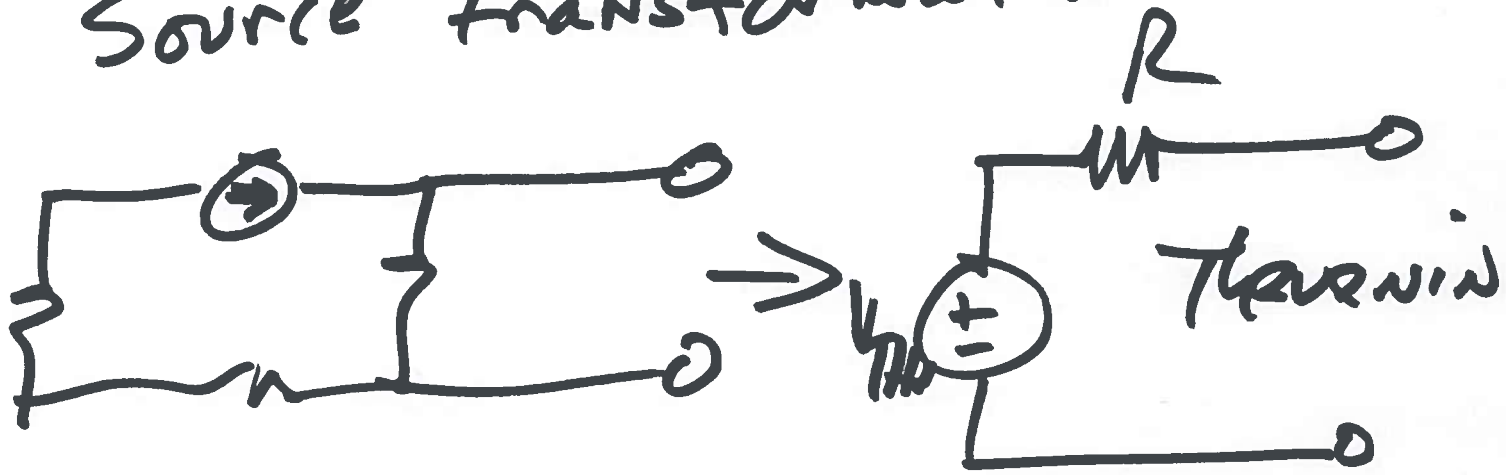
EE 220

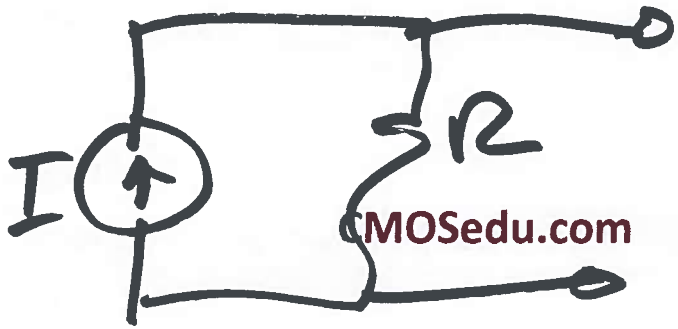
Circuits 1

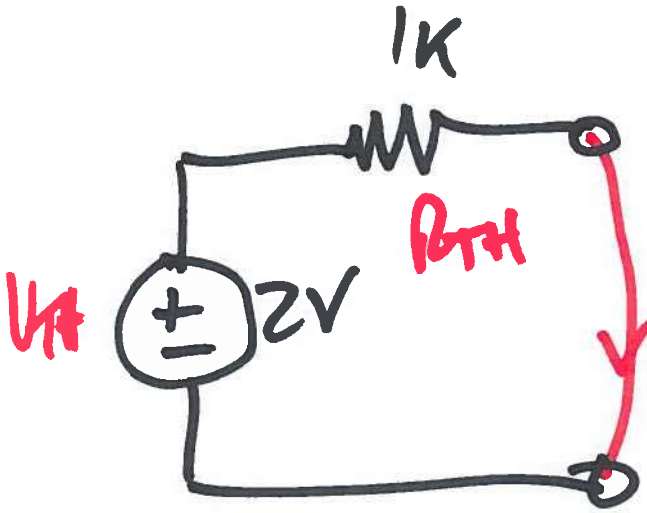
Lecture 9

September 24, 2018

