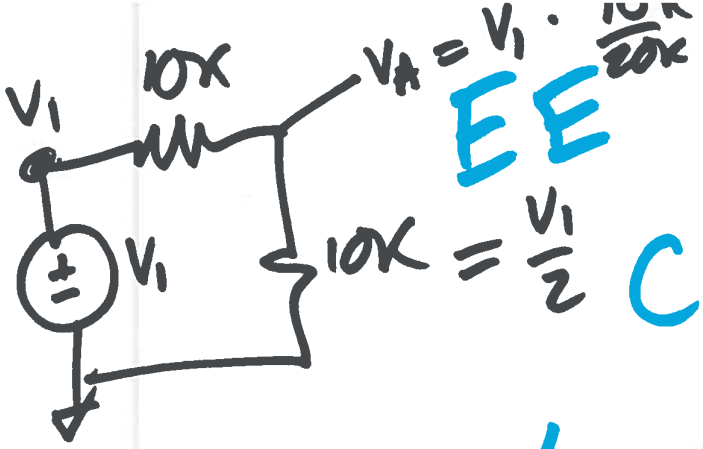
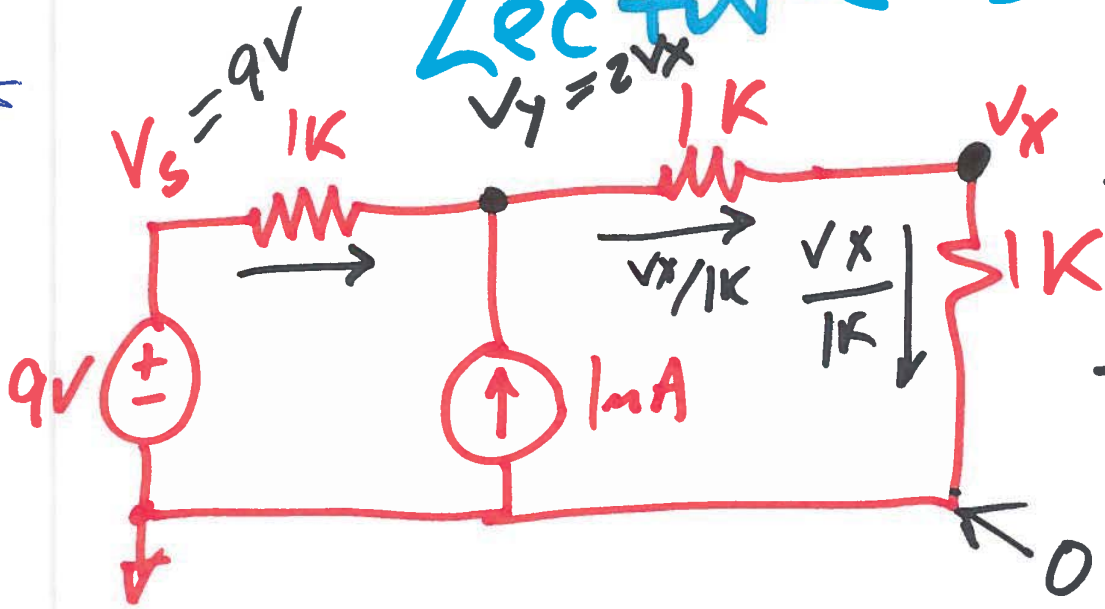
EE 220 Circuits 1

