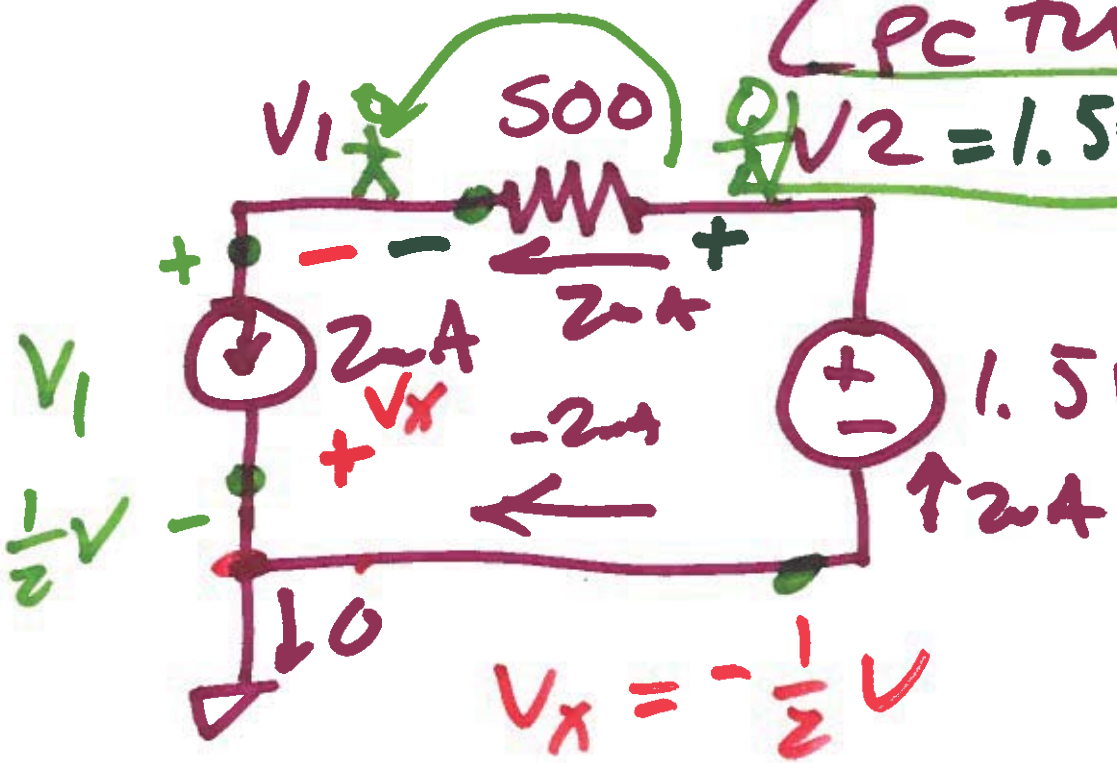
EE 220 circuits I

R, I, V=IR

Sept. 4, 2019

Lecture 3



$V_2 - V_1 = 2mA \cdot 500\Omega$

$= 1.0V$

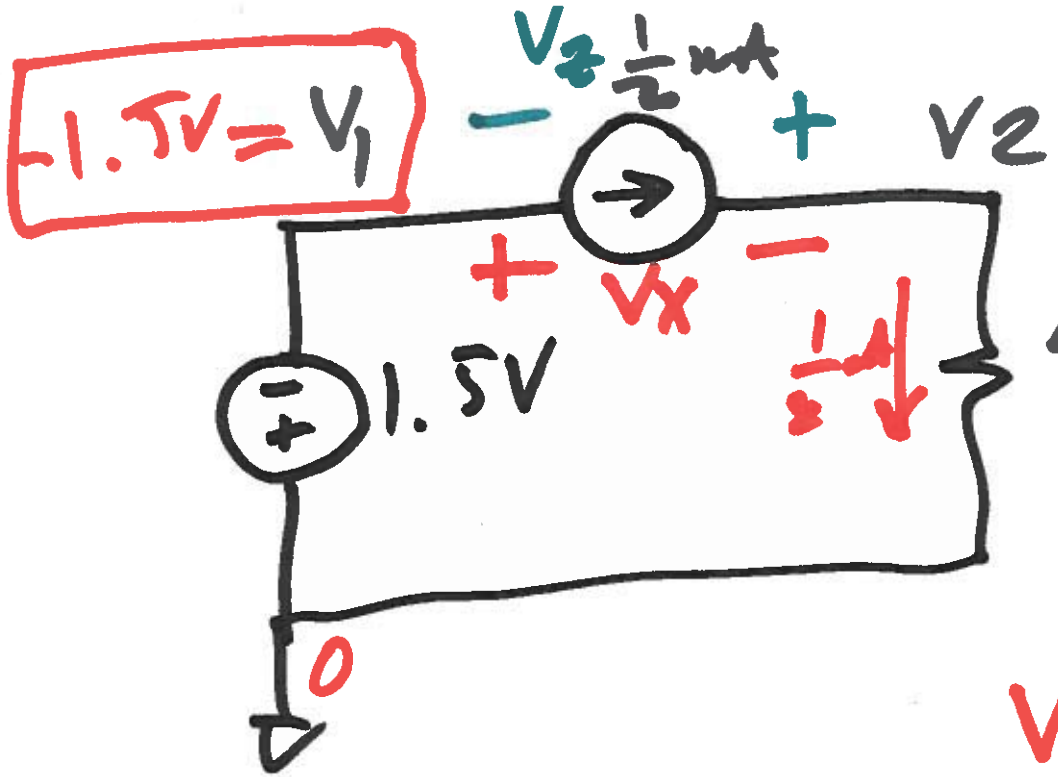
$V_1 = V_2 - 1$

$= 1.5 - 1$

$V_1 = 500mV = \frac{1}{2}V$

$V_x = -\frac{1}{2}V$

$= 0 - \frac{1}{2}$



$V_2 = \frac{1}{2}\text{mA} \cdot 5\text{k}$

