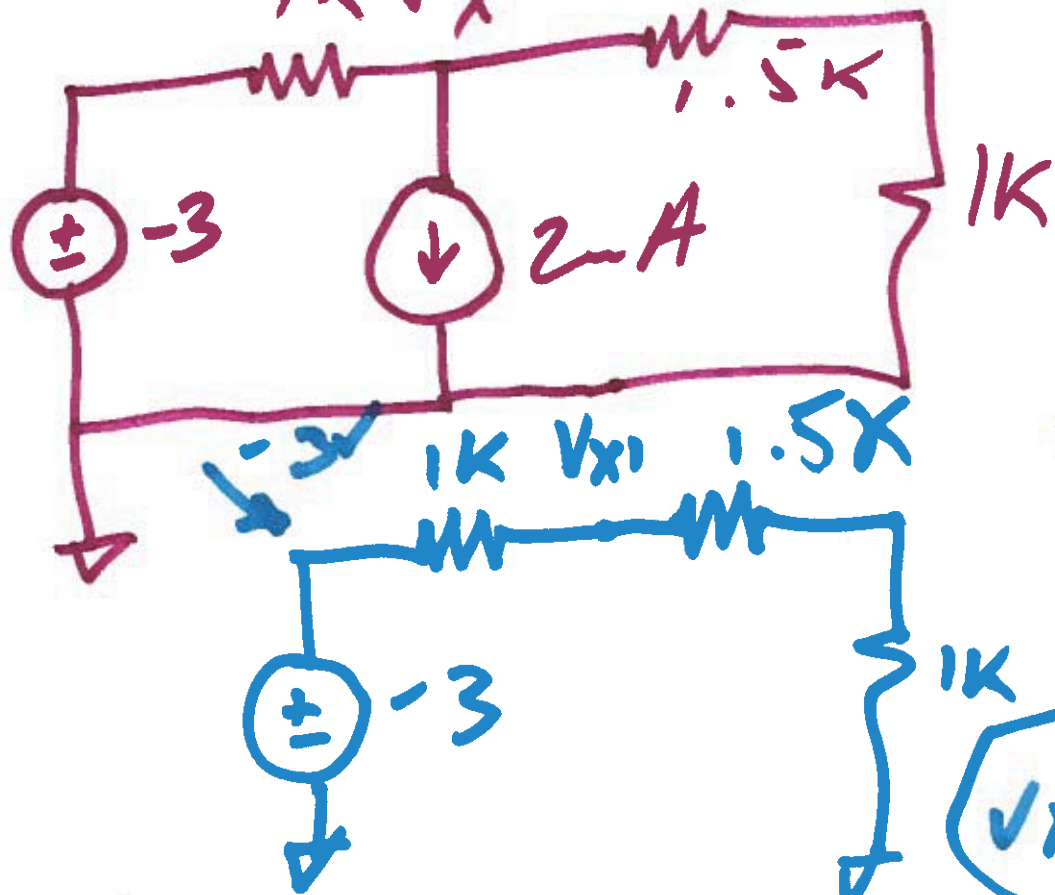


# EE 220 Circuits 1

Sept. 16, 2019

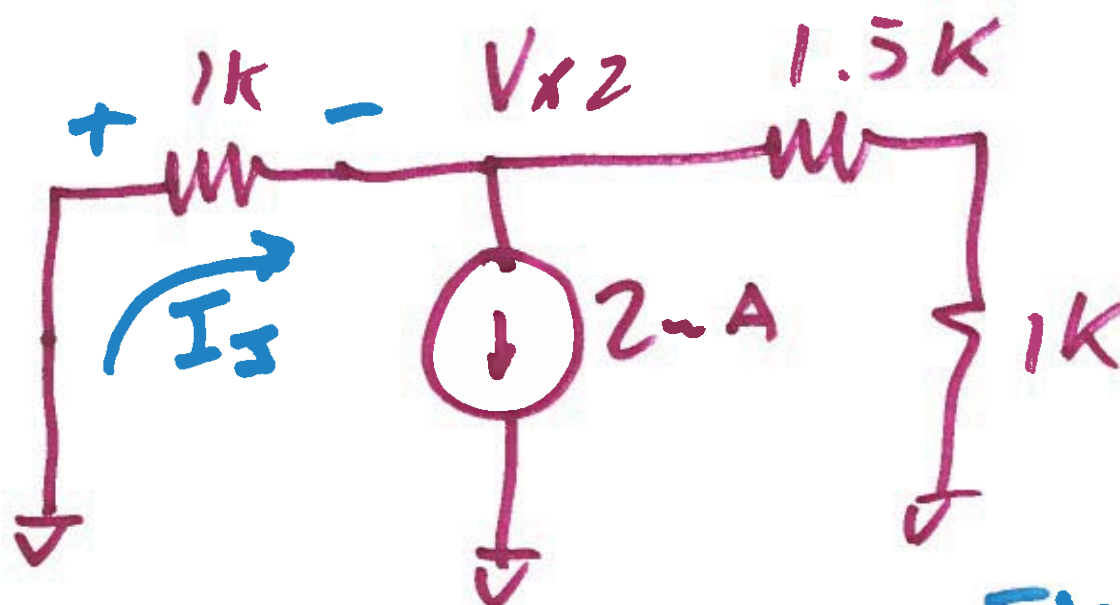
## 1kVx Lecture 6



$$V_{x1} = -3 \cdot \frac{2.5k}{1k + 2.5k}$$
$$= -3 \cdot \frac{5.500}{7.500}$$

$$V_{x1} = -\frac{15}{7} V$$

1)



