EELE 250: Circuits, Devices, and Motors

Lecture 4

Assignment Reminder

- Read 2.4 - 2.7
- Practice problems (complete before M 9/9/2013):
  - Chapter 1:
    1.6, 1.7, 1.9, 1.11, 1.17
    1.25, 1.32, 1.38, 1.42, 1.43
  - Chapter 2:
    2.1, 2.4, 2.16, 2.25, 2.32, 2.40
    2.67, 2.71, 2.77, 2.83, 2.85, 2.97
- TAKE D2L QUIZ #2 this week before next Monday at class time. Time limit is 2 hours per attempt. You have two attempts.
- NOTE that the quiz requires equation solving, so be ready to do linear algebra!

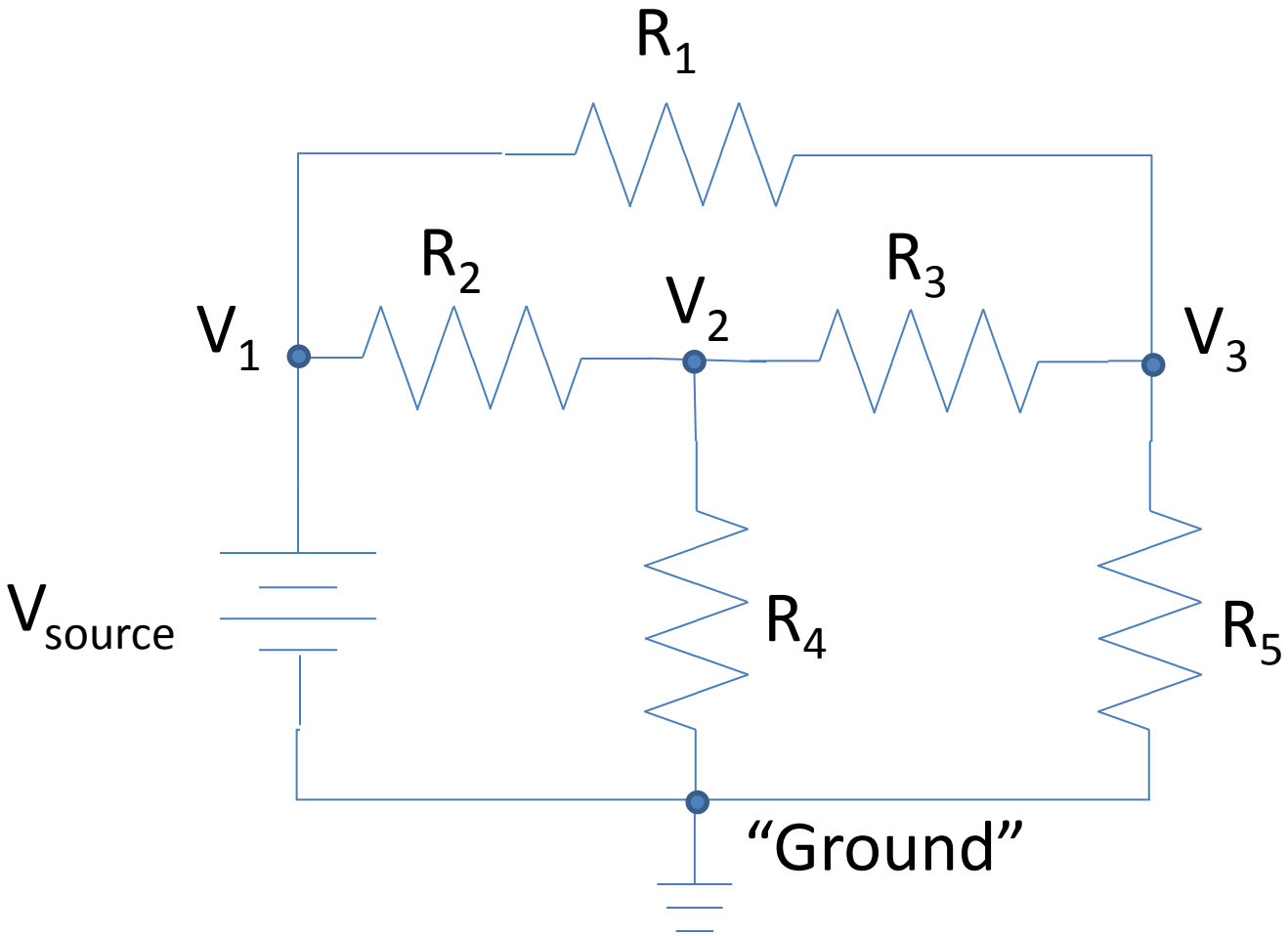
Circuit Analysis

- General techniques to find currents and voltages in electrical networks
- Use KVL, KCL, and Ohm's Law
- Remember: voltages and currents can be positive or negative, so be meticulous with the math!

