

Single Loop circuits

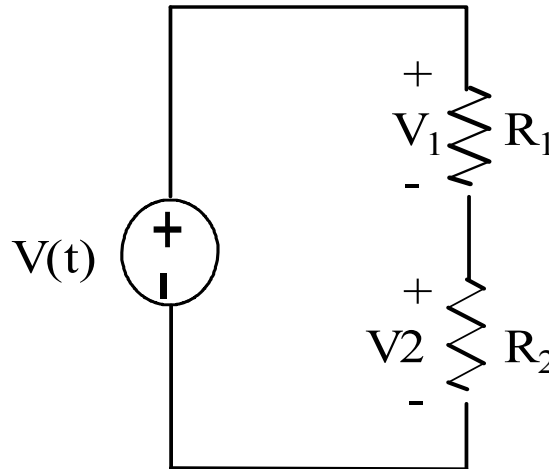
We will discuss (2) issues :

1. Voltage divider rule:

Voltage is divided between resistor in direct proportion to their resistance

$$v_1(t) = \frac{R_1}{R_1 + R_2} v(t)$$

$$v_2(t) = \frac{R_2}{R_1 + R_2} v(t)$$



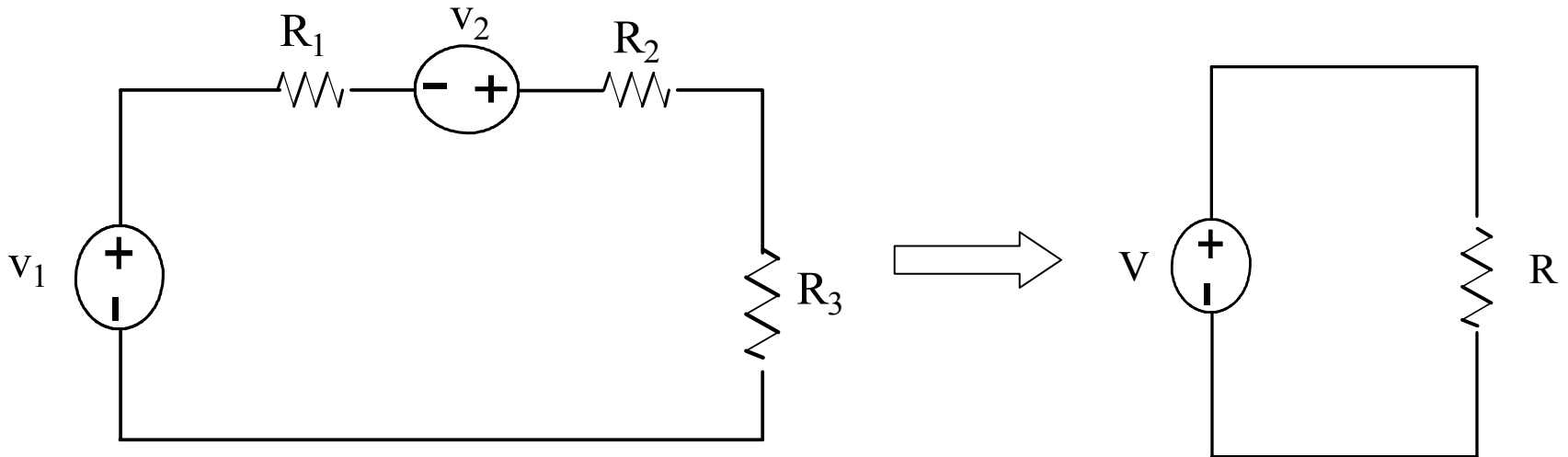
How?

$$v_1 = R_1 i = R_1 \left(\frac{v}{R_1 + R_2} \right)$$

$$v_1 = \frac{R_1}{R_1 + R_2} v$$

Multi Sources / resistors :

- Source can be added $v=v_1+v_2+\dots$
- Resistors can be added $R= R_1+R_2+\dots$



