Calculus On Normed Vector Spaces Universitext

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EDDIE KEIRA

Geometry of Normed Linear Spaces Springer
This is an axiomatic treatment of the properties of continuous multivariable functions and related results from topology. The author covers boundedness, extreme values, and uniform continuity of functions, along with connections between continuity and topological concepts such as connectedness and compactness. The order of topics mimics the order of development in elementary calculus, with analogies and generalizations from such familiar ideas as the Pythagorean theorem.

Convex Analysis in General Vector Spaces John Wiley & Sons
Vol. 1200 of the LNM series deals with the geometrical structure of finite dimensional normed spaces. One of the main topics is the estimation of the dimensions of euclidean and l^n p spaces which nicely embed into diverse finite-dimensional normed spaces. An essential method here is the concentration of measure phenomenon which is closely related to large deviation inequalities in Probability on the one hand, and to isoperimetric inequalities in Geometry on the other. The book contains also an appendix, written by M. Gromov, which is an introduction to isoperimetric inequalities on riemannian manifolds. Only basic knowledge of Functional Analysis and Probability is expected of the reader. The book can be used (and was used by the authors) as a text for a first or second graduate course. The methods used here have been useful also in areas other than Functional Analysis (notably, Combinatorics).

Banach, Frechet, Hilbert and Neumann Spaces Springer Science & Business Media
These 17 papers result from a 1983 conference held to honor Professor Mahlon Marsh Day upon his retirement from the University of Illinois. Each of the main speakers was invited to take some aspect of Day's pioneering work as a starting

point: he was the first American mathematician to study normed spaces from a geometric standpoint and, for a number of years, pioneered American research on the structure of Banach spaces. The material is aimed at researchers and graduate students in functional analysis. Many of the articles are expository and are written for the reader with only a basic background in the theory of normed linear spaces.

Asymptotic Theory of Finite Dimensional Normed Spaces CRC Press

A rigorous introduction to calculus in vector spaces The concepts and theorems of advanced calculus combined withrelated computational methods are essential to understanding nearlyall areas of quantitative science. Analysis in Vector Spacespresents the central results of this classic subject throughrigorous arguments, discussions, and examples. The book aims tocultivate not only knowledge of the major theoretical results, butalso the geometric intuition needed for both mathematicalproblem-solving and modeling in the formal sciences. The authors begin with an outline of key concepts, terminology,and notation and also provide a basic introduction to set theory,the properties of real numbers, and a review of linear algebra. Anelegant approach to eigenvector problems and the spectral theoremsets the stage for later results on volume and integration.Subsequent chapters present the major results of differential andintegral calculus of several variables as well as the theory ofmanifolds. Additional topical coverage includes: Sets and functions Real numbers Vector functions Normed vector spaces First- and higher-order derivatives Diffeomorphisms and manifolds Multiple integrals Integration on manifolds Stokes' theorem Basic point set topology Numerous examples and exercises are provided in each chapter toreinforce new concepts and to illustrate how results can be appliedto additional problems. Furthermore, proofs and examples arepresented in a clear style that emphasizes the underlying intuitiveideas. Counterexamples are provided throughout the book to warnagainst possible mistakes, and extensive appendices outline theconstruction of real numbers, include a fundamental result aboutdimension, and present general results about determinants. Assuming only a fundamental understanding of linear algebra andsingle variable calculus, Analysis in Vector Spaces is anexcellent book for a second course in analysis for mathematics,physics, computer science, and engineering majors at theundergraduate and graduate levels. It also serves as a valuablereference for further study in any discipline that requires a firmunderstanding of mathematical techniques and concepts.