Node-Voltage Analysis

- Identify all the nodes in the circuit
- Assign one of the nodes to be the reference point, referred to as the “ground” node
- Label the other nodes as V_1, V_2, etc. These unknown voltages are with respect to the “ground” node.
- Write a KCL expression at each node, and solve for the unknown voltages

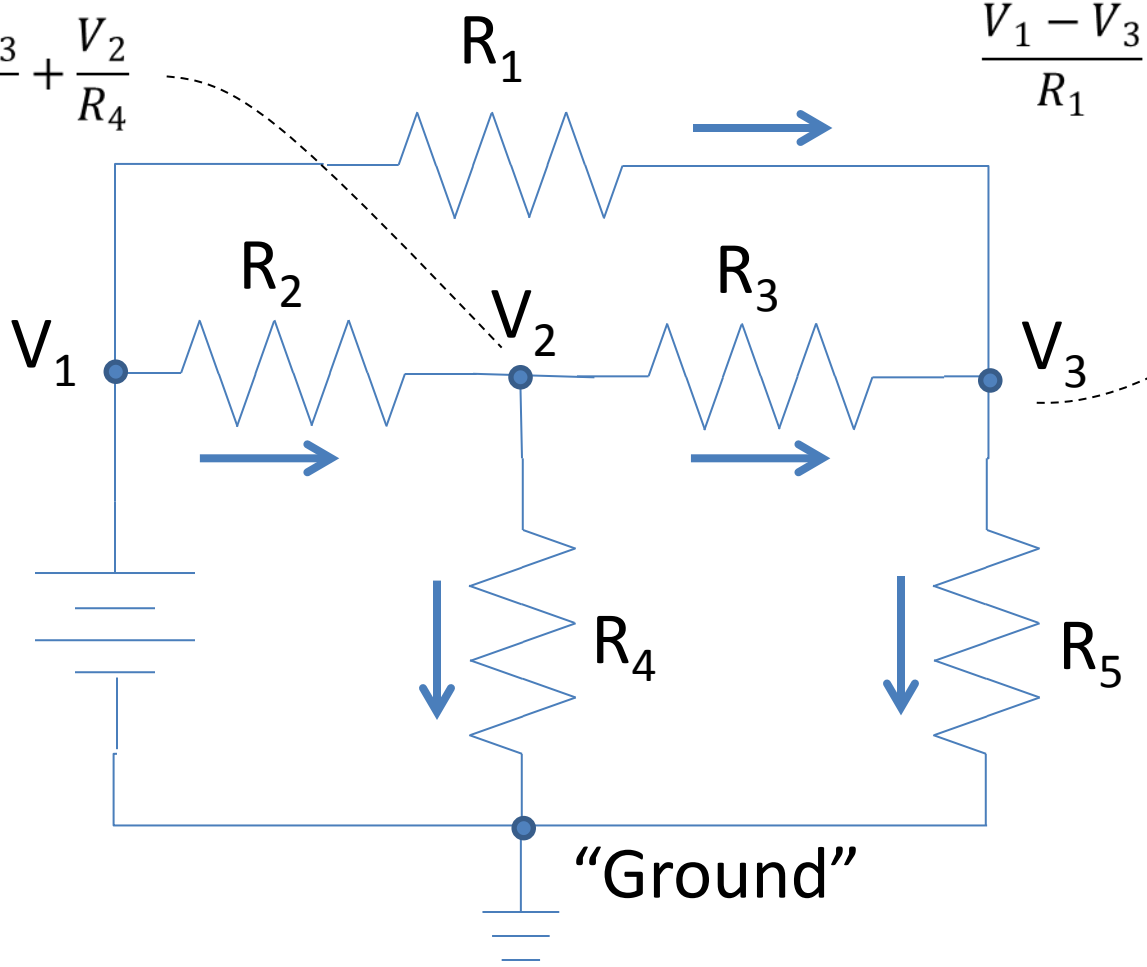
Node Voltage Example



Node Voltage Example

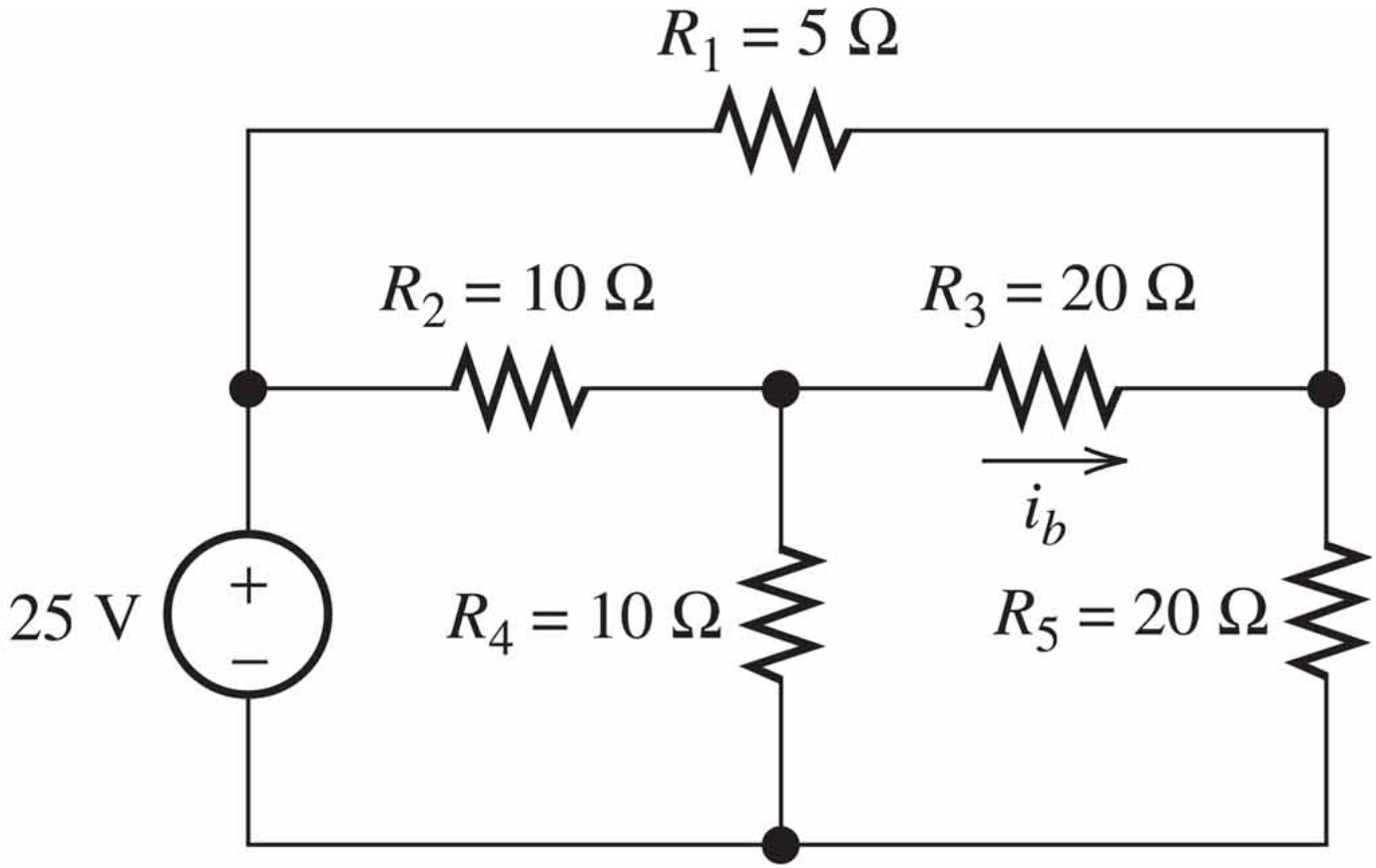
$$\frac{V_1 - V_2}{R_2} = \frac{V_2 - V_3}{R_3} + \frac{V_2}{R_4}$$

