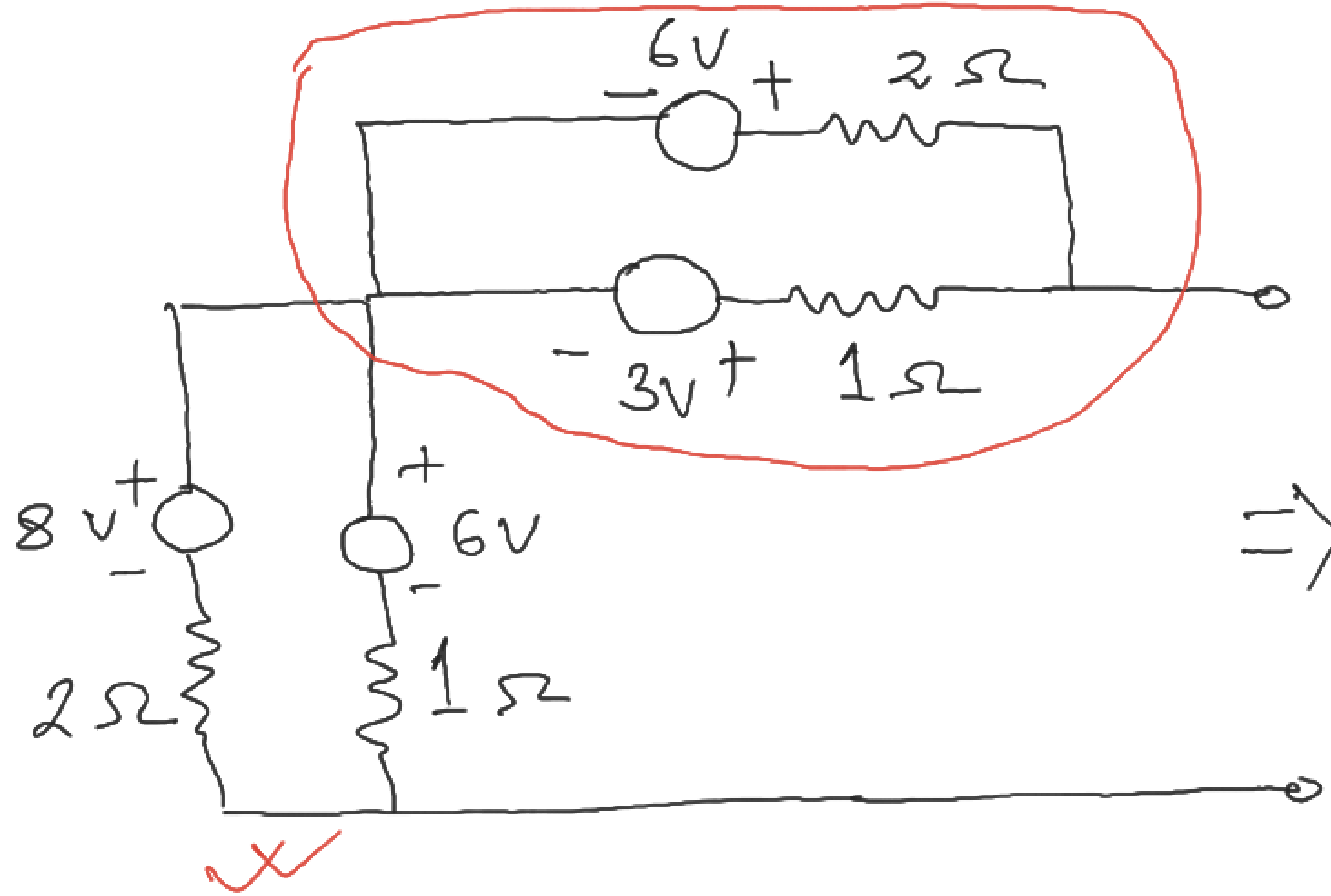


Millman's Theorem.

