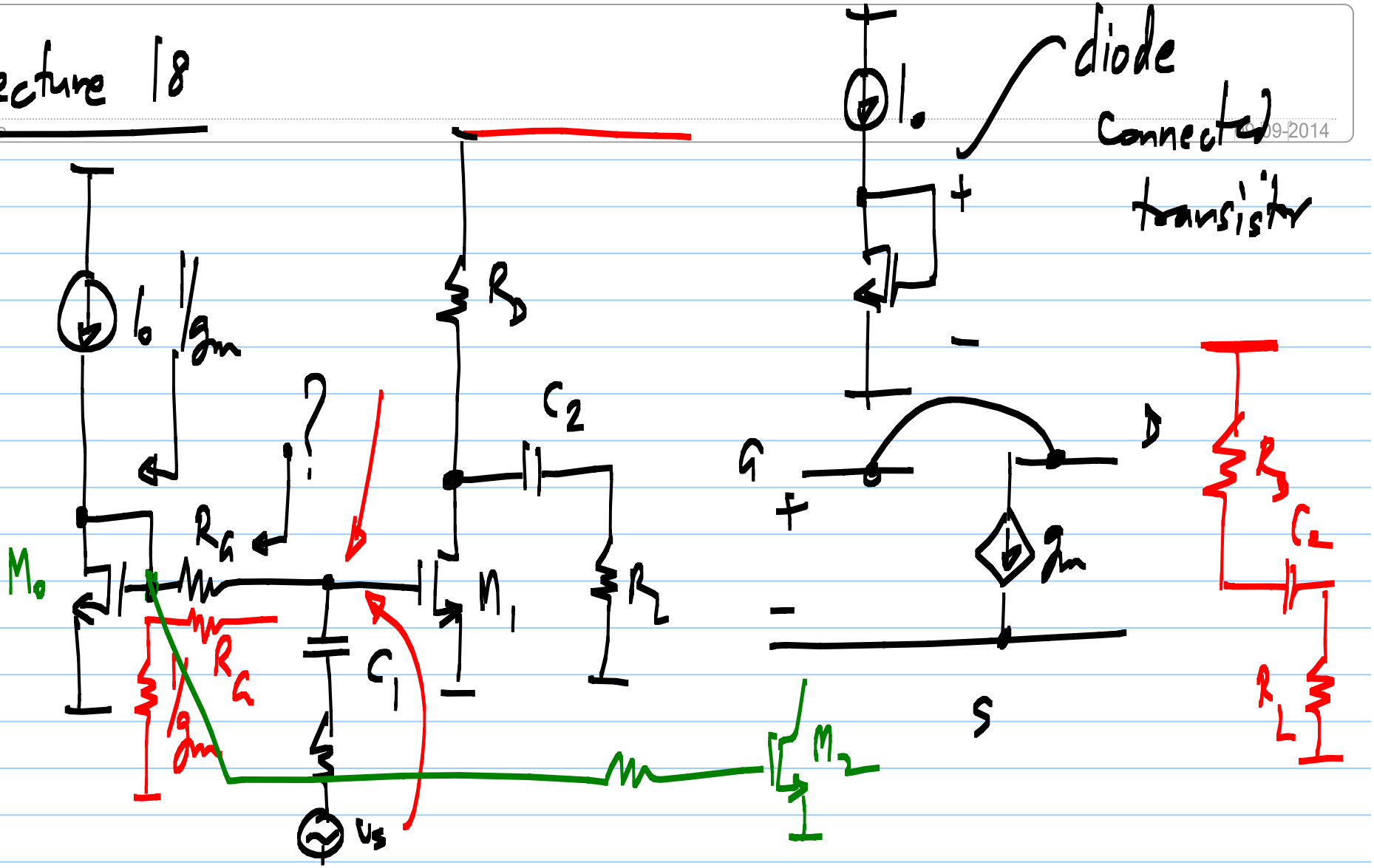
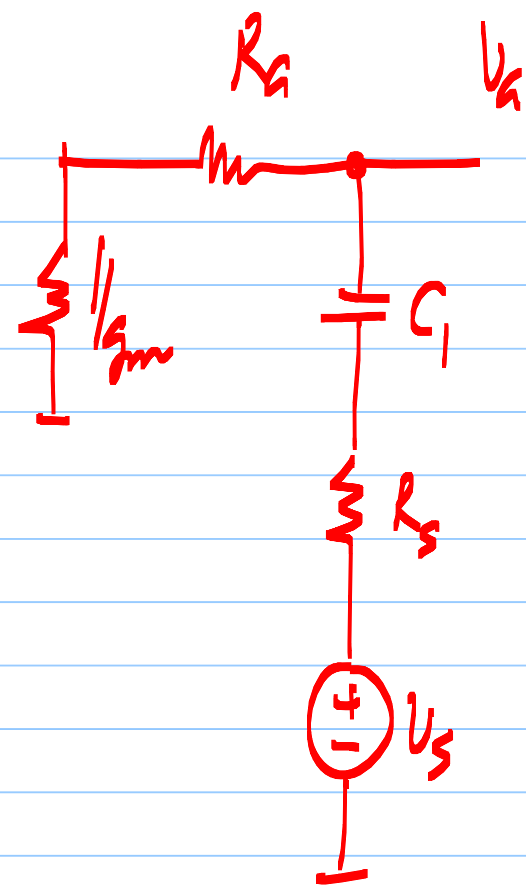
Lecture 18

