

Exercises in Statistical Mechanics

Based on course by Doron Cohen, has to be proofed
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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 5825]

Ising model 1D, domain walls

Consider the one dimensional Ising model with the Hamiltonian $\mathcal{H} = -\sum_{n,n'} J(n-n')\sigma(n)\sigma(n')$ with $\sigma(n) = \pm 1$ at each site n , and long range interaction $J(n) = b/n^\gamma$ with $b > 0$. Find the energy of a domain wall at $n = 0$, i.e. all the $n < 0$ spins are ”down” and the others are ”up”. Show that the standard argument for the absence of spontaneous magnetization at finite temperatures fails if $\gamma < 2$.