Where:

$$v = v_1 + v_2$$

$$R = R_1 + R_2 + R_3$$

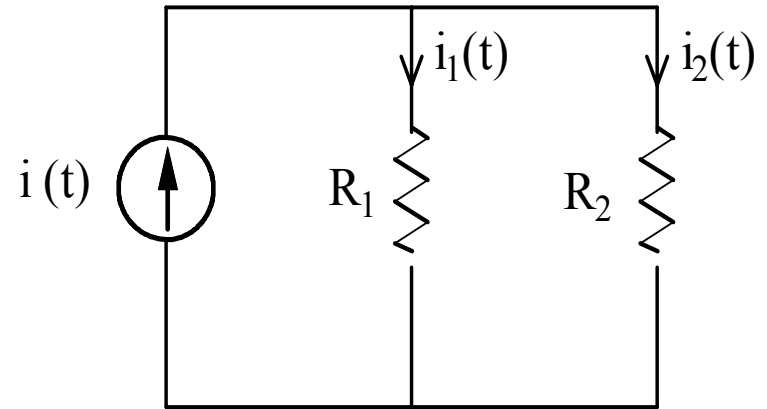
Single Node-Pair circuits :

We will discuss (2) issues:

1. Current-divider Rule .

$$i_1(t) = \frac{R_2}{R_1 + R_2} i(t)$$

$$i_2(t) = \frac{R_1}{R_1 + R_2} i(t)$$



Why ??

$$v = i_1 R_1 = i_2 R_2$$

$$\therefore i_1 = \frac{R_2}{R_1} i_2$$

$$i = i_1 + i_2 \Rightarrow i_2 = i - i_1$$

$$i_1 = \frac{R_2}{R_1} (i - i_1)$$

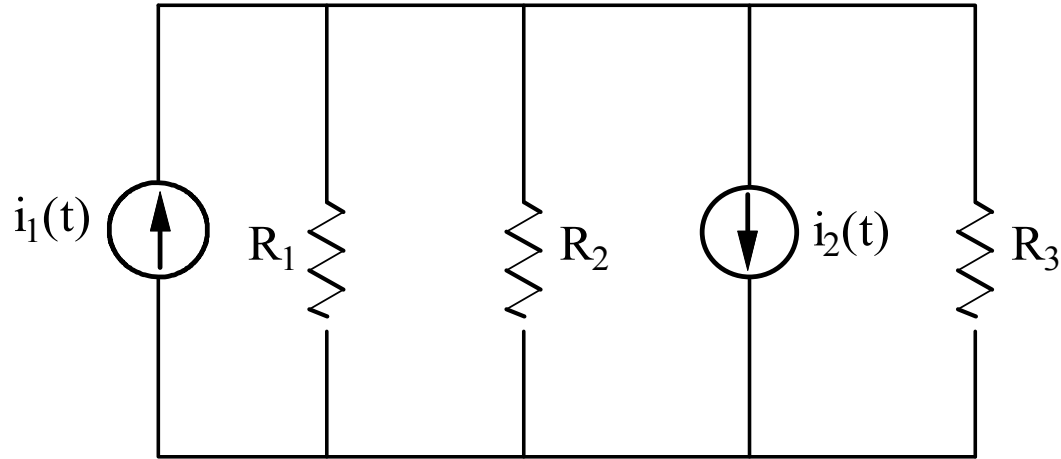
$$i_1 \left(1 + \frac{R_2}{R_1}\right) = \frac{R_2}{R_1} i$$

$$i_1 \left(\frac{R_1 + R_2}{R_1}\right) = \frac{R_2}{R_1} i$$

$$i_1 = \frac{R_2}{R_1 + R_2} i$$

2. Multiple sources/resistors :

- Current source can be added.
- Resistors can added as reciprocals



$$i(t) = i_1(t) + i_2(t)$$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

