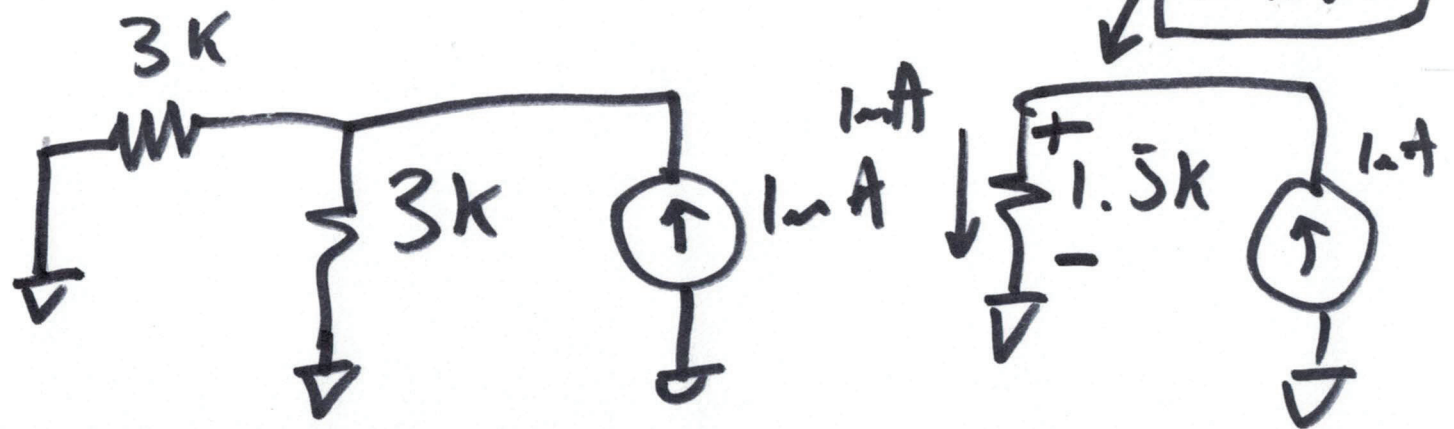
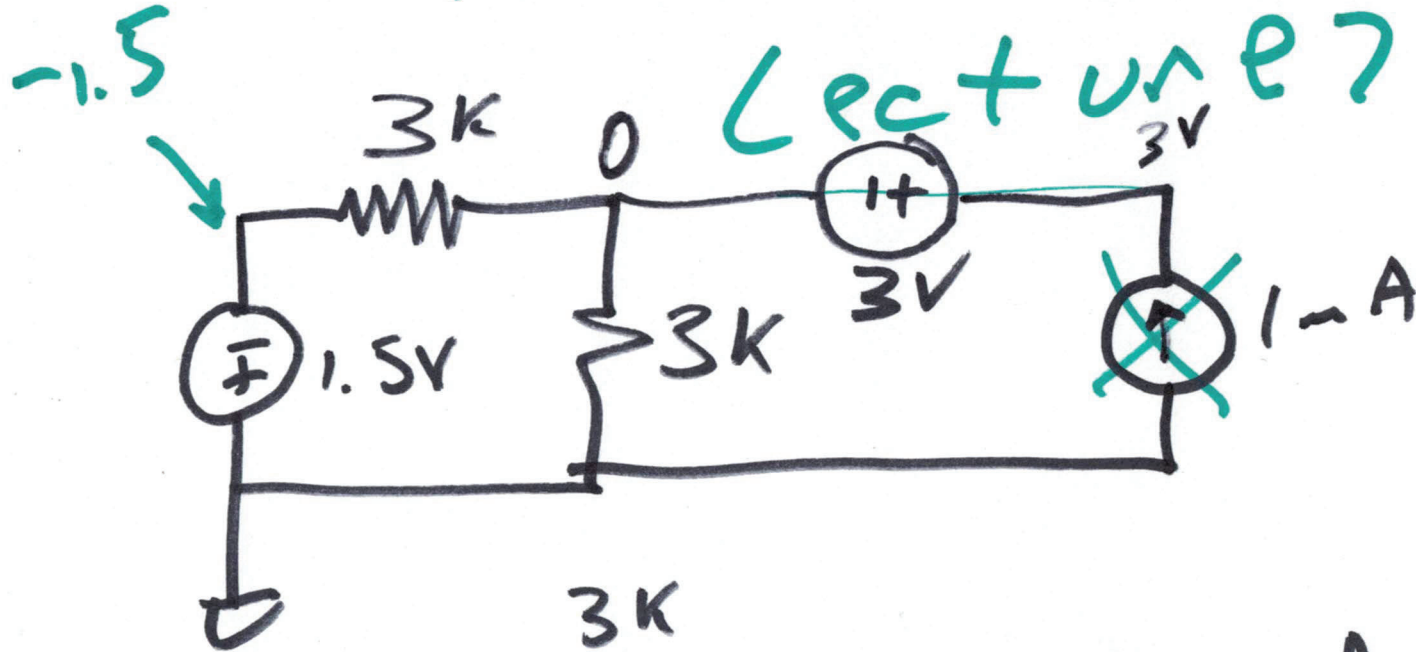
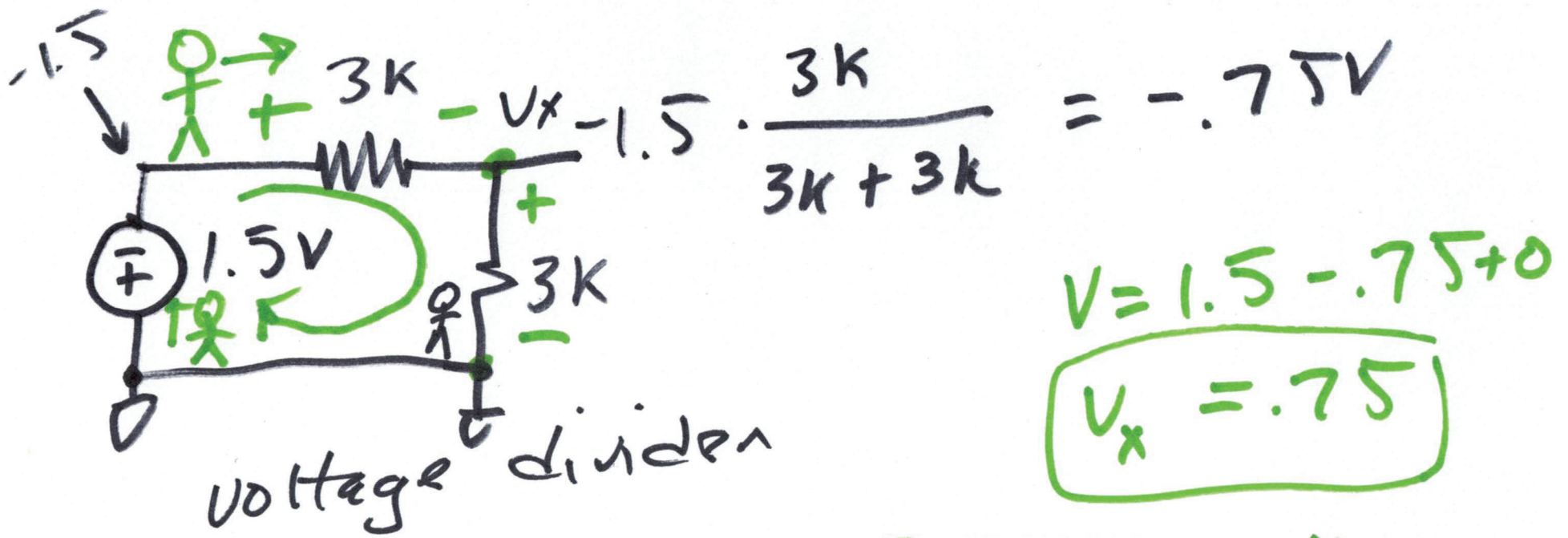


