

CIRCUIT ANALYSIS METHOD











TOPIC OUTLINE

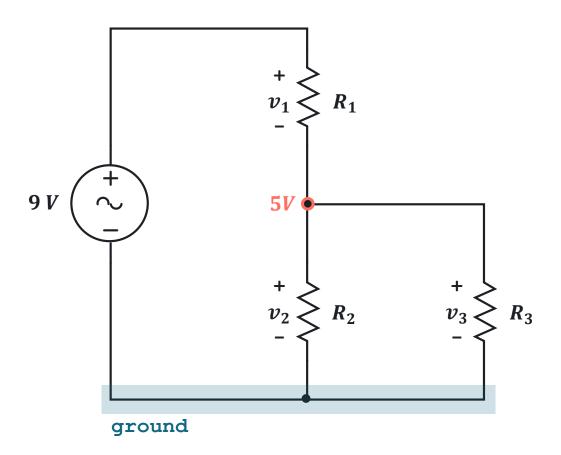
Node Voltage

Node Analysis Method





NODE VOLTAGE



Node Voltage is the electrical potential difference between a given node and a reference node (ground) in a circuit.

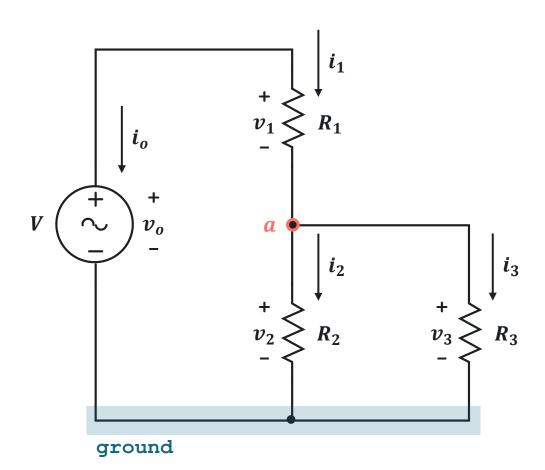
Example:

$$v_1 = 9V - 5V$$

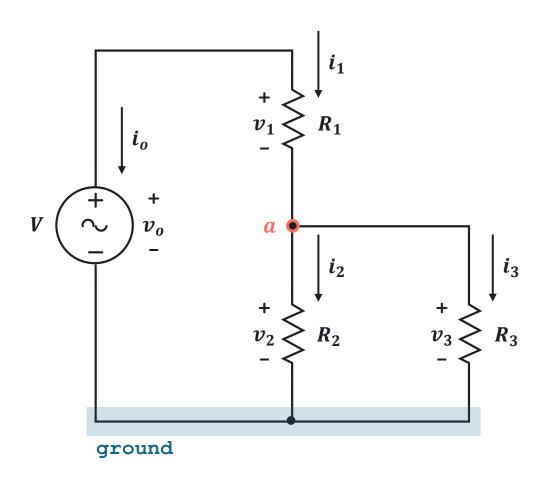
$$v_2 = 5 V - 0$$

$$v_3 = 5V - 0$$





The <u>node analysis method</u> 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 <u>unknown node voltages</u>.



KCL @a:

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

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

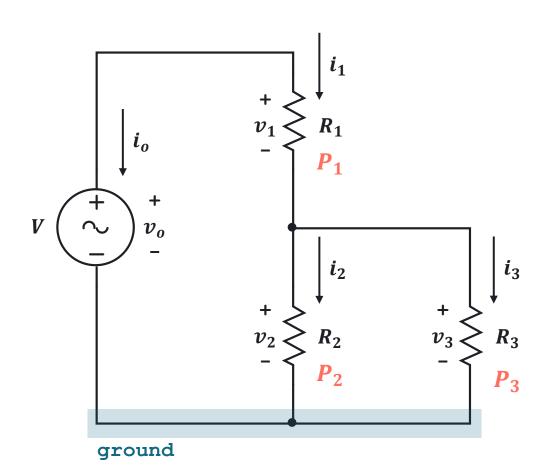
$$-\frac{v_o - v_a}{R_1} + \frac{v_a - 0}{R_2} + \frac{v_a - 0}{R_3} = 0$$

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

$$v_a(G_1 + G_2 + G_3) = v_oG_1$$



ELECTRICAL POWER



Electrical power refers to the rate at which electrical energy is transferred or converted per unit time.

Formulas:

$$P = vi$$

$$P = i^2 R$$

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

$$P_{total} = P_1 + P_2 + P_3 + \cdots P_n$$

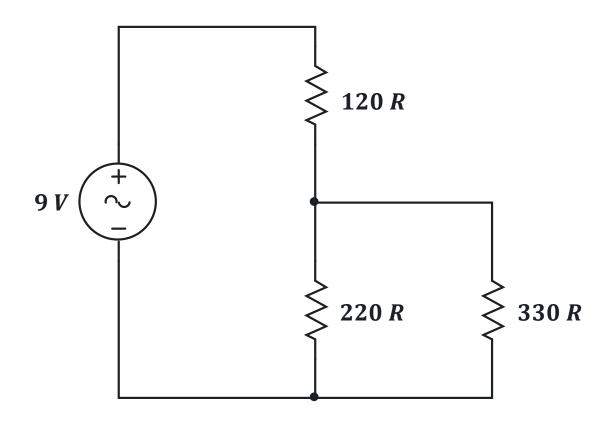
unit: Watt (W)



EXERCISE

Determine the <u>current</u> flowing through each resistor, the <u>voltage</u> drop across each resistor, and the <u>total</u> <u>power</u> in the given circuit.

Solution:

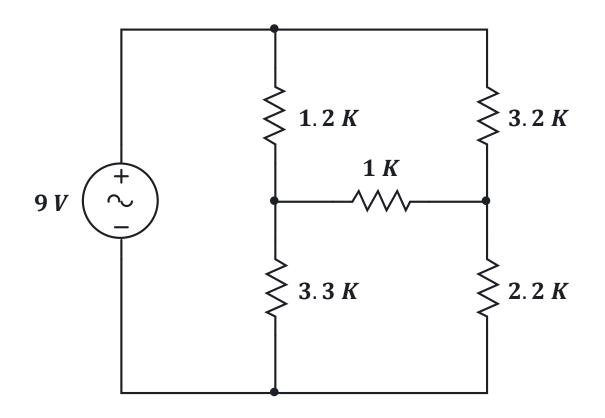




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Solution:





LABORATORY

