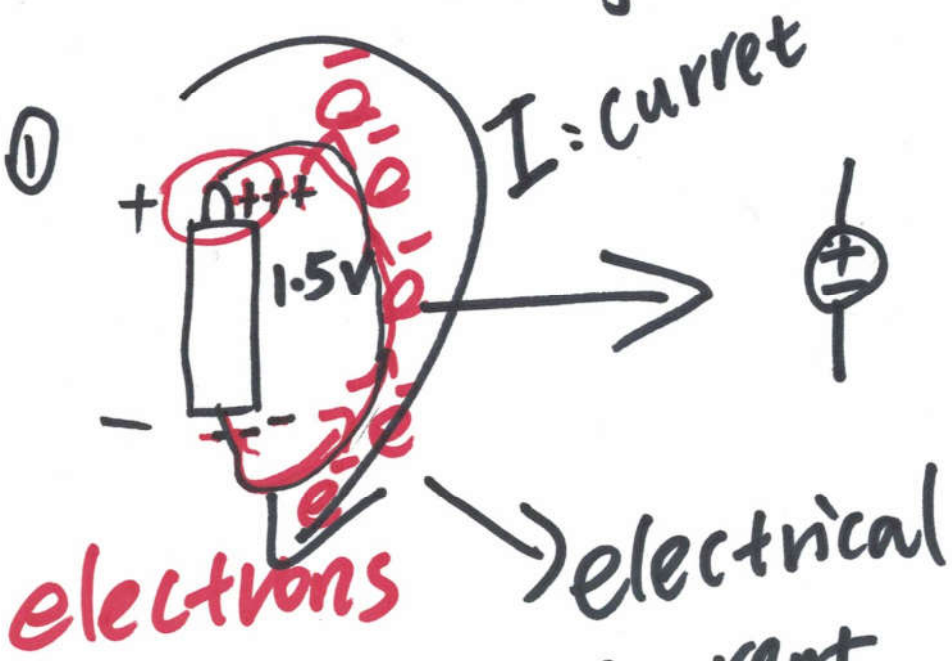
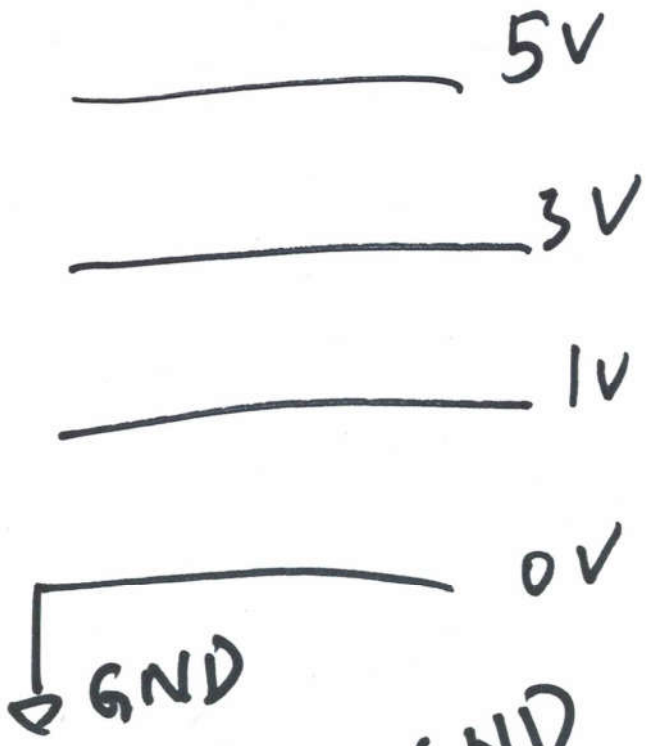
Voltages and Currents



