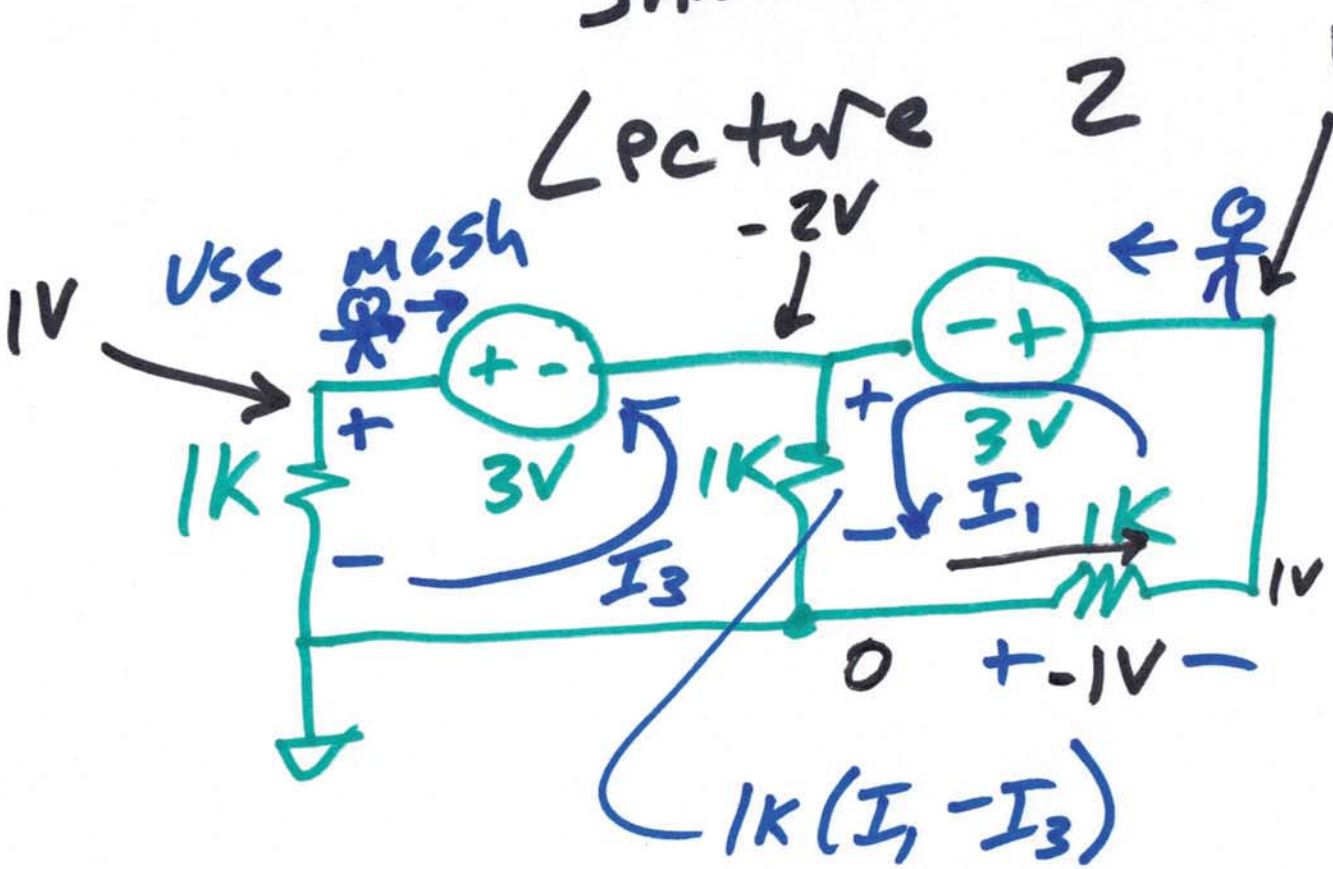
EE 221 Circuits II

January 27, 2020

Lecture 2



$-3 - 1K(I_1 - I_3)$

$-1K \cdot I_1 = 0$

$-3 - 1K(I_1 - I_3)$

$+1K\,I_3$

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

$I_3 = 1\text{-}A$