# EE 220 Circuits 1

Sept. 16, 2020

Lecture 7





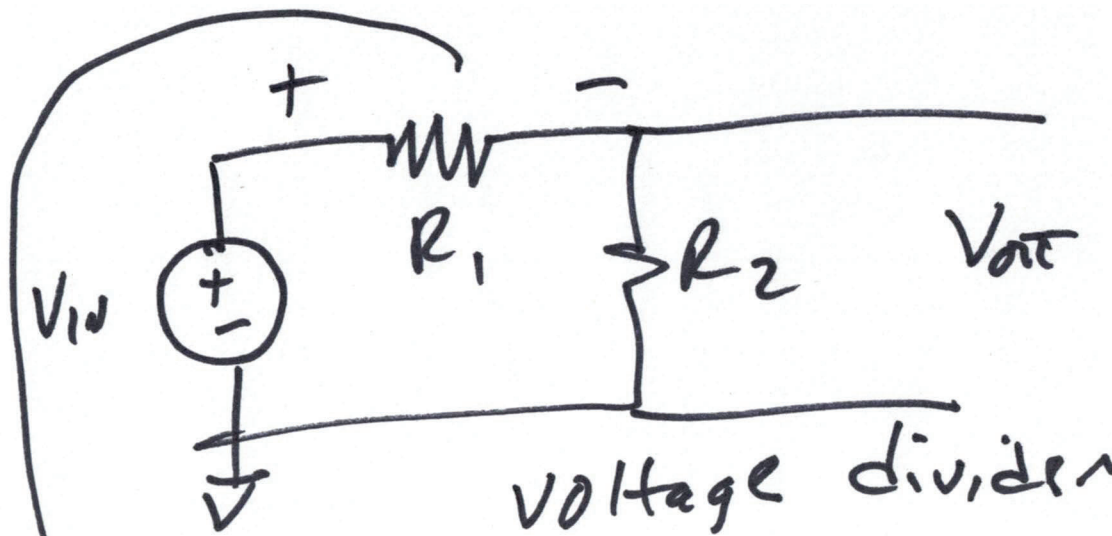
voltage divider

$$-3kI - 3kI - 1.5 = 0$$

$$3k \cdot I = V_x$$

$$I = \frac{-1.5}{6k} = \frac{-\frac{1}{4}}{2 \cdot \frac{1}{2}} \text{ mA}$$

$$V_x = 3k \cdot \left(-\frac{1}{4} \text{ mA}\right) = \underline{\underline{0.75V}}$$



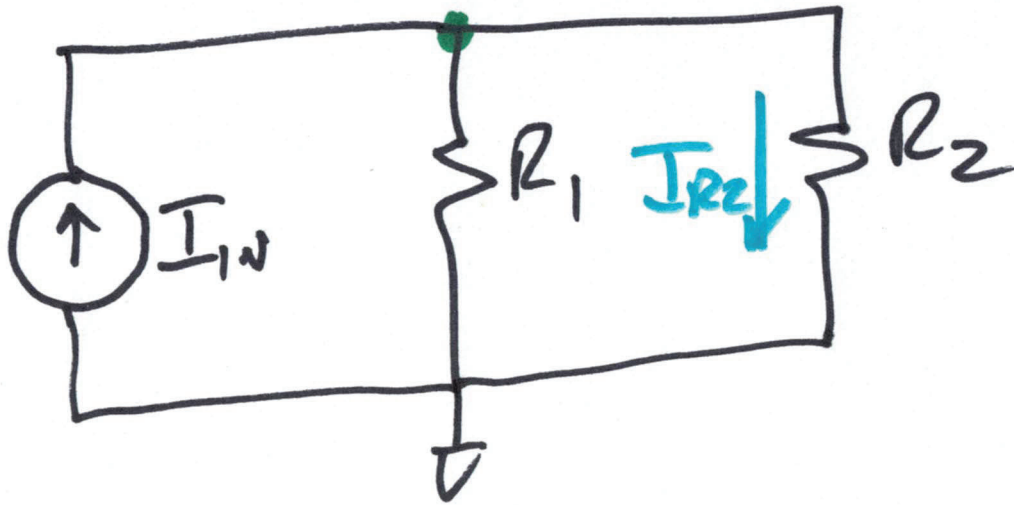
$$V_{out} = V_{in} \cdot \frac{R_2}{R_1 + R_2}$$

$$\begin{aligned} V_{in} \cdot \frac{R_1}{R_1 + R_2} &= V_{in} - V_{in} \cdot \frac{R_2}{R_1 + R_2} \\ &= V_{in} \left( \frac{R_1 + R_2}{R_1 + R_2} - \frac{R_2}{R_1 + R_2} \right) \\ &= \frac{R_1}{R_1 + R_2} \cdot V_{in} \end{aligned}$$

3)