$$\Rightarrow \frac{\frac{6}{2}+\frac{3}{1}}{\frac{1}{2}+\frac{1}{1}} = V_{eq_1} = \frac{6}{3/2}$$

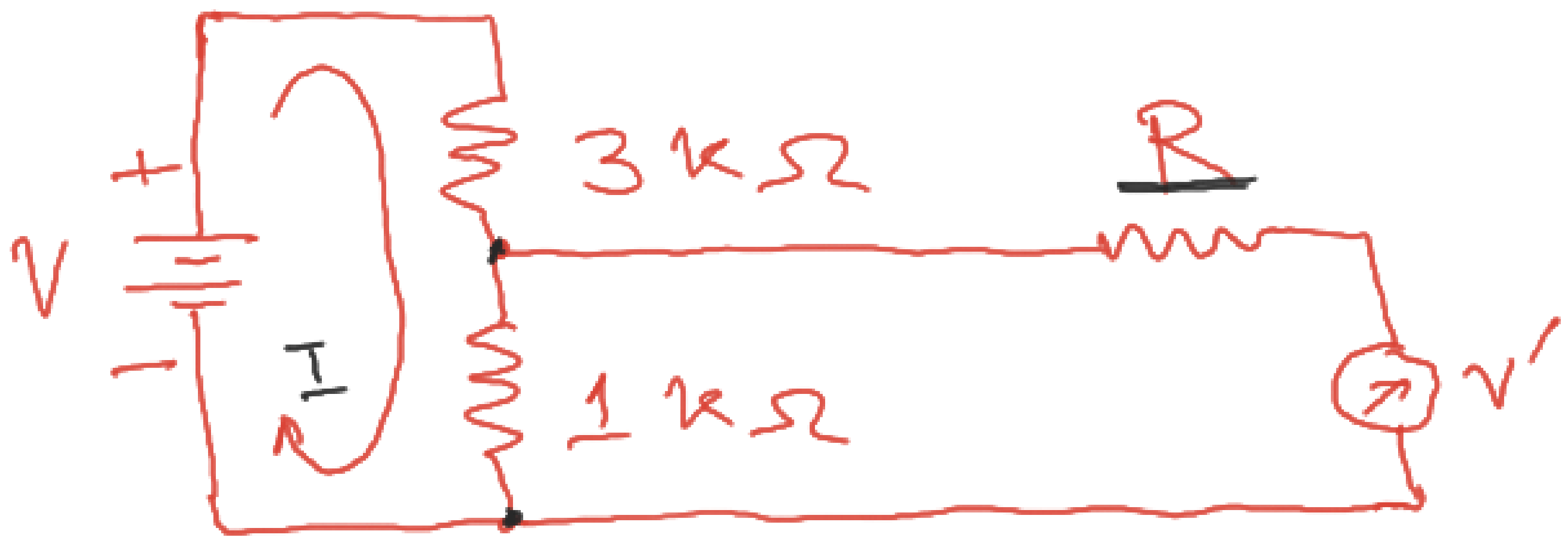
$$\boxed{V_{eq_1} = 4\,V.}$$

$$Y = \frac{1}{2}+1 = \frac{3}{2}$$

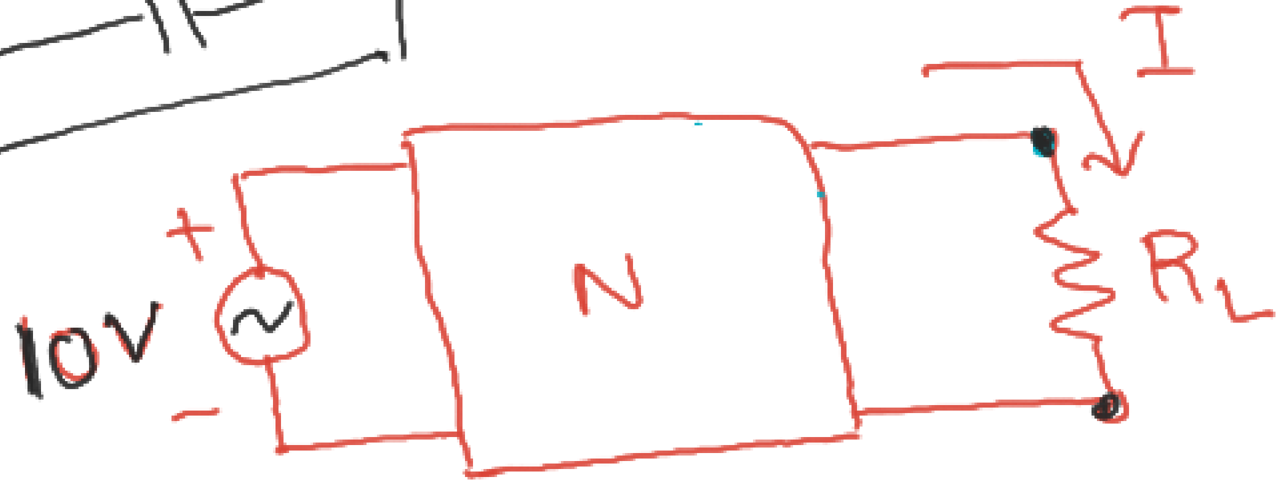
$$R_{eq} = 2/3.$$

Reduce the circuit into a single voltage source and associated resistance.

$$\Rightarrow I = \frac{4V}{3} \text{ mA}$$



Using Thevenin's theorem, determine the lowest resistence which the voltmeter must have so that the measurement error shall not exceed 1%.



$$\boxed{Z_{th} = R_{Th} + jX_{Th}}$$

The network (N) contains linear, passive, bilateral elements.

If $R_L = 1.5\,\Omega$ then $\underline{I = 2A}$.

If $R_L = 4\,\Omega$ Then $I = 1A$.

Determine R_L for maximum power transfer.

