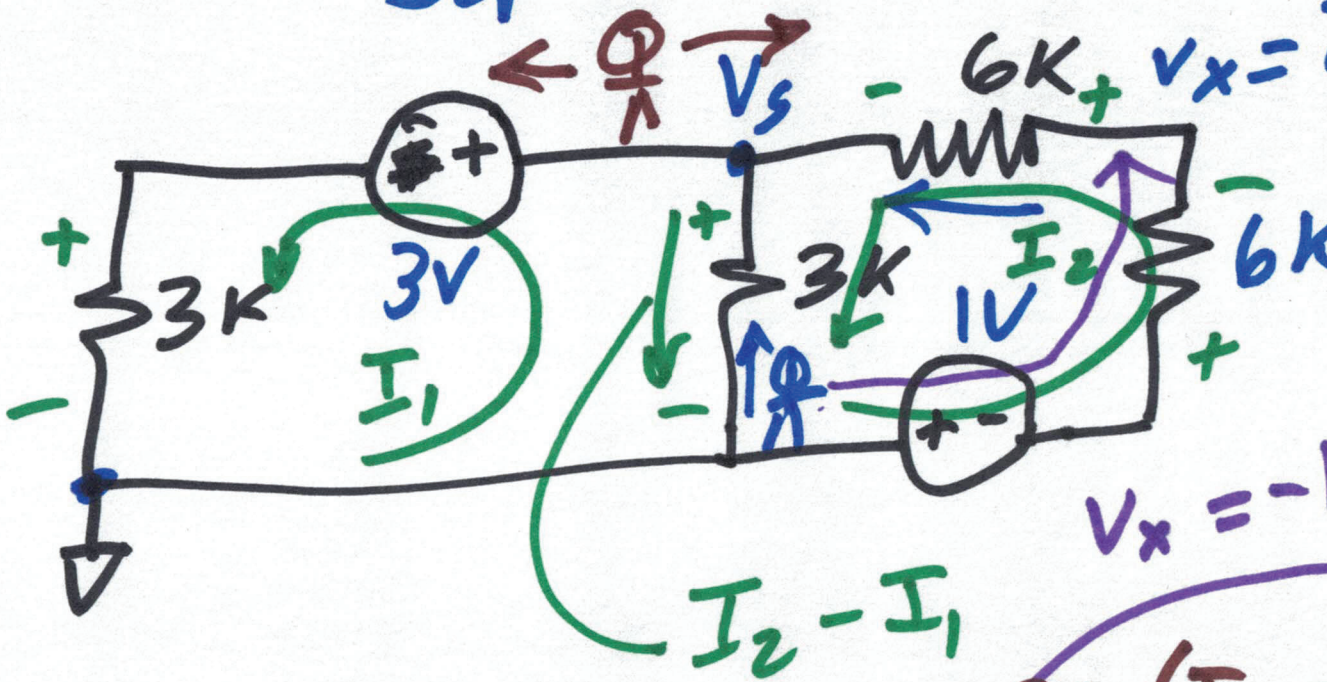
EE 220 Circuits I
Lecture 8
Sept. 25, 2023



