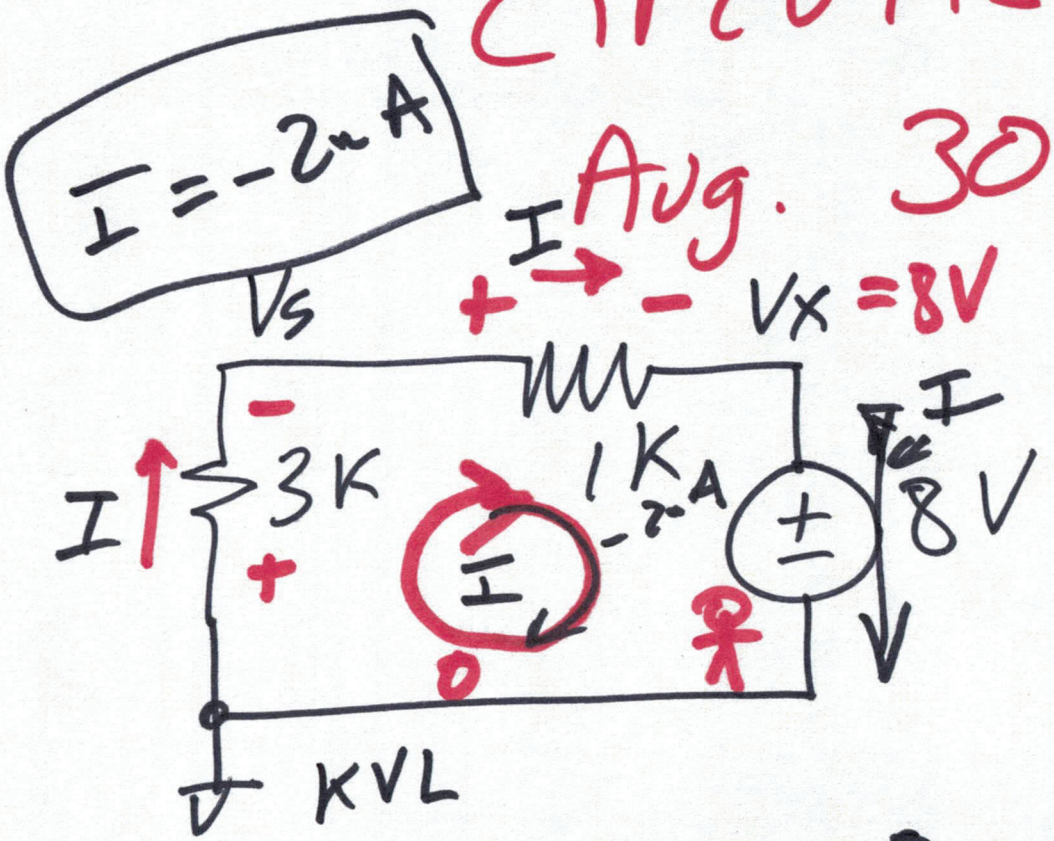
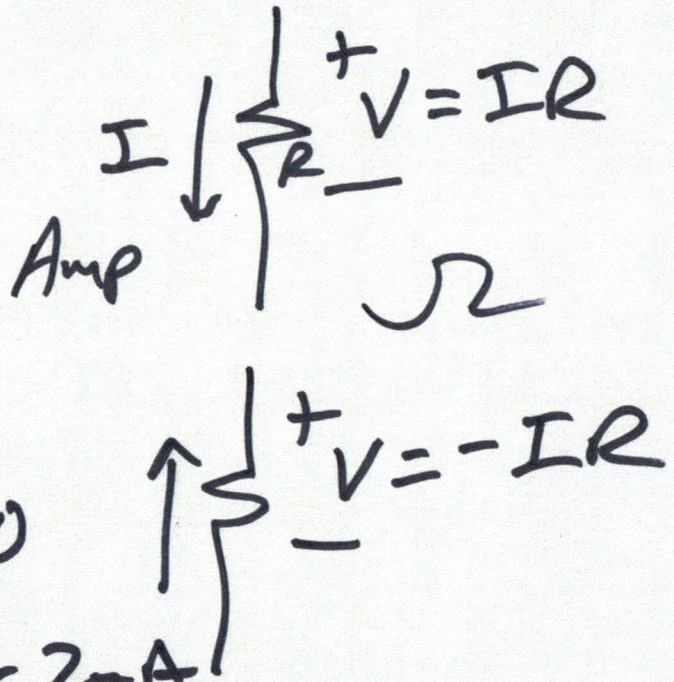
EE 220
Circuits I
Lecture 2
Aug. 30, 2023

