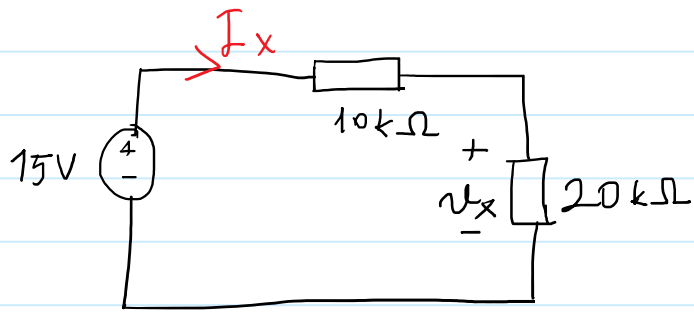
Q1




$v_x = ?$

Voltage devider

$$v_x = \frac{15}{10k+20k} \times 20k = 10\,V$$

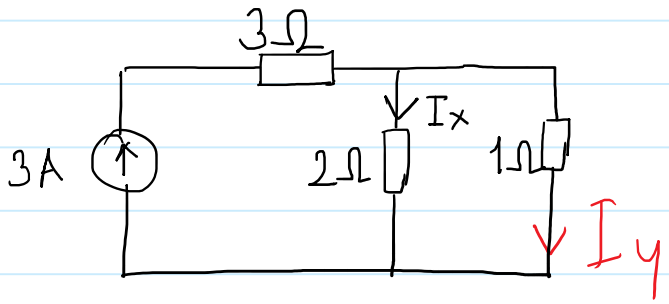
Or

$$\hat{I}_x = \frac{15}{30k} = \frac{1}{2}\,mA$$

$$V_x = I_x \cdot 20k = \frac{1m}{2} \cdot 20k = \underline{10\,V}$$

Answer: $v_x = 10\,V$

Q2




$I_x = ?$

Current devider

$$I_x = \frac{3}{3} \cdot 1 = 1A$$

Or

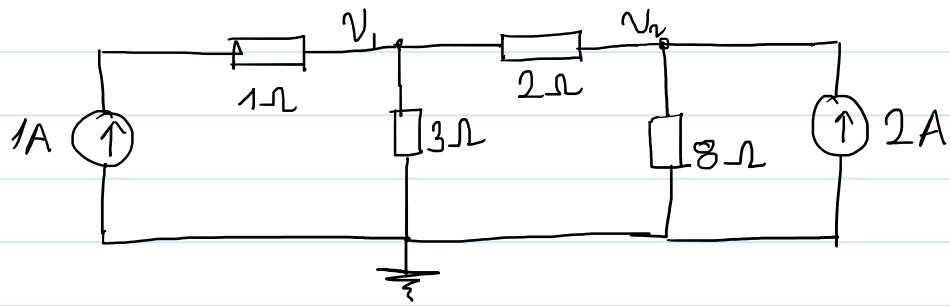
(KCL) $I_x + I_y = 3$ and $I_x \cdot 2 = I_y \cdot 1$

$I_x + \overbrace{2I_x}^{I_y} = 3$

$I_x = 1A$

Answer: $I_x = 1A$

Q3




Using node-voltage method find $v_1$ and $v_2$.

@ node 1: $-1 + \frac{v_1}{3} + \frac{v_1 - v_2}{2} = 0 \Rightarrow 6 = 6 + 2v_1 + 3v_1 - 3v_2$

@ node 2: $\frac{v_2 - v_1}{2} + \frac{v_2}{8} - 2 = 0 \Rightarrow 0 = -16 + 4v_2 - 4v_1 + v_2$

4/ $6 = 5v_1 - 3v_2 \Rightarrow 24 = 20v_1 - 12v_2$

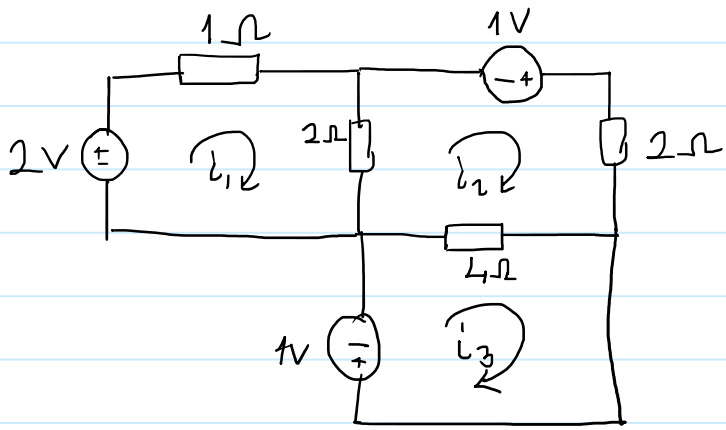
5/ $16 = -4v_1 + 5v_2 \Rightarrow 80 = -20v_1 + 25v_2$

$104 = 13v_2$

$v_1 = 6V \Leftarrow v_2 = 8V$

Answer: $v_1 = 6V$, $v_2 = 8V$

Q4




KVL @1: $-2 + (1+2)i_1 - 2i_2 = 0$

$-1 + (2+4+2)i_2 - 2i_1 - 4i_3 = 0$

$1 + 4i_3 - 4i_2 = 0$

$$\begin{bmatrix} 3 & -2 & 0 \\ -2 & 8 & -4 \\ 0 & -4 & 4 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} +2 \\ 1 \\ -1 \end{bmatrix}$$

$i_1 = 1A,\ i_2 = 1/2 A,\ i_3 = 1/4 A$

Answer: $i_1 = 1A,\ i_2 = \frac{1}{2} A,\ i_3 = \frac{1}{4} A$