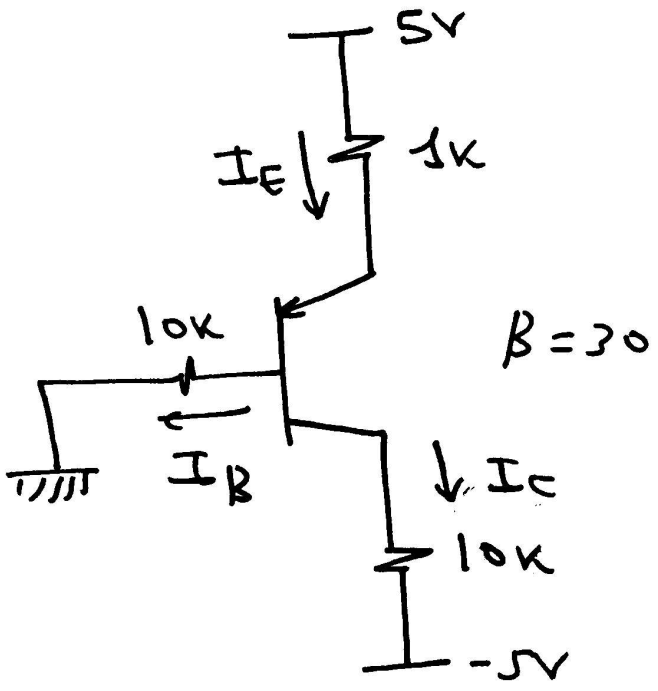


$$5 = I_E * 1K + 0.7 + I_B * 10K$$

$$5 = 31\, I_B + 1K + 0.7 + 10K \cdot I_B$$

$$4.3 = 41\, I_B \Rightarrow I_B = 0.104\ mA$$

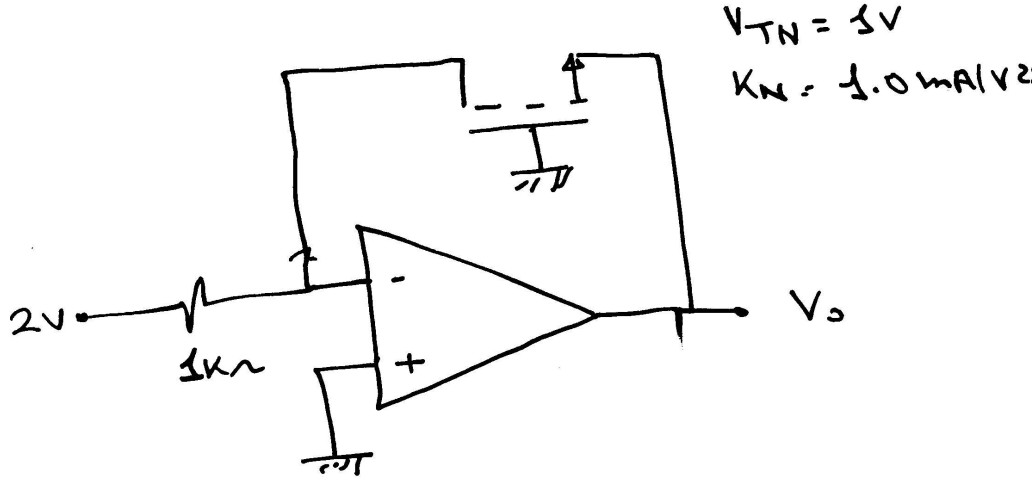
$$I_E = 3.25\ mA \quad , I_C = 3.12\ mA$$

$$V_B = 10K * I_B = 1.04V$$

$$V_C = -5 + I_C * 10 = 25 \leftarrow \text{rejected}$$

$\therefore$ transistor must be saturated

$\therefore$ $V_{EC} = V_{EC\,SAT} = 0.2\ V$



If $V_i = 2V$, what is V_o?