$= 2.5\text{V}$

$V_x = -1.5 - 2.5 = V_1 - V_2$

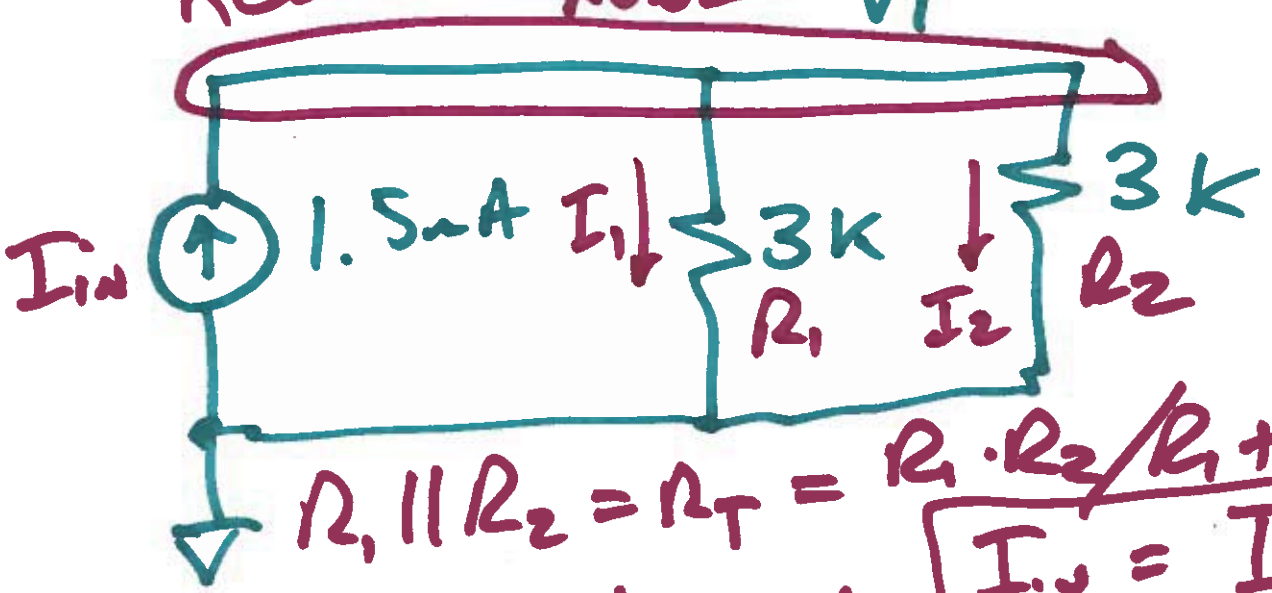
$V_x = -4.0\text{V}$

$V_t = V_2 - V_1$

$= 2.5 - (-1.5\text{V})$

$V_t = 4\text{V}$

KCL NODE V_1



$$I_1 = \frac{V_1}{R_1}$$

$$I_2 = \frac{V_1}{R_2}$$

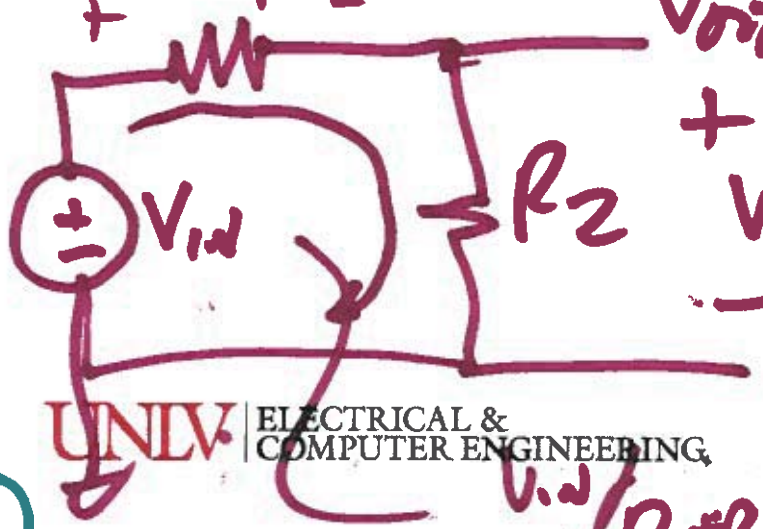
