

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 5721]

Baruch's C03.

- (a) Antiferromagnetism is a phenomenon akin to ferromagnetism. The simplest kind of an antiferromagnet consists of two equivalent antiparallel sublattices A and B such that members of A have only nearest neighbors in B and vice versa. Show that the mean field theory of this type of (Ising) antiferromagnetism yields a formula like the Curie-Weiss law for the susceptibility $\chi \sim (T - T_c)^{-1}$, except that $T - T_c$ is replaced by $T + T_c$; T_c is the transition temperature into antiferromagnetism (Neel's temperature).
- (b) Below T_c the susceptibility χ of an antiferromagnet drops again. Show that in the mean field theory of (a) the rate of increase of immediately below T_c is twice the rate of decrease immediately above. (Assume that the applied field is parallel to the antiferromagnetic orientation.)