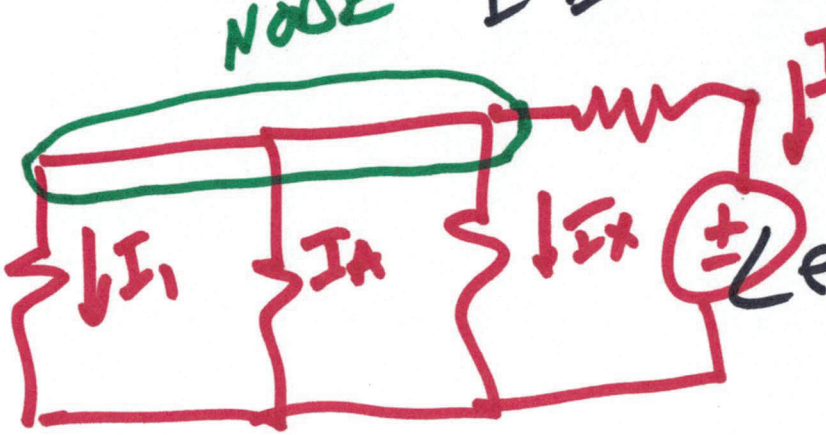
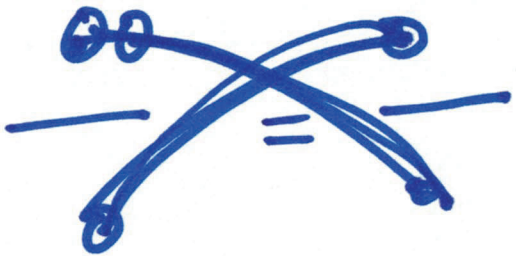
EE 220 Circuits I

