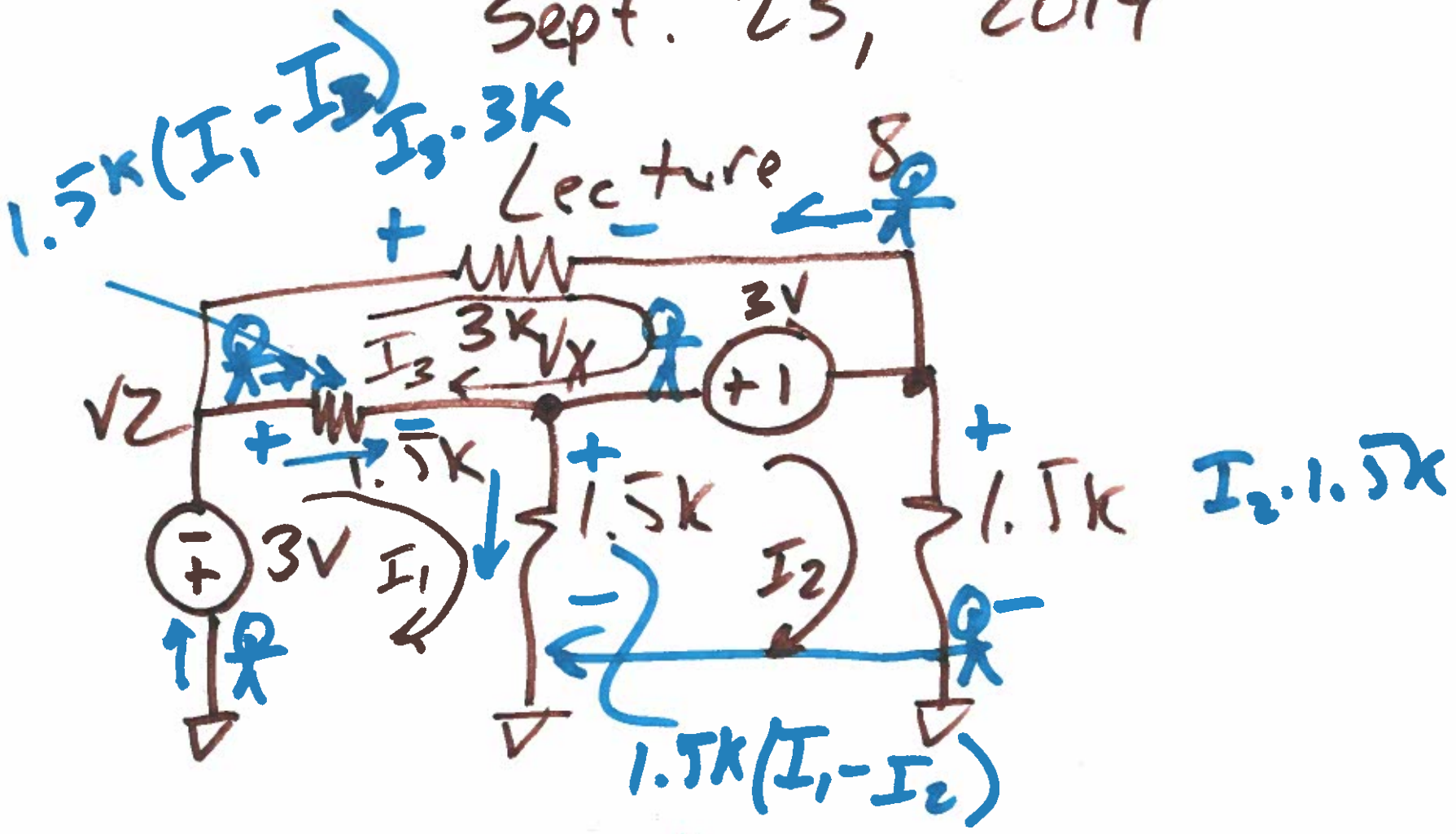
EE 220 Circuits 1

Sept. 23, 2019



$$-3V - 1.5k(I_1 - I_3) - 1.5k(I_1 - I_2) = 0$$

$$-1.5k(I_1 - I_3) - 3V + I_3 \cdot 3k = 0$$

$$1.5k(I_1 - I_2) - 3V - I_2 \cdot 1.5k = 0$$

$$+2mA + I_1 - I_3 + I_1 - I_2 = 0$$

$$I_1 - I_3 + 2mA - 2I_3 = 0$$