$$-3 - 3kI_1 + 3k(I_2 - I_1) = 0$$

$$+6kI_2 + 6kI_2 + 1V + 3k(I_2 - I_1) = 0$$

$$V_x = -1V - 6k\left(\frac{-5}{27}mA\right)$$

$$-1 + \frac{30}{27}V$$

$$-\frac{27}{27} + \frac{30}{27} = \frac{3}{27} = \frac{1}{9}V$$

$3 = -3kI_1 + 3kI_2 - 3kI_1$

$1\text{-}A = -I_1 + I_2 - I_1$

$I_2 = 2I_1 + 1\text{-}A$

$12kI_2 + 1 + 3kI_2 - 3kI_1 = 0$

$15kI_2 + 1 - 3kI_1 = 0$

$15k(2I_1 + 1\text{-}A) + 1 - 3kI_1 = 0$

$30kI_1 + 15 + 1 - 3kI_1 = 0$

$27kI_1 = -16$

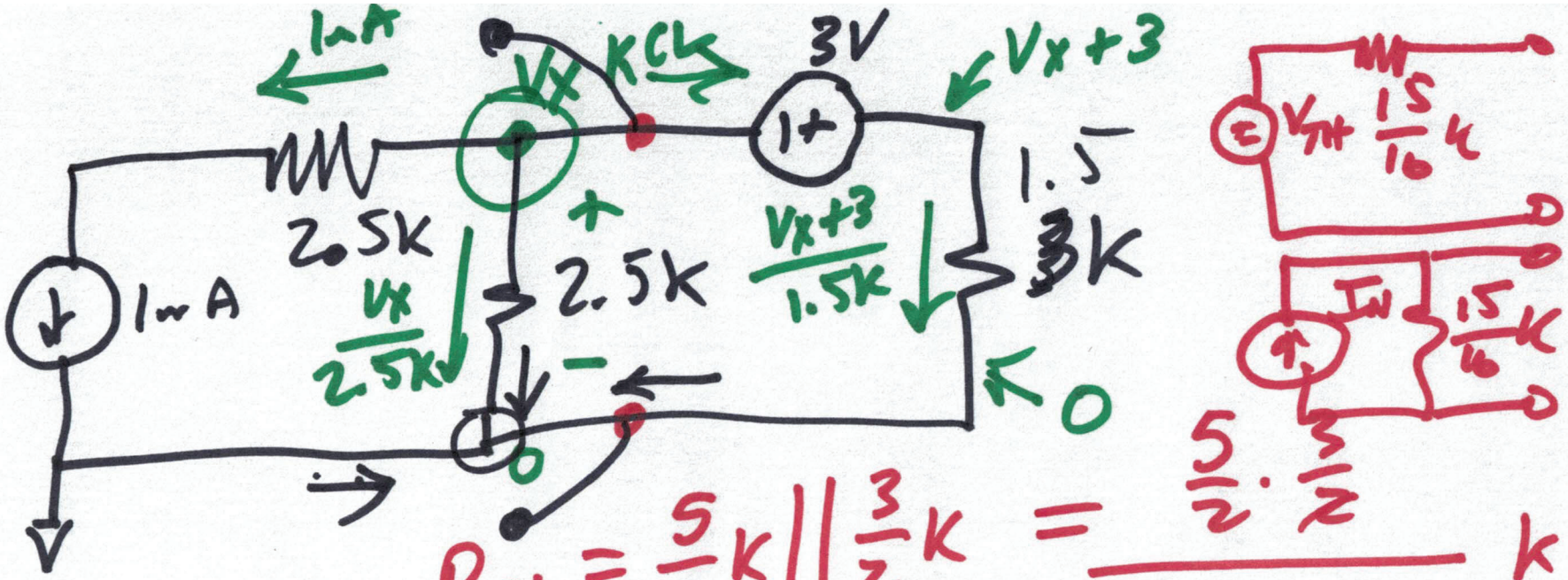
$I_1 = \frac{-16}{27k}$

$I_2 = 2\left(\frac{-16}{27k}\right) + 1\text{-}A$

$= \frac{-32}{27k} + 1\text{-}A$

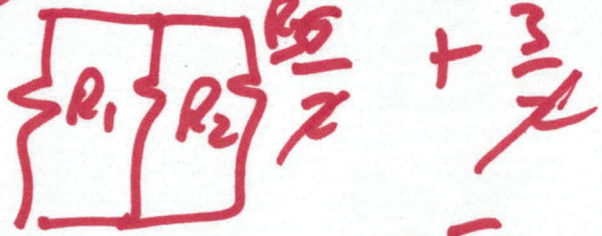
$-1\text{-}A \quad \frac{5}{27}\text{-}A + 1\text{-}A$