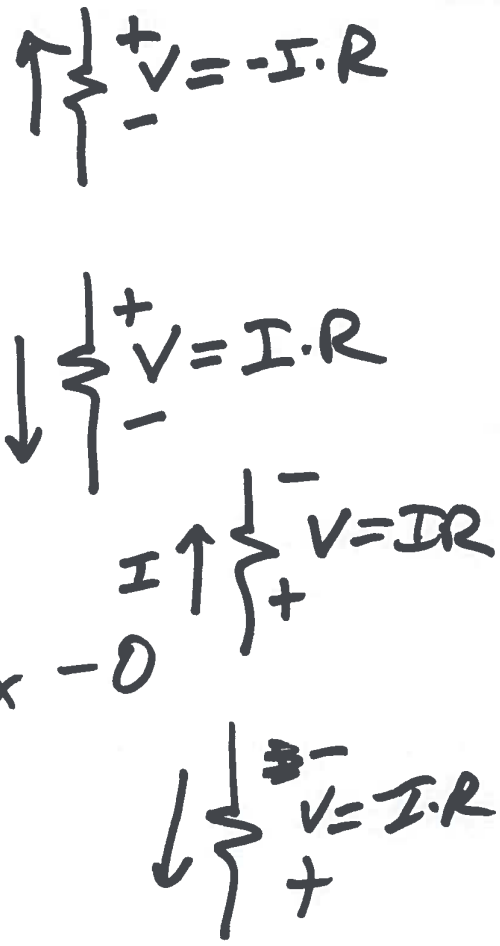
Lecture 5

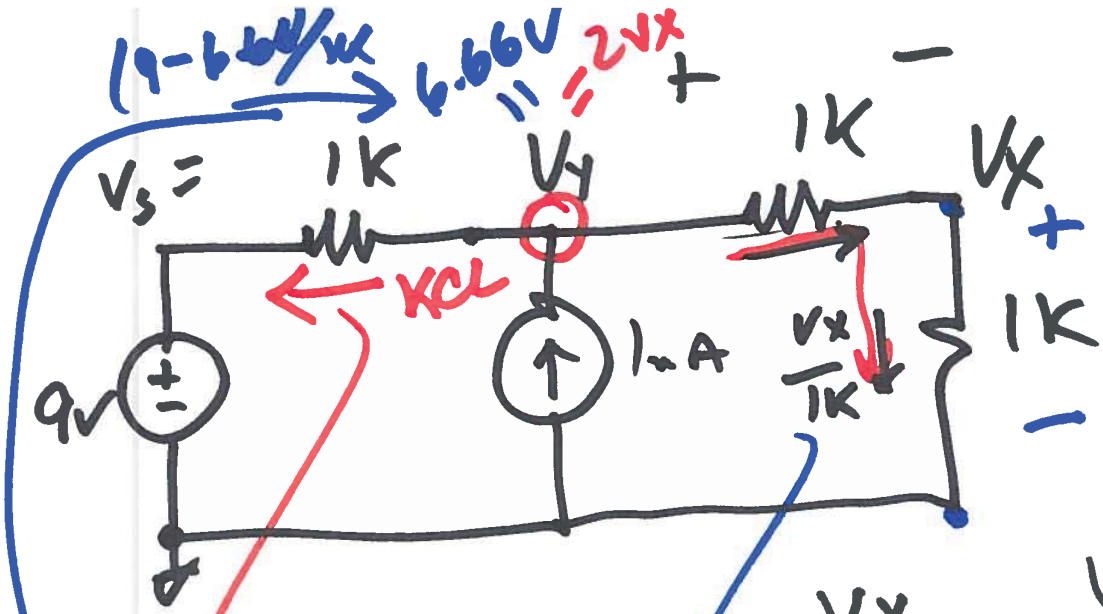


$V_A = V_1 \cdot \frac{10K}{20K} = \frac{V_1}{2}$



$V_x = V_x - 0$





KCL $\frac{2V_x-9}{1K} + \frac{V_x}{1K} = 1mA$

$2V_x - 9 + V_x = 1V$

$3V_x = 10$

$V_x = \frac{10}{3}$

$V_x = 3.33V$

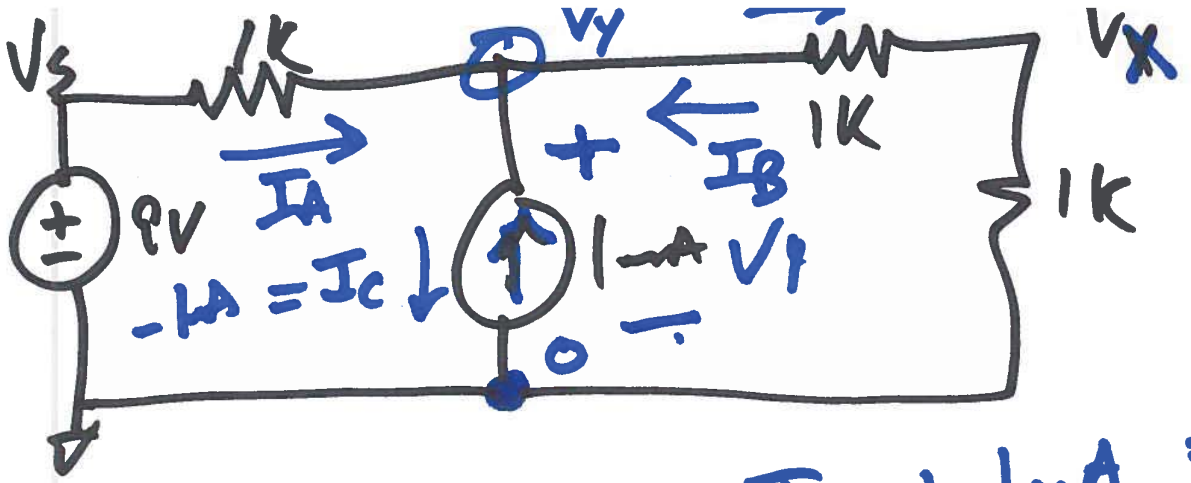
$\frac{V_x}{1K} = \frac{V_y - V_x}{1K}$

$V_y = 2V_x$

