



Mathematical methods of classical mechanics /

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

<https://id.oclc.org/worldcat/entity/E39PBJht4fhJ6BVBBMjxPtcMfq>

Springer-Verlag,
1978

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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Título uniforme: Matematheskie metody klassicheskoi mekhaniki. English

Título: Mathematical methods of classical mechanics V.I. Arnold ; translated by K. Vogtmann and A. Weinstein

Editorial: New York Springer-Verlag 1978

Descripción física: 1 online resource (x, 462 pages) illustrations

Tipo Audiovisual: Mechanics, Analytic

Mención de serie: Graduate texts in mathematics 60

Bibliografía: Includes bibliographical references and index

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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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Lengua: Text in English, translated from the original Russian

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1302160032 1408987075

ISBN: 9781475716931 electronic bk.) 1475716931 electronic bk.) 9781475716955 print) 1475716958 print)
0387903143 New York) 9780387903149 New York) 3540903143 9783540903147

Materia: Mechanics, Analytic Mécanique analytique Mechanics, Analytic Mathematische Methode Mechanik
Klassieke mechanica Wiskundige methoden Mechanics, Analytic

Enlace a formato físico adicional: Print version Arnold, V.I. (Vladimir Igorevich), 1937-2010. Matematicheskie metody klassicheskoi mekhaniki. English. Mathematical methods of classical mechanics. New York : Springer-Verlag, 1978 (DLC) 78015927 (OCOLOC)4037141

Punto acceso adicional serie-Título: Graduate texts in mathematics 60

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