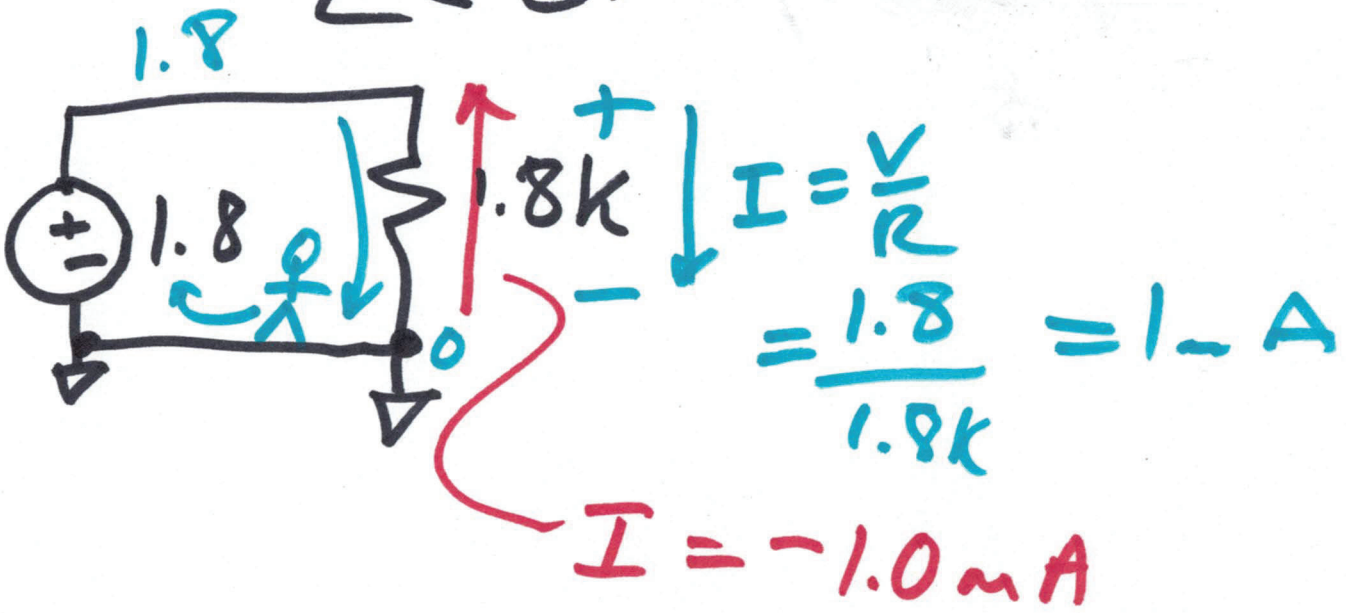
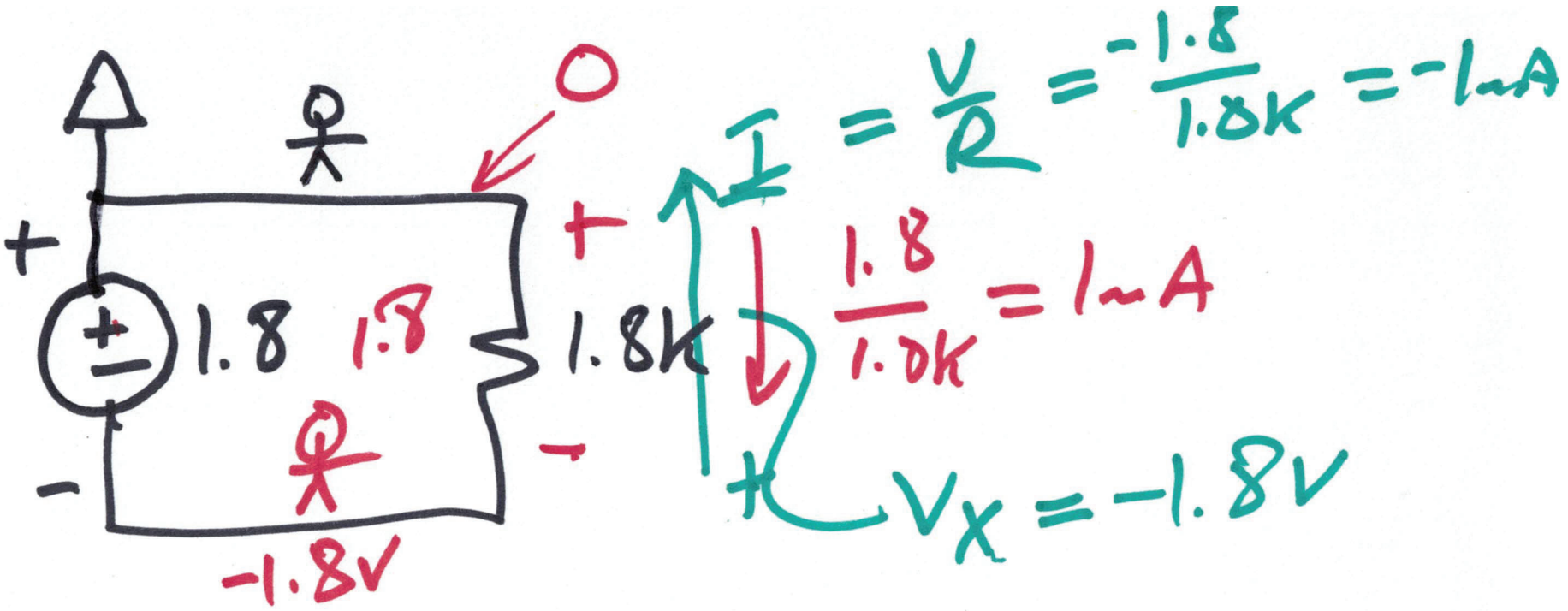
EE 220 circuits 1

