

PHYS-552: Advanced Statistical Mechanics

February 21, 2012

Due date: 1st of March, 2012

1 Time development of the density

An N -particle system has a Hamiltonian of the form

$$H = \sum_{i=1}^N \frac{p_i^2}{2m} + \sum_{i < j} V(|\mathbf{r}_i - \mathbf{r}_j|). \quad (1)$$

The function which gives the density in position space is

$$n(\mathbf{r}) = \sum_{i=1}^N \delta(\mathbf{r}_i - \mathbf{r}), \quad (2)$$

where $\delta(\mathbf{r} - \mathbf{r}')$ denotes the Dirac delta function in three dimensions. Write the equation of motion for $n(\mathbf{r})$ (in terms of the particle current phase function).

2 Pathria and Beale: Problem 3.1

3 Pathria and Beale: Problem 3.2

4 Pathria and Beale: Problem 3.3

5 Pathria and Beale: Problem 3.4

6 Pathria and Beale: Problem 3.6