NODE ANALYSIS METHOD

BASIC CIRCUIT ANALYSIS METHOD

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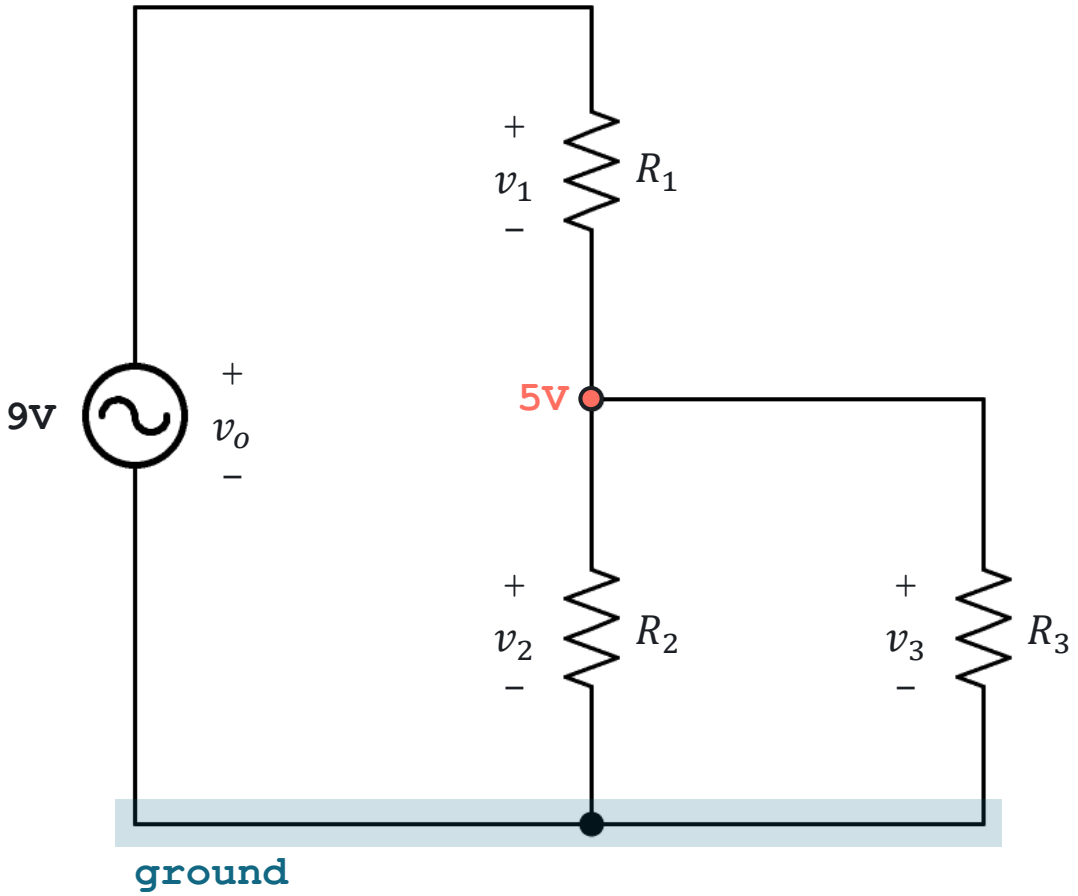
TOPIC OUTLINE

Node Voltage

Node Analysis Method

NODE ANALYSIS METHOD

NODE VOLTAGE



Node Voltage is the electrical potential difference at a specific node in a circuit relative to a reference node.