$$R_1 \| R_2 = R_T = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

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

$$I_{IN} = I_1 + I_2$$

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

$$I_{IN} = \frac{V_1}{R_1 \| R_2}$$



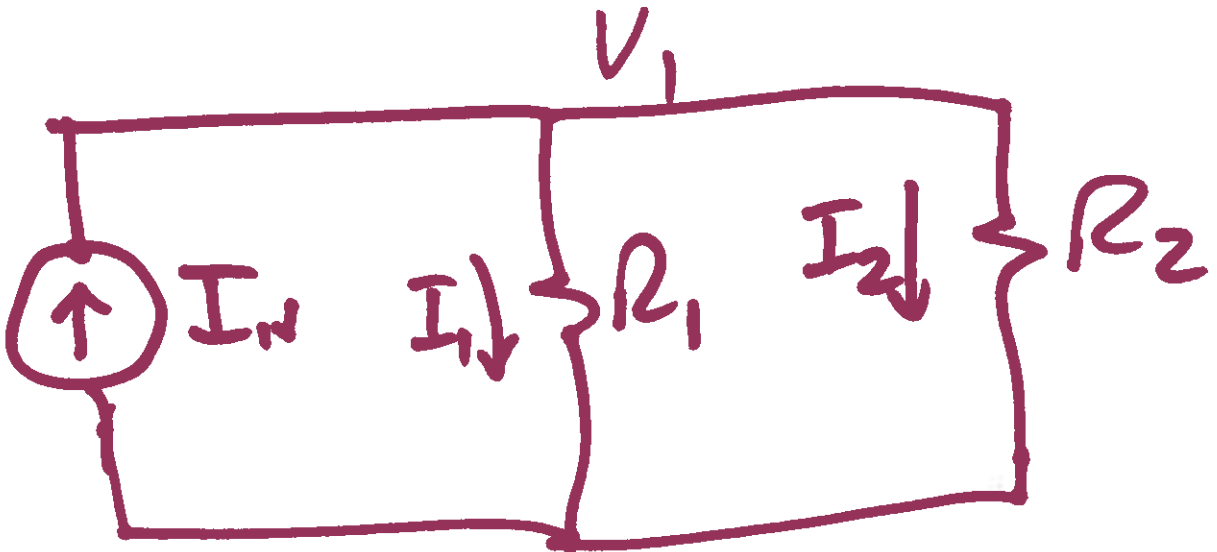
$$V_{OUT} = V_{IN} \cdot \frac{R_2}{R_1 + R_2}$$

