Notes

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Contents

Abstract

Abstract of this course

1 Some basic concepts

Collisional v collisionless fluids
Eulerian and Lagrangian framework
Concepts of streamlines, particle paths and streaklines:
They coinside if the flow is steady.i.e.

2 Formulation of the Fluid Equations

This chapter talked about the conservation of mass and momentum. Some of spec

2.1 Conservation of mass

2.2 Conservation of momentum

We consider 4 different which contribute to the change of momentum,?

3 Gravitation

In this section, we used $\vec{\mathbf{g}}$ to denote gravitational acceleration; Ψ to denote gravitational potential; and Ω to denote the energy required to take the system of point masses to infinity

Example: Spherical distribution of mass

Example: Infinitely cylindrical symmetrical mass

Example: Infinite planar distribution of masses

Example: Finite axisymmetric disk

3.1 Potential of a Spherical Mass Distribution

Ψ is affected by any matter outside r through our choice of setting Psi at infinity. i.e. We **can't** say that $\Psi = -GM/r$

3.2 Gravitational Potential Energy

3.3 Virial Theorem

Virial Theorem: states that for a system in steady state, $I \equiv mr^2 = constant$, $2T + \Omega = 0$

Kinetic energy T has contribution from local flows and random/thermal motions.
A result of virial theorem is that the gravitational potential sets the temperature or velocity dispersion of the system.