Exercises in Statistical Mechanics

Based on course by Doron Cohen, has to be proofed
Department of Physics, Ben-Gurion University, Beer-Sheva 84105, Israel

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 3338]

Bose gas in graviation

Consider an ideal Bose gas of particles with mass m in a uniform gravitational field of accelaration g.

(a) Find the condensation temperature to leading order in g. [Hint: $g_{3/2}(\zeta) = g_{3/2}(1) - 2\sqrt{-\pi \ln \zeta} + O(\ln \zeta)$.]

(b) Show that the condensation is accompanied by a discontinuity in the specific heat at T_c. Calculate this discontinuity to leading order. [Hint: ΔC_V is due to discontinuity in $(\partial\zeta/\partial T)_{N,V}$].