+ V_{OUT} −

voltage divider

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

3)



$$I_{1N} = \frac{V_1}{R_1 \| R_2}$$

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

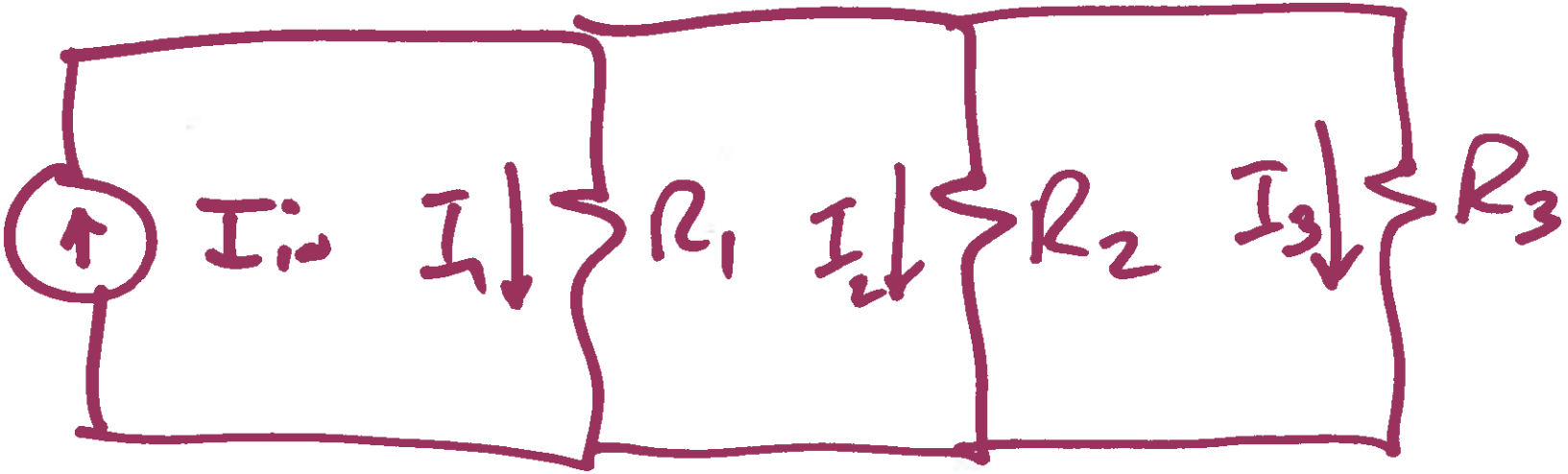
$$I_2 = \frac{R_1}{R_1 + R_2} \cdot I_{1N}$$

