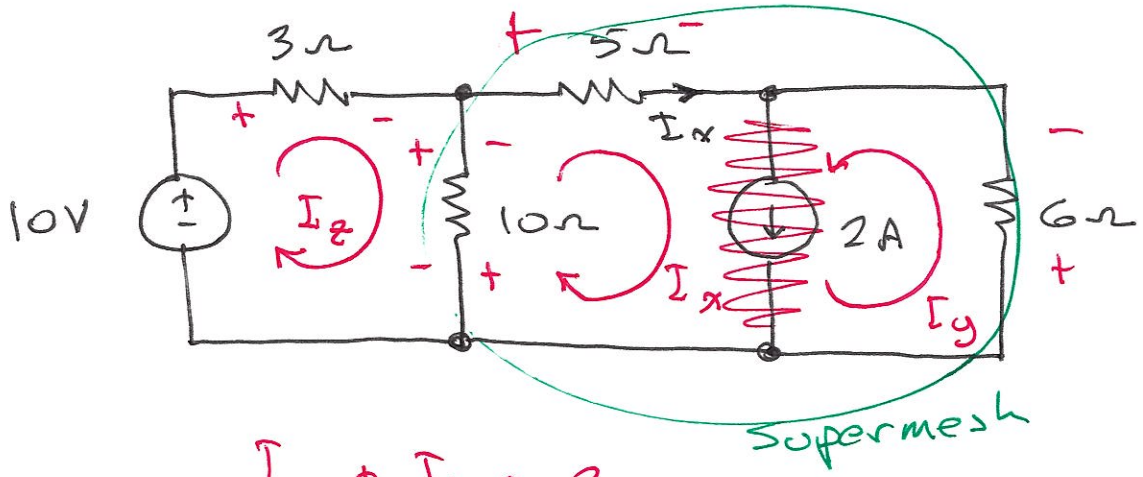
Mesh Analysis



Find I_x using mesh analysis.

$$I_x + I_y = 2 \quad \text{(constraint equation)}$$

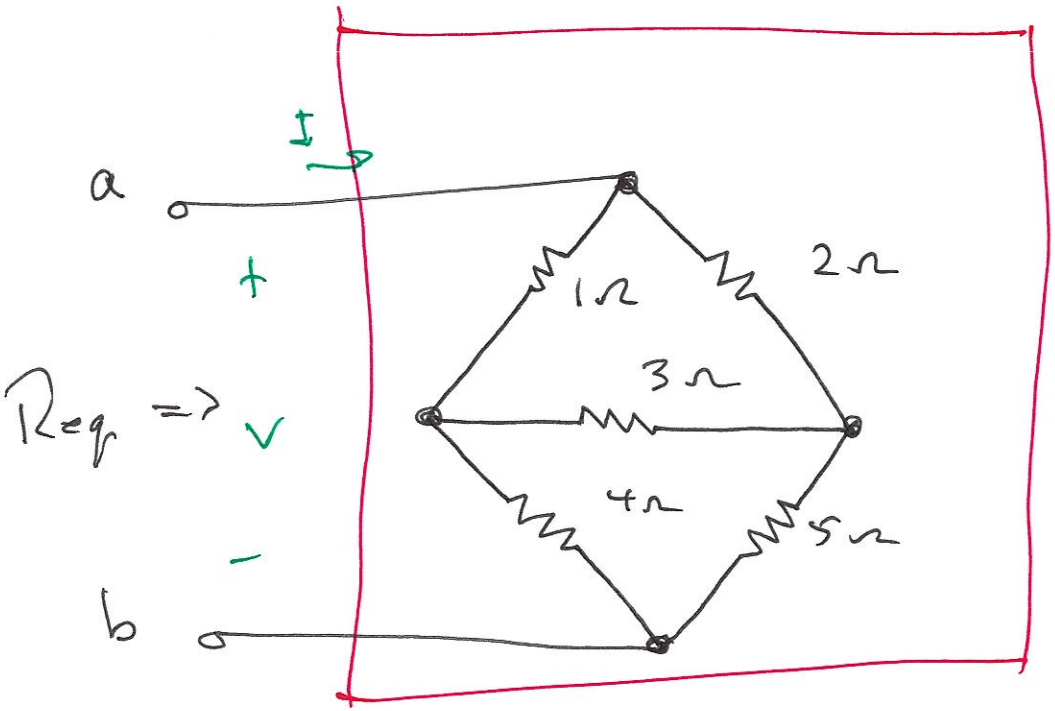
$$-10 + 3I_z + 10(I_z - I_x) = 0 \quad \text{(KVL for mesh z)}$$