Source transformation

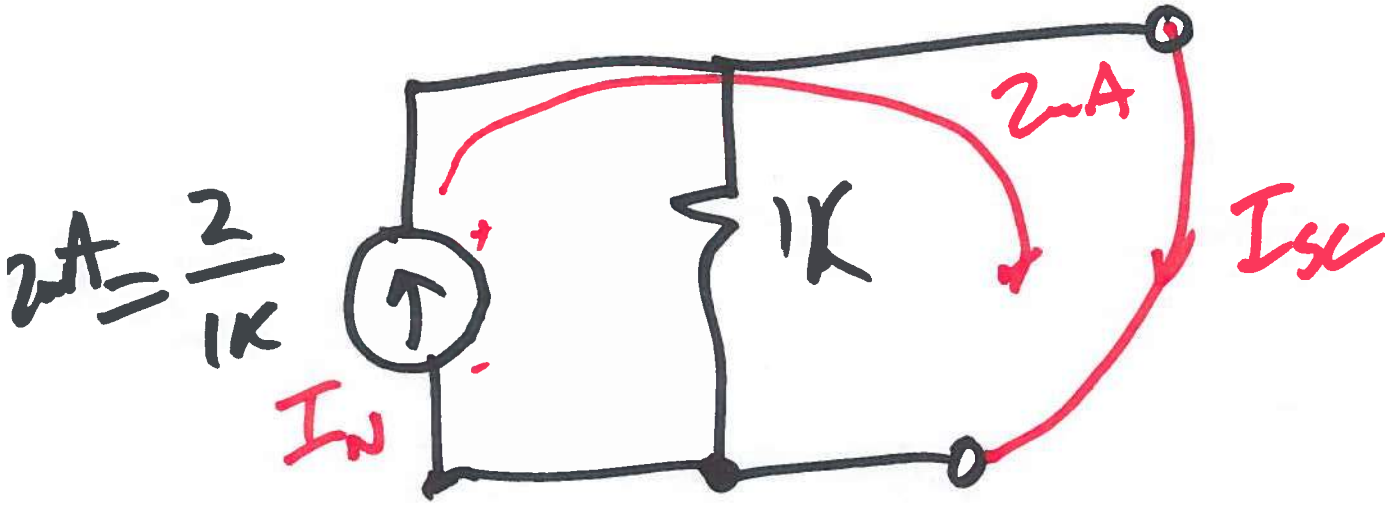




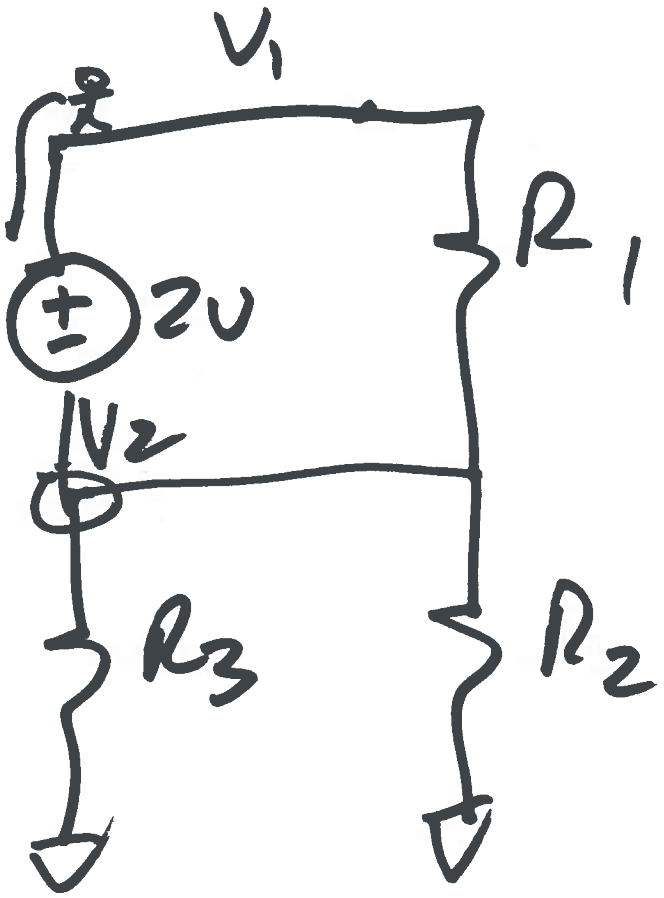


Thevenin

$$V_{TH} = I_{SC} \cdot R_{TH}$$



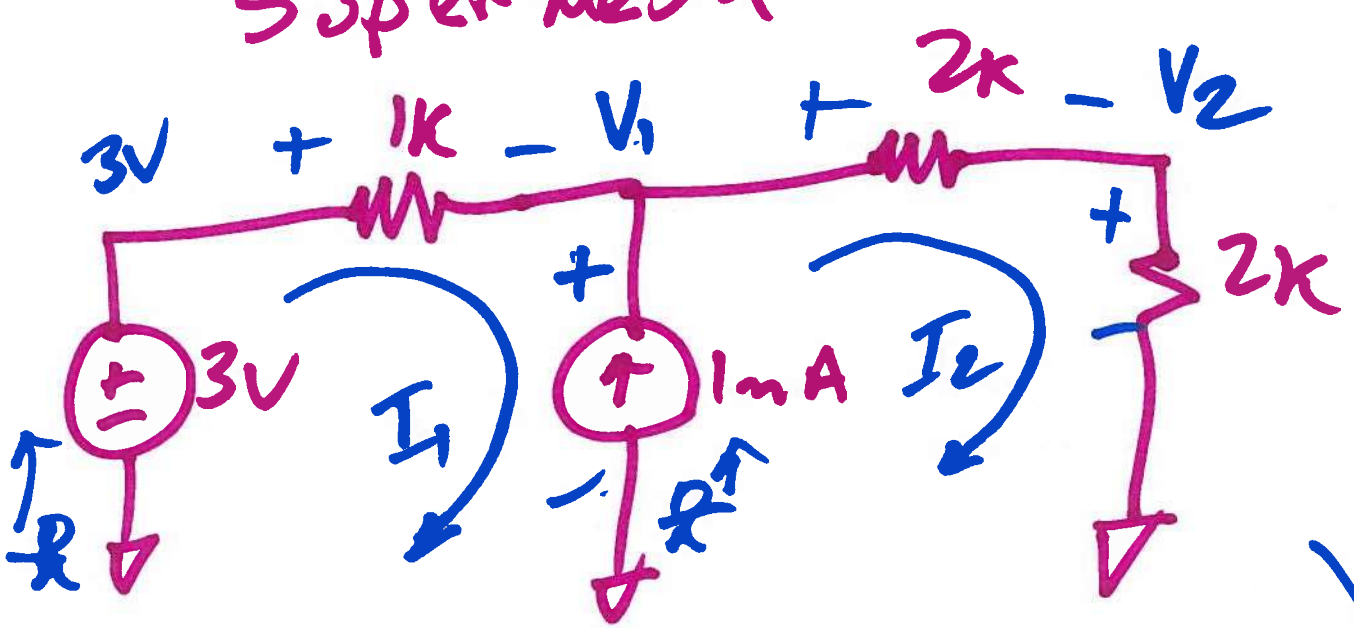
