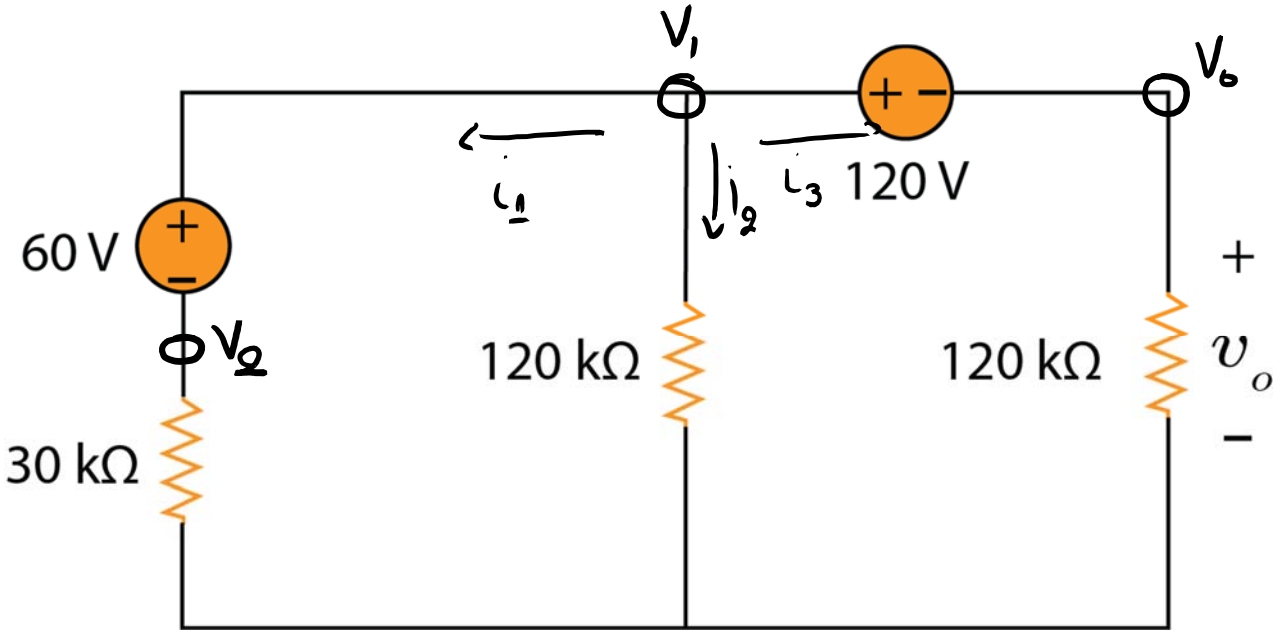


1) Identify all nodes

2) From the independent sources:

