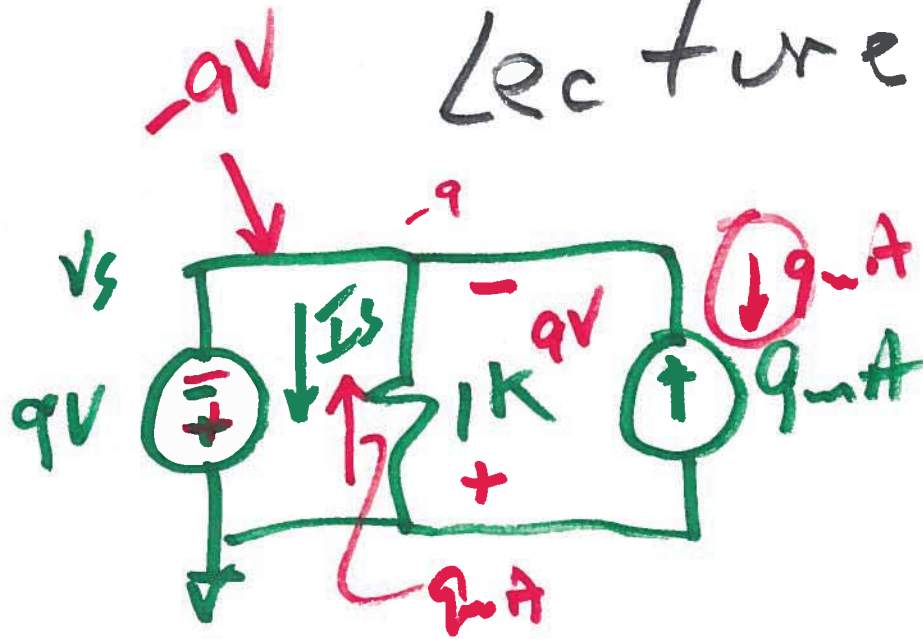


EE 220

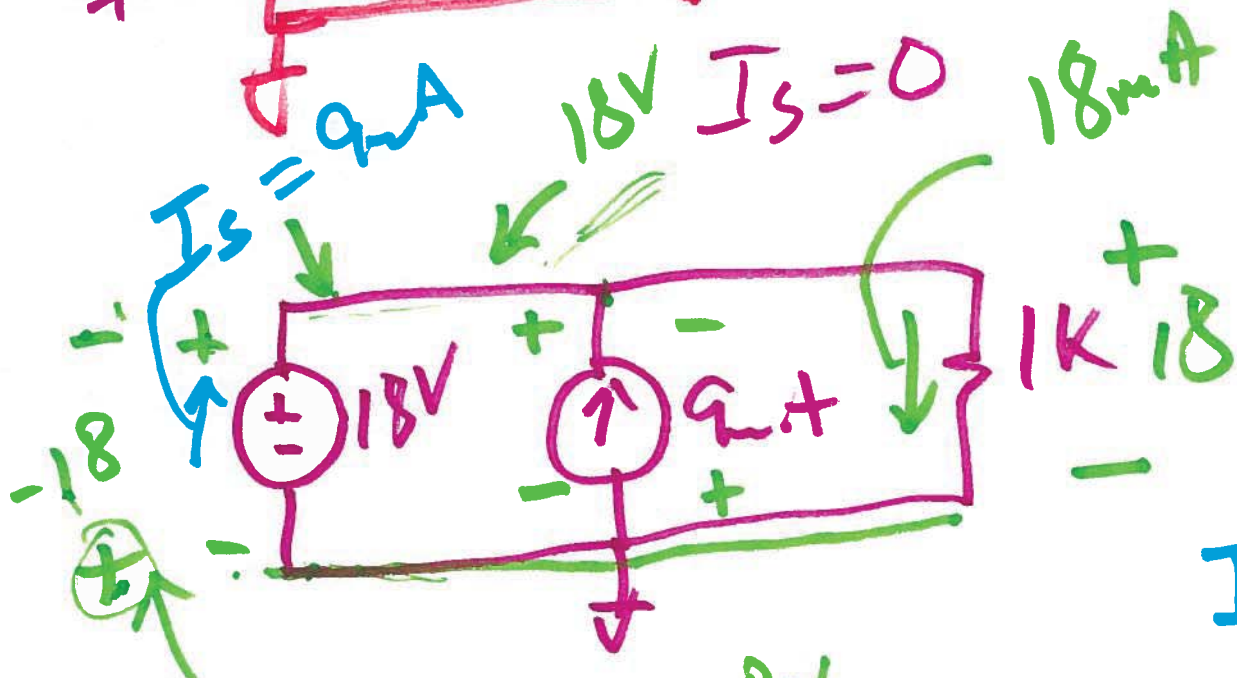
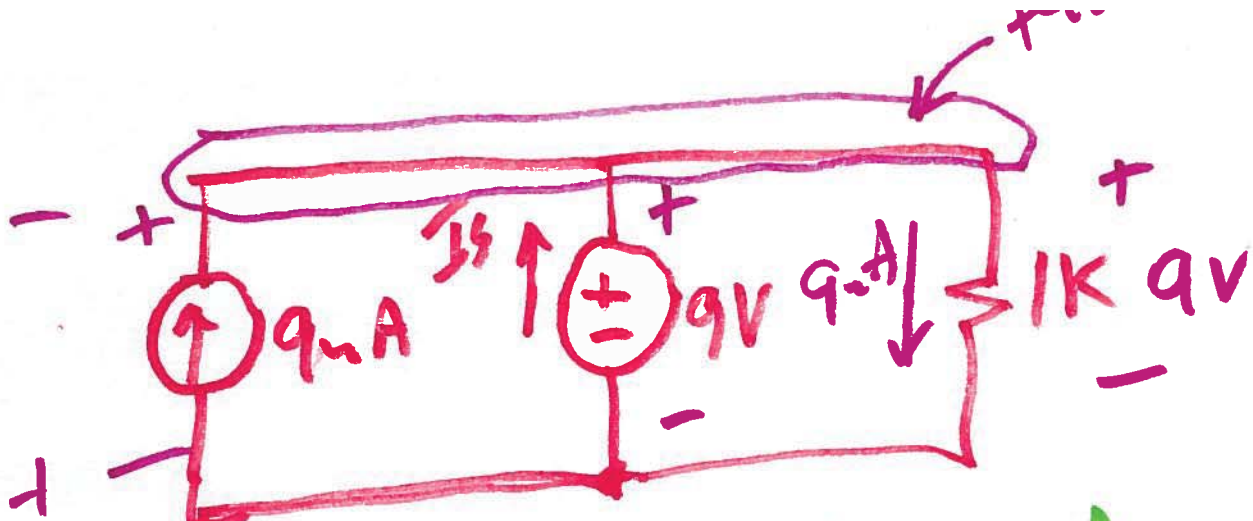
Circuits I