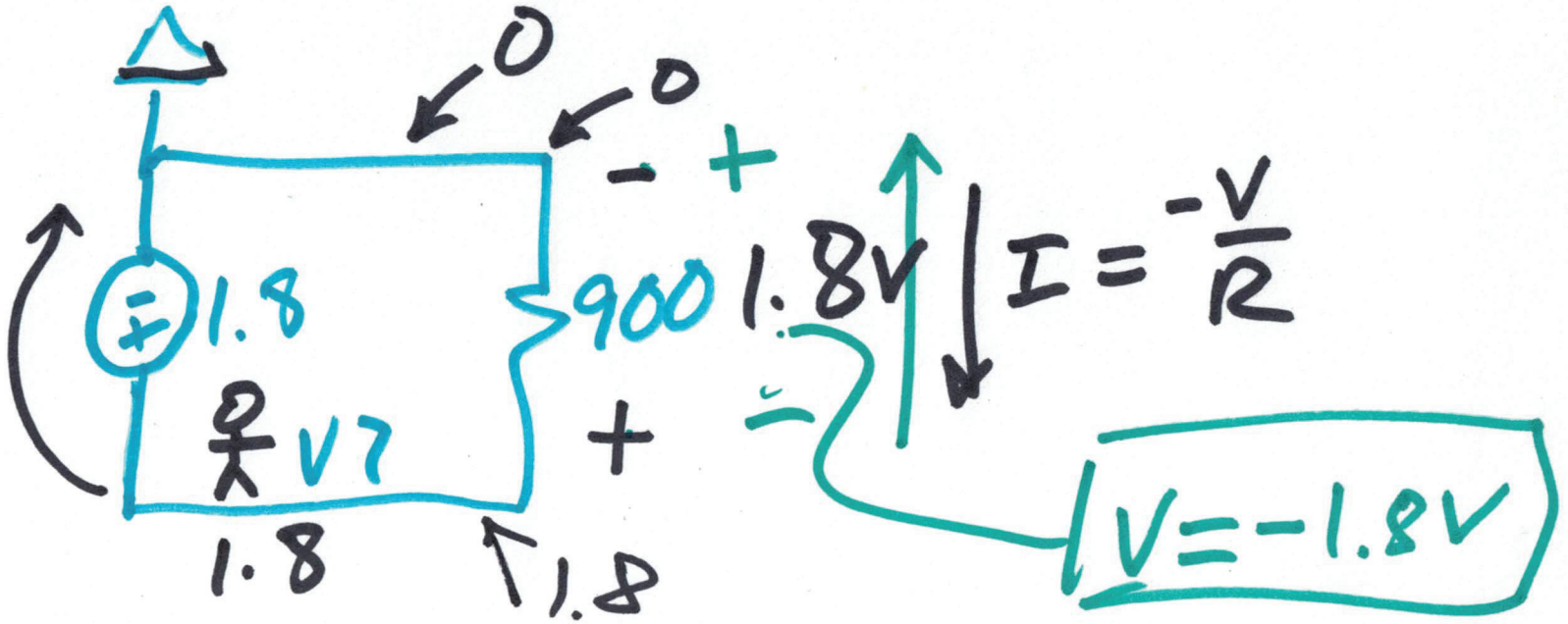
August 26, 2020

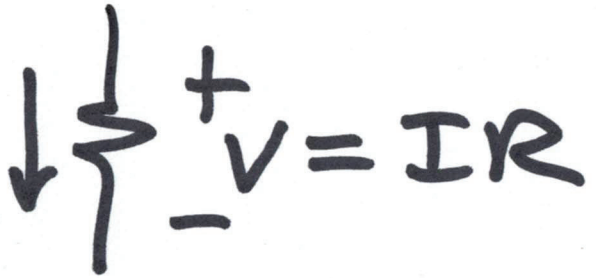
Lecture 2

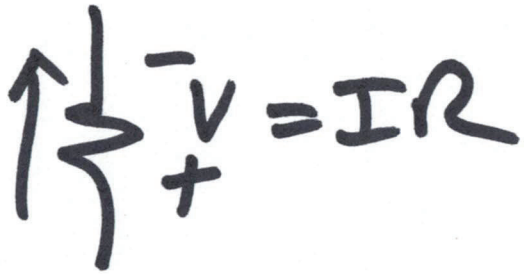



0
+
1.8
1.8
−
+
1.8K
−
−1.8V
I = V/R = -1.8/1.8K = -1mA
1.8/1.8K = 1mA
+
Vx = -1.8V


