EE 220

Lecture 3

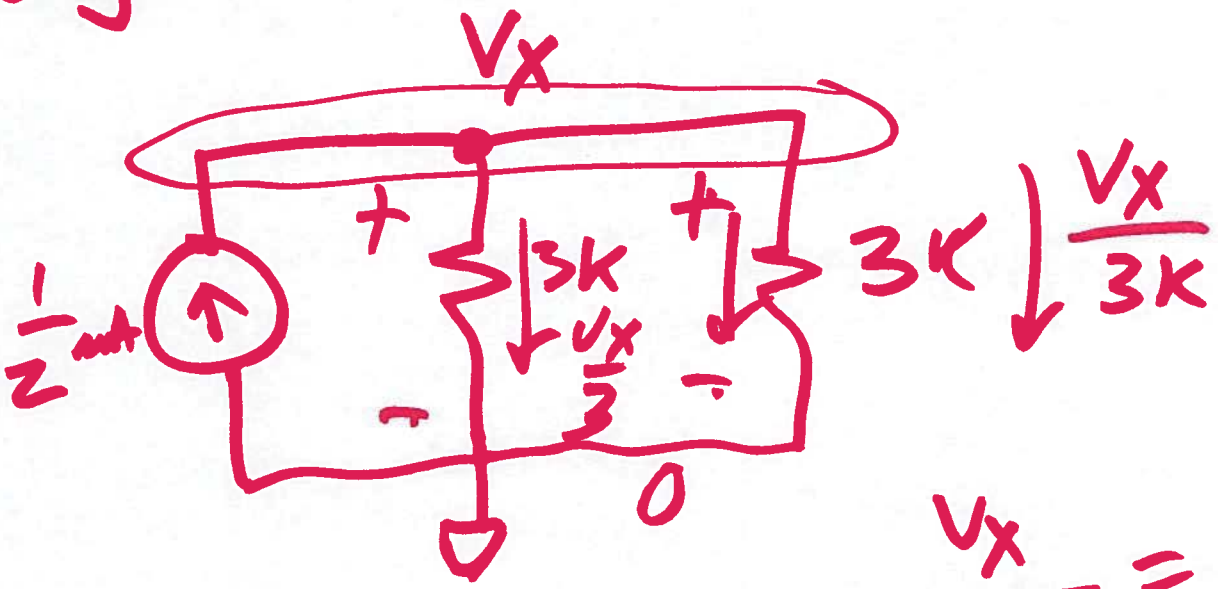
Sept. 6, 2017

V=IR

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

KCL

2.9



$\frac{1}{2}mA = \frac{V_x}{3k} + \frac{V_x}{3k}$

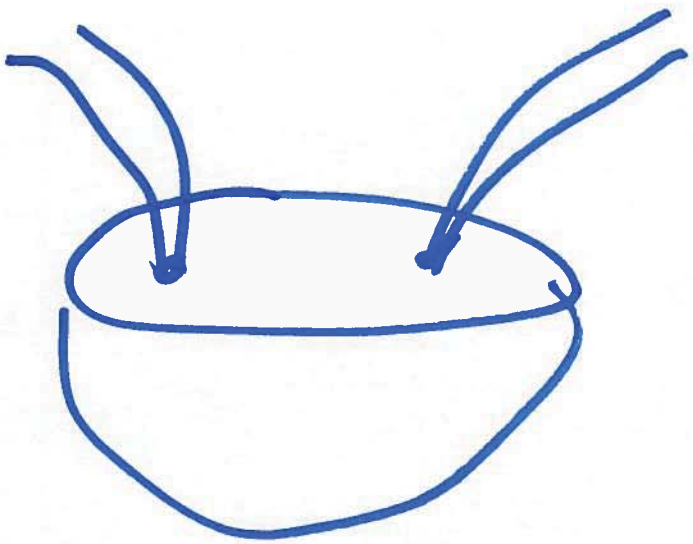
$\frac{V_x}{\frac{1}{2}mA} = \frac{1}{\frac{1}{3k} + \frac{1}{3k}}$

$$\frac{ab}{c} = \frac{5\cdot(a+3)}{4}$$

$$\frac{b}{1} = \frac{5\cdot c\cdot(a+3)}{4\cdot a}$$

$$\frac{4ab}{5(a+3)} = c$$

20hours 10 hours



$$\frac{1\ \text{pool}}{20\ \text{hours}} + \frac{1\ \text{pool}}{10\ \text{hours}} = \frac{1\ \text{pool}}{\text{together}}$$

