

# The Arithmetic Of Dynamical Systems Graduate Texts In Mathematics 241 By Silverman Joseph H Author Jun 06 2007 Hardcover

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The Arithmetic of Elliptic Curves Joseph H. Silverman 2010-11-19 The theory of elliptic curves is distinguished by its long history and by the diversity of the methods that have been used in its study. This book treats the arithmetic approach in its modern formulation, through the use of basic algebraic number theory and algebraic geometry. Following a brief discussion of the necessary algebro-geometric results, the book proceeds with an exposition of the geometry and the formal group of elliptic curves, elliptic curves over finite fields, the complex numbers, local fields, and global fields. Final chapters deal with integral and rational points, including Siegel's theorem and explicit computations for the curve  $Y^2 = X^3 + DX$ , while three appendices conclude the whole: Elliptic Curves in Characteristics 2 and 3, Group Cohomology, and an overview of more advanced topics.

Dynamical Numbers: Interplay between Dynamical Systems and Number Theory S. F. Koliada 2010 This volume contains papers from the special program and international conference on Dynamical Numbers which were held at the Max-Planck Institute in Bonn, Germany in 2009. These papers reflect the extraordinary range and depth of the interactions between ergodic theory and dynamical systems and number theory. Topics covered in the book include stationary measures, systems of enumeration, geometrical methods, spectral methods, and algebraic dynamical systems.

Ergodic Theory, Dynamical Systems, and the Continuing Influence of John C. Oxtoby Joseph Auslander 2016-11-29 This volume contains the proceedings of three conferences in Ergodic Theory and Symbolic Dynamics: the Oxtoby Centennial Conference, held from October 30–31, 2010, at Bryn Mawr College; the Williams Ergodic Theory Conference, held from July 27–29, 2012, at Williams College; and the AMS Special Session on Ergodic Theory and Symbolic Dynamics, held from January 17–18, 2014, in Baltimore, MD. This volume contains articles covering a variety of topics in measurable, symbolic and complex dynamics. It also includes a survey article on the life and work of John Oxtoby, providing a source of information about the many ways Oxtoby's work influenced mathematical thought in this and other fields.

Frontiers in Complex Dynamics Araceli Bonifant 2014-03-16 John Milnor, best known for his work in differential topology, K-theory, and dynamical systems, is one of only three mathematicians to have won the Fields medal, the Abel prize, and the Wolf prize, and is the only one to have received all three of the Leroy P. Steele prizes. In honor of his eightieth birthday, this book gathers together surveys and papers inspired by Milnor's work, from distinguished experts examining not only holomorphic dynamics in one and several variables, but also differential geometry, entropy theory, and combinatorial group theory. The book contains the last paper written by William Thurston, as well as a short paper by John Milnor himself. Introductory sections put the papers in mathematical and historical perspective, color figures are included, and an index facilitates browsing. This collection will be useful to students and researchers for decades to come. The contributors are Marco Abate, Marco Arizzi, Alexander Blokh, Thierry Bousch, Xavier Buff, Serge Cantat, Tao Chen, Robert Devaney, Alexandre Dezotti, Tien-Cuong Dinh, Romain Dujardin, Hugo García-Compeán, William Goldman, Rotislav Grigorchuk, John Hubbard, Yunping Jiang, Linda Keen, Jan Kiwi, Genadi Levin, Daniel Meyer, John Milnor, Carlos Moreira, Vincente Muñoz, Viet-Anh Nguyễn, Lex Oversteegen, Ricardo Pérez-Marco, Ross Ptacek, Jasmin Raissy, Pascale Roesch, Roberto Santos-Silva, Dierk Schleicher, Nessim Sibony, Daniel Smania, Tan Lei, William Thurston, Vladlen Timorin, Sebastian van Strien, and Alberto Verjovsky.

