

Homework 14. Due November 6

Problem 1. 5x3 points. Beam distribution in phase space.

Consider a simplified 1D-Hamiltonian in terms of coordinates p_x and x

$$H = 1/2(A p_x^2 + Bx^2)$$

the equilibrium beam profile is a function of the Hamiltonian. If we assume it to have a Gaussian distribution

$$\rho = C \exp\left(-\frac{1}{2\sigma_{p_x}^2} p_x^2 - \frac{1}{2\sigma_x^2} x^2\right)$$

- Find the conditions where this Gaussian distribution satisfies Vlasov's equation.
- Find the normalization factor C where

$$\int \rho dx dp_x = 1$$

- Calculate the rms phase-space area of the beam