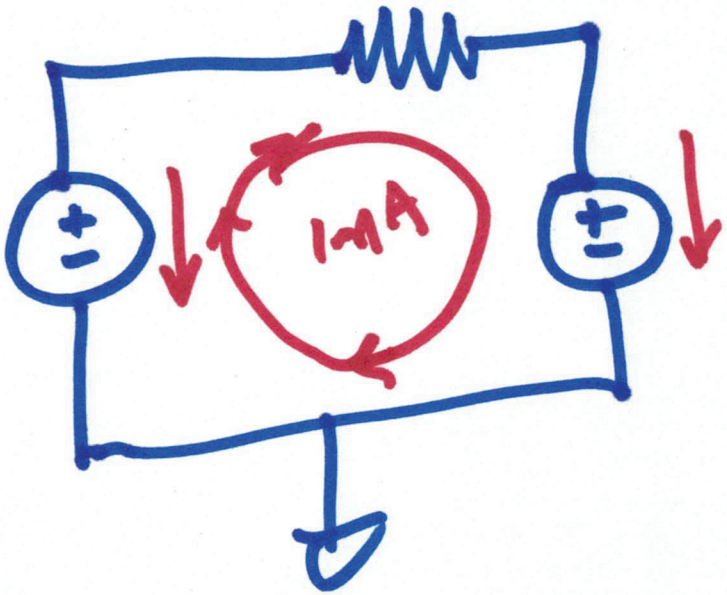
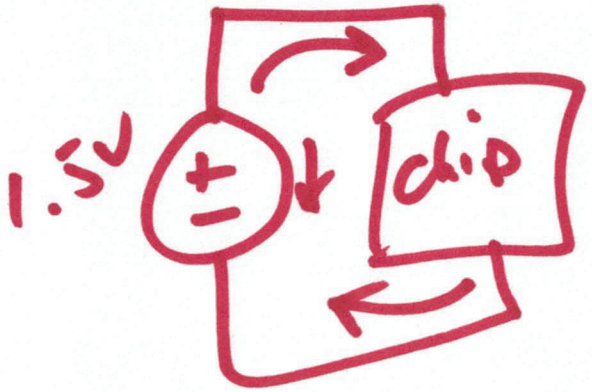
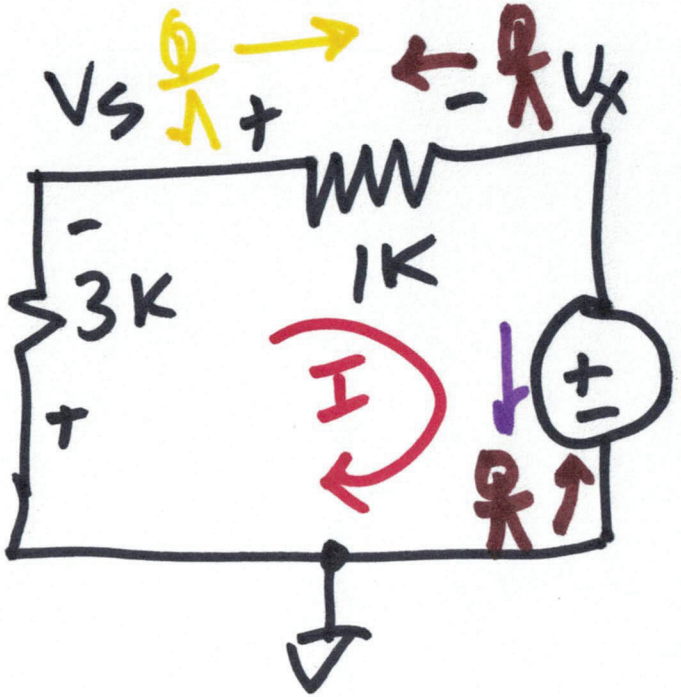
EE 220 Circuits I

Lecture 2

August 31, 2022

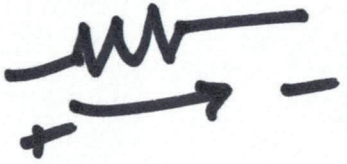






Kirchoff's Voltage Law (KVL)