$$I_1 - I_2 - 2mA - I_2 = 0$$

$$I_1 = 2mA + 2I_2$$

$$2mA + 2I_1 - I_2 - I_3 = 0$$

$$2mA + 4mA + 4I_2 - I_2 - I_3 = 0$$

$$6mA + 3I_2 - I_3 = 0$$

$$I_3 = 6mA + 3I_2$$

$$2mA + 2I_2 - 6mA - 3I_2 + 2mA$$

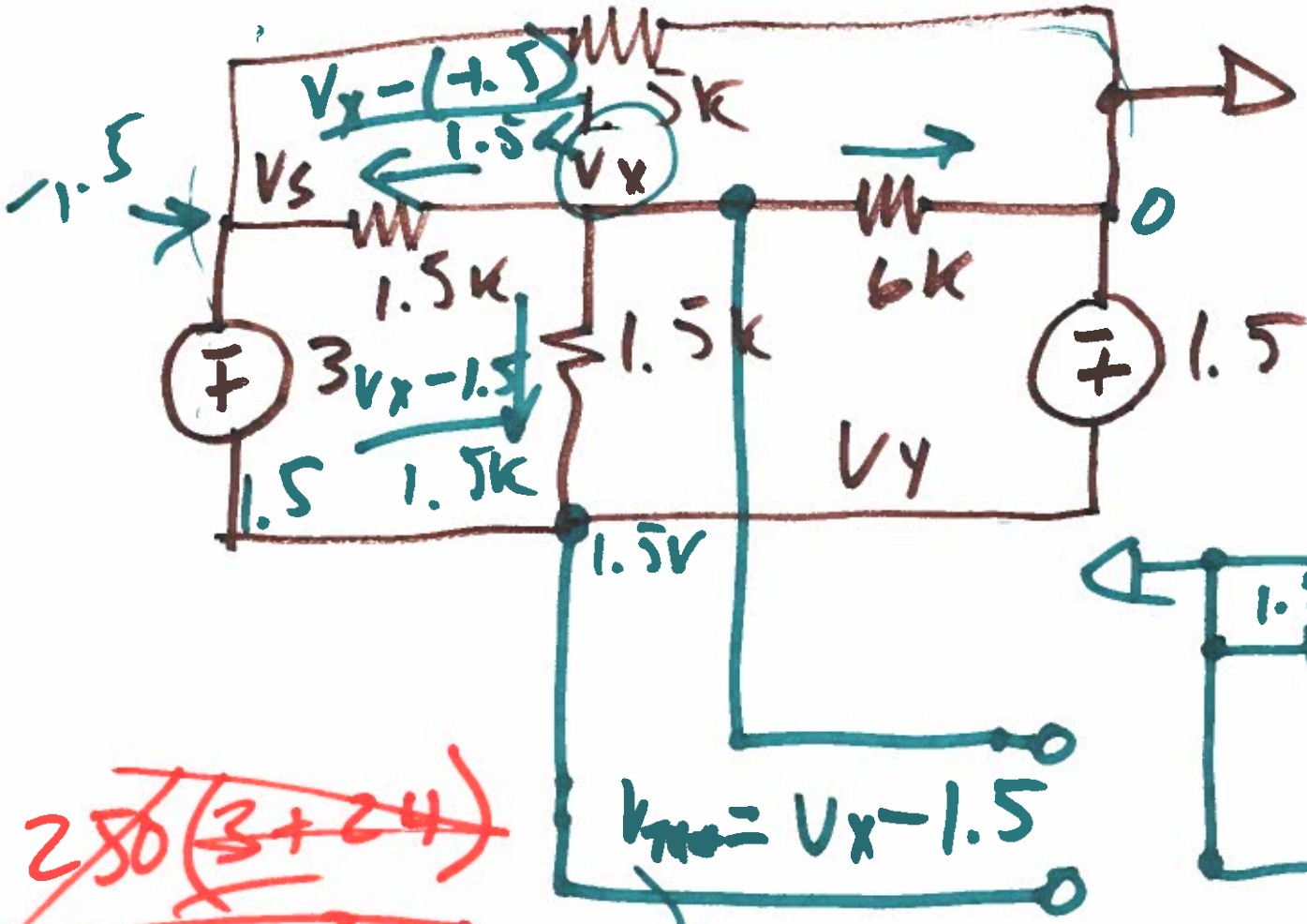
$$-12mA - 6I_2 = 0$$

$$-14mA - 7I_2 = 0$$