# Current divider

$$V_x = I_{in} \cdot R_1 \parallel R_2$$

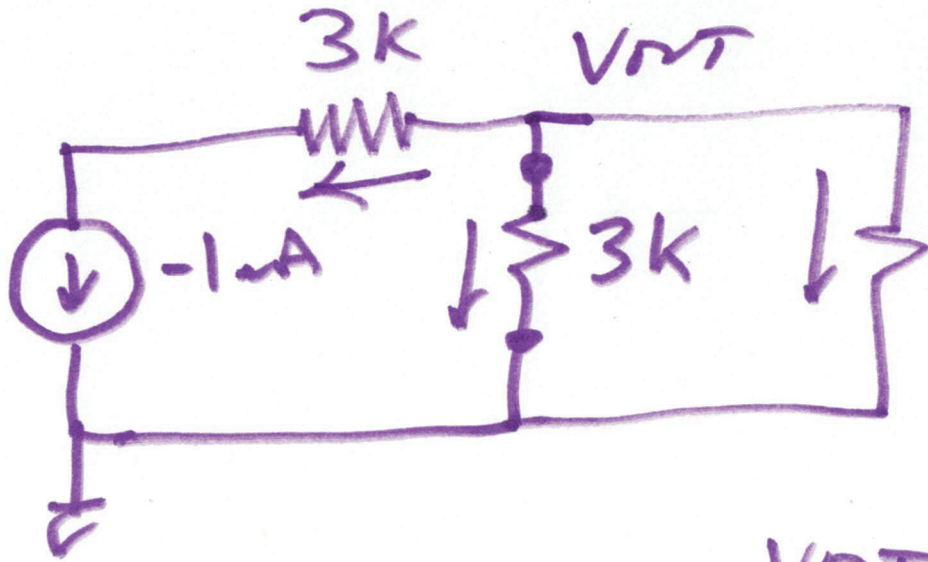


$$\frac{R_1 \parallel R_2}{R_1 + R_2}$$

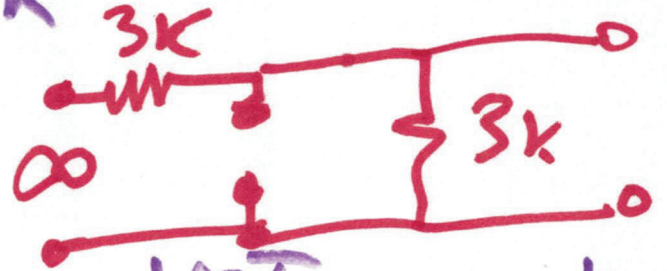
$$I_{R2} = \frac{V_x}{R_2} = I_{in} \cdot \frac{R_1 R_2}{R_1 + R_2}$$