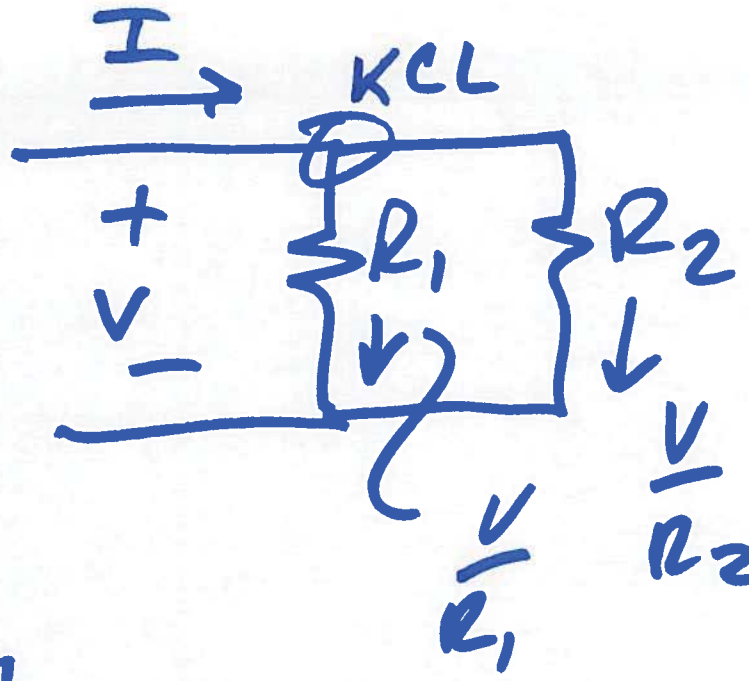
$$\frac{1}{20} + \frac{1}{10} = \frac{1}{T}$$

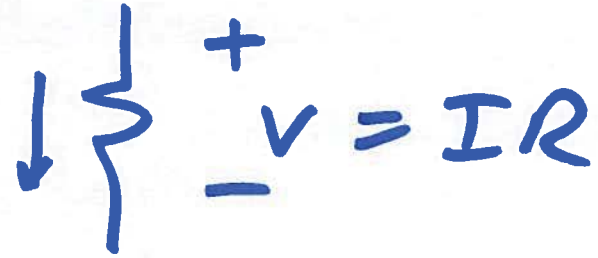
$$\frac{10 \cdot 20}{20+10} = \frac{1}{T} \Rightarrow T = \frac{20+10}{10 \cdot 20}$$

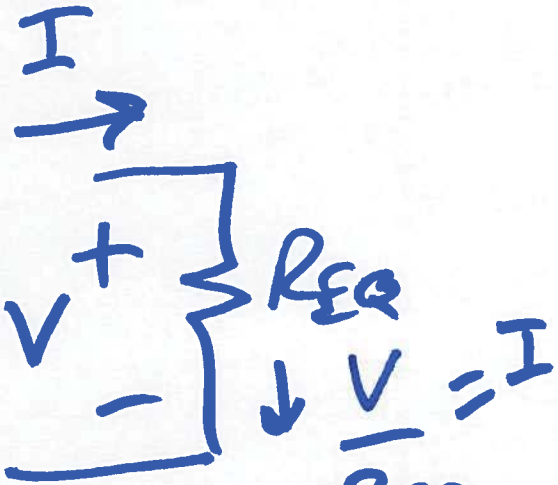
$$T = \frac{200}{30} = 6.67\text{hrs}$$

$$= \frac{1}{\frac{10 \cdot 20}{20+10}}$$

3)