$V = I \cdot R$

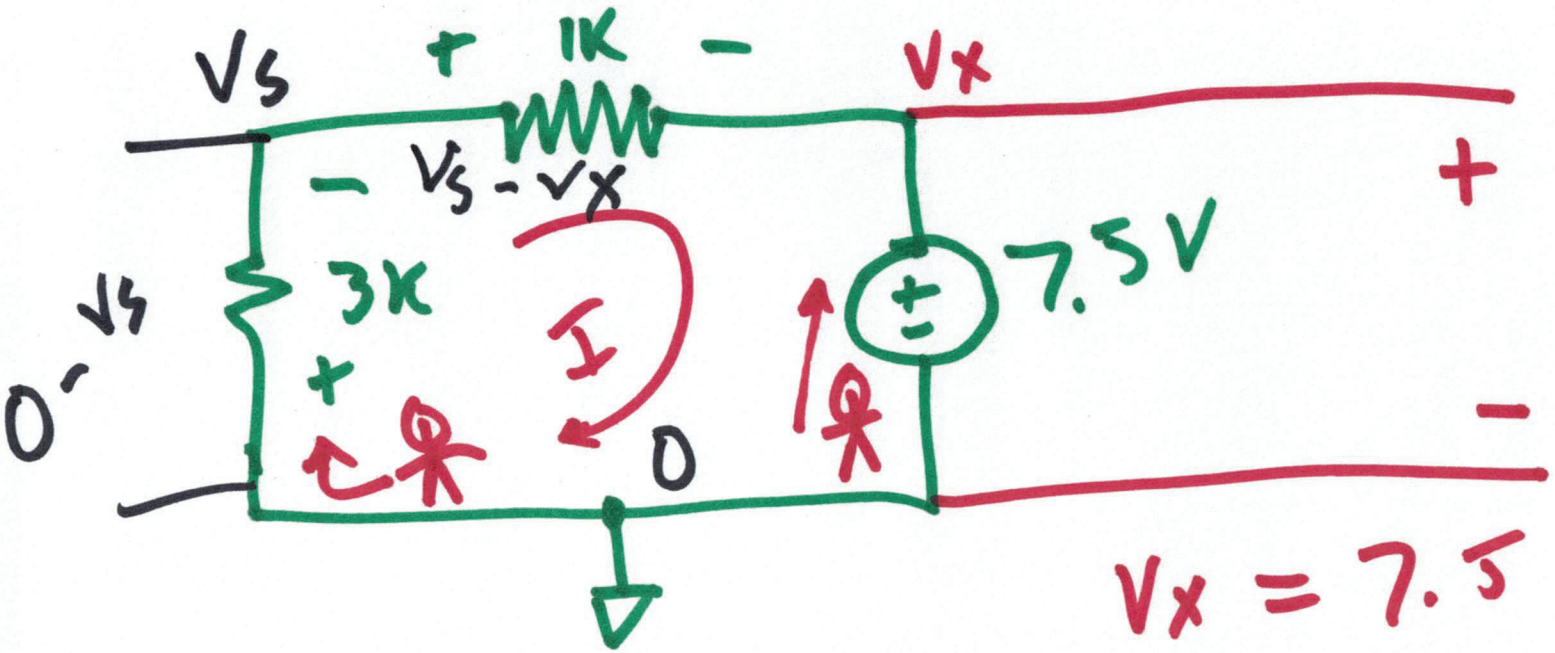


$$+ \; -I \cdot 1K - 7.5V - I \cdot 3K = 0$$

$$+I \cdot 1K + 3K \cdot I + 7.5V = 0$$

$$4K \cdot I = -7.5$$

$$I = \frac{-7.5}{4.K}$$



$V_x = 7.5$

$V_s = 7.5 + I \cdot 1K$

$= 7.5 + \left(-\frac{7.5}{4K}\right) \cdot 1K$