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

$$I_1 = \frac{V_1}{R_1}$$

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

current divider equation



$$I_3 = I_{in} \cdot \frac{R_1 \| R_2}{R_1 + R_2 + R_3}$$

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

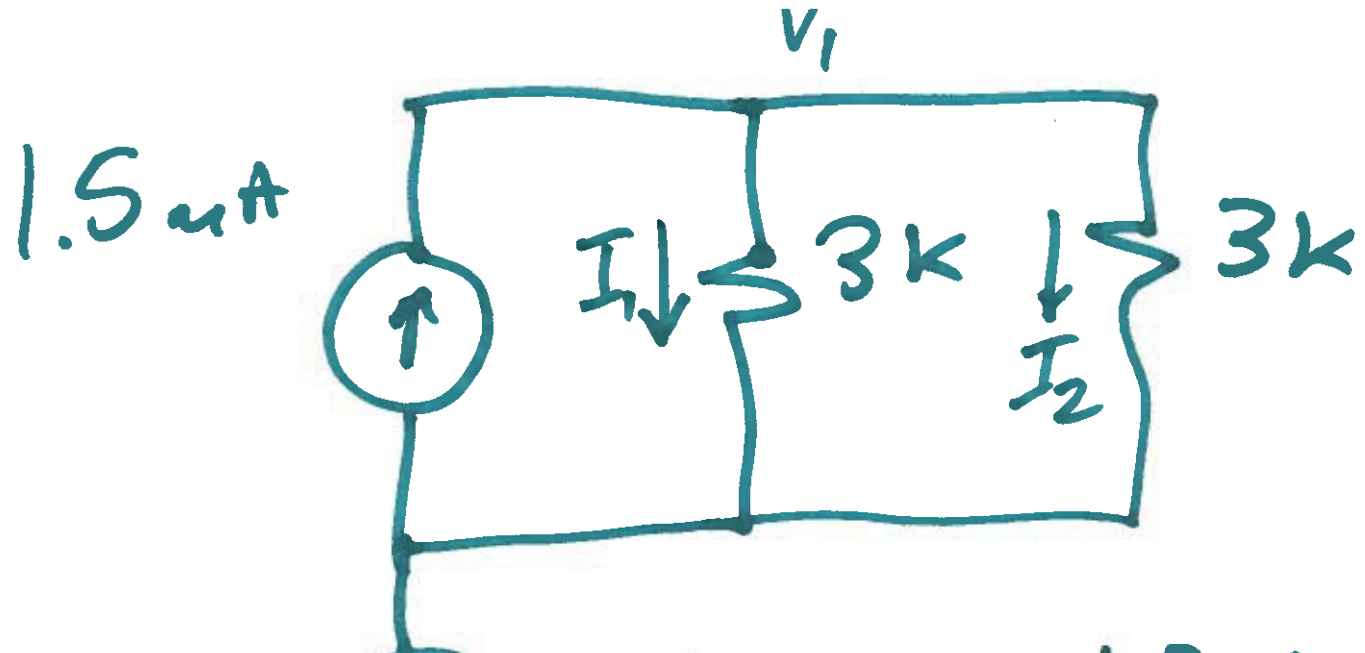
$$\frac{A}{BC} = \frac{B \cdot (A+D)}{X}$$

$$X = \frac{BC \cdot D(A+D)}{A}$$

$$I_{IN} \leftarrow \frac{V_{IN}}{\frac{R_1 \cdot R_2}{R_1 + R_2}}$$

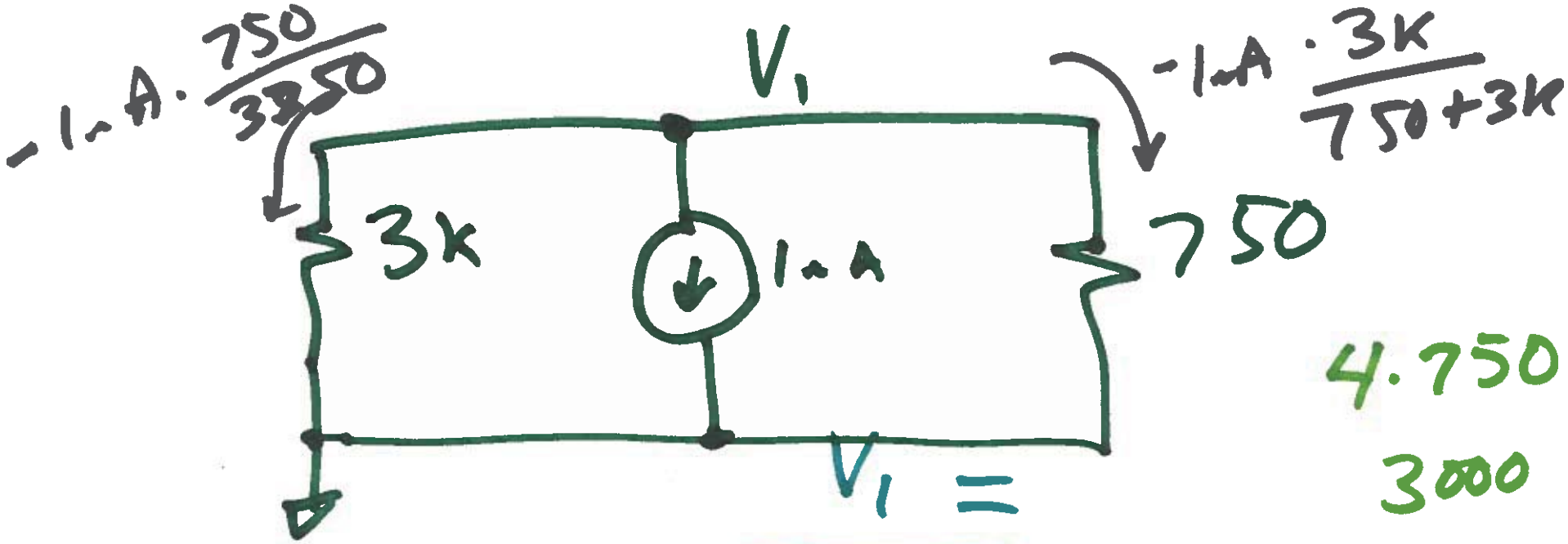
$$V_{IN} = I_{IN} \cdot \frac{R_1 \cdot R_2}{R_1 + R_2}$$