"Super Node"



$$V_2 = V_1 - 2V$$

3)

Supermesh



mesh analysis

$$1mA = I_2 - I_1 \quad (1)$$

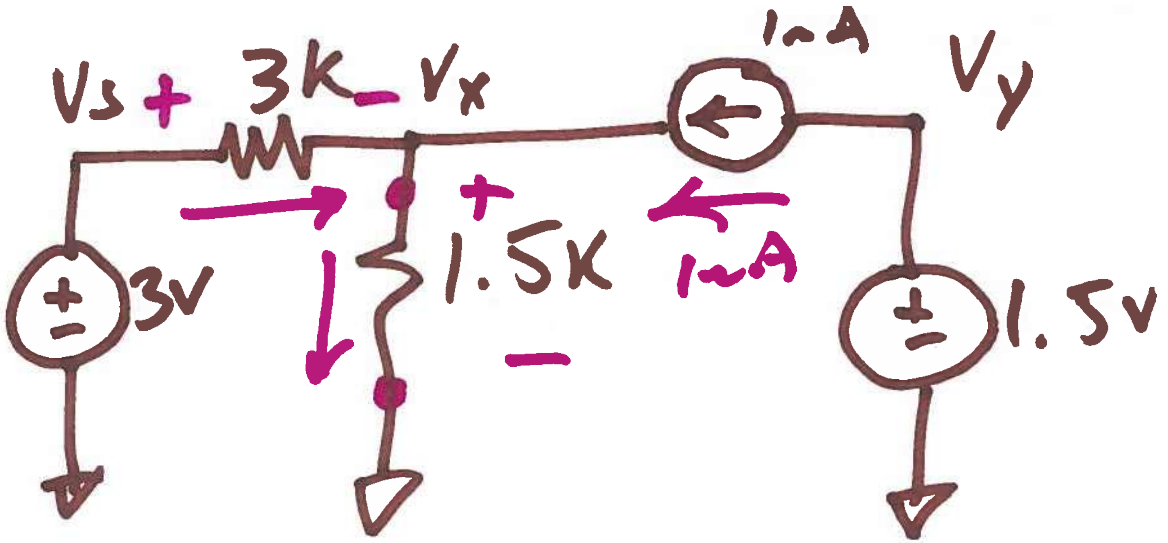
$$3 - 1K \cdot I_1 - V_1 = 0 \quad (2)$$

