Exercises in Statistical Mechanics

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This exercises pool is intended for a graduate course in "statistical mechanics". Some of the problems are original, while other were assembled from various undocumented sources. In particular some problems originate from exams that were written by B. Horovitz (BGU), S. Fishman (Technion), and D. Cohen (BGU).

===== [Exercise 5012]

The Van der Waals equation

N spheres with radius R are contained in box volume V. The temperature is T. Find the pressure using a mean-field one particle approximation. Extend the result if there is an extra potential $u(r)$ between the particles. Show that you get the Van der Waals equation. Define the term "excluded volume" in this context, and identify the a and b coefficients.