$V_s = -3K\left(\frac{-7.5}{4K}\right)$

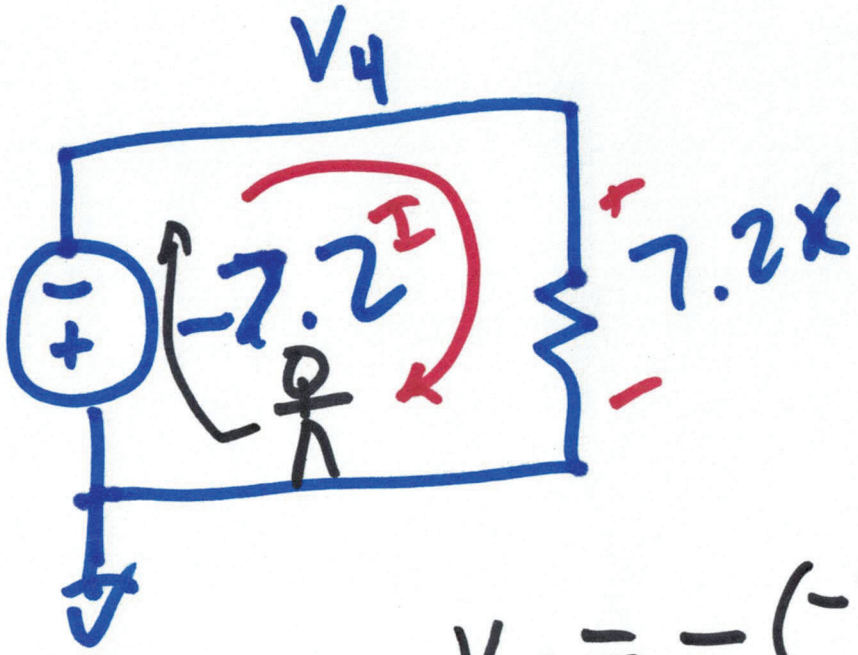
$= I = \frac{-7.5}{4K}$

$V_x = -3K \cdot I - 1K \cdot I$

$V_x = -4K \cdot I$

$V_x = -4K \cdot \left(\frac{-7.5}{4K}\right)$

$V_x = 7.5V$



KVL

$0 = +7.2kI + (-7.2)$

