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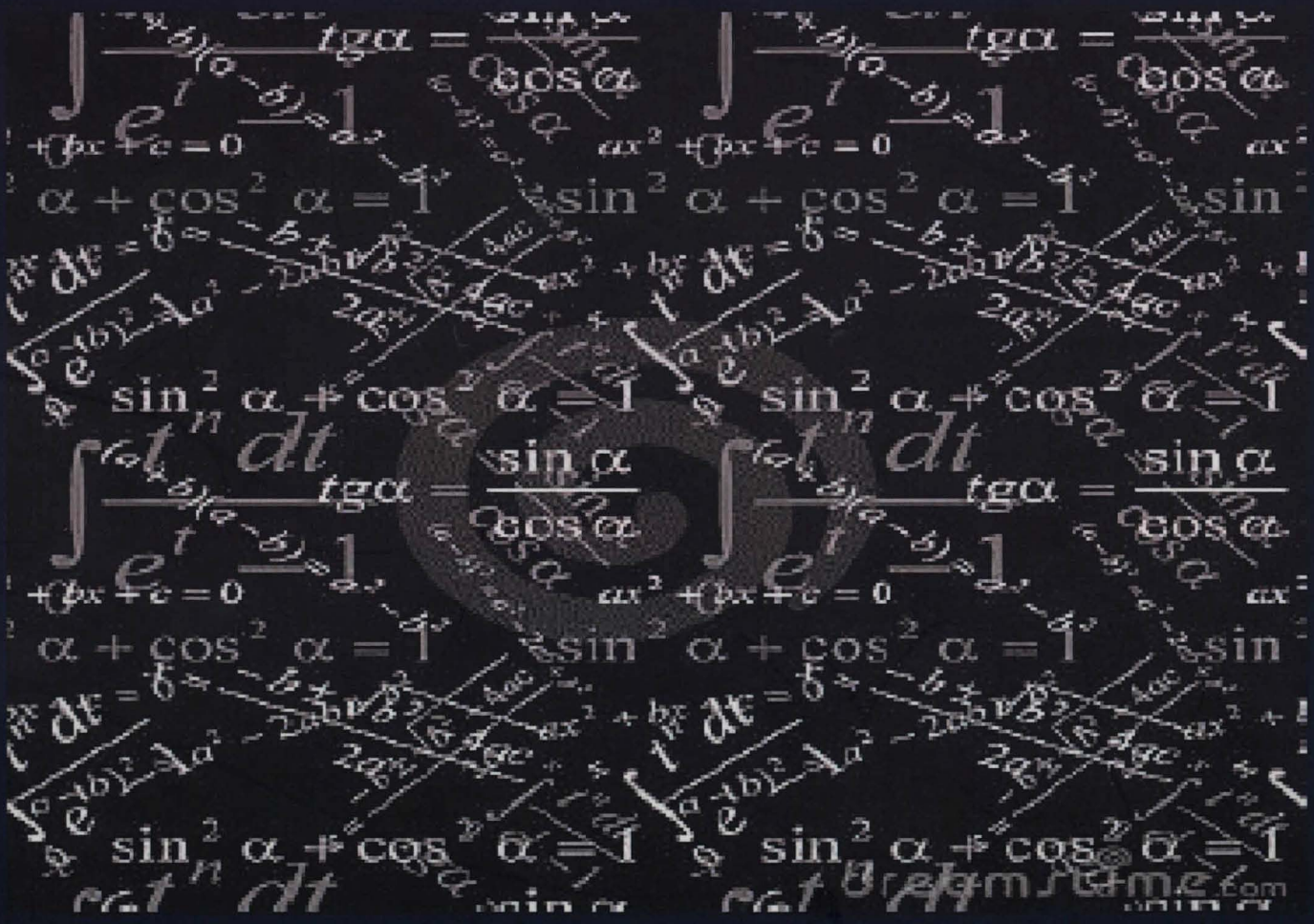

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ON THE EXISTENCE OF PHASE TRANSITION FOR ONE DIMENSIONAL *P*-ADIC COUNTABLE STATE POTTS MODEL

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Abstract

In the present paper we shall consider countable state p-adic Potts model on Z_+. A main aim is to establish the existence of the phase transition for the model. In our study, we essentially use one dimensionality of the model. To show it we reduce the problem, to the investigation of an infinite-dimensional nonlinear equation. We find a condition on weights to show that the derived equation has two solutions, which yields the existence of the phase transition. We prove that measures corresponding to first and second solutions are a p-adic Gibbs and generalized p-adic Gibbs measures, respectively. Note that it turns out that the finding condition does not depend on values of the prime p, and therefore, an analogous fact is not true when the number of spins is finite. Note that, in the usual real case, if one considers one dimensional translation-invariant model with nearest neighbor interaction, then such a model does not exhibit a phase transition.

Keywords: p-adic numbers; countable state; Potts model; p-adic Gibbs measure; weight; phase transition.

Introduction

Due to the assumption that p-adic numbers provide a more exact and more adequate description of microworld phenomena, starting the 1980s, various models described in the language of p-adic analysis have been actively studied (see for exmple [1],[3]). The well-known studies in this area are primarily devoted to investigating quantum mechanics models using equations of mathematical physics [11]. One of the first applications of p-adic numbers in quantum physics appeared in the framework of quantum logic in [2]. This model is especially interesting for us because it could not be described by using conventional real valued probability. Besides, it is also known that a number of p-adic models in physics cannot be described using ordinary Kolmogorov's probability theory. New probability models, namely p-adic values ones were investigated in [5]. Using that p-adic measure theory in