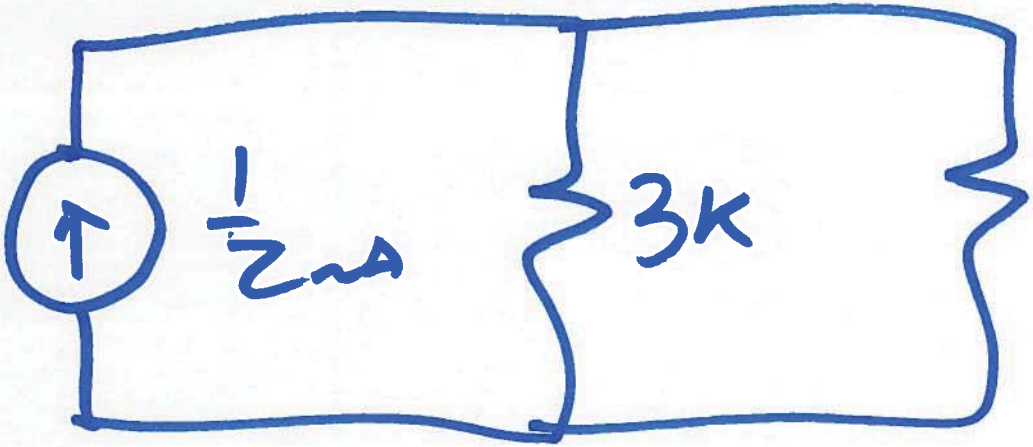




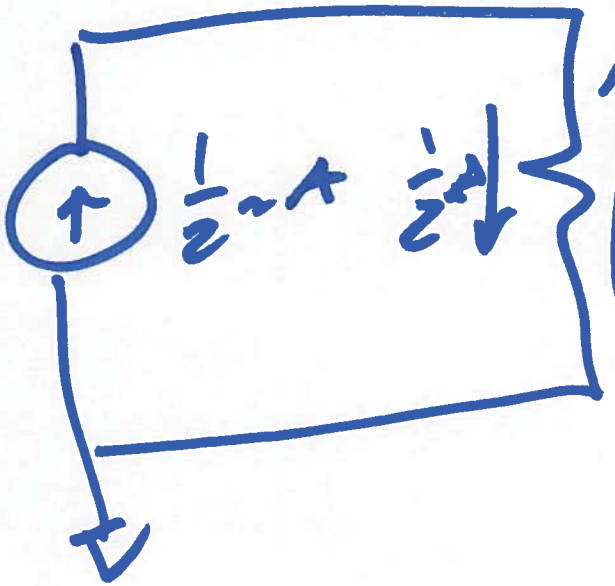


$$\frac{I}{1} = \frac{V}{R_1} + \frac{V}{R_2} = V\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$$

$$R_{EQ} = \frac{V}{I} \qquad \frac{V}{I} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} = \boxed{\frac{R_1 R_2}{R_1 + R_2} = R_{eq}}$$



$$R_{eq} = \frac{3k \cdot 3k}{3k + 3k} = \frac{9 \cdot k \cdot k}{6 \cdot k} = 1.5k$$



