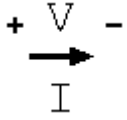
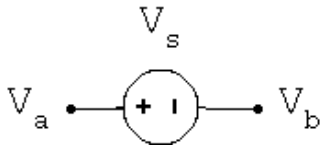
## Lecture 5, Tuesday, January 25, 2022

- Node-voltage method

1. Identify all nodes and label their node voltages $\mathbf{V_1}$, $\mathbf{V_2}, \ldots,$ $\mathbf{V_n}$ plus a reference.
2. Assign current directions and polarities to all elements (use SRS for simplicity).

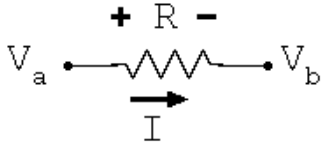



3. Use voltage sources to obtain equations between their node voltages.




$$\mathbf{V_s = V_a - V_b}$$

4. Use KCL on remaining nodes to get a total of $\mathbf{n}$ equations in terms of the node voltages.




$$\mathbf{I = \frac{V_a - V_b}{R}}$$

5. Solve equations.

- Supernode: combine the two nodes of a voltage source into a single *supernode*. This avoids introducing an additional variable for the current through the voltage source. Only works on voltage sources.

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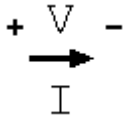
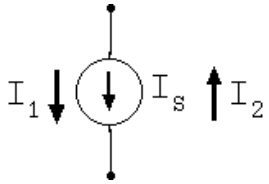
**Lecture 5, continued from previous page...**

- Loop-current method

1. Assign loop currents $\mathbf{I_1},\ \mathbf{I_2}, \ldots,\ \mathbf{I_n}$.
2. Assign current directions and polarities to all elements (use SRS for simplicity).

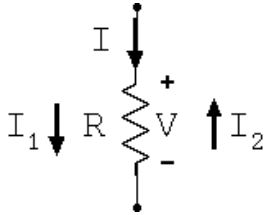



3. Use Current sources to obtain equations between their loop currents.




$$\mathbf{I_s = I_1 - I_2}$$

4. Use KVL on remaining loops to get a total of $\mathbf{n}$ equations in terms of the loop currents.




$$\mathbf{V = R\,(I_1 - I_2)}$$

5. Solve equations.