$I_2 = \frac{-5}{27}\text{-}A$



$$R_{TH} = \frac{5}{2}k \,||\, \frac{3}{2}k = \frac{\frac{5}{2}\cdot\frac{3}{2}}{\frac{5}{2}+\frac{3}{2}}\,k$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$



$$R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

$$= \frac{15}{2(8)}\,k$$

$$R_{TH} = \frac{15}{16}\,k$$

$$2.5k\left(1mA + \frac{V_x}{2.5k} + \frac{V_x+3}{1.5k}\right) = 0$$

$$2.5V + V_x + \frac{5}{3}(V_x+3) = 0$$

$$\frac{2.5k}{1.5k}(V_x+3)\ 2.5V + \frac{3V_x}{3} + \frac{5}{3}V_x + 5 = 0$$

$$\frac{500.5}{500.3}(V_x+3)$$

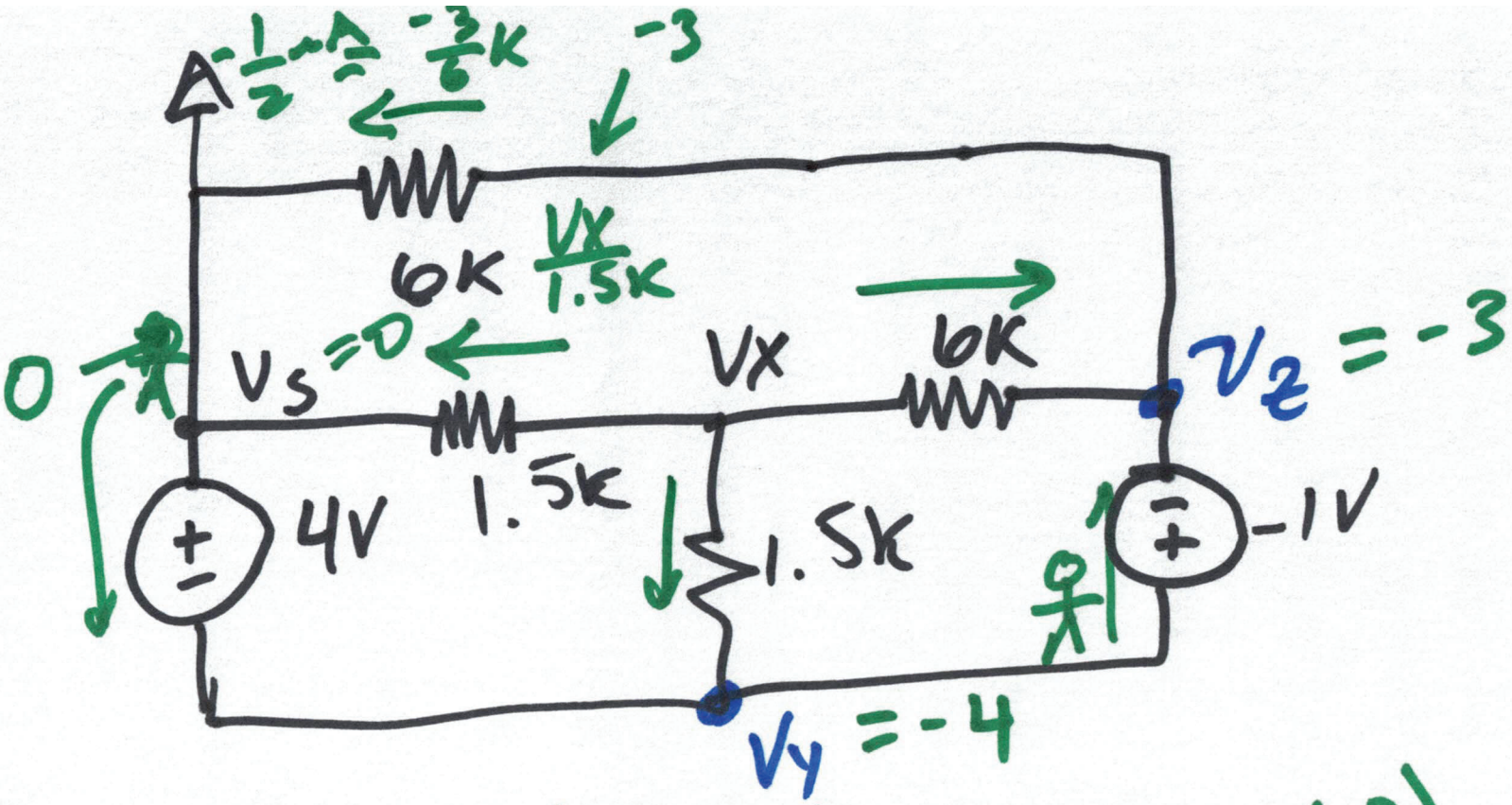
$$\frac{8}{3}V_x = -7.5$$