Trilogy of Numbers and Arithmetic - Book 1: History of Numbers and Arithmetic: An Information Perspective Mark Burgin

Current Trends in Analysis and Its Applications Vladimir V. Mityushev 2015-02-04 This book is a collection of papers from the 9th International ISAAC Congress held in 2013 in

Kraków, Poland. The papers are devoted to recent results in mathematics, focused on analysis and a wide range of its applications. These include up-to-date findings of the following topics: - Differential Equations: Complex and Functional Analytic Methods - Nonlinear PDE - Qualitative Properties of Evolution Models - Differential and Difference Equations - Toeplitz Operators - Wavelet Theory - Topological and Geometrical Methods of Analysis - Queueing Theory and Performance Evaluation of Computer Networks - Clifford and Quaternion Analysis - Fixed Point Theory - M-Frame Constructions - Spaces of Differentiable Functions of Several Real Variables Generalized Functions - Analytic Methods in Complex Geometry - Topological and Geometrical Methods of Analysis - Integral Transforms and Reproducing Kernels - Didactical Approaches to Mathematical Thinking Their wide applications in biomathematics, mechanics, queueing models, scattering, geomechanics etc. are presented in a concise, but comprehensible way, such that further ramifications and future directions can be immediately seen.

**Dynamics: Topology and Numbers** Pieter Moree 2020-02-12 This volume contains the proceedings of the conference Dynamics: Topology and Numbers, held from July 2–6, 2018, at the Max Planck Institute for Mathematics, Bonn, Germany. The papers cover diverse fields of mathematics with a unifying theme of relation to dynamical systems. These include arithmetic geometry, flat geometry, complex dynamics, graph theory, relations to number theory, and topological dynamics. The volume is dedicated to the memory of Sergiy Kolyada and also contains some personal accounts of his life and mathematics.

**Glimpses of Soliton Theory** Alex Kasman 2010 Solitons are explicit solutions to nonlinear partial differential equations exhibiting particle-like behavior. This is quite surprising, both mathematically and physically. Waves with these properties were once believed to be impossible by leading mathematical physicists, yet they are now not only accepted as a theoretical possibility but are regularly observed in nature and form the basis of modern fiber-optic communication networks. Glimpses of Soliton Theory addresses some of the hidden mathematical connections in soliton theory which have been revealed over the last half-century. It aims to convince the reader that, like the mirrors and hidden pockets used by magicians, the underlying algebro-geometric structure of soliton equations provides an elegant and surprisingly simple explanation of something seemingly miraculous. Assuming only multivariable calculus and linear algebra as prerequisites, this book introduces the reader to the KdV Equation and its multisoliton solutions, elliptic curves and Weierstrass  $\wp$ -functions, the algebra of differential operators, Lax Pairs and their use in discovering other soliton equations, wedge products and decomposability, the KP Equation and Sato's theory relating the Bilinear KP Equation to the geometry of Grassmannians. Notable features of the book include: careful selection of topics and detailed explanations to make this advanced subject accessible to any undergraduate math major, numerous worked examples and thought-provoking but not overly-difficult exercises, footnotes and lists of suggested readings to guide the interested reader to more information, and use of the software package Mathematica to facilitate computation and to animate the solutions under study. This book provides the reader with a unique glimpse of the unity of mathematics and could form the basis for a self-study, one-semester special topics, or "capstone" course.

**The Dynamical Mordell–Lang Conjecture** Jason P. Bell 2016-04-20 The Dynamical Mordell–Lang Conjecture is an analogue of the classical Mordell–Lang conjecture in the context of arithmetic dynamics. It predicts the behavior of the orbit of a point  $x$  under the action of an endomorphism  $f$  of a quasiprojective complex variety  $X$ . More precisely, it claims that for any point  $x$  in  $X$  and any subvariety  $V$  of  $X$ , the set of indices  $n$  such that the  $n$ -th iterate of  $x$  under  $f$  lies in  $V$  is a finite union of arithmetic progressions. In this book the authors present all known results about the Dynamical Mordell–Lang Conjecture, focusing mainly on a  $p$ -adic approach which provides a parametrization of the orbit of a point under an endomorphism of a variety.

