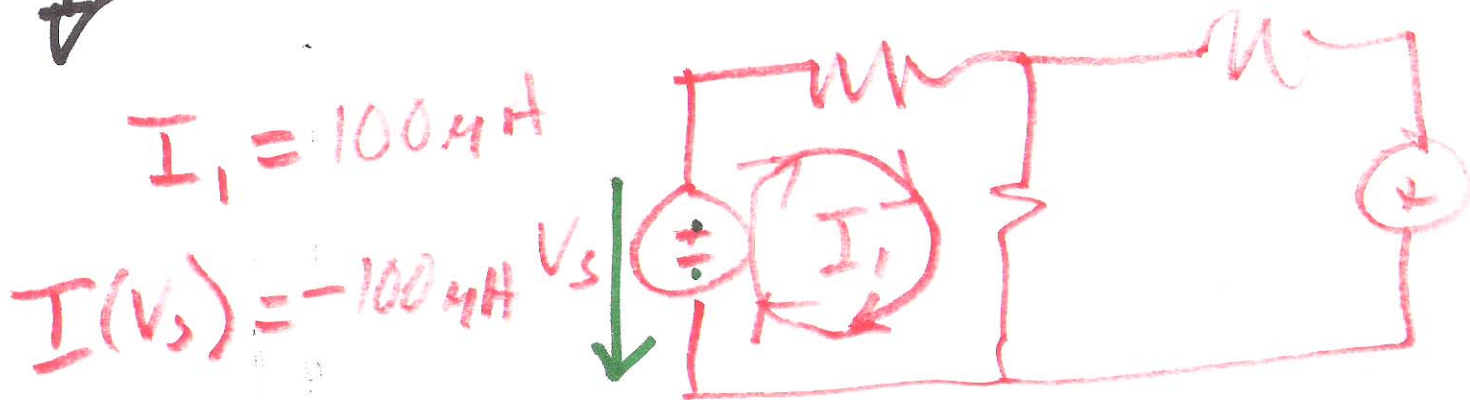
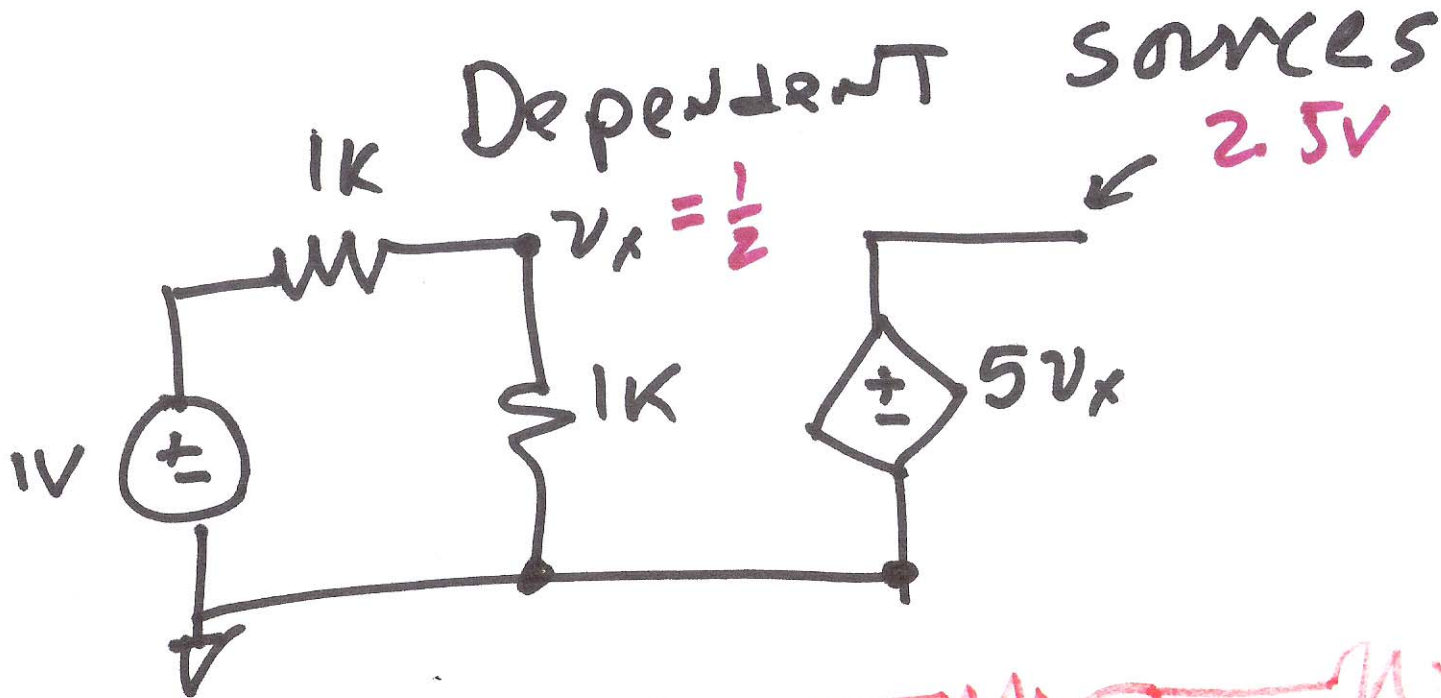