$$V_x = V_{x1} + V_{x2}$$

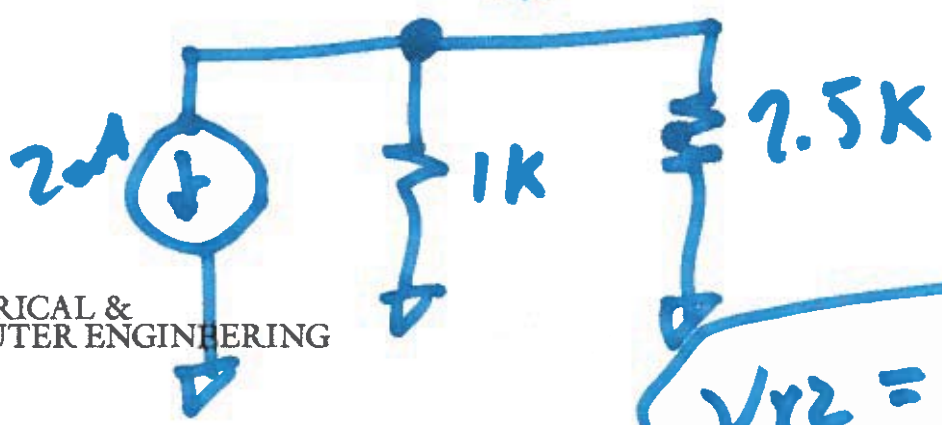
$$= -\frac{15}{7} + -\frac{10}{7}$$

$$V_x = -\frac{25}{7} \text{ V}$$

$$I_j = 2 \text{ mA} \cdot \frac{2.5 \text{ k}}{2.5 \text{ k} + 1 \text{ k}}$$

$$V_{x2} = -I_j \cdot 1 \text{ k}$$

$$= -2 \text{ mA} \cdot \frac{1 \text{ k} \cdot 2.5 \text{ k}}{1 \text{ k} + 2.5 \text{ k}}$$

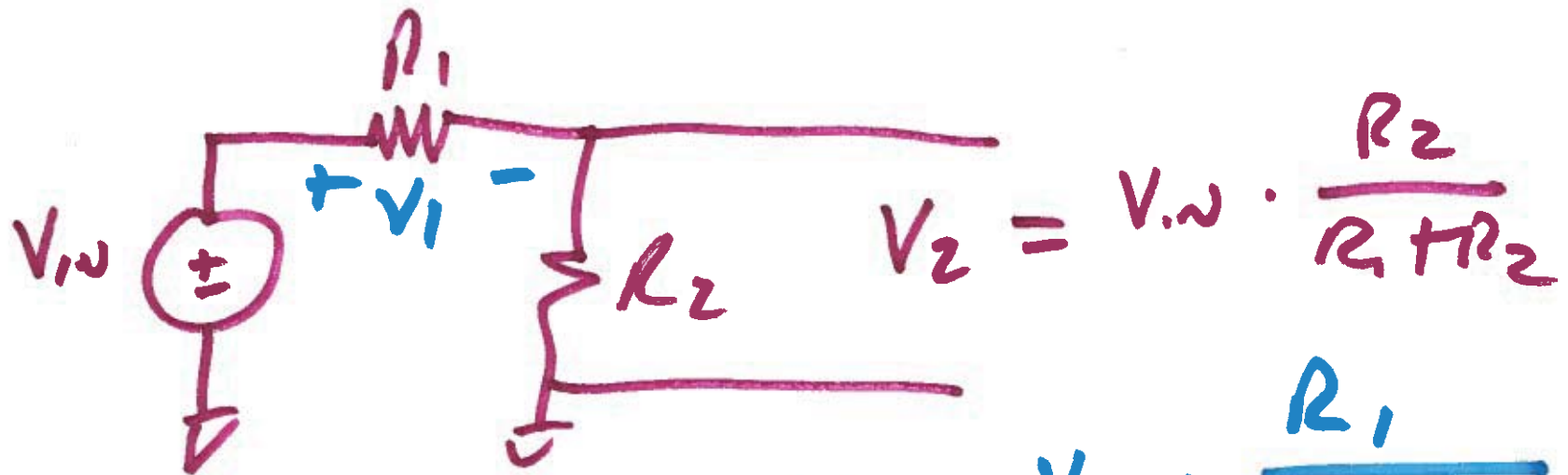


$$= -2 \text{ mA} \cdot \frac{1 \text{ k} \cdot 2.5 \text{ k}}{1 \text{ k} + 2.5 \text{ k}}$$

$$= -2 \text{ V} \cdot \frac{5 \cdot 500}{7 \cdot 500}$$

$$V_{x2} = -\frac{10}{7} \text{ V}$$

2)