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

$$I_{R2} = I_{in} \frac{R_1}{R_1 + R_2}$$



$$V_{oc} = V_{TH} = 3V$$



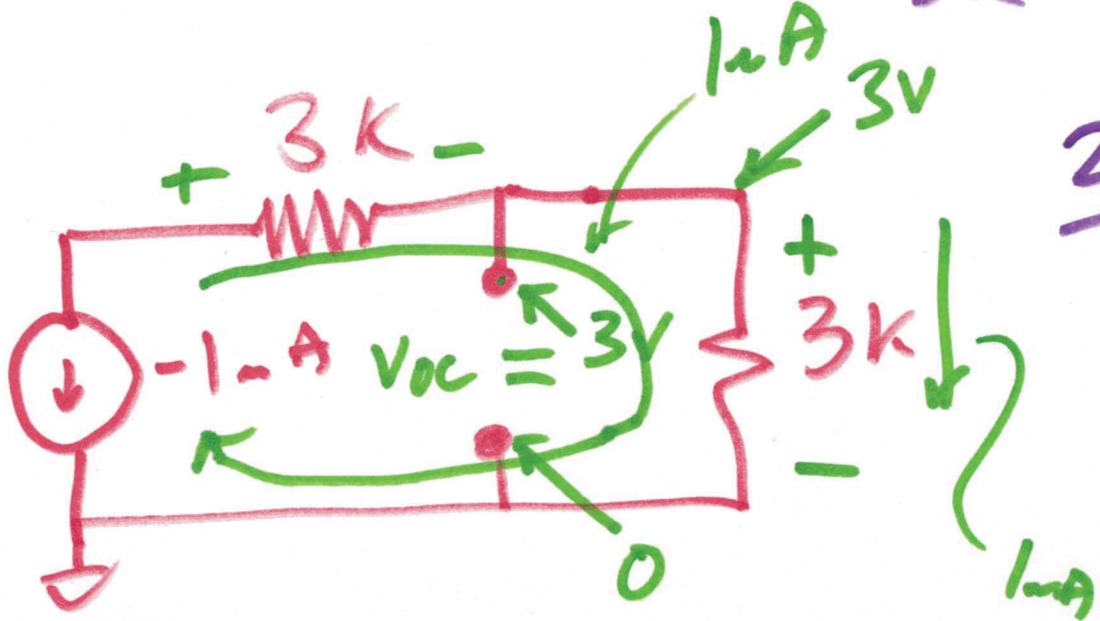
$$+ \frac{V_{TH}}{3k} = 0 \text{ KCL}$$

