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 The Calculus of Variations and Optimal Control
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 Canadian Journal of Mathematics
 Rate-Independent Systems
 Mathematical Evolutions

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KIRSTEN DEANNA

Geometric Integration Theory Courier Corporation

The present book — which is the third, significantly revised edition of the textbook originally published by Elsevier Science — emphasizes the interdependence of mathematical formulation and physical meaning in the description of seismic phenomena. Herein, we use aspects of continuum mechanics, wave theory and ray theory to explain phenomena resulting from the propagation of seismic waves. The book is divided into three main sections: Elastic Continua, Waves and Rays and Variational Formulation of Rays. There is also a fourth part, which consists of appendices. In Elastic Continua, we use continuum mechanics to describe the material through which seismic waves propagate, and to formulate a system of equations to study the behaviour of such a material. In Waves and Rays, we use these equations to identify the types of body waves propagating in elastic continua as well as to express their velocities and displacements in terms of the properties of these continua. To solve the equations of motion in anisotropic inhomogeneous continua, we invoke the concept of a ray. In Variational Formulation of Rays, we show that, in elastic continua, a ray is tantamount to a trajectory along which a seismic signal propagates in accordance with the variational principle of stationary travelttime. Consequently, many seismic problems in elastic continua can be conveniently formulated and solved using the calculus of variations. In the

Appendices, we describe two mathematical concepts that are used in the book; namely, homogeneity of a function and Legendre's transformation.

This section also contains a list of symbols. Request Inspection Copy

Calculus of Variations Springer Science & Business Media

Appropriate for one- or two-semester Advanced Engineering Mathematics courses in departments of Mathematics and Engineering. This clear, pedagogically rich book develops a strong understanding of the mathematical principles and practices that today's engineers and scientists need to know. Equally effective as either a textbook or reference manual, it approaches mathematical concepts from a practical-use perspective making physical applications more vivid and substantial. Its comprehensive instructional framework supports a conversational, down-to-earth narrative style offering easy accessibility and frequent opportunities for application and reinforcement.

The Calculus of Variations and Optimal Control CRC Press

- Serves as an excellent introduction to the calculus of variations - Useful to researchers in different fields of mathematics who want to get a concise but broad introduction to the subject - Includes more than 70 exercises with solutions

A Contribution to the Theory of Discontinuous Solutions in the Calculus of Variations PHI Learning Pvt. Ltd.

The purpose of the calculus of variations is to find optimal solutions to engineering problems whose optimum may be a certain quantity, shape, or function. Applied Calculus of Variations for Engineers addresses this important mathematical area applicable to many engineering disciplines. Its

unique, application-oriented approach sets it apart from the theoretical treatises of most texts, as it is aimed at enhancing the engineer's understanding of the topic. This Second Edition text: Contains new chapters discussing analytic solutions of variational problems and Lagrange-Hamilton equations of motion in depth Provides new sections detailing the boundary integral and finite element methods and their calculation techniques Includes enlightening new examples, such as the compression of a beam, the optimal cross section of beam under bending force, the solution of Laplace's equation, and Poisson's equation with various methods Applied Calculus of Variations for Engineers, Second Edition extends the collection of techniques aiding the engineer in the application of the concepts of the calculus of variations.

The Calculus of Variations and Optimal Control American Mathematical Society

Fresh, lively text serves as a modern introduction to the subject, with applications to the mechanics of systems with a finite number of degrees of freedom. Ideal for math and physics students.

The Survival of a Mathematician American Mathematical Soc.

Handbook of Convex Geometry, Volume B offers a survey of convex geometry and its many ramifications and connections with other fields of mathematics, including convexity, lattices, crystallography, and convex functions. The selection first offers information on the geometry of numbers, lattice points, and packing and covering with convex sets. Discussions focus on packing in non-Euclidean spaces, problems in the Euclidean plane, general convex bodies, computational complexity of lattice point problem, centrally symmetric convex bodies, reduction theory, and lattices and the space of lattices. The text then examines finite packing and covering and tilings, including plane tilings, monohedral tilings, bin packing, and sausage problems. The manuscript takes a look at valuations and dissections, geometric crystallography, convexity and differential geometry, and convex functions. Topics include differentiability, inequalities, uniqueness theorems for convex hypersurfaces, mixed discriminants and mixed volumes, differential geometric characterization of convexity, reduction of quadratic forms, and finite groups of symmetry operations. The selection is a dependable source of data for mathematicians and researchers interested in convex geometry.