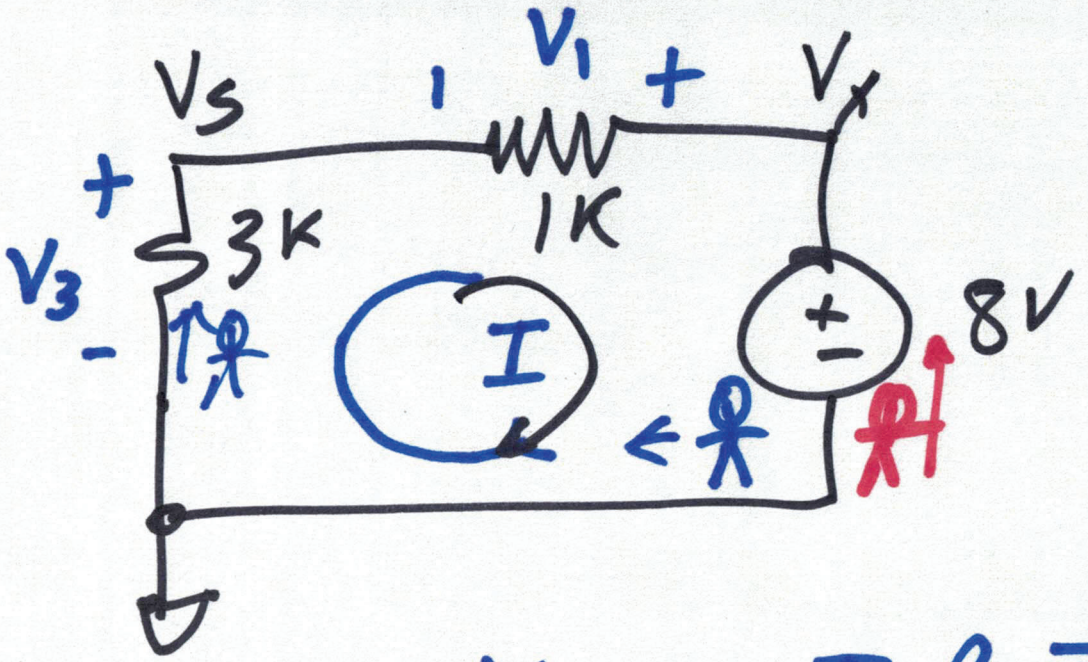


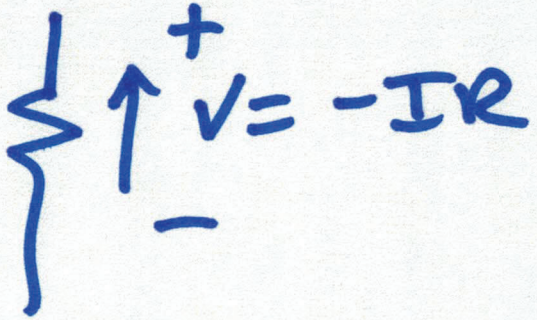
ohm's law



$$+I \cdot 1K + I3K + 8 = 0$$

$$I = \frac{-8}{4K} = -2mA$$





$$V_3 = -I \cdot R = -I \cdot 3K$$

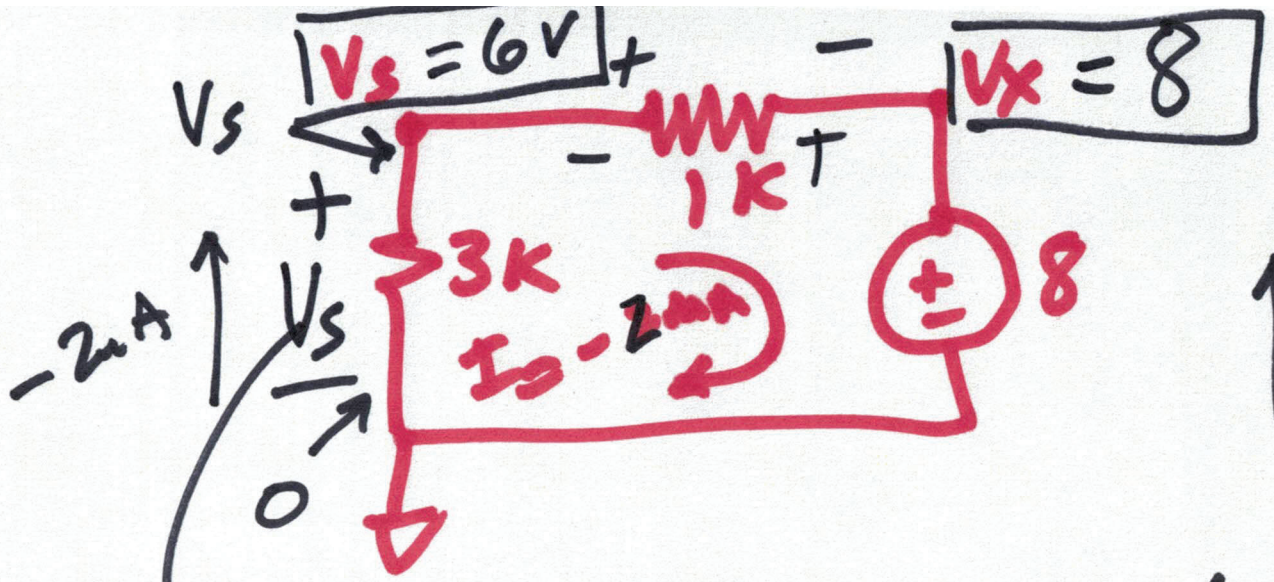
$$V_1 = -I \cdot R = -I \cdot 1K$$

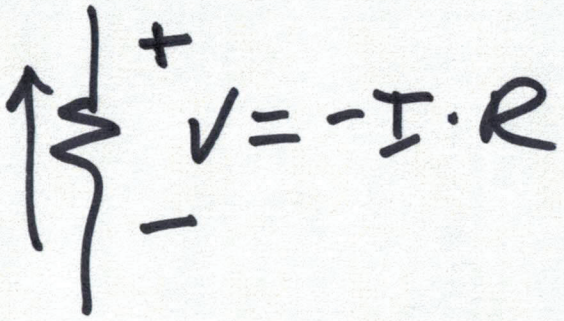
$$+V_3 + V_1 - 8 = 0 \rightarrow -I \cdot 3K - I \cdot 1K - 8$$

