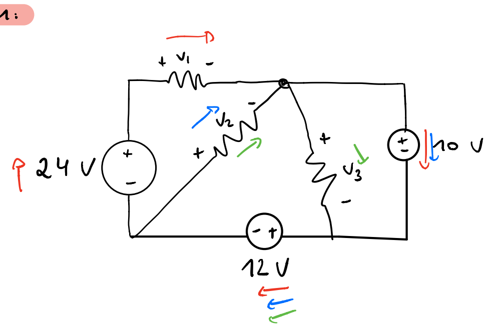
Exercise 1:



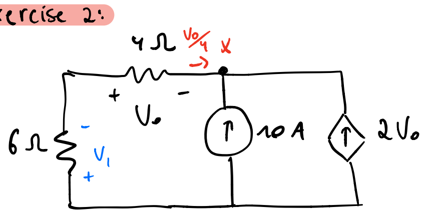
Solution:

a) $v_1 + 10 + 12 - 24 = 0 \iff v_1 = 2$ V

b) $V_2 + 10 + 12 = 0 \iff V_2 = -22$ V

c) $V_3 + 12 + V_2 = 0 \iff V_3 + 12 - 22 = 0 \iff V_3 = 10$ V

Exercise 2:



Solution:

- Au noeud x, la somme des courants = 0

$2V_0 + 10\,A + \frac{V_0}{4} = 0 \iff V_0 = -4,44$ V

$i = V/R$

- Le courant qui passe à travers la source est $i = 2 \cdot V_0 = -8,88$ A

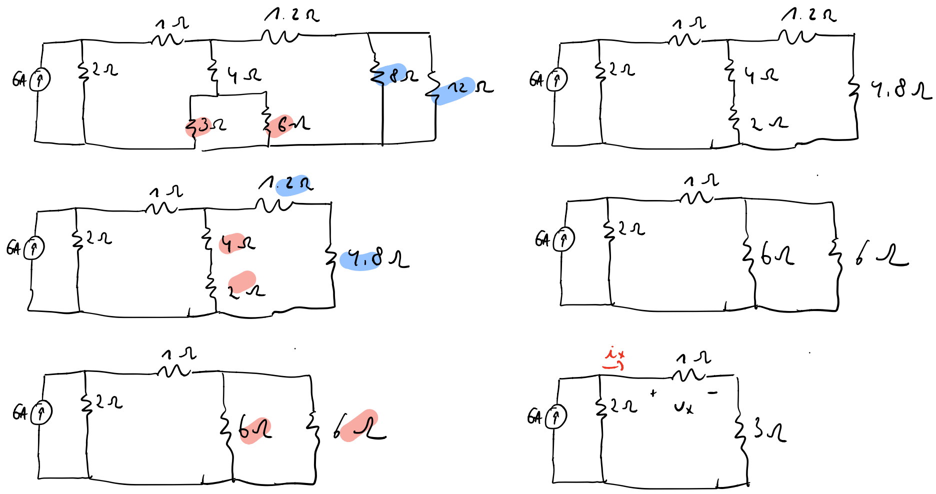
et la différence de potentiel aux bornes de la source :

$V_S = V_0 + V_1 = -4,44 + 6 \cdot \frac{V_0}{4} = -11,111$ V

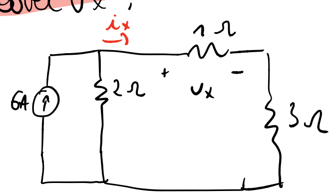
$V = R \cdot i$

Exercise 3:

Simplification circuit:



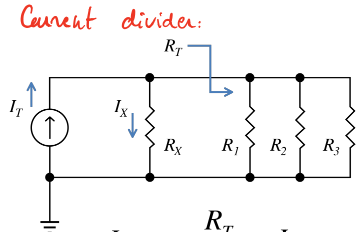
Trouver V_x :



Si on trouve i_x, on a v_x.

Rappel :

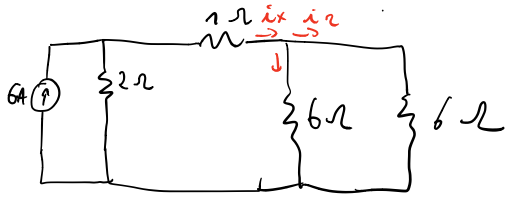
Current divider:



$$I_X = \frac{R_T}{R_X + R_T} I_T$$

$$i_x = \frac{2\Omega}{(1\Omega + 3\Omega) + 2\Omega} \cdot 6A = 2A \iff V_x = 2V$$

Si on reprend l'étape de la simplification :

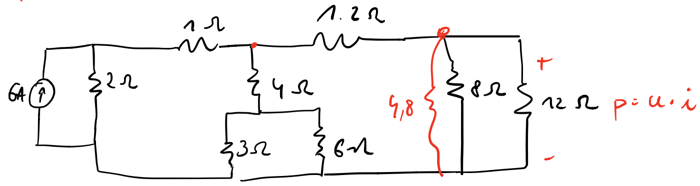


De nouveau, on utilise la formule du current divider.