Note Title 09-2014





$$\frac{V_G}{V_S} = \frac{sC_1\left(R_G + 1/g_m\right)}{1 + sC_1\left(R_S + R_G + 1/g_m\right)}$$

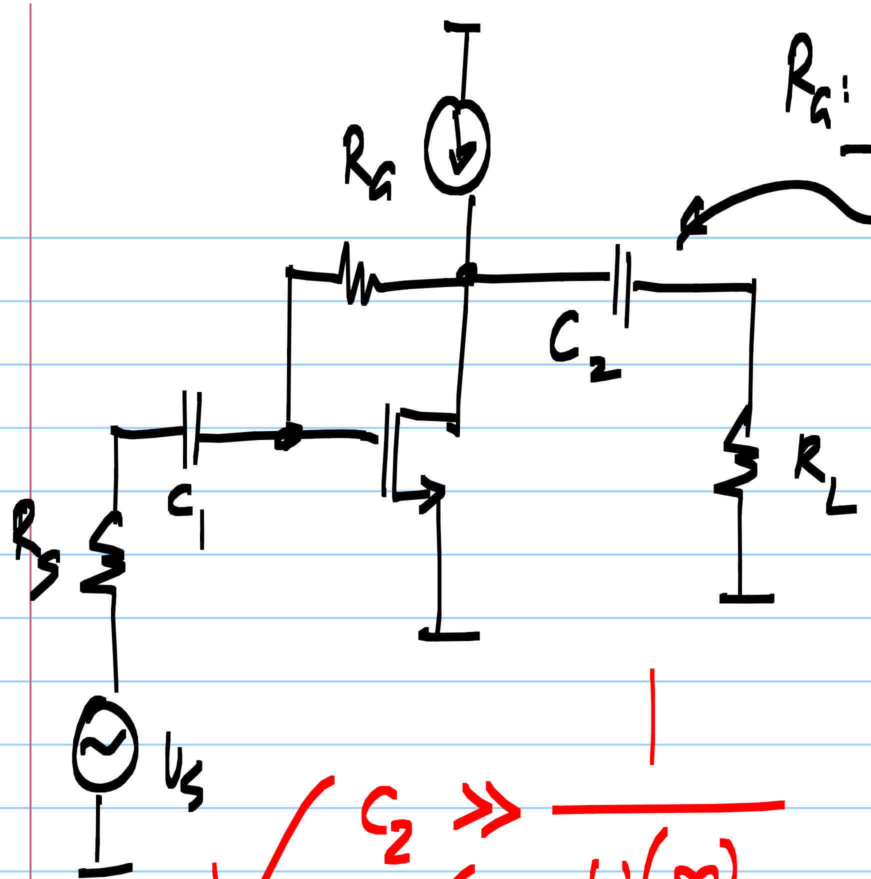
$s \to \infty$

$$\left.\frac{V_G}{V_S}\right|_{s \to \infty} = \frac{R_G + 1/g_m}{R_S + R_G + 1/g_m}$$