$$+8 - V_1 - V_3 = 0 \quad \downarrow$$

$$-I \cdot 4K = 8$$

$$I = -2mA$$

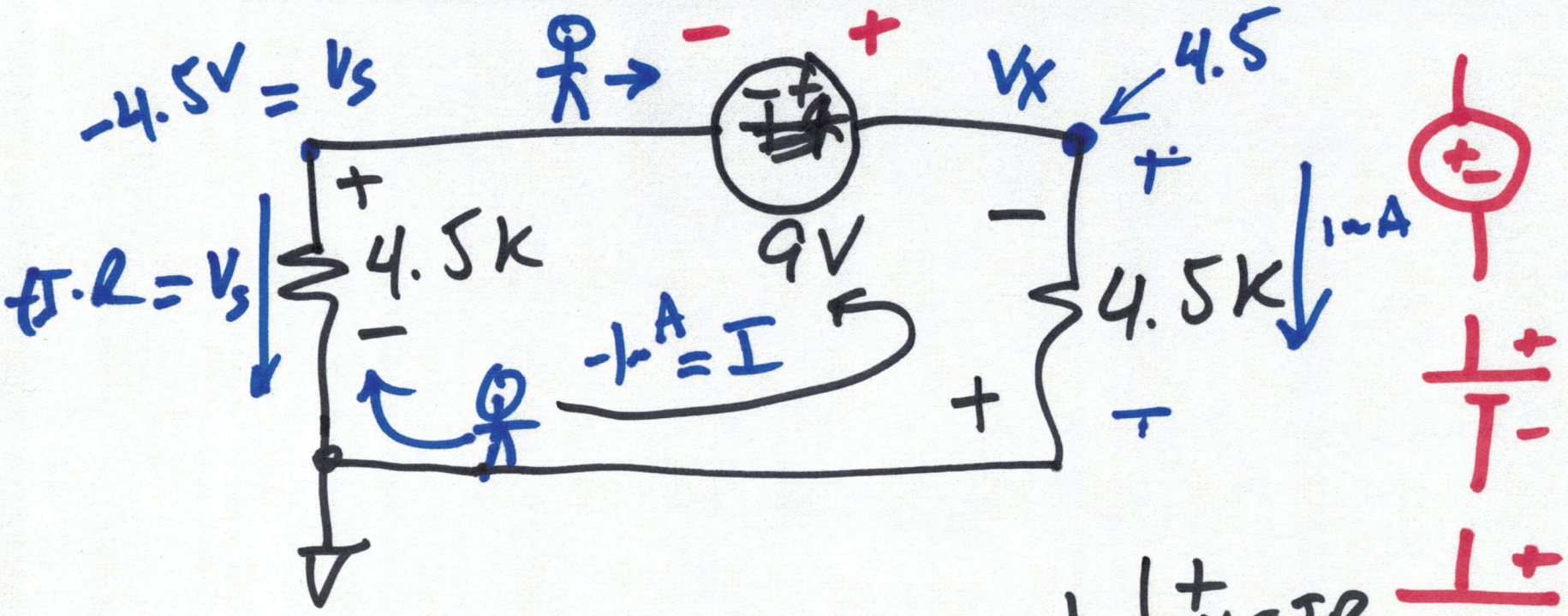




$$V_S = -I \cdot 3K = -(-2A) \cdot 3K = 6v$$

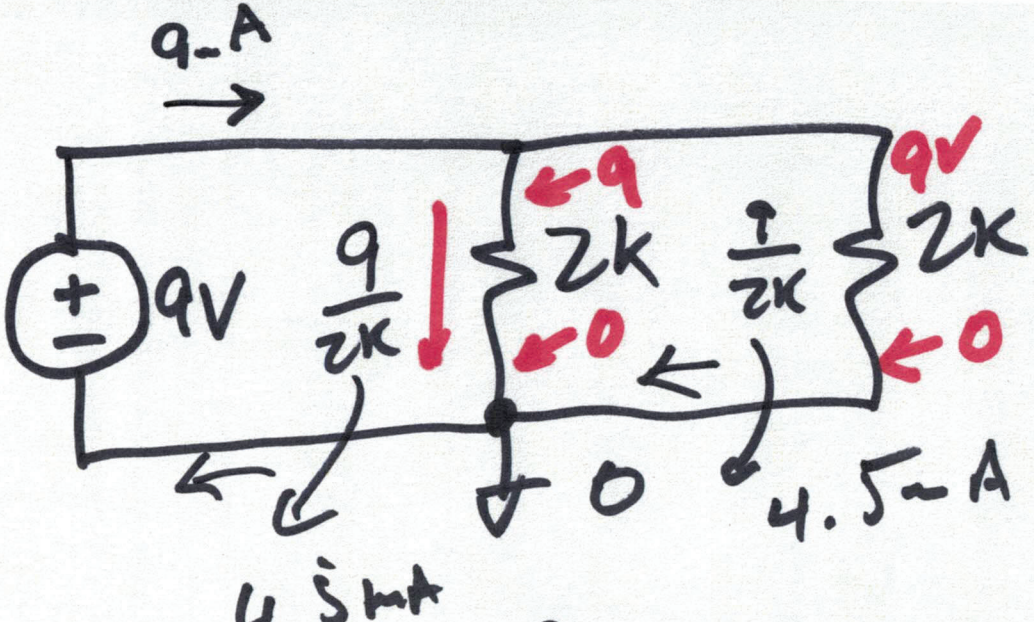
$$8 - 6 = 2$$

$$6 - 8 = -2$$



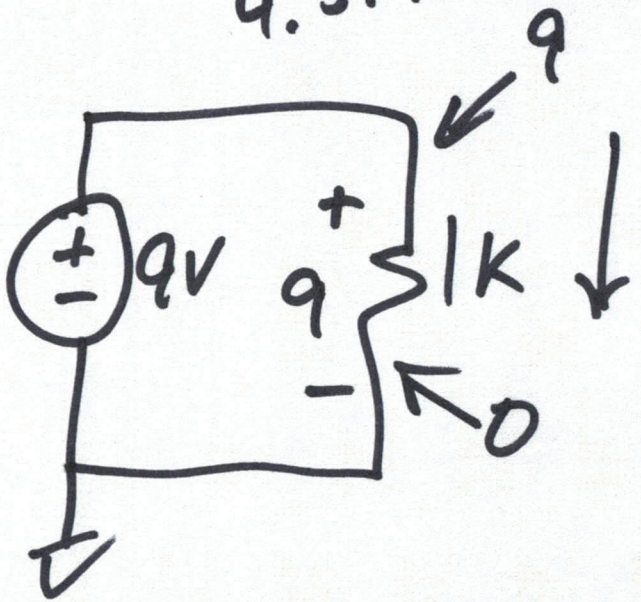
$$+9 + I \cdot 4.5k + I \cdot 4.5k = 0$$

$$\boxed{I = -1mA}$$



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

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



$$\frac{9}{1K} = 9\,mA$$

