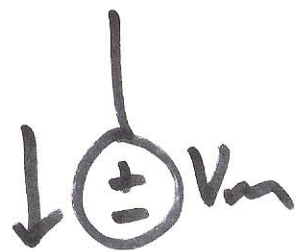


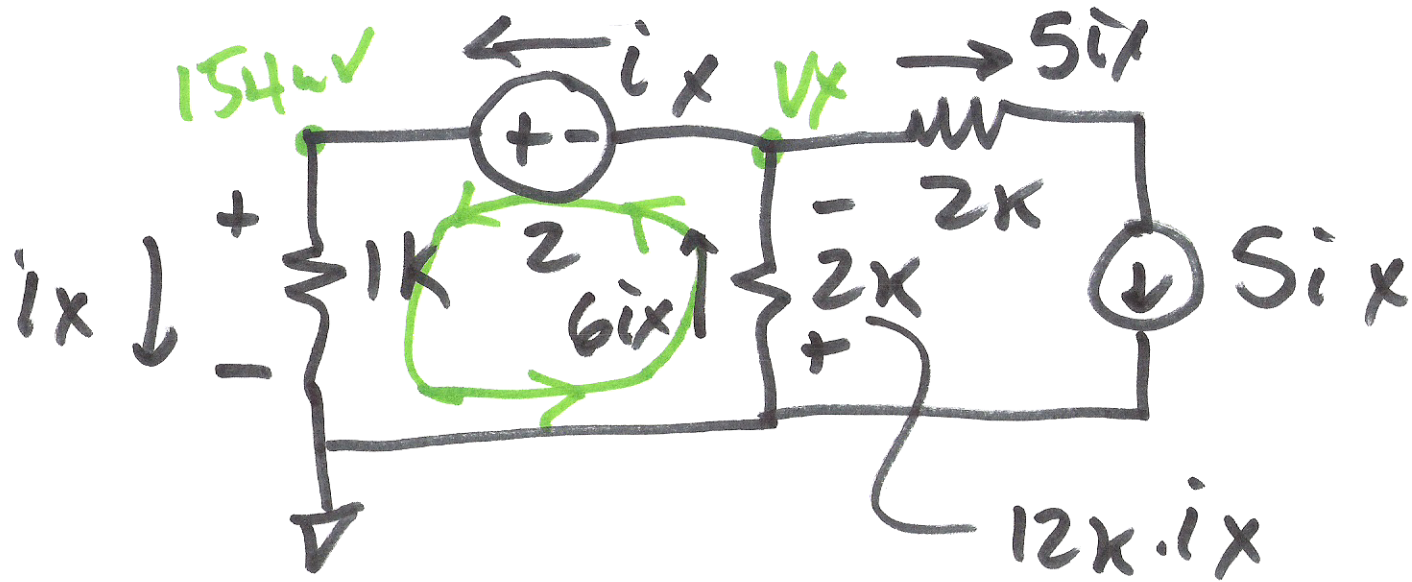
$$i_x + \frac{i_x \cdot 1k - 2}{2k} + 5i_x = 0$$

$$i_x \cdot 1k - 2 + 12k i_x = 0$$

$$13k i_x = 2$$

$$i_x = \frac{2}{13k} = 154 \mu A$$





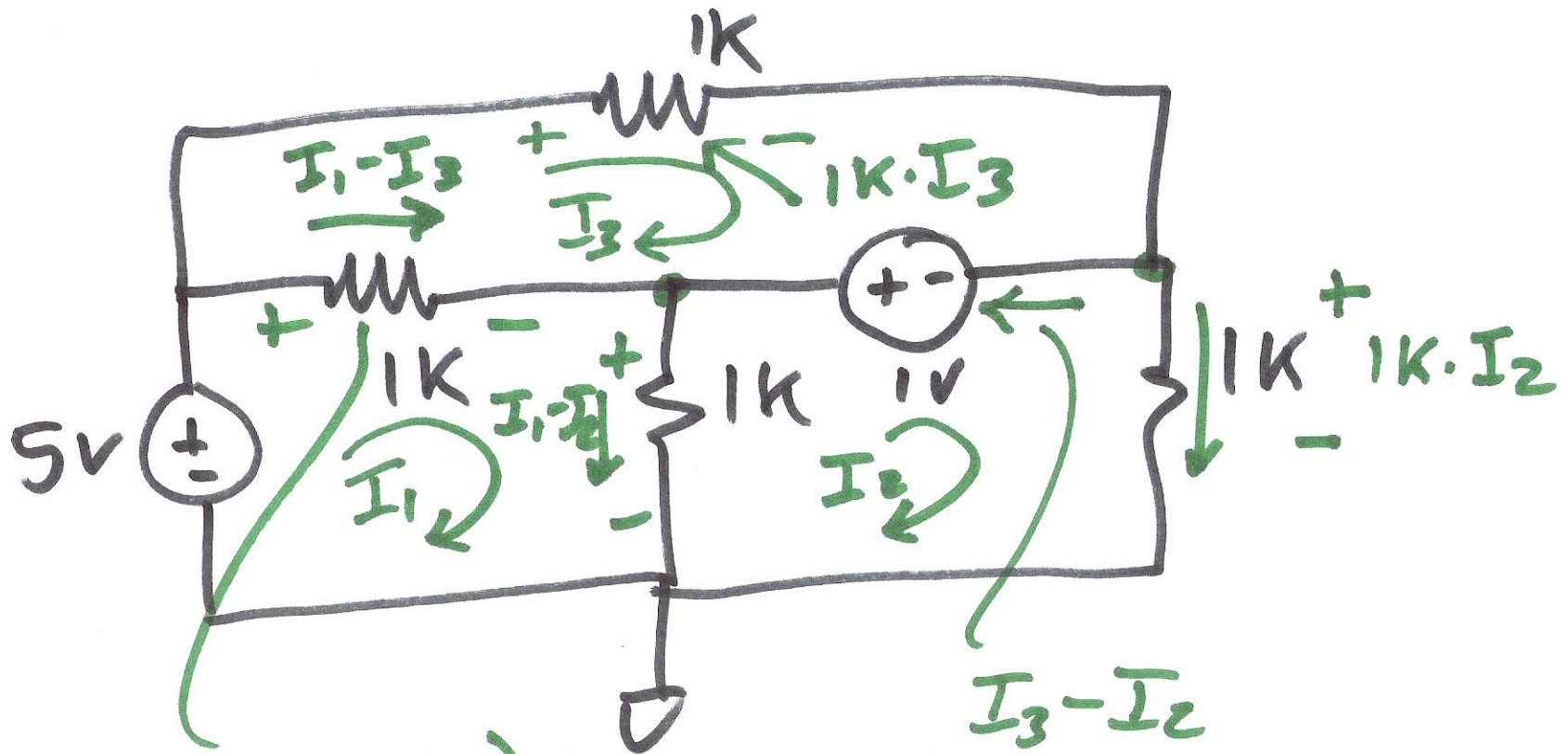
$$1k \cdot i_x + 12k \cdot i_x = 2$$

$$i_x = \frac{2}{13k} = 154 \mu A$$

$$1k \cdot 154 \mu A = 154 \mu V$$

$$V_x = 154 \mu V - 2 = \underline{\underline{-1.846 \mu V}}$$

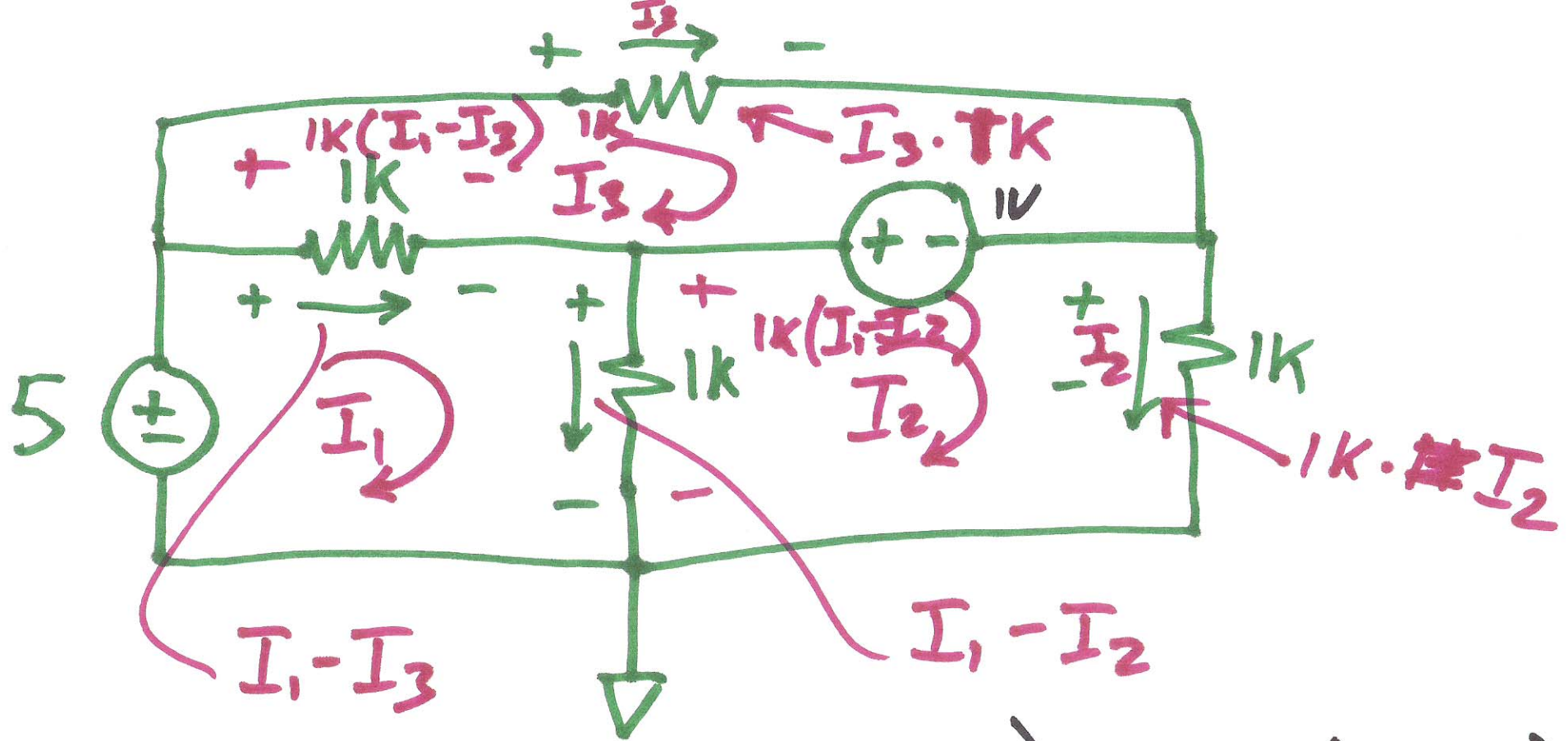
2)



$$1k(I_1 - I_3) = 5 - (I_1 - I_3)k - (I_1 - I_2)k$$

$$0 = + (I_1 - I_2)k - 1 - 1kI_2$$

$$0 = 1 + 1k(I_1 - I_3) - 1kI_3$$



$$\text{Loop 3: } -1 - 1k(I_1 - I_3) + I_3 \cdot 1k = 0$$

$$\text{Loop 2: } 1 + I_2 \cdot 1k - 1k(I_1 - I_2) = 0$$

$$\text{Loop 1: } 1k(I_1 - I_2) - 5 + 1k \cdot (I_1 - I_3) = 0$$

4)

$$\begin{aligned}
 & -1kI_1 + 2kI_3 = 1 \quad I_1 = 5 \text{ A} \\
 & -(-1kI_1 + 2kI_2 = -1) \quad -5V \neq 2kI_3 = 1 \\
 & \hline
 & 2kI_1 - 1kI_2 - 1kI_3 = 5 \quad 2k \cdot I_3 = 6 \\
 & \qquad \qquad \qquad \qquad \qquad \qquad I_3 = 3 \text{ A}
 \end{aligned}$$

$$\begin{bmatrix} -1k & 0 & 2k \\ -1k & 2k & 0 \\ 2k & -1k & -1k \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \\ 5 \end{bmatrix}$$

$$\begin{aligned}
 2k(I_3 - I_2) &= 2 \quad 2k \cdot 1k - (-1k \cdot 0) \\
 I_3 - I_2 &= 1 \text{ A}
 \end{aligned}$$

$$\rightarrow 2kI_1$$

5)

