3 Mass Conservation in Flowing Media

3.1 Mass conservation law in differential form. The physical significance of the divergence of the velocity: \( \nabla \cdot \vec{V} = \text{the rate of increase of the material's volume, per unit volume.} \)

3.2 Law of mass conservation for a continuum expressed in control volume form. Examples.

3.3 Some special forms of the mass conservation equation for quasi-one-dimensional flow, accounting for the effects of unsteadiness, compressibility, and cross-sectional area variations. Examples. Limitations to the maximum velocity for incompressibility to be a good approximation.

Read: Fay, Chapt. 3 or Kundu, Chapt. 3.6, 3.7, 3.13 Chapt 4.1, 4.2, 4.3.

Problems: Shapiro & Sonin 3.3, 3.5, 3.7, 3.8