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

$$\frac{1\text{pool}}{X} = \frac{1\text{pool}}{20} + \frac{1\text{pool}}{30}$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{X} = \frac{1}{20} + \frac{1}{30}$$

$$1 = \frac{X}{X} = X\left(\frac{1}{20} + \frac{1}{30}\right)$$

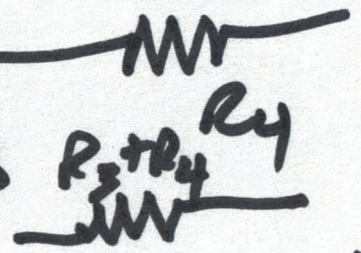
$$1 = X\left(\frac{30 \cdot 1}{20 \cdot 30} + \frac{20 \cdot 1}{30 \cdot 20}\right)$$

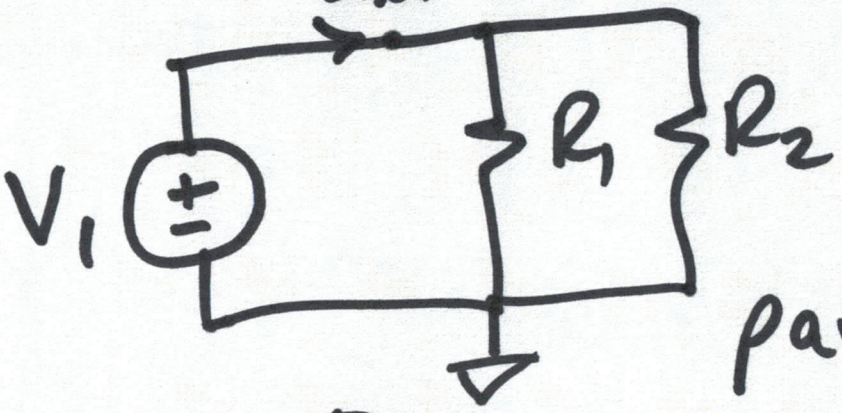
$$1 = X\left(\frac{30 + 20}{20 \cdot 30}\right)$$