Lecture 2

8/25/2021



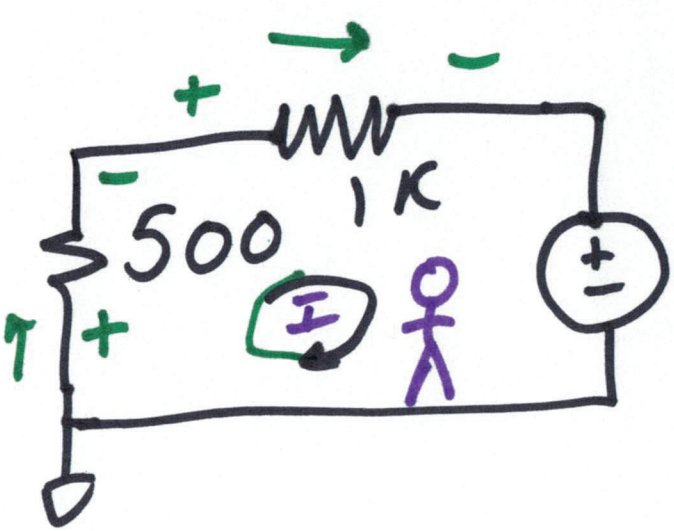


$$\frac{A(B+C)}{D} = \frac{(A+C)\cdot F}{E\cdot C}$$

$$I_1 + I_A + I_x + I_4 = 0$$

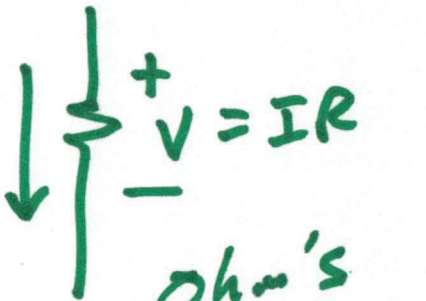
KCL

$$\frac{A(B+C)\cdot E\cdot C}{(A+C)\cdot F} = D$$

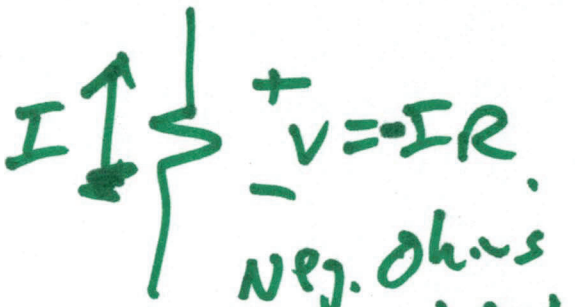


KVL

$\Sigma V = 0$ ← sum of voltage drops $= 0$



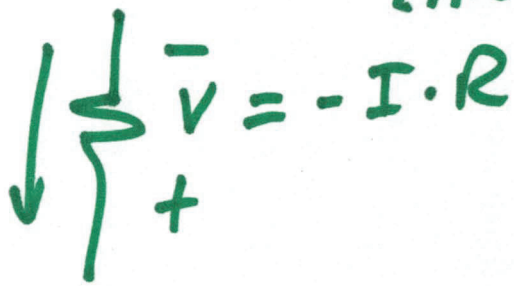
$$-500I - 1000I - 7.5V = 0$$

