



Ohms Law

FORCE = RESISTANCE \times CURRENT.

VOLTS = Ohms \times AMPS.

CURRENT LAW (NODES)

KIRCHHOFF

THE SUM OF THE CURRENT FLOWING INTO ANY NODE IS EQUAL TO THE SUM OF THE CURRENT FLOWING OUT OF THAT NODE.

VOLTAGE LAW (CIRCUITS)

KIRCHHOFF

THE SUM OF THE VOLTAGE DROPS AROUND ANY CIRCUIT IS EQUAL TO THE SUM OF THE TOTAL VOLTAGE PROVIDED BY THE BATTERIES.

TO DETERMINE THE CURRENTS I_1 , I_2 and I_3 FORM A LINEAR SYSTEM.

2 BATTERIES
4 RESISTORS.

NODE A THE CURRENT LAW GIVES: $I_1 + I_3 = I_2$
 $= I_1 - I_2 + I_3 = 0$

CIRCUIT CADC VOLTAGE LAW:

DROPS ARE $2I_1, I_2, 2I_1 = 4I_1 + I_2 = 8$

CIRCUIT DABC VOLTAGE LAW

DROPS $4I_3, I_2 = I_2 + 4I_3 = 16$

$$I_1 - I_2 + I_3 = 0$$

$$4I_1 + I_2 = 8$$

$$I_2 + 4I_3 = 16$$

AS A MATRIX
$$\begin{bmatrix} 1 & -1 & 1 & 0 \\ 4 & 1 & 0 & 8 \\ 0 & 1 & 4 & 16 \end{bmatrix}$$

GAUSSIAN REDUCTION.

$$\begin{bmatrix} 1 & -1 & 1 & 0 \\ 4 & 1 & 0 & 8 \\ 0 & 1 & 4 & 16 \end{bmatrix}$$

$R_2 - 4R_1$
↓

$$\begin{bmatrix} 1 & -1 & 1 & 0 \\ 0 & 5 & -4 & 8 \\ 0 & 1 & 4 & 16 \end{bmatrix}$$

SWAP R_2 & R_3
↓

$$\begin{bmatrix} 1 & -1 & 1 & 0 \\ 0 & 1 & 4 & 16 \\ 0 & 5 & -4 & 8 \end{bmatrix}$$

$$\begin{bmatrix} 1 & -1 & 1 & 0 \\ 0 & 1 & 4 & 16 \\ 0 & 0 & -24 & -72 \end{bmatrix}$$

$R_3 \div -24$
↓
 $R_3 - 5R_2$

$$\begin{bmatrix} 1 & -1 & 1 & 0 \\ 0 & 1 & 4 & 16 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

$R_2 - 4R_3, R_1 - R_3$
↓

$$\begin{bmatrix} 0 & -1 & 0 & 3 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 3 \end{bmatrix}$$

$$\begin{matrix} I_1 & I_2 & I_3 \\ \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 3 \end{bmatrix} \end{matrix}$$

- $I_1 = 1$
- $I_2 = 4$
- $I_3 = 3$