$$X = \frac{20 \cdot 30}{20 + 30} = \frac{600}{50} = 12 \text{ hrs}$$

$V = I \cdot R$

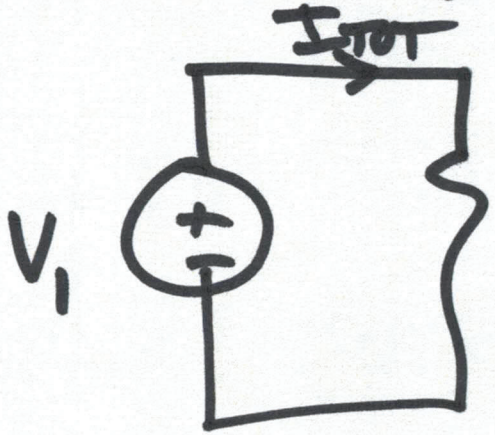
series





$$\frac{V_1}{R_1} + \frac{V_1}{R_2} = I_{TOT}$$

parallel



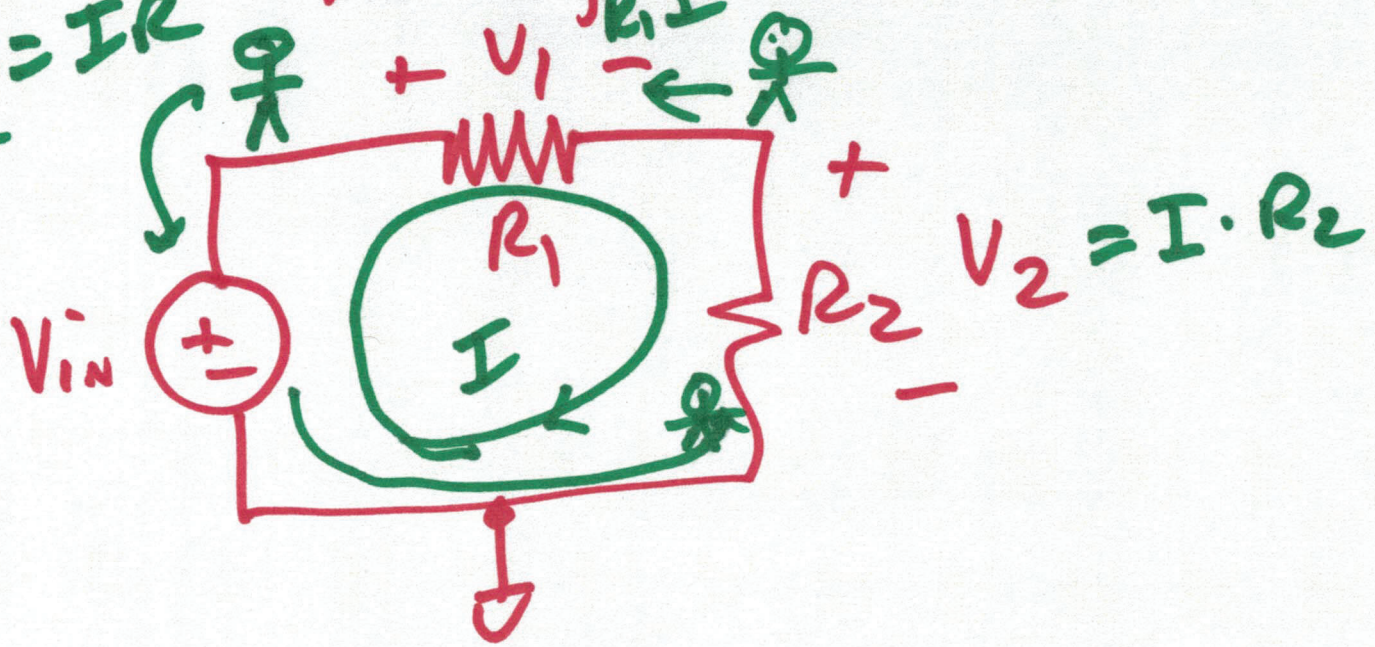
$$\frac{V_1}{R_{eq}} = I_{TOT}$$

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

$$\frac{V_1}{R_{eq}} = \frac{V_1}{R_1} + \frac{V_1}{R_2}$$

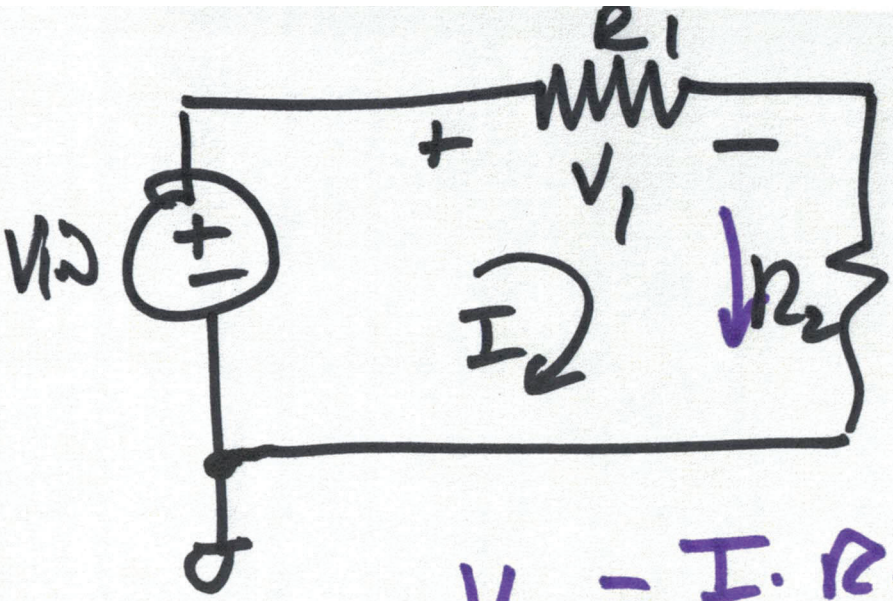
Voltage divider