$R_G \gg R_S$

$$C_1 \gg \frac{1}{\omega\left(R_S + R_G + 1/g_m\right)}$$

$$C_2 \gg \frac{1}{\omega\left(R_S + R_L\right)}$$



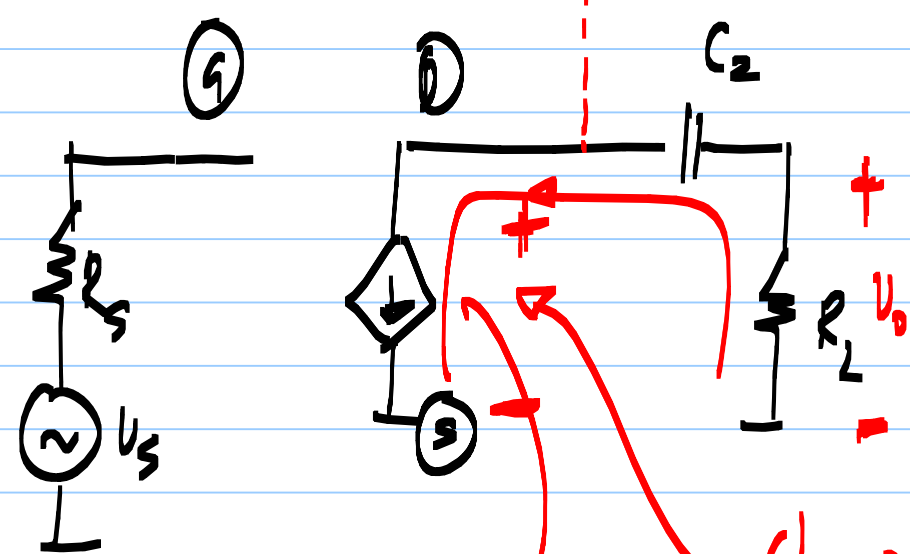
R_G: very large

$C_2 \gg$

~~$C_2 \gg \frac{1}{\omega(R_D + R_L)}$~~

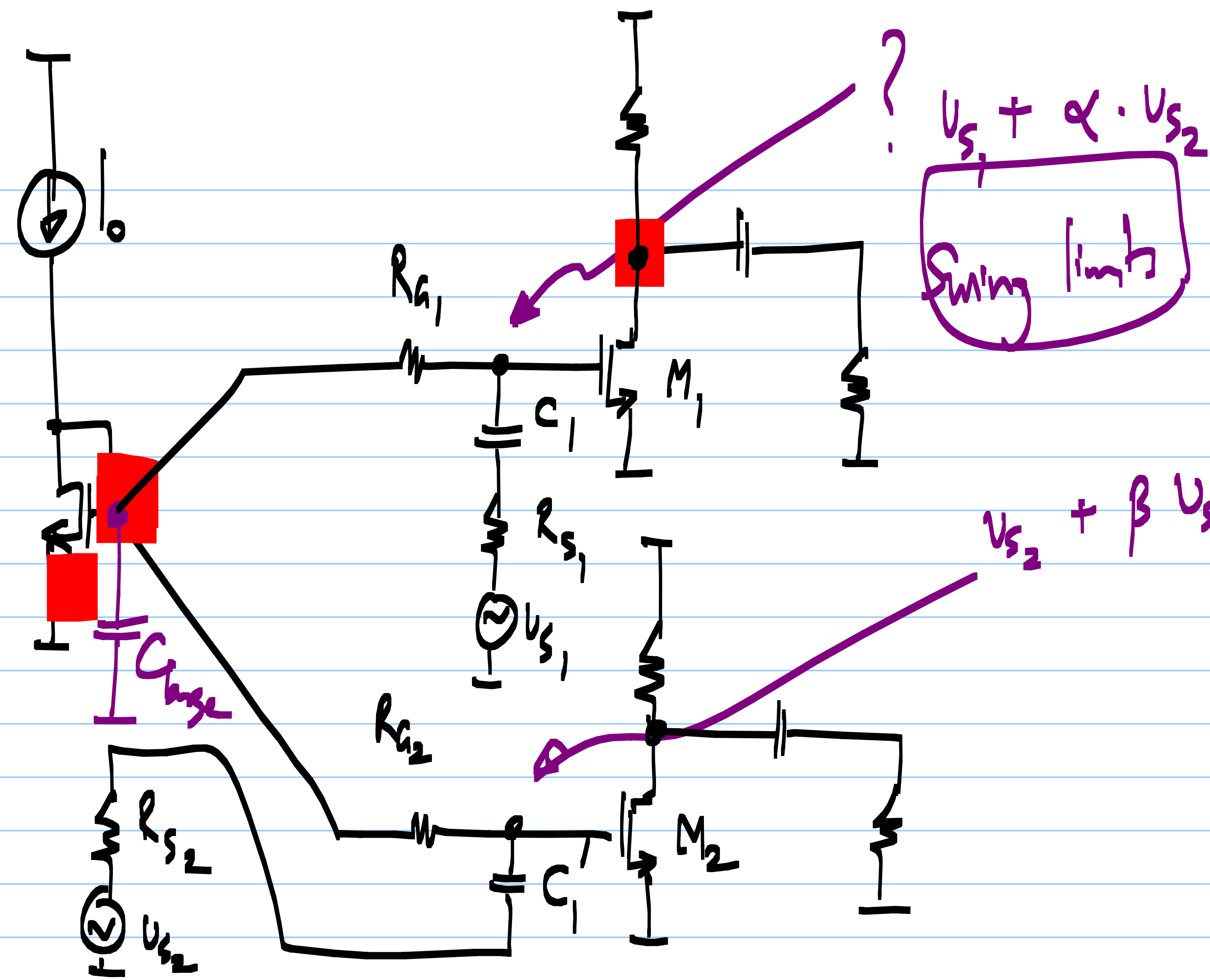
$C_2 \gg \frac{1}{\omega(\infty)}$ ✓