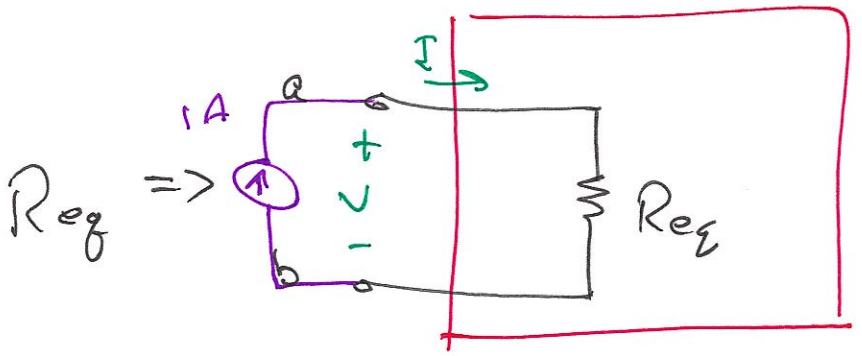
$$+10(I_x - I_z) + 5I_x - 6I_y = 0 \quad \text{(KVL for supermesh)}$$

$$\begin{bmatrix} 1 & 1 & 0 \\ -10 & 0 & 13 \\ 15 & -6 & -10 \end{bmatrix} \begin{bmatrix} I_x \\ I_y \\ I_z \end{bmatrix} = \begin{bmatrix} 2 \\ 10 \\ 0 \end{bmatrix}$$

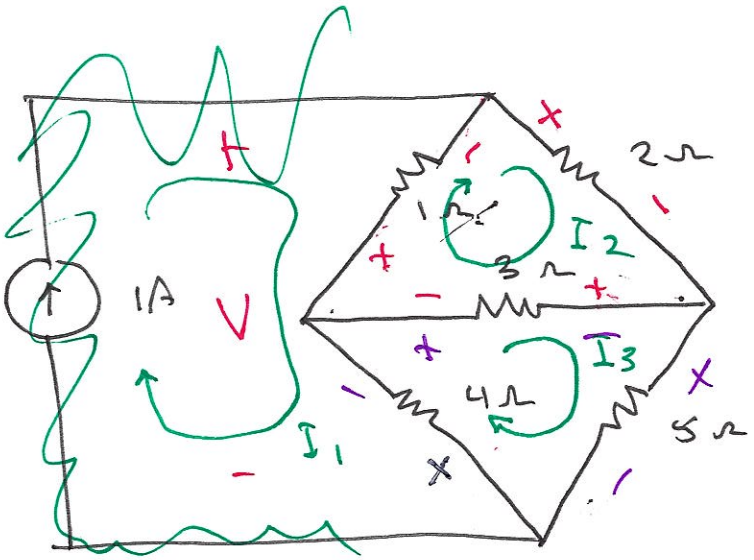
Solve for I_x.

$$I_x = 1.48\ A$$





$$\frac{V}{I} = R_{eq}$$



$$V \equiv R_{eq}$$

$$I_1 = 1 \qquad \text{(constraint)}$$

$$2I_2 + 3(I_2 - I_3) + 1(I_2 - I_1) = 0 \qquad \text{(KVL for mesh 2)}$$

$$3(I_3 - I_2) + 5I_3 + 4(I_3 - I_1) = 0 \qquad \text{(KVL for mesh 3)}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ -1 & 6 & -3 \\ -4 & -3 & 12 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

$I_2 = 0.38\ A$ $\qquad$ $I_3 = 0.43\ A$

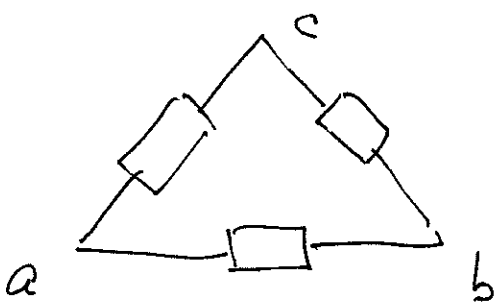
$$V = 2I_2 + 5I_3$$

$$= 2(0.38) + 5(0.43)$$

$$= 2.91\ V$$

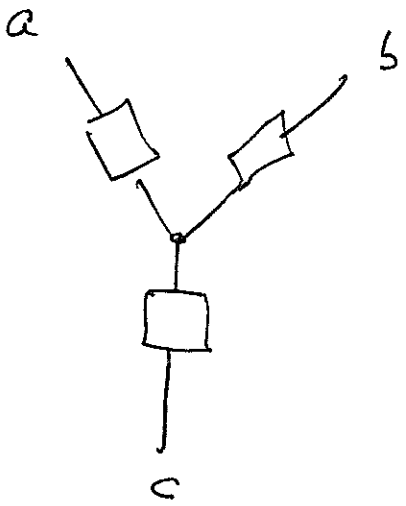
$$\therefore R_{eq} = 2.91\ \Omega$$

Δ -> Y transformation

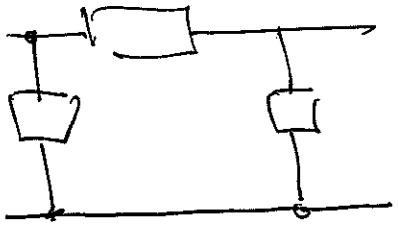


delta

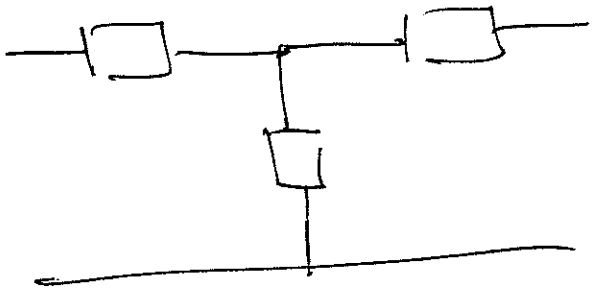
=>



wye



π



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