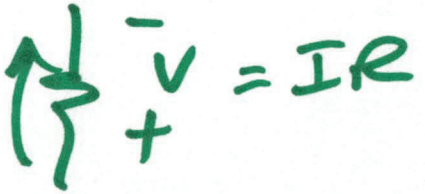


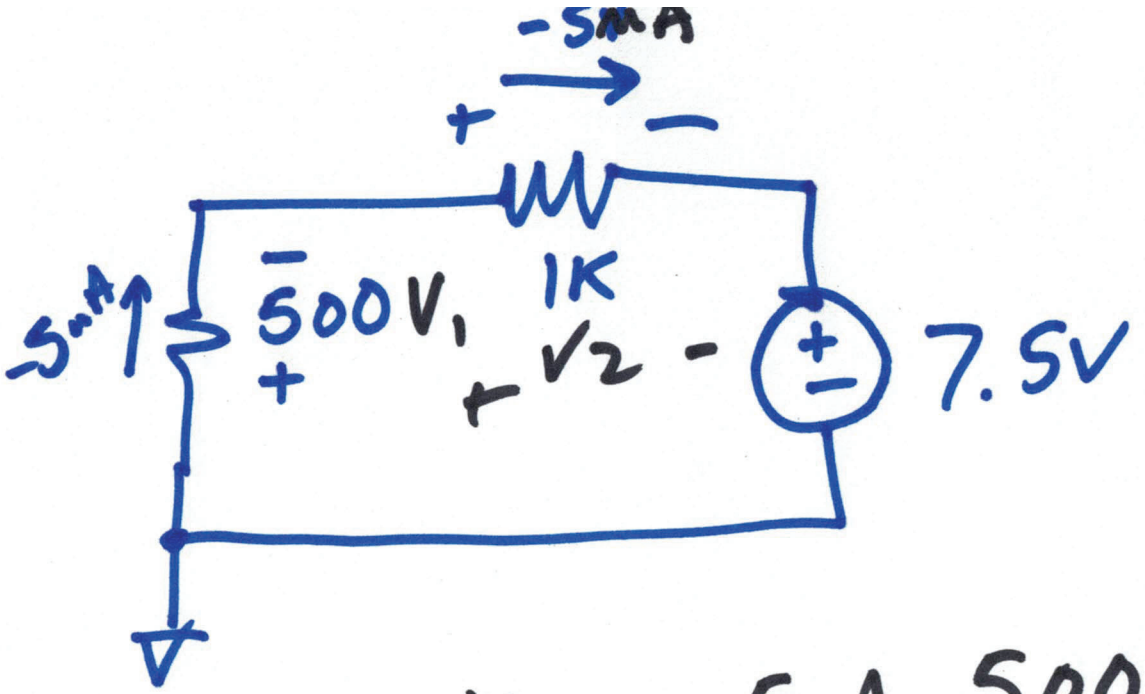
$$-1{,}500I = 7.5V$$

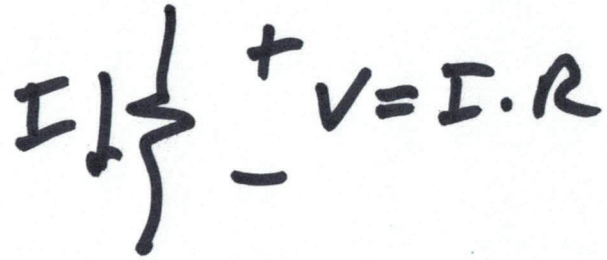
$$I = -\frac{7.5}{1.5K} =$$

$$\boxed{I = -5mA}$$



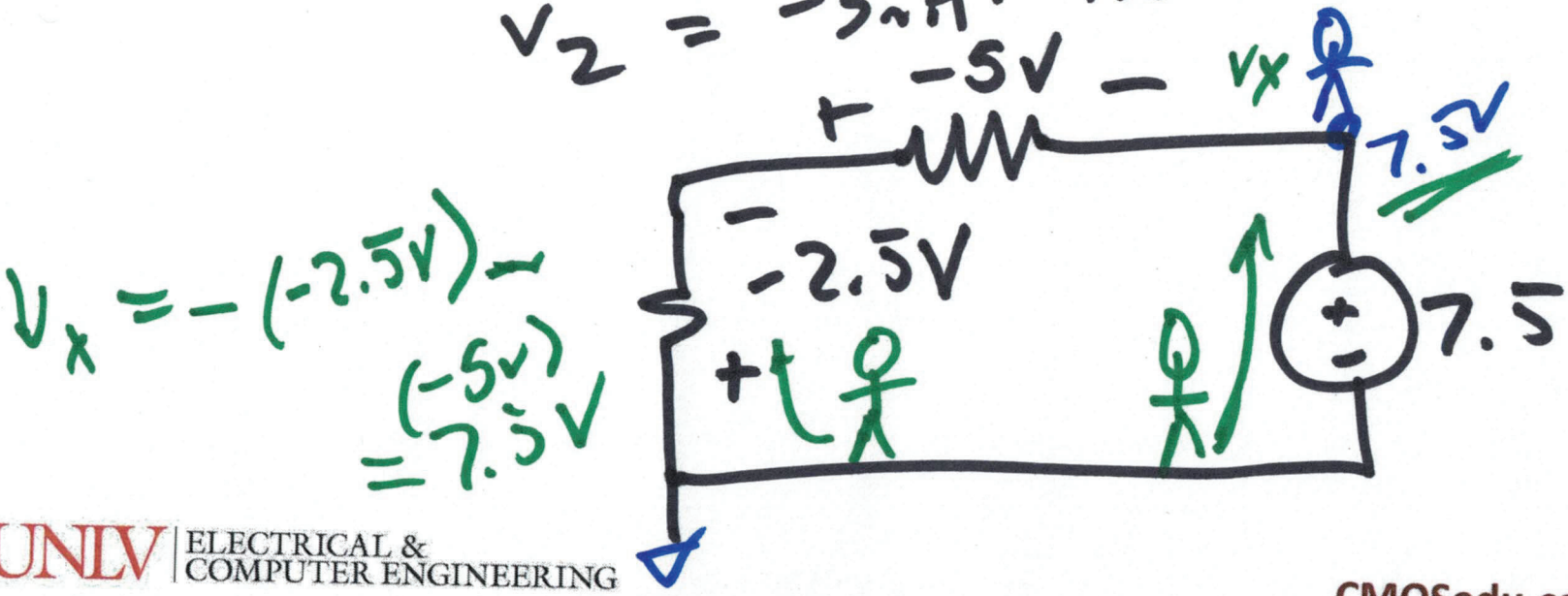






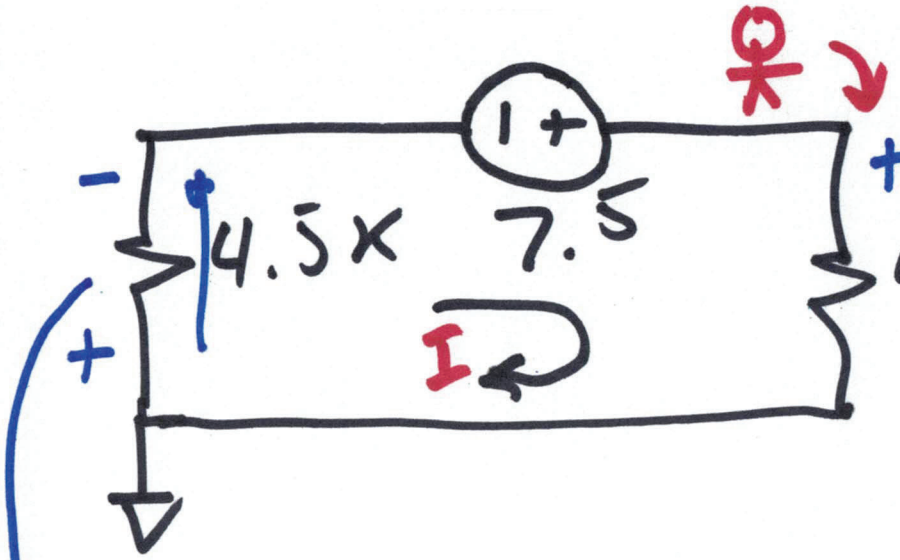
$$V_1 = -5\text{mA} \cdot 500 = -2.5\text{V}$$

$$V_2 = -5\text{mA} \cdot 1\text{K} = -5\text{V}$$



$$V_x = -(-2.5\text{V}) - (-5\text{V}) = 7.5\text{V}$$

b)