Banachâ Hilbert Spaces, Vector Measures and Group Representations Wiley

This is an introduction to the analysis of metric and normed linear spaces for undergraduate students in mathematics. Assuming a basic knowledge of real analysis and linear algebra, the student is exposed to the axiomatic method in analysis and is shown its power in exploiting the structure of fundamental analysis, which underlies a variety of applications. An example is the link between normed linear spaces and linear algebra; finite dimensional spaces are discussed early. The treatment progresses from the concrete to the abstract: thus metric spaces are studied in some detail before general topology is begun, though topological properties of metric spaces are explored in the book. Graded exercises are provided at the end of each section; in each set the earlier exercises are designed to assist in the detection of the structural properties in concrete examples while the later ones are more conceptually sophisticated.

From Vector Spaces to Function Spaces Lecture Notes in Mathematics

An authorised reissue of the long out of print classic textbook, Advanced Calculus by the late Dr Lynn Loomis and Dr Shlomo Sternberg both of Harvard University has been a revered but hard to find textbook for the advanced calculus course for decades. This book is based on an honors course in advanced calculus that the authors gave in the 1960's. The foundational material, presented in the unstarred sections of Chapters 1 through 11, was normally covered, but different applications of this basic material were stressed from year to year, and the book therefore contains more material than was covered in any one year. It can accordingly be used (with omissions) as a text for a year's course in advanced calculus, or as a text for a three-semester introduction to analysis. The prerequisites are a good grounding in the calculus of one variable from a mathematically rigorous point of view, together with some acquaintance with linear algebra. The reader should be familiar with limit and continuity type arguments and have a certain amount of mathematical sophistication. As possible introductory texts, we mention Differential and Integral Calculus by R Courant, Calculus by T Apostol, Calculus by M Spivak, and Pure Mathematics by G Hardy. The reader should also have some experience with partial derivatives. In overall plan the book divides roughly into a first half which develops the calculus (principally the differential calculus) in the setting of normed vector spaces, and a second half which deals with the calculus of differentiable manifolds.

Solutions Manual to accompany Analysis in Vector Spaces Springer Science & Business Media

This book provides a treatment of analytical methods of applied mathematics. It starts with a review of the basics of vector spaces and brings the reader to an advanced discussion of applied mathematics, including the latest applications to systems and control theory. The text is designed to be accessible to those not familiar with the material and useful to working scientists, engineers, and mathematics students. The author provides the motivations of definitions and the ideas underlying proofs but does not sacrifice mathematical rigor. From Vector Spaces to Function Spaces presents: an easily accessible discussion of analytical methods of applied mathematics from vector spaces to distributions, Fourier analysis, and Hardy spaces with applications to system theory; an introduction to modern functional analytic methods to better familiarize readers with basic methods and mathematical thinking; and an understandable yet penetrating treatment of such modern methods and topics as function spaces and distributions, Fourier and Laplace analyses, and Hardy spaces.

Banach, Fréchet, Hilbert and Neumann Spaces World Scientific Publishing Company

The three volumes of this series of books, of which this is the second, put forward the mathematical elements that make up the foundations of a number of contemporary scientific methods: modern theory on systems, physics and engineering. Whereas the first volume focused on the formal conditions for systems of linear equations (in particular of linear differential equations) to have solutions, this book presents the approaches to finding solutions to polynomial equations and to systems of linear differential equations with varying coefficients. Fundamentals of Advanced Mathematics, Volume 2: Field Extensions, Topology and Topological Vector Spaces, Functional Spaces, and Sheaves begins with the classical Galois theory and the theory of transcendental field extensions. Next, the differential side of these theories is treated, including the differential Galois theory (Picard-Vessiot theory of systems of linear differential equations with time-varying coefficients) and differentially transcendental field extensions. The treatment of analysis includes topology (using both filters and nets), topological vector spaces (using the notion of disked space, which simplifies the theory of duality), and the radon measure (assuming that the usual theory of measure and integration is known). In addition, the theory of sheaves is developed with application to the theory of distributions and the theory of hyperfunctions (assuming that the usual theory of functions of the complex variable is known). This volume is the prerequisite to the study of linear systems with time-varying coefficients from the point-of-view of algebraic analysis and the algebraic theory of nonlinear systems. Present Galois Theory, transcendental field extensions, and Picard Includes sections on Vessiot theory, differentially transcendental field extensions, topology, topological vector spaces, Radon measure, differential calculus in Banach spaces, sheaves, distributions, hyperfunctions, algebraic analysis, and local analysis of systems of linear differential equations