charge Voltages Current

Volt

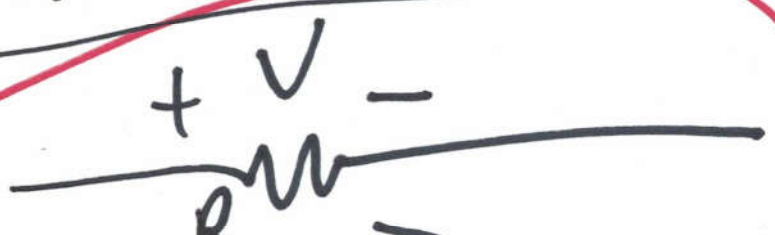
② Voltages are relative



Common GND

Voltage difference
potential drop

(3) Ohm's Law

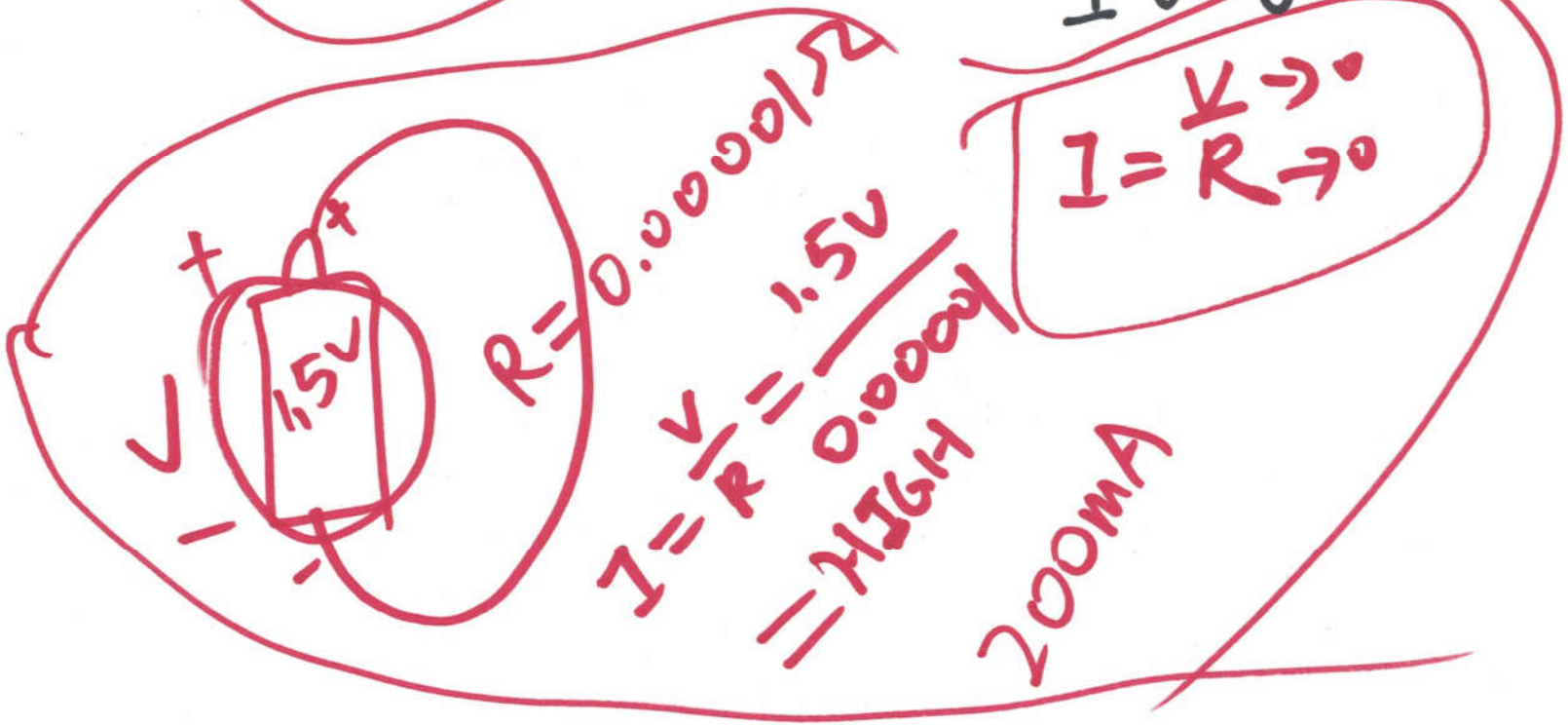


$$\frac{V}{R} = I$$