0
1.8
-1.8
0
1.8

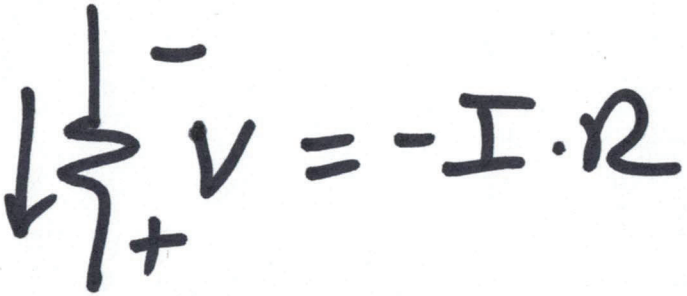


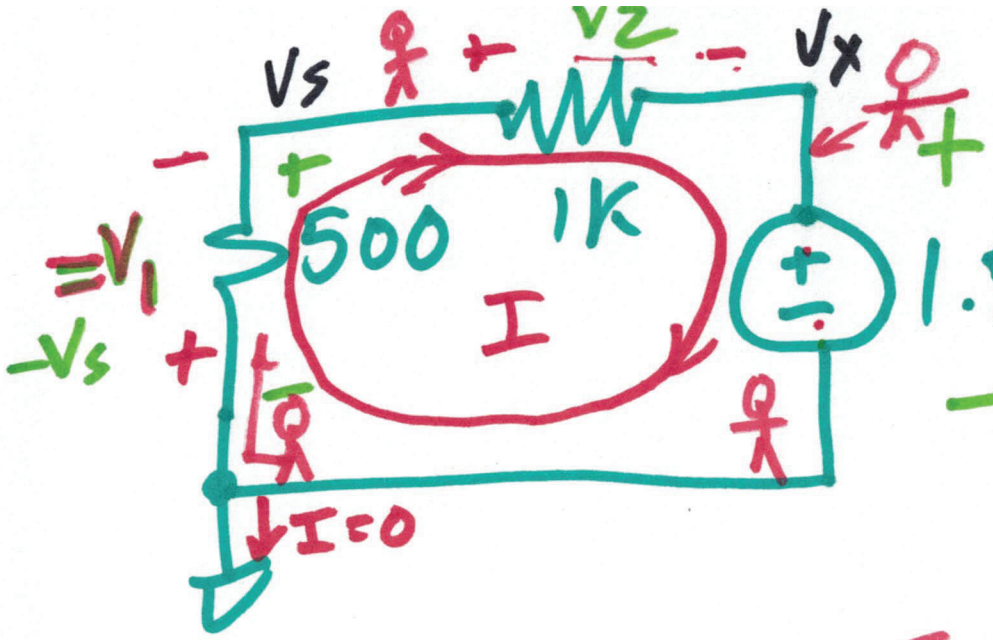




$$I = \frac{V}{R} = 2mA$$

$$\frac{1.8}{900} = 2mA$$





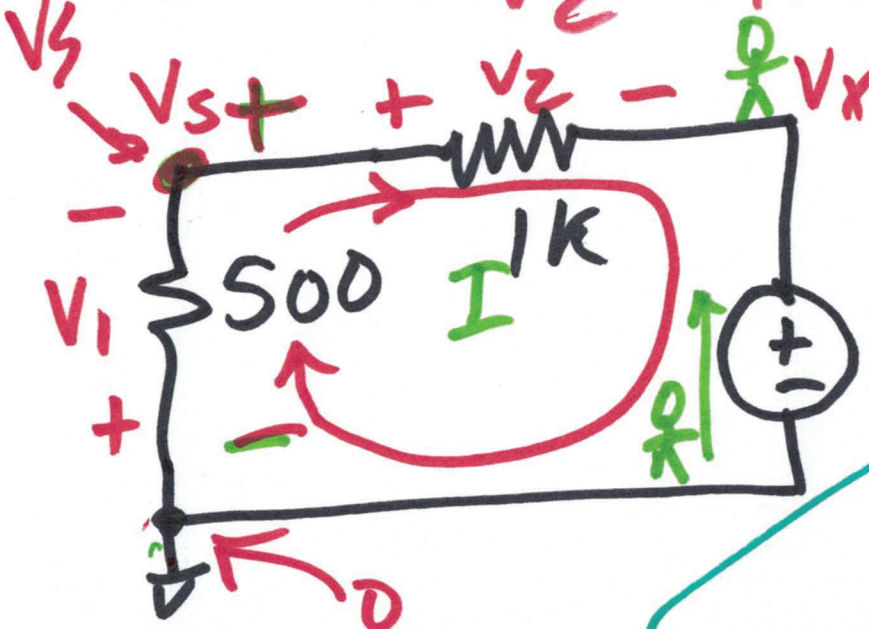
$1.5V = +V_2 - V_x$

$+V = IR$

$V_1 = I \cdot 500$

$V_2 = I \cdot 1K$ (OL)