$$\frac{V_1 - V_3}{R_1} + \frac{V_2 - V_3}{R_3} = \frac{V_3}{R_5}$$

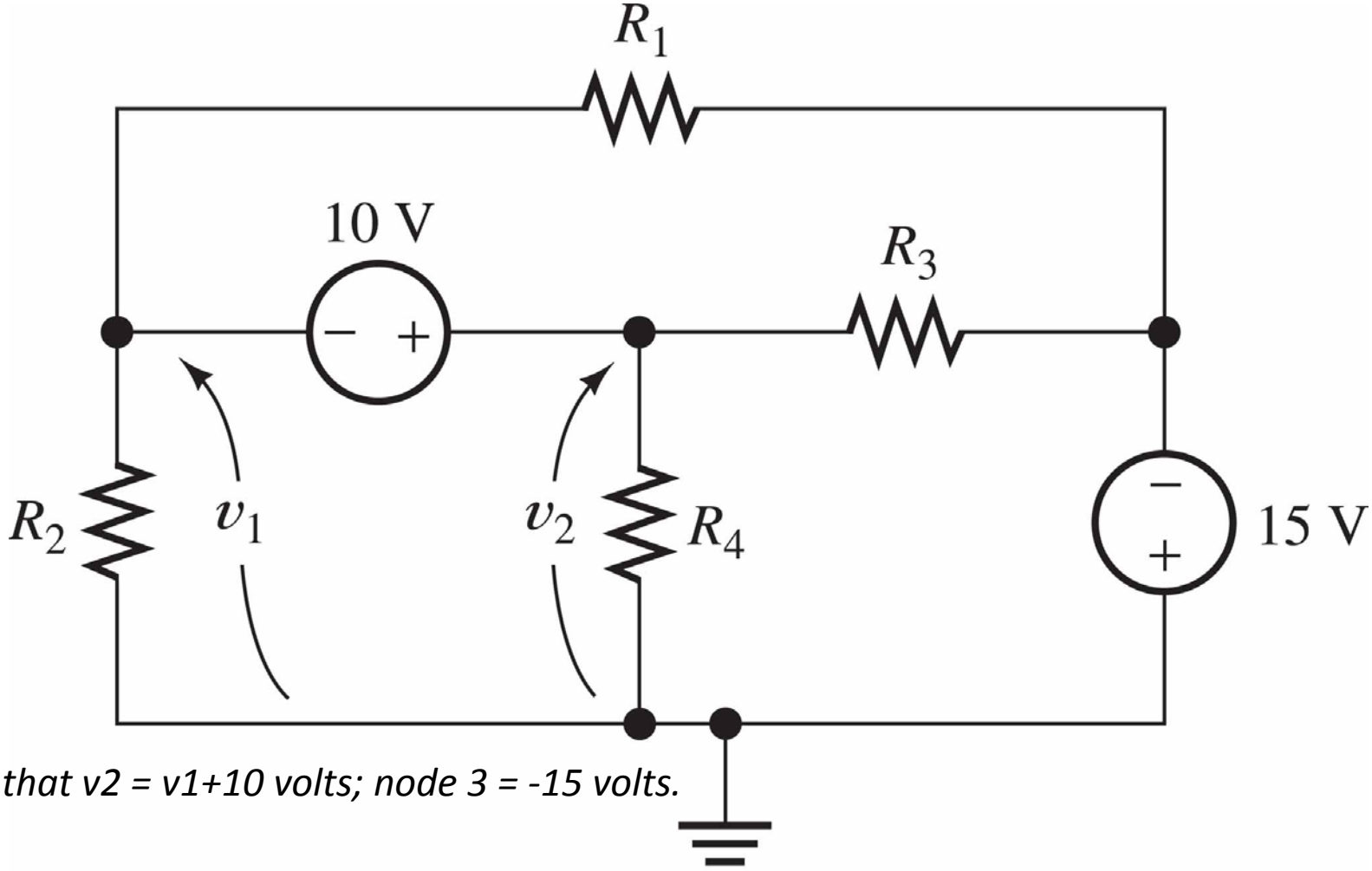


$V_1 = V_{source}$

Node Voltage Example



Node Voltage Example



Note that v2 = v1+10 volts; node 3 = -15 volts.

Problem: voltage source s do not constrain current, so how do we write KCL? Need to use “supernode” concept.

Summary and Review

- Nodes
- Assign reference and unknown labels
- Identify any known node voltages
- Write KCL expressions
- Solve for the unknowns
- Remember to keep track of the signs (positive and negative)

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