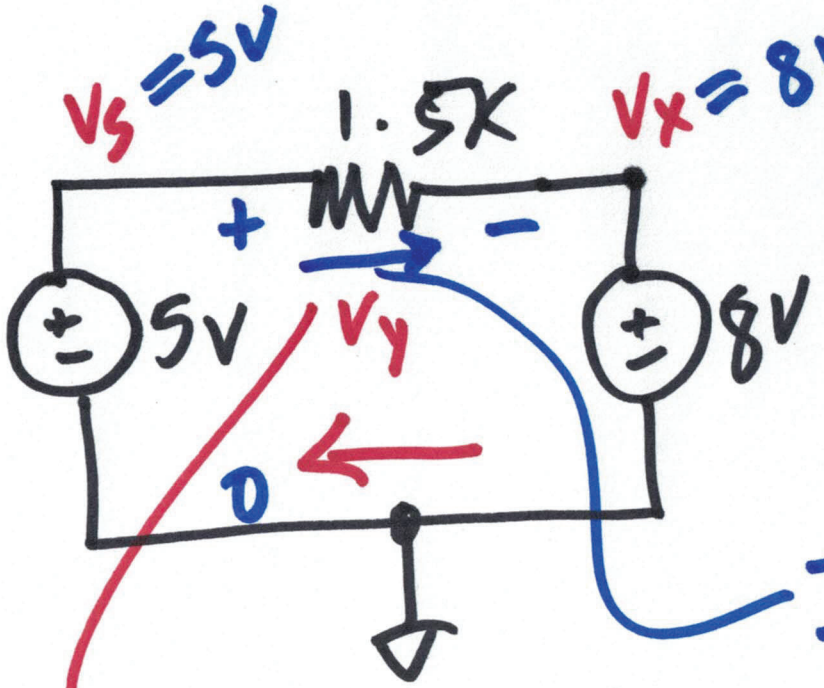
$I = 1mA$

$= 0.001A$

$= 1,000\mu A$

$V_4 = -(-7.2) = 7.2V$

$= 0.001A$



$$I = \frac{5-8}{1.5K} = -\frac{3}{\frac{3}{2}K}$$

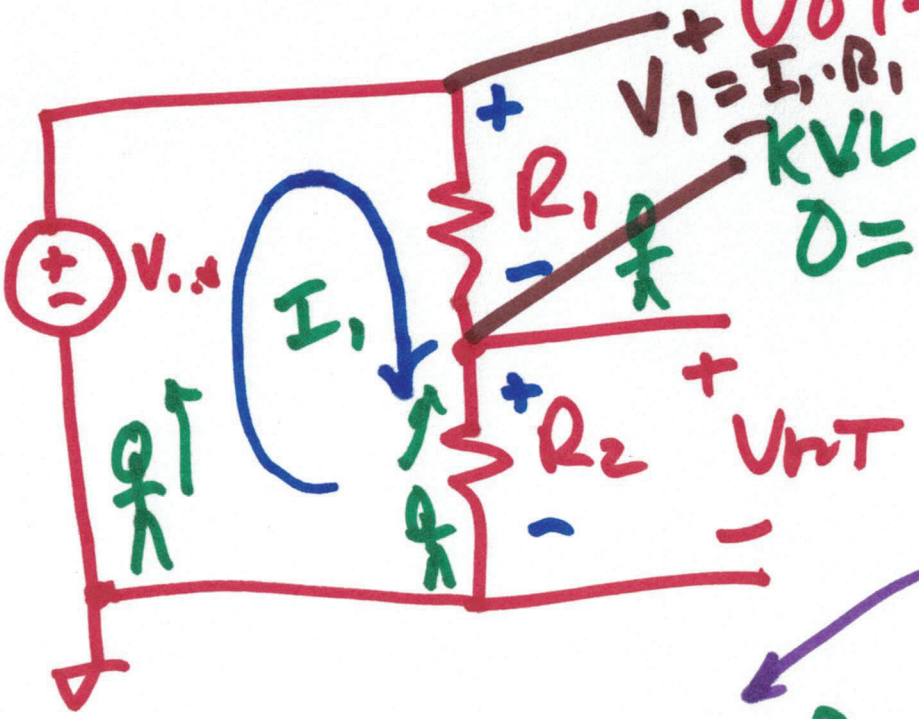
$$= -2\,mA$$

$$V_Y = V_S - V_X$$

$$= 5 - 8 = -3V$$

5)

