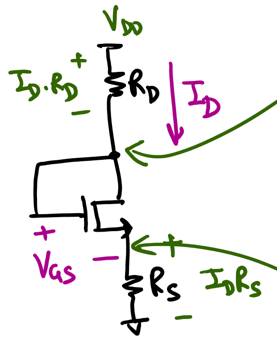
Exam 2 Study Session

Wednesday, March 7, 2018 5:34 PM



$V_{DD} - I_D \cdot R_D$

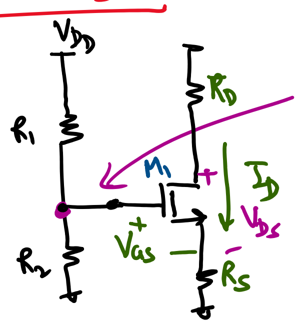
$V_{GS} = V_{DD} - I_D(R_D + R_S)$

$\Rightarrow I_D = \frac{V_{DD} - V_{GS}}{R_D + R_S} = \frac{1}{2} KP_n \frac{W}{L} (V_{GS} - V_{THN})^2$

→ I_D & V_{GS}

$I_D \cdot R_S$

4-Resistor Biasing:



$V_{GG} = V_{DD} \cdot \frac{R_2}{R_1 + R_2}$

$I_D = ?$

Assume M_1 is in SAT

$V_{GG} = V_{GS} + I_D \cdot R_S$

$V_{GS} = \sqrt{\frac{2 I_D}{KP_n W/L}} + V_{THN}$ ← SAT. Equation

