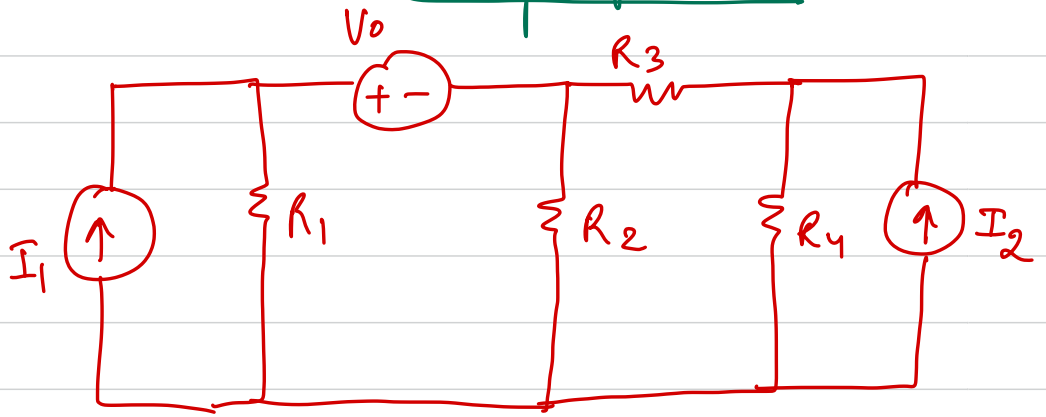
Superposition



$$\begin{bmatrix} G_1 & G_2+G_3 & -G_3 \\ 1 & -1 & 0 \\ 0 & -G_3 & G_4+G_3 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} I_1 \\ V_0 \\ I_2 \end{bmatrix}$$

