

Problem Set 3

Astrophysics and Cosmology through Problems

Due 25 Sept 2008

1. Rewrite Euler's equation and the entropy flux equation in one dimension using Lagrangian coordinates. That is, simplify to $\nabla = \partial/\partial x$, and then change variables from x – which is independent of time – to a new variable $a(t)$, where $a(t) = vt$, and v is the fluid velocity.
2. Recalling the results derived in the previous lecture, calculate the sound speed for gas in white dwarfs. How do the non-relativistic and relativistic cases differ? Speculate on / discuss the consequences of this difference.
3. Repeat the analysis from class today for characteristic variables for sound propagation in the case of spherical symmetry.
4. Using techniques like those shown in lecture, find q^i for a gas in LTE. (part of Padmanabhan 3.1)
5. Padmanabhan 3.6 (d)