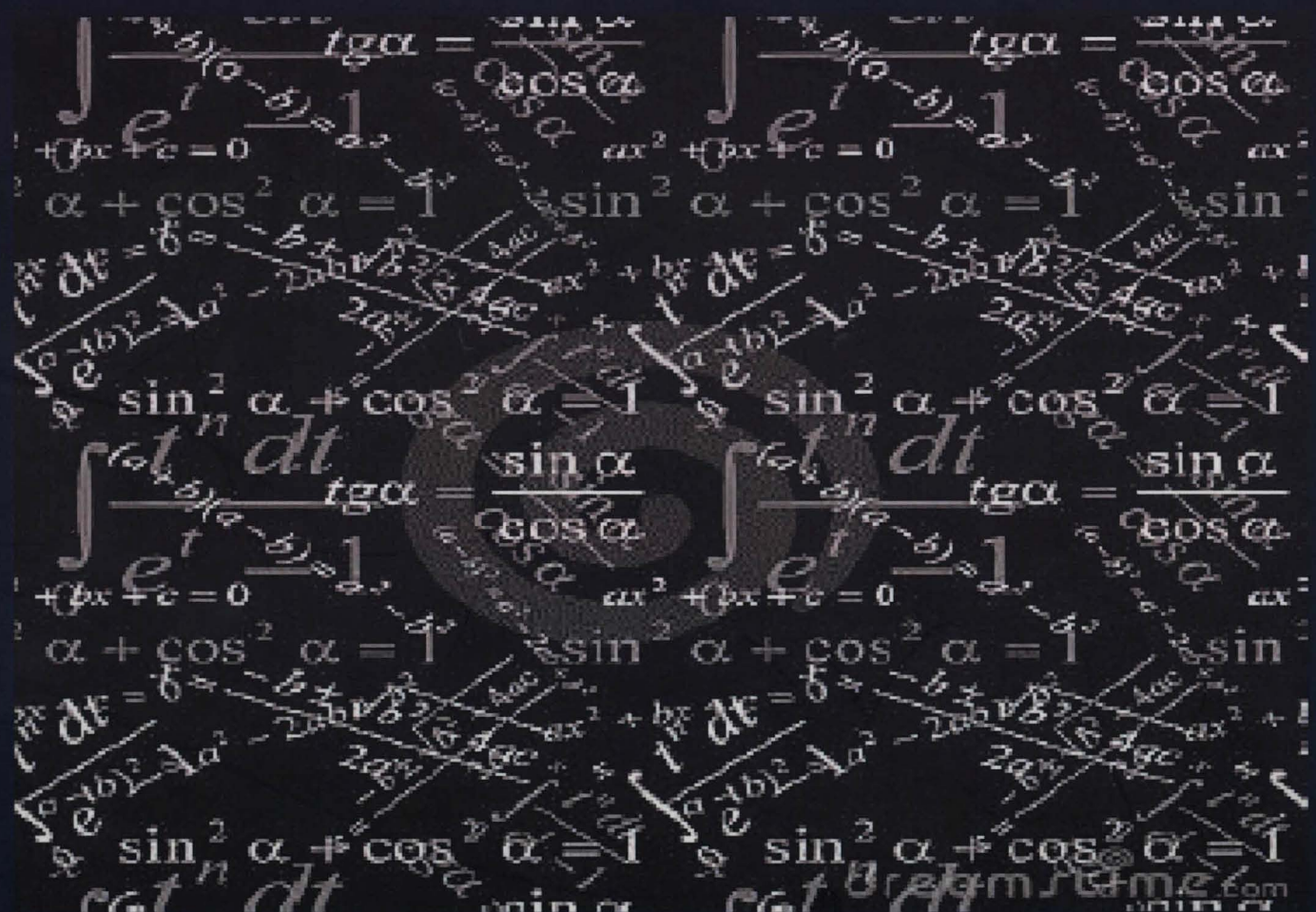




RECENT ACHIEVEMENTS IN DYNAMICAL SYSTEMS

Proceedings of Department of
Computational and Theoretical
Sciences, Faculty of Science, IIUM



Chief Editor : Farrukh Mukhamedov

Editors : Nasir Ganikhodjaev

: Mansoor Saburov

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Vol. 2



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
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Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Farrukh Mukhamedov, Nasir Ganikhodjaev & Mansoor Saburov
Recent Achievements in Dynamical Systems
Farrukh Mukhamedov, Nasir Ganikhodjaev & Mansoor Saburov

ISBN: 978-967-418-201-4

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

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A CORRELATION INEQUALITY FOR POTTS MODEL

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Abstract

In this paper, correlation inequalities which were considered only on Ising Model are extended to q-Potts model. The Potts model was introduced as a generalization of the Ising model to more than two components (spins). We introduce centered valued spins in place of the normal q valued spins to give it symmetrical properties.

Keywords: *Correlation inequality; Griffith's first inequality; Potts model;*

Introduction

Statistical physics seeks to explain the macroscopic behaviour of matter on the basis of its microscopic structure. This includes the analysis of simplified mathematical models [1]. Ferromagnetic metal can be regarded as being composed of elementary magnetic moments called spins which are arranged on the vertices of a crystal lattice. The orientation of each spin is random but subject to spin-spin interaction which favors their alignment. Griffiths' inequalities [2] exhibit the monotonic behaviour of the moments (correlations) in a ferromagnetic Ising system as a function of interactions [3]. By proving that these correlation inequalities can be applied to Potts model, calculations regarding interactions of q-spins will be simplified and more of its properties can be explained mathematically.

Preliminaries

Let N denote the index set $\{1, 2, \dots, n\}$, consider the space of all spin configurations $(\sigma_1, \sigma_2, \dots, \sigma_n)$ where each σ_i is allowed the values from 1 to q ($q \geq 2$). A general configuration is denoted by γ and $(\sigma_i)_\gamma$ is the number of values $(1, \dots, q)$ which appears as the i th spin (component) in γ . Let Ω be the set of all possible configurations.

For each pair (i, j) of distinct indices in N the extended real number

$$J_{ij} = J_{ji} \geq 0 \quad (1)$$

is given ($J_{ji} = \infty$ is permitted). The requirement $J_{ji} \geq 0$ is that the system be ferromagnetic. The Hamiltonian of the system is the real valued function on configurations, whose value at the configuration γ is