$$V_x = \frac{-22.5}{8}$$

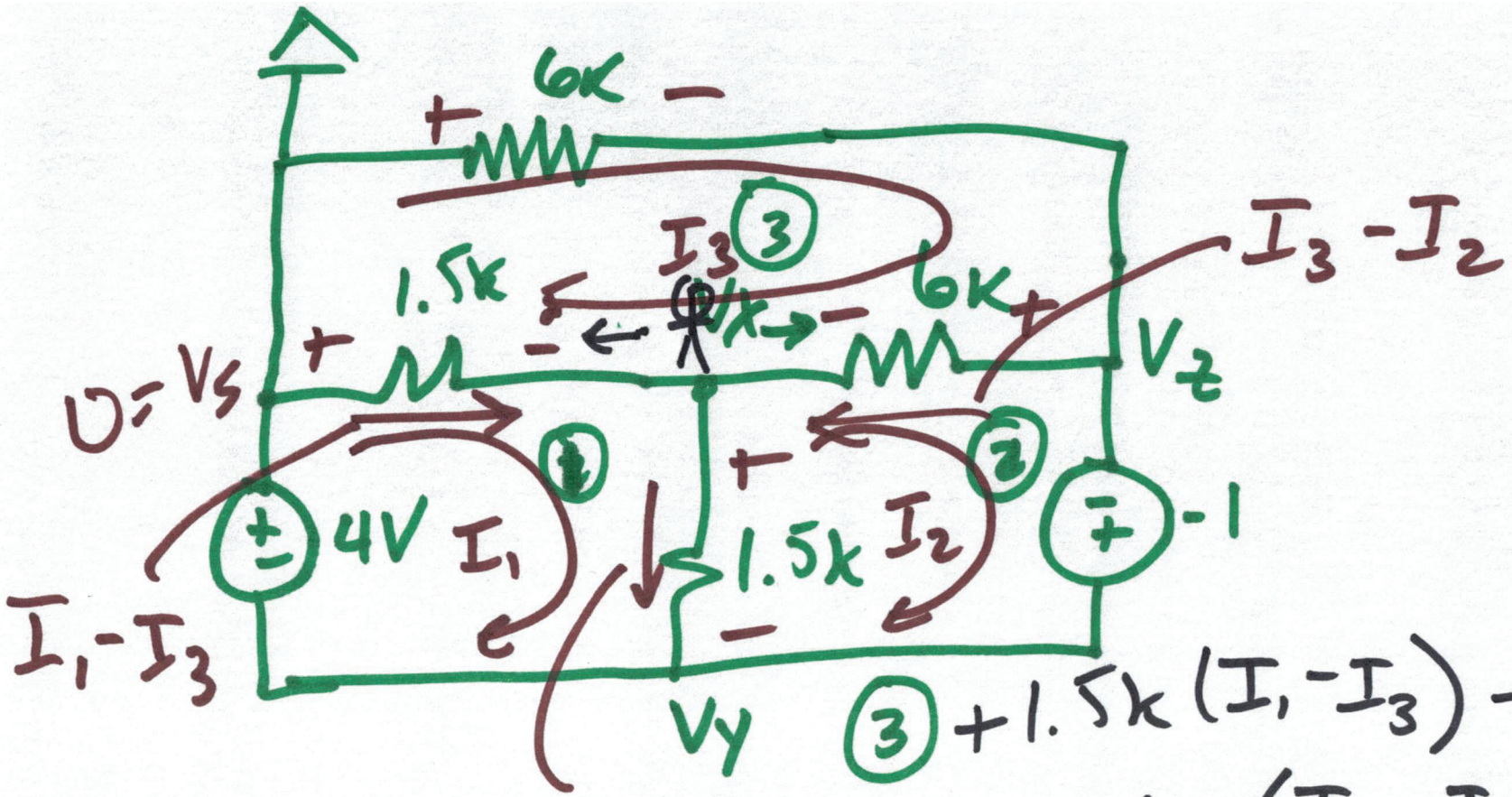
$$V_{TH} = \frac{-22.5}{8}$$

$$I_N = \frac{-22.5}{8} \div \frac{15}{16}k$$

$$= \frac{-55}{16}mA$$



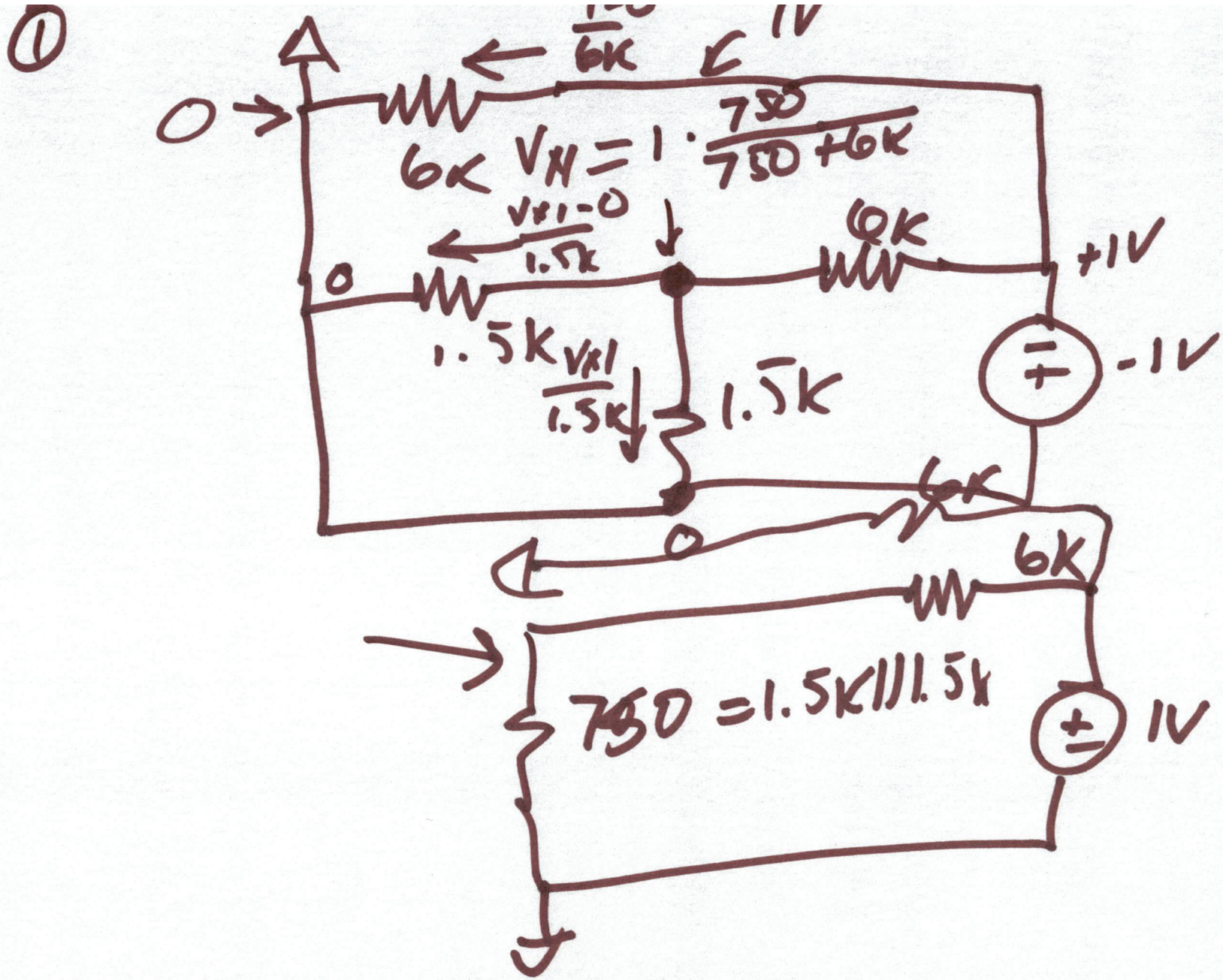
$$\frac{V_x - 0}{1.5k} + \frac{V_x - (-4)}{1.5k} + \frac{V_x - (-3)}{6k} = 0$$