$$R_{TH} = 3k$$

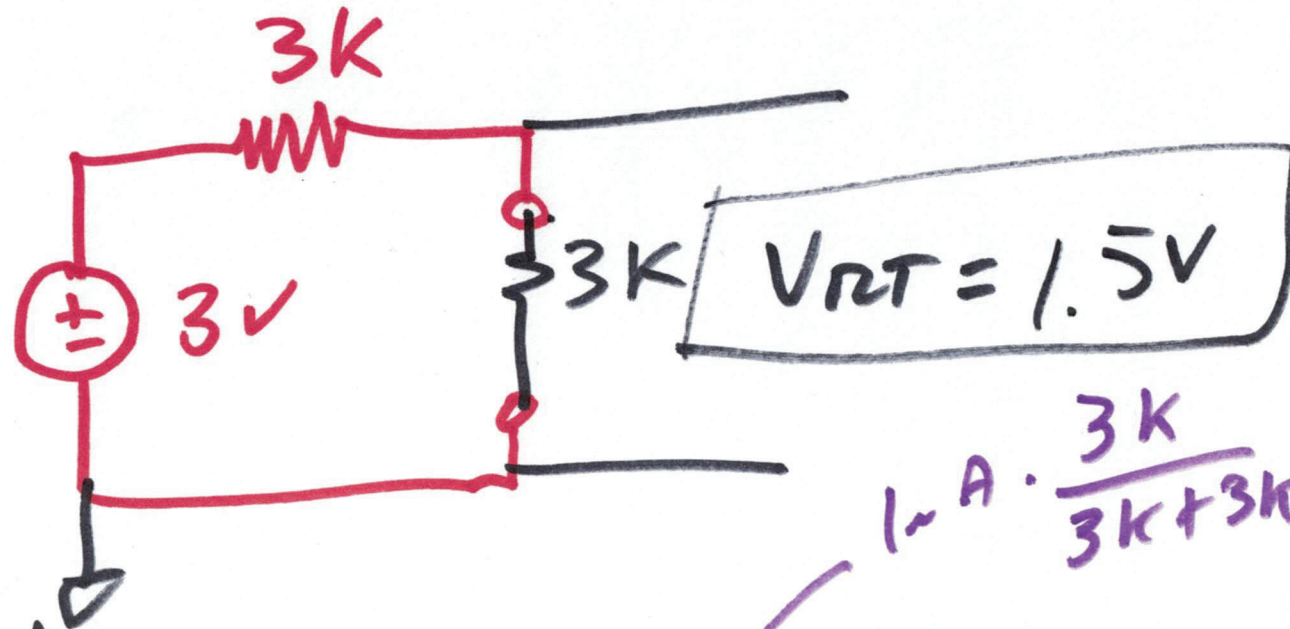
$$-1mA + \frac{V_{TH}}{3k}$$

$$\frac{2V_{TH}}{3k} = 1mA$$

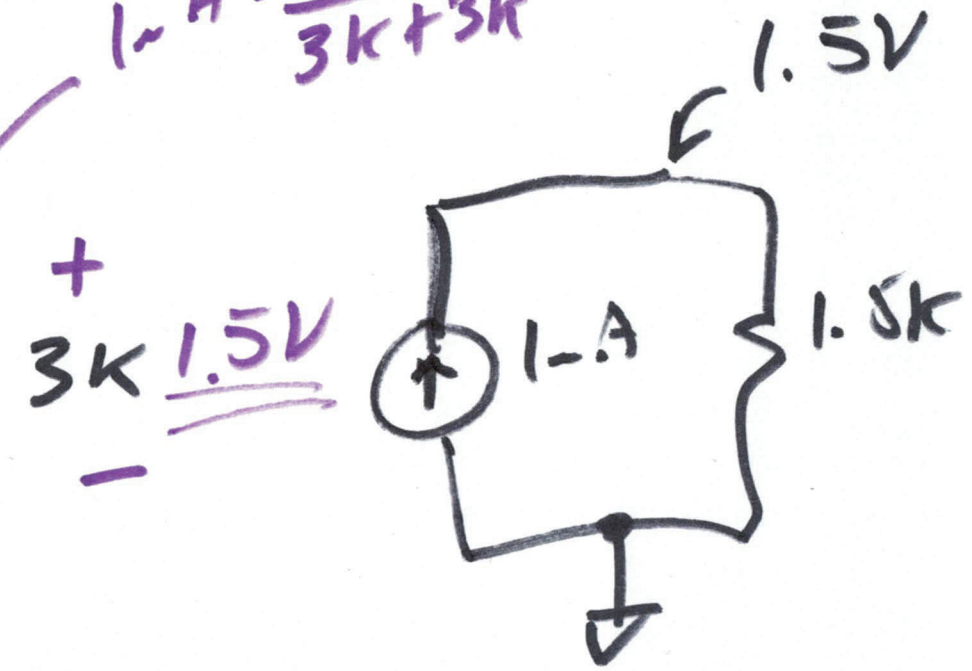
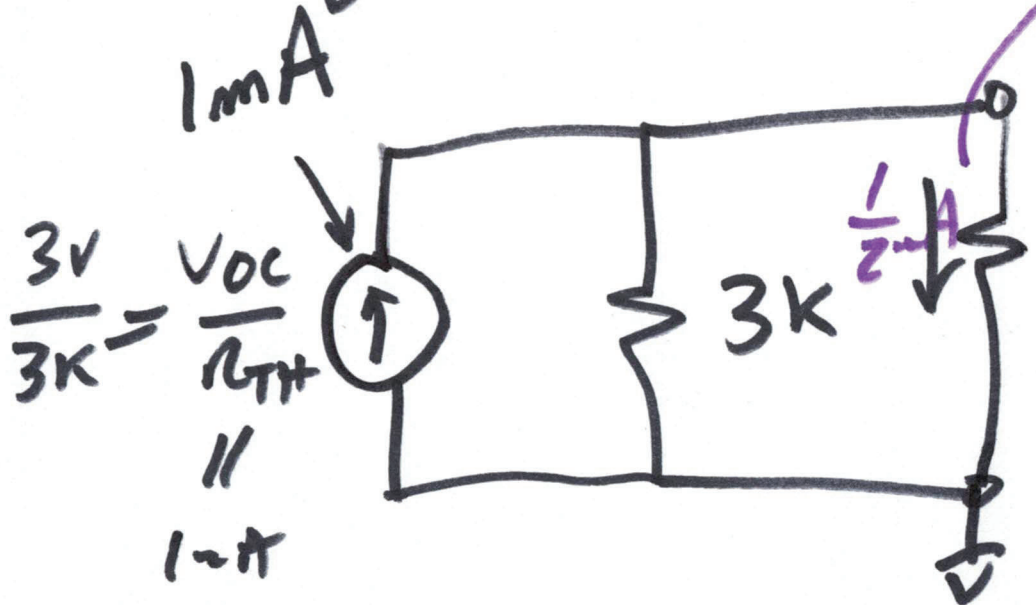
$$V_{TH} = 1.5V$$