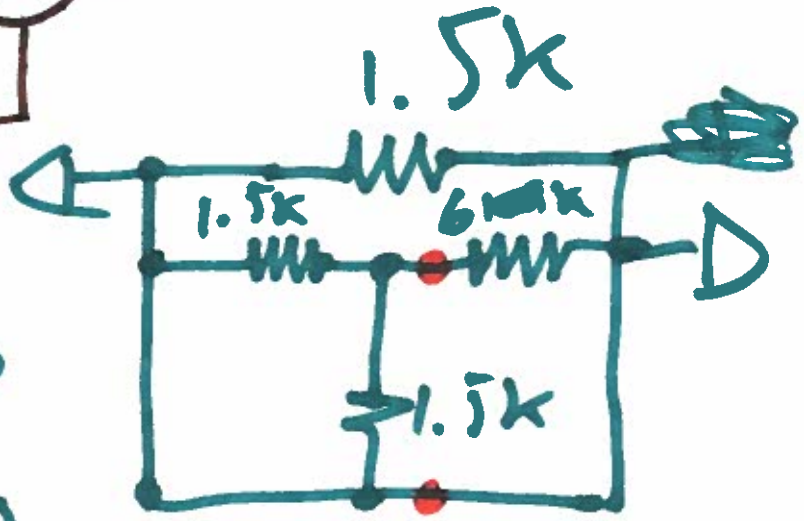
$$\boxed{I_3 = 0}$$

$$\boxed{I_2 = -2mA}$$

$$\boxed{I_1 = -2mA}$$



$V_x = \frac{}{6k}$



$1.5k \,/\!/\, 6k \,/\!/\, 1.5k$

$750 \,/\!/\, 6k$

$\frac{750 \cdot 6{,}000}{750 + 6{,}000}$

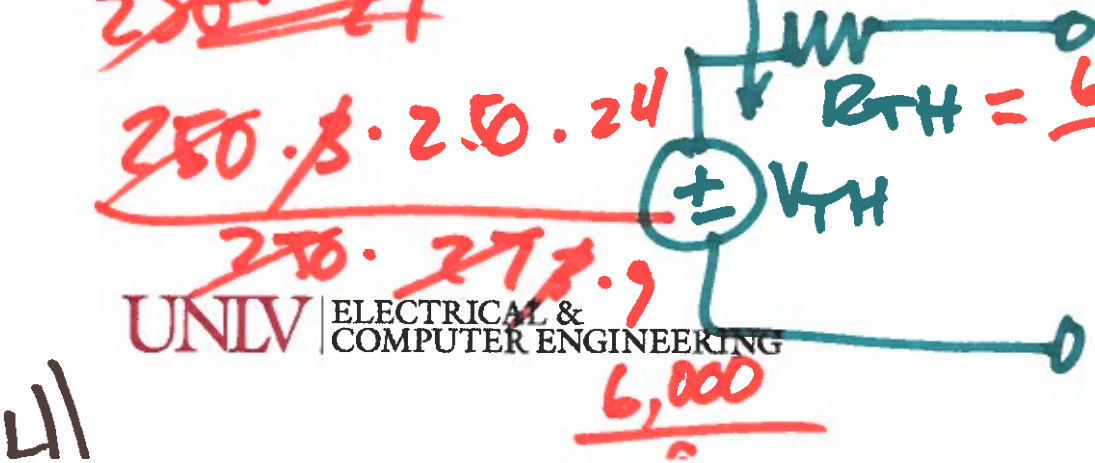