$$-1kI_1 + 2kI_3 = 1$$

$$4kI_1 - 2kI_2 - 2kI_3 = 10$$

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$$3kI_1 - 2kI_2 = 11$$

$$-1kI_1 + 2kI_2 = -1$$

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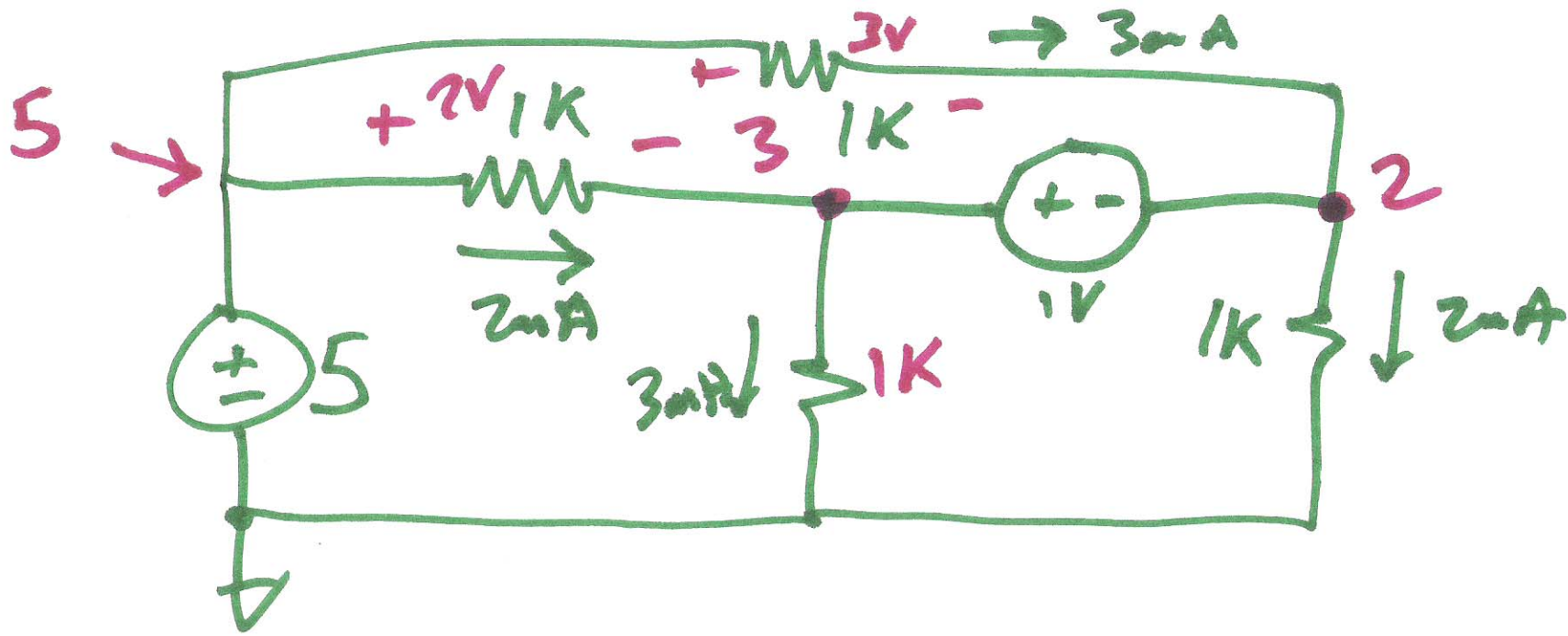
$$2kI_1 = 10$$