**Number Theory Revealed: A Masterclass** Andrew Granville 2020-09-23 Number Theory Revealed: A Masterclass acquaints enthusiastic students with the “Queen of Mathematics”. The text offers a fresh take on congruences, power residues, quadratic residues, primes, and Diophantine equations and presents hot topics like cryptography, factoring, and primality testing. Students are also introduced to beautiful enlightening questions like the structure of Pascal's triangle mod  $p$  and modern twists on traditional questions like the values represented by binary quadratic forms, the anatomy of integers, and elliptic curves. This Masterclass edition contains many additional chapters and appendices not found in Number Theory Revealed: An Introduction, highlighting beautiful developments and inspiring other subjects in mathematics (like algebra). This allows instructors to tailor a course suited to their own (and their students') interests. There are new yet accessible topics like the curvature of circles in a tiling of a circle by circles, the latest discoveries on gaps between primes, a new proof of Mordell's Theorem for congruent elliptic curves, and a discussion of the abc-conjecture including its proof for polynomials. About the Author: Andrew Granville is the Canada Research Chair in Number Theory at the University of Montreal and professor of mathematics at University College London. He has won several international writing prizes for exposition in mathematics, including the 2008 Chauvenet Prize and the 2019 Halmos-Ford Prize, and is the author of Prime Suspects (Princeton University Press, 2019), a beautifully illustrated graphic novel murder mystery that explores surprising connections between the anatomies of integers and of permutations.

**Advances in Non-Archimedean Analysis** Helge Glöckner 2016-05-20 This volume contains the Proceedings of the 13th International Conference on  $p$ -adic Functional Analysis, held from August 12–16, 2014, at the University of Paderborn, Paderborn, Germany. The articles included in this book feature recent developments in various areas of non-Archimedean analysis, non-Archimedean functional analysis, representation theory, number theory, non-Archimedean dynamical systems and applications. Through a combination of new research articles and survey papers, this book provides the reader with an overview of current developments and techniques in non-Archimedean analysis as

well as a broad knowledge of some of the sub-areas of this exciting and fast-developing research area.

**Mathematics of Complexity and Dynamical Systems** Robert A. Meyers 2011-10-05 Mathematics of Complexity and Dynamical Systems is an authoritative reference to the basic tools and concepts of complexity, systems theory, and dynamical systems from the perspective of pure and applied mathematics. Complex systems are systems that comprise many interacting parts with the ability to generate a new quality of collective behavior through self-organization, e.g. the spontaneous formation of temporal, spatial or functional structures. These systems are often characterized by extreme sensitivity to initial conditions as well as emergent behavior that are not readily predictable or even completely deterministic. The more than 100 entries in this wide-ranging, single source work provide a comprehensive explication of the theory and applications of mathematical complexity, covering ergodic theory, fractals and multifractals, dynamical systems, perturbation theory, solitons, systems and control theory, and related topics. Mathematics of Complexity and Dynamical Systems is an essential reference for all those interested in mathematical complexity, from undergraduate and graduate students up through professional researchers.

**Symmetry in Chaos** Michael Field 2009-06-04 A striking full-colour book which explores how combining symmetry and chaos can lead to the construction of remarkable images. This book is an engaging look at the interplay of art and mathematics, and between symmetry and chaos. The underlying mathematics involved in the generation of the images is described.

**Research Directions in Number Theory** Jennifer S. Balakrishnan 2019-08-01 These proceedings collect several number theory articles, most of which were written in connection to the workshop WIN4: Women in Numbers, held in August 2017, at the Banff International Research Station (BIRS) in Banff, Alberta, Canada. It collects papers disseminating research outcomes from collaborations initiated during the workshop as well as other original research contributions involving participants of the WIN workshops. The workshop and this volume are part of the WIN network, aimed at highlighting the research of women and gender minorities in number theory as well as increasing their participation and boosting their potential collaborations in number theory and related fields.

**The Arithmetic of Dynamical Systems** J.H. Silverman 2010-05-05 This book provides an introduction to the relatively new discipline of arithmetic dynamics. Whereas classical discrete dynamics is the study of iteration of self-maps of the complex plane or real line, arithmetic dynamics is the study of the number-theoretic properties of rational and algebraic points under repeated application of a polynomial or rational function. A principal theme of arithmetic dynamics is that many of the fundamental problems in the theory of Diophantine equations have dynamical analogs. This graduate-level text provides an entry for students into an active field of research and serves as a standard reference for researchers.

**Algebraic and Topological Dynamics** S. F. Koli?ada 2005 This volume contains a collection of articles from the special program on algebraic and topological dynamics and a workshop on dynamical systems held at the Max-Planck Institute (Bonn, Germany). It reflects the extraordinary vitality of dynamical systems in its interaction with a broad range of mathematical subjects. Topics covered in the book include asymptotic geometric analysis, transformation groups, arithmetic dynamics, complex dynamics, symbolic dynamics, statistical properties of dynamical systems, and the theory of entropy and chaos. The book is suitable for graduate students and researchers interested in dynamical systems.

