

Contents

Preface	vii
Notation	xvii
1 Nonautonomous Dynamical Systems	1
1.1 Nonautonomous Sets and 2-Parameter Semigroups	2
1.2 Invariant and Limit Sets	5
1.3 Attractors and Global Attractors	16
1.4 Periodic and Autonomous 2-Parameter Semigroups	21
1.5 Applications: Discretized Semiflows	24
1.5.1 Retarded Functional Differential Equations	24
1.5.2 Abstract Evolution Equations	26
1.5.3 Reaction-Diffusion Equations	29
1.5.4 Doubly Nonlinear Equations	31
1.6 Remarks	33
2 Nonautonomous Difference Equations	37
2.1 Basics and Examples	39
2.2 Existence and Boundedness of Solutions	44
2.3 Difference Equations and 2-Parameter Semigroups	51
2.4 Stability	60
2.5 Periodic and Autonomous Difference Equations	68
2.6 Applications	70
2.6.1 Fully Discretized Functional Differential Equations	71
2.6.2 Time-Discretized Abstract Evolution Equations	73
2.6.3 Fully Discretized Reaction-Diffusion Equations	75
2.6.4 Fully Discretized Finite Difference Ginzburg–Landau Equation	80
2.6.5 Time-Discretized Doubly Nonlinear Equations	88
2.7 Remarks	89
3 Linear Difference Equations	95
3.1 Basics	96
3.2 Periodic Linear Equations	108

3.3	Invariant Splittings and Exponential Growth	114
3.4	Dichotomies and Splittings.....	128
3.5	Admissibility	151
3.6	Roughness.....	161
3.7	Applications.....	170
3.7.1	Discretized Linear Functional Differential Equations	170
3.7.2	Time-Discretized Linear Abstract Evolution Equations	173
3.7.3	Time-Discretized Linear Parabolic Equations	174
3.7.4	Fully Discretized Diffusion Equations	175
3.8	Remarks	180
4	Invariant Fiber Bundles	187
4.1	Semilinear Difference Equations.....	189
4.2	Existence of Invariant Fiber Bundles	194
4.3	Invariant Foliations and Asymptotic Phase	214
4.4	Smoothness of Fiber Bundles and Foliations.....	230
4.5	Normal Hyperbolicity	250
4.6	Pseudo-stable and Pseudo-unstable Fiber Bundles.....	256
4.7	Inertial Fiber Bundles	274
4.8	Approximation of Invariant Fiber Bundles	279
4.9	Applications.....	287
4.9.1	Discretized Functional Differential Equations	287
4.9.2	Time-Discretized Abstract Evolution Equations.....	289
4.9.3	Time-Discretized Parabolic Evolution Equations.....	293
4.9.4	Fully Discretized Reaction-Diffusion Equations	295
4.9.5	Fully Discretized Finite Difference Ginzburg–Landau Equation	304
4.10	Remarks	310
5	Linearization	317
5.1	Topological Conjugation and Decoupling	318
5.2	Generalized Hartman–Grobman Theorem	326
5.3	Solution Conjugation	334
5.4	Applications.....	338
5.4.1	Time-Discretized Abstract Evolution Equations.....	339
5.4.2	Time-Discretized Parabolic Evolution Equations.....	340
5.5	Remarks	341
A	Discrete Inequalities.....	345
A.1	Generalized Exponential Function.....	345
A.2	Gronwall Inequalities	348
A.3	Remarks	350

B	Fixed Point and Inversion Theorems	351
B.1	Contractive Mappings	352
B.2	Compact Mappings	355
B.3	Global Inverse Function Theorems	356
B.4	Remarks	360
C	Smooth Mappings and Extensions	363
C.1	Differentiability	363
C.2	Smooth Norms and Extensions	364
C.3	Remarks	371
	References	373
	Index	393

Geometric Theory of Discrete Nonautonomous
Dynamical Systems

Pötzsche, C.

2010, XXIV, 399 p. 17 illus., 2 illus. in color., Softcover

ISBN: 978-3-642-14257-4