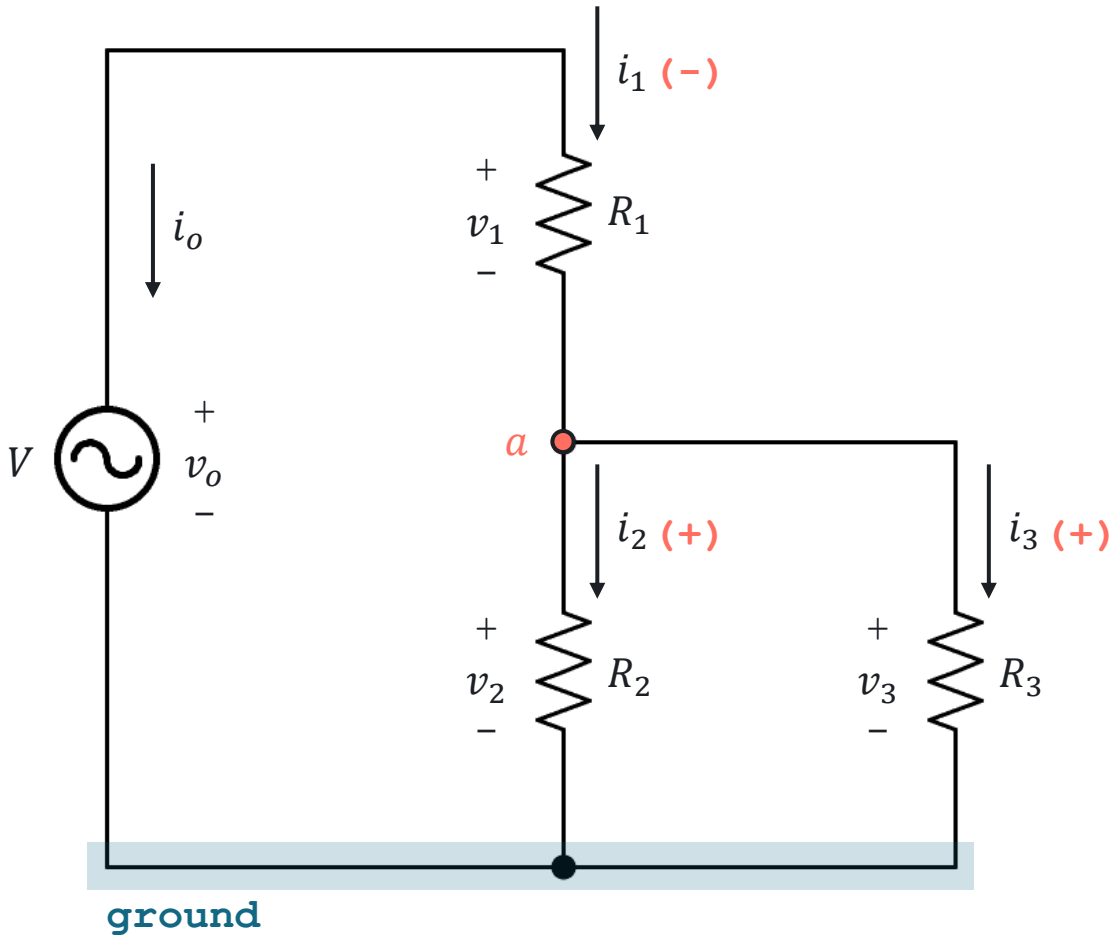
example

$v_1 = 9\text{V} - 5\text{V}$

$v_2 = 5\text{V} - 0$

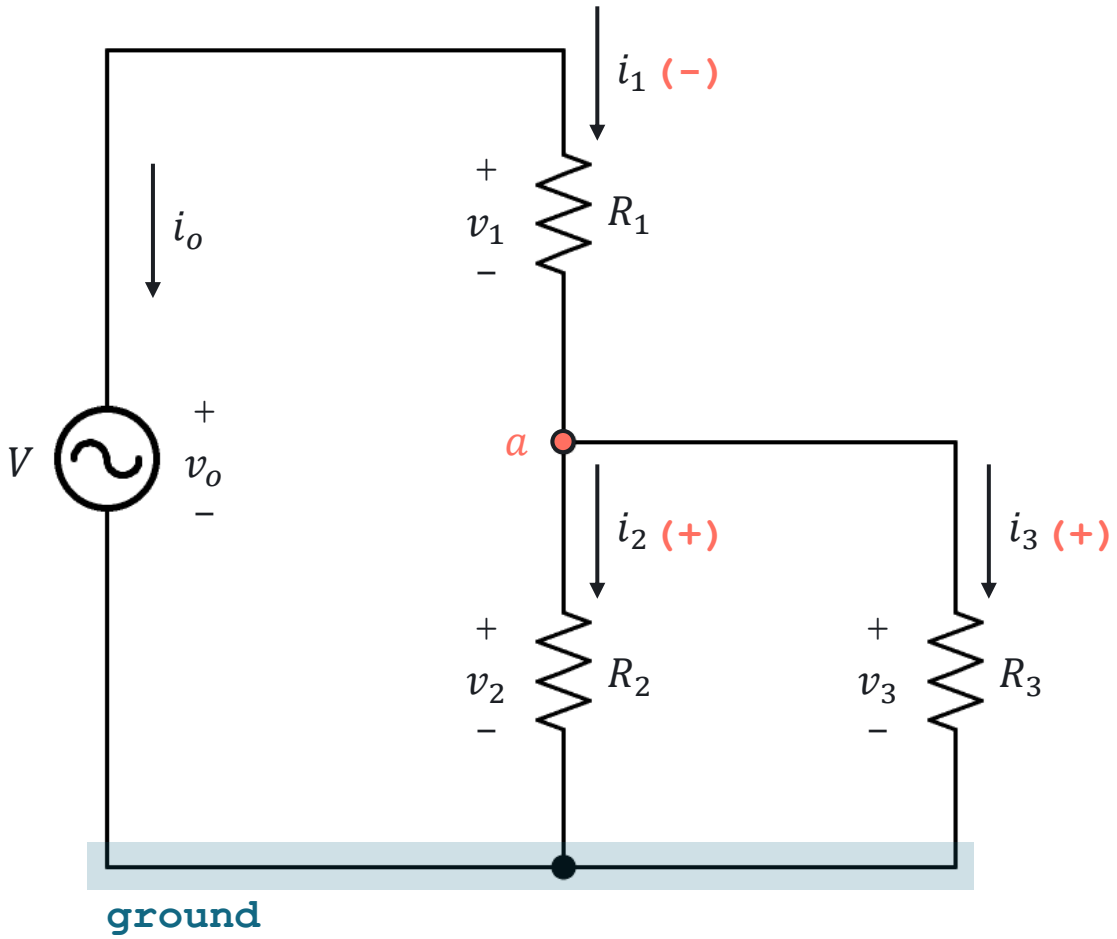
$v_3 = 5\text{V} - 0$

NODE ANALYSIS METHOD



The **node analysis method** is based on Kirchhoff's current law (KCL), which is implicitly applied to establish voltage-current relationships forming a system of equations to solved for the **unknown node voltages**.