$$V_{th} = IR_{Th} + IR_L$$

$$V_{th} = 2R_{th} + 2 \times 1.5$$

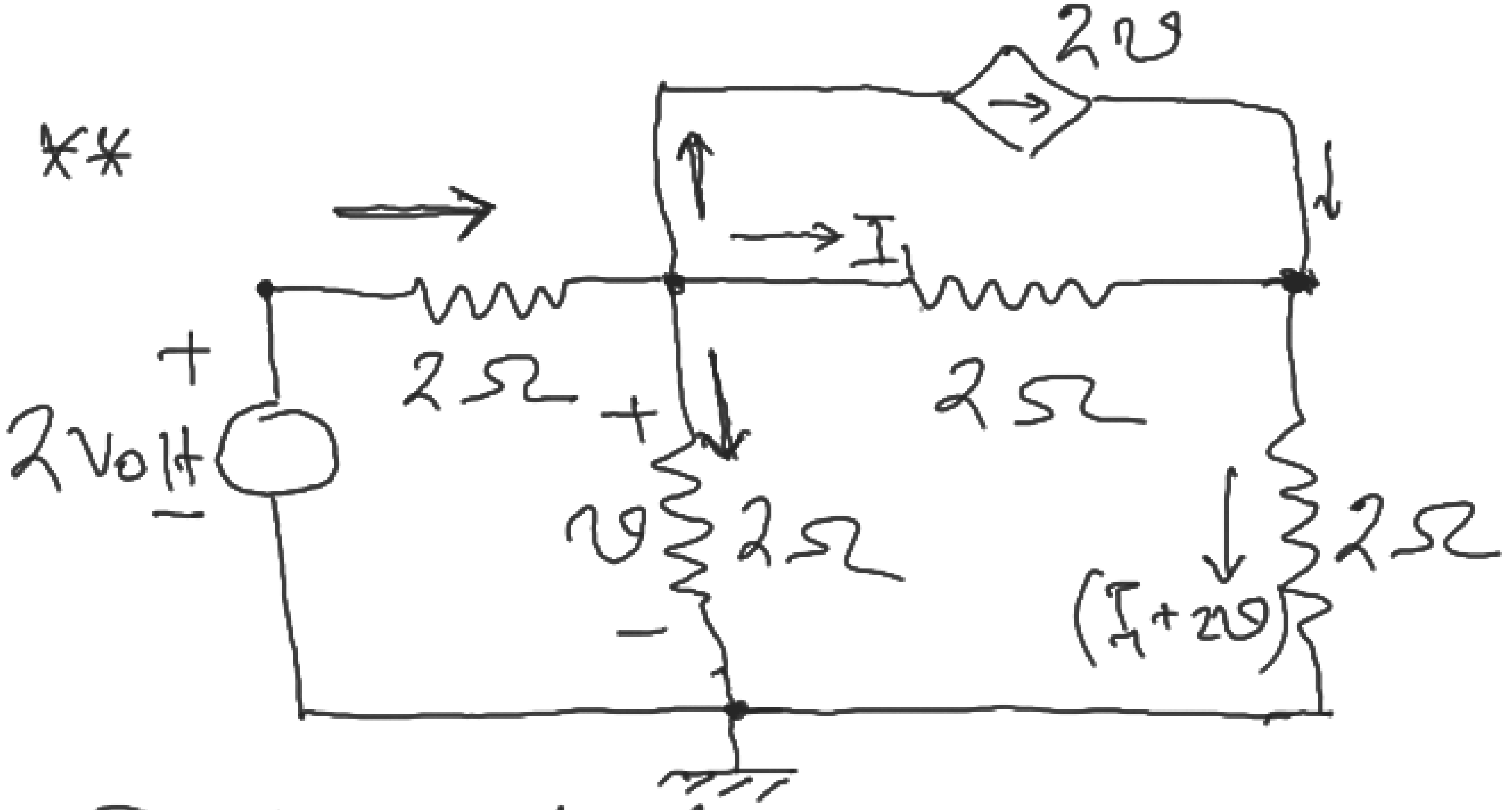
$$V_{Th} = 2R_{th} + 3 \quad \ldots (i)$$

$$V_{Th} = R_{Th} + 4 \quad \ldots (ii)$$

$$V_{Th} = 5V \;\&\; R_{Th} = 1\,\Omega.$$

$R_L = 1\,\Omega$ for maximum power transfer

**



Find out 'v'.