5)



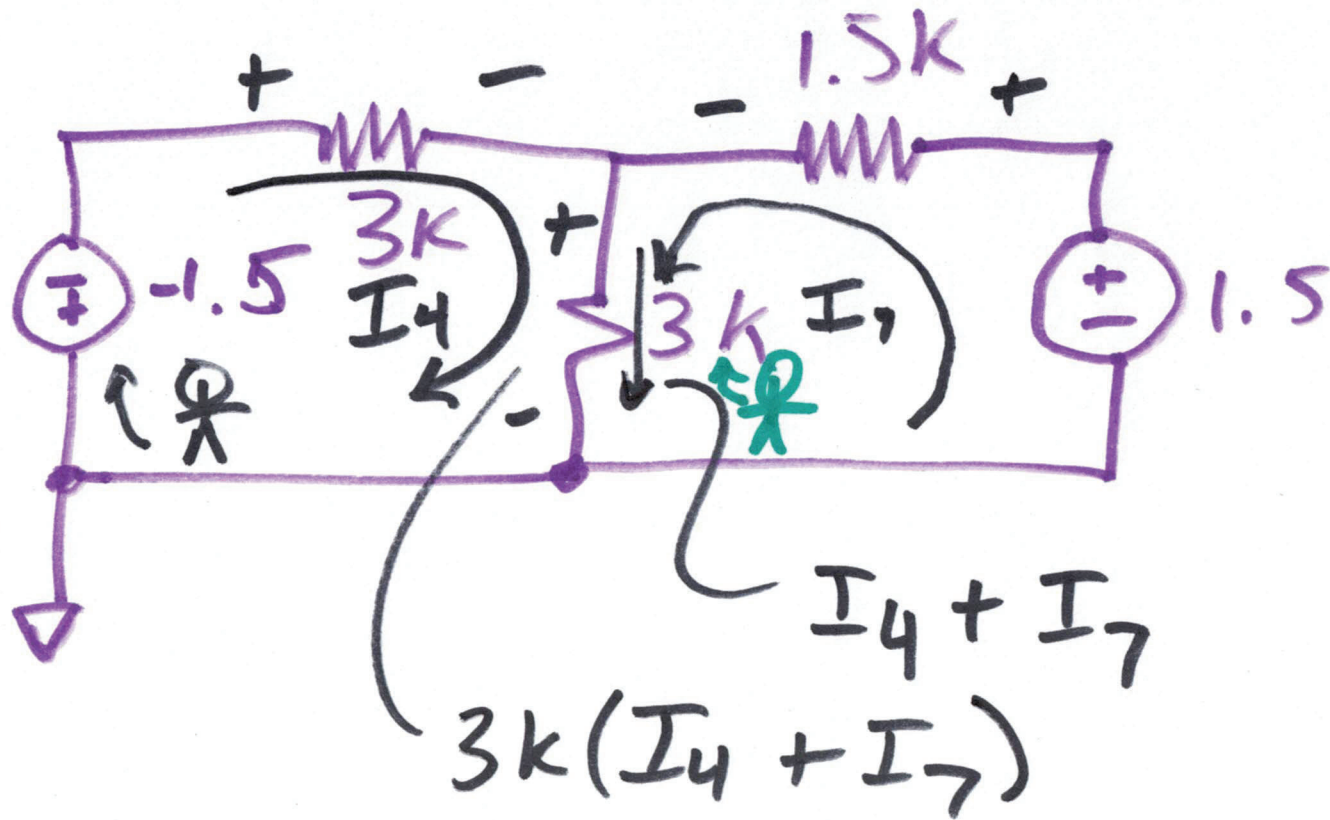
$$1 \mu A \cdot \frac{3K}{3K + 3K} = \frac{1}{2} \mu A$$