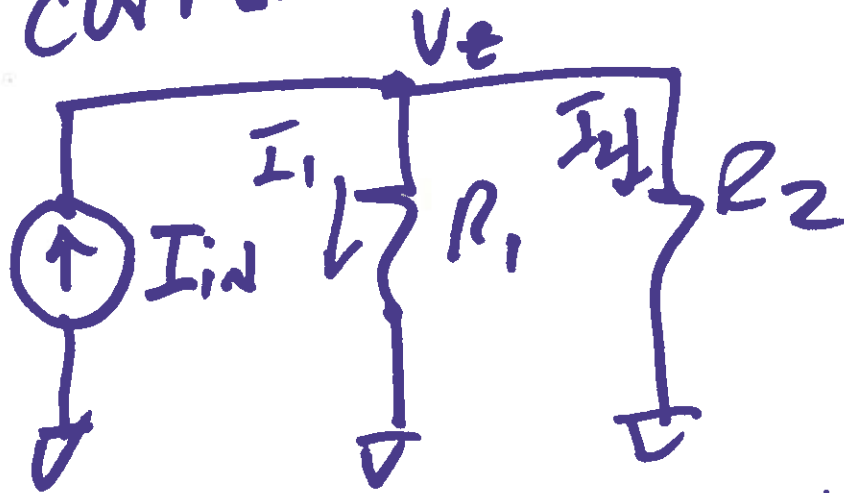


voltage divider  $V_1 = V_{in} \cdot \frac{R_1}{R_1 + R_2}$

$$V_2 = V_{in} \cdot \frac{R_2}{R_1 + R_2}$$

$$V_1 = V_{in} - V_2$$

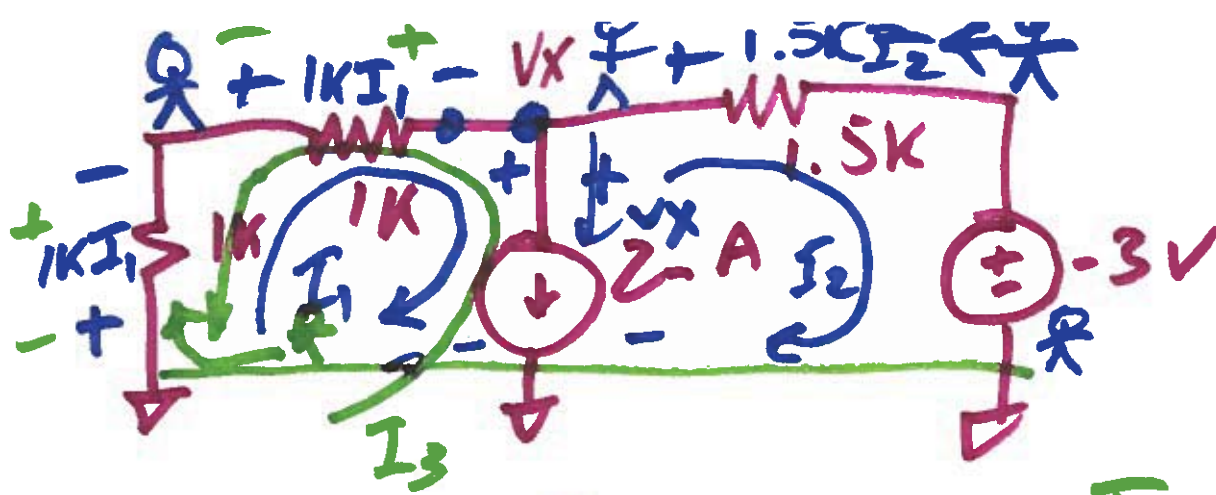
current divider



$$I_1 = I_{in} \cdot \frac{R_2}{R_1 + R_2}$$

$$I_2 = I_{in} \cdot \frac{R_1}{R_1 + R_2}$$

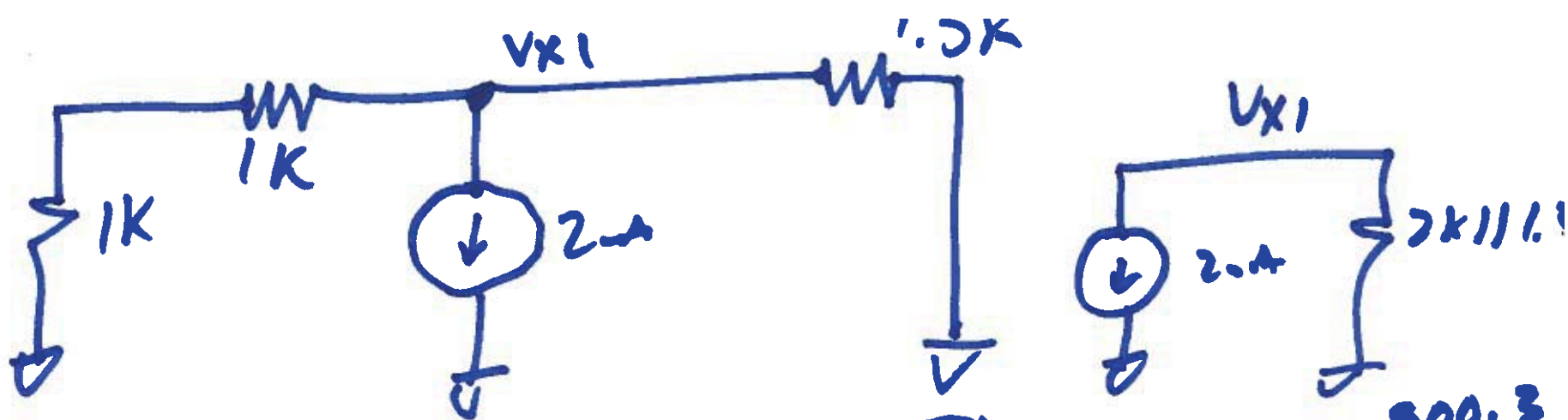
$$V_2 = I_{in} \cdot \frac{R_1 \cdot R_2}{R_1 + R_2}$$