Lecture 7



$$I_s = 0$$

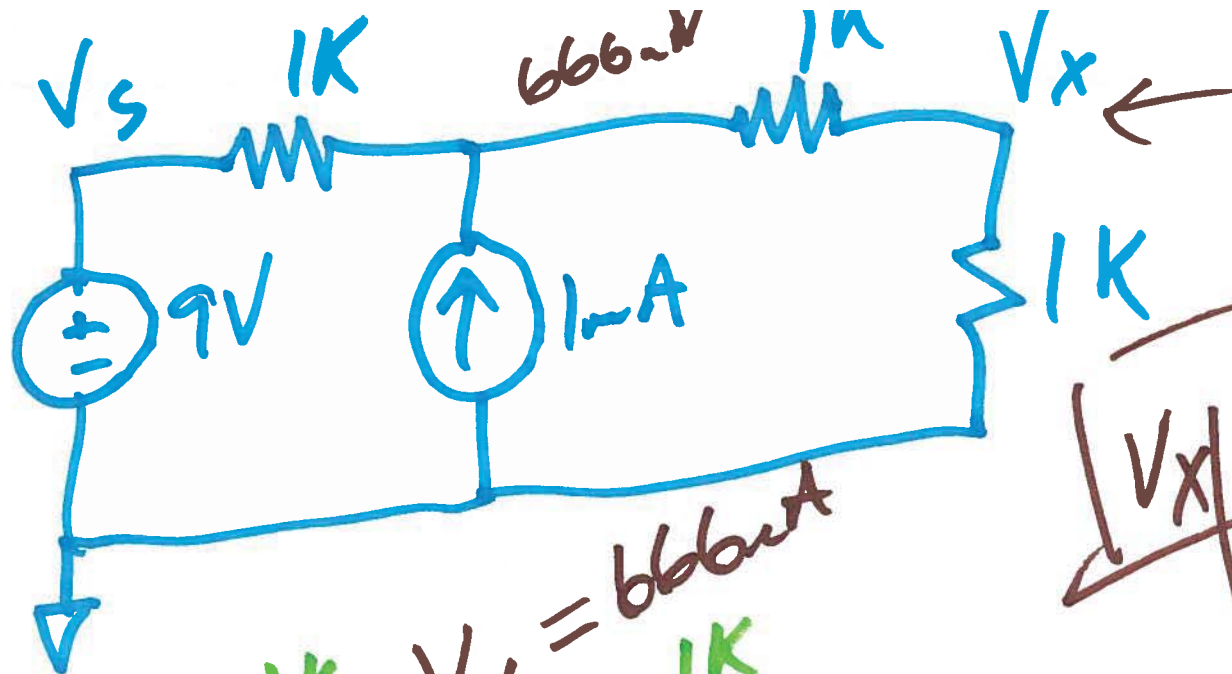
1)