$V = IR$



$$-V_{in} + I \cdot R_2 + I \cdot R_1 = 0$$

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



$$I = \frac{V_{IN}}{R_1 + R_2}$$

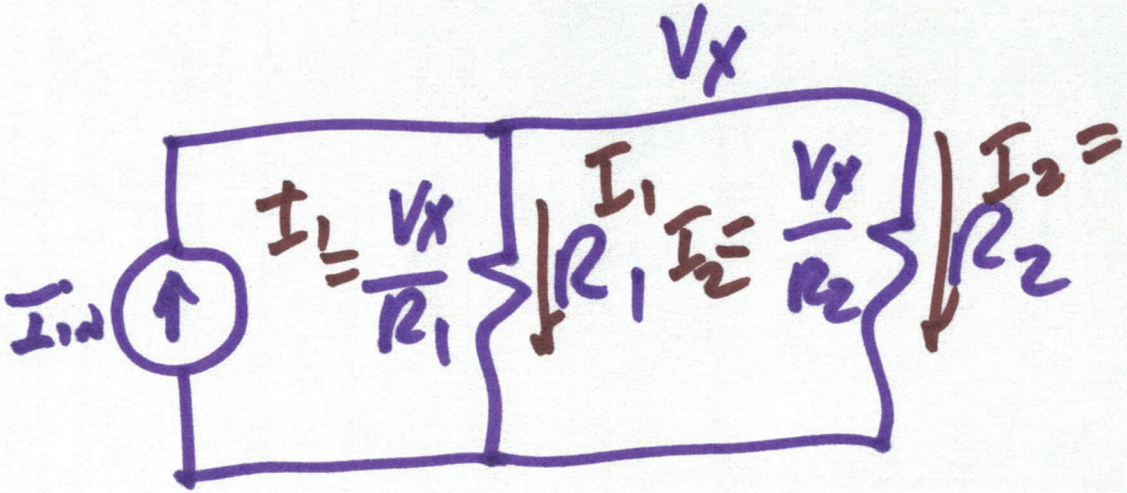
$$V_2 = I \cdot R_2 = V_{IN} \cdot \frac{R_2}{R_1 + R_2}$$

Voltage divider

$$V_2 = V_{IN} \cdot \frac{R_2}{R_1 + R_2}$$

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

a)



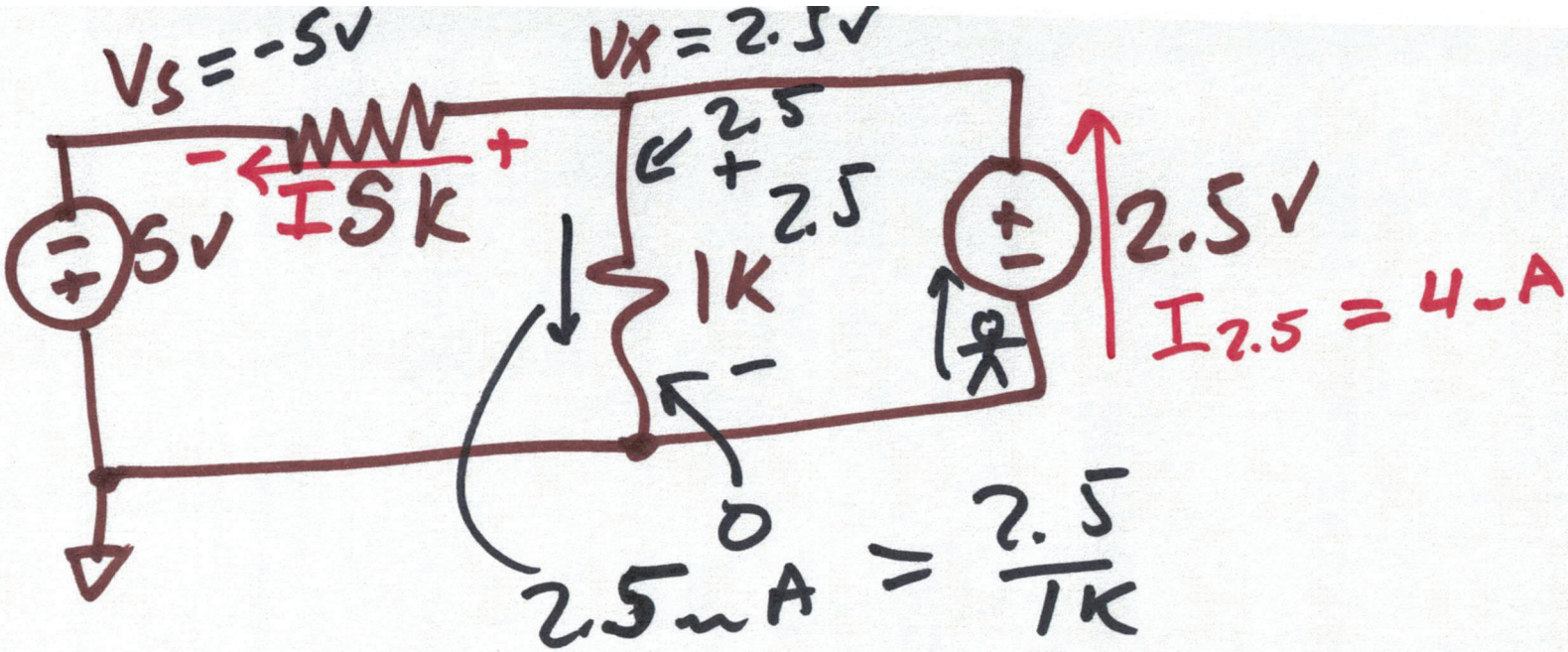
$$I_2 = I_{IN} \cdot \frac{R_1}{R_1 + R_2}$$

