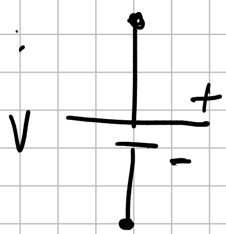
Guía 2:

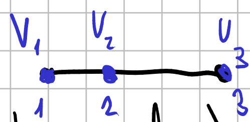
Corriente continua:

Elementos: - Fuentes:



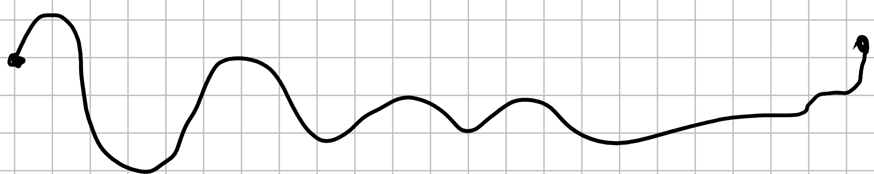
Trabajo
Energía
Movimiento de cargas
Corrientes.

- Cables (Ideales):

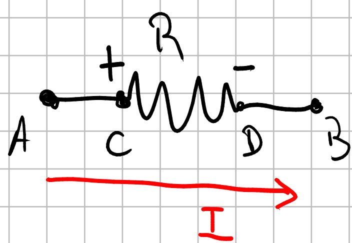


$V_1 = V_2 = V_3$

No hay caída de tensión (Equipotenciales)



- Resistencias:



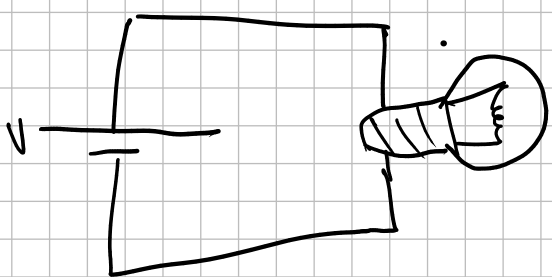
Ley de Ohm

$$\boxed{\underset{\overset{\shortparallel}{V}}{\Delta V_{AB}} = IR}$$

ΔE por efecto Joule ⇝ Calor.

$$P = \frac{\Delta E}{t} = \underbrace{\frac{QV}{t}}_{I} = IV = \frac{V^2}{R}$$

$$[I] = \frac{[Q]}{[t]} = \frac{C}{s} = A \quad ; \quad [R] = \frac{[V]}{[I]} = \frac{V}{A} = \Omega$$



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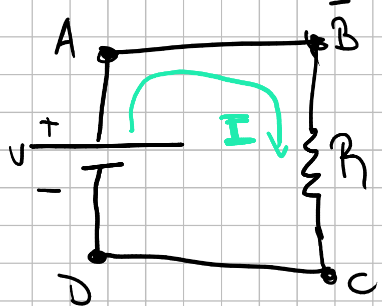
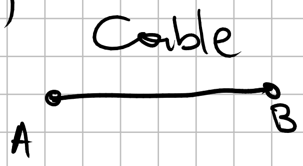


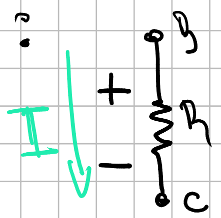
Elegir un camino para recorrer el circuito: (Arbitrario)

$A \to B$:



$$\Delta V_{AB} = 0$$

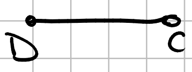
$B \to C$:



$$\Delta V_{BC} = -IR$$

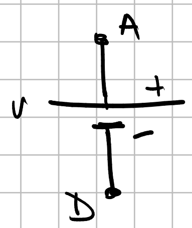
$$V_C - V_B$$

$C \to D$:



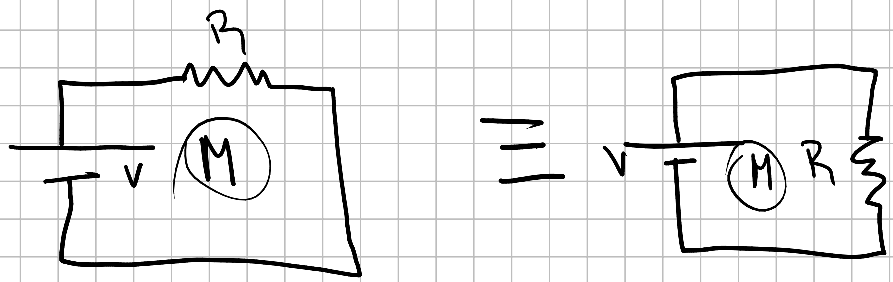
$$\Delta V_{CD} = 0$$

$D \to A$:



$$\Delta V_{DA} = V$$

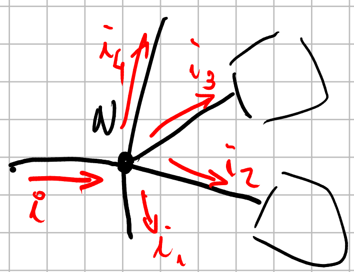
$$\Delta V_{ABCDA} = 0 = 0 - IR + 0 + V \Rightarrow \boxed{I = \frac{V}{R}}$$



Ley de Mallas:

Caminos cerrados $\Delta V_M = 0$

Ley de Nodos:



$$i = i_1 + i_2 + i_3 + i_4$$

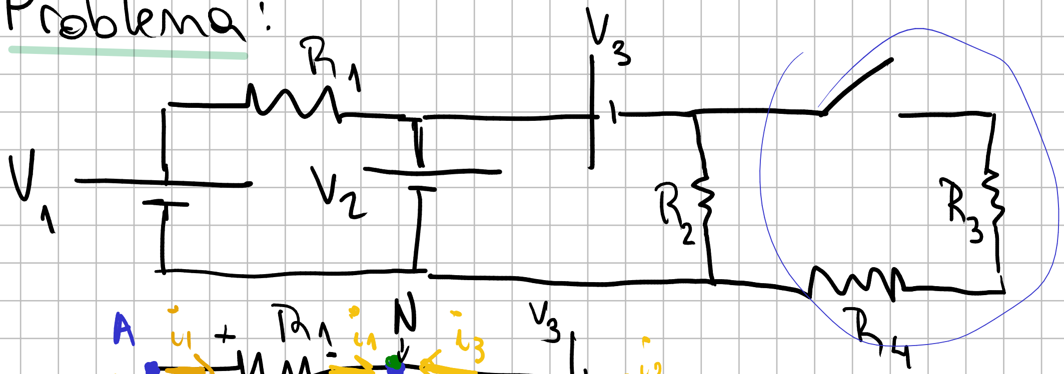
$$i - i_1 - i_2 - i_3 - i_4 = 0$$

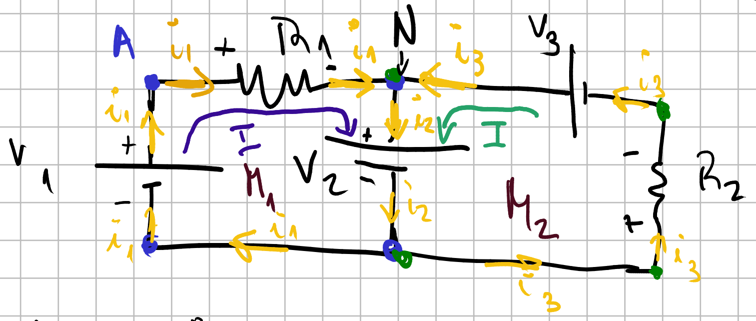
$$\sum I_N = 0$$

Si entran son positivos

Si salen son negativos

Problema:





Quiero conocer las corrientes

$$N: \quad i_1 - i_2 + i_3 = 0$$

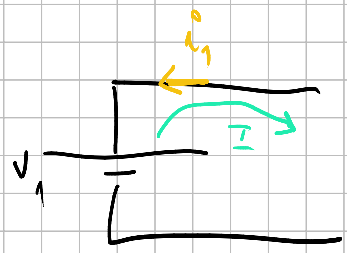
$$M_1: \quad -i_1 R_1 - V_2 + V_1 = 0 \quad \rightarrow \quad V_1 - V_2 = i_1 R_1 \iff \boxed{i_1 = \frac{V_1 - V_2}{R_1}}$$