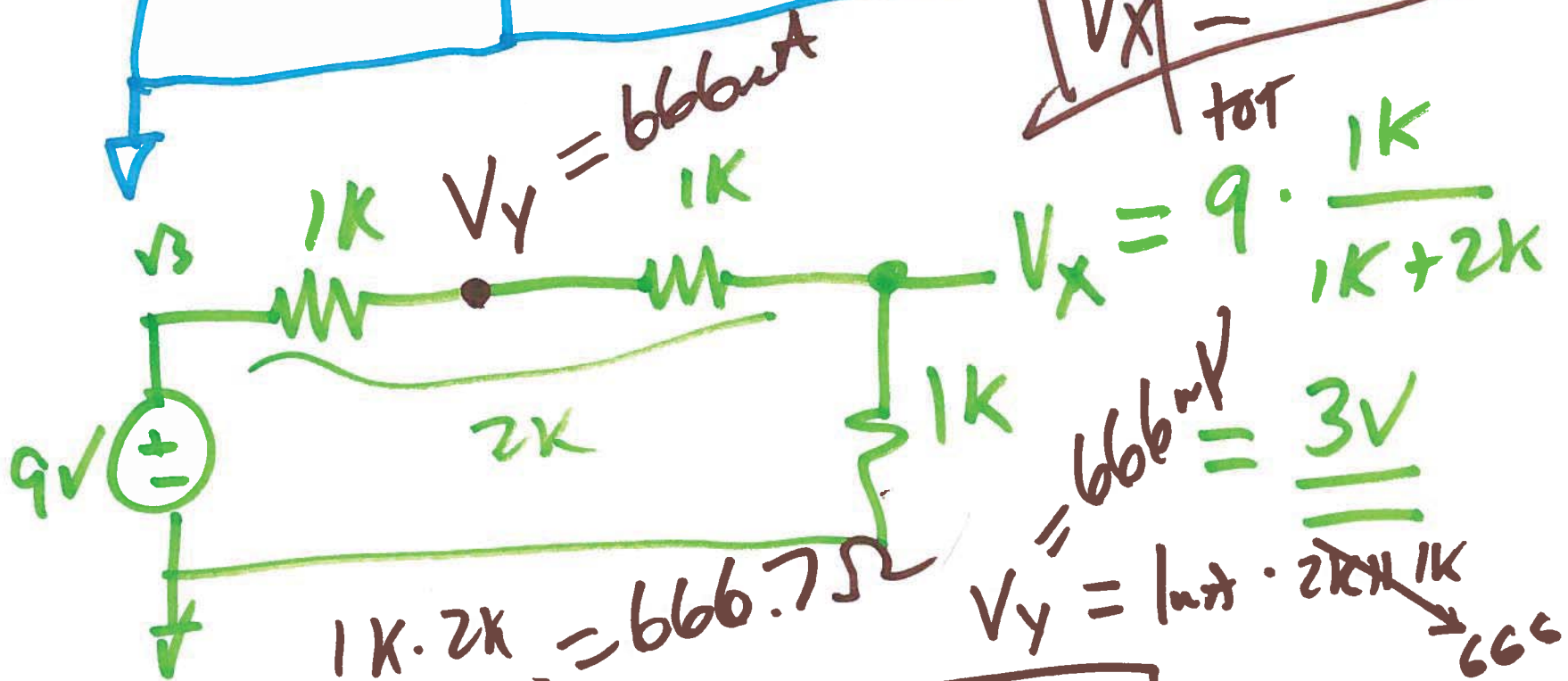
$0 - 18 = -18V$

$I_s + 9\mu A = 18\mu A$
 $I_s = 9\mu A$

2)



