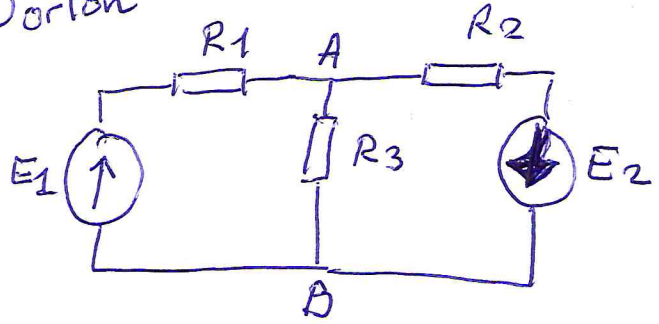
EX ; Calculer la tension V_{AB} du circuit suivant

En utilisant les Théorèmes de

- Millman - superposition - Thévenin
- Norton



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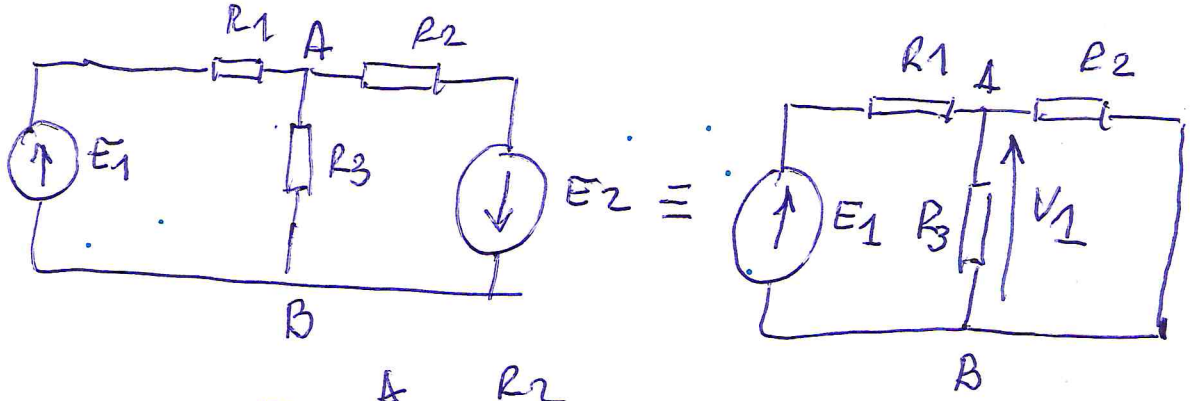
Millman

$$V_{AB} = \frac{\frac{E_1}{R_1} - \frac{E_2}{R_2}}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

2- Superposition



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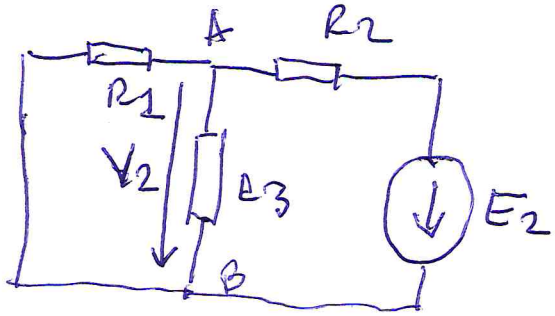


$$V_1 = \frac{\frac{R_2 R_3}{R_2 + R_3}}{R_1 + \frac{R_2 R_3}{R_2 + R_3}} E_1$$

$$= \frac{\frac{R_2 R_3}{R_2 + R_3}}{\frac{R_1 R_2 + R_1 R_3 + R_2 R_3}{R_2 + R_3}} E_1 = \frac{R_2 R_3}{R_1 R_2 + R_2 R_3 + R_1 R_3} E_1$$

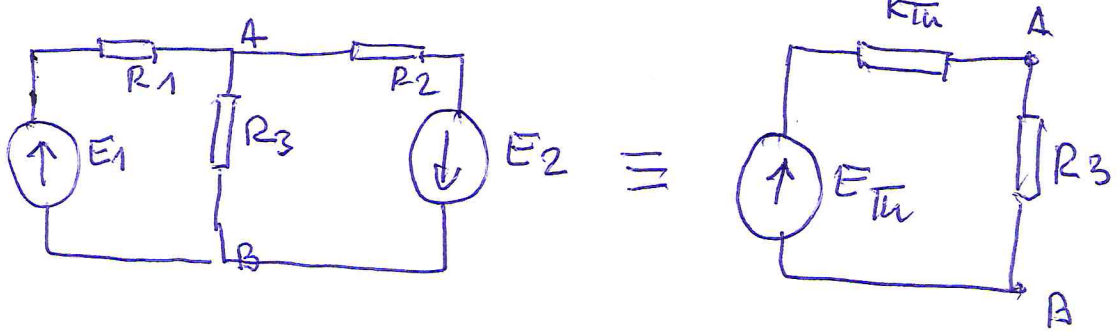
$$V_2 = \frac{\frac{R_1 R_3}{R_1 + R_3}}{R_2 + \frac{R_1 R_3}{R_1 + R_3}} \cdot E_2$$

$$V_2 = \frac{\frac{R_1 R_3}{R_1 + R_3}}{\frac{R_1 R_2 + R_2 R_3 + R_1 R_3}{R_1 + R_3}} \cdot E_2 = \frac{R_1 R_3}{R_1 R_2 + R_2 R_3 + R_1 R_3} \cdot E_2$$