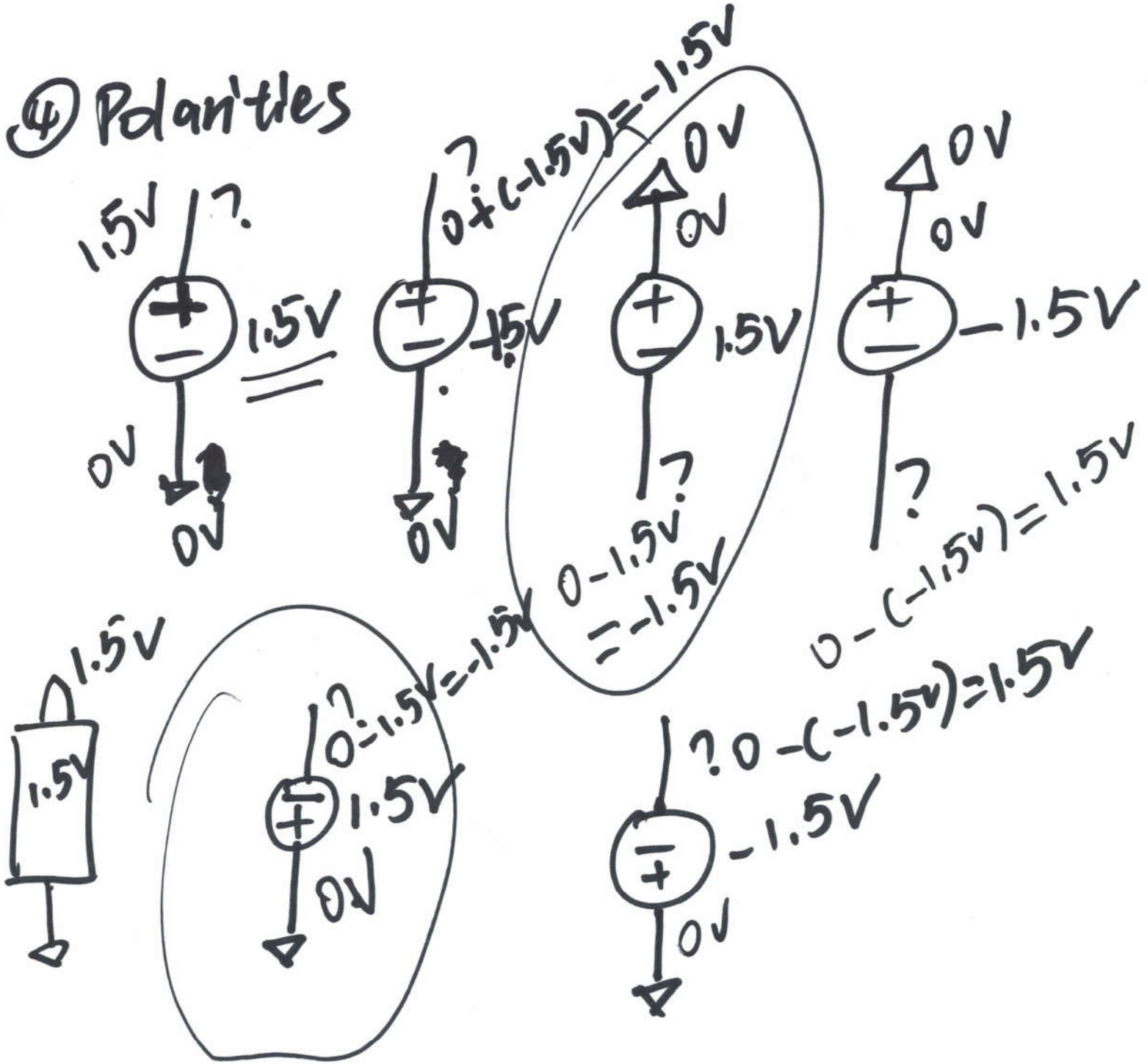
$$\frac{V}{I} = R$$

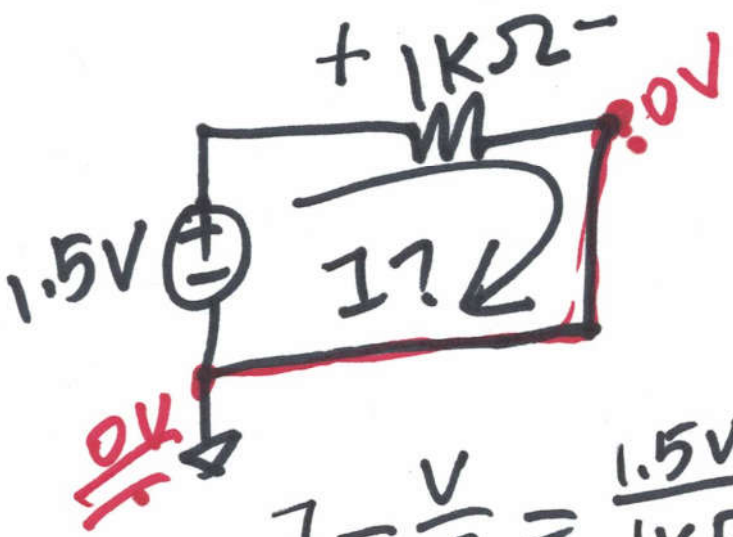
$$I \cdot R = V$$

$$I \cdot 0 = 0$$



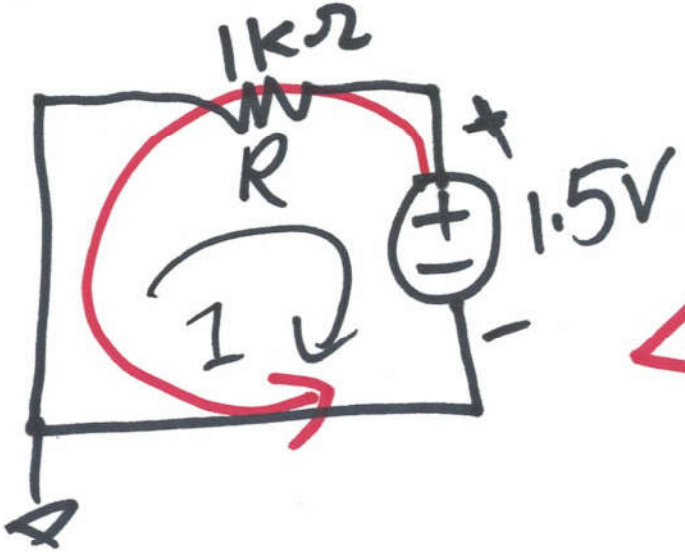
④ Polarities



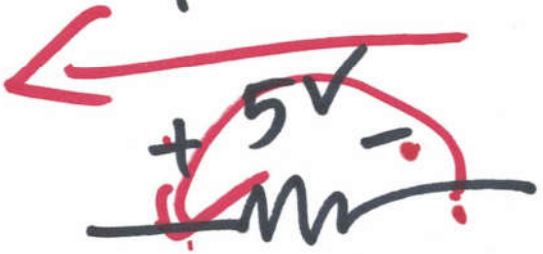


