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 2041]

The functions $N(E)$ and $Z(T)$ for particle in a box with gravitation

Find the distribution function $Z(\beta)$ of a particle in a three dimensional box with a gravitation field along axis $-Z$. Assume the box dimensions are $L \times L \times (Z_b - Z_a)$
Guideline: write the hamiltonian and calculate

$$Z(\beta) = \int\int\int \frac{dxdp_x}{z\pi}\frac{dydp_y}{2\pi}\frac{dzdp_z}{2\pi} e^{-\beta H(x,y,z,p_x p_y p_z)}$$