$$\Rightarrow \frac{2-v}{2} = \frac{v}{2} + I_1 + 2v$$

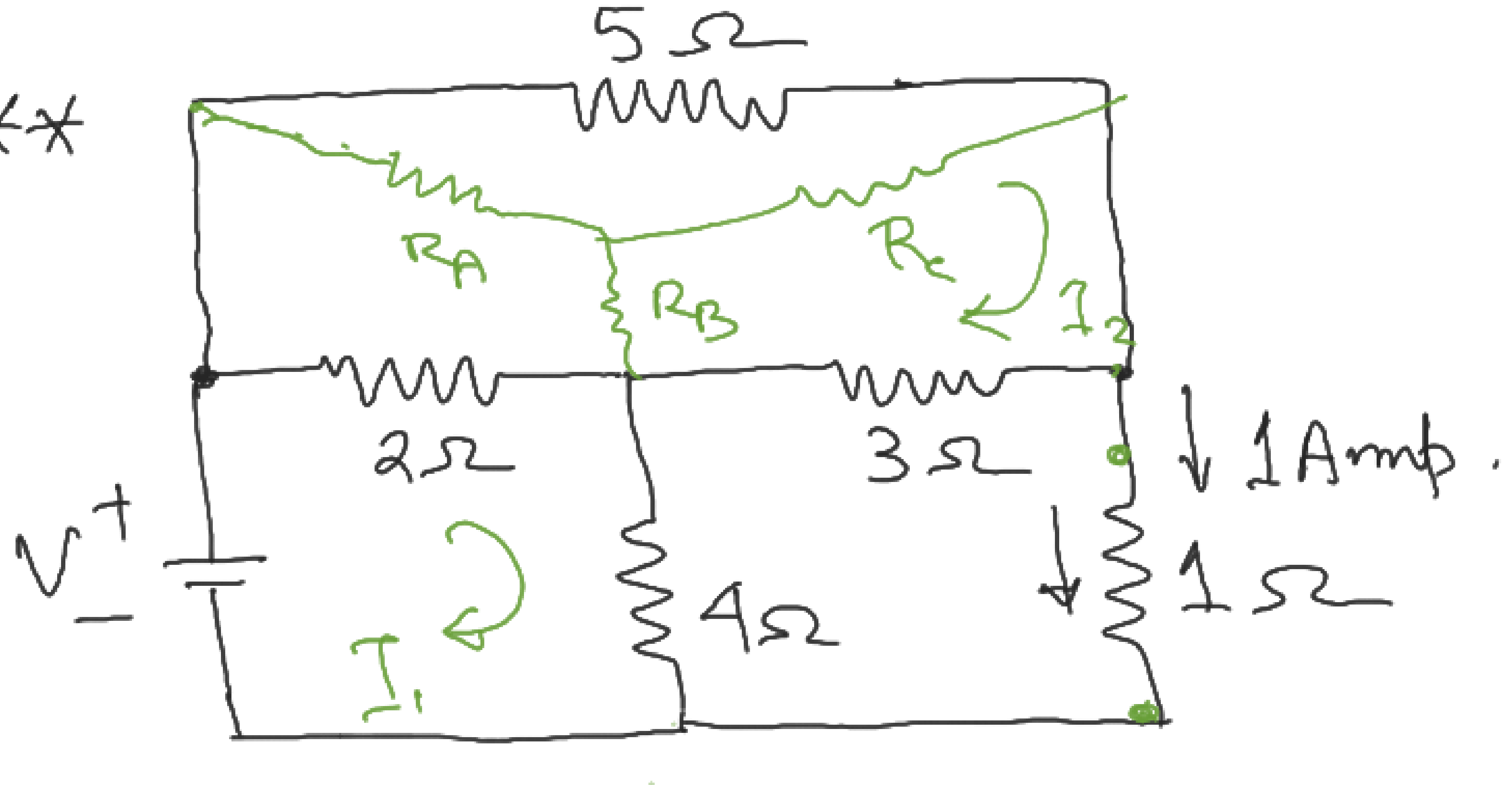
$$6v + 2I_2 = 2 \quad \text{.....(i)}$$

$$v = 2I_1 + 2(I_1 + 2v)$$

$$\boxed{I_1 = -\frac{3}{4}v} \quad \text{.....(ii)}$$

