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 7487]

Velocity-velocity correlation and diffusion

(a) Write the Diffusion constant D in terms of the velocity-velocity correlation function. [Assume that this correlation has a finite range in time].

(b) Use Kubo's formula, assuming uncorrelated particles, to derive the Einstein-Nernst formula for the mobility $\mu = eD/k_BT$. [$\mu = \sigma(\omega = 0)/ne$ and n is the particle density].