$$|V_x| = 3.333V$$



$$V_x = 9 \cdot \frac{1K}{1K + 2K}$$

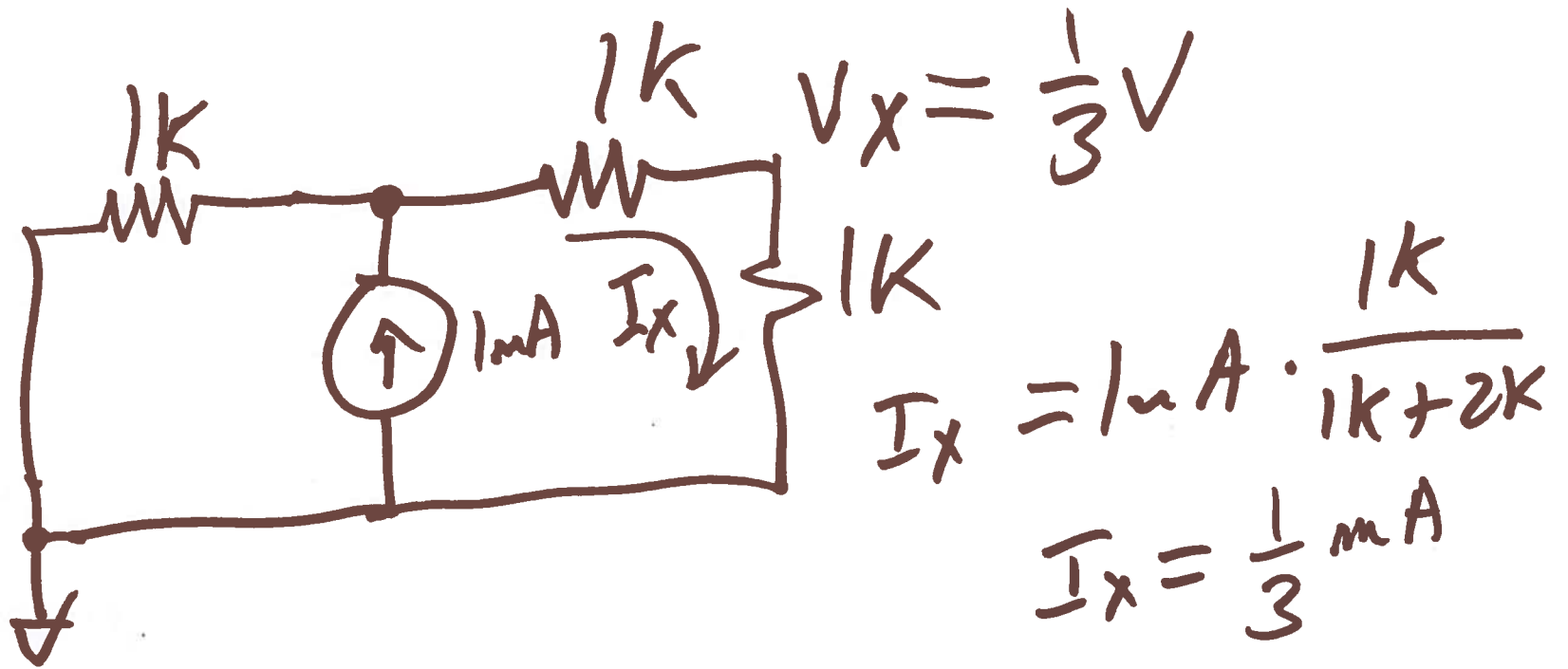
$$V_y = 666mV = 3V$$

$$\frac{1K \cdot 2K}{1K + 2K} = 666.7\Omega$$

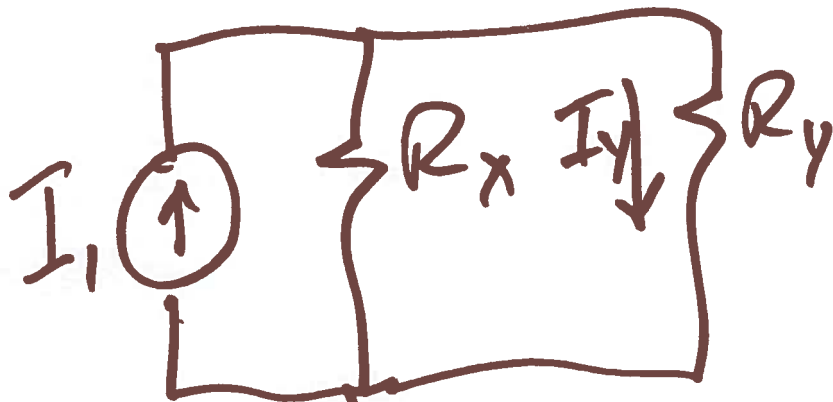
$$V_y = 1mA \cdot 2K \parallel 1K \rightarrow 666$$