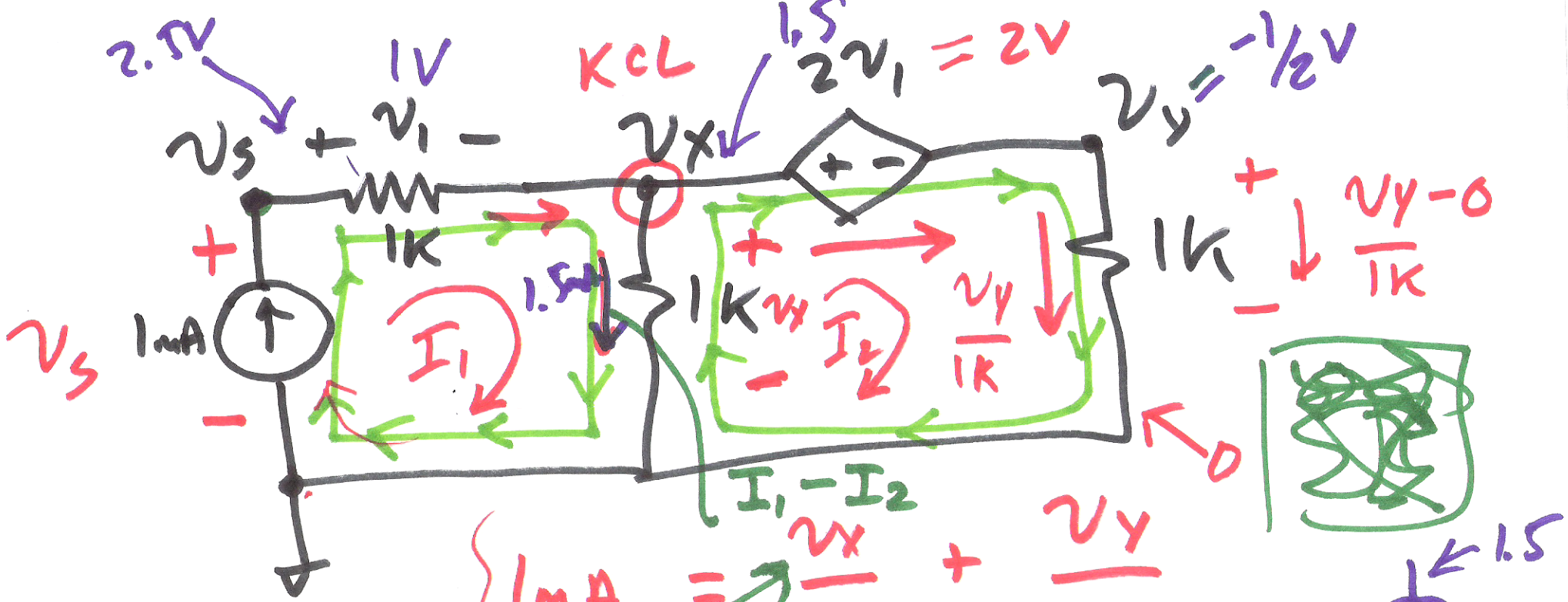