$$\frac{3V}{3K} = \frac{V_{OC}}{R_{TH}} \parallel 1 \mu A$$

$$+ \frac{1.5V}{3K}$$

b)



$$-(-1.5) - 3kI_4 - 3k(I_4 + I_7) = 0$$

$$1.5 - 6kI_4 - 3kI_7 = 0$$

$$3k(I_4 + I_7) + 1.5kI_7 - 1.5 = 0$$

7)

$$\begin{array}{r}
 1.5 - 6kI_4 - 3kI_7 = 0 \\
 + 2 \left[ (-1.5) + 3kI_4 + 4.5kI_7 = 0 \right] \\
 \hline
 \end{array}$$

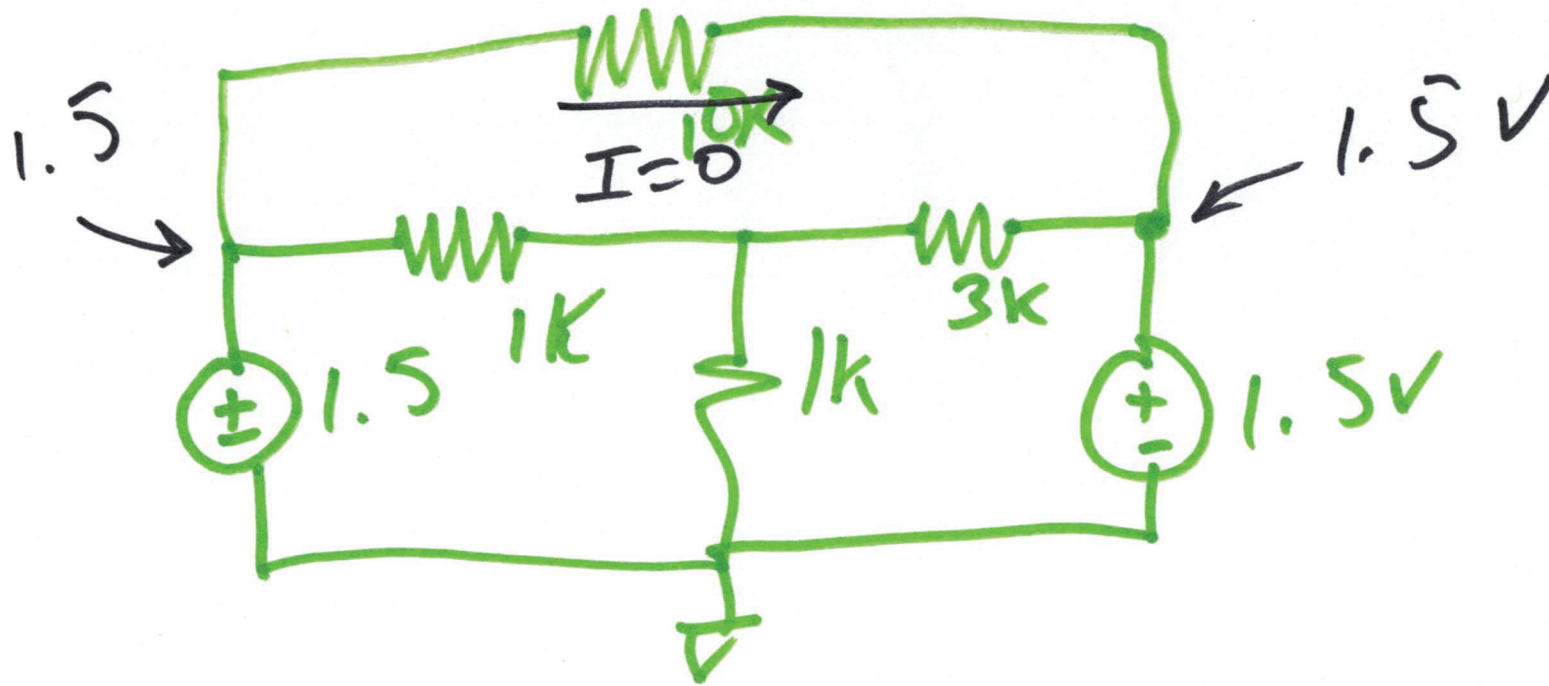
$$\begin{array}{r}
 1.5 - 6kI_4 - 3kI_7 = 0 \\
 + -3 + 6kI_4 + 9kI_7 = 0 \\
 \hline
 \end{array}$$