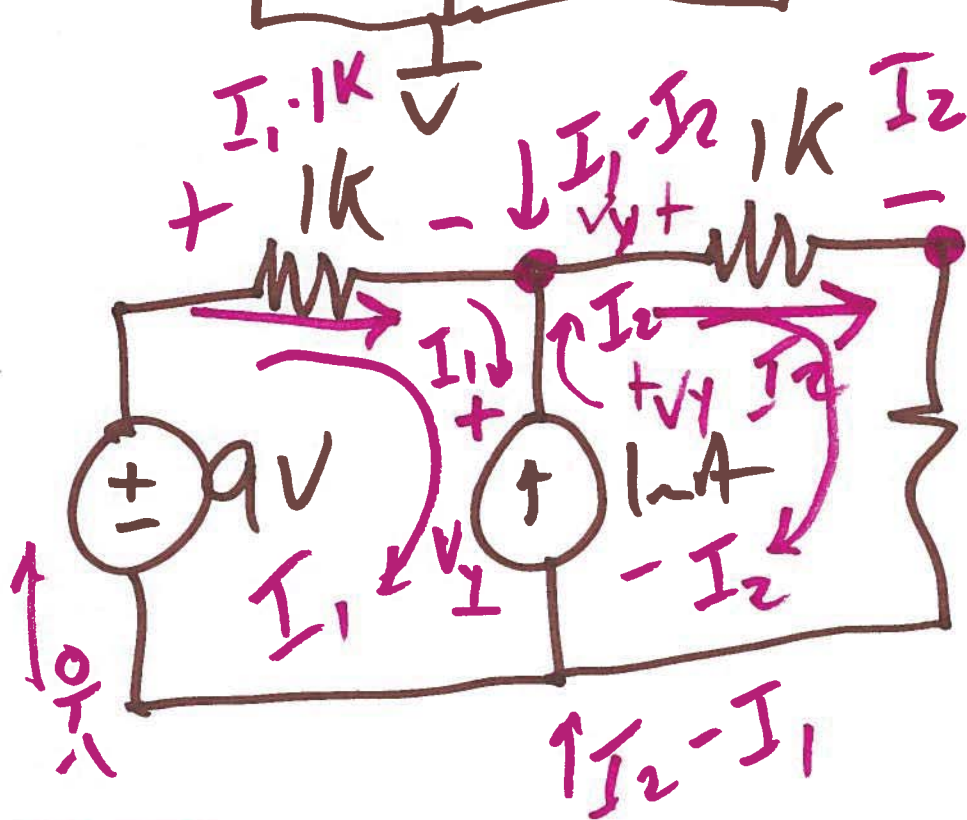
$$V_x = 337mV$$



$$V_{x_{tot}} = 3V + \frac{1}{3}V = \underline{\underline{3.333V}}$$



$$I_y = I_1 \cdot \frac{R_x}{R_x + R_y}$$



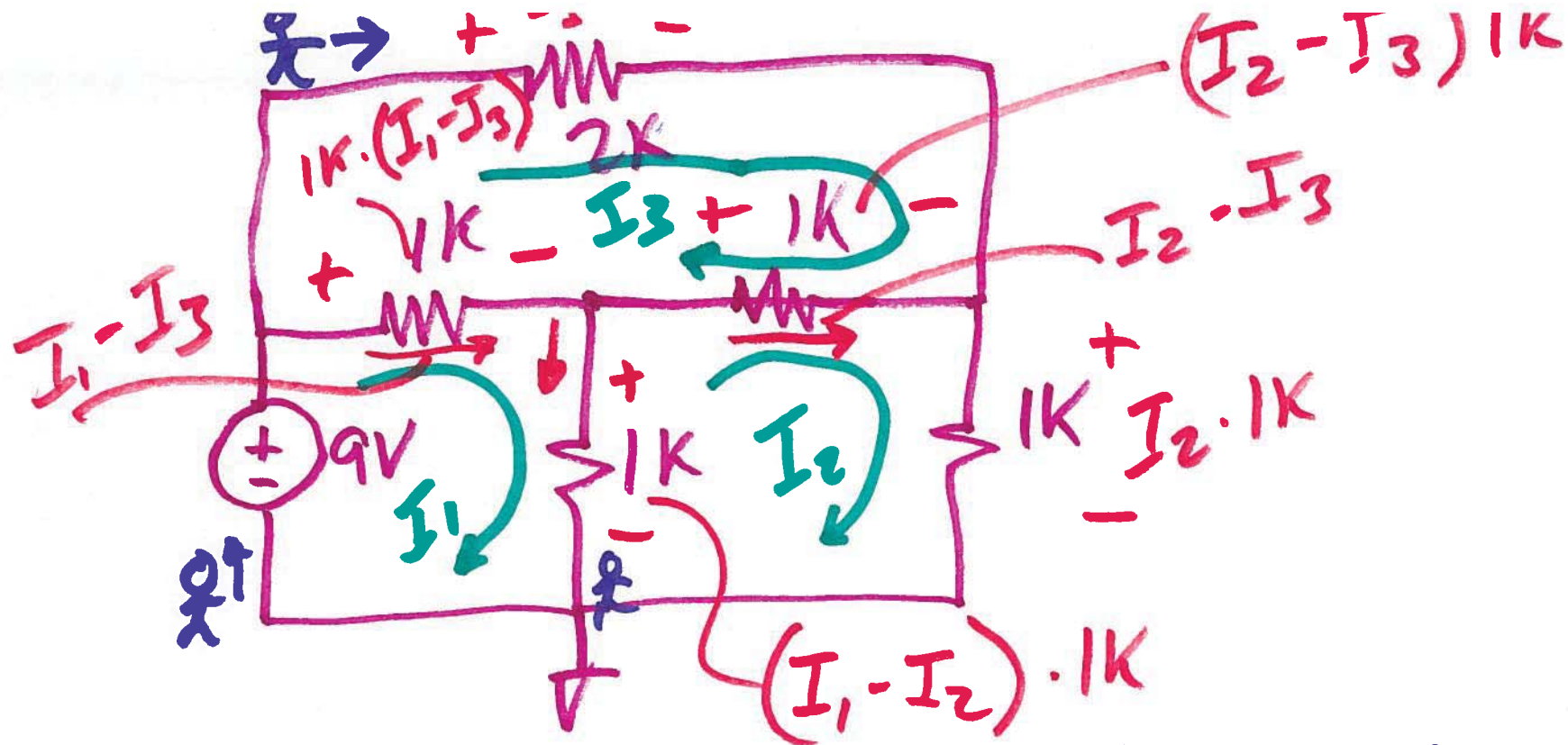
$$I_1 - I_2 = 1 \text{ mA} \quad (3)$$

$$1k + I_2 \cdot 1k$$

$$9 - I_1 \cdot 1k - V_1 = 0 \quad (1)$$

$$V_1 - I_2 \cdot 1k - I_2 \cdot 1k = 0 \quad (2)$$

5)

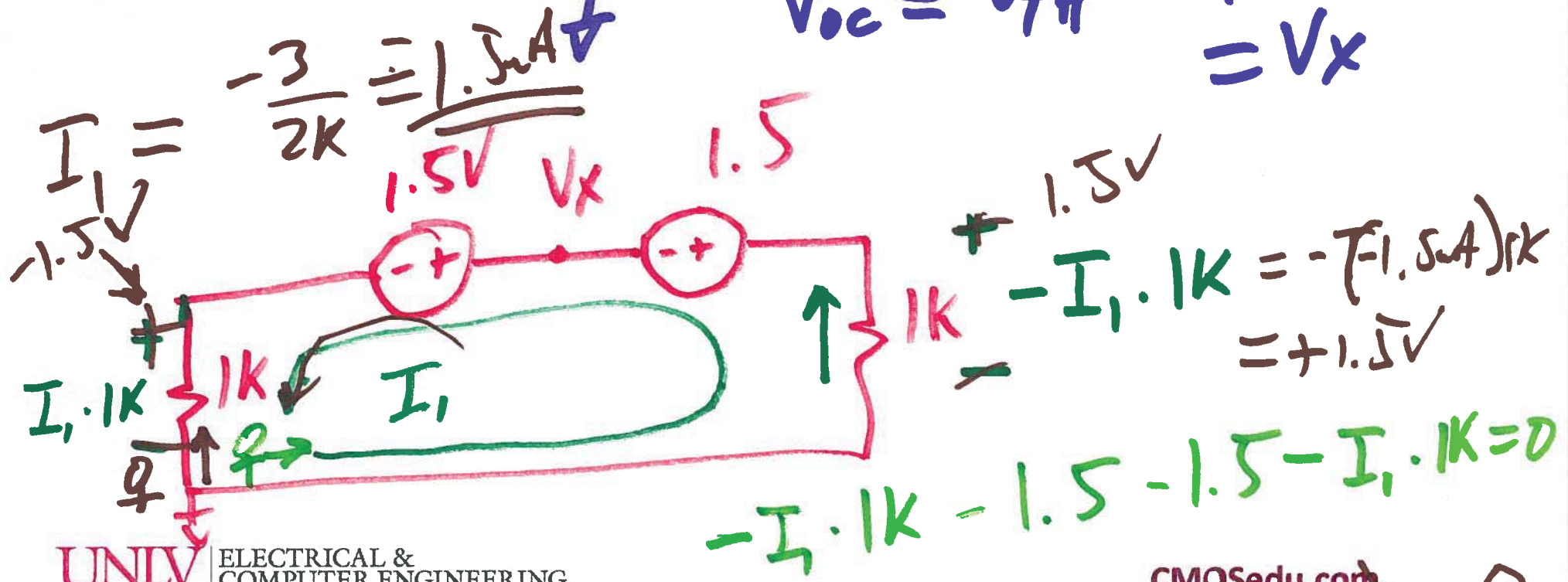
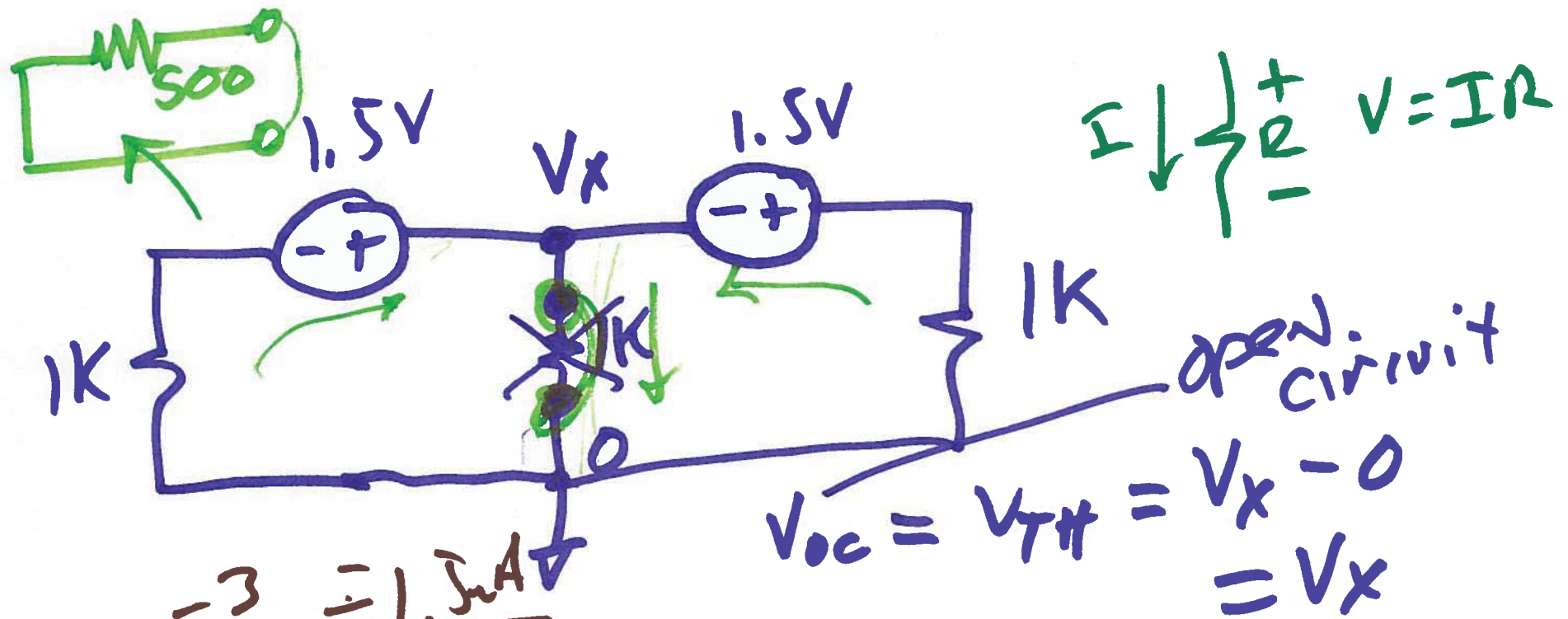