$$I_{IN} = \frac{V_X}{R_1} + \frac{V_X}{R_2}$$

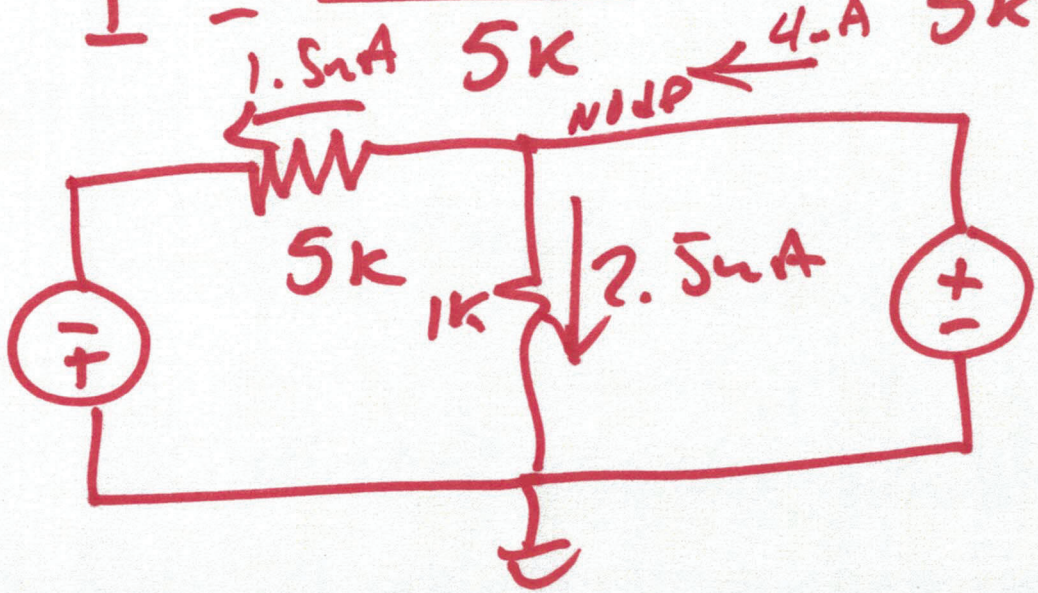
$$I_1 = I_{IN} \cdot \frac{R_2}{R_1 + R_2}$$

$$V_X = \frac{I_{IN}}{\frac{1}{R_1} + \frac{1}{R_2}}$$

CURRENT divider



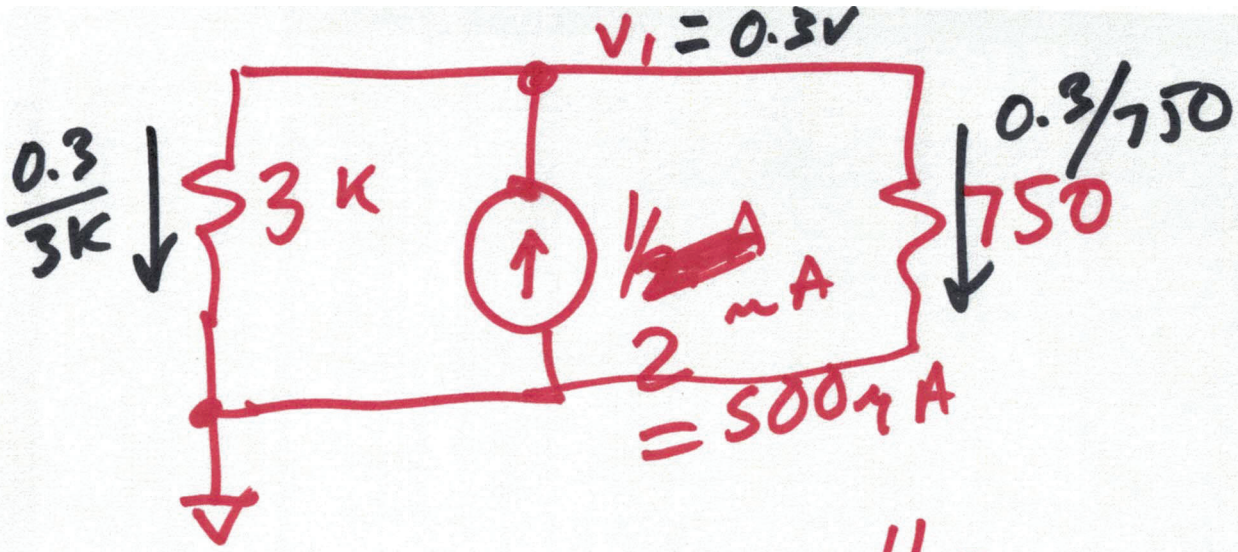
$$I = \frac{2.5-(-5)}{5K} = \frac{7.5}{5K} = 1.5mA$$

