Resistance networks: constitutive laws, pressure, and conservation — review sheet

Use this after attempting the worked examples and practice. Explain each claim in words before calculating.

Key ideas

- Pressure difference divided by positive resistance gives signed flow.
- A reference arrow does not enforce one-way motion.
- Steady internal nodes have zero net accumulation.
- Internal transfers cancel in a whole-network account.
- Common pressure shifts preserve flow in this model.
- Uniform resistance scaling inversely scales all flows at fixed endpoint pressures.

Common errors and repairs

Using one pressure instead of a difference. Subtract the downstream reference pressure using the declared arrow.

Clipping a negative resistor flow. Interpret its direction; a valve requires a separate rule.

Checking only the total boundary flow. Also check every internal node balance.

Retrieve without your notes

- What does a negative A-to-B reference flow mean?
- What are the resistance units when pressure is mmHg and flow is L/min?
- What does this steady model omit?

Readiness check

- Use a pressure difference and positive resistance to calculate a signed flow.
- Check that each internal node has equal total inflow and outflow.
- Interpret a negative answer relative to a declared arrow.
- Predict the effect of shifting the pressure reference or scaling all resistances.
- State which steady-flow assumptions limit the model.