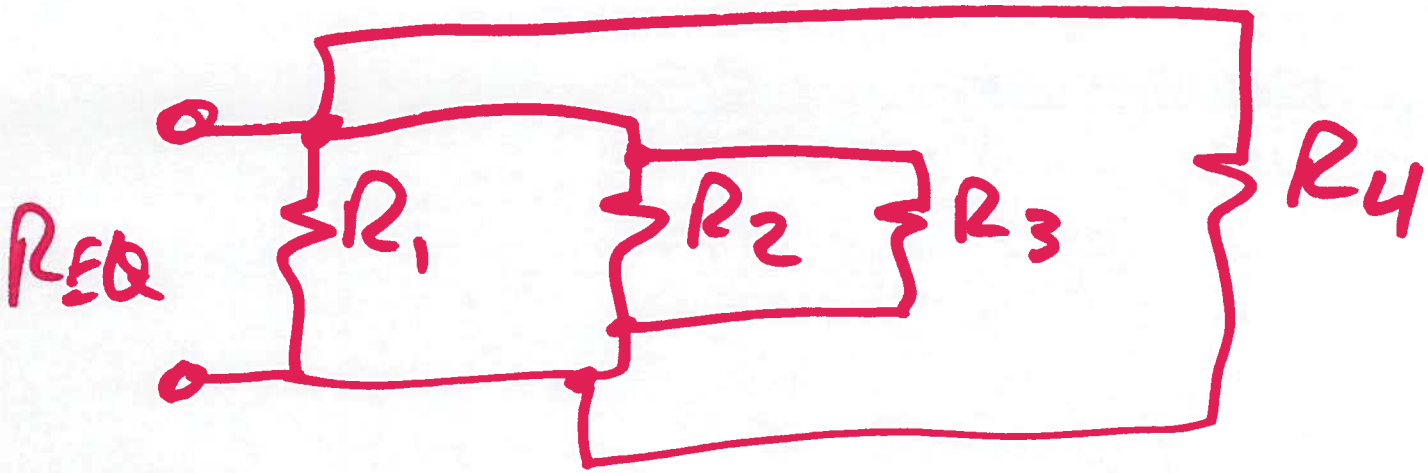
$-\frac{1}{2}$ mA

$+$

$V = \frac{1}{2}\,mA \cdot 1.5k$

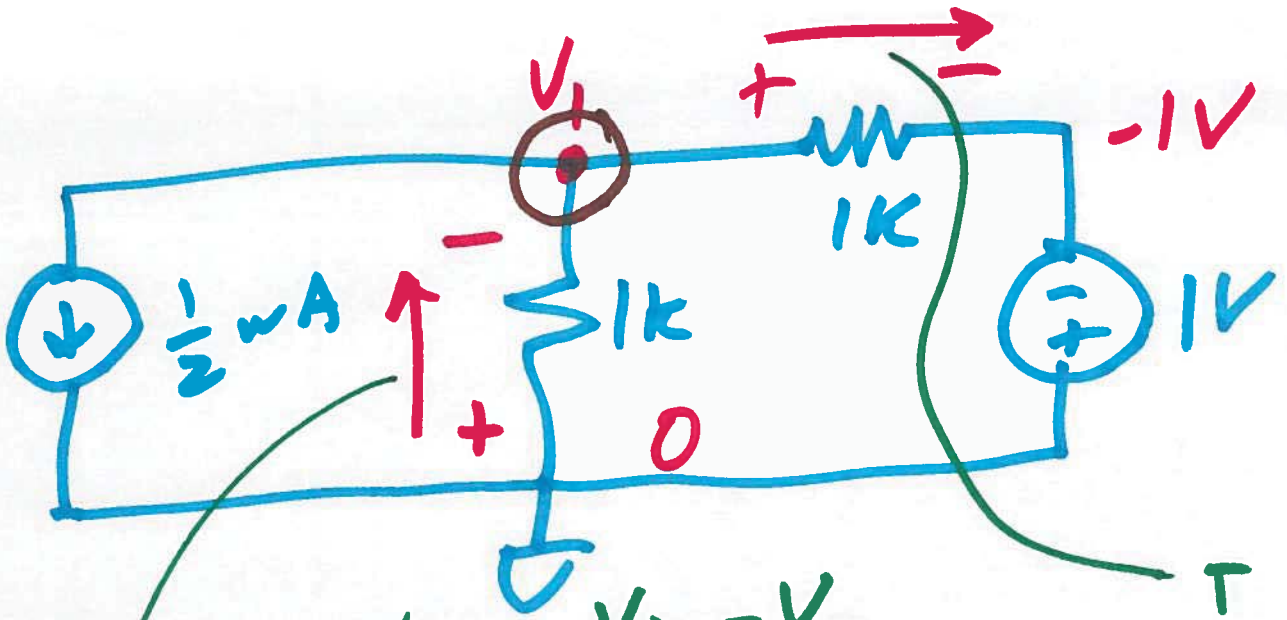
$-$

$= 0.75\,V$



$$\frac{1}{R_{EQ}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$$

Parallel Resistors



$$I = \frac{V}{R} = \frac{V_+ - V_-}{R}$$

$$I = \frac{V_1 - V_2}{1K}$$

$$I = \frac{0 - V_1}{1K} = \frac{-V_1}{1K}$$

$$= \frac{V_1 - (-1)}{1K}$$

$$= \frac{V_1 + 1}{1K}$$

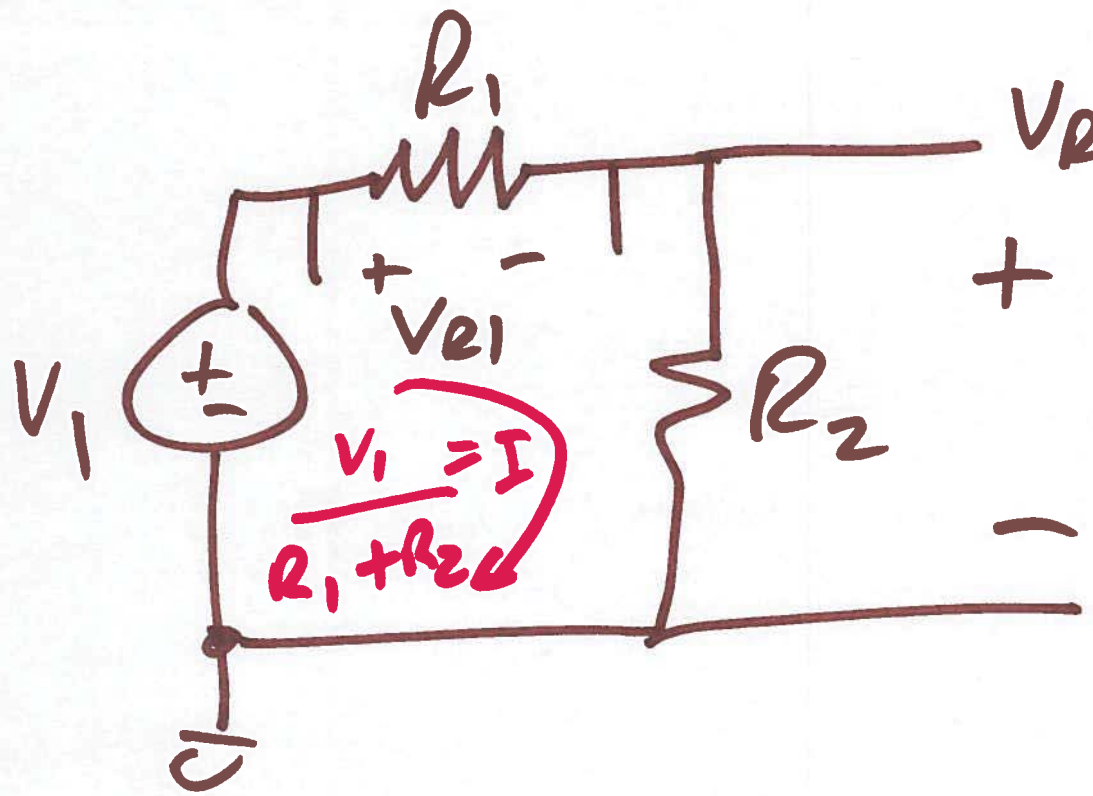
$$-\frac{V_1}{1K} = \frac{1}{2}mA + \frac{V_1+1}{1K}$$

$$2V_1 = -1.5V$$

$$-V_1 = \frac{1}{2}V + V_1 + 1$$

$$V_1 = -.75V$$

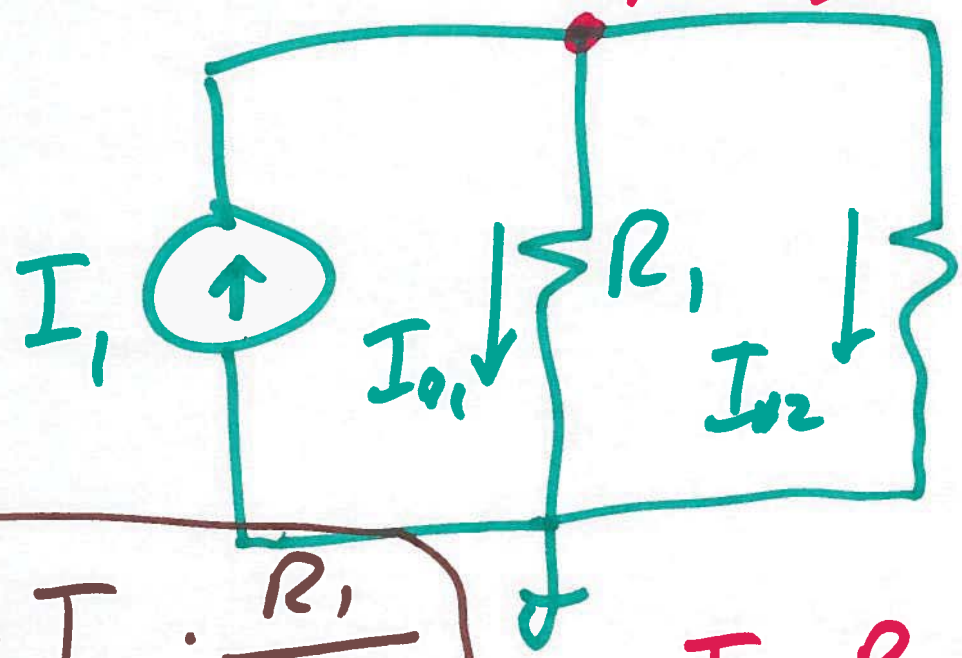
Voltage divider (attenuator)



$$V_{R2} = I \cdot R_2 = V_1 \cdot \frac{R_2}{R_1 + R_2}$$

$$V_{R1} = I \cdot R_1 = V_1 \cdot \frac{R_1}{R_1 + R_2}$$

CURRENT divider



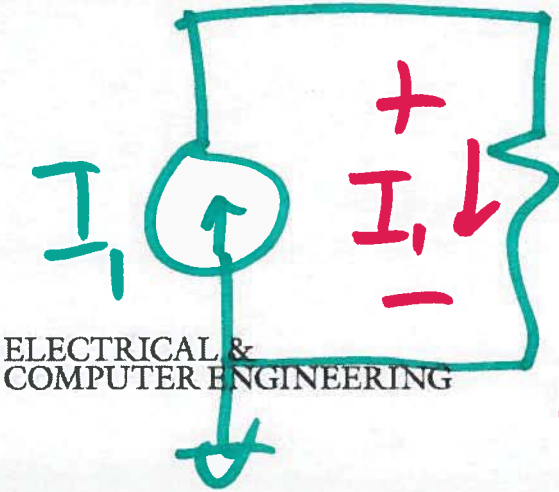
$$I_1 \cdot \frac{R_1 \cdot R_2}{R_1 + R_2} = V_1$$

$$I_{R1} = \frac{V_1}{R_1}$$

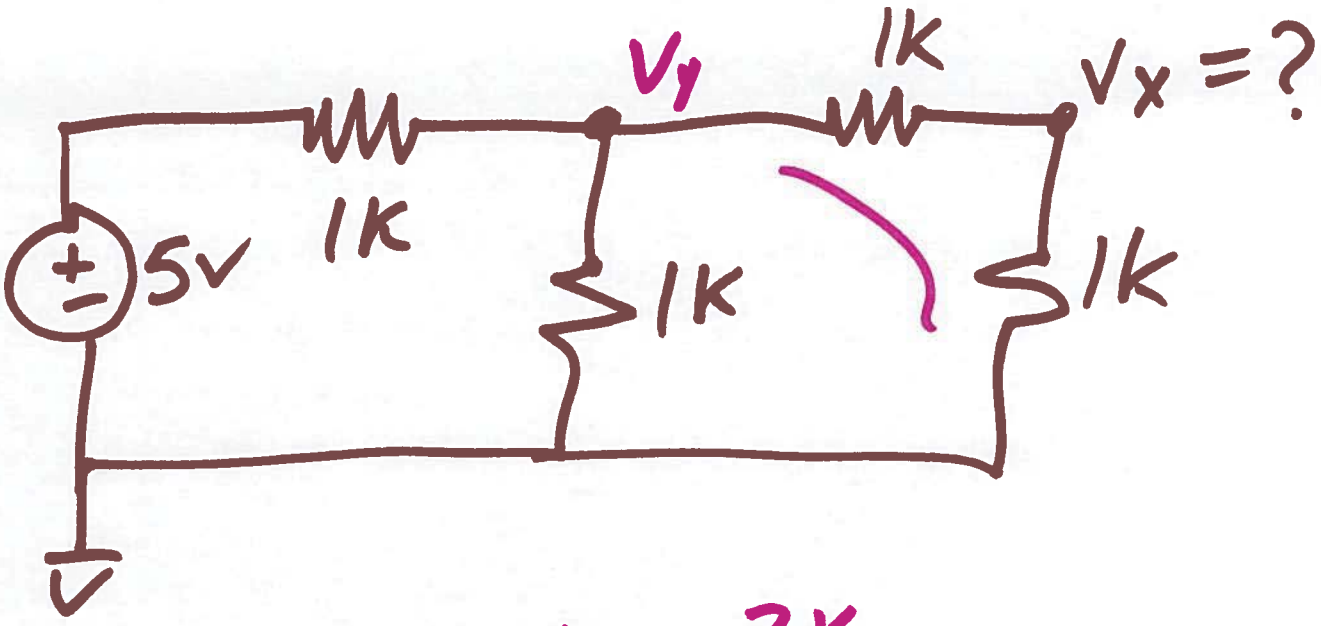
$$I_{R1} = I_1 \cdot \frac{R_2}{R_1 + R_2}$$