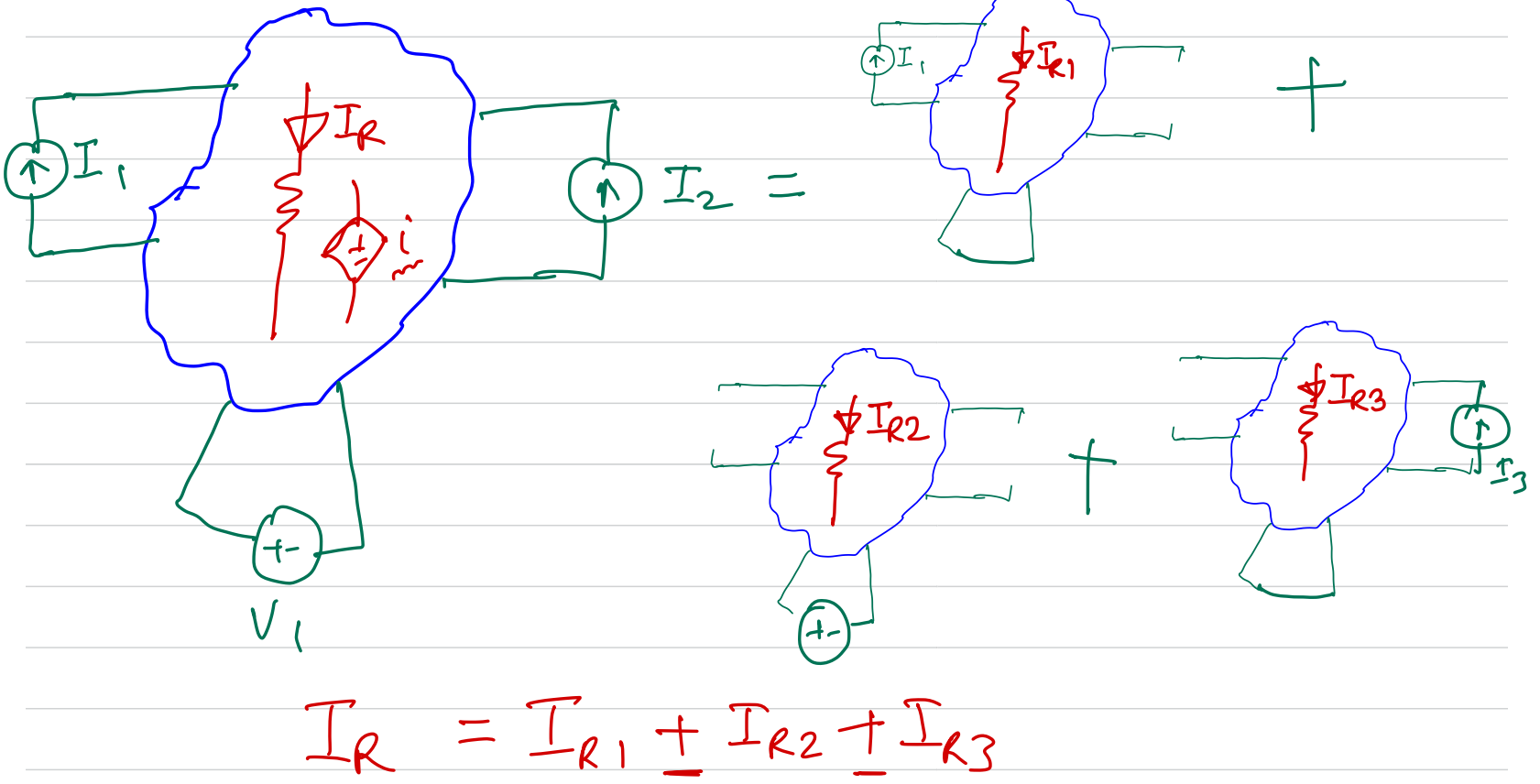
$$\rightarrow G\,V = I \rightarrow$$

$$V = G^{-1} I$$

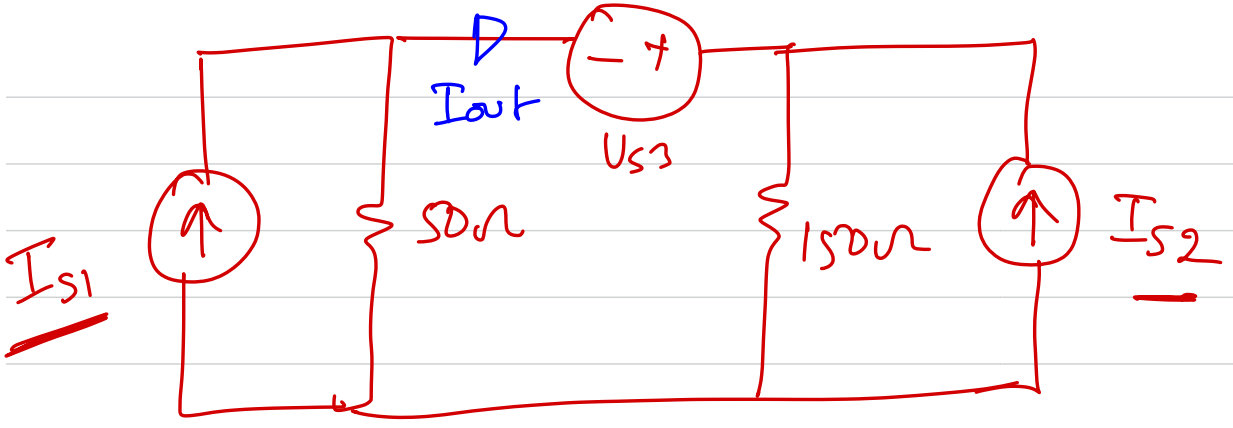
$$V = G^{-1}\begin{bmatrix} I_1 \\ V_0 \\ I_2 \end{bmatrix} = G^{-1}\begin{bmatrix} I_1 \\ 0 \\ 0 \end{bmatrix} + G^{-1}\begin{bmatrix} 0 \\ V_0 \\ 0 \end{bmatrix} + G^{-1}\begin{bmatrix} 0 \\ 0 \\ I_2 \end{bmatrix}$$