NODE ANALYSIS METHOD



KCL @a

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

$$-\frac{v_1}{R_1} + \frac{v_2}{R_2} + \frac{v_3}{R_3} = 0$$

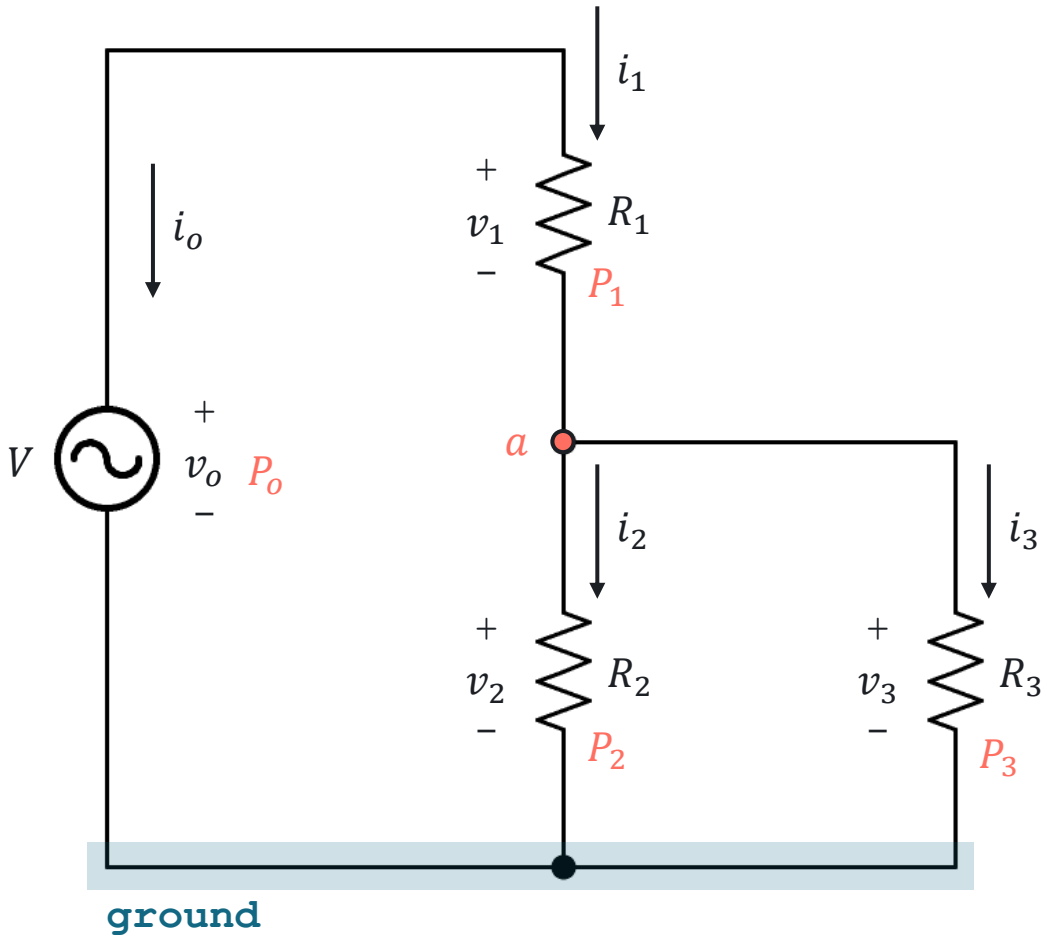
$$-\frac{v_o - v_a}{R_1} + \frac{v_a - 0}{R_2} + \frac{v_a - 0}{R_3} = 0$$

$$-v_o G_1 + v_a G_1 + v_a G_2 + v_a G_3 = 0$$

$$v_a(G_1 + G_2 + G_3) = v_o G_1$$

$$v_a = \frac{v_o G_1}{G_1 + G_2 + G_3}$$

ELECTRICAL POWER



Electrical power refers to the rate at which electrical energy is converted per unit time (joules/second).