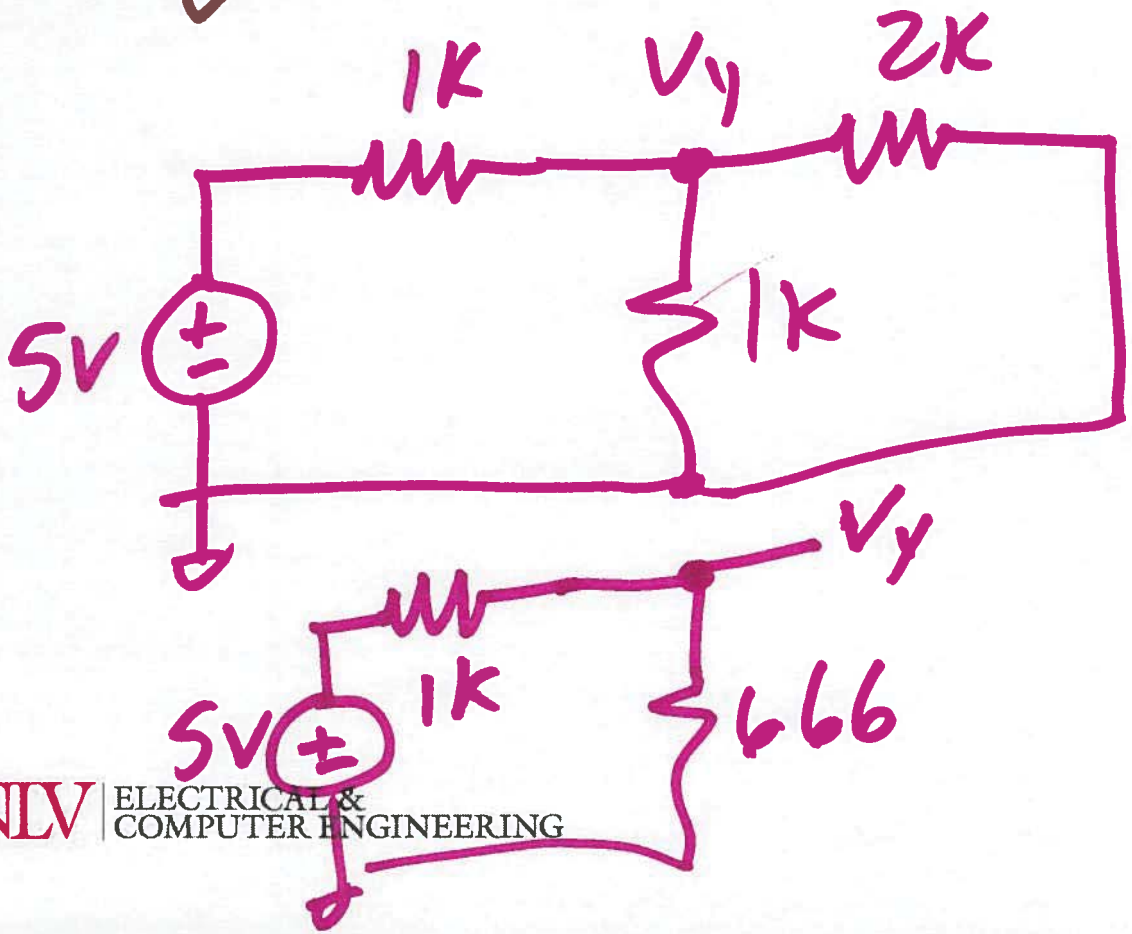
$$I_{R2} = I_1 \cdot \frac{R_1}{R_1 + R_2}$$