b)



$$0.75\text{mA} = I_1 = 1.5\text{mA} \cdot \frac{3\text{k}}{3\text{k}+3\text{k}}$$

$$0.75\text{mA} = I_2 = 1.5\text{mA} \cdot \frac{3\text{k}}{3\text{k}+3\text{k}}$$

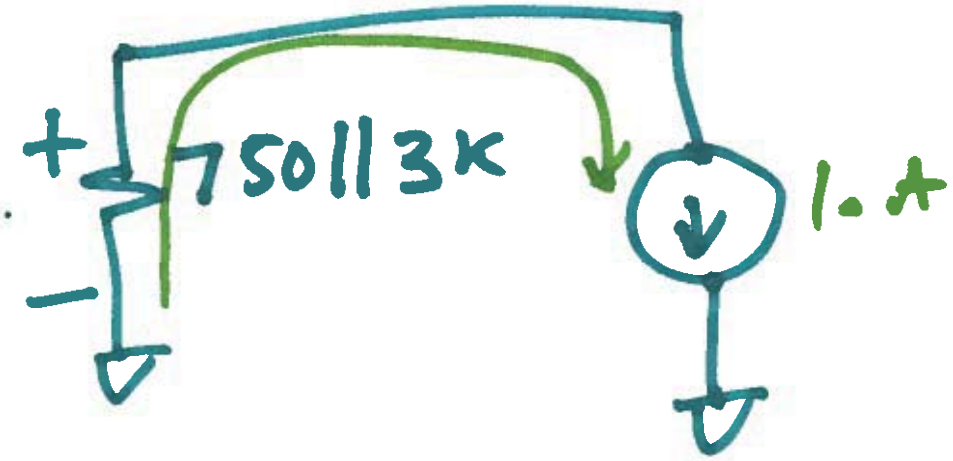