$\frac{250(3+24)}{250 \cdot 27}$

$\frac{250 \cdot 3 \cdot 250 \cdot 24}{250 \cdot 27 \cdot 3 \cdot 9}$

$\frac{6{,}000}{9}$

$R_{TH} = \frac{6{,}000}{9} = 666$

$V_{TH} = V_x - 1.5$



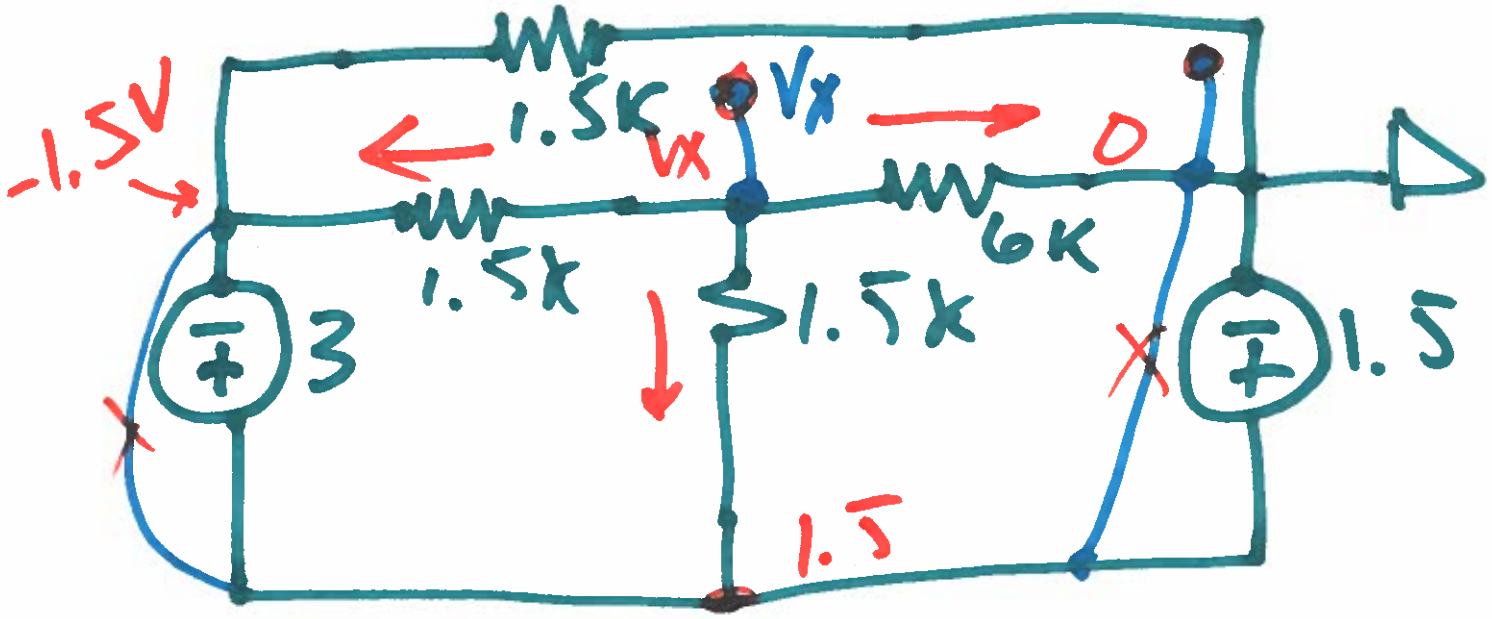
$$750 \,||\, 6{,}000 = \frac{750 \cdot 6{,}000}{750 + 6{,}000}$$