$$-3 - 1K(I_1 - I_3) - 1K \cdot I_1 = 0$$

$$-(-3 - 1K(I_1 - I_3) + 1K I_3) = 0$$

$$0 + 0 + -1K I_1 - 1K I_3 = 0$$

$$I_1 = -I_3$$

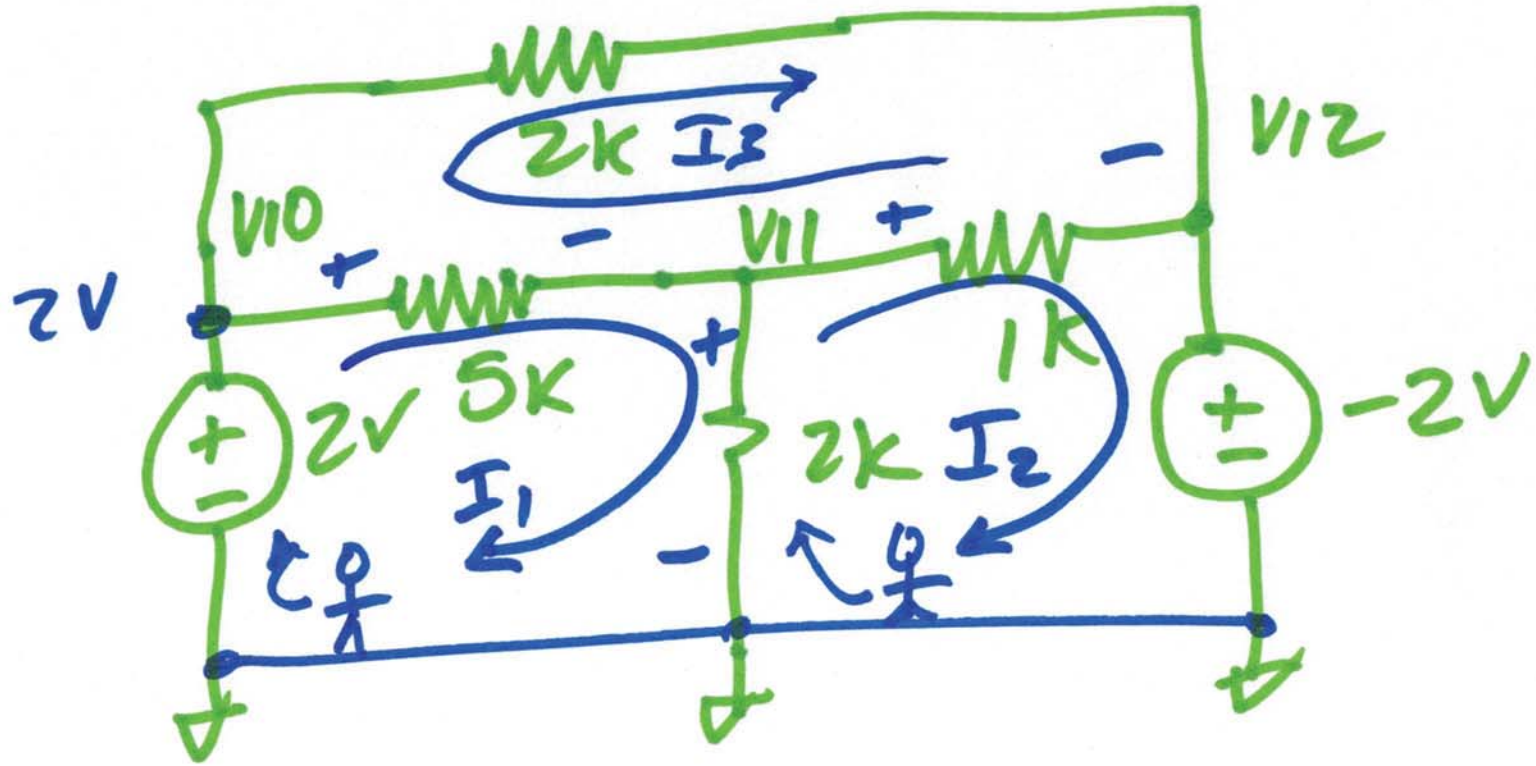
$$-3 - 1K\,2I_1 - 1K I_1 = 0 \qquad I_3 = -I_1$$

$$-3 - 3K I_1 = 0$$

$$I_1 = -1mA$$

$$I_3 = 1mA$$

2)