# Lecture 5

6/13/14

EE 220





$$I_1 = 1\text{mA}$$

$$v_s = v_1 + v_x$$

$$1\text{mA} = \frac{v_x}{1\text{k}} + \frac{v_y}{1\text{k}}$$

$$v_x - v_y = 2v_1 = 2$$

$$v_1 = 1\text{k} \cdot 1\text{mA} = 1\text{V}$$

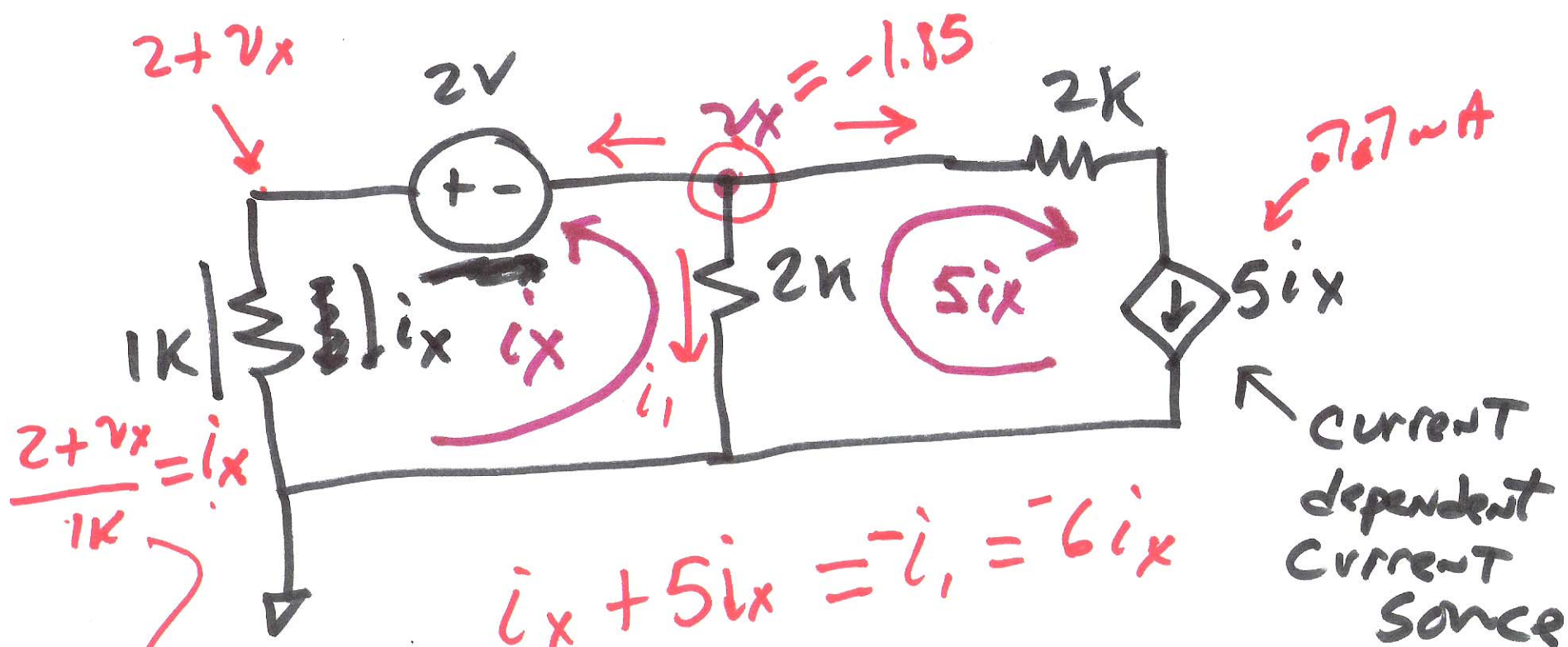
$$v_x = 2v_1 + v_y$$

$$v_x = (I_1 - I_2) 1\text{k}$$

$$1\text{mA} = \frac{1}{1\text{k}} (2 + v_y + v_y)$$