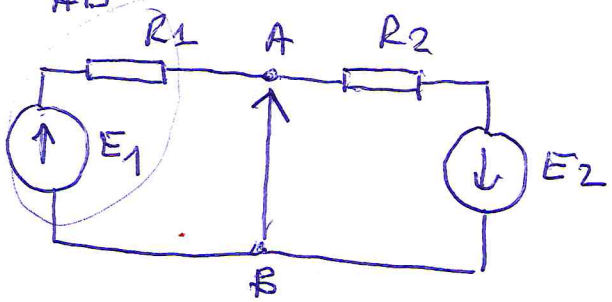
$$V_{AB} = V_1 - V_2 = \frac{R_2 R_3 E_1}{R_1 R_2 + R_2 R_3 + R_1 R_3} - \frac{R_1 R_3 E_2}{R_1 R_2 + R_2 R_3 + R_1 R_3}$$

$$\boxed{V_{AB} = \frac{R_2 R_3 E_1 - R_1 R_3 E_2}{R_1 R_2 + R_2 R_3 + R_1 R_3}}$$

Théorème de Thévenin :



$E_{Th} = V_{AB}$



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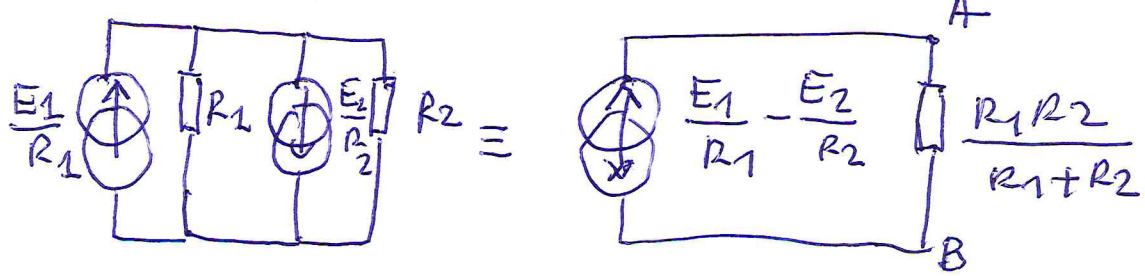
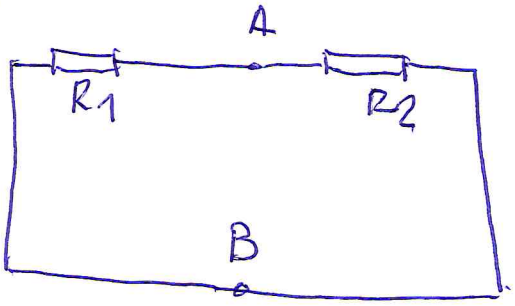


$$V_{AB} = \left(\frac{E_1}{R_1} - \frac{E_2}{R_2}\right) \frac{R_1 R_2}{R_1 + R_2}$$

$R_{Th} = ?$



$$R_{Th} = \frac{R_1 R_2}{R_1 + R_2}$$

Ider'

$$V_{AB} = \frac{R_3}{R_3 + R_{Th}} \cdot E_{Th}$$

$$= \frac{R_3}{R_3 + \frac{R_1 R_2}{R_1 + R_2}} \cdot \left(\frac{E1}{R_1} - \frac{E_2}{R_2}\right) \frac{R_1 R_2}{R_1 + R_2}$$

$$= \frac{R_3}{\frac{R_1 R_3 + R_2 R_3 + R_1 R_2}{R_1 + R_2}} \cdot \frac{R_1 R_2}{R_1 + R_2} \left(\frac{E1}{R_1} - \frac{E_2}{R_2}\right)$$

$$\frac{R_1 R_2 R_3}{R_1 R_3 + R_2 R_3 + R_1 R_2} \left(\frac{E1}{R_1} - \frac{E_2}{R_2}\right) =$$

$$\boxed{V_{AB} = \frac{R_2 R_3 E1 - R_1 R_3 E_2}{R_1 R_2 + R_2 R_3 + R_1 R_2}}$$

Norton