$$V_1 - 2K I_2 - 2K I_2 = 0 \quad (3)$$

supermesh

$$1mA = I_2 - I_1$$

$$3 - 1K I_1 - 2K I_2 - 2K I_2 = 0$$



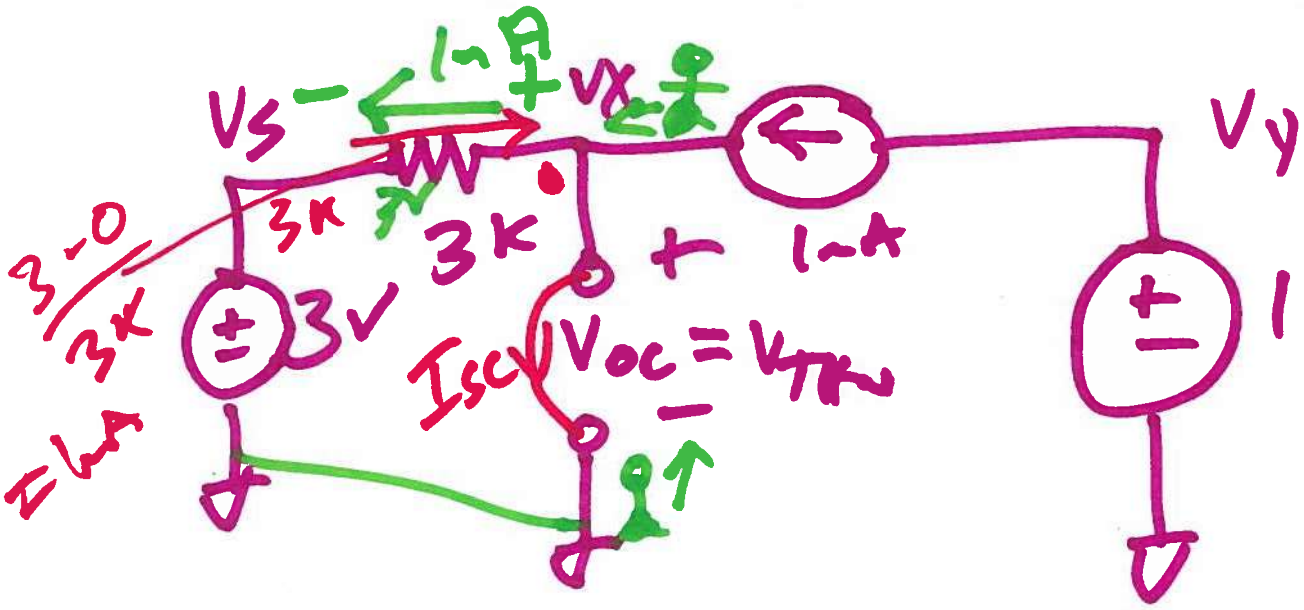
$$\frac{3-V_x}{3k} - \frac{V_x}{1.5k} + 1mA = 0$$

$$3 - V_x - 2V_x + 3V = 0$$

$$6 = 3V_x$$

$$\boxed{V_x = 2V}$$

5)