10^{-6} = MICRON

$V = I \cdot R$ (+ at top, − at bottom)

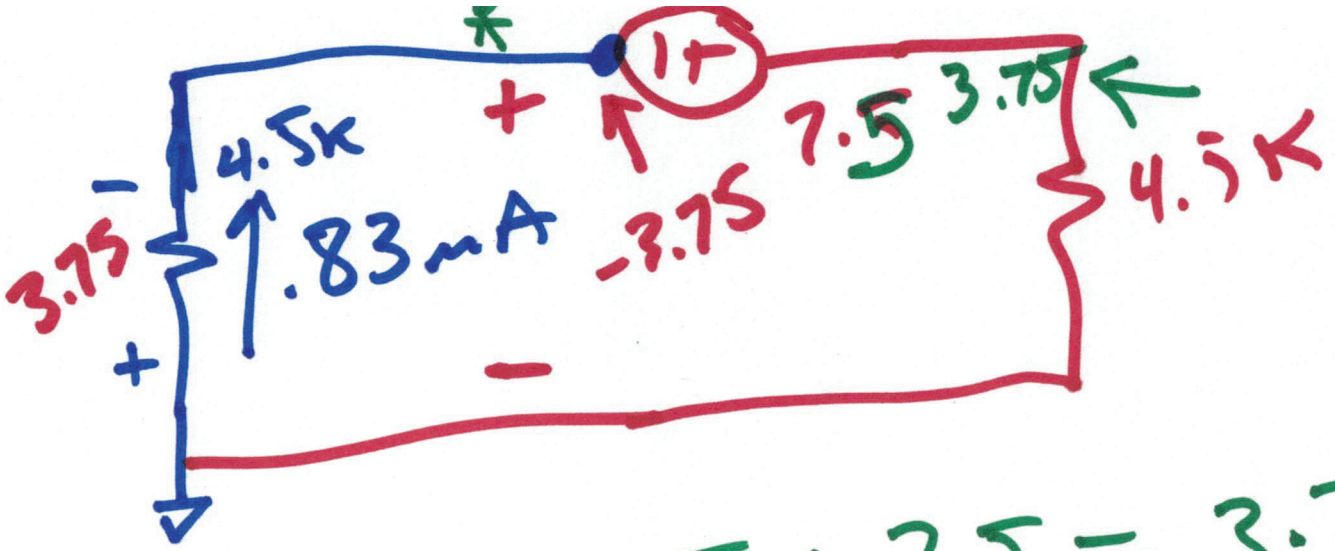
$V = -I \cdot R$ (− at top, + at bottom)

