

Problem Set 5 (due Friday, 16.05.2014 in the class)

QUESTIONS

- (Q1) How did we get from a kinetic description to a fluid description?
- (Q2) How did pressure and viscosity arise in the derivation of fluid equations?
- (Q3) Using fluid equations we derived dispersion relations for plasma waves more easily than previously with the kinetic equations. So, where's the advantage of the kinetic approach?

(5.1) PRESSURE

Show that the pressure tensor P is diagonal if the distribution function F is spherically symmetric. Under which conditions is P diagonal but with $p_x \neq p_y \neq p_z$?

(5.2) MAGNETOSPHERE AS A PLASMA ATMOSPHERE

Consider an isothermal electron-ion plasma in the gravitational field of the earth, $V_{e,i}(r) = -m_{e,i}gR^2/r$, where R is the earth's radius, r is measured from the earth's center, and g is the usual gravitational acceleration. Calculate the electric field near the earth's surface. What is the net force on an ion near the earth's surface?