$$\frac{V_{THN}}{I_{SC}} = \frac{V_{OC}}{I_{SC}} = R_{TH}$$

$$V_x = 2mA \cdot 3k \,||\, 1.5k$$

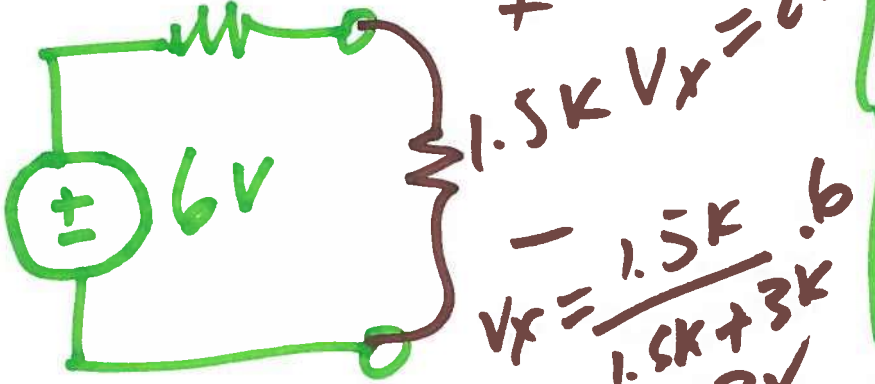
$$\frac{3 \cdot 1.5}{3+1.5} = \frac{4.5}{4.5}$$