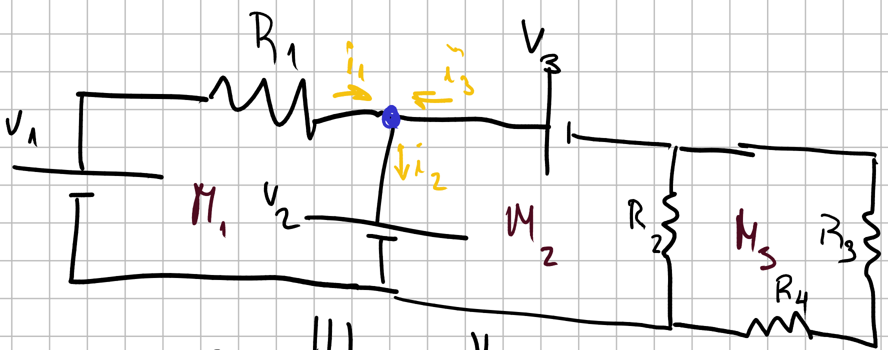
$$M_2: \quad V_3 - V_2 - i_3 R_2 = 0 \quad \rightarrow \quad \boxed{i_3 = \frac{V_3 - V_2}{R_2}}$$

$$N \rightarrow \overbrace{\frac{V_1 - V_2}{R_1}}^{i_1} - i_2 + \overbrace{\frac{V_3 - V_2}{R_2}}^{i_3} = 0 \Rightarrow \boxed{i_2 = \frac{(V_1 - V_2)}{R_1} + \frac{(V_3 - V_2)}{R_2}}$$

i_1: Si $V_1 > V_2 \Rightarrow i_1 > 0$

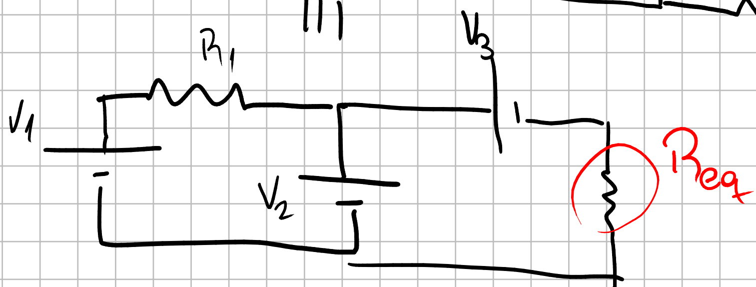
$V_1 < V_2 \Rightarrow i_1 < 0$





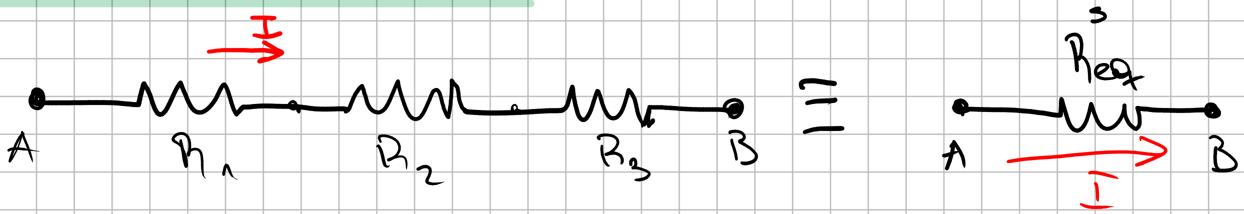
Si quiero las corrientes i_1, i_2, i_3

|||



$$i_3 = \frac{V_3 - V_2}{R_{eq}}$$

Resistencias en Serie:



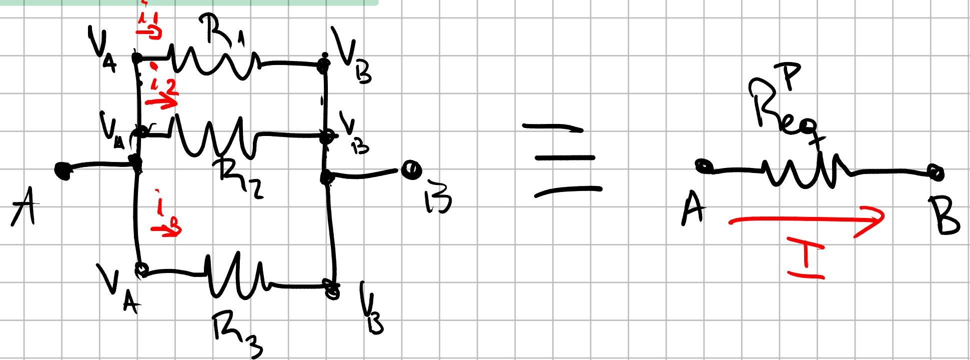
$$\Delta V_{AB} = \Delta V_{R_1} + \Delta V_{R_2} + \Delta V_{R_3}$$

$$\Delta V_{AB} = \Delta V_{R_{eq}^s}$$

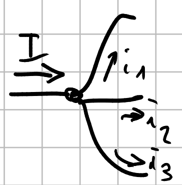
$$\sum_i \Delta V_{R_i} = \Delta V_{R_{eq}}^s$$

$$-IR_1 - IR_2 - IR_3 = -IR_{eq}^S \Leftrightarrow \boxed{R_{eq}^S = \sum_{i=1}^{N} R_i}$$

Resistencias en Paralelo:



$$\Delta V_1 = \Delta V_2 = \Delta V_3 = \Delta V_{AB} = IR_{eq}^P$$



$$i_1R_1 = i_2R_2 = i_3R_3 = IR_{eq}^P$$

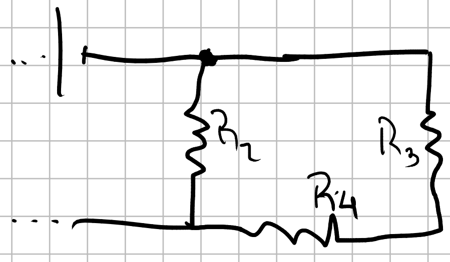
$$\left.\begin{aligned} i_1R_1 &= IR_{eq}^P \\ i_2R_2 &= IR_{eq}^P \\ i_3R_3 &= IR_{eq}^P \end{aligned}\right\}$$

$$I = i_1 + i_2 + i_3$$

$$I = \frac{\Delta V_{AB}}{R_1} + \frac{\Delta V_{AB}}{R_2} + \frac{\Delta V_{AB}}{R_3}$$

$$\frac{I}{\Delta V_{AB}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\boxed{\frac{1}{R_{eq}^P} = \sum_{i=1}^{N} \frac{1}{R_i}}$$



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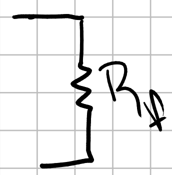

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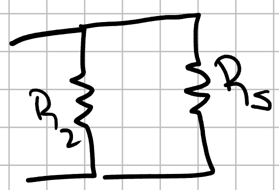
En serie $\equiv$



Con $R_s = R_3 + R_4$

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Como R_2 y R_s están en paralelo

$$R_f^{-1} = \frac{1}{R_2} + \frac{1}{R_s}$$

$$R_f^{-1} = \frac{R_s + R}{R_2 R_s} \iff R_f = \frac{R_2 R_s}{R_s + R_2}$$

$$\iff \boxed{R_f = \frac{R_2 (R_3 + R_4)}{R_2 + R_3 + R_4}}$$

Observación

Si $R_2 = R_s \equiv R$ $\quad R_f \overset{?}{\gtrless} R_2$

$$R_f = \frac{R \cdot R}{R + R} = \frac{R^2}{2\cancel{R}} = \frac{R}{2} \iff R_f < R$$

Si uso arreglos en

Serie:

Aumentar resistencias

Paralelo:

Disminuir resistencias