$$9 - (I_1 - I_3)1k - (I_1 - I_2)1k = 0$$

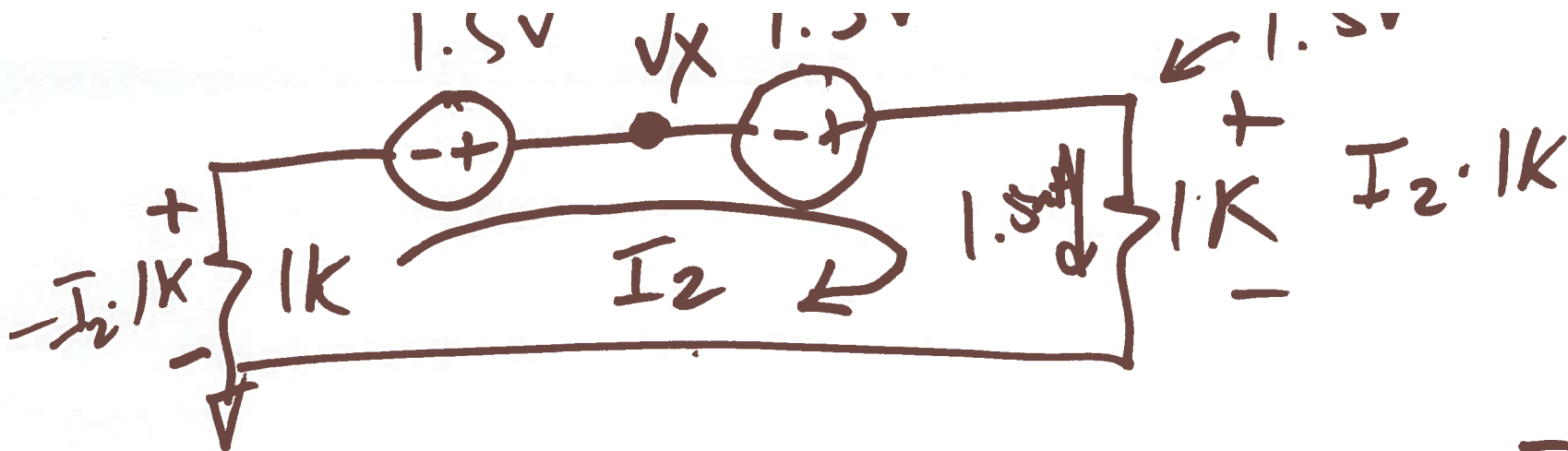
$$(I_1 - I_2)1k - (I_2 - I_3)1k - I_2 \cdot 1k = 0$$

$$-I_2 \cdot 2k + (I_2 - I_3)1k + (I_1 - I_3)1k = 0$$

b)