$-V_2 - 1.5 - V_1 = 0$ (KVL)



$1.5 + \underbrace{I \cdot 1K}_{V_2} + \underbrace{I \cdot 500}_{V_1 = -V_s} = 0$

$V_s - 0 = 0 - V_1 = 0 - (-V_s)$

$1.5 + 1.5K \cdot I = 0$

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

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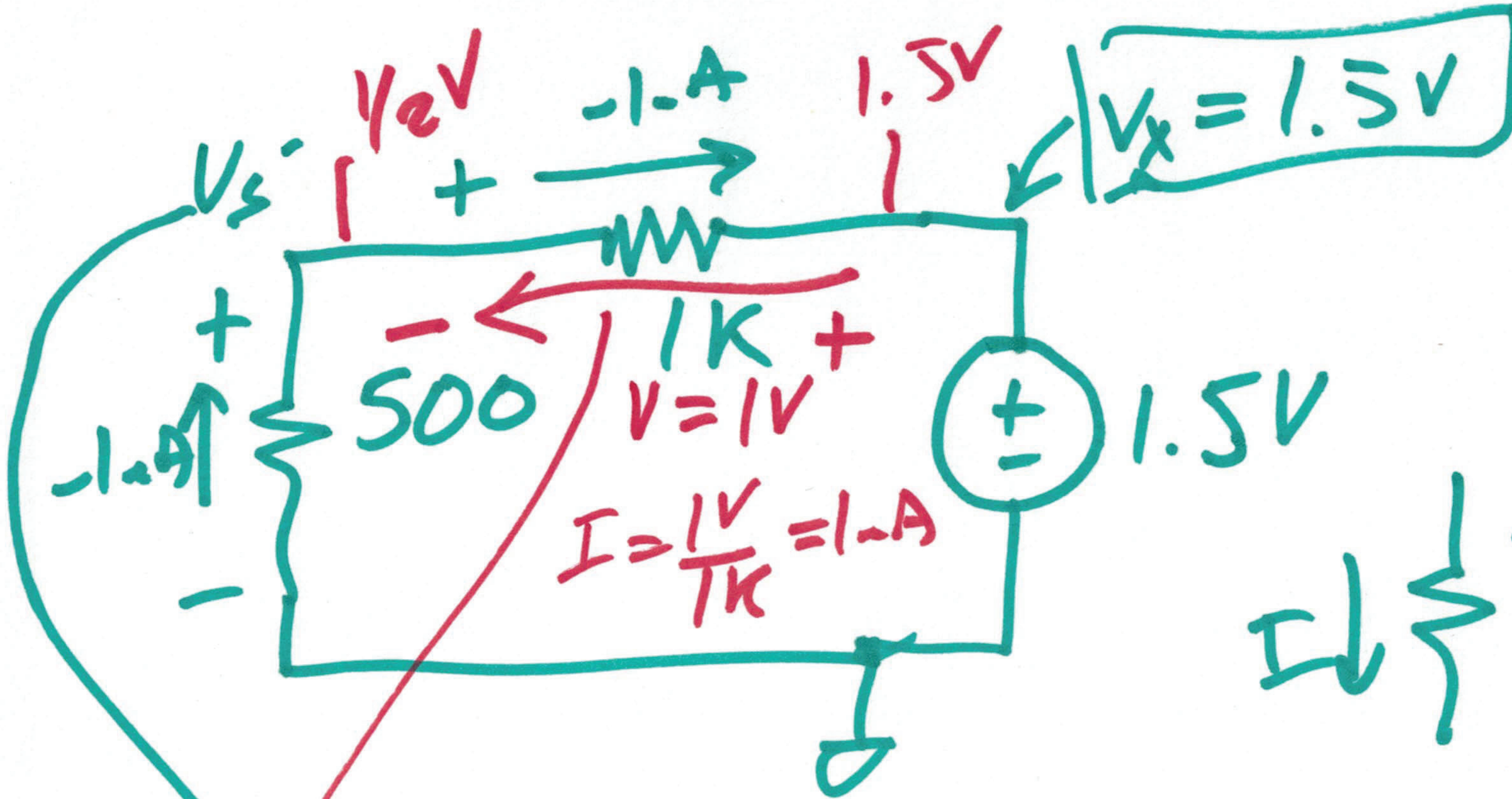
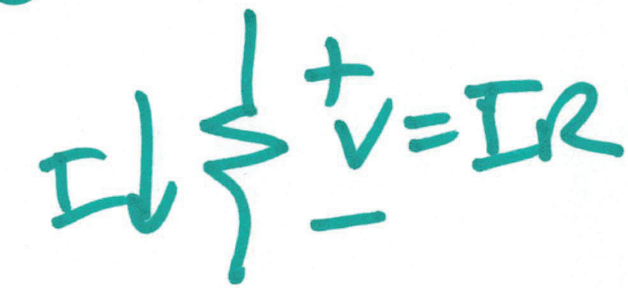
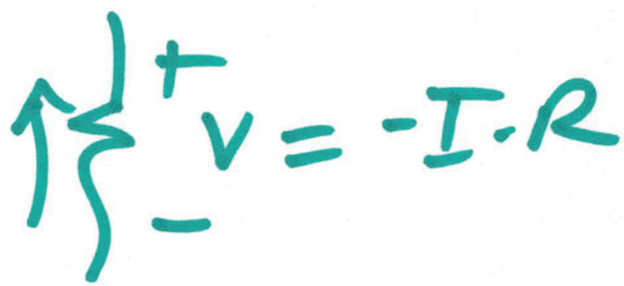
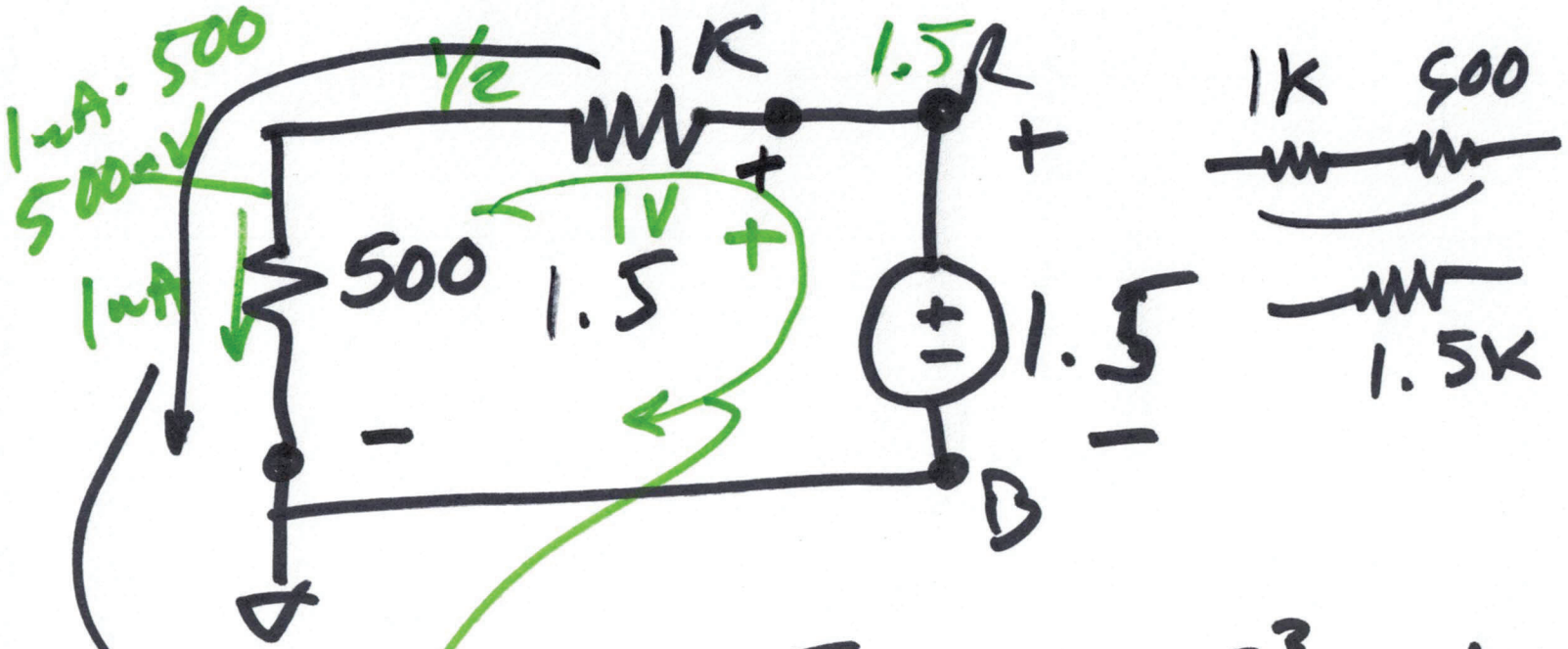
4)