Voltage dividers



KVL

$0 = +V_{IN} - I_1 \cdot R_1 - I_1 R_2$

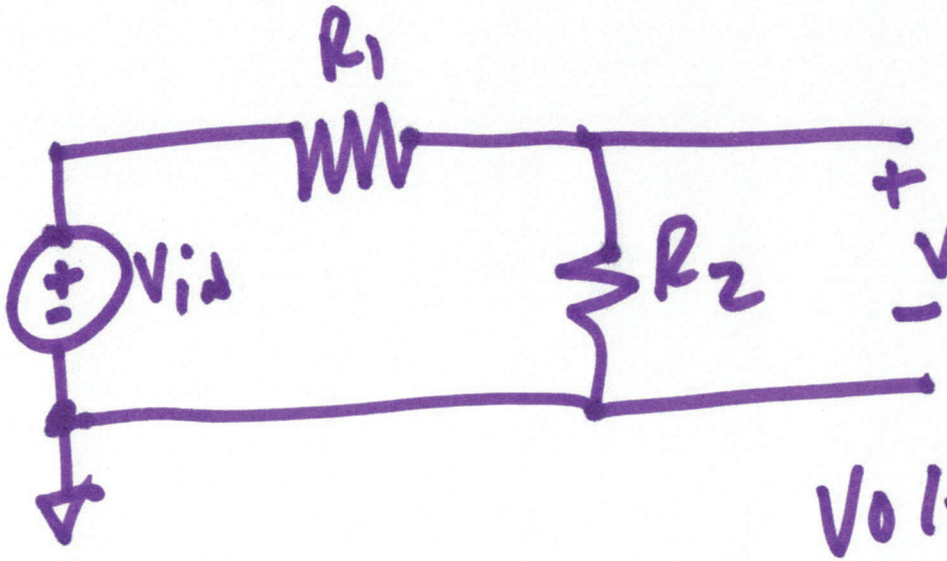
$I_1(R_1 + R_2) = V_{IN}$

$I_1 = \dfrac{V_{IN}}{R_1 + R_2}$

$V_{OUT} = +I_1 \cdot R_2$

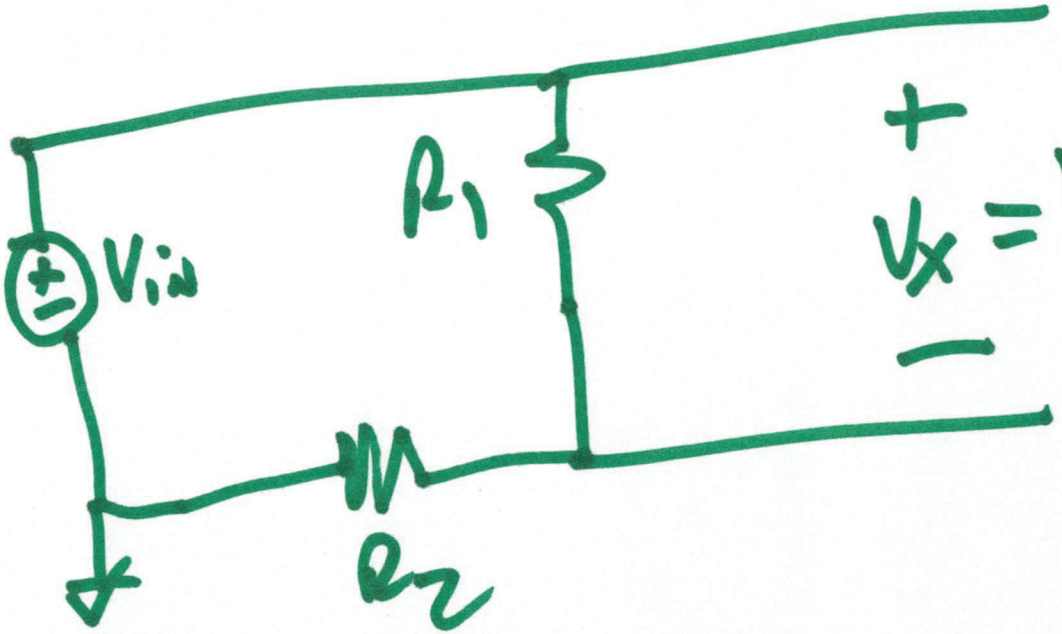
$$V_{OUT} = V_{IN} \cdot \frac{R_2}{R_1 + R_2}$$

