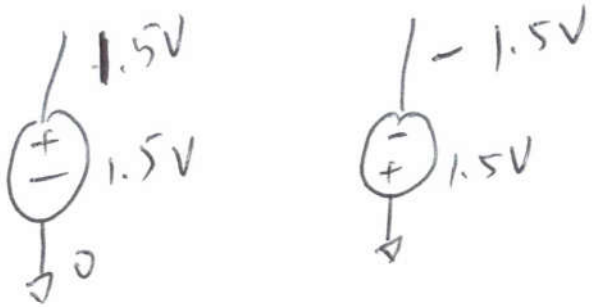
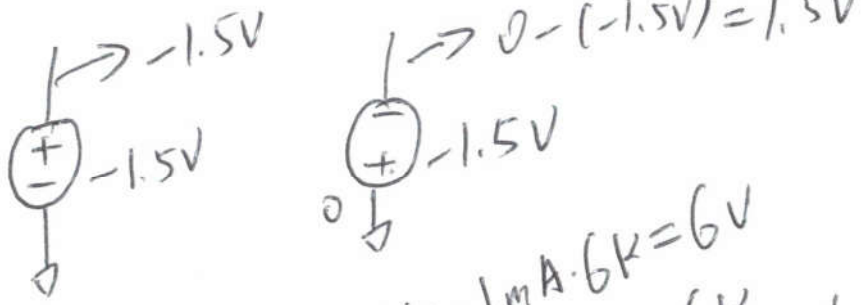
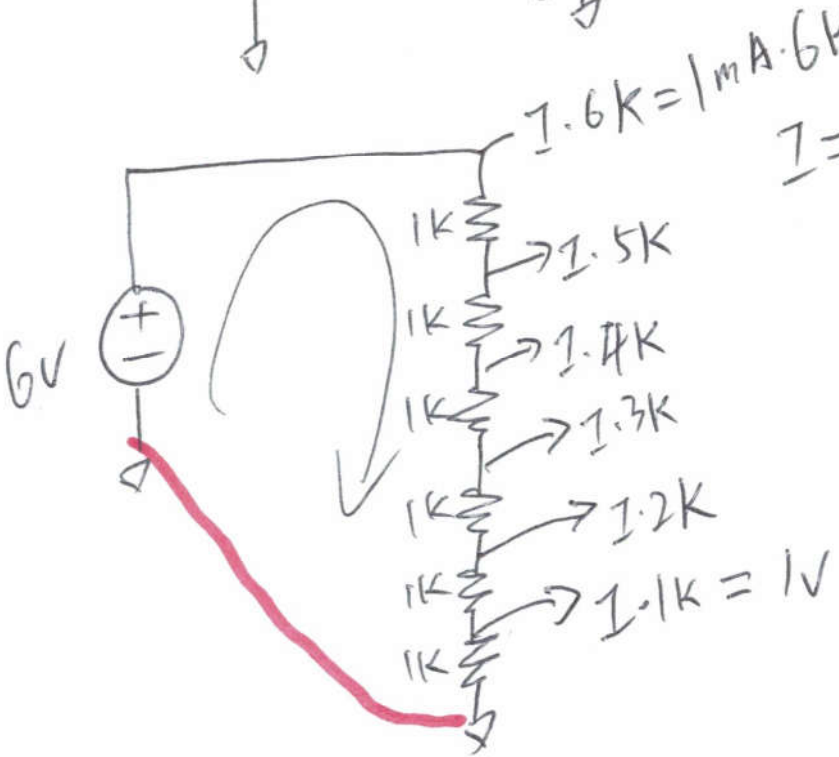
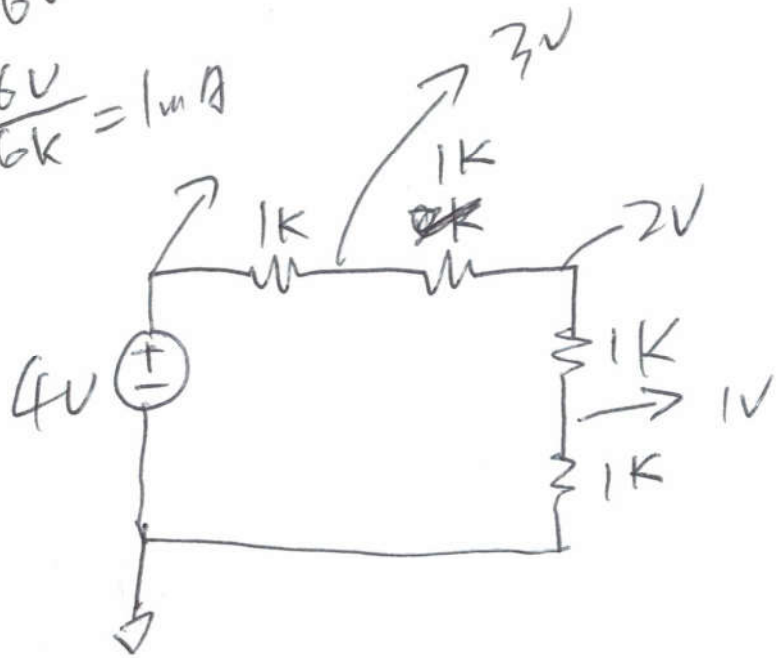
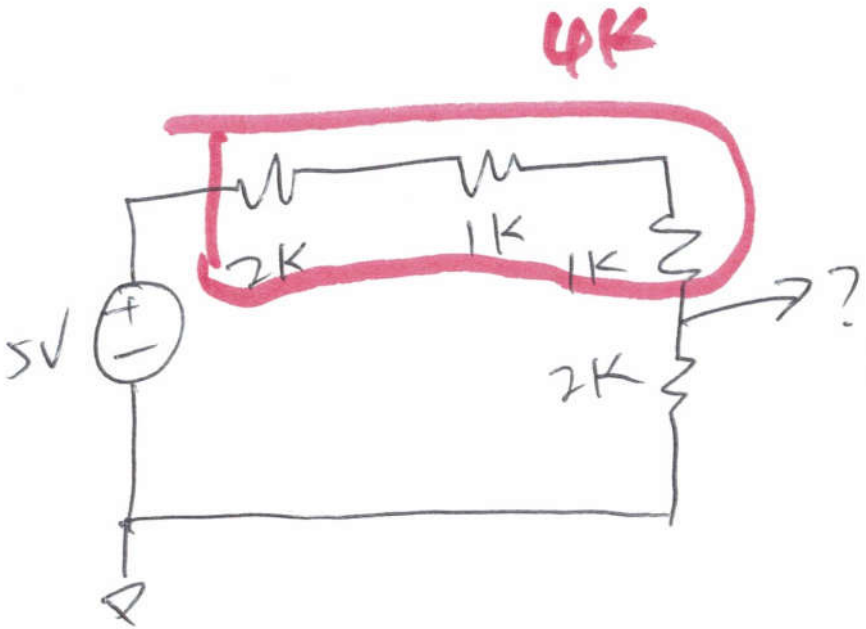
HW1 / Quiz / Review