Formulas

$$P = vi$$

$$P = i^2R$$

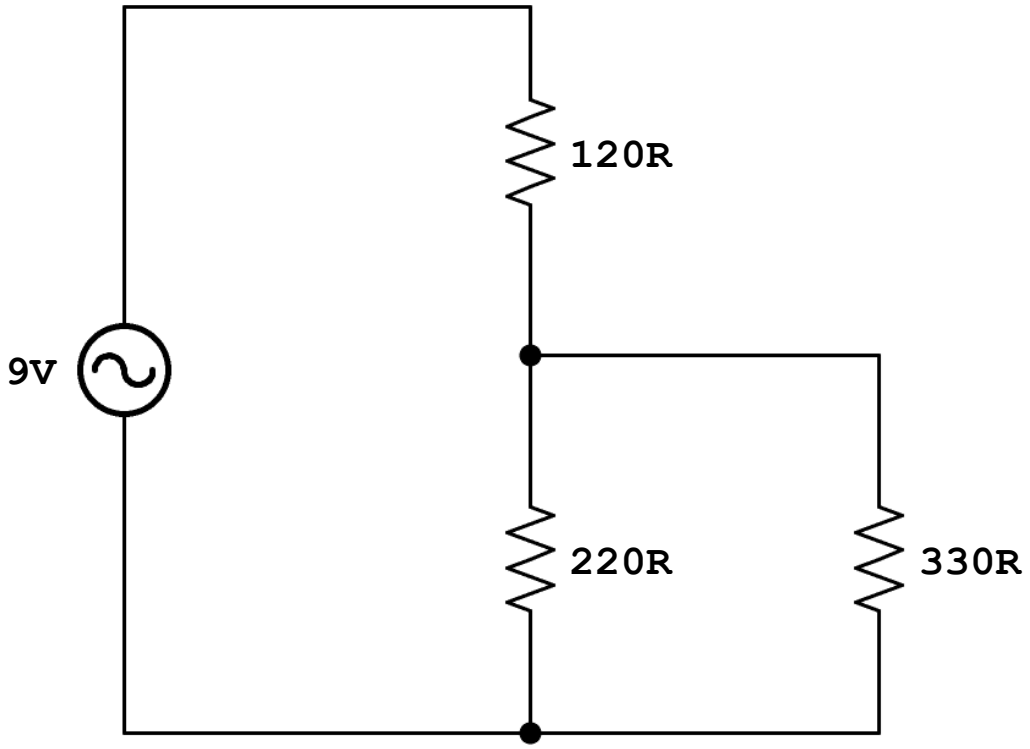
$$P = \frac{v^2}{R}$$

$$P_o = P_1 + P_2 + P_3 + \cdots P_n$$

unit: Watt (W)

EXERCISE

Determine the current through and voltage across each resistor, as well as the total power in the given circuit.



Solution

EXERCISE

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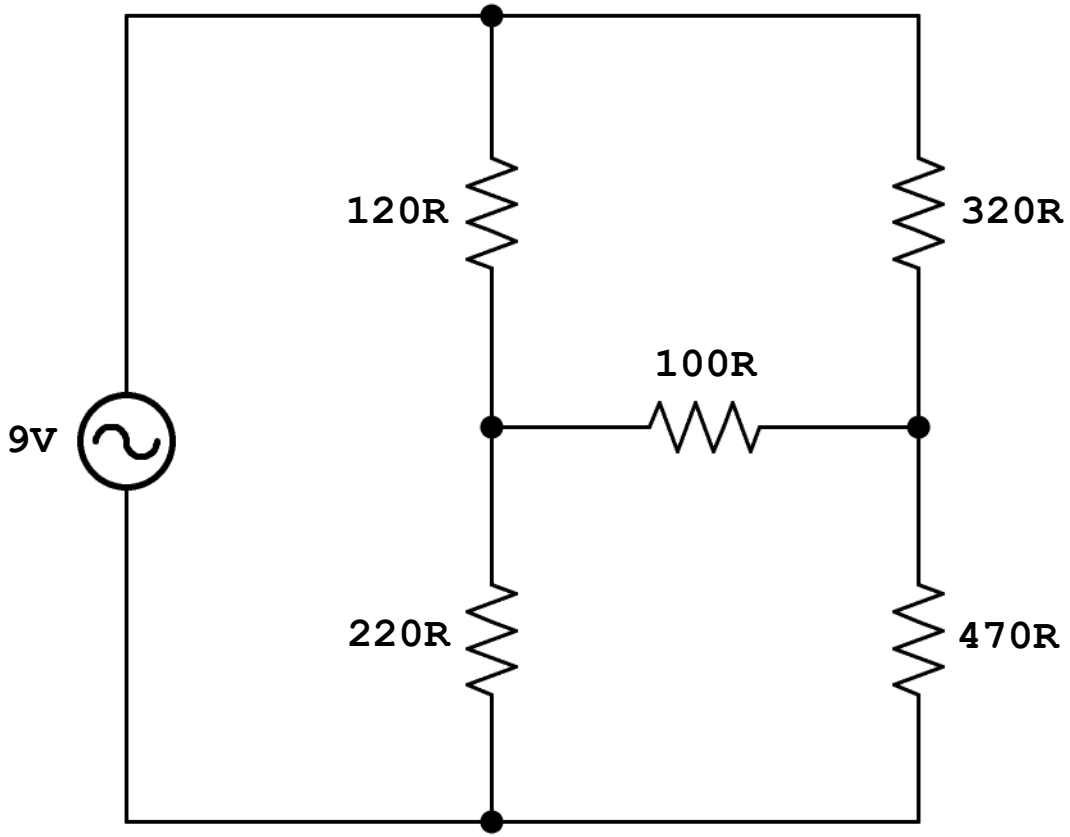

Solution

LABORATORY