$I_1 \cdot 1k + 1.5 + 1.5 - (-I_1 \cdot 1k) = 0$



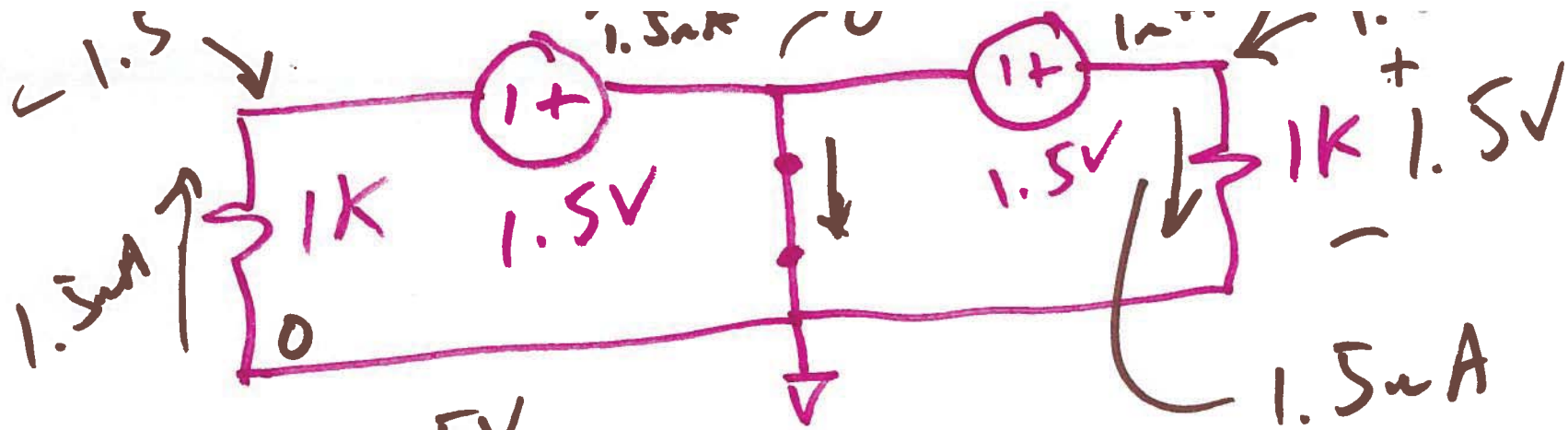
$$-I_2 \cdot 1k + 1.5 + 1.5 - I_2 \cdot 1k = 0$$

$$-I_2 \cdot 2k + 3V = 0$$

$$I_2 = \underline{\underline{+1.5 \mu A}}$$

$$\underline{\underline{V_x = V_{TH} = 0V}}$$

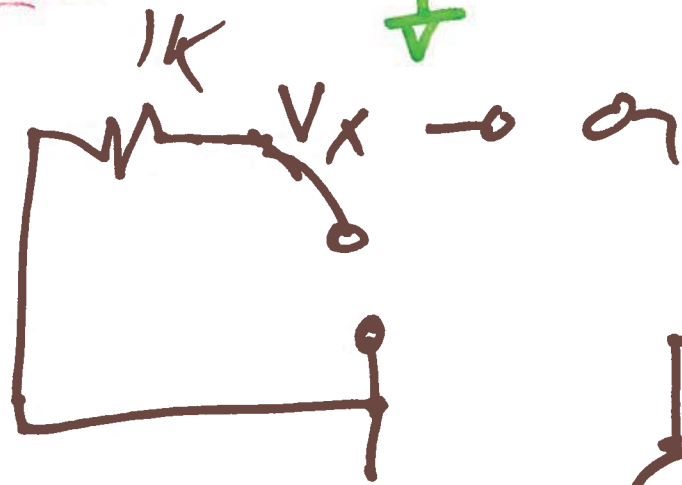
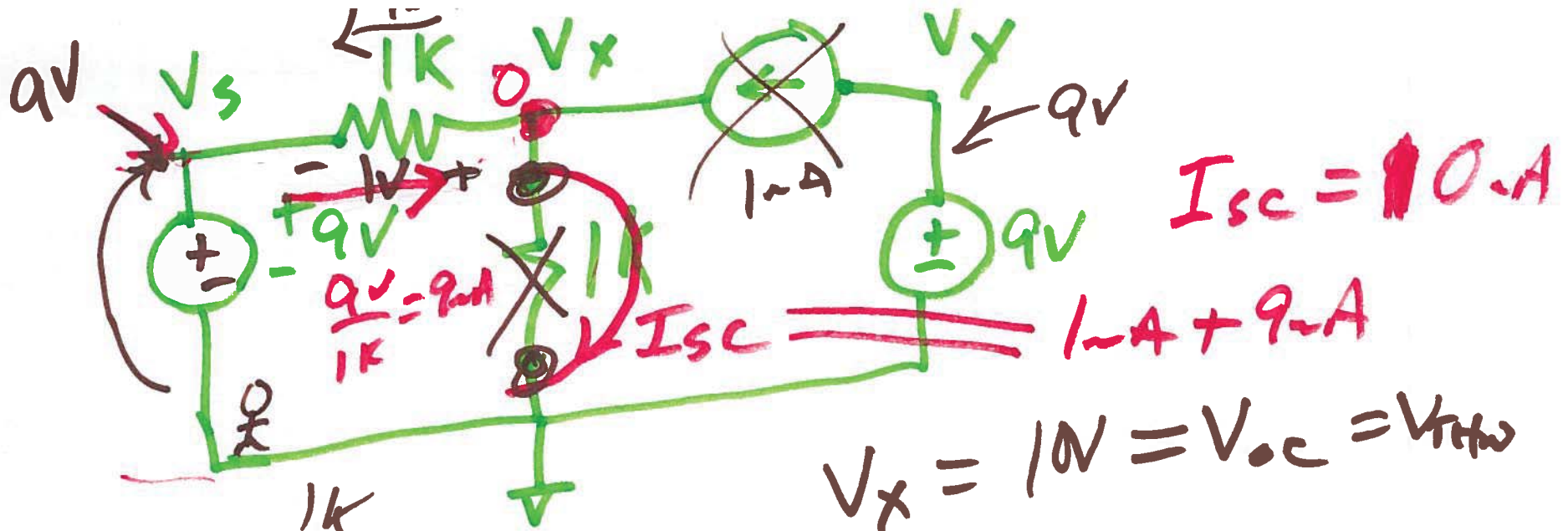
8)