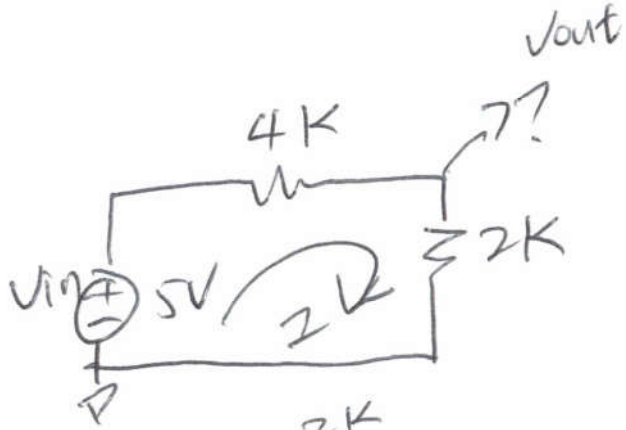










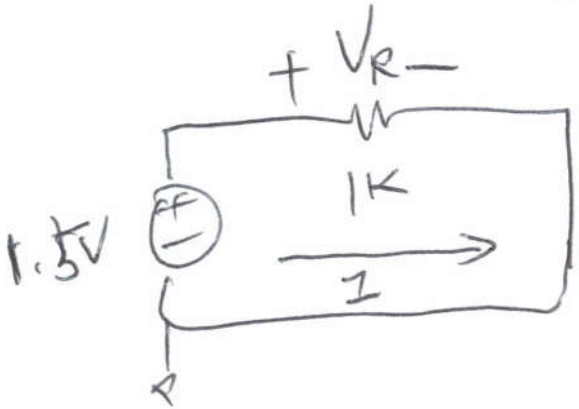


$$V_{out} = 5 \cdot \frac{2K}{4K+2K}$$

$$= 5 \cdot \frac{1}{3} = \frac{5}{3} V.$$

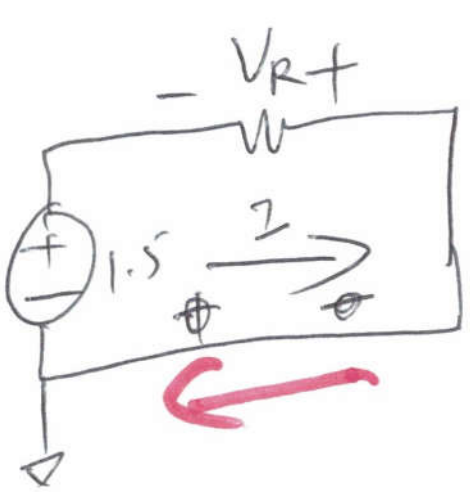
$$\frac{V_{out}}{V_{in}} = \frac{1 \cdot 2K}{1 \cdot 6K} = \frac{1}{3}$$

$$V_{out} = \frac{1}{3} \cdot V_{in} = \frac{5}{3} V$$



$$V_R = 1.5V$$

$$I = \frac{1.5V}{1K} = 1.5mA$$



$V_R = -1.5V$

$I = \frac{1.5V}{1K} = 1.5mA$

Lab 2

2.