**Dynamical Systems and Ergodic Theory** Mark Pollicott 1998-01-29 Essentially a self-contained text giving an introduction to topological dynamics and ergodic theory.

**Ultrametric Pseudodifferential Equations and Applications** Andrei Yu. Khrennikov 2018-04-26 Starting from physical motivations and leading to practical applications, this book provides an interdisciplinary perspective on the cutting edge of ultrametric pseudodifferential equations. It shows the ways in which these equations link different fields including mathematics, engineering, and geophysics. In particular, the authors provide a detailed explanation of the geophysical applications of p-adic diffusion equations, useful when modeling the flows of liquids through porous rock. p-adic wavelets theory and p-adic pseudodifferential equations are also presented, along with their connections to mathematical physics, representation theory, the physics of disordered systems, probability, number theory, and p-adic dynamical systems. Material that was previously spread across many articles in journals of many different fields is brought together here, including recent work on the van der Put series technique. This book provides an excellent snapshot of the fascinating field of ultrametric pseudodifferential equations, including their emerging applications and currently unsolved problems.

**The Arithmetic of Elliptic Curves** Joseph H. Silverman 2009-04-20 The theory of elliptic curves is distinguished by its long history and by the diversity of the methods that have been used in its study. This book treats the arithmetic approach in its modern formulation, through the use of basic algebraic number theory and algebraic geometry. Following a brief discussion of the necessary algebro-geometric results, the book proceeds with an exposition of the geometry and the formal group of elliptic curves, elliptic curves over finite fields, the complex numbers, local fields, and global fields. Final chapters deal with integral and rational points, including Siegel's theorem and explicit computations for the curve  $Y^2 = X^3 + DX$ , while three appendices conclude the whole: Elliptic Curves in Characteristics 2 and 3, Group Cohomology, and an overview of more advanced topics.

**Geometry In Advanced Pure Mathematics** Bullett Shaun 2017-03-07 This book leads readers from a basic foundation to an advanced level understanding of geometry in advanced pure mathematics. Chapter by chapter, readers will be led from a foundation level understanding to advanced level understanding. This is the perfect text for graduate or PhD mathematical-science students looking for support in algebraic geometry, geometric group theory, modular group, holomorphic dynamics and hyperbolic geometry, syzygies and minimal resolutions, and minimal surfaces. Geometry in Advanced Pure Mathematics is the fourth volume of the LTCC Advanced Mathematics Series. This series is the first to provide advanced introductions to mathematical science topics to advanced students of mathematics. Editor the three joint heads of the London Taught Course Centre

for PhD Students in the Mathematical Sciences (LTCC), each book supports readers in broadening their mathematical knowledge outside of their immediate research disciplines while also covering specialized key areas.

**Applied Algebraic Dynamics** Vladimir Anashin 2009 This monograph presents recent developments of the theory of algebraic dynamical systems and their applications to computer sciences, cryptography, cognitive sciences, psychology, image analysis, and numerical simulations. The most important mathematical results presented in this book are in the fields of ergodicity,  $p$ -adic numbers, and noncommutative groups. For students and researchers working on the theory of dynamical systems, algebra, number theory, measure theory, computer sciences, cryptography, and image analysis.

**Dynamical Systems, Ergodic Theory and Applications** L.A. Bunimovich 2000-04-05 This EMS volume, the first edition of which was published as *Dynamical Systems II*, EMS 2, familiarizes the reader with the fundamental ideas and results of modern ergodic theory and its applications to dynamical systems and statistical mechanics. The enlarged and revised second edition adds two new contributions on ergodic theory of flows on homogeneous manifolds and on methods of algebraic geometry in the theory of interval exchange transformations.

**Pluripotential Theory** Giorgio Patrizio 2013-05-16 Pluripotential theory is a very powerful tool in geometry, complex analysis and dynamics. This volume brings together the lectures held at the 2011 CIME session on "pluripotential theory" in Cetraro, Italy. This CIME course focused on complex Monge-Ampère equations, applications of pluripotential theory to Kahler geometry and algebraic geometry and to holomorphic dynamics. The contributions provide an extensive description of the theory and its very recent developments, starting from basic introductory materials and concluding with open questions in current research.