$V_{GG} = \sqrt{\frac{2 I_D}{KP_n W/L}} + V_{THN} + I_D \cdot R_S$

Let $x = \sqrt{I_D}$

$\left(\sqrt{\frac{2}{KP_n W/L}}\right) x + x^2 R_S - (V_{GG} - V_{THN}) = 0$

Solve for $x = ?$

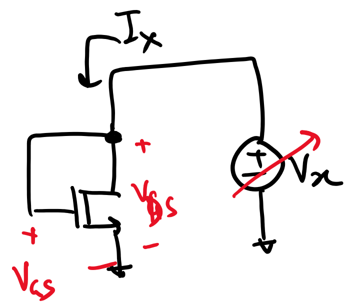
$I_D = x^2$

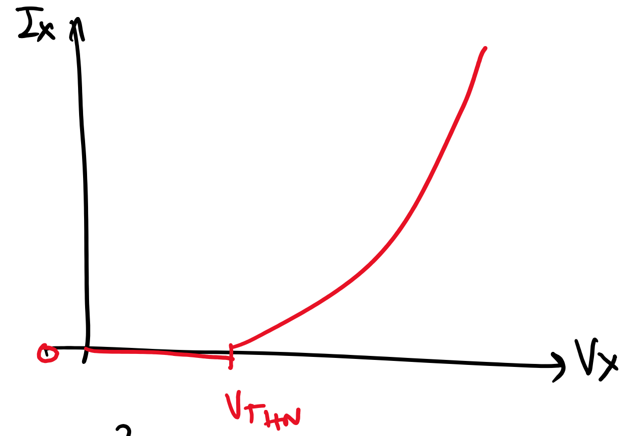
$V_{DS} = V_{DD} - I_D (R_D + R_S)$

V_{DS}

Check for saturation

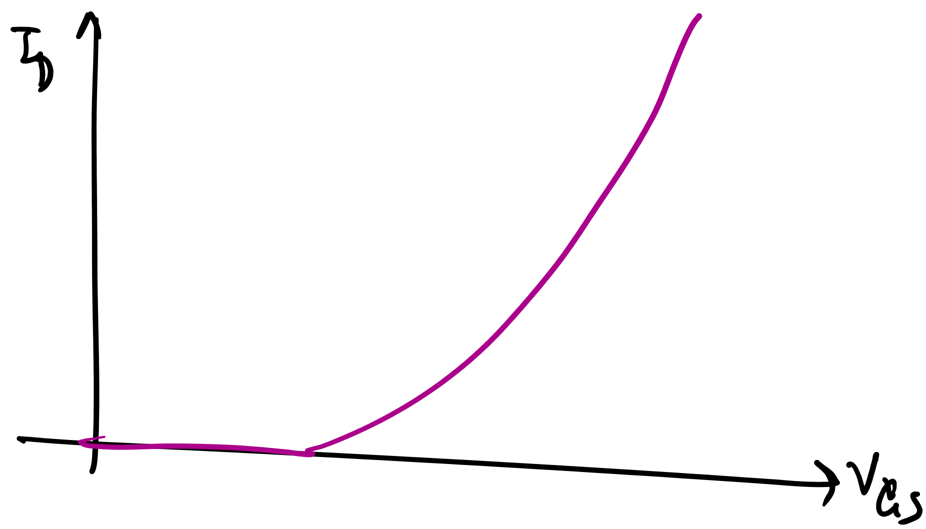
$V_{DS} > V_{GS} - V_{THN}$



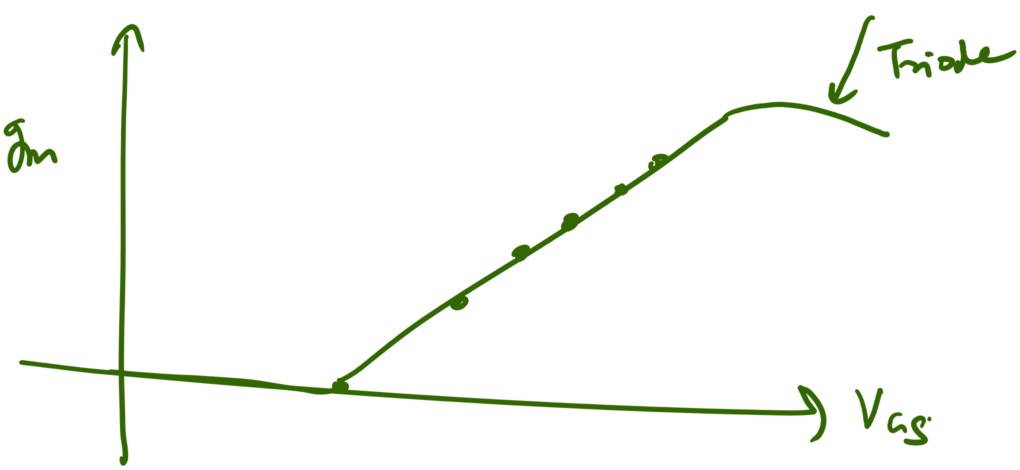


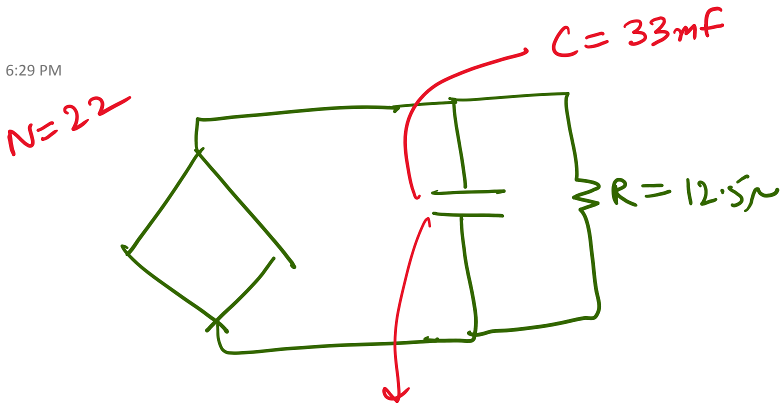
$$I_D = \frac{1}{2} KP_n \frac{W}{L} (V_{GS} - V_{THN})^2$$