$C_2 \gg \frac{1}{\omega \cdot R_L}$ ✓



Zero current (o.c) if $\omega = 0$

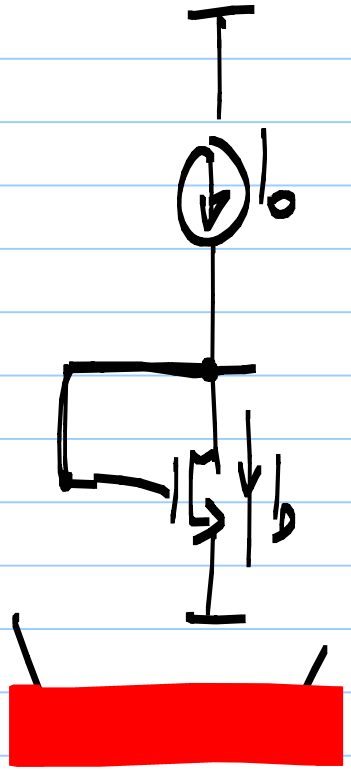
$-g_m V_{GS}\left(\frac{1}{sC_2} + R_L\right)$



I_0
R_{G_1}
C_1
M_1
R_{S_1}
v_{S_1}
C_{large}
R_{G_2}
R_{S_2}
v_{S_2}
C_1
M_2
?
$v_{S_1} + \alpha \cdot v_{S_2}$
Swing limits
$v_{S_2} + \beta v_{S_1}$