R·I=0
0·I=0

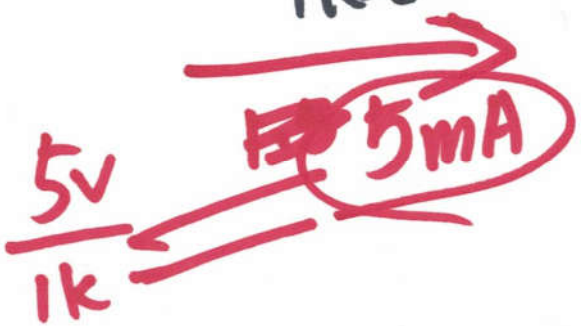
$$I = \frac{V}{R} = \frac{1.5V}{1K\Omega} = 1.5mA = 1.5 \times 10^{-3} A$$



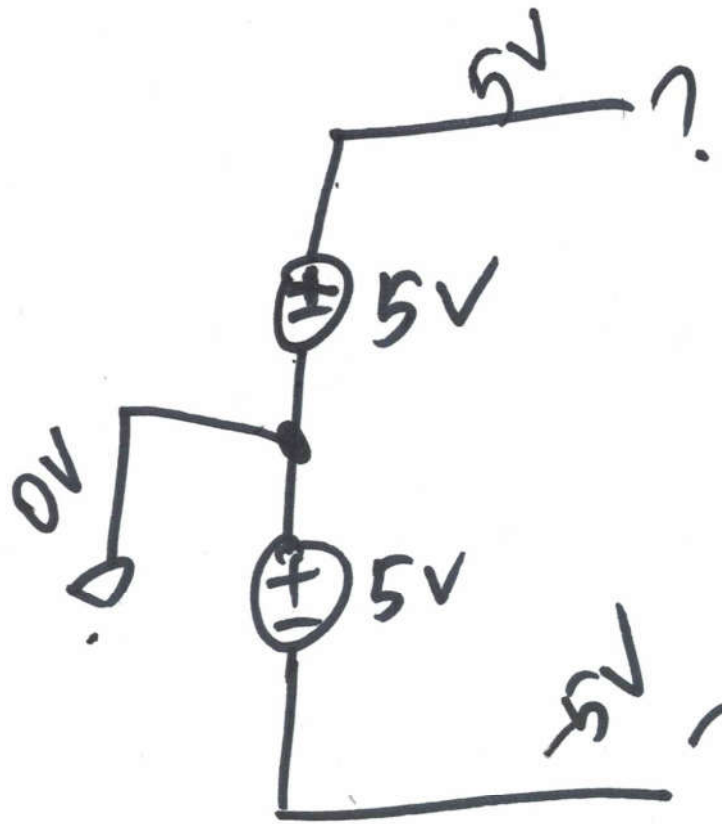
I can define the current flow in any direction