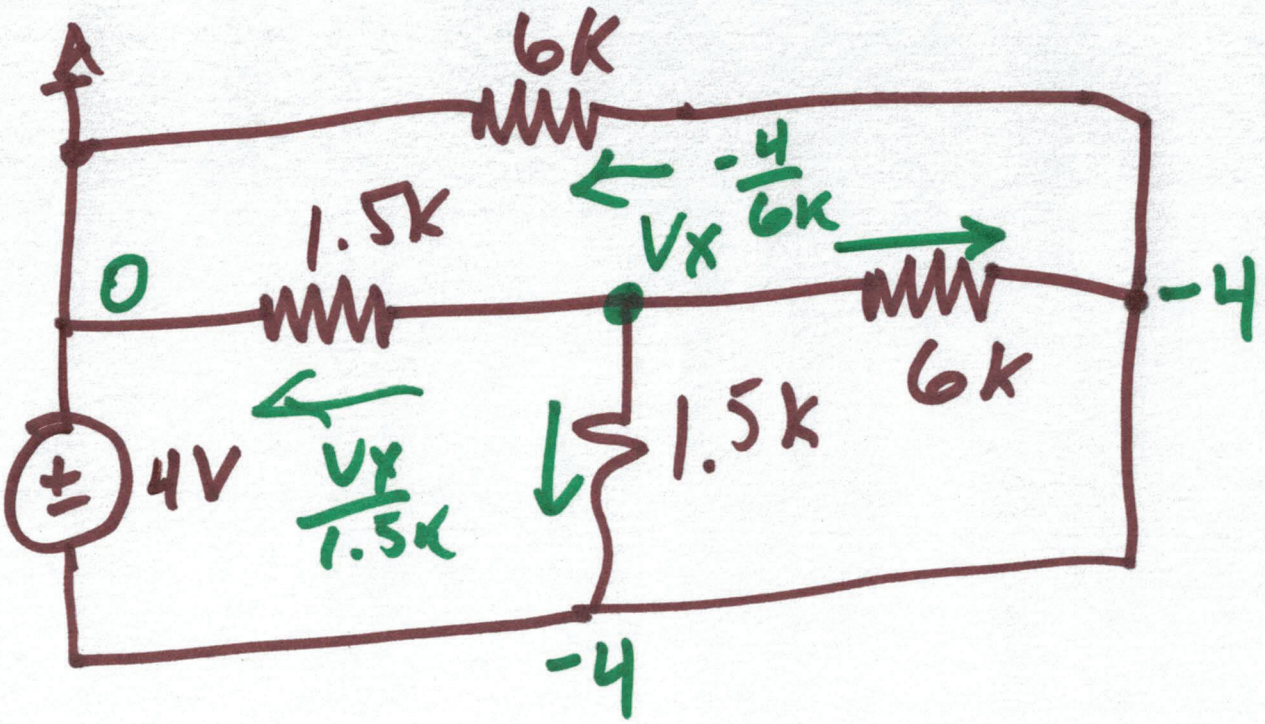


$$③ \; +1.5k(I_1 - I_3) - 6k I_3 - 6k(I_3 - I_2) = 0$$

$$① \; +1.5k(I_1 - I_3) - 4 + 1.5k(I_1 - I_2) = 0$$

$$② \; 6k(I_3 - I_2) + (-1) + 1.5k(I_1 - I_2) = 0$$


①
6K
1V
0
6K
$V_H = 1 \cdot \frac{750}{750+6K}$
$\frac{V_{x1}-0}{1.5k}$
1.5K
V_{x1}
$\frac{V_{x1}}{1.5K}$
1.5K
6K
+1V
-1V
6K
750 = 1.5K||1.5k
1V



$$\frac{V_x}{1.5K} + \frac{V_x + 4}{1.5K} + \frac{V_x - (-4)}{6K} = 0$$