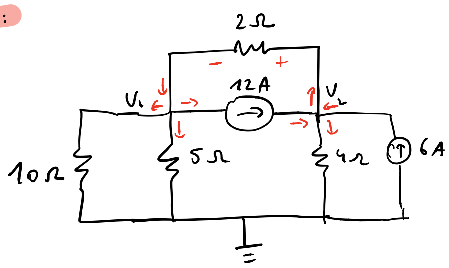
$i_\Omega = 0,5\ i_x = 1$ A et la différence de potentiel aux bornes = la différence de potentiel aux bornes de la résistance de 4.8 Ω, voir dans la simplification*

Donc $V_\Omega = 4.8 \cdot 1 = 4,8\,V$ et $P = \frac{V^2}{R} = \frac{4.8^2}{12} = 1,92\,W$

*



Exercise 4 :



Méthode des noeuds :

(1) $\frac{(V_2 - V_1)}{2} = 12 + \frac{V_1}{5} + \frac{V_1}{10}$

(2) $12 + 6 = \frac{V_2}{4} + \frac{(V_2 - V_1)}{2}$

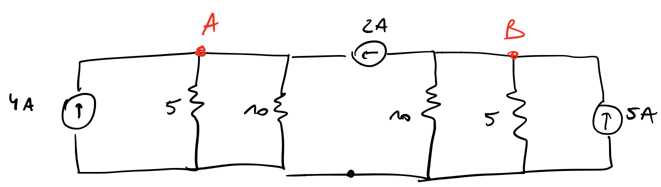
$$\begin{cases} \frac{8V_1}{10} = \frac{V_2}{2} - 12 \\ \frac{3V_2}{4} = 18 + \frac{V_1}{2} \end{cases} \qquad \begin{cases} 8V_1 = 5V_2 - 120 \\ \frac{3V_2}{2} - 36 = V_1 \end{cases}$$

$12V_2 - 288 = 5V_2 - 120 \Leftrightarrow 7V_2 = 168 \Leftrightarrow V_2 = 24\ V$ et $V_1 = 0\ V$

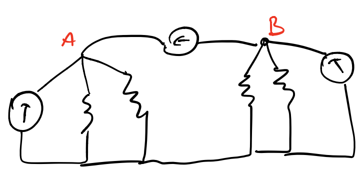
Exercise 5 :

Il y a 2 points d'intérêts A et B, utilisons la méthode des noeuds.

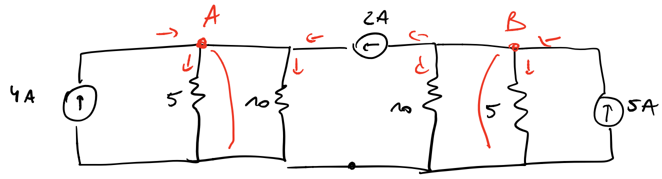
Rappel : Pas de différence de potentiel le long d'un cable :
Ces deux circuits sont équivalents



et



Faire attention aux courants considérés dans la méthodes des noeuds.



A) $4A + 2A = \frac{V_A}{5} + \frac{V_A}{10}$

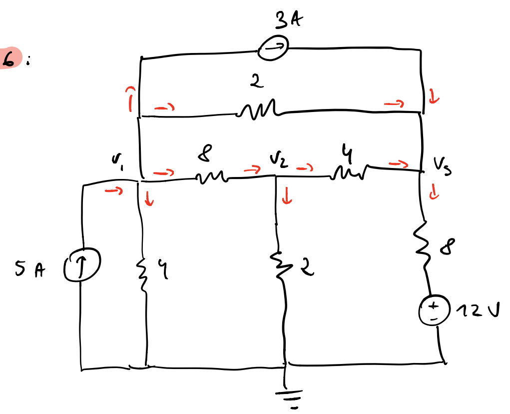
B) $5A = \frac{V_B}{5} + \frac{V_B}{10} + 2$

$V_A = 20\,V$

$V_B = 10\,V$

$i_1 = \frac{20}{5} = 4A$, $i_2 = \frac{20}{10} = 2A$, $i_3 = 1A$ et $i_4 = 2A$.

Exercise 6 :



Méthodes des noeuds :

① fixer les courants

② écrire la loi de Kirchhoff pour chaque noeud

③ Résoudre le système.

① $5 = 3 + \frac{(V_1 - V_3)}{2} + \frac{(V_1 - V_2)}{8} + \frac{V_1}{4} \iff 16 = 7V_1 - V_2 - 4V_3$

② $\frac{V_1 - V_2}{8} = \frac{V_2}{2} + \frac{V_2 - V_3}{4} \iff 0 = -V_1 + 7V_2 - 2V_3$

③ $3 + \frac{12 - V_3}{8} + \frac{V_1 - V_3}{2} + \frac{V_2 - V_3}{4} = 0 \iff -36 = 4V_1 + 2V_2 - 7V_3$

Sol : $V_1 = 10\,V$, $V_2 = 4.933\,V$, $V_3 = 12,267\,V$