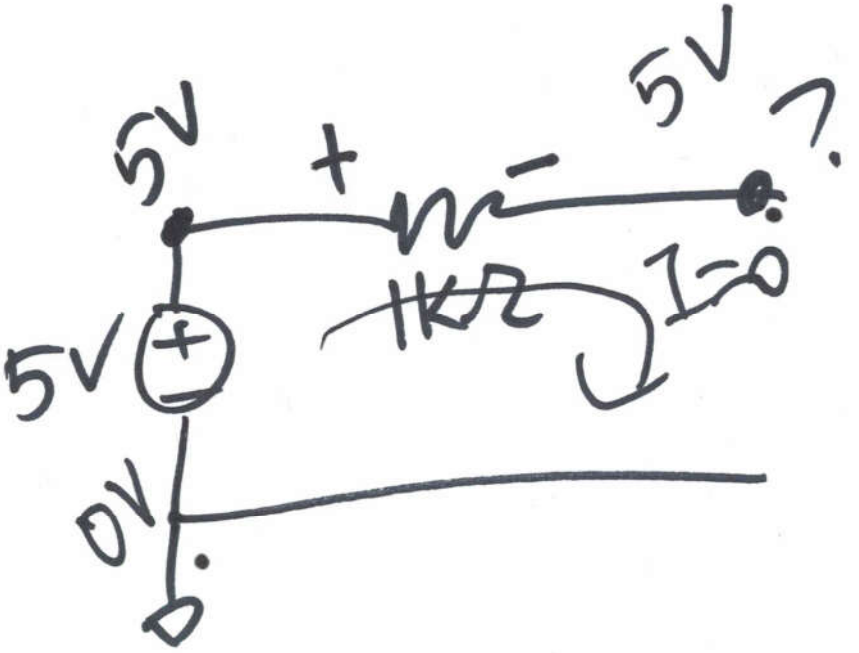


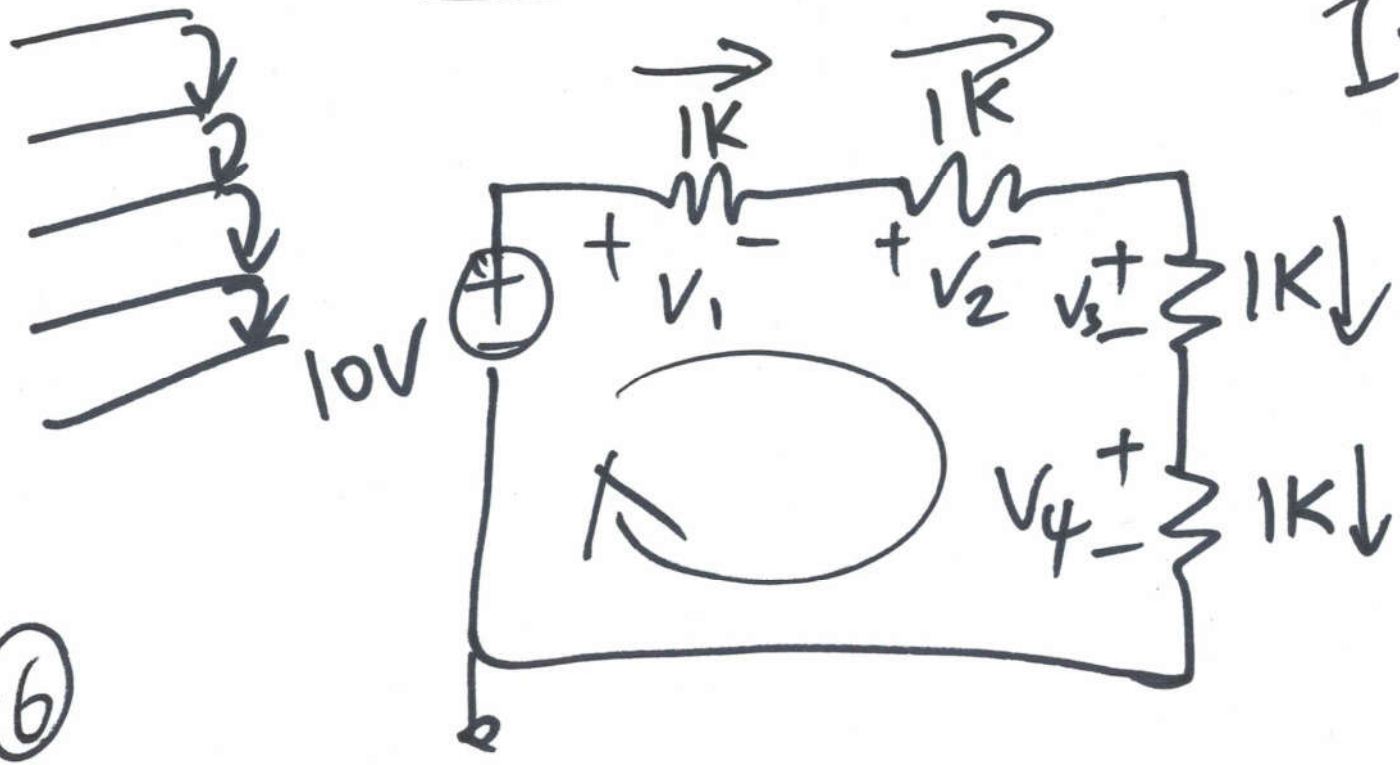
$$\frac{-5V}{R} = \frac{-5V}{1K} = -5mA$$



