

Contents

Preface	xi
Introduction	1
Chapter 1. Lyapunov Stability Theory of Differential Equations	5
1.1. Lyapunov Exponents for Differential Equations	6
1.2. Abstract Theory of Lyapunov Exponents	9
1.3. Forward and Backward Regularity	16
1.4. Stability Theory of Nonautonomous Differential Equations	26
1.5. Lyapunov Regularity and the Oseledets Decomposition	31
Chapter 2. Elements of Nonuniform Hyperbolic Theory	35
2.1. Dynamical Systems with Nonzero Lyapunov Exponents	36
2.2. Nonuniform Hyperbolicity and Regular Sets	45
2.3. Hölder Continuity of Invariant Distributions	48
2.4. Proof of the Multiplicative Ergodic Theorem	51
Chapter 3. Examples of Nonuniformly Hyperbolic Systems	61
3.1. Anosov Diffeomorphisms	61
3.2. Diffeomorphisms with Nonzero Lyapunov Exponents on Surfaces	66
3.3. A Flow with Nonzero Lyapunov Exponents	71
3.4. Geodesic Flows on Compact Manifolds of Nonpositive Curvature	74
Chapter 4. Local Manifold Theory	81
4.1. Existence of Local Stable Manifolds	81
4.2. Basic Properties of Stable and Unstable Manifolds	94
4.3. Absolute Continuity Property	99
4.4. Computing the Jacobian of the Holonomy Map	109
4.5. Partial Hyperbolicity	111
Chapter 5. Ergodic Properties of Smooth Hyperbolic Measures	115
5.1. Absolute Continuity and Smooth Invariant Measures	115
5.2. Ergodicity of Smooth Hyperbolic Measures	117
5.3. Local Ergodicity	122

5.4.	The Entropy Formula	130
5.5.	SRB-Measures and General Hyperbolic Measures	138
5.6.	Geodesic Flows on Compact Surfaces of Nonpositive Curvature	140
	Bibliography	145
	Index	147

xi	Preface	
1	Introduction	
5	Chapter 1. Lyapunov Stability Theory of Differential Equations	
6	1.1. Lyapunov Exponents for Differential Equations	
9	1.2. Abstract Theory of Lyapunov Exponents	
16	1.3. Forward and Backward Regularity	
28	1.4. Stability Theory of Nonautonomous Differential Equations	
31	1.5. Lyapunov Regularity and the Oseledec Decomposition	
35	Chapter 2. Elements of Nonuniform Hyperbolic Theory	
36	2.1. Dynamical Systems with Nonzero Lyapunov Exponents	
42	2.2. Nonuniform Hyperbolicity and Regular Sets	
44	2.3. Hölder Continuity of Invariant Distributions	
61	2.4. Proof of the Multiplicative Ergodic Theorem	
61	Chapter 3. Examples of Nonuniformly Hyperbolic Systems	
61	3.1. Anosov Diffeomorphisms	
66	3.2. Diffeomorphisms with Nonzero Lyapunov Exponents on Surfaces	
71	3.3. A Flow with Nonzero Lyapunov Exponents	
74	3.4. Geodesic Flows on Compact Manifolds of Nonpositive Curvature	
81	Chapter 4. Local Manifold Theory	
81	4.1. Existence of Local Stable Manifolds	
94	4.2. Basic Properties of Stable and Unstable Manifolds	
99	4.3. Absolute Continuity Property	
108	4.4. Computing the Jacobian of the Holonomy Map	
111	4.5. Partial Hyperbolicity	
115	Chapter 5. Ergodic Properties of Smooth Hyperbolic Measures	
115	5.1. Absolute Continuity and Smooth Invariant Measures	
117	5.2. Ergodicity of Smooth Hyperbolic Measures	
123	5.3. Local Ergodicity	