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Curvature -1""1.3.3 Example 4: The Ergodic Automorphisms of the Torus""; ""1.4 Martingales in Hyperbolic Geometry""; ""1.4.1 Example 5: The Geodesic Flow in Dimension d, Constant Curvature (Compact Case)""; ""1.4.2 Example 6: The Geodesic Flow on a Surface with Constant Curvature of Finite Volume""; ""1.4.3 Example 7: The Diagonal Flows on Compact Quotients of $SL(d, \mathbb{R})$ ""; ""1.4.4 Examples of Geometrical Applications""; ""1.5 Mixing and Equidistribution""; ""1.5.1 Mixing and Directional Regularity""
 ""1.5.2 Example 8: Composing Different Transformations""""1.6 Some General References""; ""References""; ""Chapter 2 Semiclassical Approach for the Ruelle-Pollicott Spectrum of Hyperbolic Dynamics""; ""2.1 Introduction""; ""2.1.1 The General Idea Behind the Semiclassical Approach""; ""2.2 Hyperbolic Dynamics""; ""2.2.1 Anosov Maps""; ""2.2.1.1 General Properties of Anosov Diffeomorphism""; ""2.2.2 Prequantum Anosov Maps""; ""2.2.3 Anosov Vector Field""; ""2.2.3.1 General Properties of Contact Anosov Flows""; ""2.3 Transfer Operators and Their Discrete Ruelle-Pollicott Spectrum""
 ""2.3.1 Ruelle Spectrum for a Basic Model of Expanding Map""""2.3.1.1 Transfer Operator""; ""2.3.1.2 Asymptotic Expansion""; ""2.3.1.3 Ruelle Spectrum""; ""2.3.1.4 Arguments of Proof of Theorem 2.4""; ""2.3.1.5 Ruelle Spectrum for Expanding Map in \mathbb{R}^d ""; ""2.3.2 Ruelle Spectrum of Anosov map""; ""2.3.2.1 Proof of Theorem 2.6""; ""2.3.2.2 The Atiyah-Bott Trace Formula""; ""2.3.3 Ruelle Band Spectrum for Prequantum Anosov Maps""; ""2.3.3.1 Proof of Theorem 2.7""; ""2.3.4 Ruelle Spectrum for Anosov Vector Fields""; ""2.3.4.1 Sketch of Proof of Theorem 2.9""
 ""2.3.5 Ruelle Band Spectrum for Contact Anosov Vector Fields""""2.3.5.1 Case of Geodesic Flow on Constant Curvature Surface""; ""2.3.5.2 General Case""; ""2.3.5.3 Consequence for Correlation Functions Expansion""; ""2.3.5.4 Proof of Theorem 2.10""; ""2.4 Trace Formula and Zeta Functions""; ""2.4.1 Gutzwiller Trace Formula for Anosov Prequantum Map""; ""2.4.1.1 The Question of Existence of a ``Natural Quantization""""; ""2.4.2 Gutzwiller Trace Formula for Contact Anosov Flows""; ""2.4.2.1 Zeta Function""; ""2.4.2.2 Application: Counting Periodic Orbits""
 ""2.4.2.3 Semiclassical Zeta Function""

Sommario/riassunto

The work of E. Hopf and G.A. Hedlund, in the 1930s, on transitivity and ergodicity of the geodesic flow for hyperbolic surfaces, marked the beginning of the investigation of the statistical properties and stochastic behavior of the flow. The first central limit theorem for the geodesic flow was proved in the 1960s by Y. Sinai for compact hyperbolic manifolds. Since then, strong relationships have been found between the fields of ergodic theory, analysis, and geometry. Different approaches and new tools have been developed to study the geodesic flow, including measure theory, thermodynamic formalism, transfer operators, Laplace operators, and Brownian motion. All these different points of view have led to a deep understanding of more general dynamical systems, in particular the so-called Anosov systems, with applications to geometric problems such as counting, equidistribution, mixing, and recurrence properties of the orbits. This book comprises two independent texts that provide a self-contained introduction to two different approaches to the investigation of hyperbolic dynamics. The first text, by S. Le Borgne, explains the method of martingales for the central limit theorem. This approach can be used in several situations, even for weakly hyperbolic flows, and the author presents a good number of examples and applications to equidistribution and mixing. The second text, by F. Faure and M. Tsujii, concerns the semiclassical approach, by operator theory: chaotic dynamics is

described through the spectrum of the associated transfer operator, with applications to the asymptotic counting of periodic orbits. The book will be of interest for a broad audience, from PhD and Post-Doc students to experts working on geometry and dynamics.