$$V_s = -(-1mA) \cdot 500$$
$$= 500mV = 0.5V$$

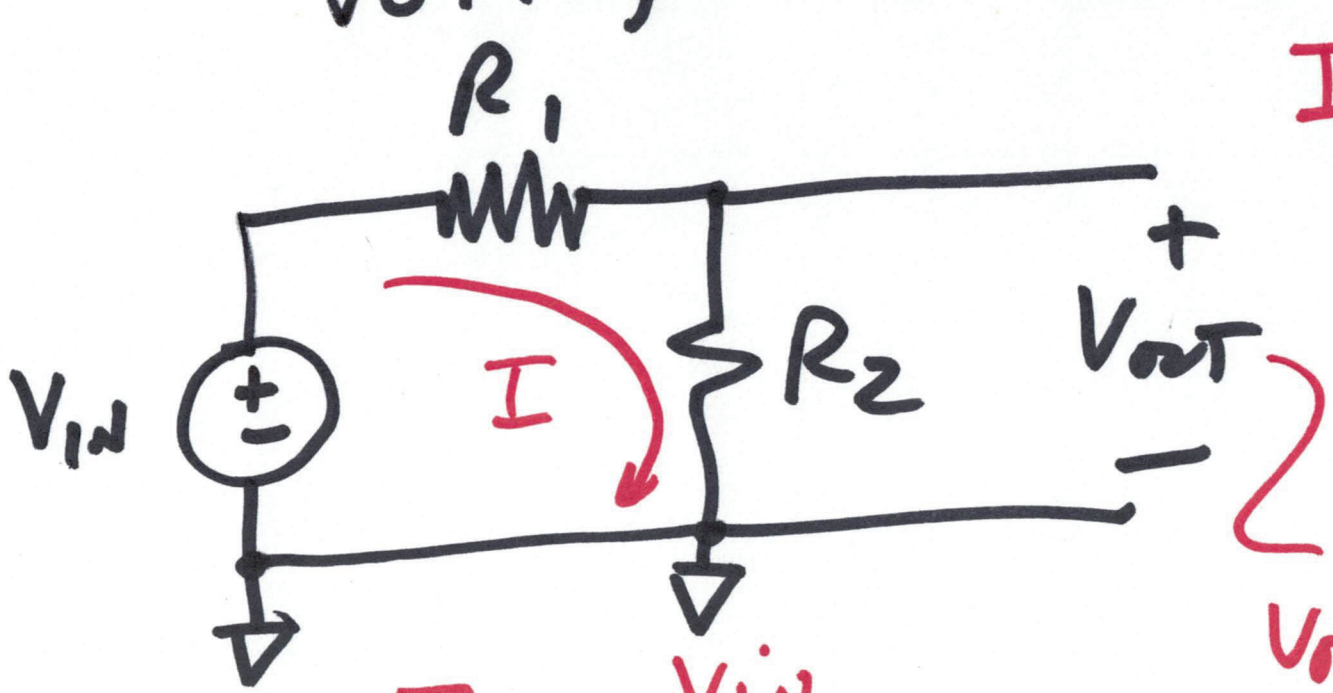




$$I = \frac{1.5}{1.5k} = 1 \cdot 10^{-3} = 1mA$$

$$I = -1mA$$

Voltage dividers



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

$V = IR$

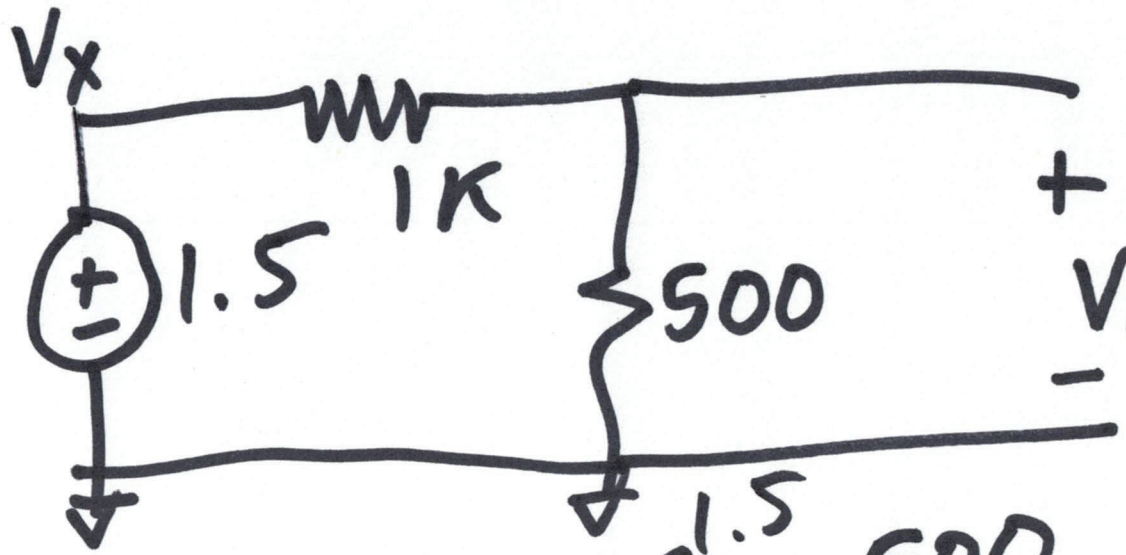
$V_{OUT} = I \cdot R_2$

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

Attenuation

Voltage divider equation