$$= 1k$$

$$3k\ -3V - 3 + V_{TH} = 0$$

$$V_{TH} = 6V$$

$$V_x = 2V$$

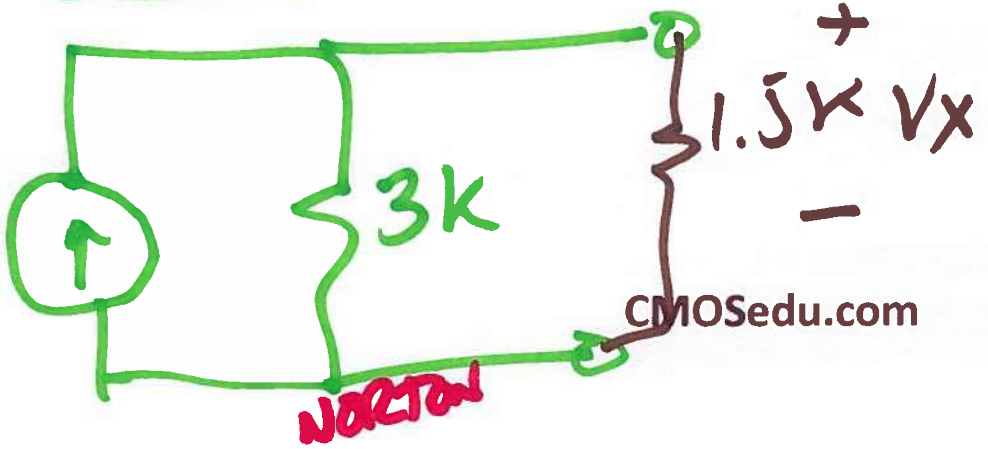


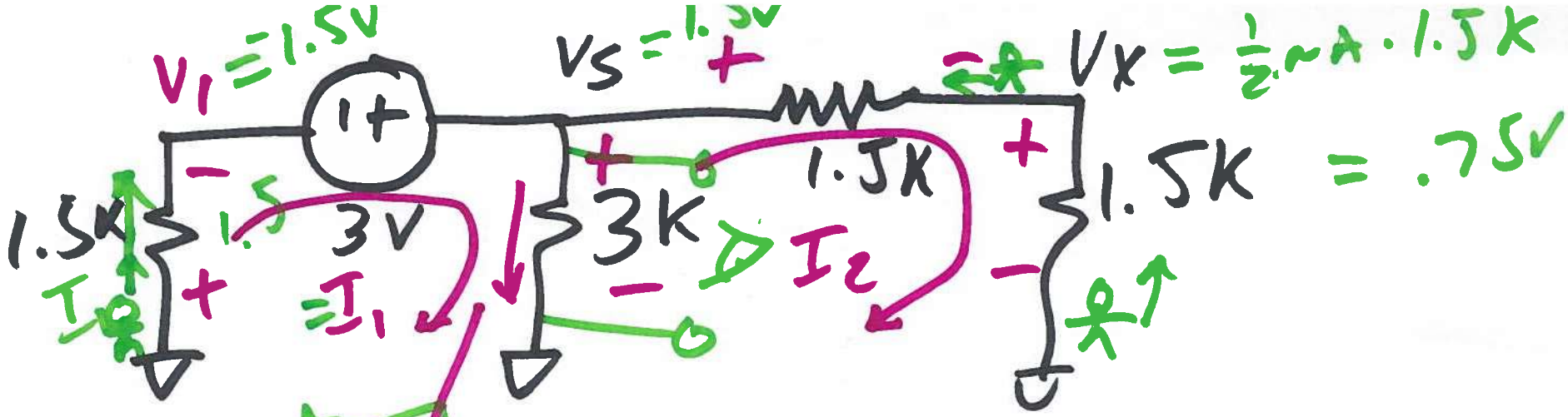
$$V_x = \frac{1.5k}{1.5k+3k} \cdot 6$$

$$= 2V$$

$$R_{TH} = 3k$$

$$\frac{2mA}{} = \frac{6}{3k}$$





$4I_2 = 2mA$

$I_2 = \frac{1}{2}mA$

$I_1 - I_2$

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

$6I_2 - 2I_2 = 2mA$

$1.5k\,I_2 - 3k(I_1 - I_2) + 1.5k\,I_2 = 0$

$3I_1 - 2I_2 = 2A$

$\leftarrow I_1 - 2mA + 2I_1 - 2I_2 = 0$

$4I_2 - 2I_1 = 0$

$\leftarrow I_2 - 2I_1 + 2I_2 + I_2 = 0$

$2I_1 = 4I_2$

$I_1 = 2I_2$

$I_1 = 1mA$

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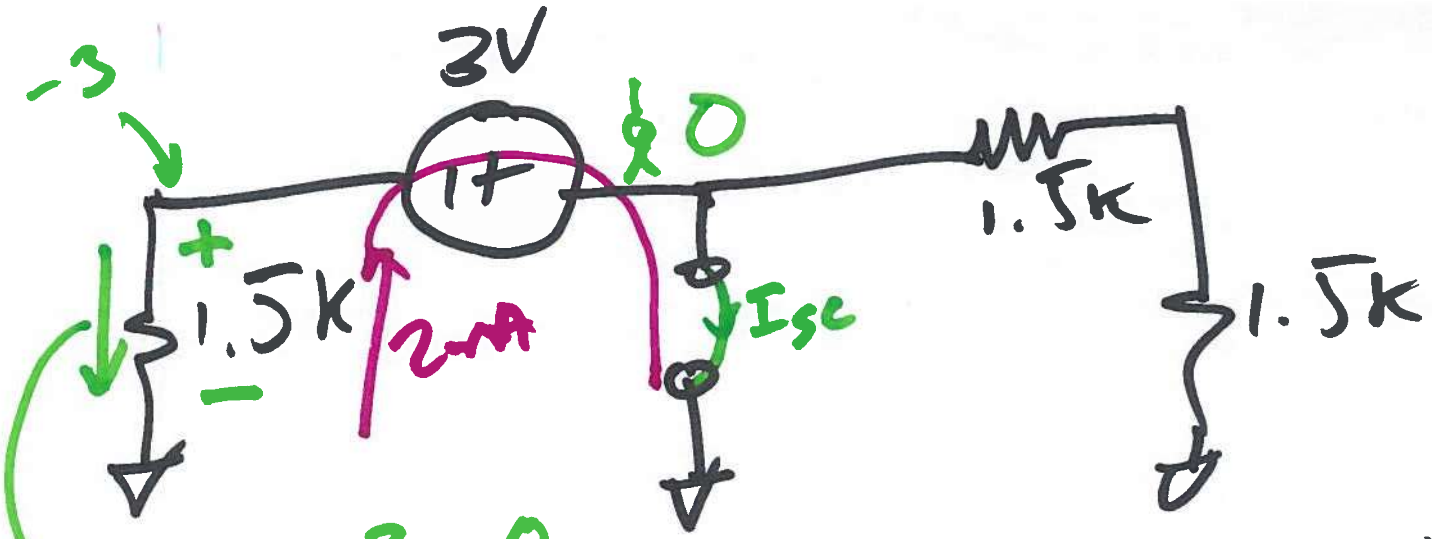
7)



