

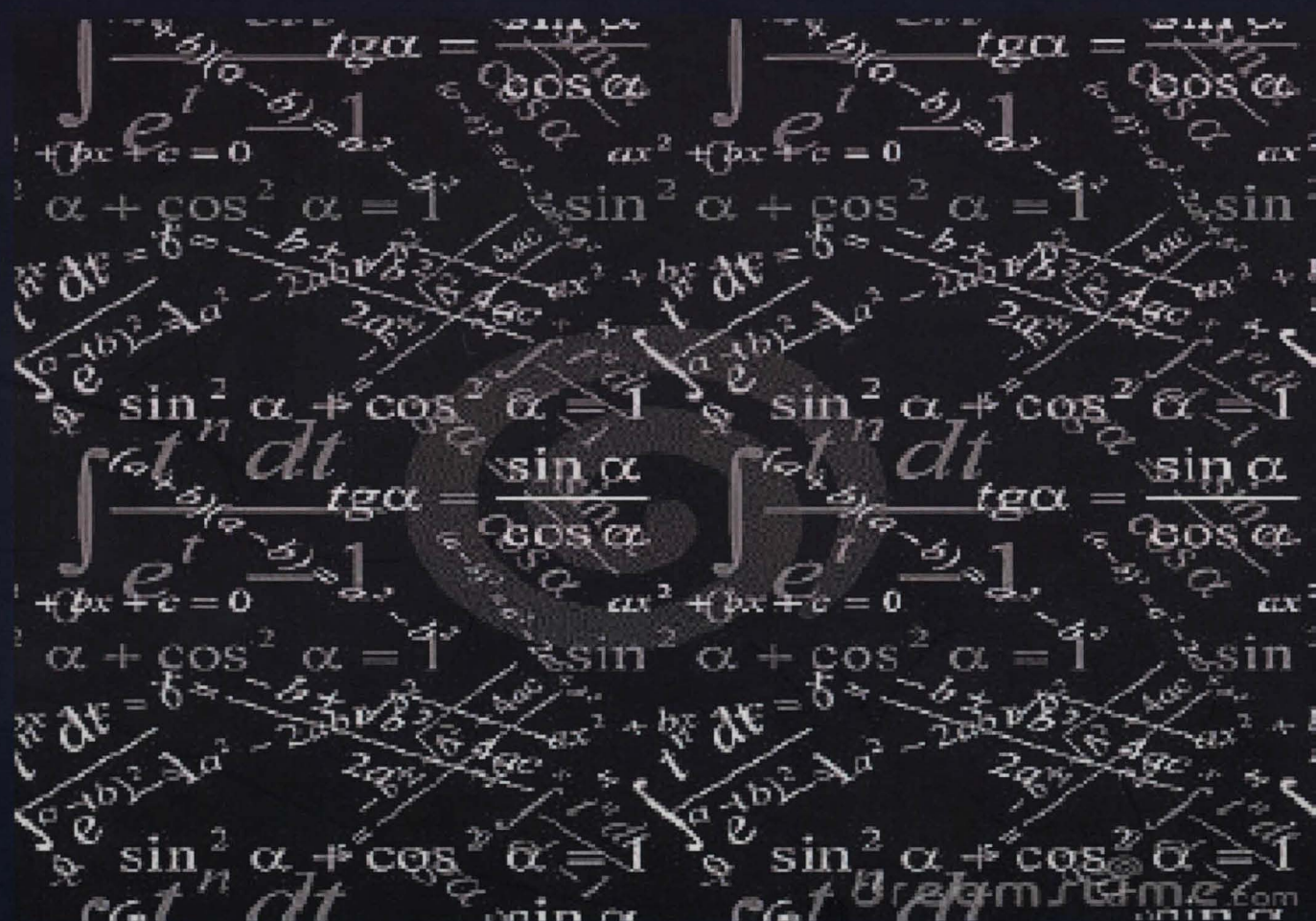


الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
يُؤَيِّدُ بَرَكَاتُهَا اِسْلَامًا اَنْتَارَا اَبْحَثًا مُلِدِّسًا

VOLUME 2

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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ON p -ADIC GENERALIZED LOGISTIC DYNAMICAL SYSTEM

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Abstract

Applications of p -adic numbers in p -adic mathematical physics, quantum mechanics stimulated increasing interest in the study of p -adic dynamical system. One of the interesting p -adic dynamical system is p -adic logistic map. It is known such a mapping is chaotic. In the present paper, we consider its cubic generalization namely we study a dynamical system of the form $f(x) = ax(1-x^2)$. The paper is devoted to the investigation of trajectory of the given system. We investigate the generalized logistic dynamical system with respect to parameter a . For the value of parameter, we consider the case when $|a|_p < 1$. In this case, we study the existence of the fixed points and periodic points for every prime number, p . Not only that, their behavior also being investigated whether such fixed points and periodic points are attracting, repelling or neutral. Moreover, we describe the Siegel discs of the system, since the structure of the orbits of the system is related to the geometry of the p -adic Siegel discs.

Keywords: p -adic; Siegel disc; attractors; trajectory; chaotic.

Introduction

Applications of p -adic numbers in p -adic mathematical physics, quantum mechanics [2] and many others [3],[7] stimulated increasing interest in the study of p -adic dynamical systems. p -adic numbers were first introduced by the German mathematician K.Hensel. During a century after their discovery they were considered mainly objects of pure mathematics.

The most studied discrete p -adic dynamical systems (iteration of maps) are so called monomial systems. Behavior of a p -adic dynamical system $f(x) = x^n$ over the fields of p -adic numbers \mathbb{Q}_p and \mathbb{C}_p was investigated [1],[4]. In [5], pertubated monomial dynamical system defined by function $f_q(x) = x^n + q(x)$, have been studied. It was investigated the connection between monomial and pertubated monomial systems. Formulas for the number of cycles of a specific length to a given system and the total number of cycles of such dynamical systems were provided. In [6], the generalization of logistic dynamical system was investigated. Namely, attractors and Siegel discs of the dynamical system defined by $g(x) = x^3 + ax^2$ has been investigated. Therefore in the present paper we are going to study another type of generalization of the