**An Experimental Introduction to Number Theory** Benjamin Hutz 2018-04-17 This book presents material suitable for an undergraduate course in elementary number theory from a computational perspective. It seeks to not only introduce students to the standard topics in elementary number theory, such as prime factorization and modular arithmetic, but also to develop their ability to formulate and test precise conjectures from experimental data. Each topic is motivated by a question to be answered, followed by some experimental data, and, finally, the statement and proof of a theorem. There are numerous opportunities throughout the chapters and exercises for the students to engage in (guided) open-ended exploration. At the end of a course using this book, the students will understand how mathematics is developed from asking questions to gathering data to formulating and proving theorems. The mathematical prerequisites for this book are few. Early chapters contain topics such as integer divisibility, modular arithmetic, and applications to cryptography, while later chapters contain more specialized topics, such as Diophantine approximation, number theory of dynamical systems, and number theory with polynomials. Students of all levels will be drawn in by the patterns and relationships of number theory uncovered through data driven exploration.

**Women in Numbers Europe II** Irene I. Bouw 2018-06-01 Inspired by the September 2016 conference of the same name, this second volume highlights recent research in a wide range of topics in contemporary number theory and arithmetic geometry. Research reports from projects started at the conference, expository papers describing ongoing research, and contributed papers from women number theorists outside the conference make up this diverse volume. Topics cover a broad range of topics such as arithmetic dynamics, failure of local-global principles, geometry in positive characteristics, and heights of algebraic integers. The use of tools from algebra, analysis and geometry, as well as computational methods exemplifies the wealth of techniques available to modern researchers in number theory. Exploring connections between different branches of mathematics and combining different points of view, these papers continue the tradition of supporting and highlighting the contributions of women number theorists at a variety of career stages. Perfect for students and researchers interested in the field, this volume provides an easily accessible introduction and has the potential to inspire future work.

**Berkovich Spaces and Applications** Antoine Ducros 2014-11-21 We present an introduction to Berkovich's theory of non-archimedean analytic spaces that emphasizes its applications in various fields. The first part contains surveys of a foundational nature, including an introduction to Berkovich analytic spaces by M. Temkin, and to étale cohomology by A. Ducros, as well as a short note by C. Favre on the topology of some Berkovich spaces. The second part focuses on applications to geometry. A second text by A. Ducros contains a new proof of the fact that the higher direct images of a coherent sheaf under a proper map are coherent, and B. Rémy, A. Thuillier and A. Werner provide an overview of their work on the compactification of Bruhat-Tits buildings using Berkovich analytic geometry. The third and final part explores the relationship between non-archimedean geometry and dynamics. A contribution by M. Jonsson contains a thorough discussion of non-archimedean dynamical systems in dimension 1 and 2. Finally a survey by J.-P. Otal gives an account of Morgan-Shalen's theory of compactification of character varieties. This book will provide the reader with enough material on the basic concepts and constructions related to Berkovich spaces to move on to more advanced research articles on the subject. We also hope that the applications presented here will inspire the reader to discover new settings where these beautiful and intricate objects might arise.

**Fifth International Congress of Chinese Mathematicians** Lizhen Ji 2012 This two-part volume represents the proceedings of the Fifth International Congress of Chinese Mathematicians, held at Tsinghua University, Beijing, in December 2010. The Congress brought together eminent Chinese and overseas mathematicians to discuss the latest developments in pure and applied mathematics. Included are 60 papers based on lectures given at the conference.

**Rational Iteration** Norbert Steinmetz 1993 The series is devoted to the publication of monographs and high-level textbooks in mathematics, mathematical methods and their applications. Apart from covering important areas of current interest, a major aim is to make topics of an interdisciplinary nature accessible to the non-specialist. The works in this