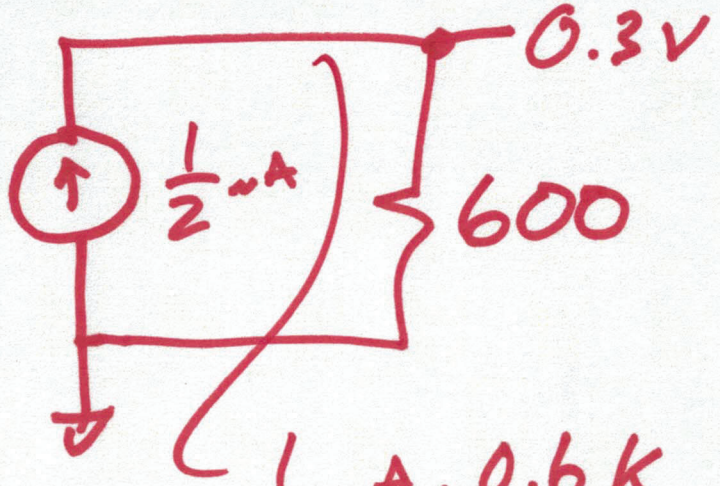


Kirchoff's current law

KCL

KVL





$750 \parallel 3K$

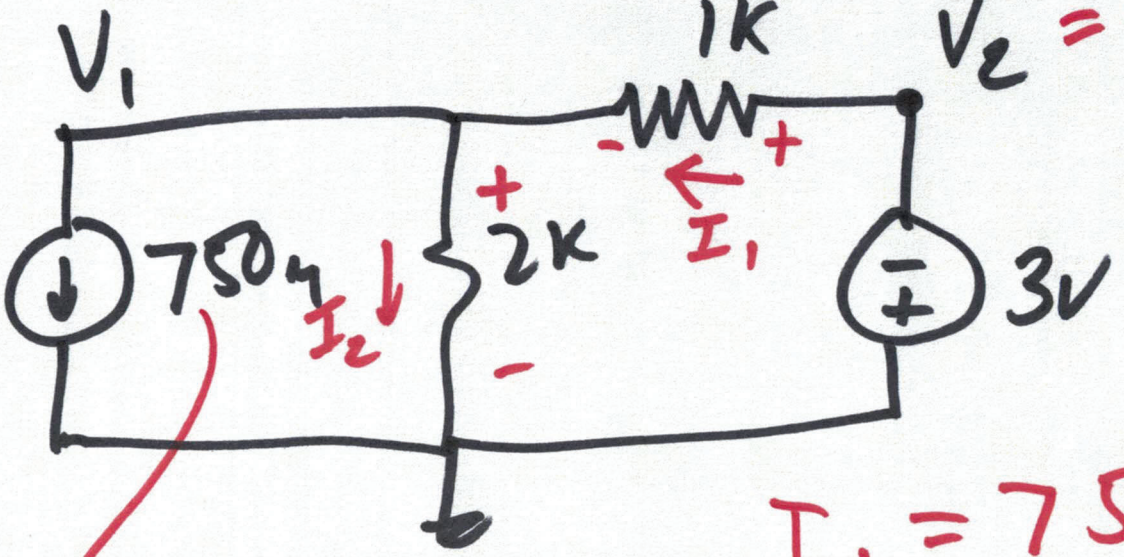
$$\frac{750 \cdot 3000}{750 + 3000} = \frac{\cancel{750} \cdot 750 \cdot 4}{\cancel{750} \cdot 5}$$

$= 150 \cdot 4$

600

$\frac{1}{2}$ mA $\cdot$ 0.6 K $= 0.3V$

$$\begin{array}{r} 150 \\ 5\overline{)750} \\ 500 \\ \hline 250 \end{array}$$



$I_1 = 750\mu + I_2$ KCL

750μA KVL $-3V - I_1 \cdot 1K - I_2 \cdot 2K = 0$

$= 0.75mA$

$= 0.00075\ A$

13)