$$0 = -4.5K \cdot I - 4.5K \cdot I + 7.5$$

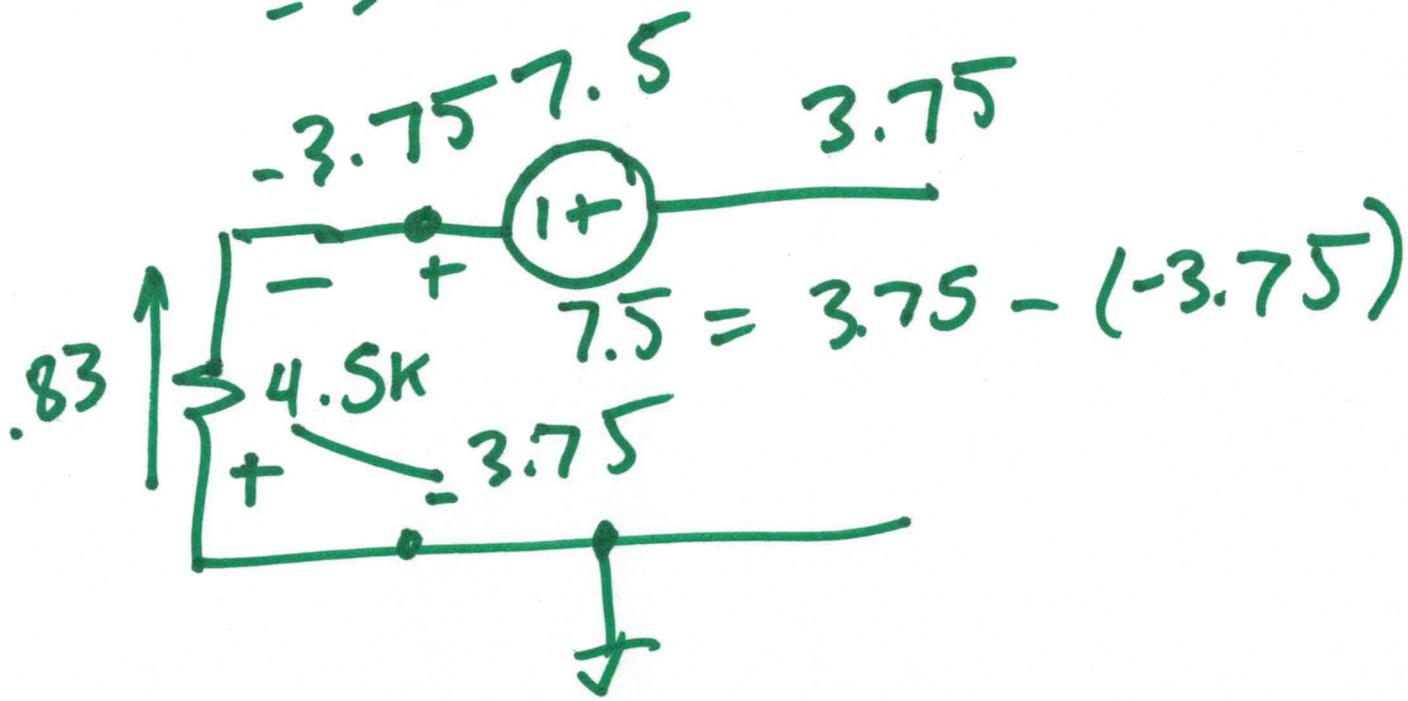
$$I = \frac{7.5}{9k} = 0.83\,mA = 830\,\mu A$$

10^{-3} = .001 10^{-6} = .000001

$$= 0.00083$$

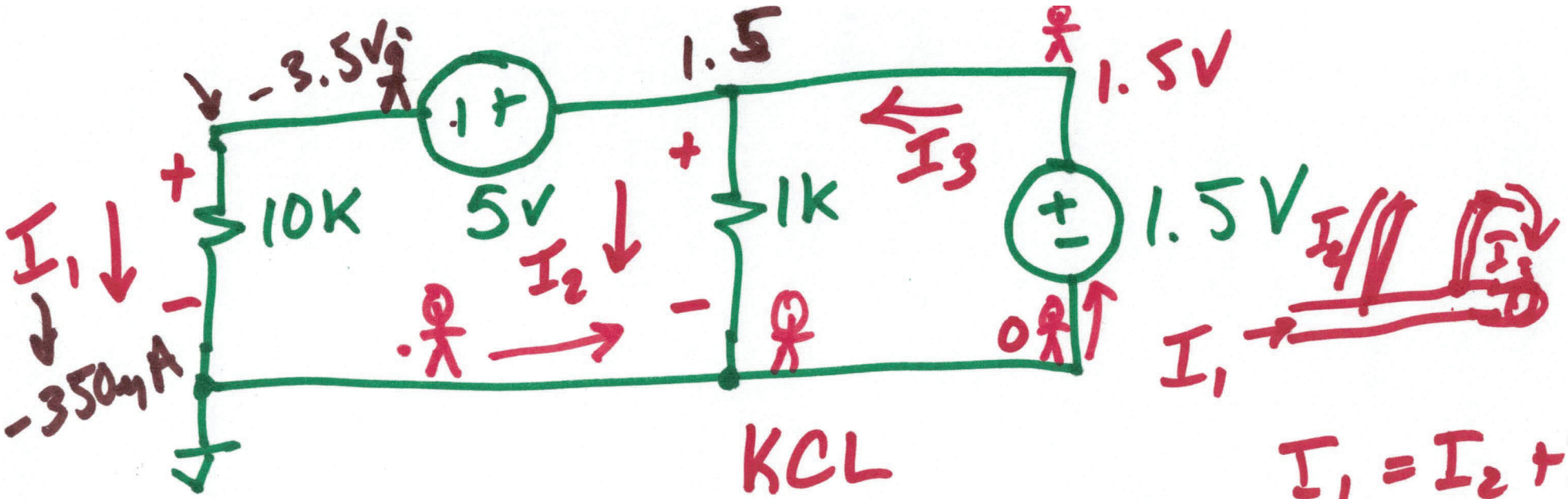


$$-3.75 + 7.5 = 3.75$$



$$7.5 = 3.75 - (-3.75)$$

5)