(5)







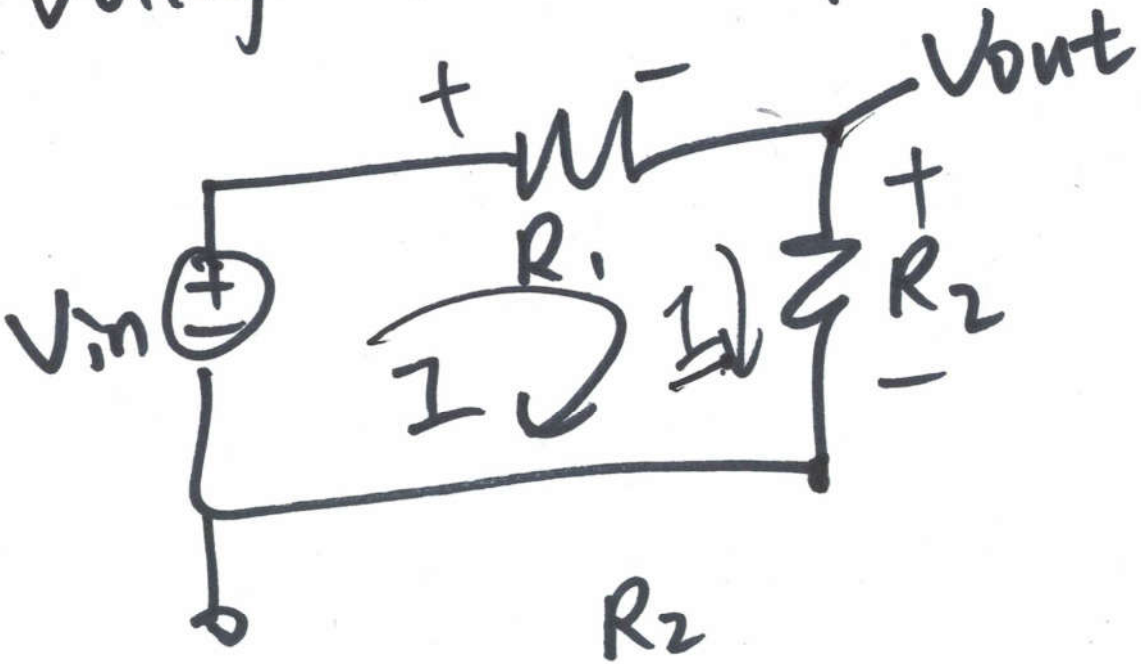
$$I = \frac{10V}{4K} = 2.5\,mA$$

$$V_1 = 2.5mA \cdot 1K$$

$$= 2.5V$$

(6)

Voltage Dividers:



$$V_{out} = V_{in} \frac{R_2}{R_1 + R_2}$$

$$\begin{cases} V_{in} = I \cdot (R_1 + R_2) \\ V_{out} = I \cdot R_2 \end{cases}$$

$$\frac{V_{out}}{V_{in}} = \frac{I R_2}{I \cdot (R_1 + R_2)}$$

$$= \frac{R_2}{R_1 + R_2}$$

$$\Rightarrow V_{out} = V_{in} \cdot \frac{R_2}{R_1 + R_2}$$