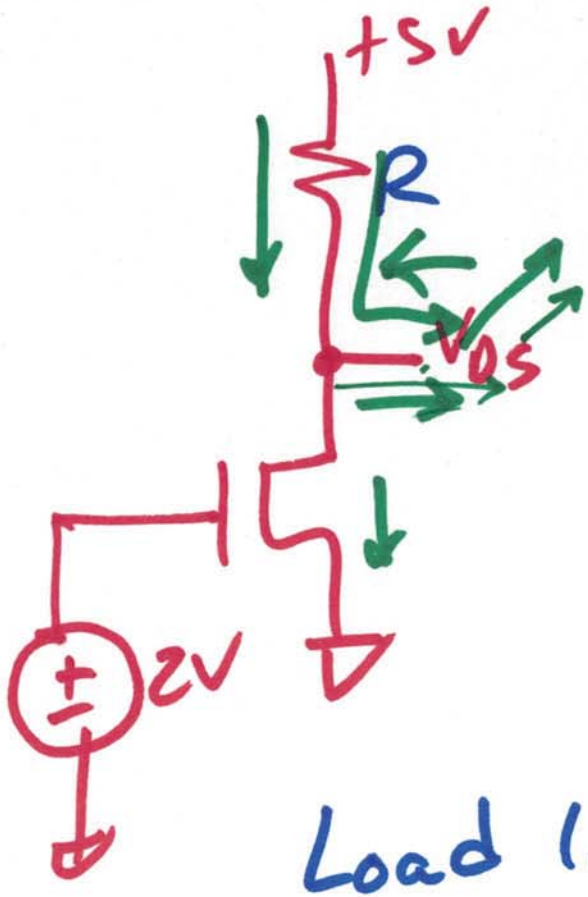
Always true when $I_D = 0$

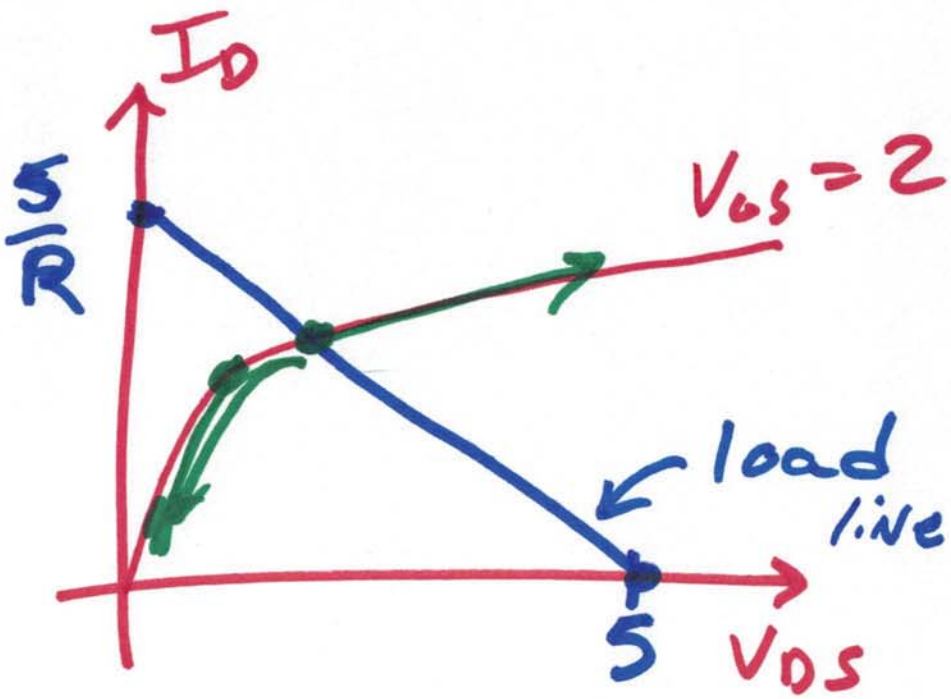


$V_D \geq V_G - V_{THN}$

$0 \geq -V_{THN}$


I=0?
yes
5V
S
5V
D
P-SUB
NEG -0.7
-.7
0.7





Load line

$$I_D = \frac{5 - V_{DS}}{R}$$

Small-Signal