$\frac{2V_x-9}{1K}$

$2.33mA$

$\frac{3.33}{1K} = 3.33mA$



KCL: $I_A + I_B + 1mA = 0$

$I_A = \frac{9 - V_y}{1K}$

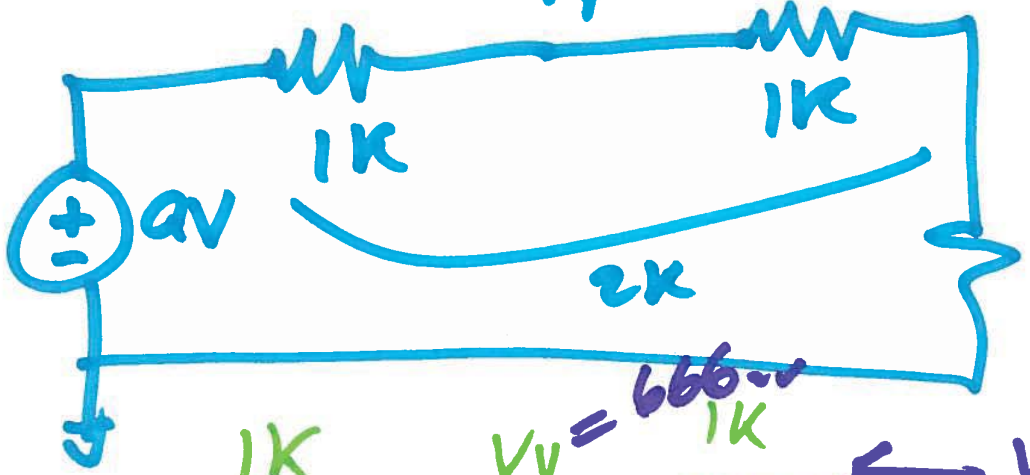
$I_B = \frac{V_x - V_y}{1K}$

$\frac{9-V_y}{1K} + \frac{V_x - V_y}{1K} + 1mA = 0$

$9 - V_y + V_x - V_y + 1K = 0$

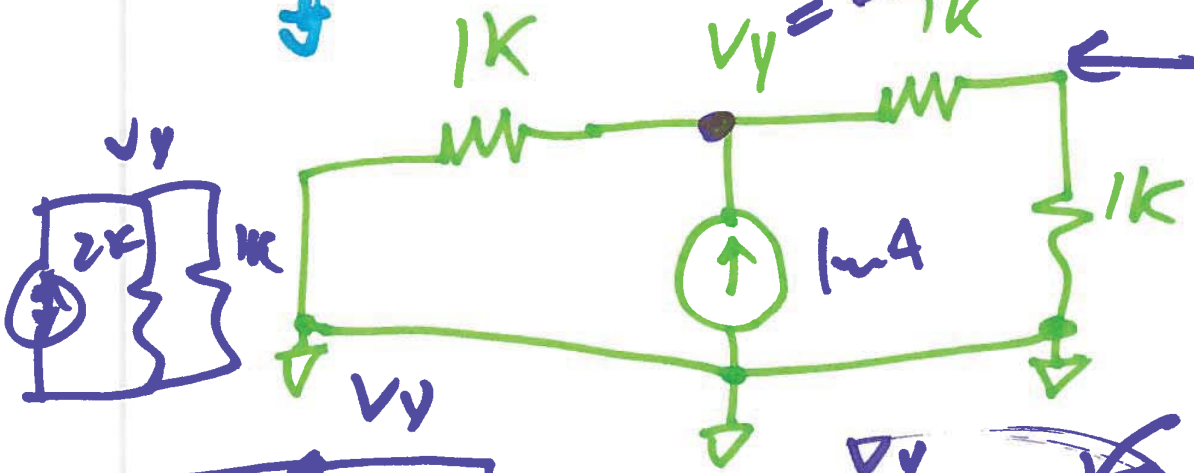
$\frac{V_y - V_x}{1K} = \frac{V_x}{1K} \Rightarrow V_y = 2V_x$