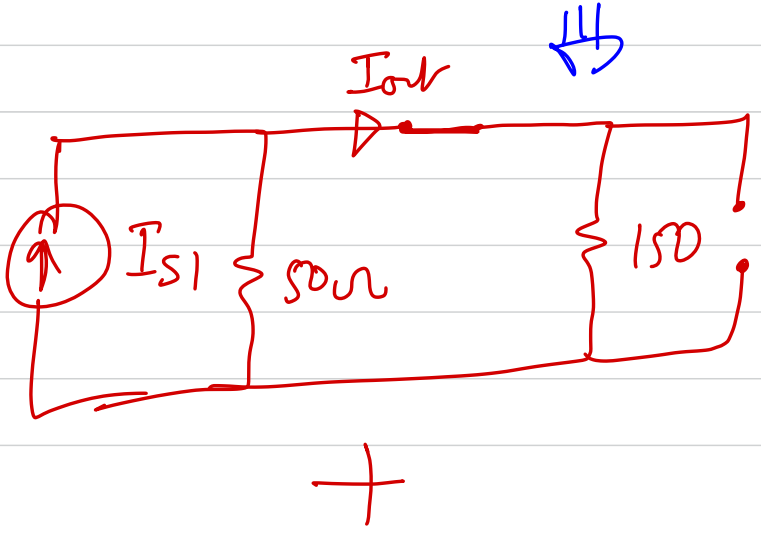
$I_1 = 0 \longrightarrow$ 

$V = 0 \longrightarrow$ 

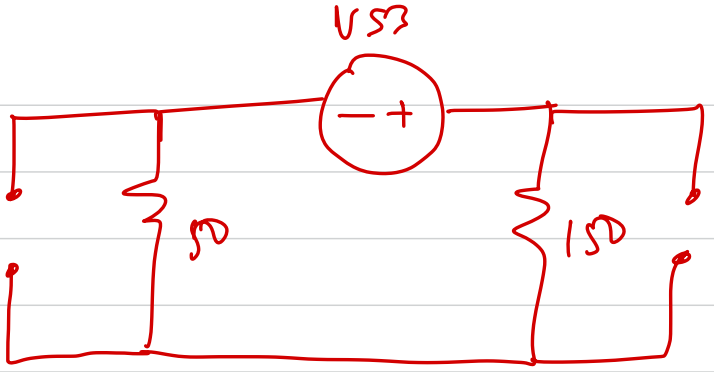


$$I_R = I_{R1} \pm I_{R2} \pm I_{R3}$$

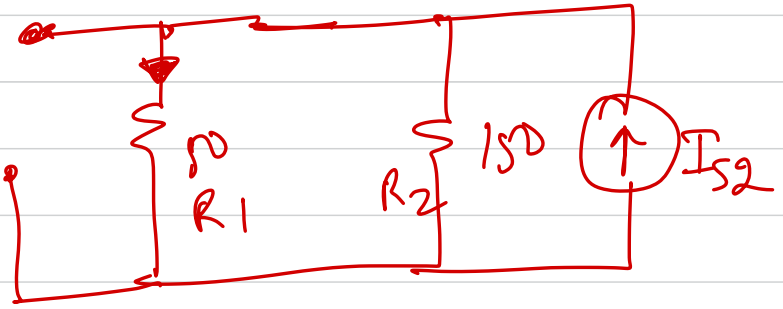




$$I_{out1} = \frac{50}{200} I_{out} = 0.25 I_{s1}$$



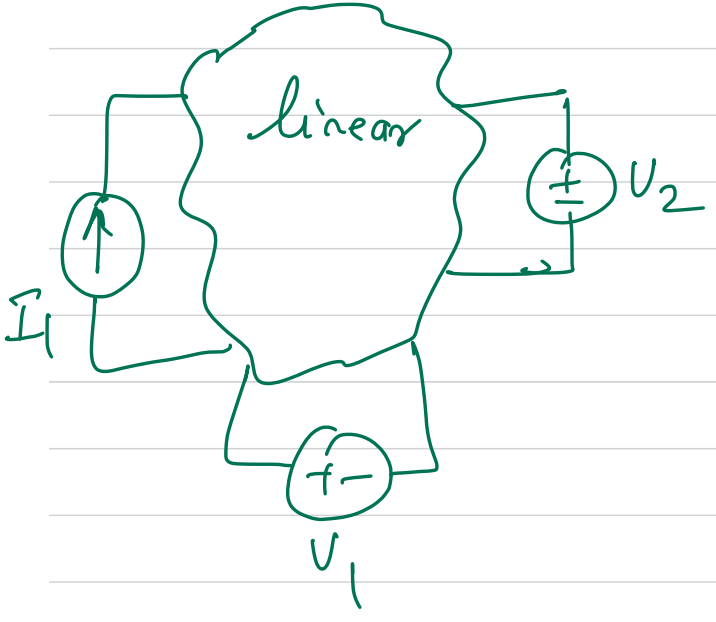
$$i_{out2} = 0.005\, V_{S3}$$



$$I_{ab3} = -0.75\, I_{S2}$$

$$I_{out} = I_{out1} + I_{ab2} + I_{ab3} = 0.25\, I_{S1} + 0.005 V_3 - 0.75\, I_{S2}$$

