

# Physics 540: Statistical Mechanics I

Read: LL 74-75

“LL 1” means section 1 from Landau and Lifshitz book

## Homework 8

### Exercise 1

Calculate the second virial coefficient  $B(T)$  for

a) the gas of hard spheres: pair potential is

$$U_{12}(r) = \begin{cases} +\infty, & r < d, \\ 0, & d < r. \end{cases}$$

b) the gas with intermolecular interaction of the form

$$U_{12}(r) = \begin{cases} +\infty, & r < d, \\ c(r^3 - R^3), & d \leq r \leq R, \\ 0, & R < r. \end{cases}$$

c) the gas with intermolecular interaction of the form

$$U_{12}(r) = \begin{cases} +\infty, & r < d, \\ c(d^3 - r^3), & d \leq r \leq R, \\ 0, & R < r. \end{cases}$$

d) Compare results of b) and c). Compare results of b,c) in limits  $c = 0$ ,  $c = -\infty$  with a).

### Exercise 2

For the monoatomic gas with an intermolecular interaction of the form given in exercise 1b find the correction to specific heats  $c_p$  and  $c_v$  in the second order of virial expansion (corresponding to  $B(T)$ ).