series are addressed to advanced students and researchers in mathematics and theoretical physics. In addition, it can serve as a guide for lectures and seminars on a graduate level. The series de Gruyter Studies in Mathematics was founded ca. 35 years ago by the late Professor Heinz Bauer and Professor Peter Gabriel with the aim to establish a series of monographs and textbooks of high standard, written by scholars with an international reputation presenting current fields of research in pure and applied mathematics. While the editorial board of the Studies has changed with the years, the aspirations of the Studies are unchanged. In times of rapid growth of mathematical knowledge carefully written monographs and textbooks written by experts are needed more than ever, not least to pave the way for the next generation of mathematicians. In this sense the editorial board and the publisher of the Studies are devoted to continue the Studies as a service to the mathematical community. Please submit any book proposals to Niels Jacob. Titles in planning include Flavia Smarazzo and Alberto Tesei, *Measure Theory: Radon Measures, Young Measures, and Applications to Parabolic Problems* (2019) Elena Cordero and Luigi Rodino, *Time-Frequency Analysis of Operators* (2019) Mark M. Meerschaert, Alla Sikorskii, and Mohsen Zayernouri, *Stochastic and Computational Models for Fractional Calculus*, second edition (2020) Mariusz Lemańczyk, *Ergodic Theory: Spectral Theory, Joinings, and Their Applications* (2020) Marco Abate, *Holomorphic Dynamics on Hyperbolic Complex Manifolds* (2021) Miroslava Antic, Joeri Van der Veken, and Luc Vrancken, *Differential Geometry of Submanifolds: Submanifolds of Almost Complex Spaces and Almost Product Spaces* (2021) Kai Liu, Ilpo Laine, and Lianzhong Yang, *Complex Differential-Difference Equations* (2021) Rajendra Vasant Gurjar, Kayo Masuda, and Masayoshi Miyanishi, *Affine Space Fibrations* (2022)

**Dynamical Systems, Number Theory and Applications** Thomas Hagen 2016-01-25 This volume consists of a selection of research-type articles on dynamical systems, evolution equations, analytic number theory and closely related topics. A strong emphasis is on a fair balance between theoretical and more applied work, thus spanning the chasm between abstract insight and actual application. Several of the articles are expected to be in the intersection of dynamical systems theory and number theory. One article will likely relate the topics presented to the academic achievements and interests of Prof. Leutbecher and shed light on common threads among all the contributions.

Contents: Preface Biographical Note on Armin Leutbecher (S Walcher) Das Jahr 1934 ... (J Fischer) Explicit Expressions for Equivariant Minimal Lagrangian Surfaces (J F Dorfmeister & H Ma) Rational Parameter Rays of the Multibrot Sets (D Eberlein, S Mukherjee & D Schleicher) The Matovich-Pearson Equations Revisited (T Hagen) Diffeomorphisms with Stable Manifolds as Basin Boundaries (S Hayes & Ch Wolf) A New Type of Functional Equations of Euler Products (B Heim) The Hexagonal Lattice and the Epstein Zeta Function (A Henn) On Putative  $q$ -Analogues of the Fano Plane (Th Honold & M Kiermaier) Integral Orthogonal Groups (A Krieg) The Role of Fourier Analysis in X-Ray Crystallography (F Rupp & J Scheurle) An Elementary Proof for Joint Continuity of Semiflows (S Schmitz) A Convergent String Method (H Schwetlick & J Zimmer) Variational Symmetries and Pluri-Lagrangian Systems (Y B Suris) Readership: Researchers in algebra and number theory, dynamical systems and analysis and differential equations. Key Features: This versatile book covers state-of-the-art work in dynamical systems, analytic number theory and applied analysis. It appeals to a wide audience due to its broad range of topics, highlighting both the breadth and the depth of modern analytical work without losing sight of a common core. Keywords: Dynamical Systems; Evolution Equations; Number Theory; Differential Geometry

**Advances in Ultrametric Analysis** Alain Escassut 2018-03-26 Articles included in this book feature recent developments in various areas of non-Archimedean analysis: summation of  $p$ -adic series, rational maps on the projective line over  $\mathbb{C}_p$ , non-Archimedean Hahn-Banach theorems, ultrametric Calkin algebras,  $p$ -modules with a convex base, non-compact Trace class operators and Schatten-class operators in  $p$ -adic Hilbert spaces, algebras of strictly differentiable functions, inverse function theorem and mean value theorem in Levi-Civita fields, ultrametric spectra of commutative non-unital Banach rings, classes of non-Archimedean Köthe spaces,  $p$ -adic Nevanlinna theory and applications, and sub-coordinate representation of  $p$ -adic functions. Moreover, a paper on the history of  $p$ -adic analysis with a comparative summary of non-Archimedean fields is presented. Through a combination of new research articles and a survey paper, this book provides the reader with an overview of current developments and techniques in non-Archimedean analysis as well as a broad knowledge of some of the sub-areas of this exciting and fast-developing research area.