$$I_1 \cdot \frac{R_1 \cdot R_2}{R_1 + R_2}$$



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

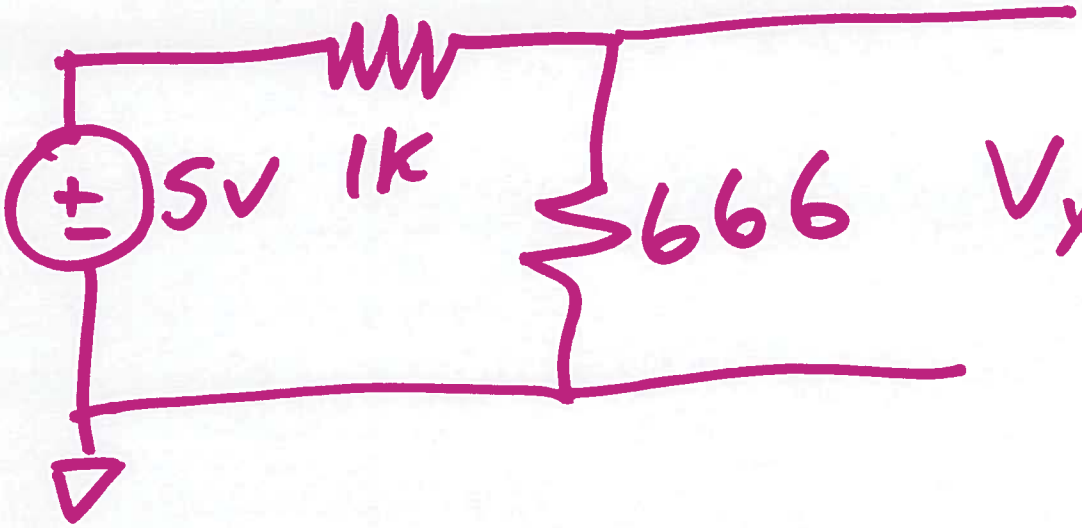




$$\frac{1}{R_{EQ}} = \frac{1}{1K} + \frac{1}{2K}$$

$$R_{eq} = \frac{1K \cdot 2K}{1K + 2K}$$

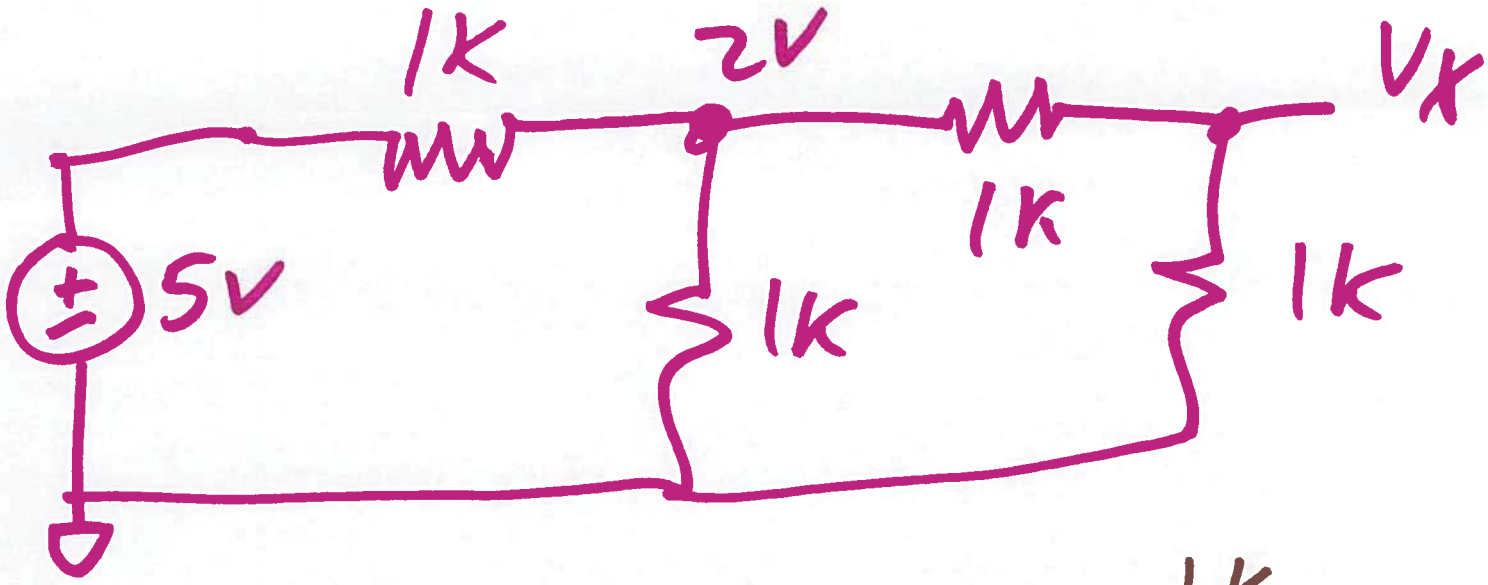
$$= 666\,\Omega$$



$$V_y = 5 \cdot \frac{666}{1k + .666k}$$

