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Nota di contenuto	Preface; Contents; Chapter 1 General Properties of Nonlinear Dynamical Systems; 1.1 Finite-dimensional dynamical systems; 1.1.1 Invariant measure; 1.1.2 The Liouville condition; 1.1.3 The Poincare theorem; 1.1.4 The Birkhoff-Khinchin theorem; 1.1.5 The Birkhoff-Khinchin theorem for discrete dynamical systems; 1.2 Poissonian and symplectic structures on manifolds; 1.2.1 Poisson brackets; 1.2.2 The Liouville theorem and Hamilton-Jacobi method; 1.2.3 Dirac reduction: Symplectic and Poissonian structures on submanifolds Chapter 2 Geometric and Algebraic Properties of Nonlinear Dynamical Systems with Symmetry: Theory and Applications2.1 The Poisson structures and Lie group actions on manifolds: Introduction; 2.2 Lie group actions on Poisson manifolds and the orbit structure; 2.3 The canonical reduction method on symplectic spaces and related geometric structures on principal fiber bundles; 2.4 The form of reduced symplectic structures on cotangent spaces to Lie group

manifolds and associated canonical connections

2.5 The geometric structure of abelian Yang-Mills type gauge field equations via the reduction method
2.6 The geometric structure of non-abelian Yang-Mills gauge field equations via the reduction method;
2.7 Classical and quantum integrability;
2.7.1 The quantization scheme, observables and Poisson manifolds;
2.7.2 The Hopf and quantum algebras;
2.7.3 Integrable flows related to Hopf algebras and their Poissonian representations;
2.7.4 Casimir elements and their special properties;
2.7.5 Poisson co-algebras and their realizations
2.7.6 Casimir elements and the Heisenberg-Weil algebra related structures
2.7.7 The Heisenberg-Weil co-algebra structure and related integrable flows;
Chapter 3 Integrability by Quadratures of Hamiltonian and Picard-Fuchs Equations: Modern Differential-Geometric Aspects;
3.1 Introduction;
3.2 Preliminaries;
3.3 Integral submanifold embedding problem for an abelian Lie algebra of invariants;
3.4 Integral submanifold embedding problem for a nonabelian Lie algebra of invariants;
3.5 Examples;
3.6 Existence problem for a global set of invariants;
3.7 Additional examples
3.7.1 The Henon-Heiles system
3.7.2 A truncated four-dimensional Fokker-Planck Hamiltonian system;
Chapter 4 Infinite-dimensional Dynamical Systems;
4.1 Preliminary remarks;
4.2 Implectic operators and dynamical systems;
4.3 Symmetry properties and recursion operators;
4.4 Backlund transformations;
4.5 Properties of solutions of some infinite sequences of dynamical systems;
4.6 Integro-differential systems;
Chapter 5 Integrability Criteria for Dynamical Systems: the Gradient-Holonomic Algorithm;
5.1 The Lax representation;
5.1.1 Generalized eigenvalue problem
5.1.2 Properties of the spectral problem

Sommario/riassunto

This distinctive volume presents a clear, rigorous grounding in modern nonlinear integrable dynamics theory and applications in mathematical physics, and an introduction to timely leading-edge developments in the field - including some innovations by the authors themselves - that have not appeared in any other book. The exposition begins with an introduction to modern integrable dynamical systems theory, treating such topics as Liouville-Arnold and Mischenko-Fomenko integrability. This sets the stage for such topics as new formulations of the gradient-holonomic algorithm for Lax integrability,

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