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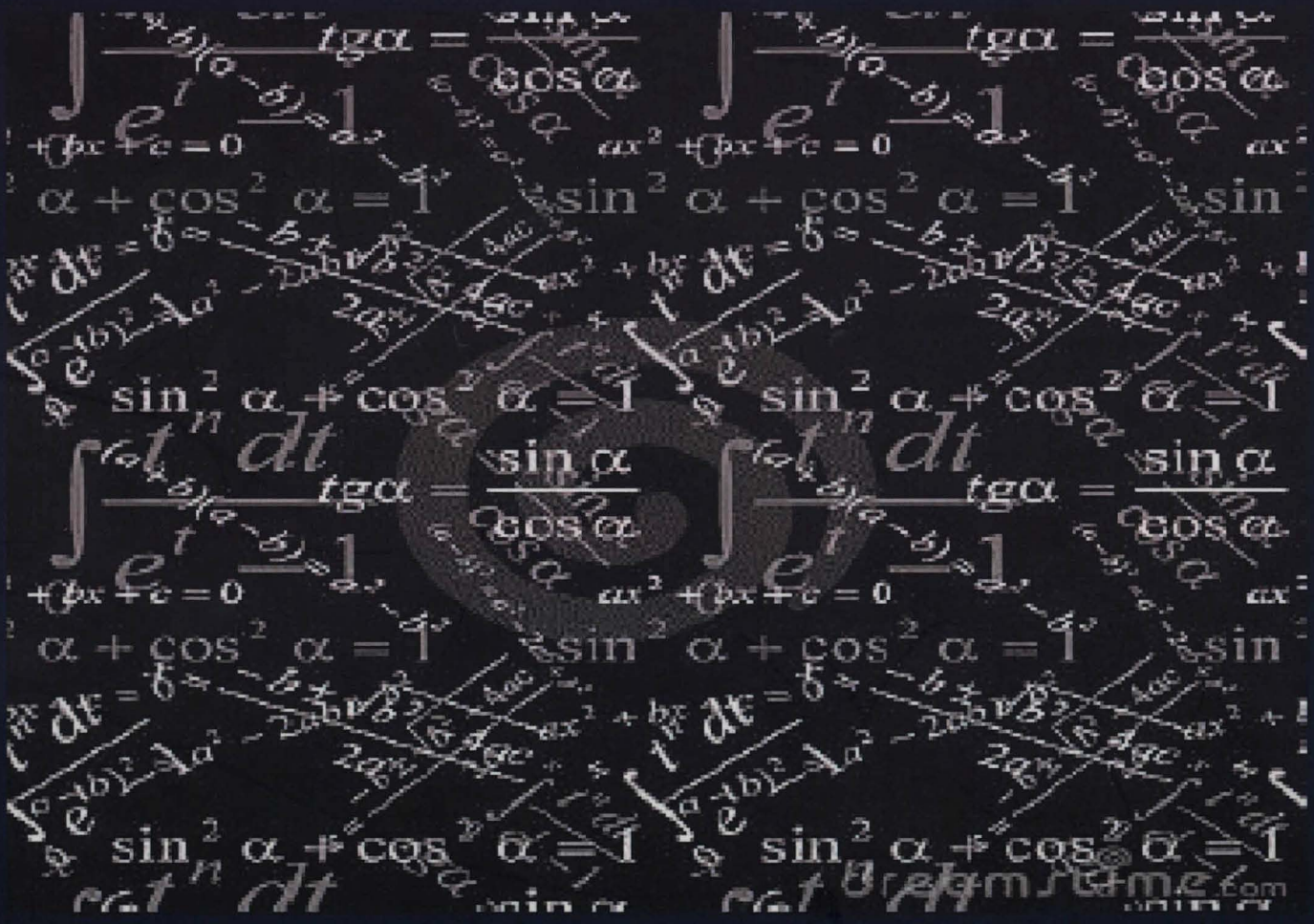

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Contents

Part I. Quadratic Operators and Their Dynamics

Part II. Dynamical Systems Arising From Physical Models

A CORRELATION INEQUALITY FOR POTTS MODEL

Nasir Ganikhodjaev[1] and **Fatimah Abdul Razak**[2]

[1]*Kulliyyah of Science International Islamic University Malaysia, 25200 Kuantan, Pahang*
Email: [1]*gnasir@iium.edu.my* [2]*fatimah84@gmail.com*

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 elementarymagnetic 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 $\{1,2,\cdots,n\}$, consider the space of all spin configurations $(\sigma_1,\sigma_2,..,\sigma_n)$ 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 thenumber of values $(1,\cdots,q)$ which appears as the ith 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

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

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