Answer: transistor must be on and in saturation region (why)

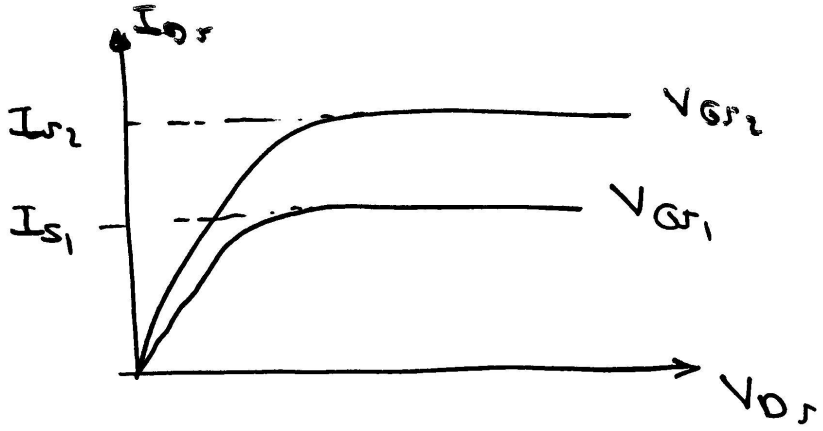
$$I = \frac{2}{1k} = 2mA = I_{DS}$$

$$\therefore 2 = \frac{K_N}{2}(V_{GS} - V_{TN})^2$$

$$4 = (V_{GS} - 1)^2 \qquad (V_{GS} - 1) = \pm 2$$

$$\therefore V_{GS} = 3V$$

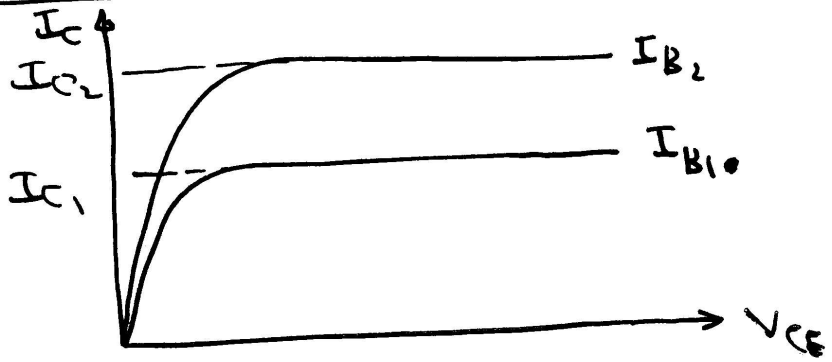
$$\therefore V_o = -3V$$



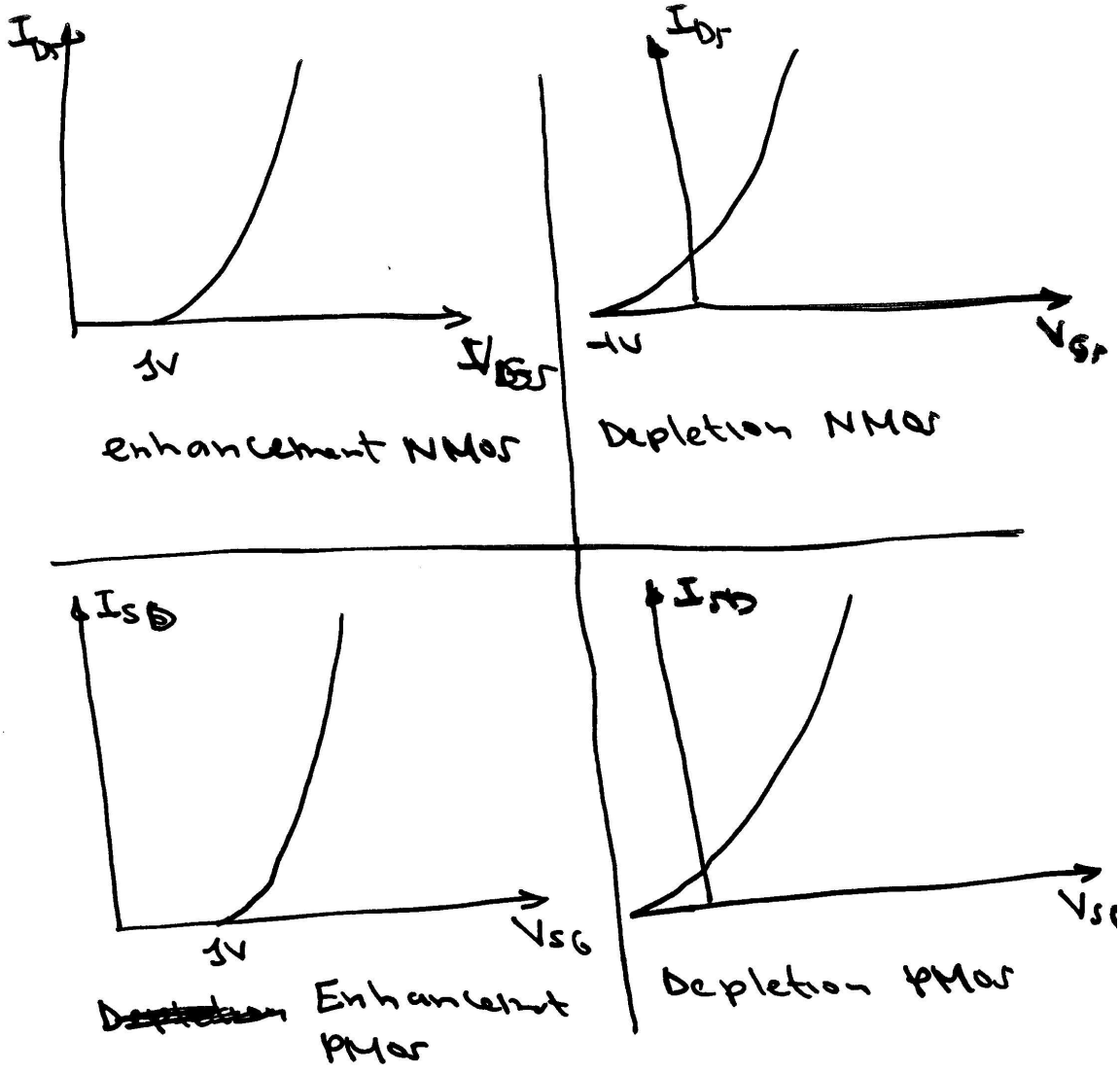
$$I_{S_1} = \frac{K_n}{2}(V_{GS_1} - V_{TN})^2$$

