Resistor

Source

- Resistors in series:

$$\boxed{R_{eq} = \sum_{i=1}^{k} R_i = R_1 + R_2 + \ldots + R_k}$$

$$v_s = i_s R_{eq}$$

- Resistors in parallel:

$$\frac{1}{R_{eq}} = \sum_{i=1}^{k} \frac{1}{R_i} = \left(\frac{1}{R_1} + \frac{1}{R_2} + \ldots + \frac{1}{R_k}\right)$$

$$G_{eq} = \sum_{i=1}^{k} G_i = (G_1 + G_2 + \ldots + G_k)$$

Special case (2 resistors)

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

- Voltage-divider circuit (Series)

$$v_1 = i R_1 = \boxed{v_s \frac{R_1}{R_1 + R_2}} \quad \text{and} \quad v_2 = i R_2 = \boxed{v_s \frac{R_2}{R_1 + R_2}}$$

- Current-divider circuit: (Parallel)

$$i_1 = \boxed{\frac{R_2}{R_1 + R_2} i_s} \quad \text{and} \quad i_2 = \boxed{\frac{R_1}{R_1 + R_2} i_s}$$

$$\begin{cases} a_1 \overset{v_1}{x} + b_1 \overset{v_2}{y} = c_1 \\ a_2 x + b_2 y = c_2 \end{cases}$$

Deteminant: $\Delta = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = a_1 b_2 - a_2 b_1$

$$\Delta_1 = \begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix} = c_1 b_2 - c_2 b_1$$

$$\Delta_2 = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix} = a_1 c_2 - a_2 c_1$$

$$x = \frac{\Delta_1}{\Delta}, \quad y = \frac{\Delta_2}{\Delta}$$

Ex:

$$\begin{matrix} 2 & -3 & 1 \\ 1 & 2 & 1 \\ 1 & -3 & 2 \end{matrix} = 2(2.2 - 1(-3)) \cdot (1.2 - 1.1) +$$