



Mathematical methods of classical mechanics /

Arnold, V. I. (Vladimir Igorevich) (1937-2010.)

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Monografía

Many different mathematical methods and concepts are used in classical mechanics: differential equations and phase flows, smooth mappings and manifolds, Lie groups and Lie algebras, symplectic geometry and ergodic theory. Many modern mathematical theories arose from problems in mechanics and only later acquired that axiomatic-abstract form which makes them so hard to study. In this book we construct the mathematical apparatus of classical mechanics from the very beginning; thus, the reader is not assumed to have any previous knowledge beyond standard courses in analysis (differential and integral calculus, differential equations), geometry (vector spaces, vectors) and linear algebra (linear operators, quadratic forms). With the help of this apparatus, we examine all the basic problems in dynamics, including the theory of oscillations, the theory of rigid body motion, and the hamiltonian formalism. The author has tried to show the geometric, qualitative aspect of phenomena. In this respect the book is closer to courses in theoretical mechanics for theoretical physicists than to traditional courses in theoretical mechanics as taught by mathematicians

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Contenido: I Newtonian Mechanics -- 1 Experimental facts -- 2 Investigation of the equations of motion -- II Lagrangian Mechanics -- 3 Variational principles -- 4 Lagrangian mechanics on manifolds -- 5 Oscillations -- 6 Rigid Bodies -- III Hamiltonian Mechanics -- 7 Differential forms -- 8 Symplectic manifolds -- 9 Canonical formalism -- 10 Introduction to perturbation theory -- Appendix 1 Riemannian curvature -- Appendix 2 Geodesics of left-invariant metrics on Lie groups and the hydrodynamics of an ideal fluid -- Appendix 3 Symplectic structure

on algebraic manifolds -- Appendix 4 Contact structures -- Appendix 5 Dynamical systems with symmetries -- Appendix 6 Normal forms of quadratic hamiltonians -- Appendix 7 Normal forms of hamiltonian systems near stationary points and closed trajectories -- Appendix 8 Perturbation theory of conditionally periodic motions and Kolmogorov's theorem -- Appendix 9 Poincaré's geometric theorem, its generalizations and applications -- Appendix 10 Multiplicities of characteristic frequencies, and ellipsoids depending on parameters -- Appendix 11 Short wave asymptotics -- Appendix 12 Lagrangian singularities -- Appendix 13 The Korteweg-de Vries equation

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