$$1 = 2 + 2v_y \Rightarrow v_y = -\frac{1}{2}\text{V}$$

2)  $v_s = 1\text{V} + v_x$



$$i_x + 5i_x = -i_1 = -6i_x$$

$$v_x = -6i_x \cdot 2k$$

$$v_x = -12k \cdot i_x$$

$$\frac{2 - 12k \cdot i_x}{1k} = i_x$$

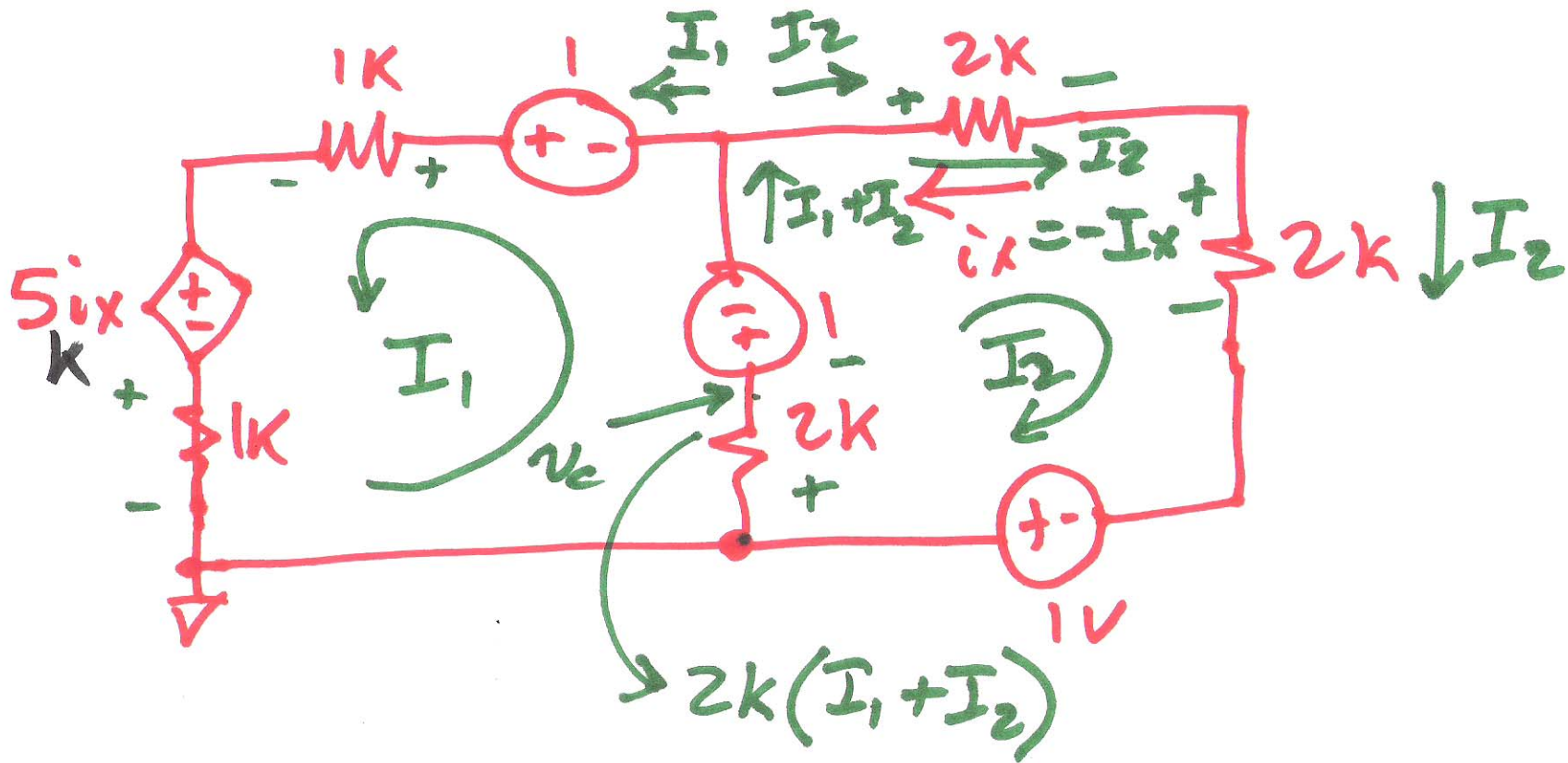
$$2 - 12k i_x = 1k i_x$$

$$i_x = \frac{2}{13k} = 0.154mA$$

$$v_x =$$

3)





