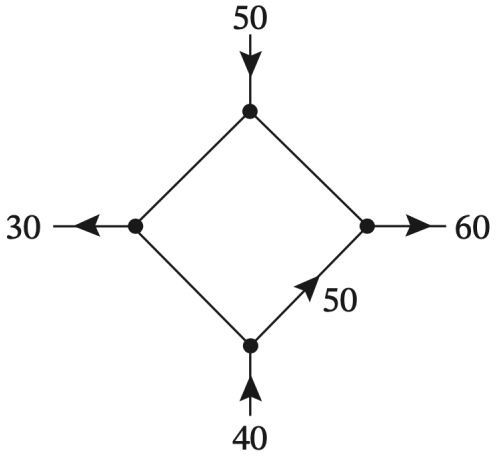
1.10 – Applications of Linear Systems

Definitions: A **network** is a set of branches through which something flows. Branches meet at **nodes** or **junctions**. Networks in our work will feature **flow conservation**, meaning the rate of flow in and out are equal at each node.

#1 The accompanying figure shows a network in which the flow rate and direction of flow in certain branches are known. Find the flow rates and directions of flow in the remaining branches.

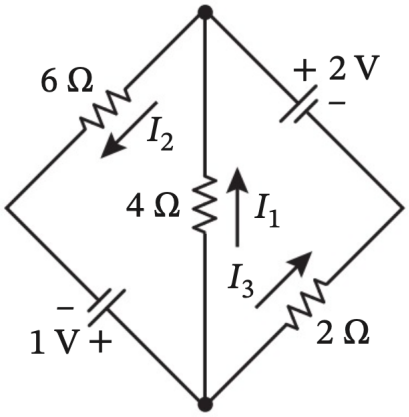


Definitions: A **battery** is a source of electric energy, and a **resistor** dissipates electric energy. A **node** is where three or more wires join in a circuit. A **closed loop** begins and ends at the same node.

Ohm's Law: $E = IR$, where E (volts) is voltage drop at a resistor with resistance R (ohms) in a circuit with current I (amperes).

Kirchhoff's Laws (summary): Net current (in and out) at a node is zero, and net voltage change (rises and drops) in a closed loop is zero.

#6 Analyze the given electrical circuit by finding the unknown currents.



Theorem 1.10.1 Polynomial Interpolation
Given any n points in the xy-plane that have distinct x-coordinates, there is a unique polynomial of degree $n-1$ or less whose graph passes through those points.

#16 The accompanying figure shows the graph of a cubic polynomial. Find the polynomial.

