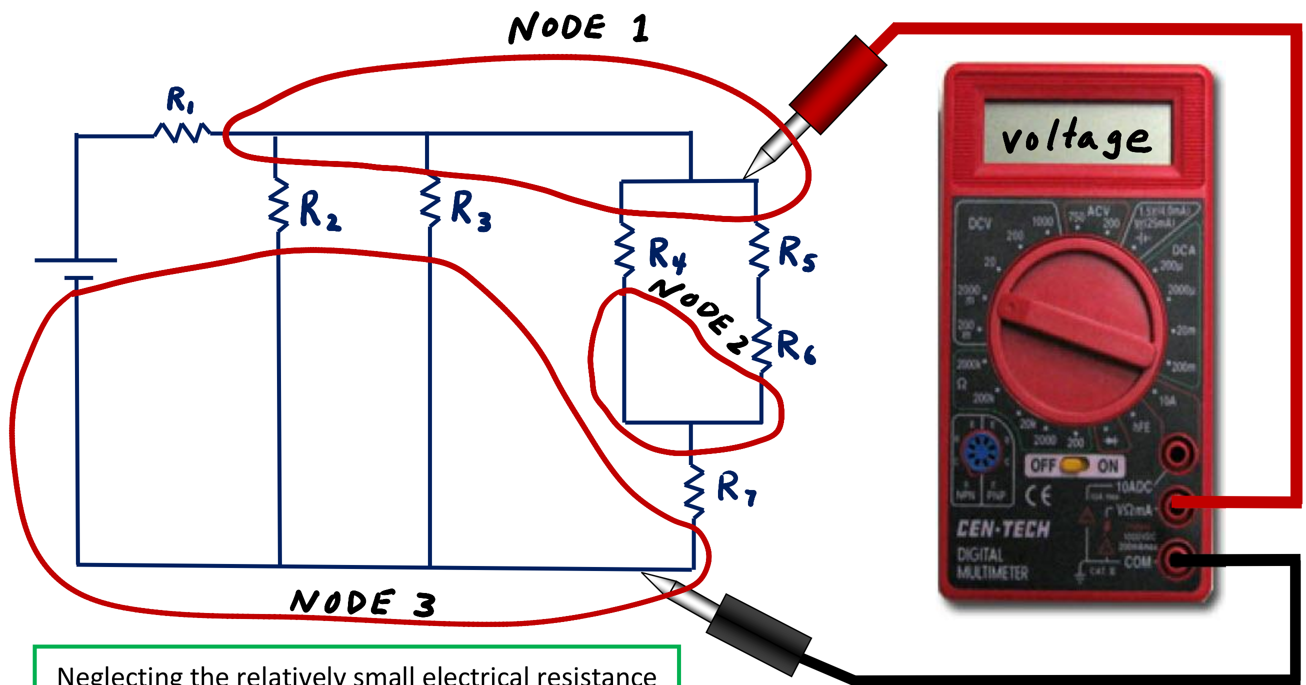
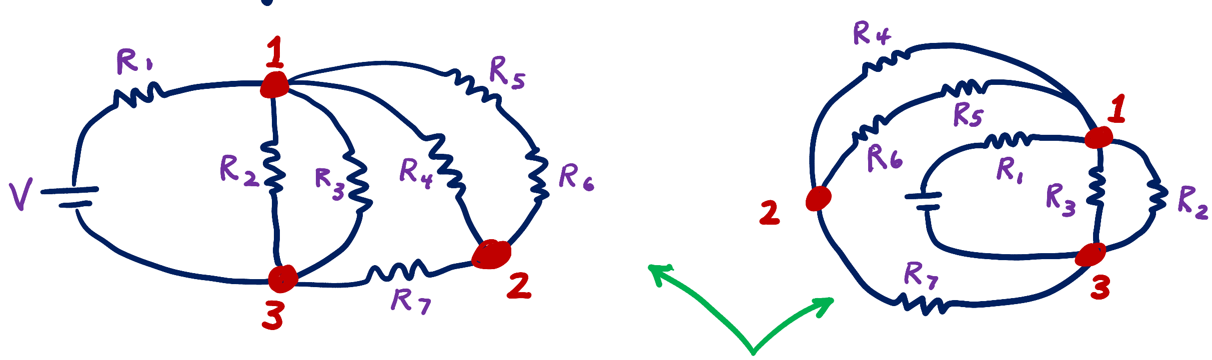
Implications of Kirchoff's Voltage Law (KVL):



Neglecting the relatively small electrical resistance of the "wires," the areas inside the circles can be considered "nodes."