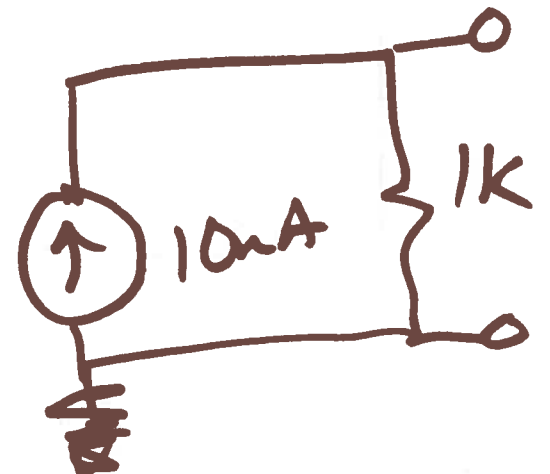
$$I = \frac{-1.5 - 0}{1k} = -1.5\mu A$$

$$I = \frac{0 - (-1.5V)}{1k} = 1.5\mu A$$

a)

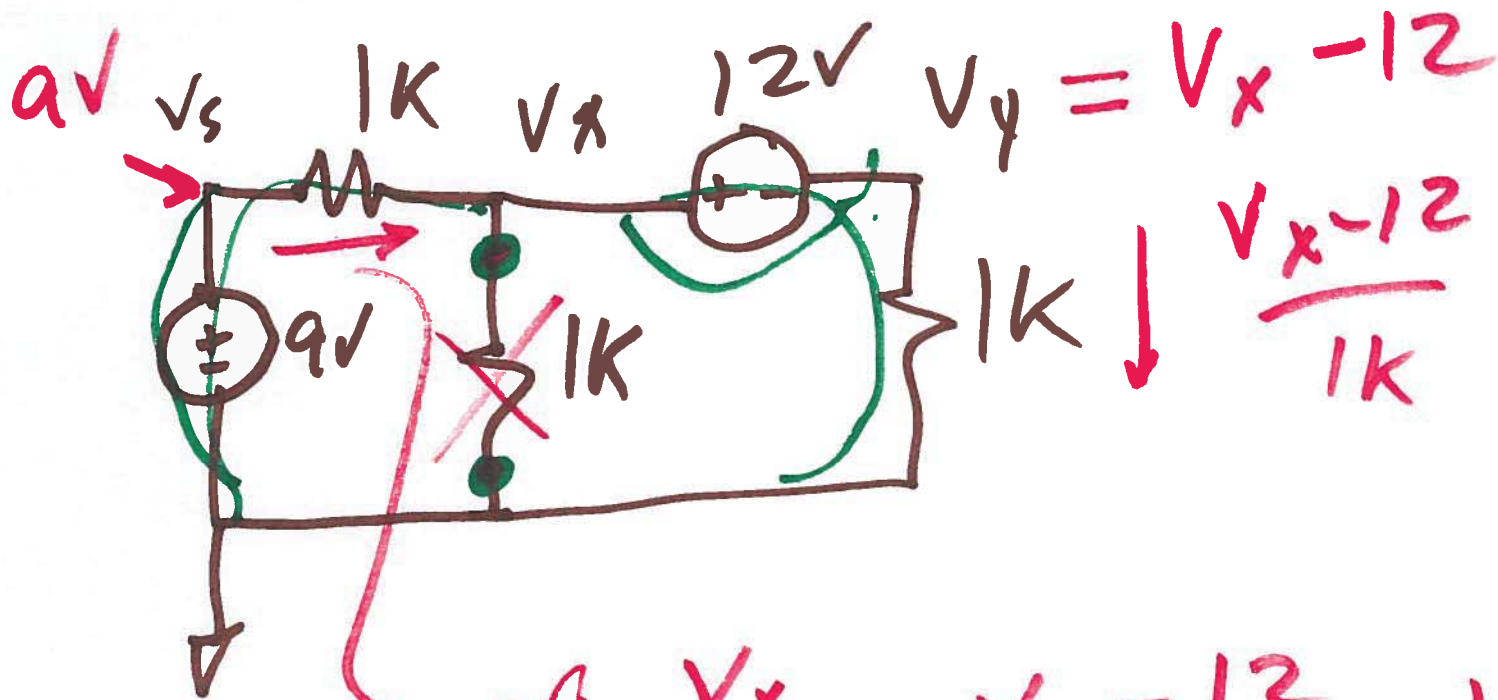


$R_{th} = 1k$



$$R_{th} = \frac{V_{oc}}{I_{sc}} = \frac{10V}{10mA} = 1k$$

(10)



$$\frac{9 - V_x}{1k} = \frac{V_x - 12}{1k}, \quad V_x = V_{TH} = V_{oc}$$

$$R_{TH} = 500 \quad 1k \parallel 1k$$