Convex Functional Analysis CRC Press

This is a basic course in functional analysis for senior undergraduate and beginning postgraduate students. The reader need only be familiarity with elementary real and complex analysis, linear algebra and have studied a course in the analysis of metric spaces; knowledge of integration theory or general topology is not required. The text concerns the structural properties of normed linear spaces in general, especially associated with dual spaces and continuous linear operators on normed linear spaces. The implications of the general theory are illustrated with a great variety of example spaces.

Elements Of Linear And Multilinear Algebra Springer Science & Business Media

This book provides an elementary introduction to classical analysis on normed spaces, with special attention paid to fixed points, calculus, and ordinary differential equations. It contains a full treatment of vector measures on delta rings without assuming any scalar measure theory and hence should fit well into existing courses. The relation between group representations and almost periodic functions is presented. The mean values offer an infinitedimensional analogue of measure theory on finitedimensional Euclidean spaces. This book is ideal for beginners who want to get through the basic material as soon as possible and then do their own research immediately.

Introduction to the Analysis of Normed Linear Spaces Cambridge University Press
Based on undergraduate courses in advanced calculus, the treatment covers a wide range of topics, from soft functional analysis and finite-dimensional linear algebra to differential equations on submanifolds of Euclidean space. 1976 edition.
Analysis in Vector Spaces Set World Scientific
Calculus in Vector Spaces addresses linear algebra from the basics to the spectral theorem and examines a range of topics in multivariable calculus. This second edition introduces, among other topics, the derivative as a linear transformation, presents linear algebra in a concrete context based on complementary ideas in calculus, and explains differential forms on Euclidean space, allowing for Green's theorem, Gauss's theorem, and Stokes's theorem to be understood in a natural setting. Mathematical analysts, algebraists, engineers, physicists, and students taking advanced calculus and linear algebra courses should find this book useful.
Fundamentals of Advanced Mathematics 2 Courier Corporation
This book gives a compact exposition of the fundamentals of the theory of locally convex topological vector spaces. Furthermore it contains a survey of the most important results of a more subtle nature, which cannot be regarded as basic, but knowledge which is useful for understanding applications. Finally, the book explores some of such applications connected with differential calculus and measure theory in infinite-dimensional spaces. These applications are a central aspect of the book, which is why it is different from the wide range of existing texts on topological vector spaces. Overall, this book develops differential and integral calculus on infinite-dimensional locally convex spaces by using methods and techniques of the theory of locally convex spaces. The target readership includes mathematicians and physicists whose research is related to infinite-dimensional analysis.
Differential Calculus in Normed Linear Spaces Walter de Gruyter GmbH & Co KG
"This book presents Advanced Calculus from a geometric point of view: instead of dealing with partial derivatives of functions of several variables, the derivative of the function is treated as a linear transformation between normed linear spaces. Not only does this lead to a simplified and transparent exposition of "difficult" results like the Inverse and Implicit Function Theorems but also permits, without any extra effort, a discussion of the Differential Calculus of functions defined on infinite dimensional Hilbert or Banach spaces." "The prerequisites demanded of the reader are modest: a sound understanding of convergence of sequences and series of real numbers, the continuity and differentiability properties of functions of a red variable and a little Linear Algebra should provide adequate background for understanding the book."--BOOK JACKET.
Topological Vector Spaces Springer
Calculus in Vector Spaces addresses linear algebra from the basics to the spectral theorem and examines a range of topics in multivariable calculus. This second edition introduces, among other topics, the derivative as a linear transformation, presents linear algebra in a concrete context based on complementary ideas in

calculus, and explains differential forms on Euclidean space, allowing for Green's theorem, Gauss's theorem, and Stokes's theorem to be understood in a natural setting. Mathematical analysts, algebraists, engineers, physicists, and students taking advanced calculus and linear algebra courses should find this book useful.