KCL

$I_1 = I_2 + I_3$

$\Sigma I_{/node} = 0$

$I_1 + I_2 = I_3$

$1.5V - I_2 \cdot 1K = 0 \longrightarrow$ $I_2 = 1.5mA$

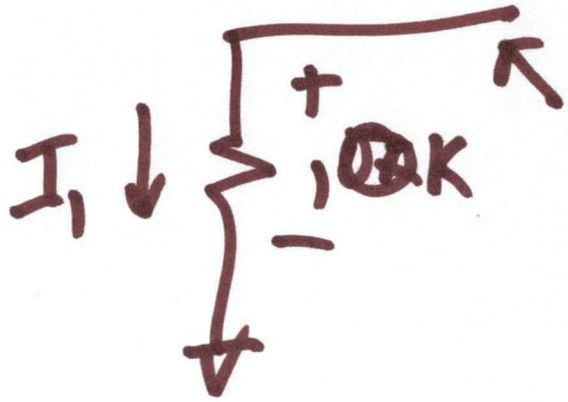
$1.5V - 5 - I_1 \cdot 10K = 0$

$I_1 \cdot 10K = 3.5$

$I_1 = \frac{-3.5}{10K} = -350\mu A$

$I_3 = 1.5mA - .35mA$

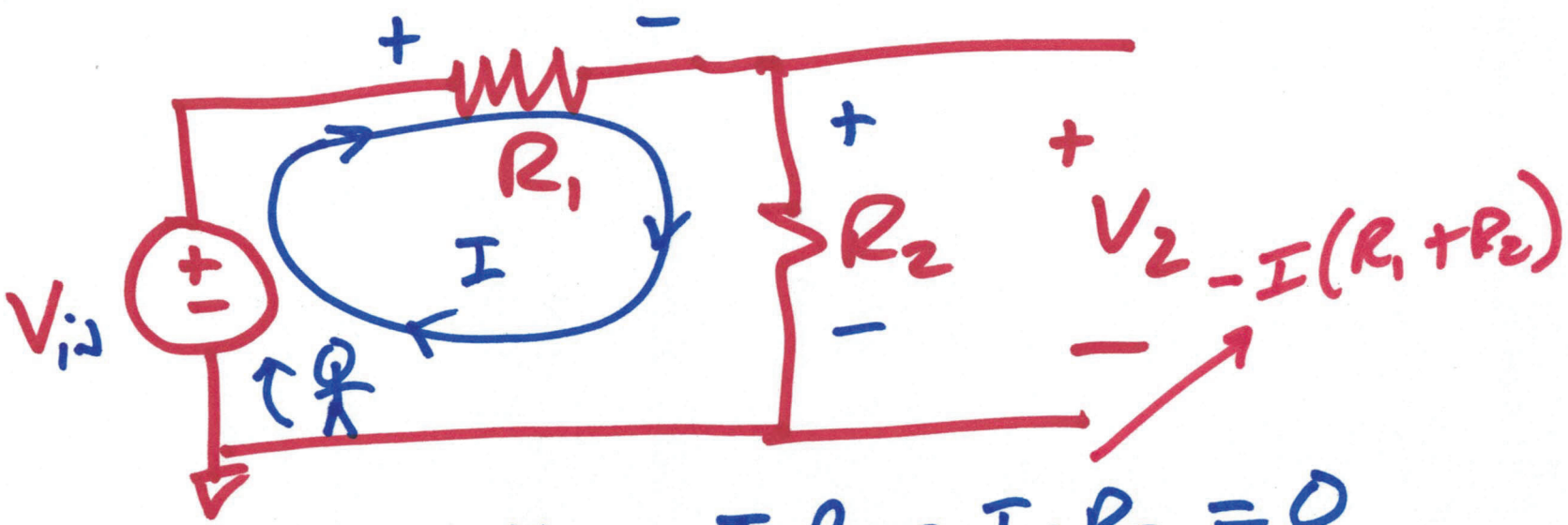
$= 1.15mA$



$I_1 \cdot 10K = -350\mu \cdot 10K$

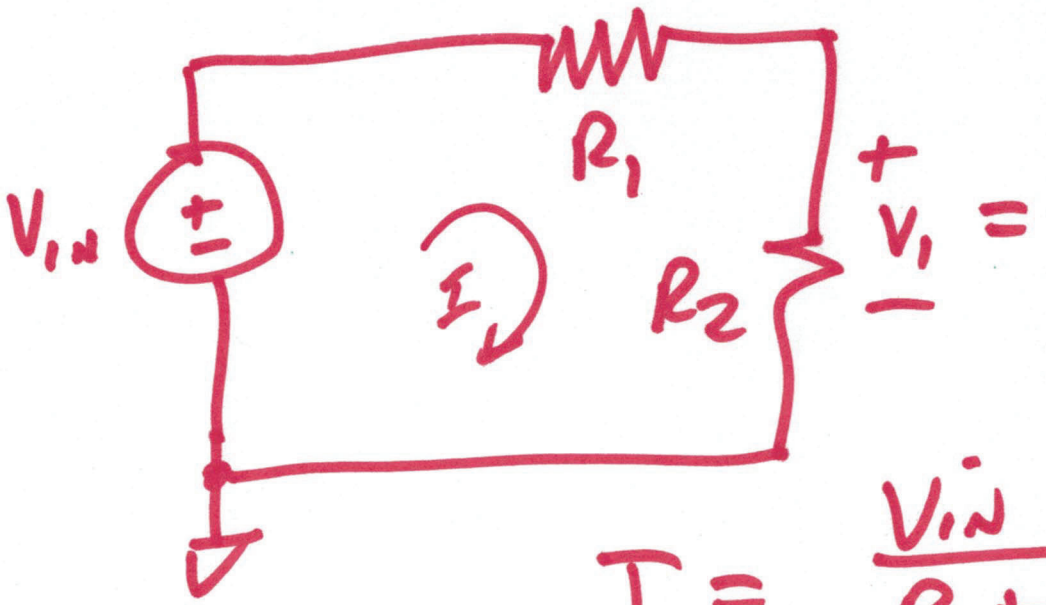