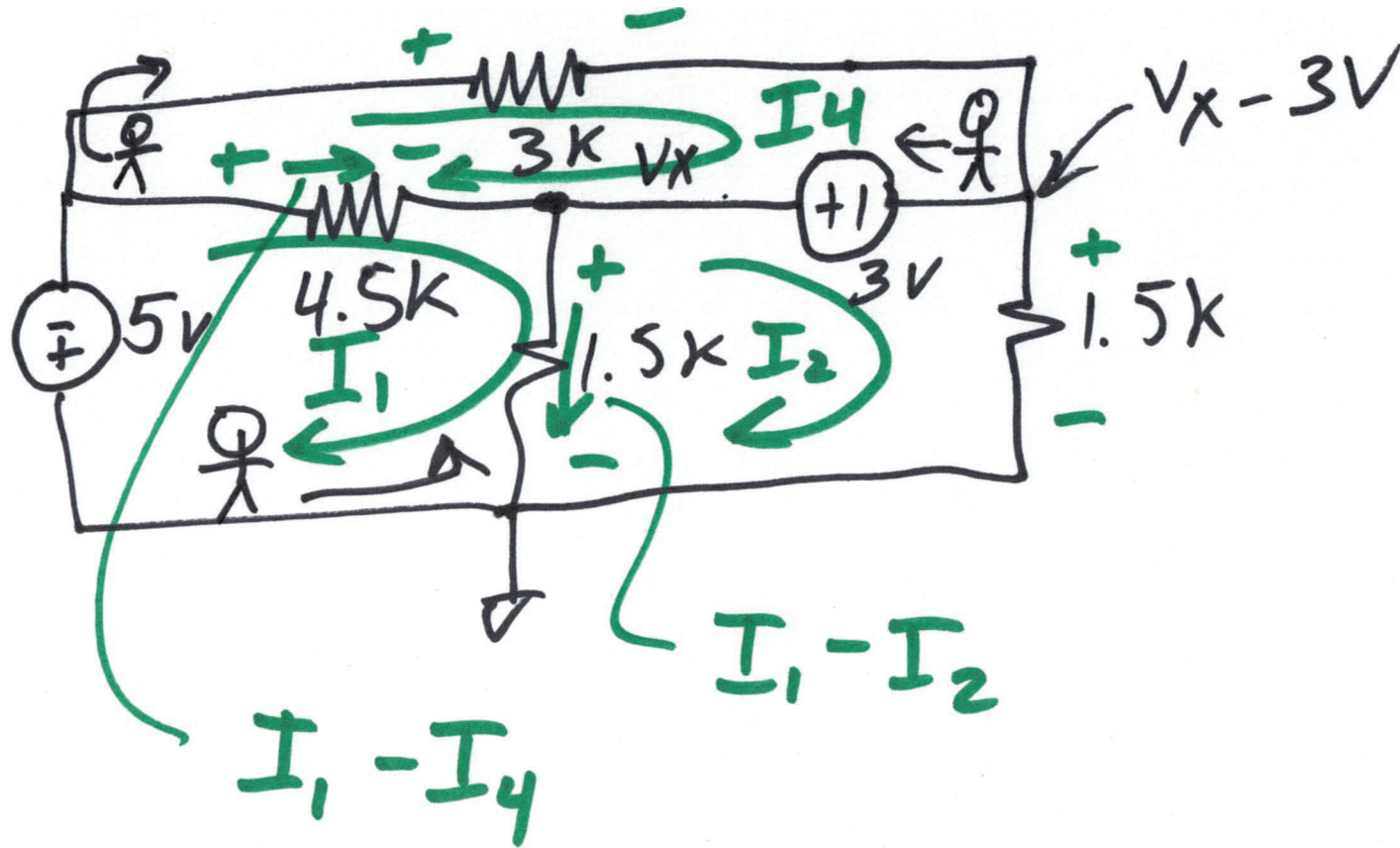
$$\begin{array}{r}
 -1.5 + 0 + 6kI_7 = 0 \\
 \frac{3}{2} \cdot \frac{6}{4} \\
 \frac{1}{5} - 6kI_4 - \frac{3}{4} = 0 \quad I_7 = \frac{1.5}{6k} = \frac{3 \cdot \cancel{V}}{12 \cdot \cancel{\mu}} \text{ mA}
 \end{array}$$

$$6kI_4 = \frac{3}{4} \quad I_7 = \frac{1}{4} \text{ mA}$$

8)







$$-3k(I_4) + 3V + 4.5k(I_1 - I_4) = 0$$

$$+1.5k(I_1 - I_2) + 4.5k(I_1 - I_4) + 5 = 0$$

$$+3 - 1.5k(I_1 - I_2) + 1.5k(I_2) = 0$$

10)