Calculus of Variations II Taylor & Francis

This monograph provides both an introduction to and a thorough exposition of the theory of rate-independent systems, which the authors have been working on with a lot of collaborators over 15 years. The focus is mostly on fully rate-independent systems, first on an abstract level either with or even without a linear structure, discussing various concepts of solutions with full mathematical rigor. Then, usefulness of the abstract concepts is demonstrated on the level of various applications primarily in continuum mechanics of solids, including suitable approximation strategies with guaranteed numerical stability and convergence. Particular applications concern inelastic processes such as plasticity, damage, phase transformations, or adhesive-type contacts both at small strains and at finite strains. A few other physical systems, e.g. magnetic or ferroelectric materials, and couplings to rate-dependent thermodynamic models are considered as well. Selected applications are accompanied by numerical simulations illustrating both the models and the efficiency of computational algorithms. In this book, the mathematical framework for a rigorous mathematical treatment of "rate-independent systems" is presented in a comprehensive form for the first time. Researchers and graduate students in applied mathematics, engineering, and computational physics will find this timely and well written book useful.

Encyclopaedia of Mathematics Springer

Applications-oriented introduction to variational theory develops insight and promotes understanding of specialized books and research papers. Suitable for advanced undergraduate and graduate students as a primary or supplementary text. 1969 edition.

Applied Calculus of Variations for Engineers CRC Press

"One of the themes of the book is how to have a fulfilling professional life. In order to achieve this goal, Krantz discusses keeping a vigorous scholarly program going and finding new challenges, as well as dealing with the everyday tasks of research, teaching, and administration." "In short, this is a survival manual for the professional mathematician - both in academics and in industry and government agencies. It is a sequel to the author's *A Mathematician's Survival Guide*."--BOOK JACKET.

Advanced Engineering Mathematics World Scientific Publishing Company

The advent of high-speed computers has encouraged a growing demand for newly graduated engineers to possess the basic skills of computational methods for heat and mass transfer and fluid dynamics. Computational fluid dynamics and heat transfer, as well as finite element codes, are standard tools in the computer-aided design and analysis of processes

Introduction to Probability Lulu.com

Introduction to the Calculus of Variations and Control with Modern Applications provides the fundamental background required to develop rigorous necessary conditions that are the starting points for theoretical and numerical approaches to modern variational calculus and control problems. The book also presents some classical sufficient conditions a

Introduction to Optimal Control Theory Springer Science & Business Media

Suitable for advanced undergraduate and graduate students of mathematics, physics, or engineering, this introduction to the calculus of variations focuses on variational problems involving one independent variable. It also discusses more advanced topics such as the inverse problem, eigenvalue problems, and Noether's theorem. The text includes numerous examples along with problems to help students consolidate the material.

Canadian Journal of Mathematics Springer Science & Business Media

This textbook introduces geometric measure theory through the notion of currents. Currents, continuous linear functionals on spaces of differential forms, are a natural language in which to formulate types of extremal problems arising in geometry, and can be used to study generalized versions of

the Plateau problem and related questions in geometric analysis. Motivating key ideas with examples and figures, this book is a comprehensive introduction ideal for both self-study and for use in the classroom. The exposition demands minimal background, is self-contained and accessible, and thus is ideal for both graduate students and researchers.

Calculus of Variations Elsevier

This book is intended for a first course in the calculus of variations, at the senior or beginning graduate level. The reader will learn methods for finding functions that maximize or minimize integrals. The text lays out important necessary and sufficient conditions for extrema in historical order, and it illustrates these conditions with numerous worked-out examples from mechanics, optics, geometry, and other fields. The exposition starts with simple integrals containing a single independent variable, a single dependent variable, and a single derivative, subject to weak variations, but steadily moves on to more advanced topics, including multivariate problems, constrained extrema, homogeneous problems, problems with variable endpoints, broken extremals, strong variations, and sufficiency conditions. Numerous line drawings clarify the mathematics. Each chapter ends with recommended readings that introduce the student to the relevant scientific literature and with exercises that consolidate understanding.