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

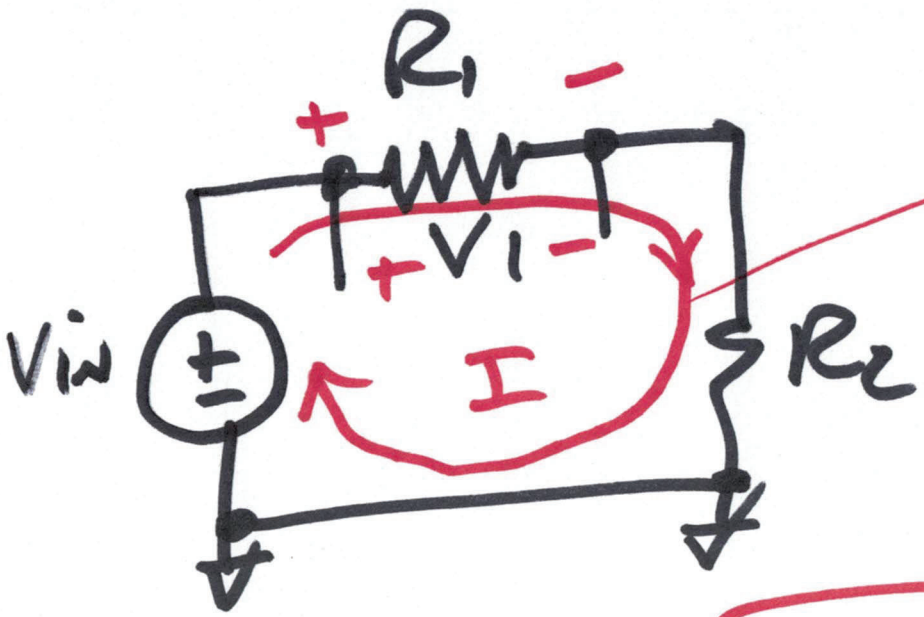


$$V_s = V_x \cdot \frac{500}{500+1K} = 1.5 \cdot \frac{1}{3}$$

$$\boxed{V_s = 500mV}$$

8)

Voltage divider II



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

$$V_1 = I \cdot R_1$$

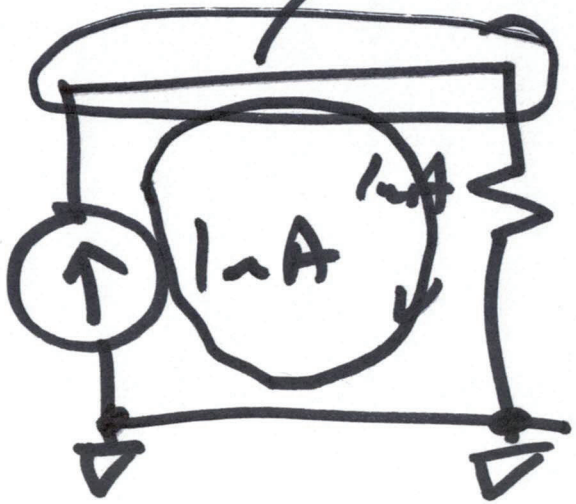
$$V_1 = V_{IN} \cdot \frac{R_1}{R_1 + R_2}$$

Current Source

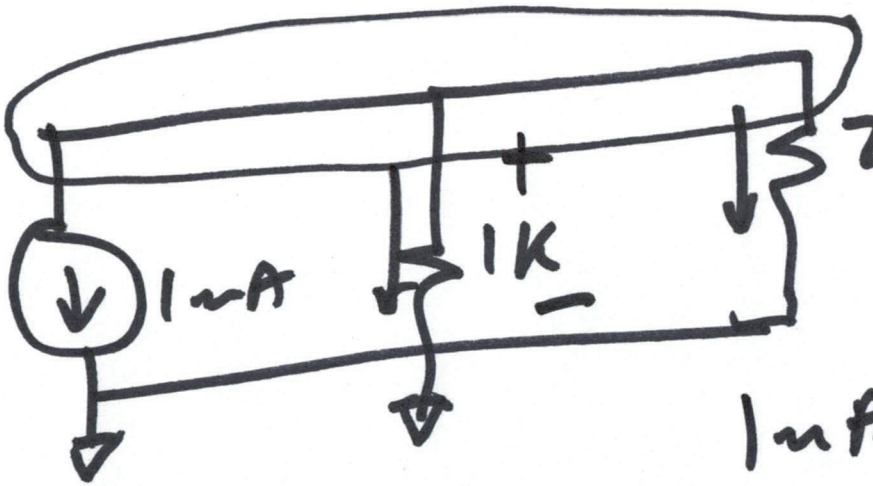
Node (wire)