$$= \frac{3 \cdot 250 \cdot 3 \cdot 24 \cdot 250}{3 \cdot 250 + 24 \cdot 250}$$

$$= \frac{3 \cdot 24 \cdot 250}{27} = \frac{3 \cdot 24 \cdot 250}{3 \cdot 9}$$

$$R_{TH} = \frac{6{,}000}{9}\ \Omega = \frac{2{,}000}{3}$$

$$= 666\Omega$$



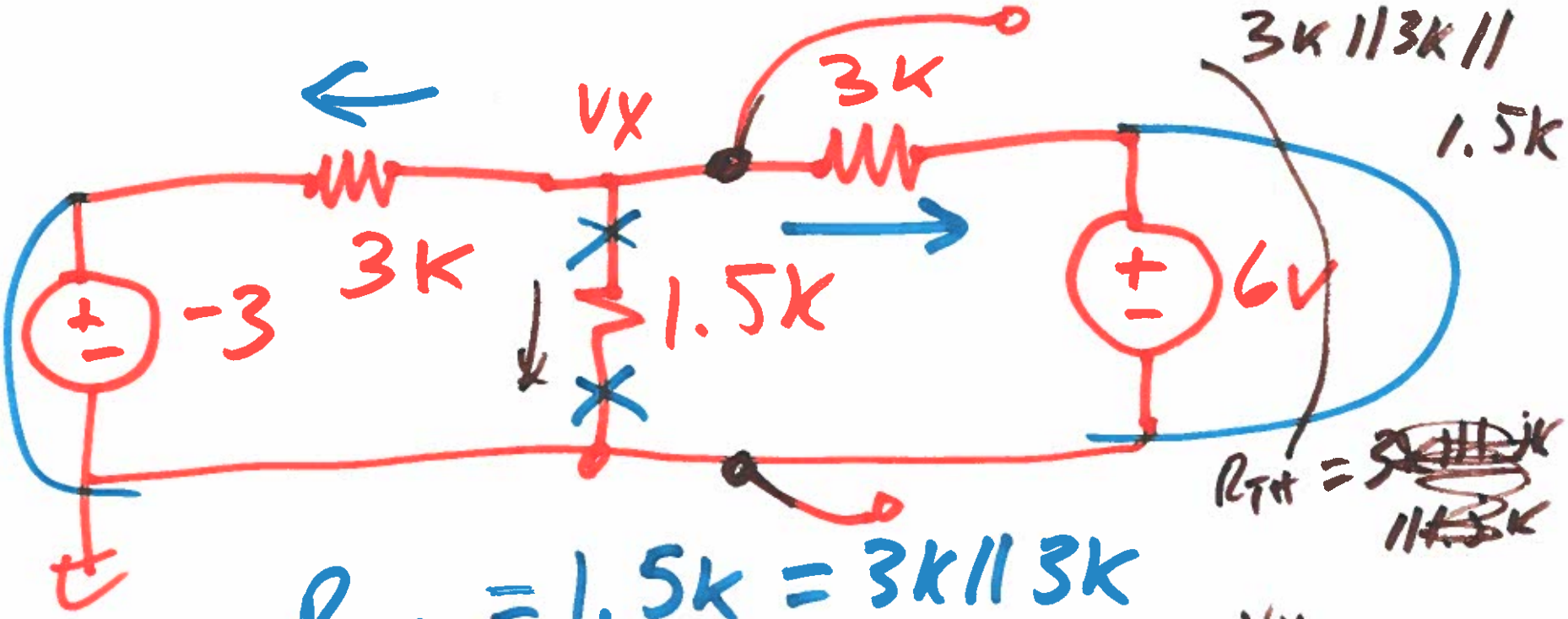
$$R_{TH} = 6k \,||\, 1.5k \,||\, 1.5k$$

$$\boxed{R_{TH} = 6666\,\Omega}$$

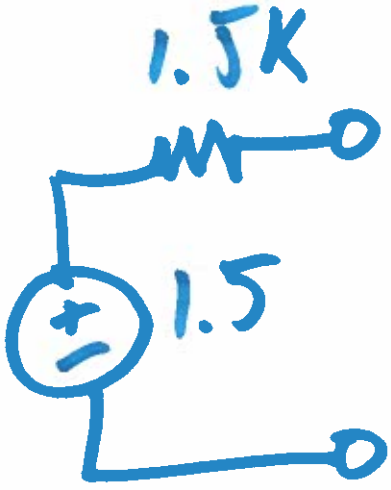
$$0 = \frac{V_x}{6k} + \frac{V_x - 1.5}{1.5k} + \frac{V_x - (-1.5)}{1.5k}$$