CALCULUS OF VARIATIONS WITH APPLICATIONS Springer Science & Business Media

First truly up-to-date treatment offers a simple introduction to optimal control, linear-quadratic control design, and more. Broad perspective features numerous exercises, hints, outlines, and appendixes, including a practical discussion of MATLAB. 2005 edition.

Introduction to the Calculus of Variations Courier Corporation

This ENCYCLOPAEDIA OF MATHEMATICS aims to be a reference work for all parts of mathematics. It is a translation with updates and editorial comments of the Soviet Mathematical Encyclopaedia published by 'Soviet Encyclopaedia Publishing House' in five volumes in 1977-1985. The annotated translation consists of ten volumes including a special index volume. There are three kinds of articles in this ENCYCLOPAEDIA. First of all there are survey-type articles dealing with the various main directions in mathematics (where a rather fine subdivision has been used). The main requirement for these articles has been that they should give a reasonably complete up-to-date account of the current state of affairs in these areas and that they should be maximally accessible. On the whole, these articles should be understandable to mathematics students in their first specialization years, to graduates from other mathematical areas and, depending on the specific subject, to specialists in other domains of science, engineers and teachers of mathematics. These articles treat their material at a fairly general level and aim to give an idea of the kind of problems, techniques and concepts involved in the area in question. They also contain background and motivation rather than precise statements of precise theorems with detailed definitions and technical details on how to carry out proofs and constructions. The second kind of article, of medium length, contains more detailed concrete problems, results and techniques.

Optimal Control with Aerospace Applications Royal Society of Chemistry

This concise text offers both professionals and students an introduction to the fundamentals and standard methods of the calculus of variations. In addition to surveys of problems with fixed and movable boundaries, it explores highly practical direct methods for the solution of variational problems. Topics include the method of variation in problems with fixed boundaries; variational problems with movable boundaries and other problems; sufficiency conditions for an extremum; variational problems of constrained extrema; and direct methods of solving variational problems. Each chapter features numerous illustrative problems, and solutions appear at the end.

The Calculus of Variations John Wiley & Sons

This book seeks to explore seismic phenomena in elastic media and emphasizes the interdependence of mathematical formulation and physical meaning. The purpose of this title - which is intended for senior undergraduate and graduate students as well as scientists interested in quantitative seismology - is to use aspects of continuum mechanics, wave theory and ray theory to describe phenomena resulting from the propagation of waves. The book is divided into three parts: Elastic continua, Waves and rays, and Variational formulation of rays. In Part I, continuum mechanics are used to describe the material through which seismic waves propagate, and to formulate a system of equations to study the behaviour of such material. In Part II, these equations are used to identify the types of body waves propagating in elastic continua as well as to express their velocities and displacements in terms of the properties of these continua. To solve the equations of motion in anisotropic inhomogeneous continua, the high-frequency approximation is used and establishes the concept of a ray. In Part III, it is shown that in elastic continua a ray is tantamount to a trajectory along which a seismic signal propagates in accordance with the variational principle of stationary travel time.

Optimal Control Systems Courier Corporation

Metamath is a computer language and an associated computer program for archiving, verifying, and studying mathematical proofs. The Metamath language is simple and robust, with an almost total absence of hard-wired syntax, and we believe that it provides about the simplest possible framework that allows essentially all of mathematics to be expressed with absolute rigor. While simple, it is also powerful; the Metamath Proof Explorer (MPE) database has over 23,000 proven theorems and is one of the top systems in the "Formalizing 100 Theorems" challenge. This book explains the Metamath language and program, with specific emphasis on the fundamentals of the MPE database.

Handbook of Convex Geometry Springer Science & Business Media

Calculus of variations is one of the most important mathematical tools of great scientific significance used by scientists and engineers. Unfortunately, a few books that are available are written at a level which is not easily comprehensible for postgraduate students. This book, written by a highly respected academic, presents the materials in a lucid manner so as to be within the easy grasp of the students with some background in calculus, differential equations and functional analysis. The aim is to give a thorough and systematic analysis of various aspects of calculus of variations.