From (i) & (ii) $v = \frac{4}{9}$ Volt $\simeq 0.44$ volt

**

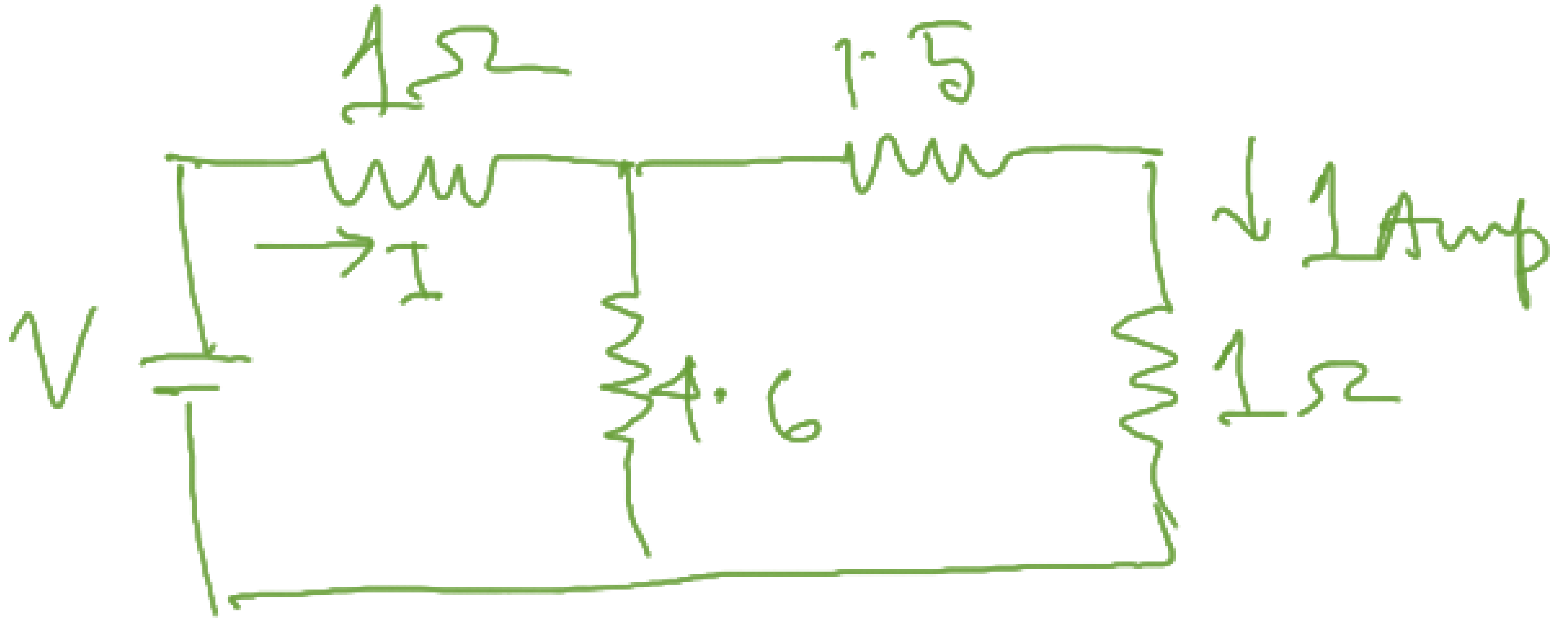


$R_A = 1\,\Omega$

$R_B = 0.6\,\Omega$

$R_C = 1.5\,\Omega$.