$$2V - I_3 \cdot 2K - (-2V) = 0$$

$$I_3 = \frac{4V}{2K} = 2mA$$

$$2V - 5K(I_1 - 2m) - 2k(I_1 - I_2) = 0$$

$$2V - 1K(I_2 - 2m) + 2K(I_1 - I_2) = 0$$

$$1mA - 2.5I_1 + 5mA - I_1 + I_2 = 0$$

$$6mA - 3.5I_1 + I_2 = 0$$

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

$$4mA + 2I_1 - 3I_2 = 0$$

$$\times 3 \rightarrow \quad 18mA - 10.5I_1 + 3I_2 = 0$$

$$22mA - 8.5I_1 = 0$$

$$I_1 = \frac{22}{\frac{17}{2}}\,mA$$

$$\boxed{I_1 = \frac{44}{17}\,mA}$$

$$6mA - \frac{7}{2}\cdot\frac{44}{17} + I_2 = 0$$

$$6mA - \frac{154\,mA}{17} + I_2 = 0$$

$$\frac{102}{17}mA - \frac{154}{17}mA + I_2 = 0$$

$$\boxed{I_2 = \frac{52}{17}mA = 3\frac{1}{17}mA}$$

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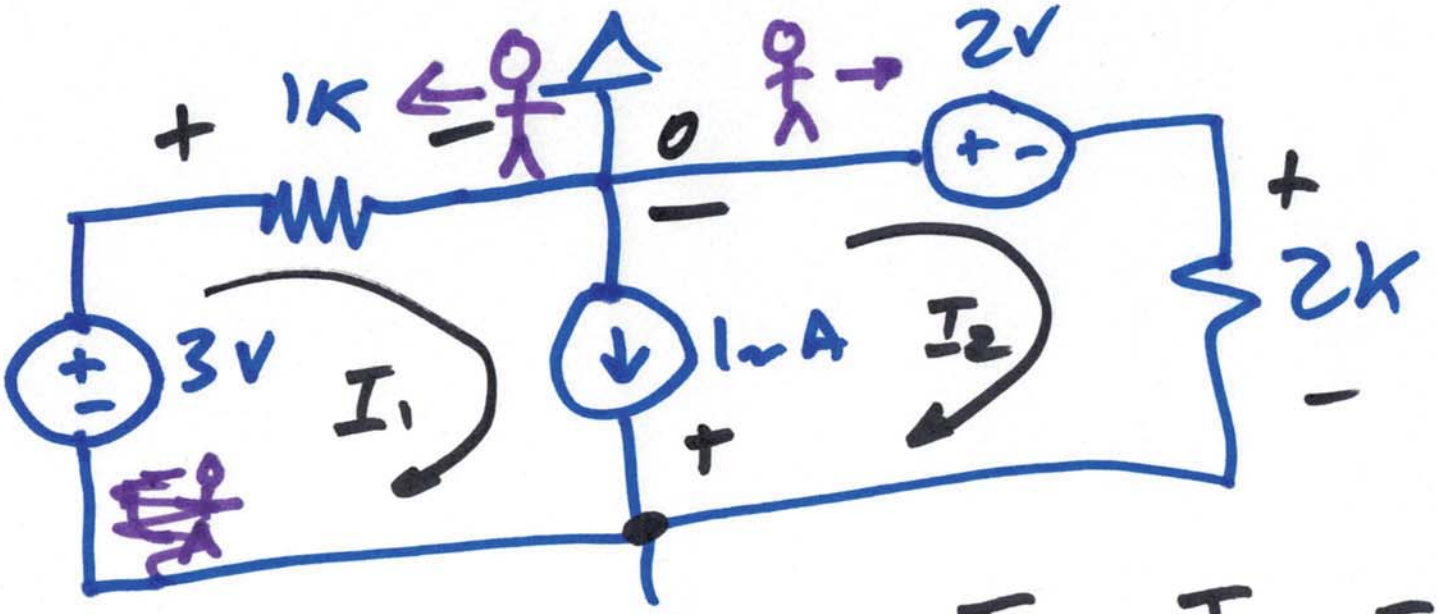
4)



$I_1 - I_2 = 1mA$

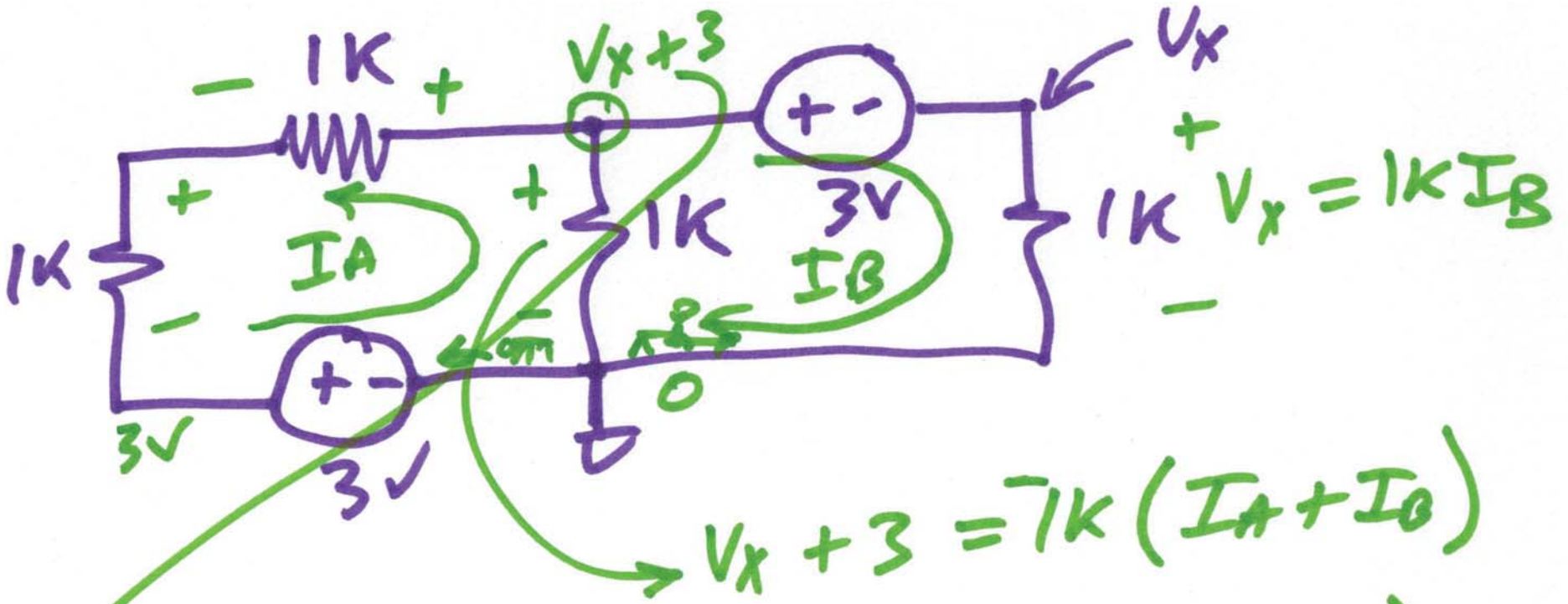
$-2V - 2kI_2 + 3 - 1kI_1 = 0$

$-2 - 2kI_2 - V_x = 0$

$1kI_1 - 3 - V_x = 0$

$V_x = 1kI_1 - 3$

5)

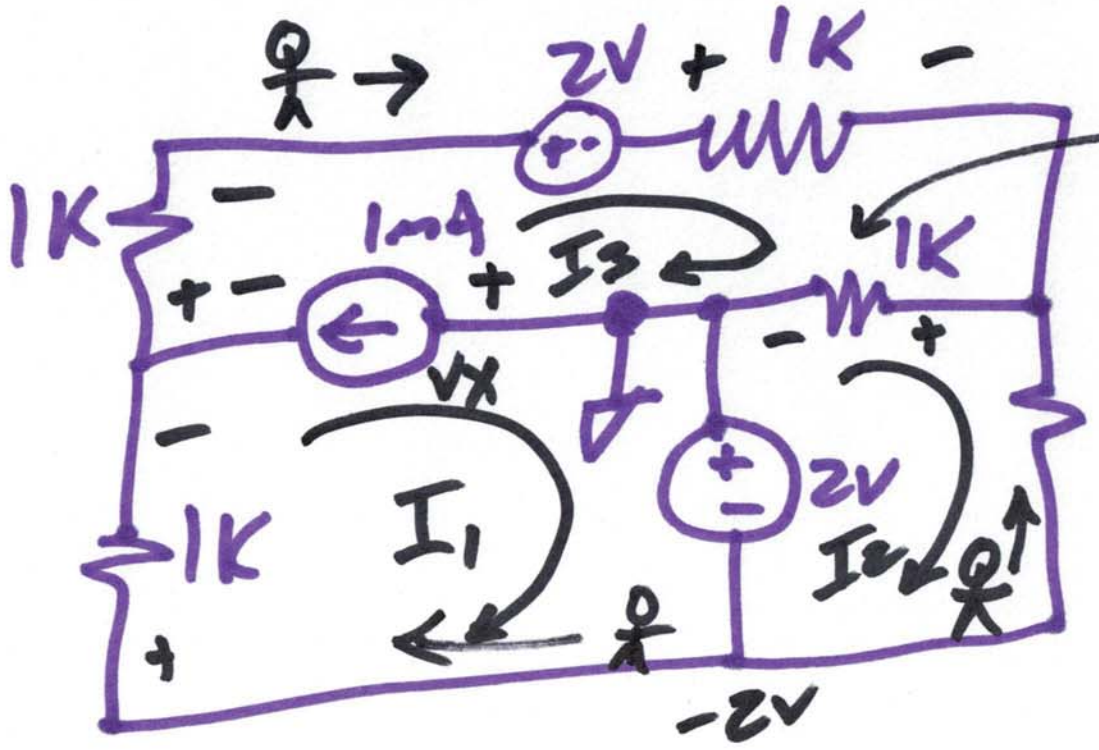


$$V_x + 3 = 1K(I_A + I_B)$$

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

$$1K I_B + 3 + 1K(I_A + I_B) = 0$$

Super Node!



$1K(I_3 - I_2)$

$+ \; I_3 - I_1 = 1mA$

$-1K I_3 = 0$

$$-2 - I_3 \cdot 1K - 1K(I_3 - I_2) - V_x = 0$$

$$-I_1 \cdot 1K + V_x - 2 = 0$$

$$+1K I_2 - 1K(I_3 - I_2) - 2 = 0$$