$$2\text{mA} = I_1 - I_2$$

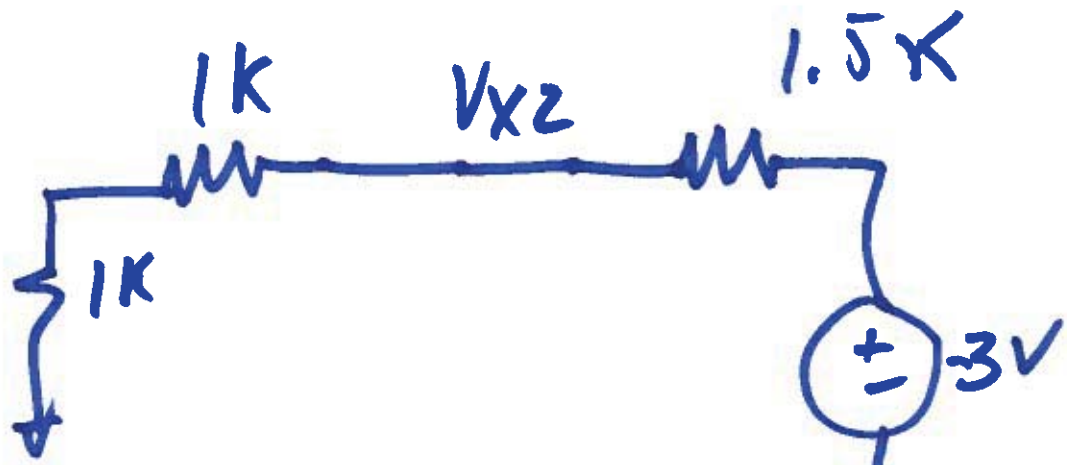
$$-1\text{k}I_1 - 1\text{k}I_1 - V_x = 0$$

$$1.5\text{k}I_2 - V_x + (-3\text{V}) = 0$$



$$V_{x1} = -2\text{A} \cdot \frac{2\text{k} \cdot 1.5\text{k}}{2\text{k} + 1.5\text{k}} = -4\text{V} \cdot \frac{3000}{5000}$$

$$V_{x1} = -\frac{12}{7}\text{V}$$



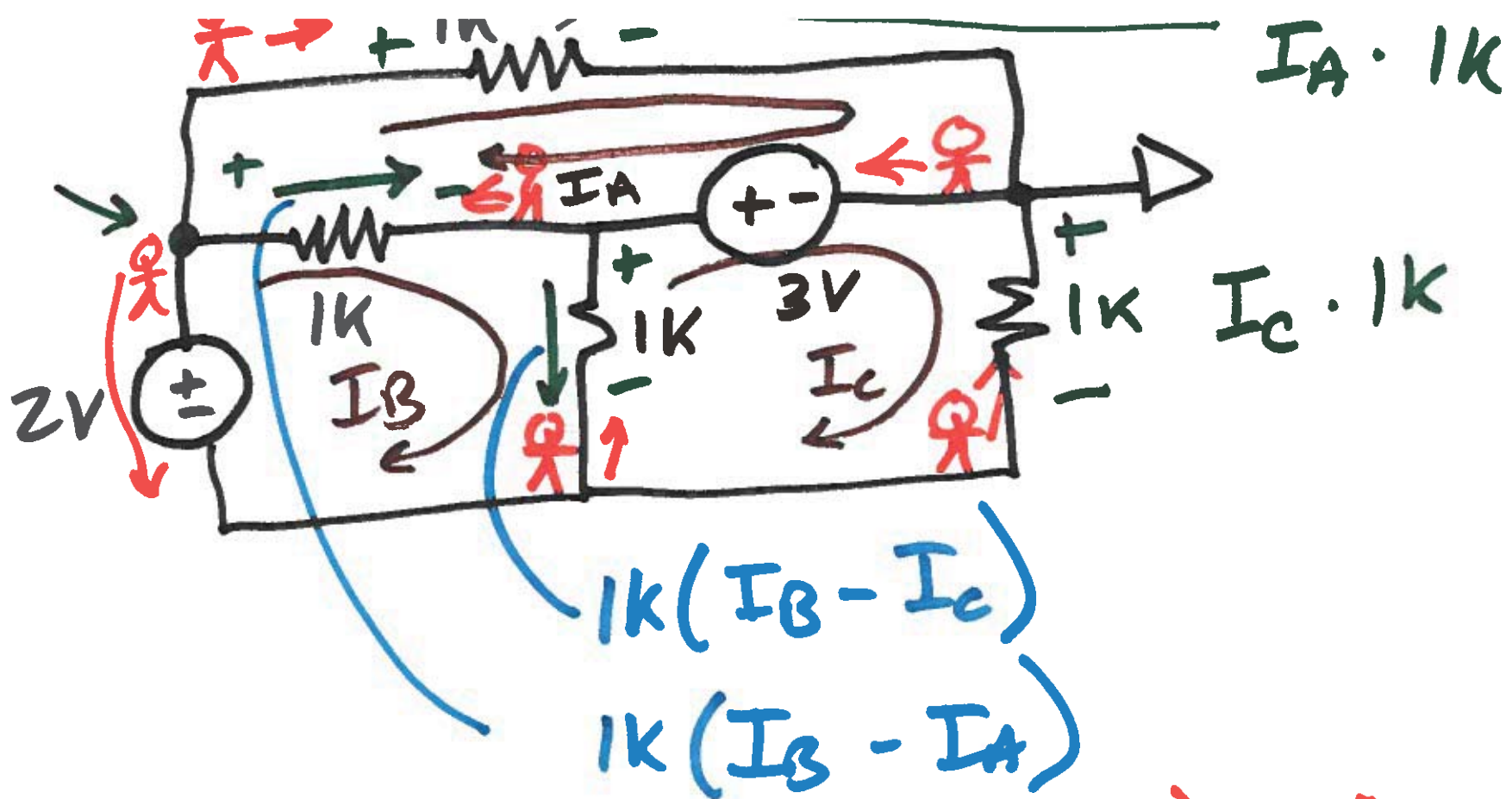
$$V_{x2} = -3 \cdot \frac{2\text{k}}{2\text{k} + 1.5\text{k}} = -3 \cdot \frac{4000}{7000}$$