$$V_1 = I_1 \cdot R_1 = V_{IN} \cdot \frac{R_1}{R_1 + R_2}$$

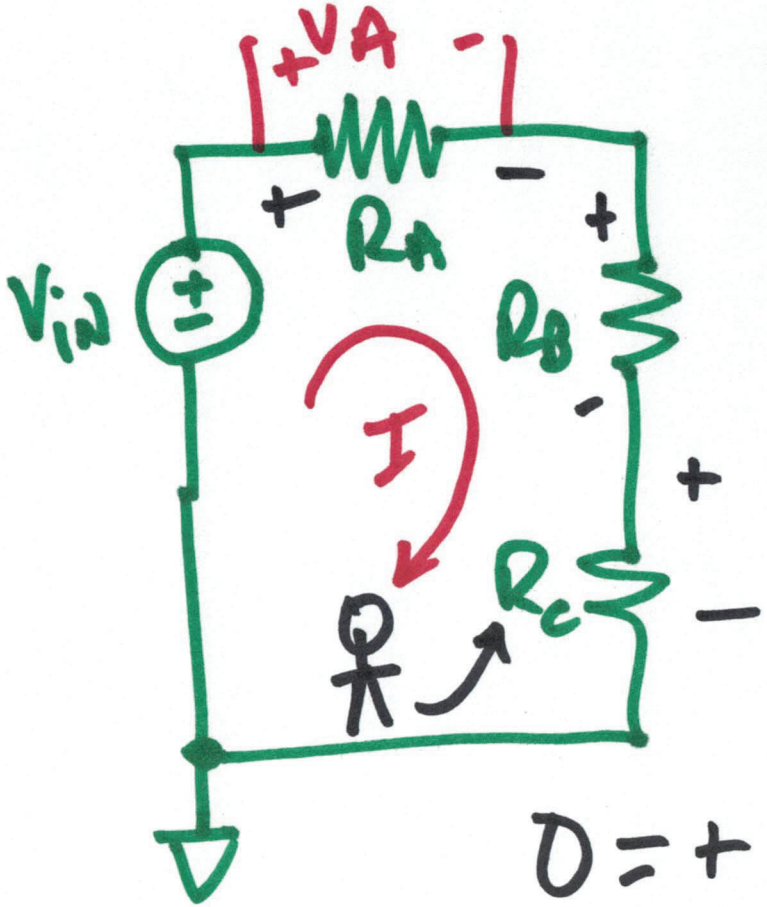


$$V_{OUT} = V_{IN} \cdot \frac{R_2}{R_1 + R_2}$$

Voltage divider Eq.