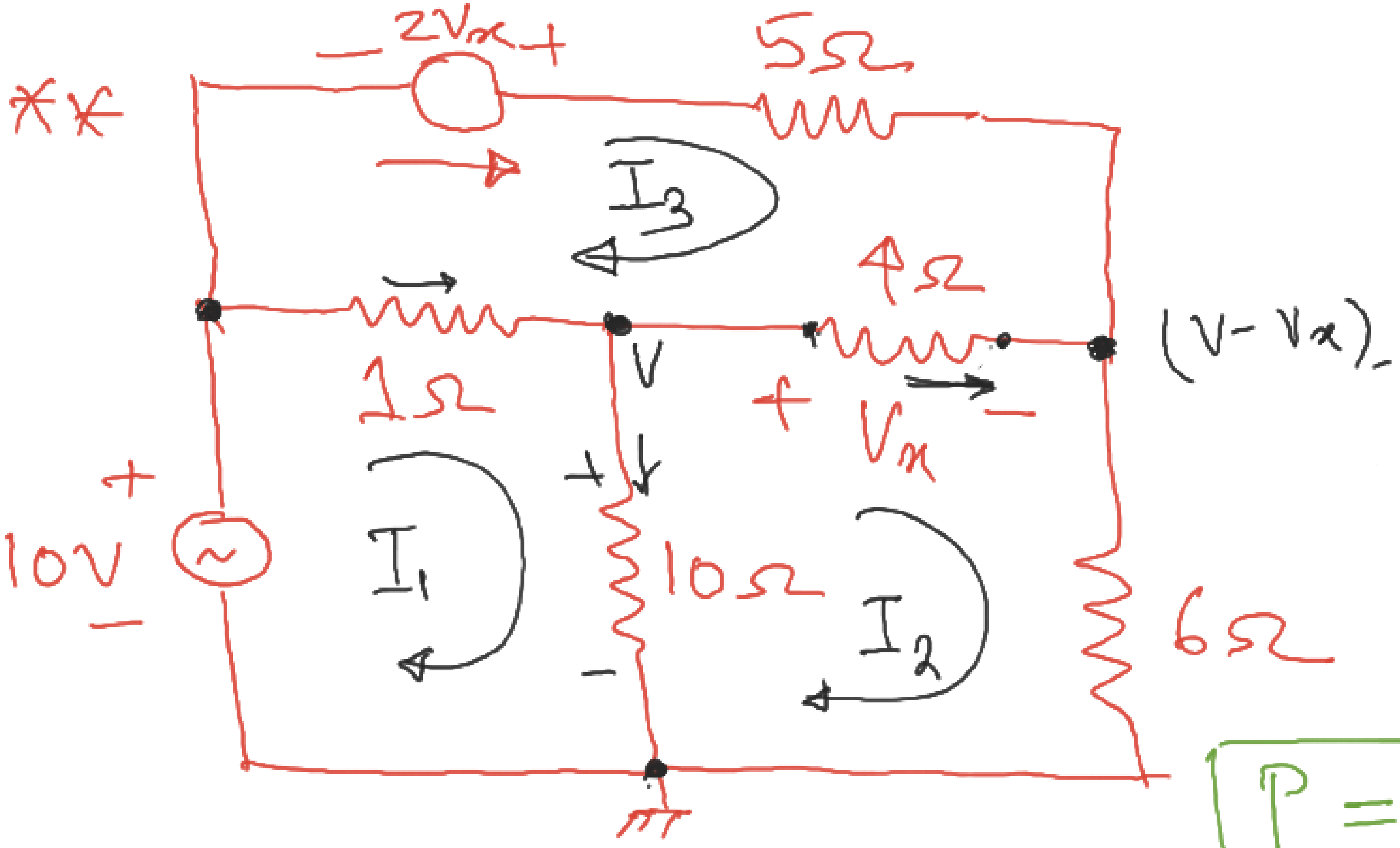
Find out V



$$R_{eq} = 1 + \frac{2.5 \times 4.6}{2.5 + 4.6} = 2.62\,\Omega$$

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

$$1 = I \times \frac{4.6}{2.5 + 4.6} \Rightarrow 1 = \frac{V}{2.62} \times \frac{4.6}{2.5 + 4.6} \text{ or } \boxed{V = 4.04 \text{ Volt}}$$



$$\boxed{V_x = (I_2 - I_3) \times 4} = -1.21 \text{ Volt}$$

$$I_1 = \frac{\Delta_1}{\Delta} = 2.36 \text{ Amp}$$

$$\Delta_1 = \begin{vmatrix} 10 & -10 & -1 \\ 0 & -20 & 4 \\ 0 & 12 & -18 \end{vmatrix} = 3432$$

$$\boxed{P = 2 \times (-1.21) \times 0.964 = -2.33 \text{ watt}}$$

$$\begin{cases} 11 I_1 - 10 I_2 - I_3 = 10 & \ldots (i) \\ 10 I_1 - 20 I_2 + 4 I_3 = 0 & \ldots (ii) \\ I_1 + 12 I_2 - 18 I_3 = 0 & \ldots (iii) \end{cases}$$

Find out the power delivered to the dependent voltage source.

$$I_2 = \frac{\Delta_2}{\Delta} = 1.2767 \text{ Amp}$$

$$I_3 = \frac{\Delta_3}{\Delta} = 0.964 \text{ Amp}$$

$$\Delta = \begin{vmatrix} 11 & -10 & -1 \\ 10 & -20 & 4 \\ 1 & 12 & -18 \end{vmatrix} = 1452$$