$$V_{x2} = -\frac{12}{7}\text{V}$$

$$V_x = -\frac{24}{7}\text{V}$$

5)



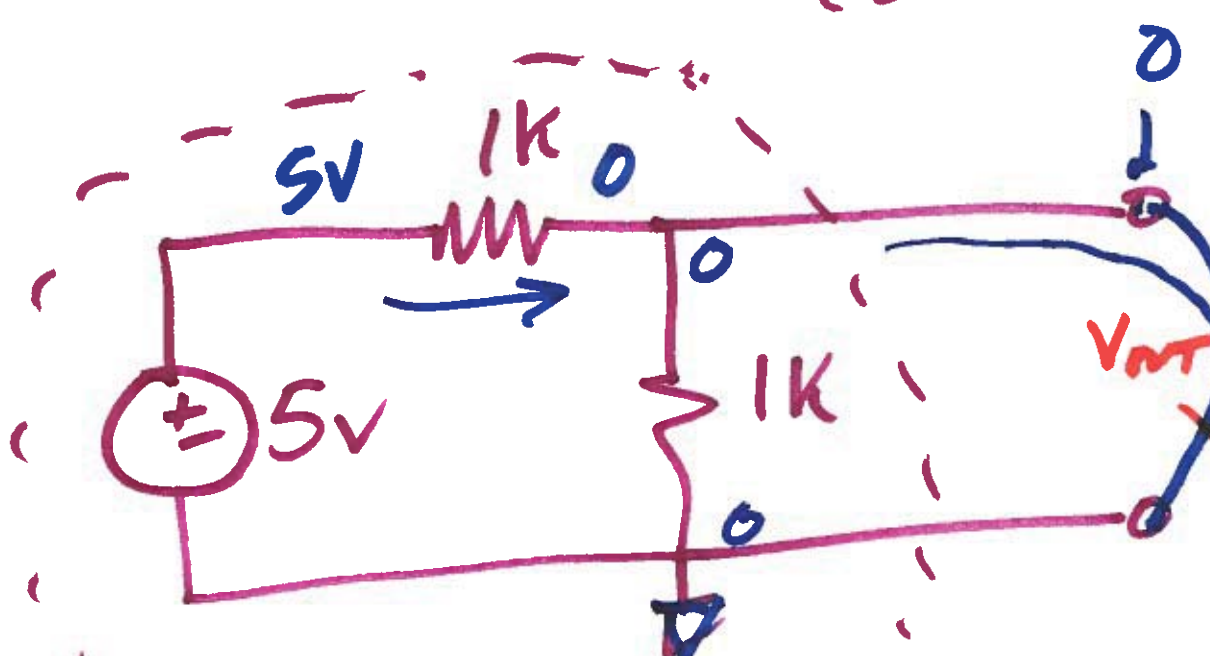


$$-I_A \cdot 1k + 3V + 1k(I_B - I_A) = 0$$

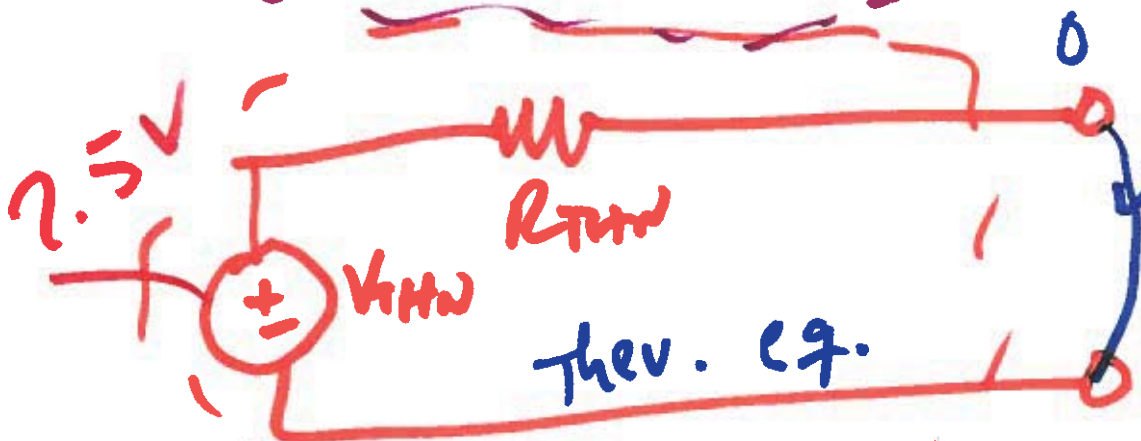
$$3V - 1k(I_B - I_C) + I_C \cdot 1k = 0$$