Calculation		Simulation		measurement	
I	Vout	I	Vout	I	Vout

.tran 0 | 0.0|

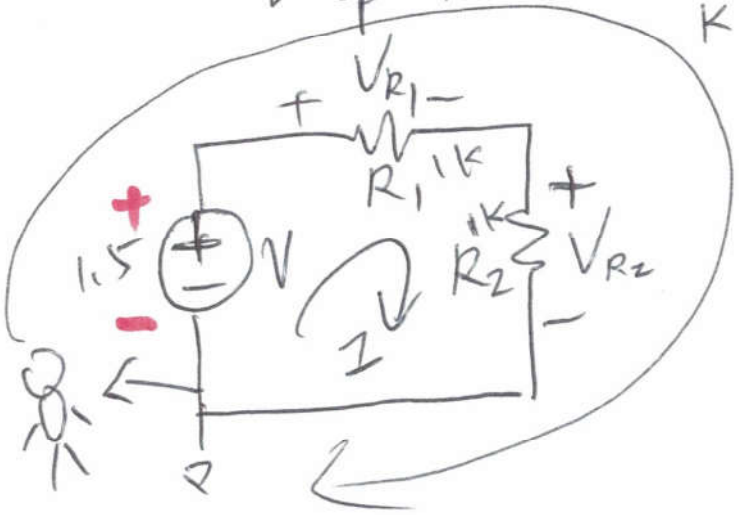
3. .dc V1 0 5 0.01 → increment

- the soure to be swept
- starting point 0
- ending voltage

Kirchoff's voltage Law (KVL)

Kirchoff's Current Law (KCL)

KVL: The sum of all voltages in an electrical circuit Loop is 0. $\sum_K V_K = 0$