**Dynamical Systems and Ergodic Theory** Mark Pollicott 1998-01-29 This book is an introduction to topological dynamics and ergodic theory. It is divided into a number of relatively short chapters with the intention that each may be used as a component of a lecture course tailored to the particular audience. The authors provide a number of applications, principally to number theory and arithmetic progressions (through Van der Waerden's theorem and Szemerédi's theorem). This text is suitable for advanced undergraduate and beginning graduate students.

**Handbook of Dynamical Systems** B. Fiedler 2002-02-21 This handbook is volume II in a series collecting mathematical state-of-the-art surveys in the field of dynamical systems. Much of this field has developed from interactions with other areas of science, and this volume shows how concepts of dynamical systems further the understanding of mathematical issues that arise in applications. Although modeling issues are addressed, the central theme is the mathematically rigorous investigation of the resulting differential equations and their dynamic behavior. However, the authors and editors have made an effort to ensure readability on a non-technical level for mathematicians from other fields and for other scientists and engineers. The eighteen surveys collected here do not aspire to encyclopedic completeness, but present selected paradigms. The surveys are grouped into those emphasizing finite-dimensional methods, numerics, topological methods, and partial differential equations. Application areas include the dynamics of neural networks, fluid flows, nonlinear optics, and many others. While the survey articles can be read independently, they deeply share recurrent themes from dynamical systems.

Attractors, bifurcations, center manifolds, dimension reduction, ergodicity, homoclinicity, hyperbolicity, invariant and inertial manifolds, normal forms, recurrence, shift dynamics, stability, to name just a few, are ubiquitous dynamical concepts throughout the articles.

KdV & KAM Thomas Kappeler 2013-04-17 This text treats the Korteweg-de Vries (KdV) equation with periodic boundary conditions. This equation models waves in homogeneous, weakly nonlinear and weakly dispersive media in general. For the first time, these important results are comprehensively covered in book form, authored by internationally renowned experts in the field.

Potential Theory and Dynamics on the Berkovich Projective Line Matthew Baker 2010-03-10 The purpose of this book is to develop the foundations of potential theory and rational dynamics on the Berkovich projective line over an arbitrary complete, algebraically closed non-Archimedean field. In addition to providing a concrete and "elementary" introduction to Berkovich analytic spaces and to potential theory and rational iteration on the Berkovich line, the book contains applications to arithmetic geometry and arithmetic dynamics. A number of results in the book are new, and most have not previously appeared in book form. Three appendices--on analysis,  $\mathbb{R}$ -trees, and Berkovich's general theory of analytic spaces--are included to make the book as self-contained as possible. The authors first give a detailed description of the topological structure of the Berkovich projective line and then introduce the Hsia kernel, the fundamental kernel for potential theory. Using the theory of metrized graphs, they define a Laplacian operator on the Berkovich line and construct theories of capacities, harmonic and subharmonic functions, and Green's functions, all of which are strikingly similar to their classical complex counterparts. After developing a theory of multiplicities for rational functions, they give applications to non-Archimedean dynamics, including local and global equidistribution theorems, fixed point theorems, and Berkovich space analogues of many fundamental results from the classical Fatou-Julia theory of rational iteration. They illustrate the theory with concrete examples and exposit Rivera-Letelier's results concerning rational dynamics over the field of  $p$ -adic complex numbers. They also establish Berkovich space versions of arithmetic results such as the Fekete-Szegő theorem and Bilu's equidistribution theorem.

Arithmetic Differential Equations Alexandru Buium 2005 This research monograph develops an arithmetic analogue of the theory of ordinary differential equations: functions are replaced here by integer numbers, the derivative operator is replaced by a "Fermat quotient operator", and differential equations (viewed as functions on jet spaces) are replaced by "arithmetic differential equations". The main application of this theory concerns the construction and study of quotients of algebraic curves by correspondences with infinite orbits. Any such quotient reduces to a point in usual algebraic geometry. But many quotients as above cease to be trivial (and become quite interesting) if one enlarges algebraic geometry by using arithmetic differential equations in place of algebraic equations. The book partly follows a series of papers written by the author; however, a substantial part of the material presented here has never been published before. For most of the book the only prerequisites are the basic facts of algebraic geometry and number theory.