$$V_x = V_{IN} \cdot \frac{R_1}{R_1 + R_2}$$

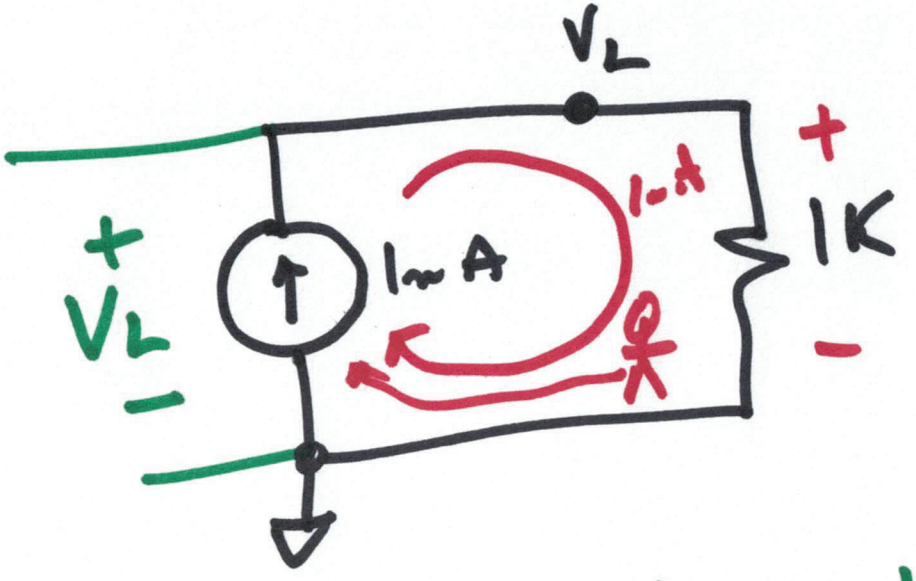


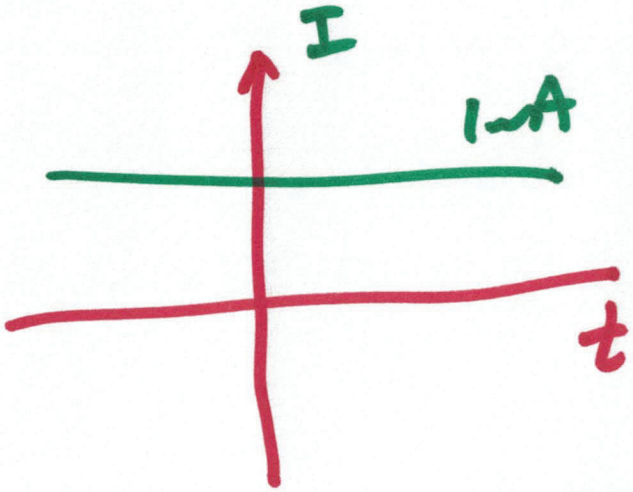
$$I = \frac{V_{IN}}{R_A + R_B + R_C}$$

$$V_A = V_{IN} \cdot \frac{R_A}{R_A + R_B + R_C}$$

$$0 = +R_C \cdot I + R_B \cdot I + R_A \cdot I - V_{IN}$$

$$I = \frac{V_{IN}}{R_A + R_B + R_C}$$





$$V_L = +I \cdot 1K = 1mA \cdot 1K$$

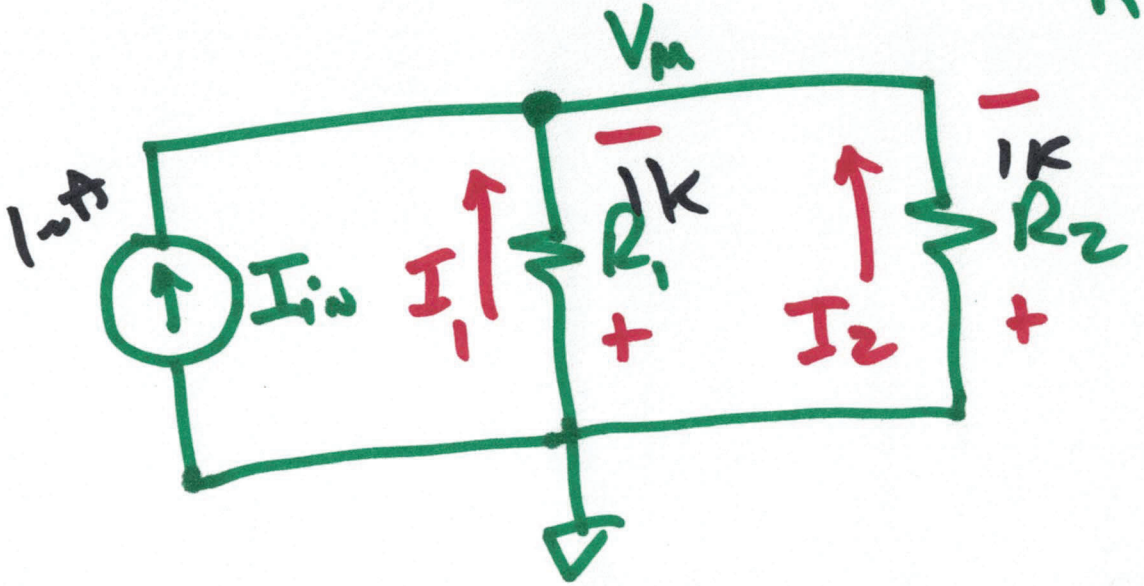
$$= 1V$$

$$+V_L - I \cdot 1K = 0$$

$$V_L = I \cdot 1K = 1mA \cdot 1K$$

$$= 1V$$

Kichoff's current law (KCL)