$$2k(I_1 + I_2) = 0 - v_c = -v_c$$

$$v_c = -2k(I_1 + I_2)$$

+

$$x + 2k(I_1 + I_2) + 1k \cdot I_1 + 5i_x + 1k \cdot I_1 = x$$

$$4kI_1 + 2kI_2 + 5i_x = 0$$

$$2k(I_1 + I_2) + x + 2kI_2 + 2kI_2 = x$$

$$2kI_1 + 6kI_2 = 0$$

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$$I_2 = -i_x$$

4)

$$4kI_1 + 2kI_2 - 5kI_2 = 0$$

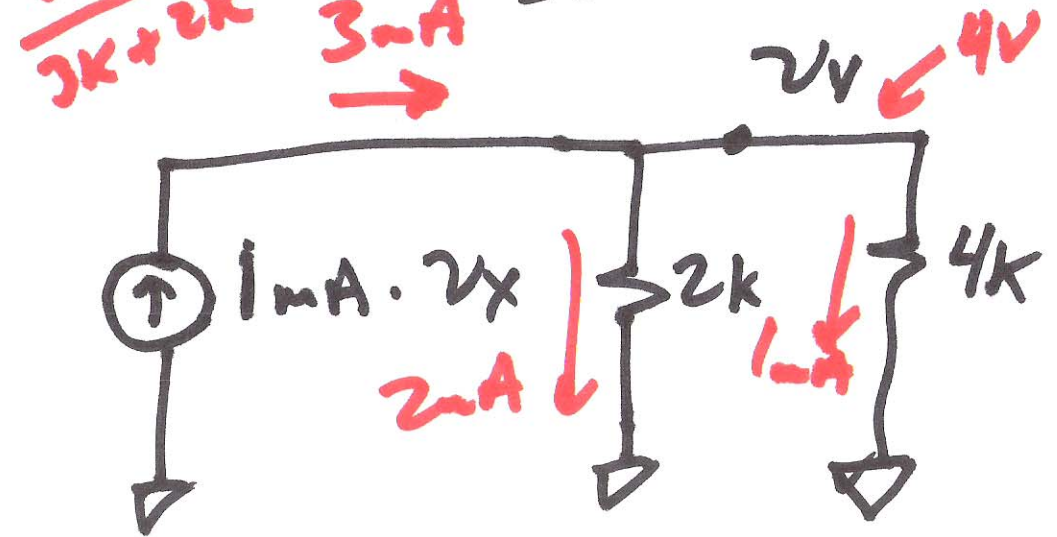
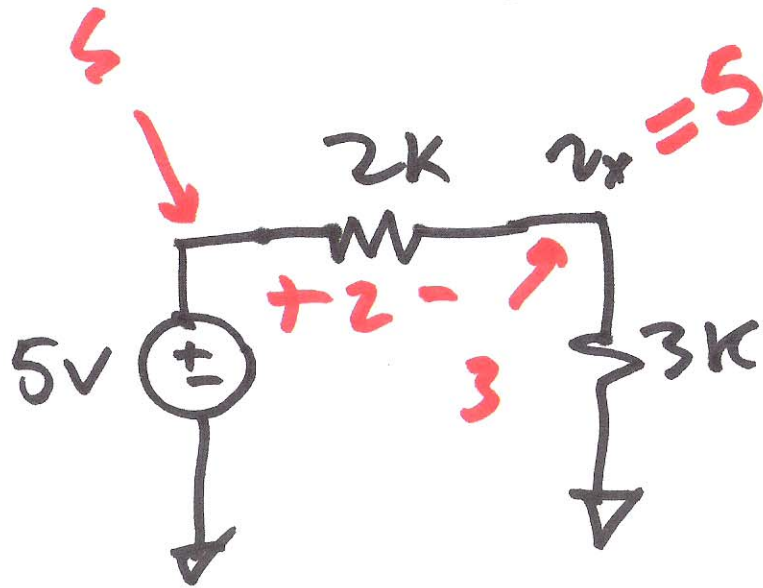
$$I_1 = -3I_2$$

