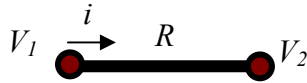


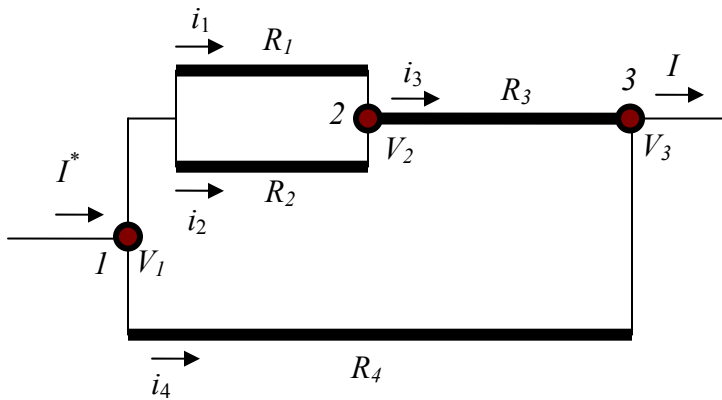
### Example by method of nodes

For each resistor:  $i = \frac{V_1 - V_2}{R}$



Example:

1. Three nodes and four resistors:



2. Assume that current coming out of a node is positive and write current balance for each node

Node 1:

$$-I^* + i_1 + i_2 + i_4 = 0$$

Node 2:

$$-i_1 - i_2 + i_3 = 0$$

Node 3:

$$-i_3 - i_4 + I = 0$$

3. Substitute for each current in terms of the resistance and voltage:

$$\begin{aligned}\frac{V_1 - V_2}{R_1} + \frac{V_1 - V_2}{R_2} + \frac{V_1 - V_3}{R_4} &= I^* \\ -\frac{V_1 - V_2}{R_1} - \frac{V_1 - V_2}{R_2} + \frac{V_2 - V_3}{R_3} &= 0 \\ -\frac{V_2 - V_3}{R_3} - \frac{V_1 - V_3}{R_4} &= -I\end{aligned}$$

4. Organize in matrix form:

$$\begin{bmatrix} \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_4} & -\frac{1}{R_1} - \frac{1}{R_2} & -\frac{1}{R_4} \\ -\frac{1}{R_1} - \frac{1}{R_2} & \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} & -\frac{1}{R_3} \\ -\frac{1}{R_4} & -\frac{1}{R_3} & \frac{1}{R_3} + \frac{1}{R_4} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} I^* \\ 0 \\ -I \end{bmatrix}$$