$$I_1 = 5 \text{ A}$$

$$\frac{I_1}{3} - I_2 = 1 \text{ A}$$

$$\downarrow$$
$$3 \text{ A}$$

$$I_2 = 2 \text{ A}$$

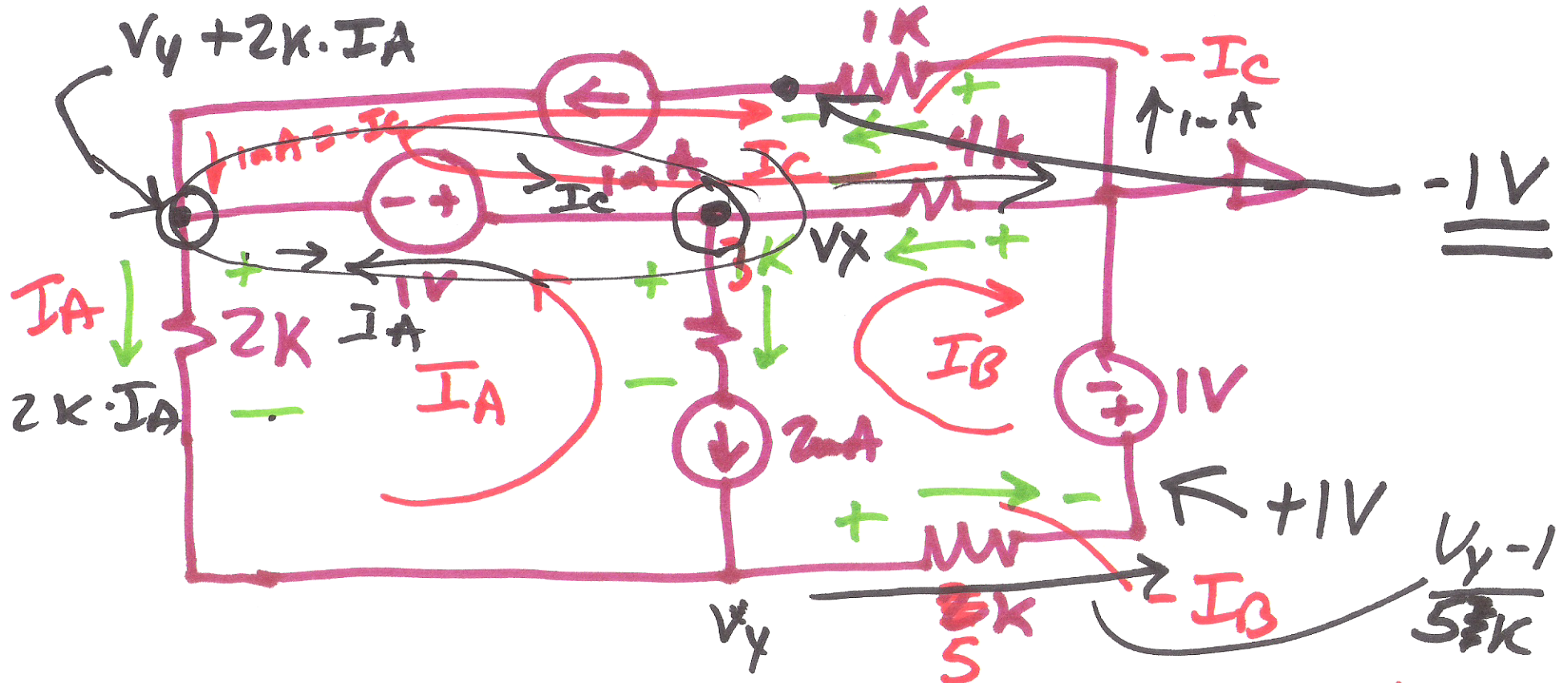


$$I_1 = 5\text{mA}$$

$$I_2 = 2\text{mA}$$

$$I_3 = 3\text{mA}$$





$$V_{1k} = -I_c \cdot 1k$$

$$V_{2k} = I_A \cdot 2k$$

$$V_{5k} = -I_B \cdot 5k$$

$$V_{3k} = 6V$$

$$V_{4k} = (I_c - I_B) \cdot 4k$$

$$1mA = I_A + 2mA + \frac{V_x}{4k}$$

$$\frac{V_y - 1}{5k} + \frac{V_x}{4k} = 1mA$$

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$$V_x = V_y + 2kI_A + 1$$



$$-4 = 4k \cdot I_A + V_x$$

$$V_y - 1 + \overset{1.25 \uparrow}{\cancel{0.75}} V_x = 5$$

$$V_x = V_y + 2kI_A + 1$$

$$-4 = 4kI_A + V_y + 2kI_A + 1$$

$$5 = V_y - 1 + 1.25V_y + 2.5kI_A + 1.25$$

$$4.75 = 2.25V_y + 2.5kI_A$$

$$V_y = \frac{4.75 - 2.5kI_A}{2.25}$$

a)

$$-5 = 6kI_A + \frac{4.75 - 2.5kI_A}{2.25}$$
$$-11.25 = 13.5kI_A + 4.75 - 2.5kI_A$$
$$-11.25 = 11kI_A + 4.75$$

$$11kI_A = -16$$

$$I_A = -\frac{16}{11k} = -1.45 \text{ mA}$$