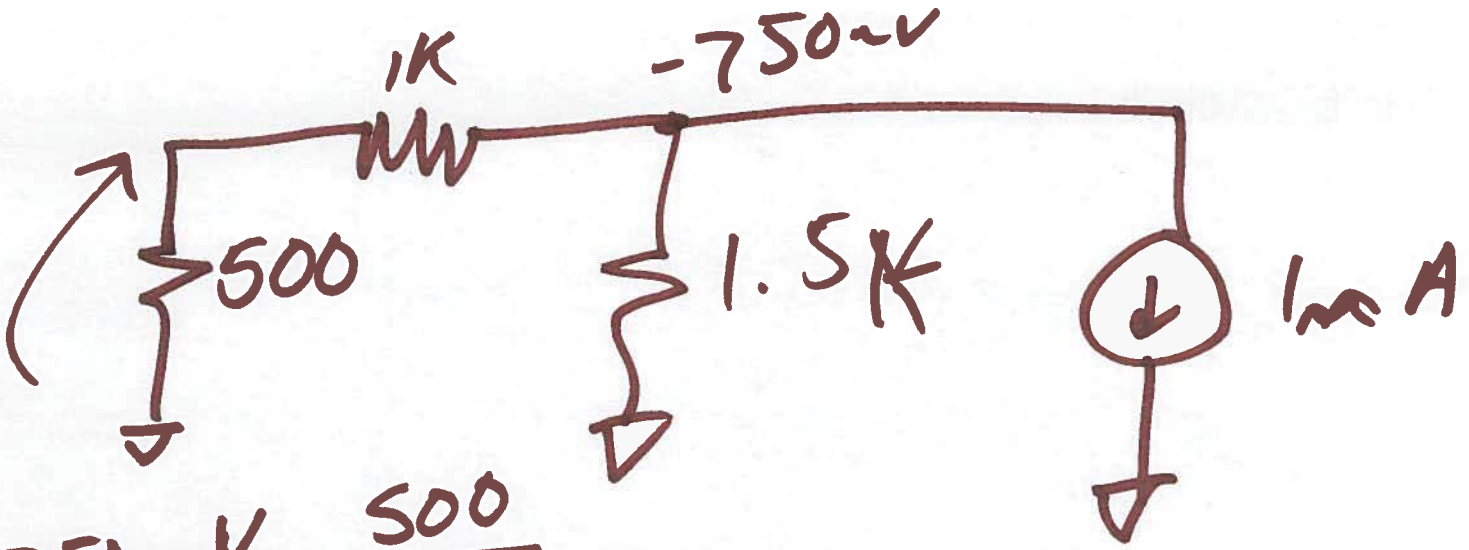
$$= 5 \cdot \frac{\frac{2}{3}k}{\frac{2}{3}k}$$

$$\boxed{V_y = 2V}$$

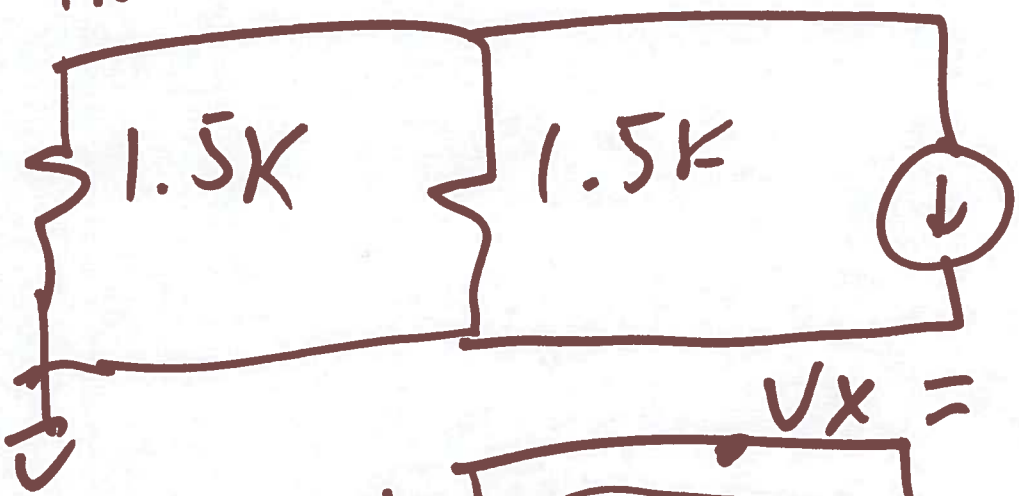


$$V_x = \frac{1k}{1k+1k} \cdot 2$$

$$V_x = 1V$$



$$-750\text{mV} \cdot \frac{500}{1\text{K}+500}$$



$$V_X = (-1\text{mA}) \cdot 750$$

$$= -750\text{mV}$$