$$I_X = \frac{1}{2} KP_n \frac{W}{L} (V_X - V_{THN})^2$$



g_m vs V_{GS}

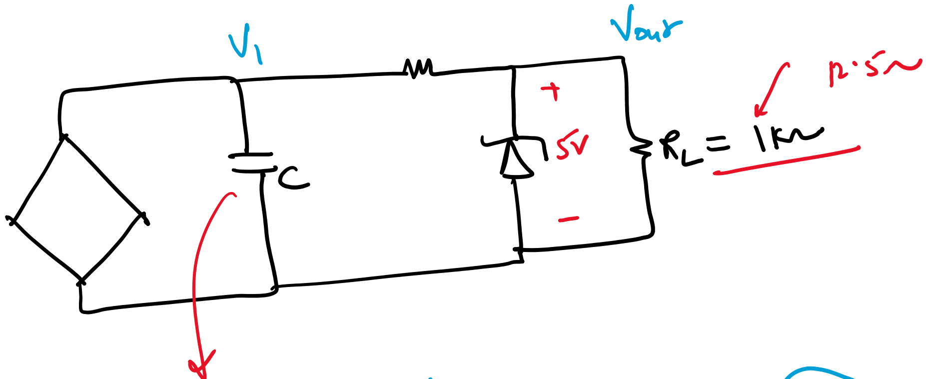


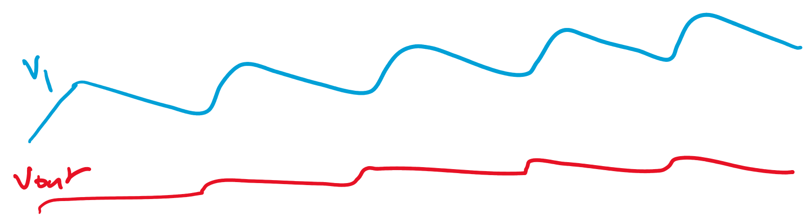


$P = \frac{V^2}{R}$

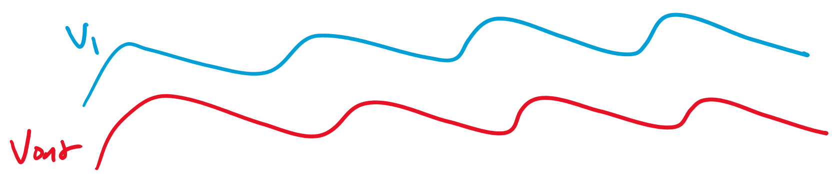
$R = \frac{(5V)^2}{2W}$

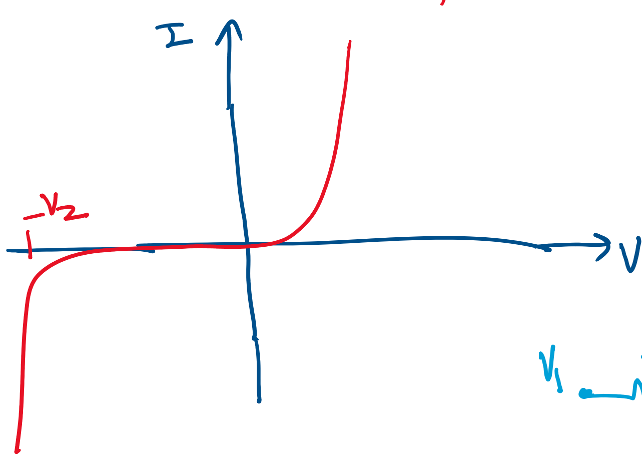
$= 12.5\Omega$

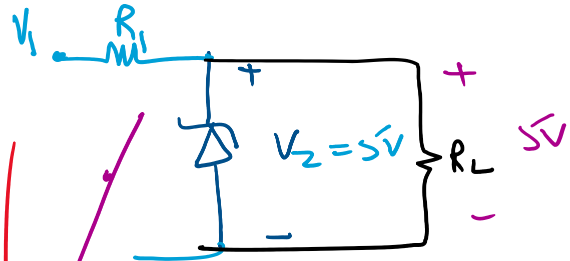


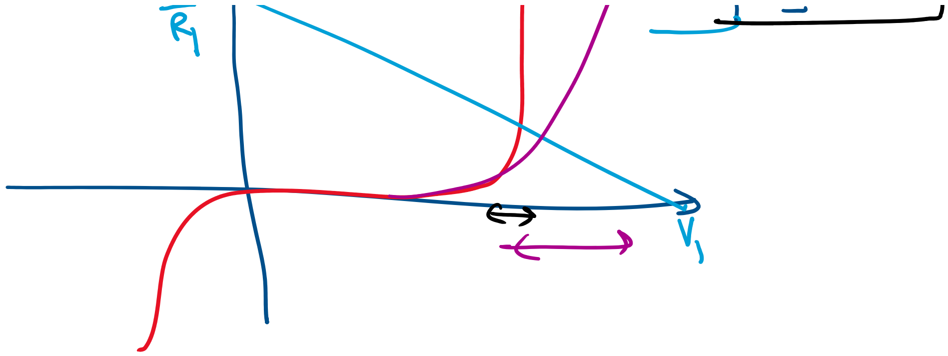


@ 12.5Ω load.








R1
V1