Two-dimensional Ising Model with Non-homogenous Interactions

By: Ganikhodjaev, N (Ganikhodjaev, Nasir)[1]; Ibrahim, HHB (Ibrahim, Huda Husna Binti)[1]

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Abstract

In this paper we investigate the Ising model on Z(2) with competing interactions. In this model we consider J(1) as horizontal interactions and J(2) as vertical interactions where J(1),J(2) > 0. We prove that this model can reach a phase transition. Onsager considered the case where horizontal interaction parameter J1 and vertical interaction parameter J(2) are different. For any fixed J(1) and J(2), he showed that below a critical temperature T-c which depends on J(1) and J(2), phase transition occurs using some matrix transfer method. However in this paper we will prove the existence of phase transition using contours methods introduced by Sinai. We will show that there exists a beta(0) > 0 such that for beta > beta(0) there exist at least two limit Gibbs distribution which leads to the phenomena of phase transition.

Keywords

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Author Information

Reprint Address: Ganikhodjaev, N (reprint author)

Int Islamic Univ Malaysia, Dept Computat & Theoret Sci, Jalan Sultan Ahmad Shah, Kuantan 25200, Pahang, Malaysia.

Addresses:

[1] Int Islamic Univ Malaysia, Dept Computat & Theoret Sci, Jalan Sultan Ahmad Shah, Kuantan 25200, Pahang, Malaysia

E-mail Addresses: gnasir@iium.edu.my; hudahusna224491@gmail.com

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