$$-12kI_2 + 2kI_2 - 5kI_2 = 0$$

$$I_2 = 0$$

$$I_1 = 0$$

# Voltage-Controlled Current Source



$$I_{4K} = 3mA \cdot \frac{2K}{2K + 4K}$$

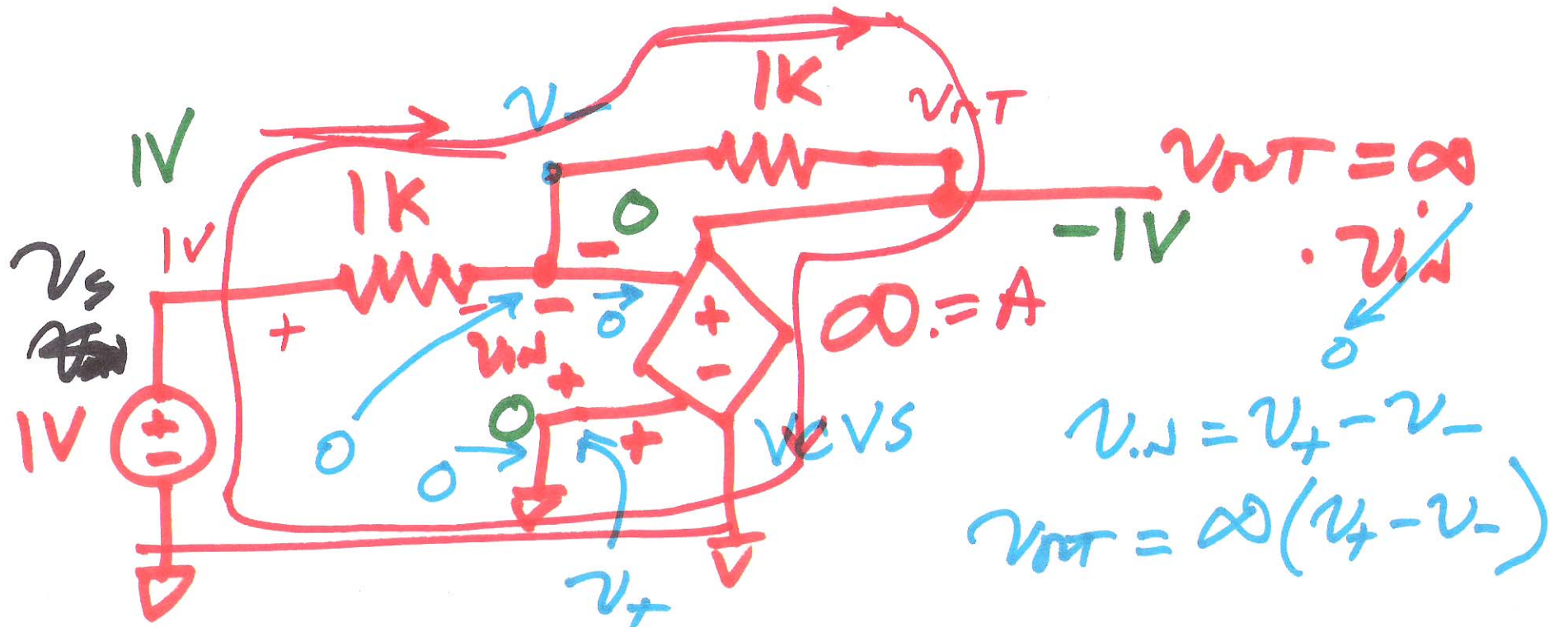
$$= 1mA$$

find  $v_y$  &  $I_{4K}$

$$v_y = 3mA \cdot 2K \parallel 4K$$

$$I_{4K} = \frac{v_y}{4K}$$

6)



$$\frac{1 - V_-}{1k} = \frac{V_- - V_{out}}{1k}$$

$$-A \cdot V_- = V_{out} = \lim_{A \rightarrow \infty} A (V_+ - V_-)$$

7)



$$v_- = \frac{v_{out}}{-A}$$

$$1 + v_{out} = 2v_-$$

$$1 + v_{out} = -\frac{2}{A} v_{out}$$

$$-1 = v_{out} \left(1 + \frac{2}{A}\right)$$

$$v_{out} = \lim_{A \rightarrow \infty} \frac{-1}{1 + \frac{2}{A}} = \underline{\underline{-1V}}$$

$$v_{out} = -1 = \lim_{A \rightarrow \infty} \frac{I_{in} A (0 - v_-)}{A}$$