$$I_{in} + I_1 + I_2 = 0$$

$$I_{in} + \frac{0 - V_m}{R_1} + \frac{0 - V_m}{R_2} = 0$$

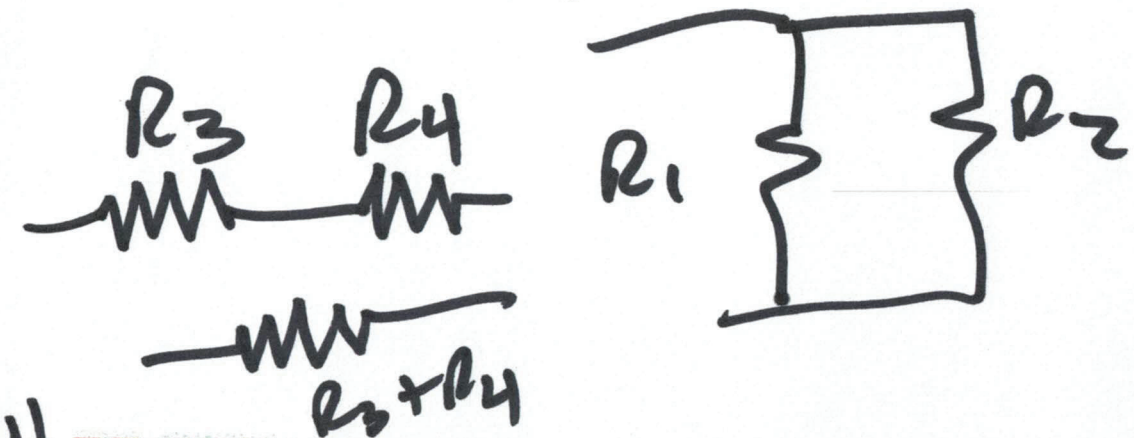
$$I_{in} = +V_m \left(\frac{1}{R_1} + \frac{1}{R_2} \right)$$

$$\frac{I_{in}}{\frac{1}{R_1}+\frac{1}{R_2}} = V_{in}$$

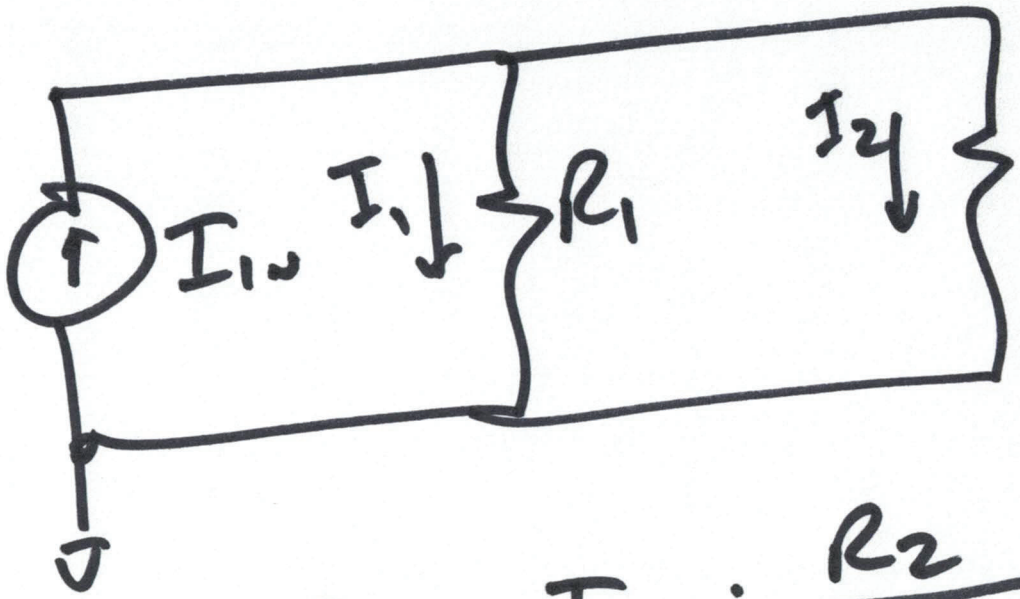
$$\frac{1\text{mA}\cdot 1\text{K}}{2} = \frac{1\text{mA}}{\frac{2}{1\text{K}}} = \frac{1\text{mA}}{\frac{1}{1\text{K}}+\frac{1}{1\text{K}}} = V_{in} = \frac{1}{2}V$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1}+\frac{1}{R_2}$$

Eq Res.



$$\Rightarrow \quad R_{eq} = \frac{1}{\frac{1}{R_1}+\frac{1}{R_2}}$$



current divider

$$I_1 = I_{1N} \cdot \frac{R_2}{R_1 + R_2}$$

$$I_2 = I_{1N} \cdot \frac{R_1}{R_1 + R_2}$$