$$1k(I_B - I_C) + 1k(I_B - I_A) - 2 = 0$$

# THEVENIN AND NORTON THEOREMS (SOURCE TRANSFORMATION)

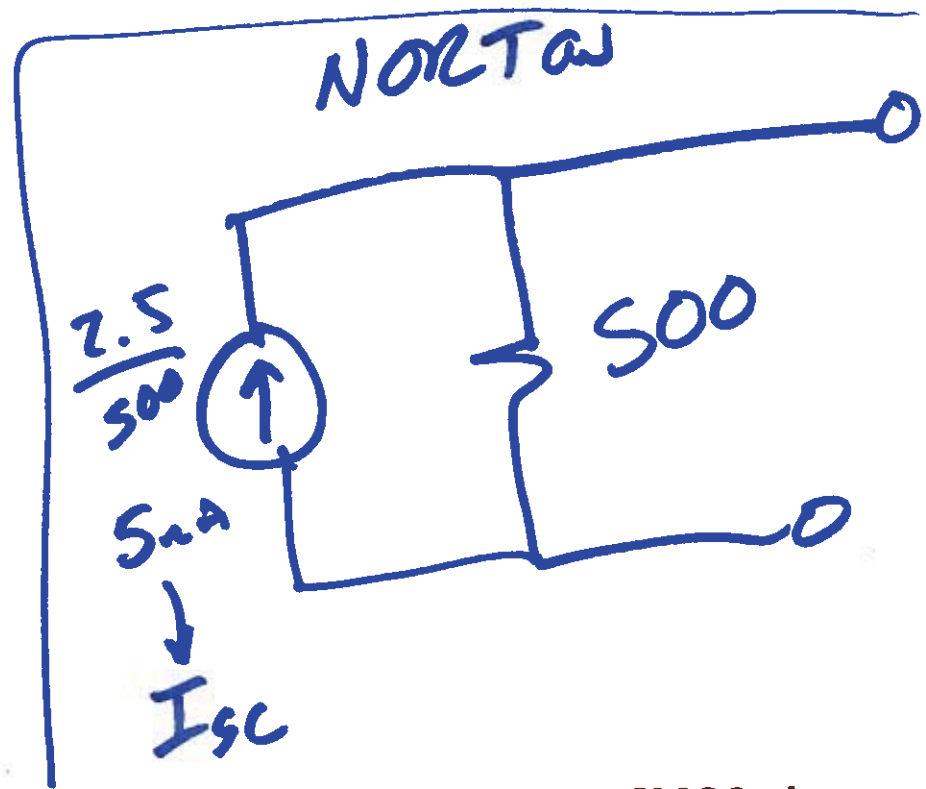
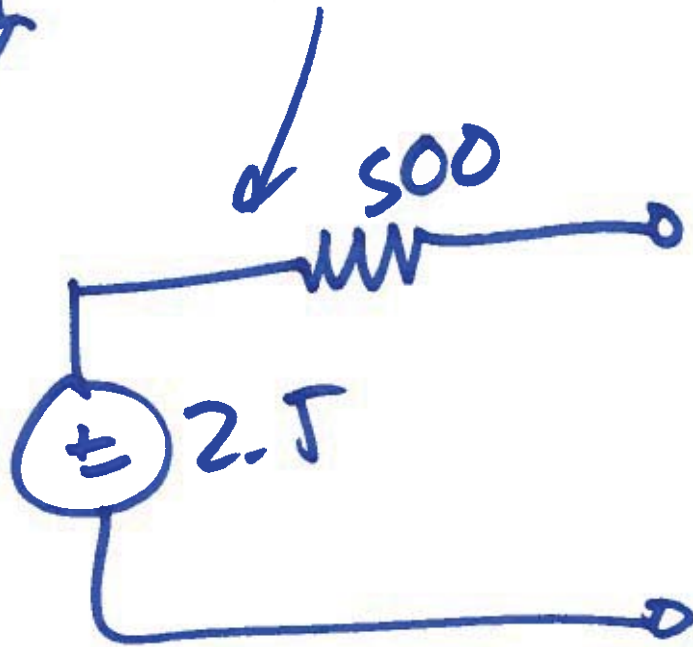
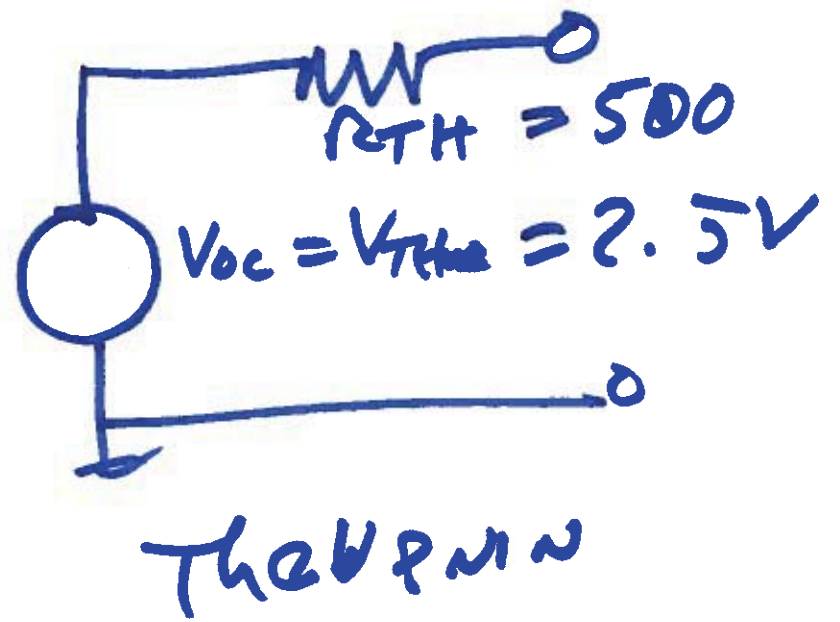
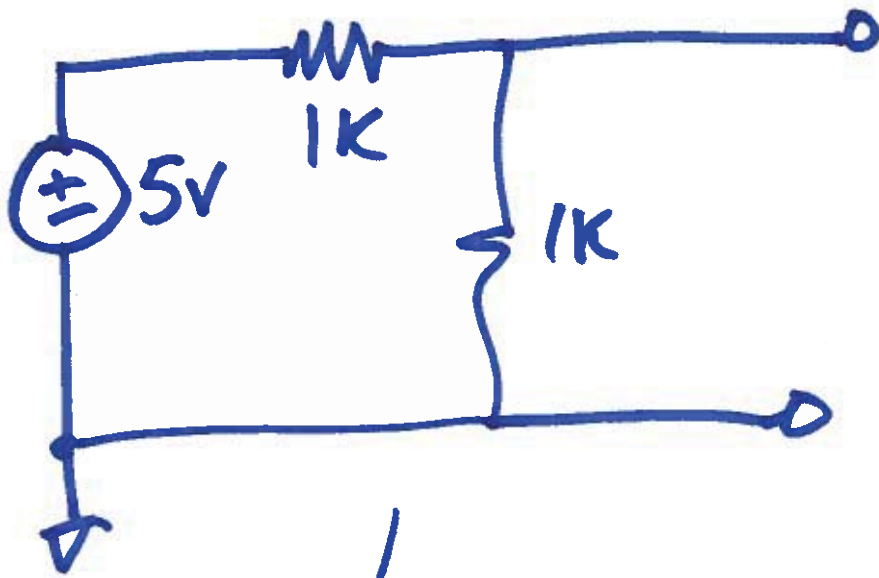