4.750

3000

5.750

$V_1 =$



600 · 1-A

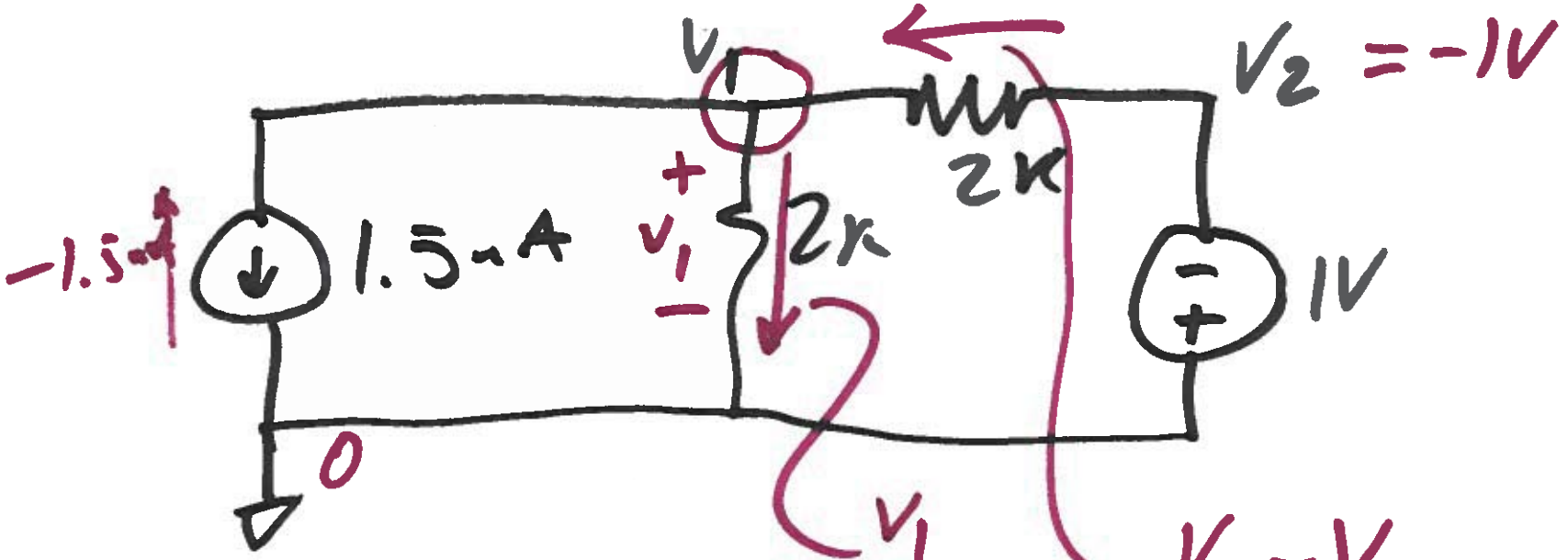
600 · 0.001

.6 = 600m

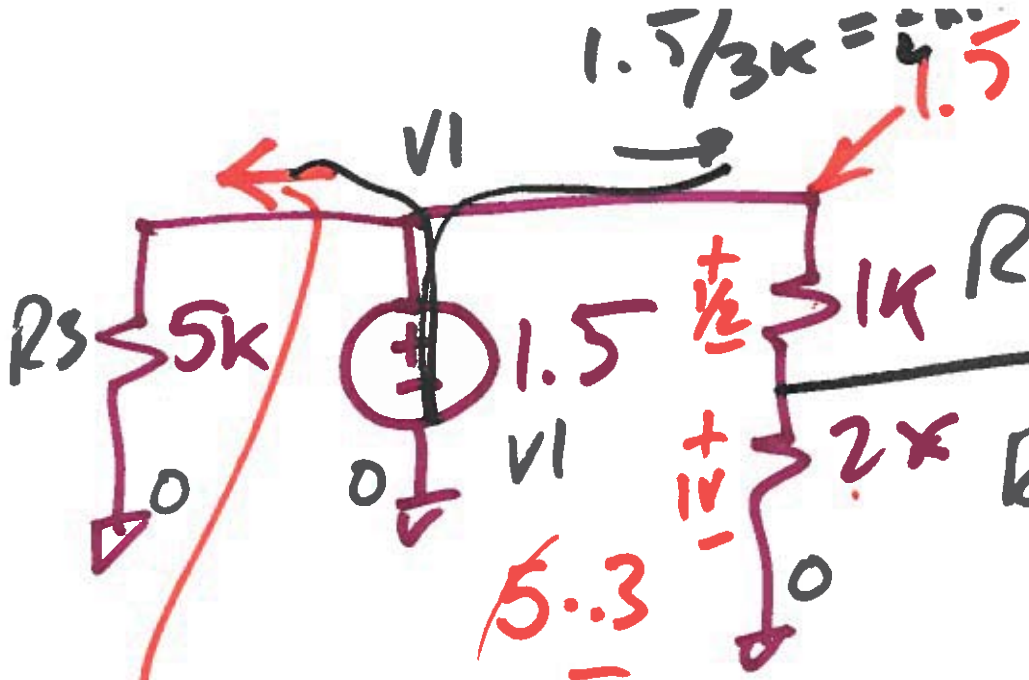
$V_1 = -1\text{-A}\cdot\frac{750\cdot 3K}{3750}$