External Superposition



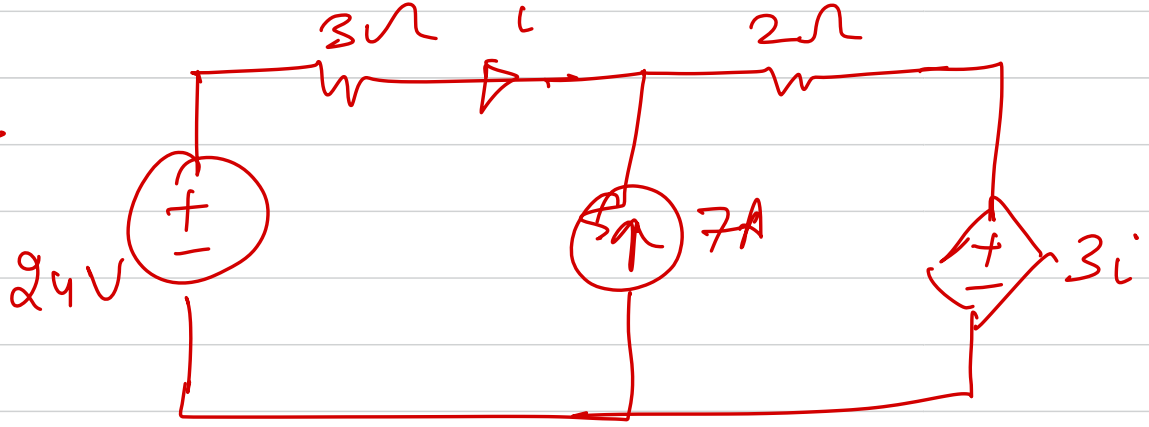
$$G^{-1}\begin{bmatrix} I_1 \\ 0 \\ 0 \end{bmatrix} + G^{-1}\begin{bmatrix} 0 \\ v_1 \\ 0 \end{bmatrix} + G^{-1}\begin{bmatrix} 0 \\ 0 \\ v_2 \end{bmatrix}$$

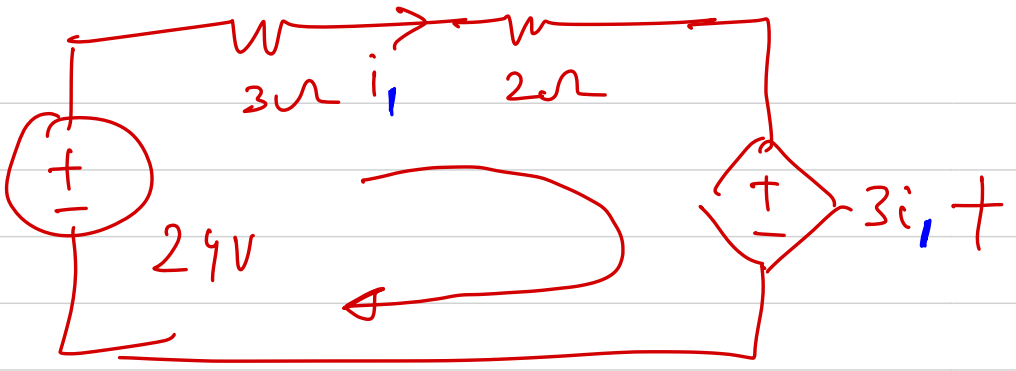
$$\equiv G^{-1}\begin{bmatrix} I_1 \\ V_1 \\ 0 \end{bmatrix} + G^{-1}\begin{bmatrix} 0 \\ 0 \\ V_2 \end{bmatrix}.$$