$I_{sc} = \frac{5V}{1k} = 5mA$   
 $V_{th} = \frac{1k}{1k+1k} \cdot 5 = 2.5V$   
 OPON CKT  
 Voltage  
 = Thevenin  
 Voltage

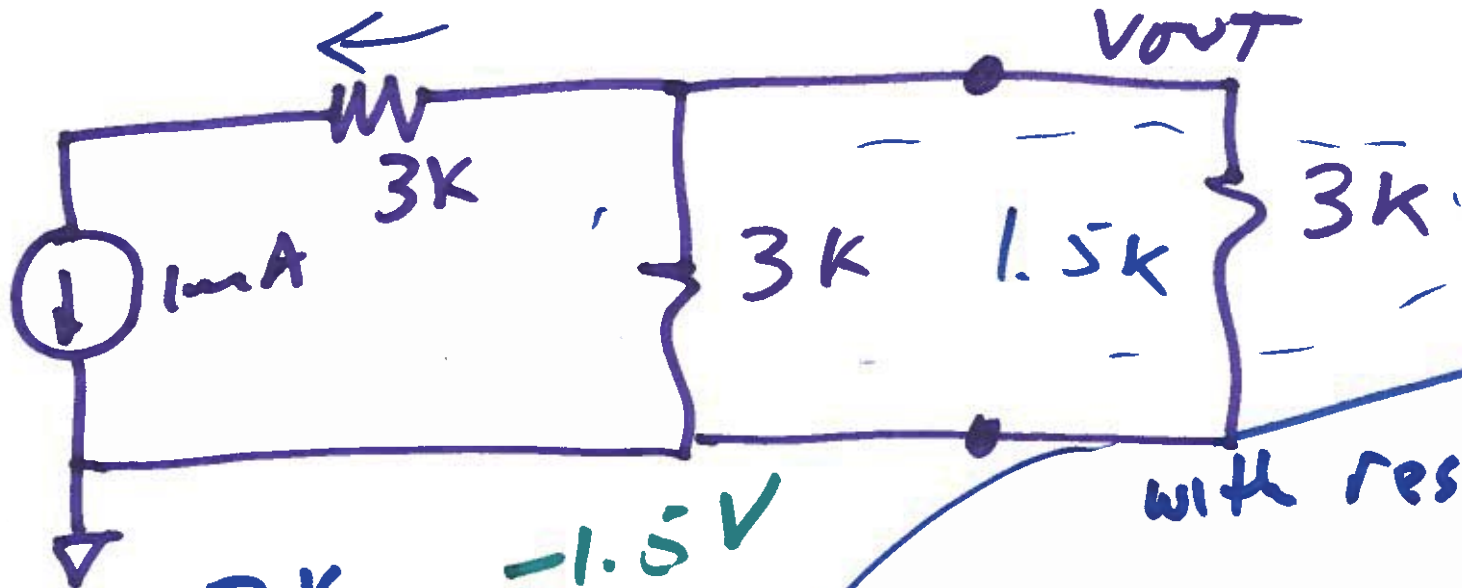


$R_{th} = \frac{V_{th}}{I_{sc}} = \frac{V_{th}}{V_{th}}$   