$$I = \frac{-3-0}{1.5K}$$

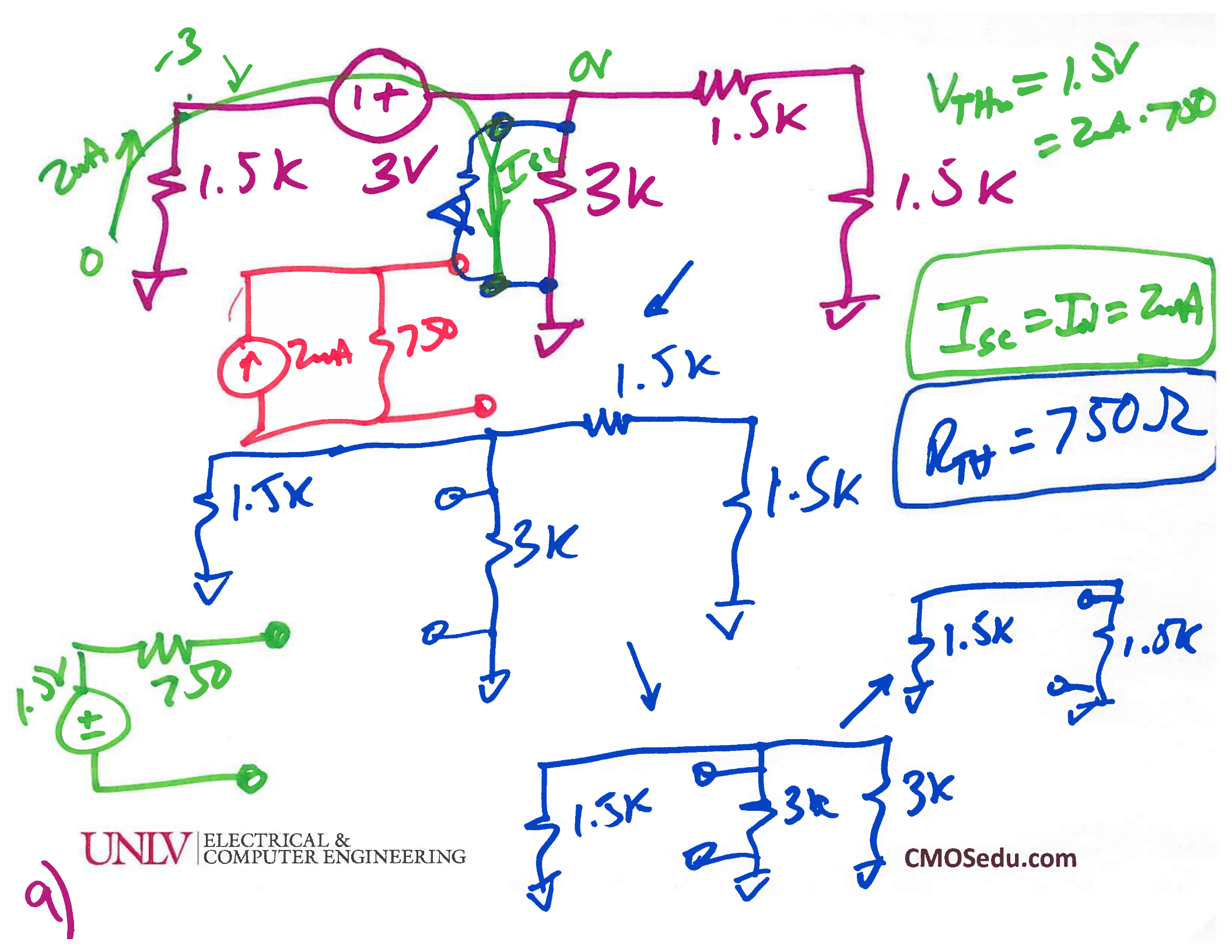
$$= -2mA$$

$$R_{TH} = 1.5K \,||\, 3K$$

$$R_{TH} = 1K$$

$$I_{SC} = 2A = I_N$$

$$V_{TH} = 2A \cdot 1K = 2V$$


-3
0V
1.5k
3V
2mA
1.5k
3k
I_{sc}
V
1.5k
$V_{TH} = 1.5V$
$= 2mA \cdot 750$
$I_{sc} = I_N = 2mA$
$R_{TH} = 750\Omega$
2mA
750
1.5k
1.5k
3k
1.5k
1.5V
750
1.5k
1.5k
1.5k
3k
3k
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9)