Moving the multimeter probe to any part of the wire within a given red circle will not significantly influence the measured voltage.

We can redraw the circuit in various ways...



R_3 is between nodes 1 and 3

R_7 is between nodes 2 and 3

Due to KVL, sets of circuit elements between two nodes are in **PARALLEL** and have **EQUAL** voltage drops:

$$\Delta V_{R3} = \Delta V_{R2} \quad \text{and} \quad \Delta V_{R4} = \Delta V_{R5} + \Delta V_{R6}$$

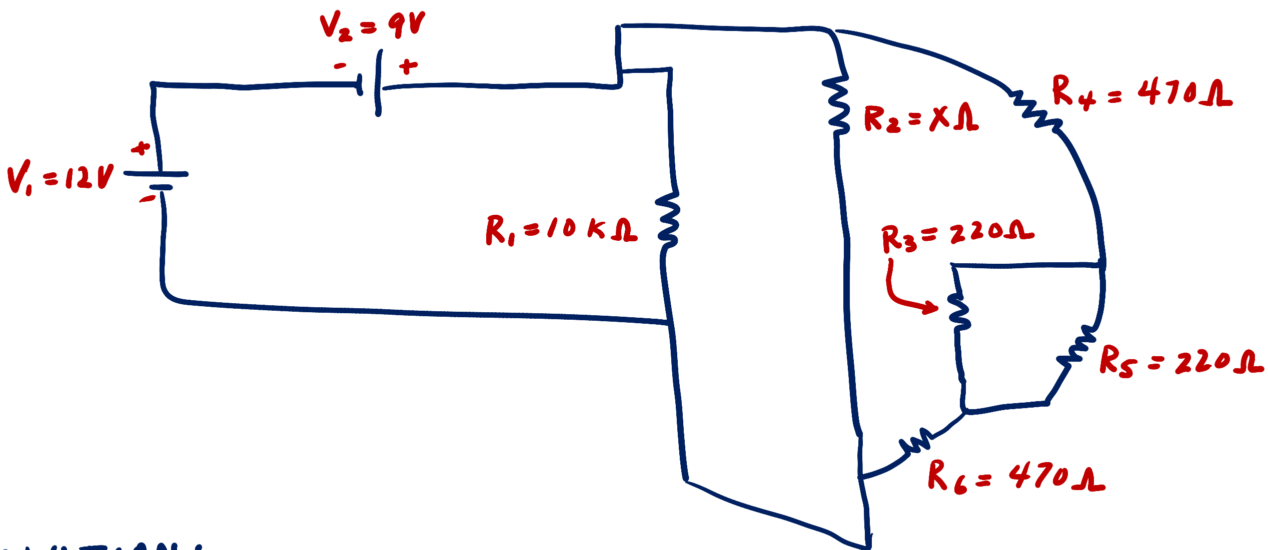
between nodes 1 and 3 — between nodes 1 and 2

$$\Delta V_{R5} + \Delta V_{R6} + \Delta V_{R7} = \Delta V_{R2}$$

between nodes 1 and 3

CLASS PROBLEM: Consider the circuit below where R_2 is a variable resistor (a resistor whose value can be changed by turning a knob). We would like to understand the variation of the total current leaving the power sources as a function of R_2.

a. Redraw the circuit so it is easier to tell which resistors are in parallel.
b. Develop a function for the current I in terms of the resistance R_2, and embed this function into Mathcad.
c. Plot the current versus the value of R_2, where R_2 varies from 100 Ω to 10,000 Ω.
d. Find the current when R_2 is equal to 220 Ω, 470 Ω, 1 kΩ, and 10 kΩ.



SOLUTION: