

Problem sheet 4

Plasma Physics course
TU Dresden
Lecturer: Katerina Falk
Summer semester April – July 2020

Question 1:

Show that for any function $g\left(\frac{1}{2}mv^2 + q\Phi\right)$, which only depends on the total energy of a particle, solves the Vlasov equation:

$$\frac{\partial f}{\partial t} + v \frac{\partial f}{\partial x} - \frac{q}{m} \frac{\partial \Phi}{\partial x} \frac{\partial f}{\partial v} = 0$$

Question 2:

Verify that the mean velocity of a one-dimensional half-Maxwellian electron distribution is given by:

$$v_{mean} = \frac{1}{n_{e0}} \int_0^\infty v f_M^{(1)} dv = \left(\frac{k_B T_e}{2\pi m_e} \right)^{1/2}$$