600

$V_1 = -600\text{mV}$



$$\frac{V_2 - V_1}{2K} = \frac{V_1}{2K} + 1.5 \sim A$$



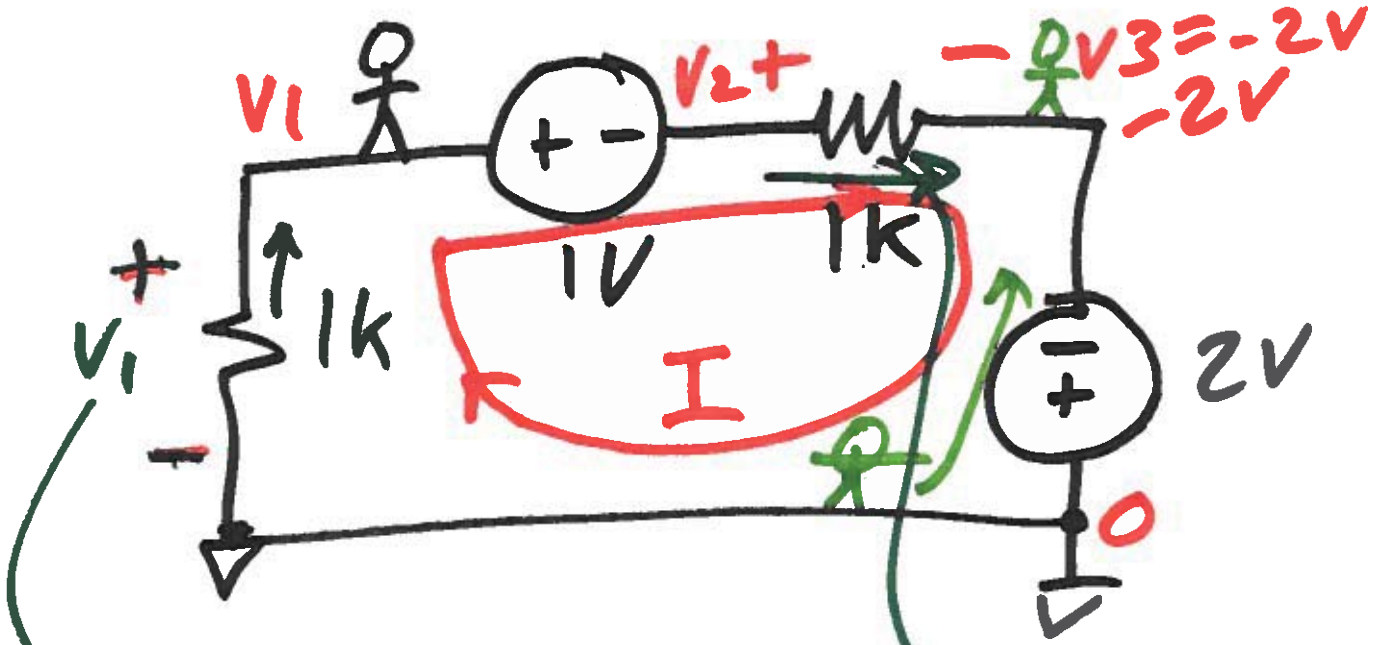
$$V2 = 1.5 \cdot \frac{2k}{2k+1k} = \frac{3k}{3k} = 1V$$

$$\frac{V1}{5k} = \frac{1.5}{5k} = .3 = 300\,\mu A$$

5.3

MY Netlist

```
V1   V1  0    DC  1.5V
R3   V1  0    5k
R1   V1  V2   1k
R2   V2  0    2k
.end
```



$$-I \cdot 1k = V_1$$

$$I \cdot 1k = V_2 - (-2)$$

$$V_2 + 2$$

$$-2 + I \cdot 1k + 1V - (-I \cdot 1k) = 0$$

$$-V_1$$