$= -3.5V$

Voltage divider

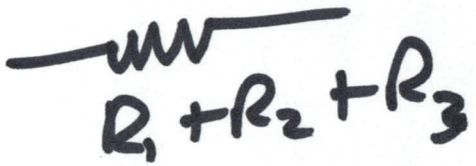


$$V_{IN} - I \cdot R_1 - I \cdot R_2 = 0$$

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



Resistors in series add

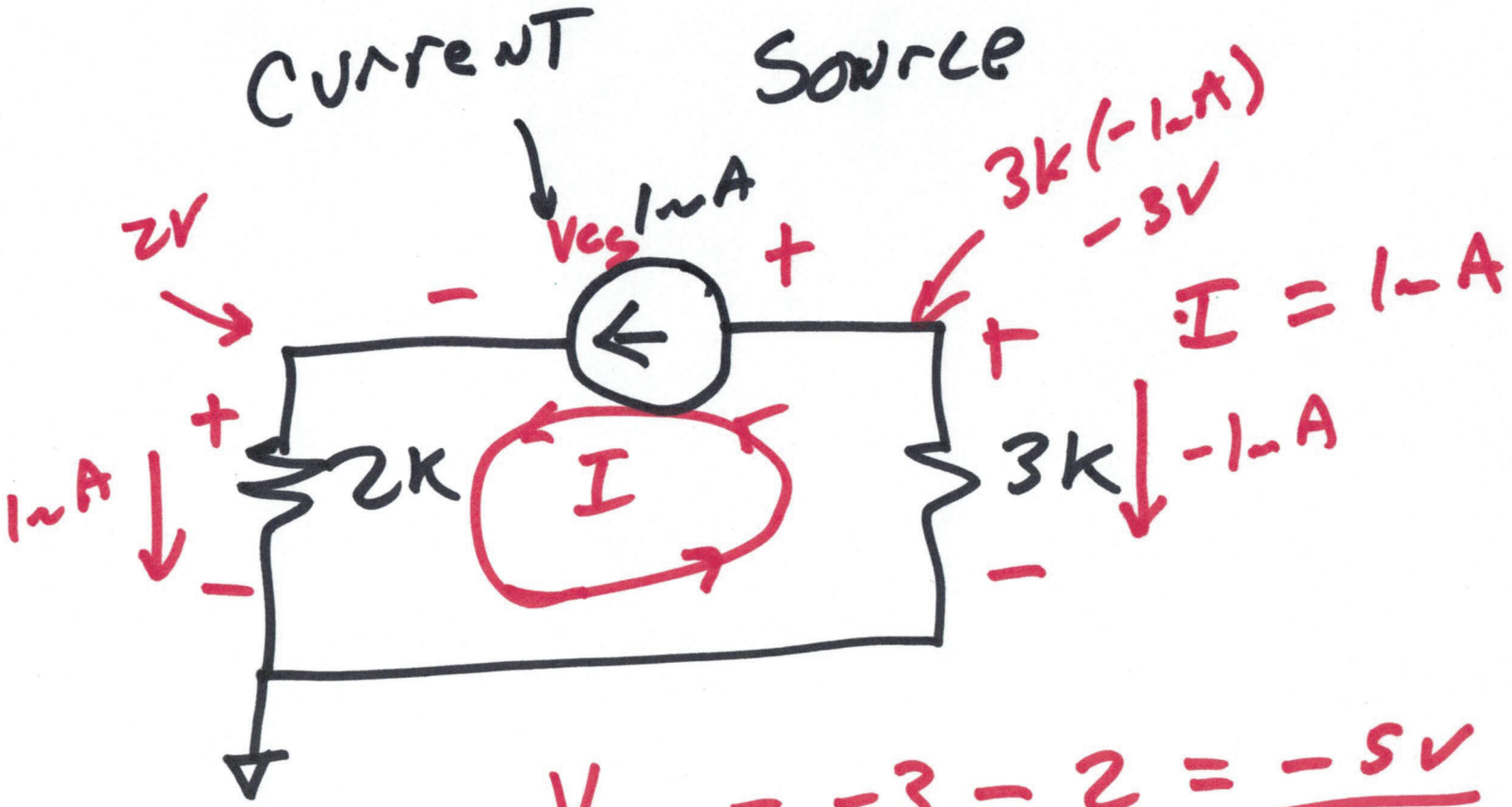


$$I = \frac{V_{IN}}{R_1+R_2}$$

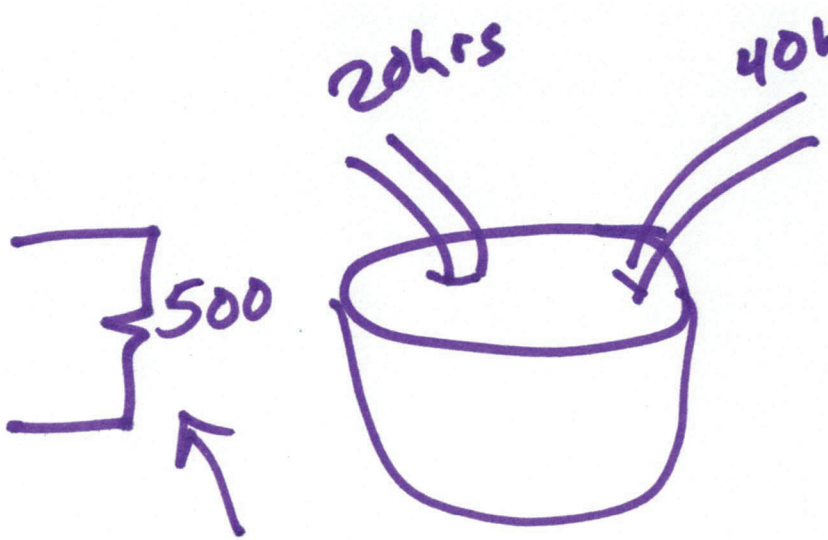
$$V_1 = R_2 \cdot I$$

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

Voltage divider equation

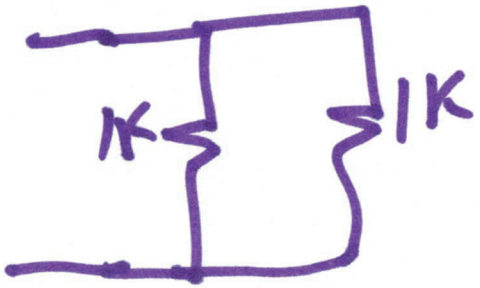


$$V_{CS} = -3 - 2 = \underline{\underline{-5V}}$$



$$\frac{1}{20} + \frac{1}{40} = \frac{1}{\text{TOTAL}}$$

R_1 R_2



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

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

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

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