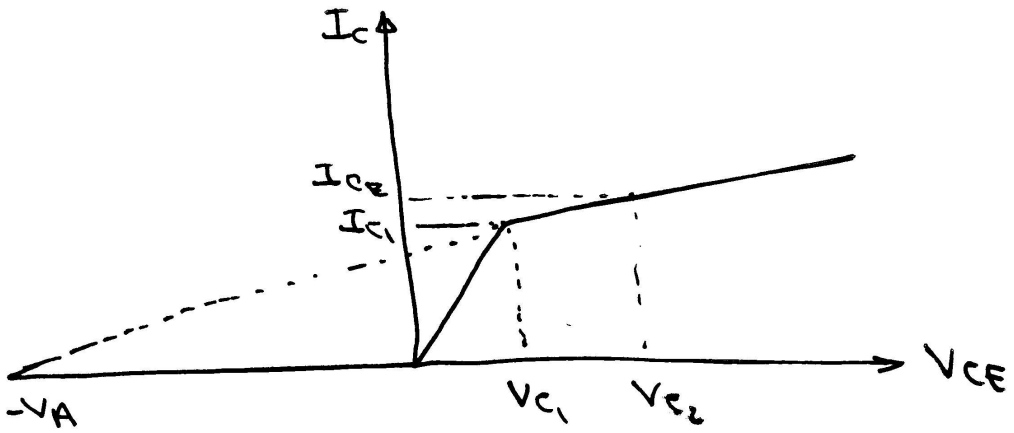
$$I_{S_2} = \frac{K_n}{2}(V_{GS_2} - V_{TN})^2$$

Solve for K_n & V_{TN}



$$\beta = \frac{I_{C_1}}{I_{B_1}} = \frac{I_{C_2}}{I_{B_2}}$$


$I_{D,n}$
1V
$V_{GS,n}$
Enhancement NMOS
$I_{D,n}$
-1V
$V_{G,n}$
Depletion NMOS
I_{SD}
1V
V_{SG}
~~Depletion~~ Enhancement PMOS
I_{SD}
V_{SG}
Depletion PMOS



$$\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{y - I_{C_1}}{V_{CE} - V_{C_1}} = \frac{I_{C_2} - I_{C_1}}{V_{C_2} - V_{C_1}}$$

put $y = 0$ to get $V_{CE} = -V_A$