 $= \frac{2.5}{5mA} = \underline{\underline{500\Omega}}$

7)

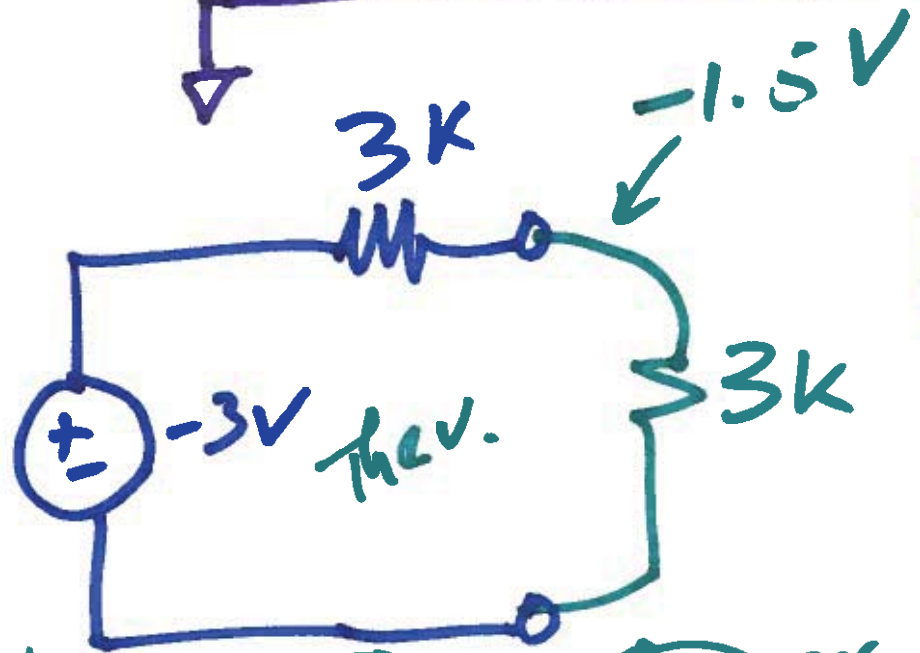




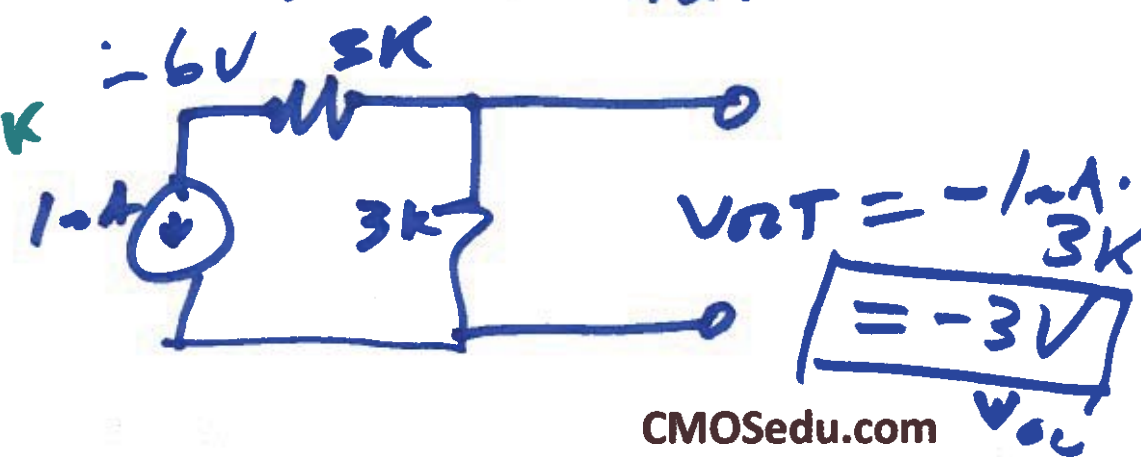


with resistor in

$$V_{out} = -1\mu A \cdot 1.5k = -1.5V$$



without the resistor



$$V_{out} = -1\mu A \cdot 3k = -3V$$



9)