KCL

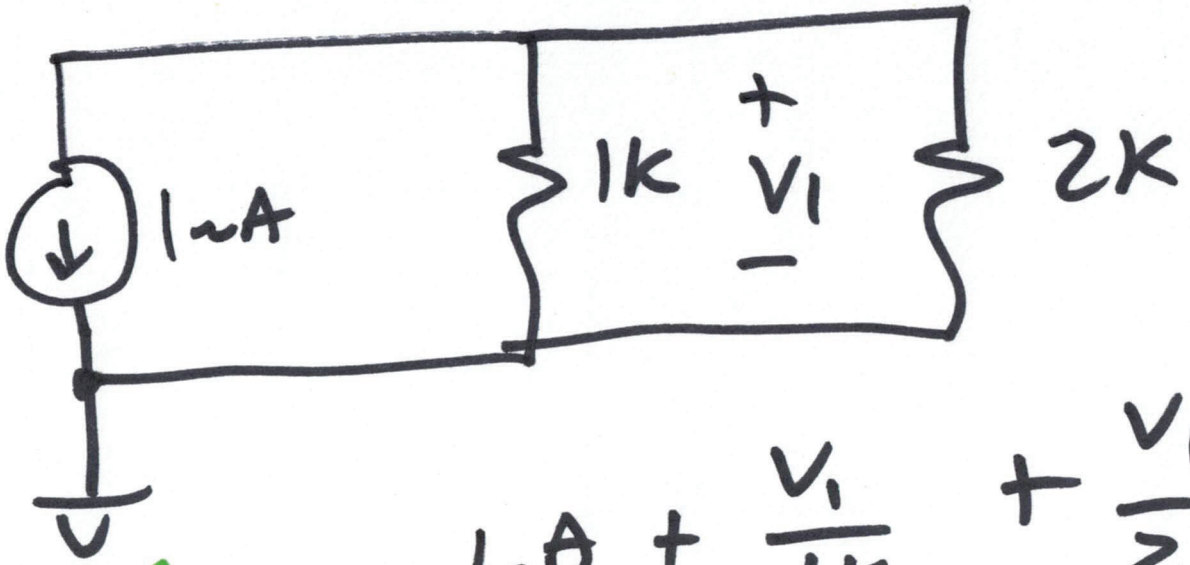
Current IN = Current OUT



$V = 1V = 1K \cdot 1mA$



$$1mA + \frac{V_1}{1K} + \frac{V_1}{2K} = 0$$



$$R = \frac{1K \cdot 2K}{1K + 2K} = 666$$

$$1mA + \frac{V_1}{1K} + \frac{V_1}{2K} = 0$$

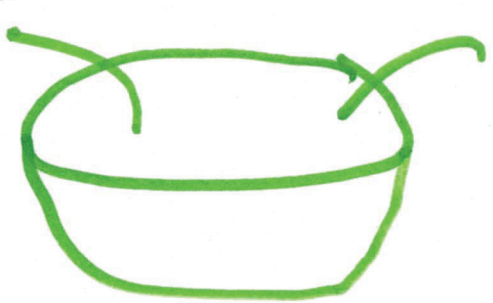
666R

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

$$= 666\,mV$$

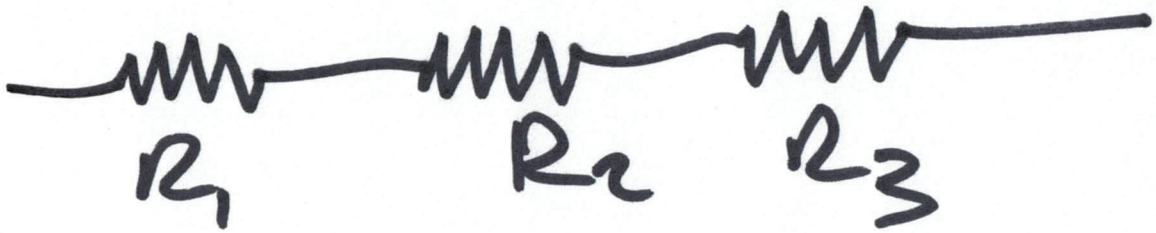
devils voltage

20 hours

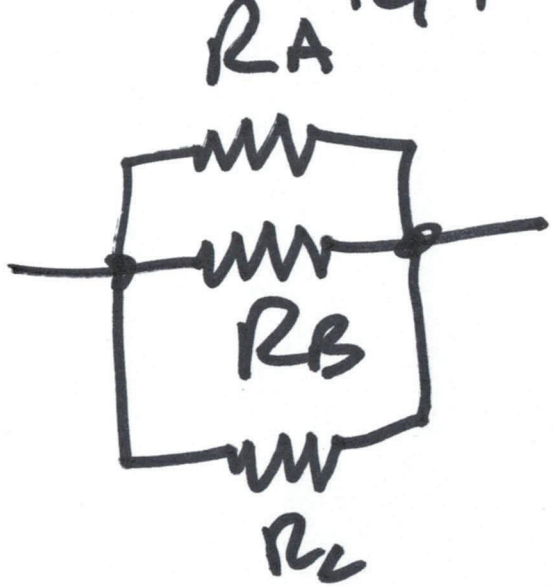


$$\frac{1}{R} = \frac{1}{20} + \frac{1}{10} + \frac{1}{x}$$

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



$R_1 + R_2 + R_3$



$$\frac{1}{R_T} = \frac{1}{R_A} + \frac{1}{R_B} + \frac{1}{R_C}$$