Homework #3

1. Estimate the number of run-away electrons in completely ionized plasma for

$$E < E_{Dreicer}, \quad E_{Dreicer} = \frac{v_{ei}(T_e)m_e v_{Te}}{e}$$

2. Find the damping rate of an electromagnetic wave in plasma due to collisions.

Hint: Solve dispersion relation (3.17) with ε defined by (3.21). Look for solution in the form $\omega = \mathrm{Re}\,\omega + i\,\mathrm{Im}\,\omega$ and assume that $|\mathrm{Im}\,\omega| << \mathrm{Re}\,\omega$

3. Find the formula for high frequency pressure created by electrostatic electron plasma wave with non-homogeneous amplitude

$$E_z = \frac{1}{2}E(z)\exp(-i\omega t) + c.c.$$

Hint: Represent the force acting on an electron in the form

$$F_z = -\frac{1}{2}e[E\exp(-i\omega t) + \delta z \frac{\partial E}{\partial z}\exp(-i\omega t)] + c.c.$$

δz is fast displacement of an electron.