Superposition



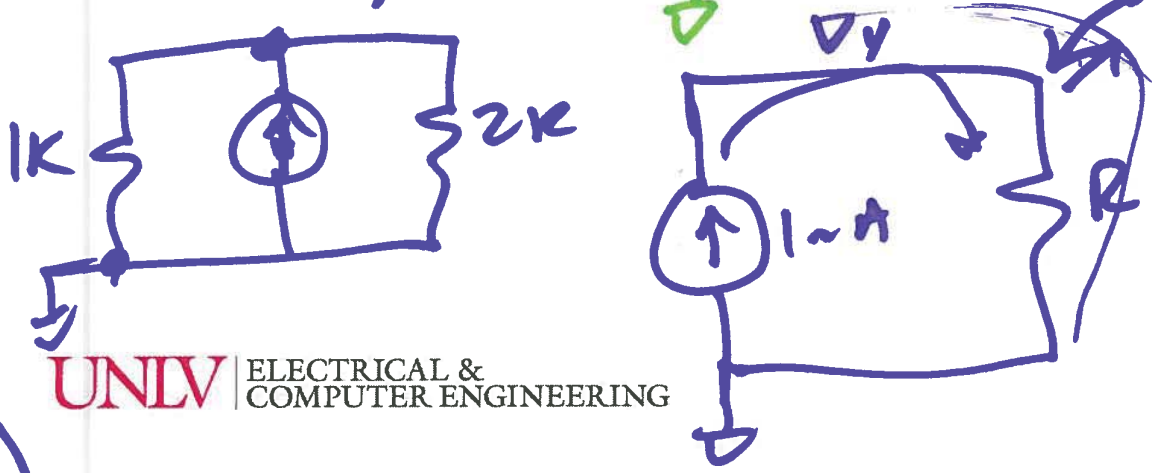
$V_x = 9V \cdot \frac{1k}{1k+2k}$

$= 3V$

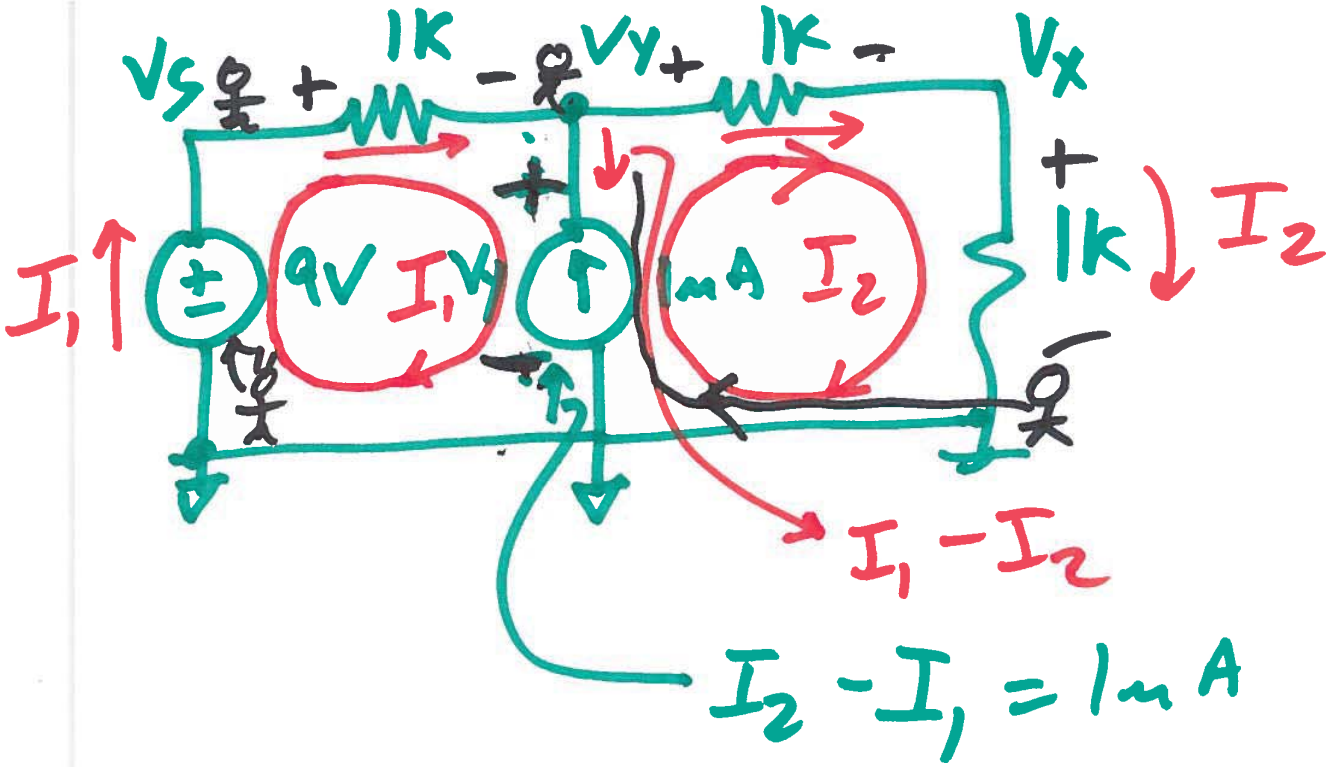


$V_x = 333mV$

$V_x|_T = 3.33V$

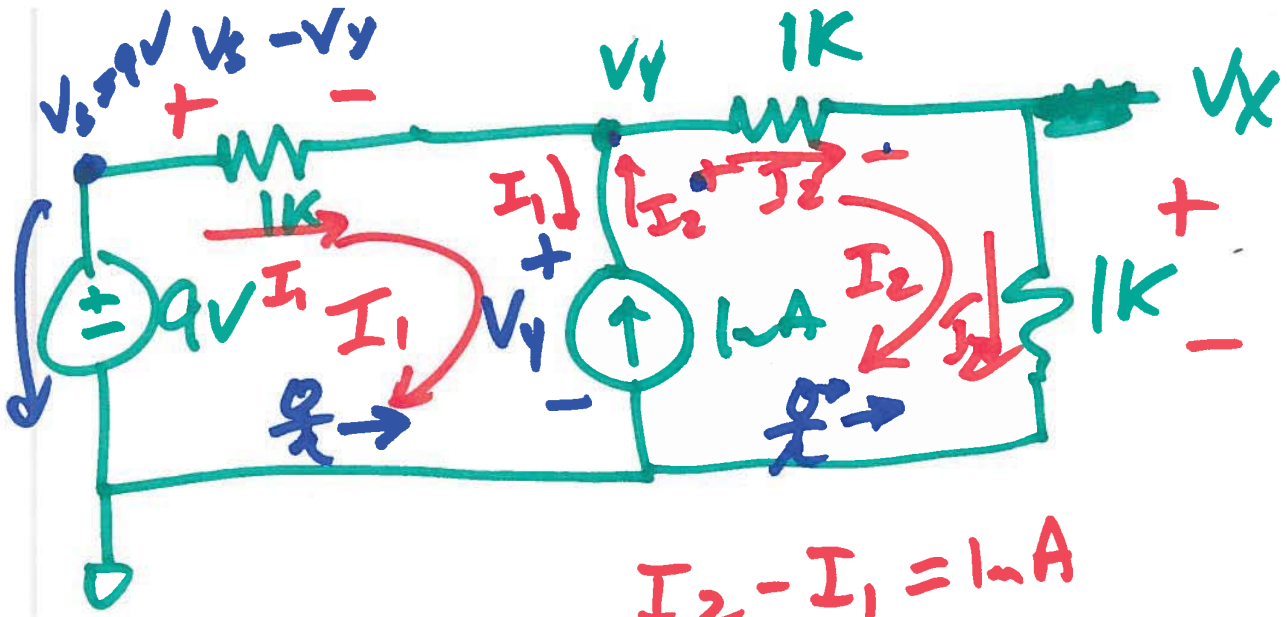


$R = \frac{2k \cdot 1k}{2k+1k} = 666\Omega$



$$9V - 1K \cdot I_1 - V_y = 0$$

$$V_y - 1K \cdot I_2 - I_2 \cdot 1K = 0$$



$$I_2 - I_1 = 1mA$$

$$V_y + 1k \cdot I_1 - 9 = 0$$

$$I_2 \cdot 1K + I_2 \cdot 1K - V_y = 0$$