$-V + V_{R_1} + V_{R_2} = 0$

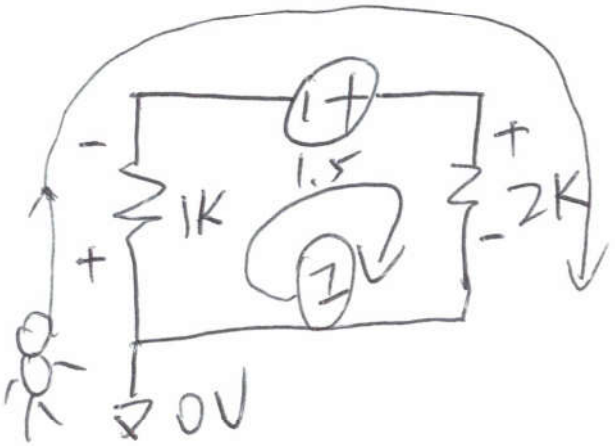
$V_{R_1} + V_{R_2} = V$

$V = 1.5V$

$V_{R_1} = \frac{1.5}{2K} \cdot 1K = 0.75V$

$V_{R_2} = 0.75V$

$-1.5 + 0.75 + 0.75 = 0$



$+1K \cdot I - 1.5 + 2K \cdot I = 0$

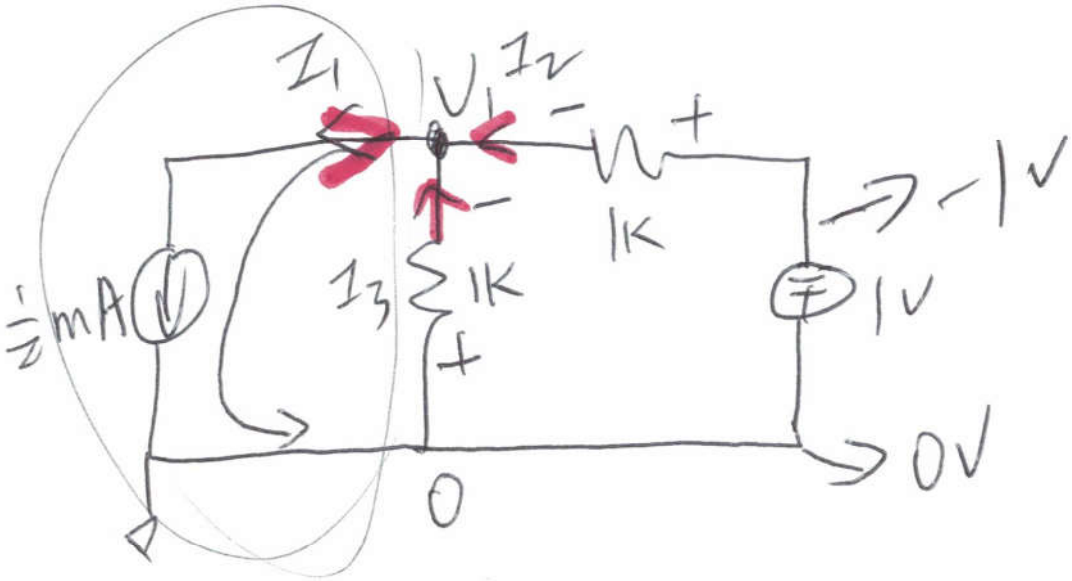
$3K \cdot I = 1.5$

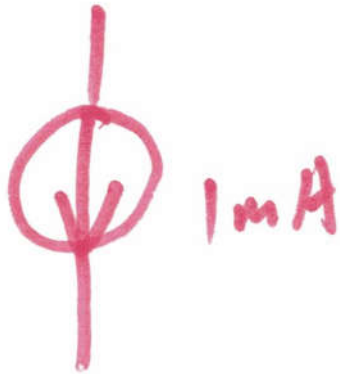
$I = \frac{1.5}{3K} = 0.5mA$

KCL: The sum of all currents enter an electrical junction is 0. $\sum_K I_K = 0$.

$-I_1 \quad I_1 + I_2 + I_3 = 0$

$I_2 + I_3 = -I_1$

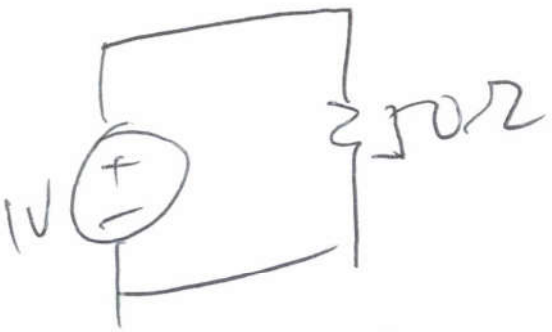




50Ω

100KΩ

$$\begin{cases} I_1 + I_2 + I_3 = 0 \quad ① \\ I_1 = -0.5\text{mA} \quad ② \\ I_2 = \dfrac{-1 - V_1}{1K} \quad ③ \\ I_3 = \dfrac{0 - V_1}{1K} \quad ④ \end{cases}$$



$\frac{1V}{50\Omega}$

plug ② ③ ④ into ①

$$-0.5\text{mA} + \frac{-1-V_1}{1K} + \frac{0-V_1}{1K} = 0$$

$$-0.5 + (-1-V_1) + 0 - V_1 = 0$$

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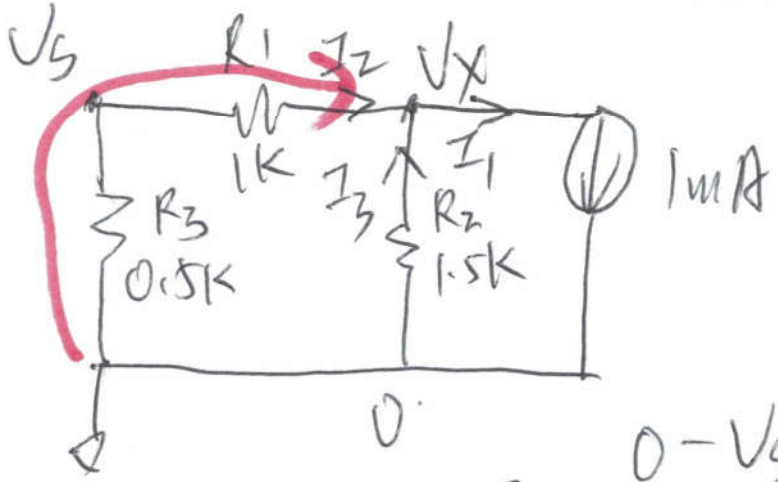
$$-0.5 - 1 - V_1 - V_1 = 0$$

$$2V_1 = -1.5$$

$$V_1 = -0.75V$$

$$I_2 = \frac{-1+0.75}{1K} = -0.25 \text{ mA}$$

$$I_3 = \frac{0+0.75}{1K} = 0.75 \text{ mA}$$



$$I_2 = \frac{0 - V_s}{R_3}$$

$$I_1 = I_2 + I_3$$

$$I_1 = 1 \text{ mA}$$

$$\frac{0 - V_x}{R_2} = I_3$$

$$\frac{V_s - V_x}{1K} = I_2$$

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