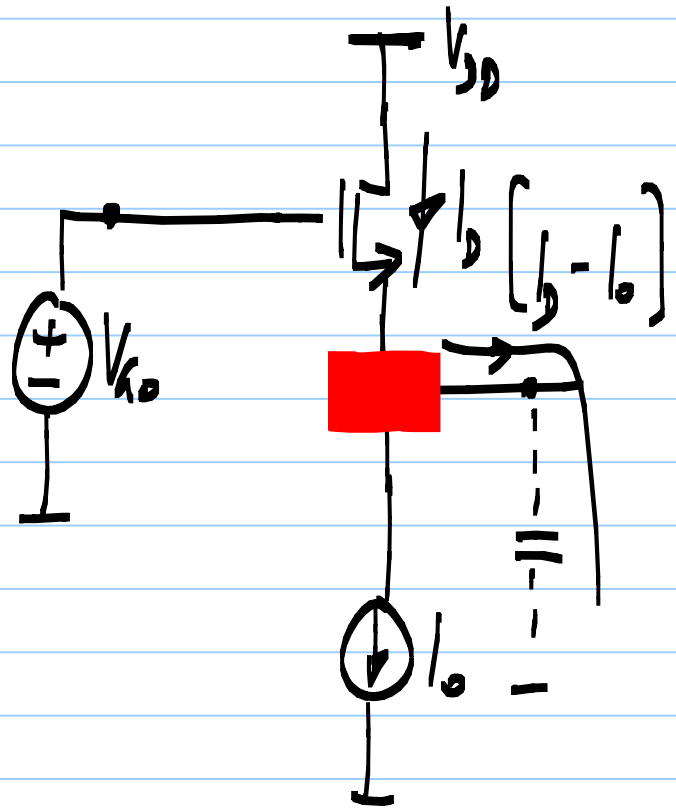
Sensing @ drain

fb to gate



Sensing @ source

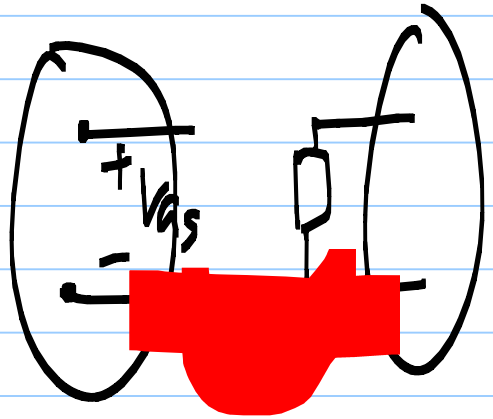
fb to source

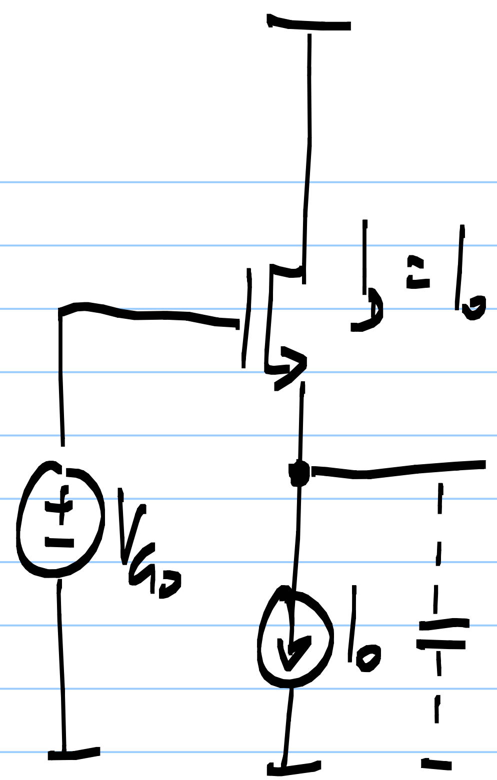


Control:

If $I_D > I_0$:

V_S must be increased

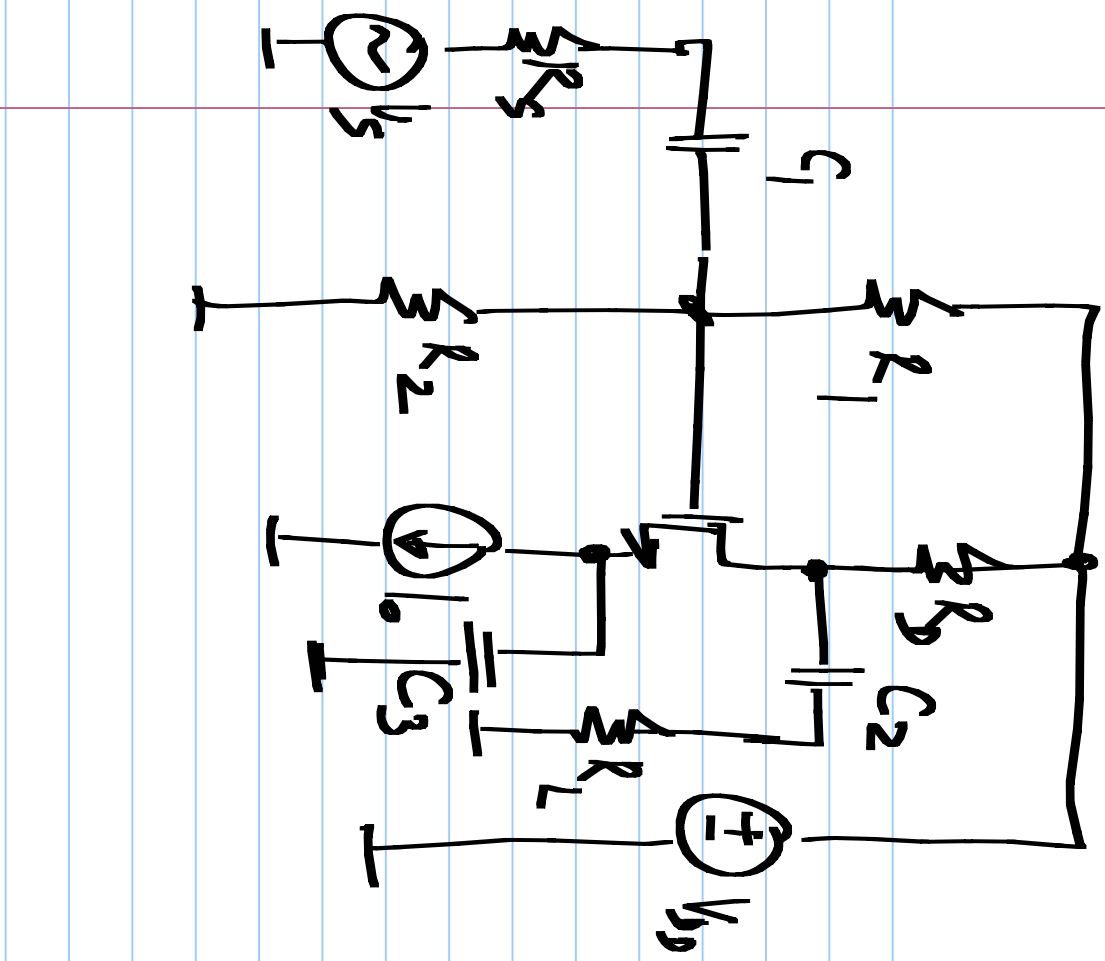


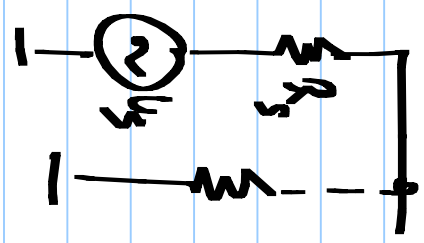


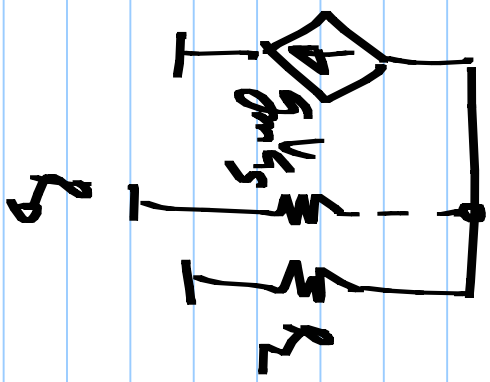
$I_D < I_o \Rightarrow V_S$ reduces

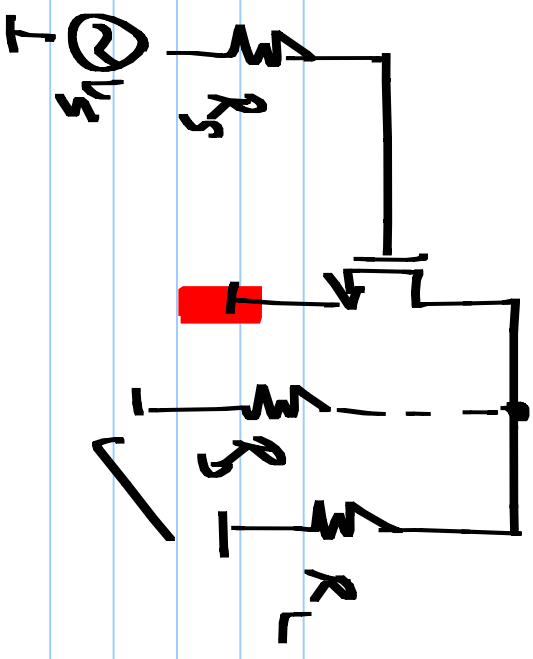
$\Rightarrow V_{GS}$ increases

$\Rightarrow I_D \uparrow$


V_s
R_s
C
R_2
R_1
I_o
C_3
C_2
R_3
R_L
V_o


V_s
R_s


$g_m v_s$
R_o


V_s
R_s
R_o
R_L