The Arithmetic of Polynomial Dynamical Pairs Charles Favre 2022-06-14 New mathematical research in arithmetic dynamics In *The Arithmetic of Polynomial Dynamical Pairs*, Charles Favre and Thomas Gauthier present new mathematical research in the field of arithmetic dynamics. Specifically, the authors study one-dimensional algebraic families of pairs given by a polynomial with a marked point. Combining tools from arithmetic geometry and holomorphic dynamics, they prove an "unlikely intersection" statement for such pairs, thereby demonstrating strong rigidity features for them. They further describe one-dimensional families in the moduli space of polynomials containing infinitely many postcritically finite parameters, proving the dynamical André-Oort conjecture for curves in this context, originally stated by Baker and DeMarco. This is a reader-friendly invitation to a new and exciting research area that brings together sophisticated tools from many branches of mathematics.

Knots and Primes Masanori Morishita 2011-11-27 This is a foundation for arithmetic topology - a new branch of mathematics which is focused upon the analogy between knot theory and number theory. Starting with an informative introduction to its origins, namely Gauss, this text provides a background on knots, three manifolds and number fields. Common aspects of both knot theory and number theory, for instance knots in three manifolds versus primes in a number field, are compared throughout the book. These comparisons begin at an elementary level, slowly building up to advanced theories in later chapters. Definitions are carefully formulated and proofs are largely self-contained. When necessary, background information is provided and theory is accompanied with a number of useful examples and illustrations, making this a useful text for both undergraduates and graduates in the field of knot theory, number theory and geometry. ?

Recent Trends in Ergodic Theory and Dynamical Systems Siddhartha Bhattacharya 2015-01-26 This volume contains the proceedings of the International Conference on Recent Trends in Ergodic Theory and Dynamical Systems, in honor of S. G. Dani's 65th Birthday, held December 26-29, 2012, in Vadodara, India. This volume covers many topics of ergodic theory, dynamical systems, number theory and probability measures on groups. Included are papers on Teichmüller dynamics, Diophantine approximation, iterated function systems, random walks and algebraic dynamical systems, as well as two surveys on the work of S. G. Dani.

Fractal Geometry and Dynamical Systems in Pure and Applied Mathematics: Fractals in pure mathematics David Carfi 2013-10-22 This volume contains the proceedings from three conferences: the PISRS 2011 International Conference on Analysis, Fractal Geometry, Dynamical Systems and Economics, held November 8-12, 2011 in Messina, Italy; the AMS Special Session on Fractal Geometry in Pure and Applied Mathematics, in memory of Benoit Mandelbrot, held January 4-7, 2012, in Boston, MA; and the AMS Special Session on Geometry and Analysis on Fractal Spaces, held March 3-4, 2012, in Honolulu, HI. Articles in this volume cover fractal geometry (and some aspects of dynamical systems) in pure mathematics. Also included are articles discussing a variety of connections of fractal geometry with other fields of mathematics, including probability theory,

number theory, geometric measure theory, partial differential equations, global analysis on non-smooth spaces, harmonic analysis and spectral geometry. The companion volume (Contemporary Mathematics, Volume 601) focuses on applications of fractal geometry and dynamical systems to other sciences, including physics, engineering, computer science, economics, and finance.

**Dynamics in One Non-Archimedean Variable** Robert L. Benedetto 2019-03-05 The theory of complex dynamics in one variable, initiated by Fatou and Julia in the early twentieth century, concerns the iteration of a rational function acting on the Riemann sphere. Building on foundational investigations of  $p$ -adic dynamics in the late twentieth century, dynamics in one non-archimedean variable is the analogous theory over non-archimedean fields rather than over the complex numbers. It is also an essential component of the number-theoretic study of arithmetic dynamics. This textbook presents the fundamentals of non-archimedean dynamics, including a unified exposition of Rivera-Letelier's classification theorem, as well as results on wandering domains, repelling periodic points, and equilibrium measures. The Berkovich projective line, which is the appropriate setting for the associated Fatou and Julia sets, is developed from the ground up, as are relevant results in non-archimedean analysis. The presentation is accessible to graduate students with only first-year courses in algebra and analysis under their belts, although some previous exposure to non-archimedean fields, such as the  $p$ -adic numbers, is recommended. The book should also be a useful reference for more advanced students and researchers in arithmetic and non-archimedean dynamics.