$$i_1 = \frac{R_1}{(R_1+R_2)} i_T$$

$$i_2 = \frac{R_2}{(R_1+R_2)} i_T$$

Q

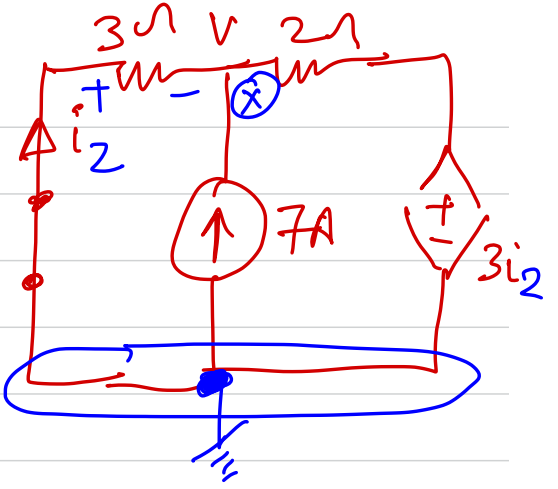




$$24 - 3i - 2i - 3i = 0$$

$$i_1 = 3 \text{ Amp.}$$

$$i = 3 - 7/4 = 5/4 \text{ Amp.}$$

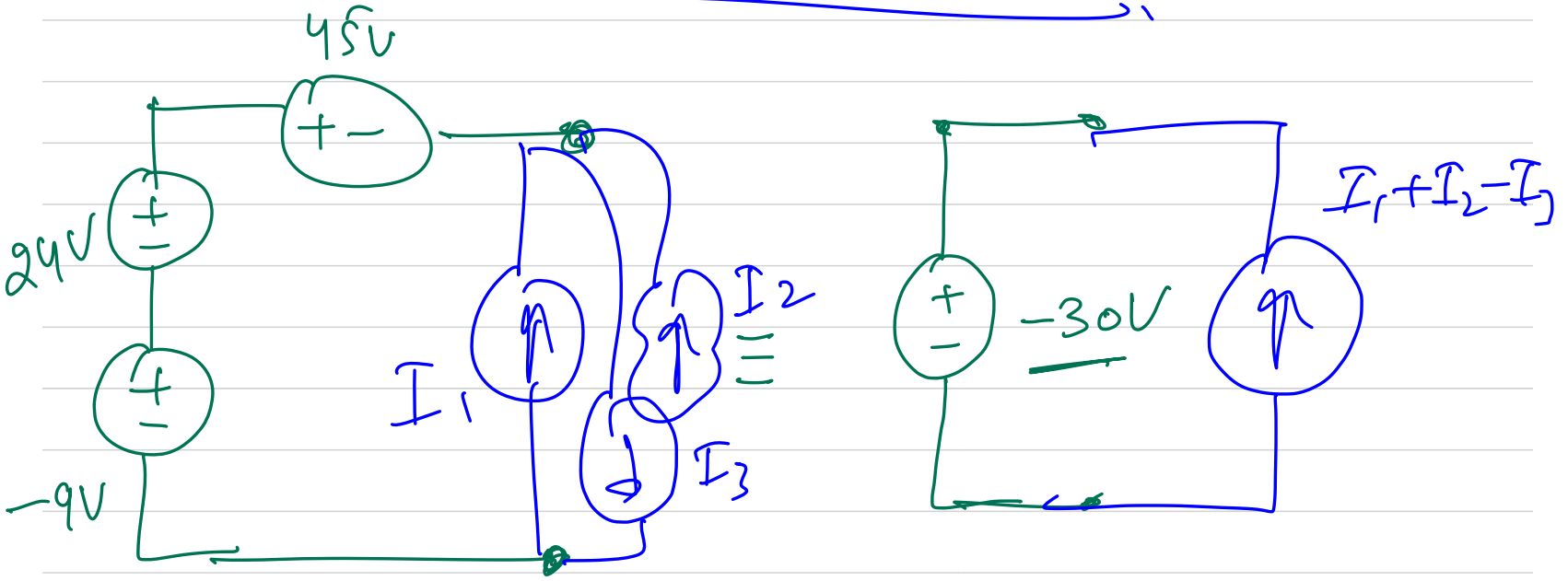


$$\frac{V}{3} + \frac{V - 3i}{2} = 7$$

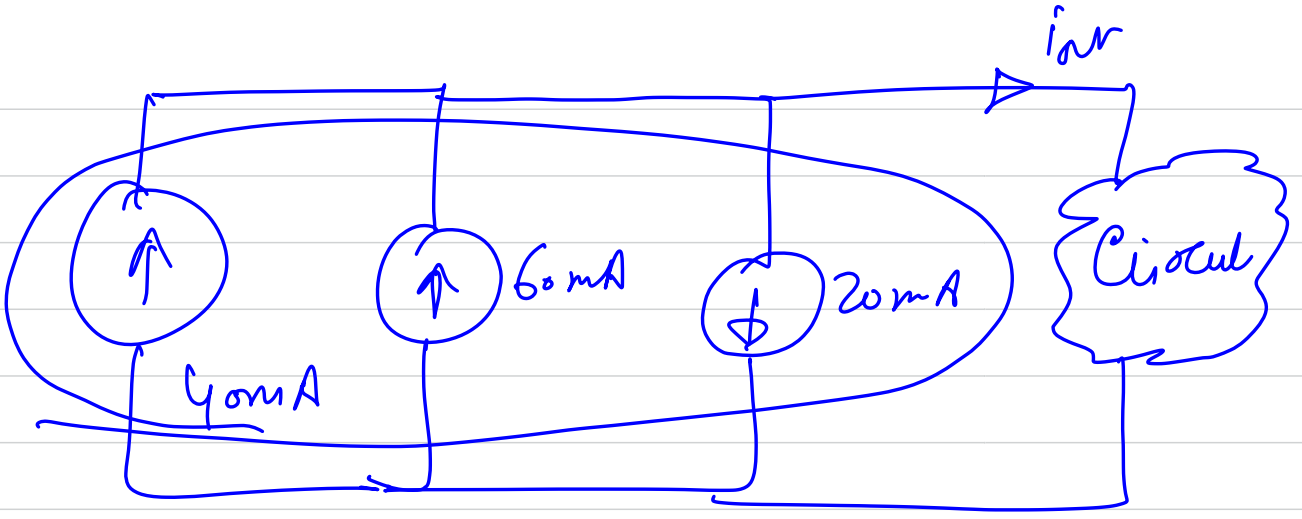
$$V_{xg} = -3i$$

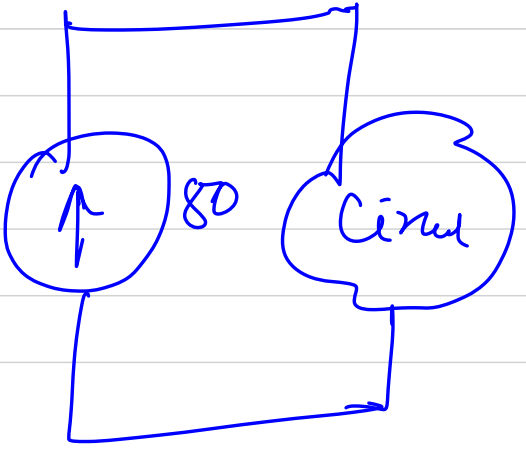
$$i_2 = -7/4 \text{ Amp.}$$

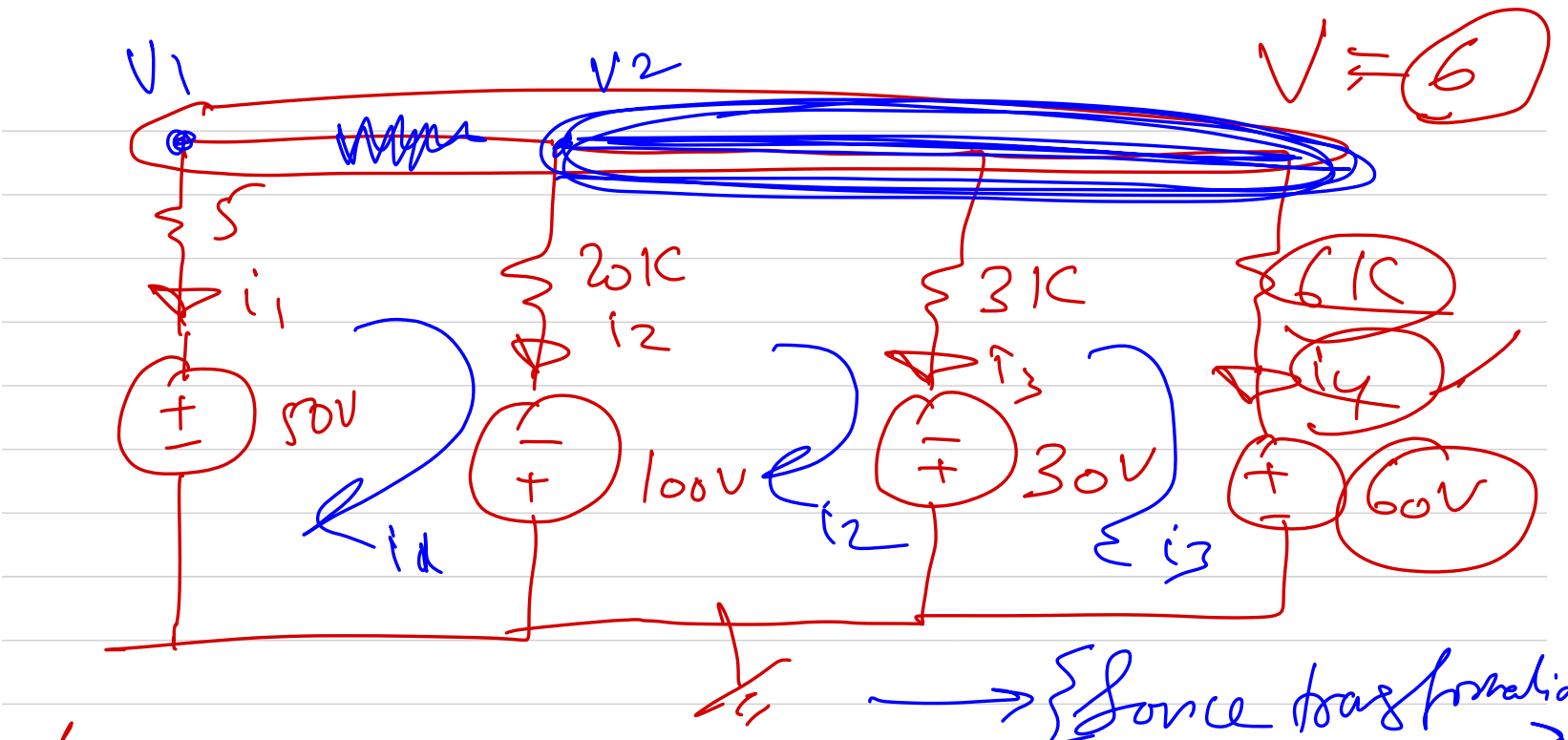
Source Transformation



$-9+24-45$


i_{NR}
60 mA
20 mA
40 mA
Circuit


80
Circuit



Source transformation

$$\frac{V-50}{5\Omega} + \frac{V+100}{20\Omega} + \frac{V+30}{3\Omega} + \frac{V-60}{6\Omega} = 0$$