$$0 = V_x + 4V_x - 6 + 4V_x + 6$$

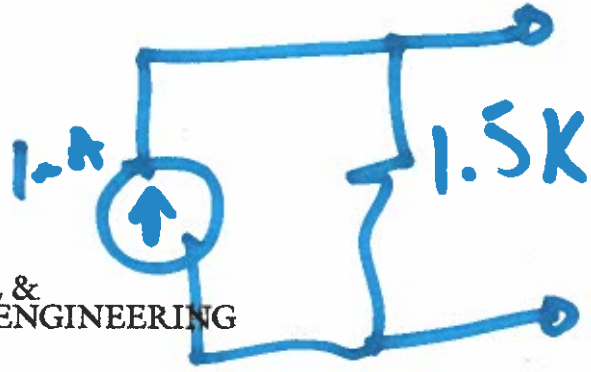
$$\boxed{V_x = 0}$$



$$R_{TH} = 1.5k = 3k \parallel 3k$$



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

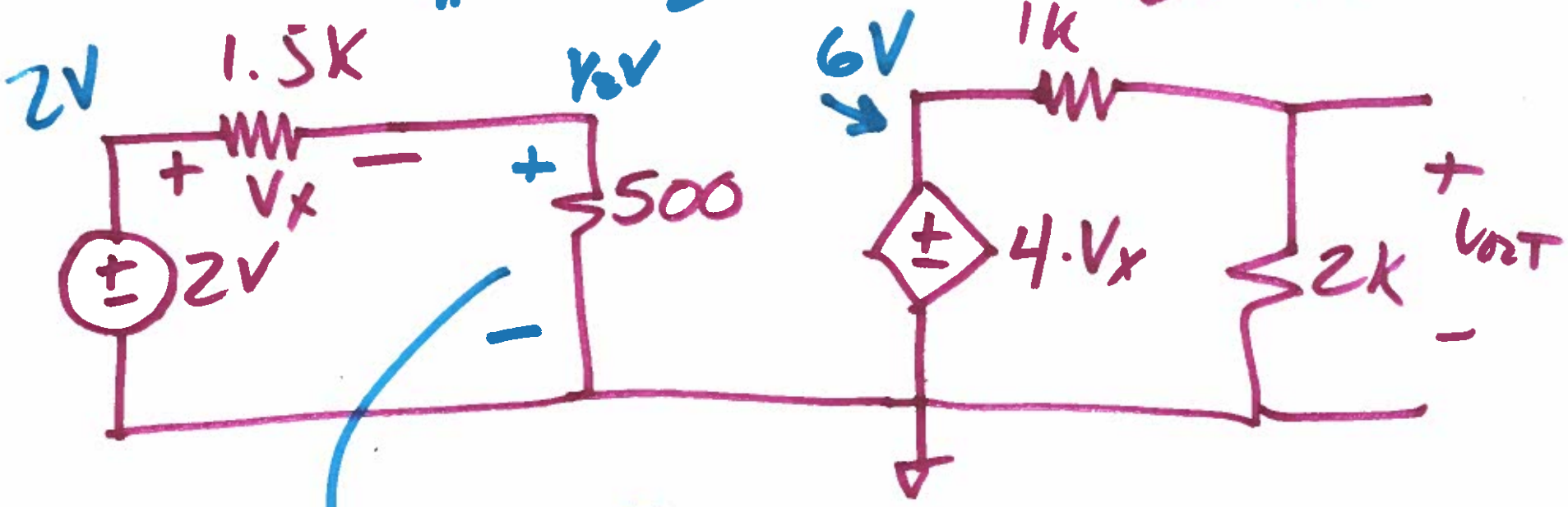


$$2V_x - 3 = 0$$

$$\boxed{V_x = 1.5V}$$

Voltage controlled voltage source

$V_x = 2 - \frac{1}{2} = 1.5V$



$$2 \cdot \frac{500}{500 + 1.5K} = 500mV$$

$$V_{OUT} = 6 \cdot \frac{2K}{2K + 1K} = 4V$$