Streamfunctions on a mapped chamber domain — review sheet

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

Key ideas

- Prescribed kinematics, solved dynamics and physiological validation are distinct.
- Shared-face conservation and sampled-velocity divergence test different operations.
- A matching port flow does not determine interior motion.
- Mesh sensitivity and boundary-input sensitivity answer different questions.
- A proposed report should state exactly which equations, observables and references were tested.

Common errors and repairs

Calling any anatomically suggestive flow plot an atrial CFD solution. State whether momentum was actually solved and whether geometry and boundary data are measured.

Interpreting V/Q as every particle's residence time. It is a bulk ratio; trajectories and exit-time distributions require additional analysis.

Equating zero net flux with zero local divergence. Local positive and negative errors can cancel; inspect a local norm as well.

Retrieve without your notes

- What does the current diagnostic say about momentum?
- Can two fields share a bulk turnover scale and differ internally?

Readiness check

- Document geometry, port flow and model omissions for a synthetic chamber.
- Check shared-face flux conservation and velocity-derived divergence as distinct diagnostics.
- Measure derivative reconstruction error and compare a boundary-input sensitivity.
- Explain why neither conservation nor grid refinement guarantees momentum balance or physiological validity.
- Prepare a proposed effort-based CFD verification and interpretation report with a defensible claim scope.