$V_1 = V_2 + 60$ or $V_2 = V_1 - 60$

$V_1 = V_o + 120$ or $V_o = V_1 - 120$

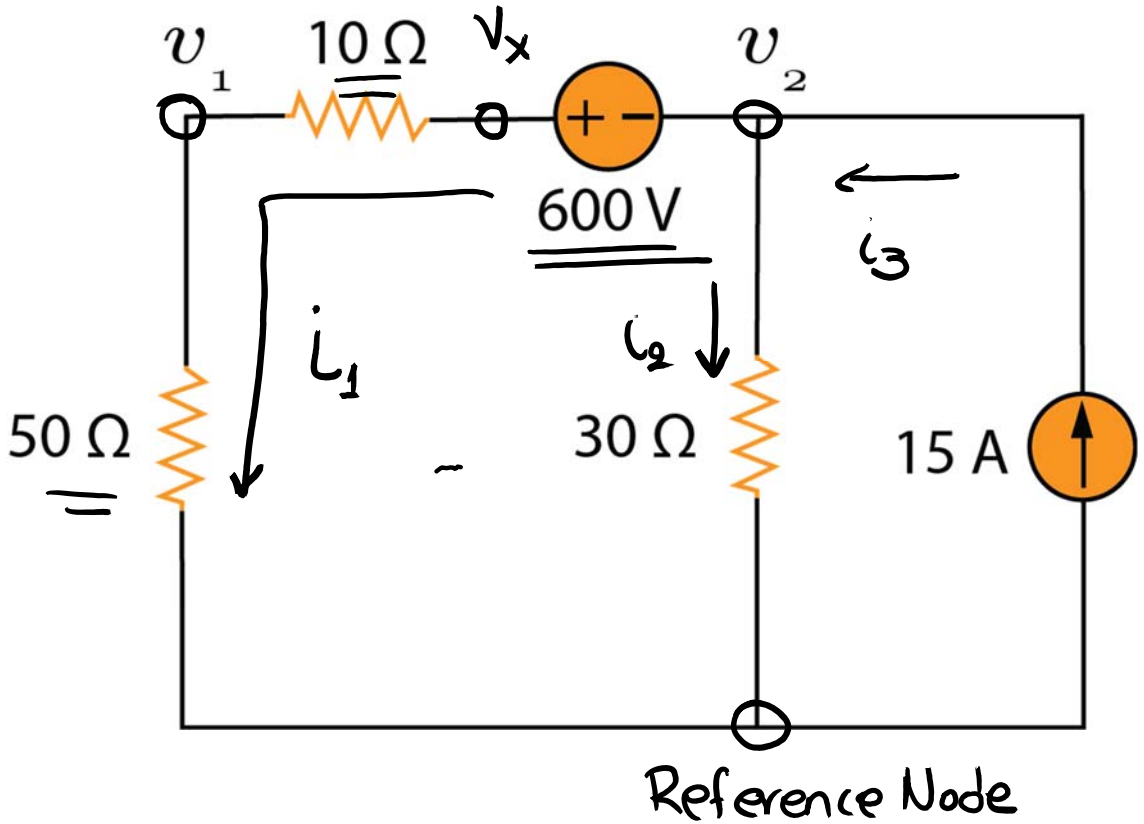
3) Define currents so KCL at node 1: $i_1 + i_2 + i_3 = 0$

Because of series elements: $i_1 = \frac{V_2}{30k}$ $\quad i_3 = \frac{V_o}{120k}$

$$\text{KCL}: \frac{V_2}{30k} + \frac{V_1}{120k} + \frac{V_o}{120k} = 0 \Rightarrow \frac{V_1 - 60}{30k} + \frac{V_1}{120k} + \frac{V_1 - 120}{120k} = 0$$

$$\Rightarrow 6V_1 = 360 \Rightarrow V_1 = 60V$$

$$V_o = V_1 - 120 = 60 - 120 = -60V$$



1) From series connection

$$\frac{V_1}{50} = \frac{V_x}{60}$$

2) At node x:

$$V_x = V_2 + 600$$

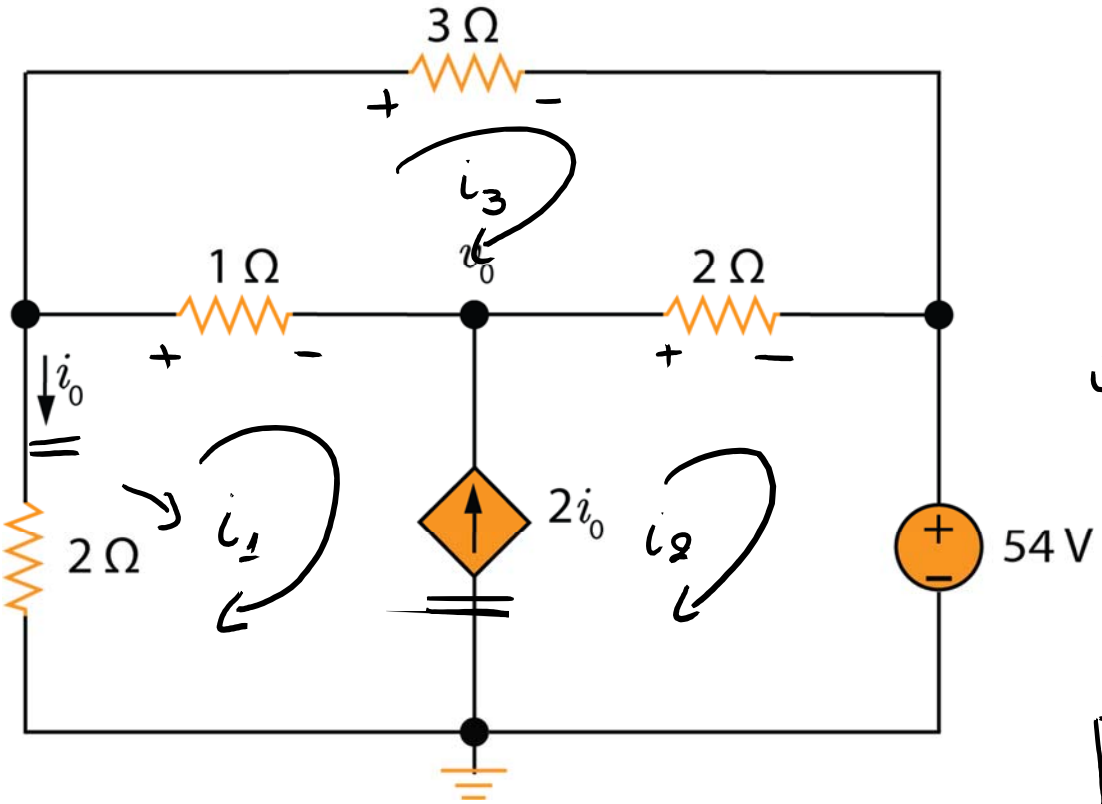
3) Nodal analysis at node 2

$$i_1 + i_2 = i_3$$

$$\Rightarrow \frac{V_x}{60} + \frac{V_2}{30} = 15 \Rightarrow$$

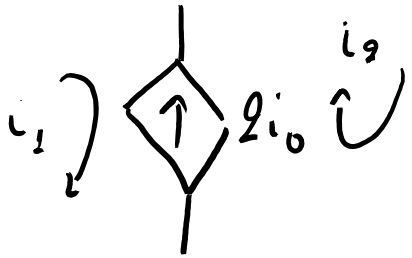
$$\Rightarrow \frac{V_2+600}{60} + \frac{V_2}{30} = 15 \Rightarrow 3V_2 + 600 = 900 \Rightarrow V_2 = 100\,V$$

$$\frac{V_1}{50} = \frac{V_2+600}{60} \Rightarrow V_1 = \frac{50}{60}(100+600) = 583.3\,V$$



i) Current source between two meshes:

Supermesh:

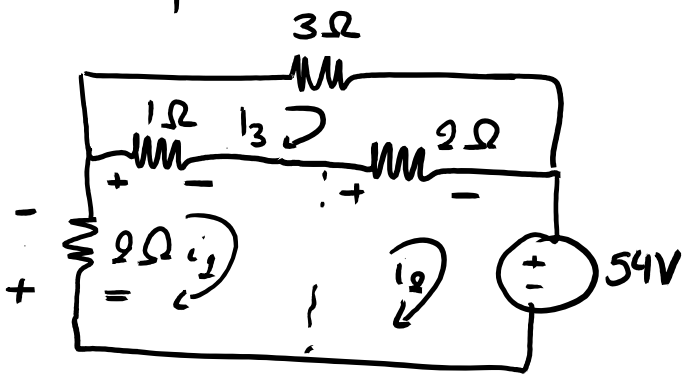


$i_1 - i_2 = -2i_0$

or

$i_2 - i_1 = 2i_0$ (1)

Supermesh:



$2i_1 + 1(i_1 - i_3) + 2(i_2 - i_3) + 54 = 0$

$\Rightarrow 3i_1 + 2i_2 - 3i_3 = -54$ (2)

Mesh 3: $3i_3 - 2(i_2 - i_3) - 1(i_1 - i_3) = 0$

$\Rightarrow 6i_3 - 2i_2 - i_1 = 0$ (3)

Finally $i_0 = -i_1$

(1) $\Rightarrow i_2 - i_1 = 2i_0 = -2i_1$

$\Rightarrow i_2 = -i_1$ (4)

$$\left.\begin{aligned} i_2 &= -i_1 \\ 3i_1 + 2i_2 - 3i_3 &= -54 \\ -i_1 - 2i_2 + 6i_3 &= 0 \end{aligned}\right\} \Rightarrow$$

Solving this system:

$$i_1 = -36\,A$$

$$i_2 = 36\,A$$

$$i_3 = 6\,A$$

$$V_o = 54 + 2\cdot(i_2 - i_3) = 54 + 2\,(36-6) = 54 + 60 = \underline{114}\,V$$

also

$$V_o = -2i_1 - 1\,(i_1 - i_3) = -2(-36) - 1\,(-36-6) = 72 + 42 = 114\,V$$