Calculus in Vector Spaces Without Norm Springer

This graduate-level textbook is a detailed exposition of key mathematical tools in analysis aimed at students, researchers, and practitioners across science and engineering. Every topic covered has been specifically chosen because it plays a key role outside the field of pure mathematics. Although the treatment of each topic is mathematical in nature, and concrete applications are not delineated, the principles and tools presented are fundamental to exploring the computational aspects of physics and engineering. Readers are expected to have a solid understanding of linear algebra, in Rn and in general vector spaces. Familiarity with the basic concepts of calculus and real analysis, including Riemann integrals and infinite series of real or complex numbers, is also required.

Banach, Frechet, Hilbert and Neumann Spaces SIAM

This classic and long out of print text by the famous French mathematician Henri Cartan, has finally been retitled and reissued as an unabridged reprint of the Kershaw Publishing Company 1971 edition at remarkably low price for a new generation of university students and teachers. It provides a concise and beautifully written course on rigorous analysis. Unlike most similar texts, which usually develop the theory in either metric or Euclidean spaces, Cartan's text is set entirely in normed vector spaces, particularly Banach spaces. This not only allows the author to develop carefully the concepts of calculus in a setting of maximal generality, it allows him to unify both single and multivariable calculus over either the real or complex scalar fields by considering derivatives of nth orders as linear transformations. This prepares the student for the subsequent study of differentiable manifolds modeled on Banach spaces as well as graduate analysis courses, where normed spaces and their isomorphisms play a central role. More importantly, it's republication in an inexpensive edition finally makes available again the English translations of both long separated halves of Cartan's famous 1965-6 analysis course at the University of Paris: The second half has been in print for over a decade as Differential Forms , published by Dover Books. Without the first half, it has been very difficult for readers of that second half text to be prepared with the proper prerequisites as Cartan originally intended. With both texts now available at very affordable prices, the entire course can now be easily obtained and studied as it was originally intended. The book is divided into two chapters. The first develops the abstract differential calculus. After an introductory section providing the necessary background on the elements of Banach spaces, the Frechet derivative is defined, and proofs are given of the two basic theorems of differential calculus: The mean value theorem and the inverse function theorem. The chapter proceeds with the introduction and study of higher order derivatives and a proof of Taylor's formula. It closes with a study of local maxima and minima including both necessary and sufficient conditions for the existence of such minima. The second chapter is devoted to differential equations. Then the general existence and uniqueness theorems for ordinary differential equations on Banach spaces are proved. Applications of this material to linear equations and to obtaining various properties of solutions of differential equations are then given. Finally the relation between partial differential equations of the first order and ordinary differential equations is discussed. The prerequisites are rigorous first courses in calculus on the real line (elementary analysis), linear algebra on abstract vectors spaces with linear transformations and the basic definitions of topology (metric spaces, topology,etc.) A basic course in differential equations is advised as well. Together with its' sequel, Differential Calculus On Normed Spaces forms the basis for an outstanding advanced undergraduate/first year graduate analysis course in the Bourbakian French tradition of Jean Dieudonn�'s Foundations of Modern Analysis, but a more accessible level and much more affordable then that classic.

Differential Calculus and Its Applications World Scientific Publishing Company

A rigorous introduction to calculus in vector spaces The concepts and theorems of advanced calculus combined with related computational methods are essential to understanding nearly all areas of quantitative science. Analysis in Vector Spaces presents the central results of this classic subject through rigorous arguments, discussions, and examples. The book aims to cultivate not only knowledge of the major theoretical results, but also the geometric intuition needed for both mathematical problem-solving and modeling in the formal sciences. The authors begin with an outline of key concepts, terminology, and notation and also provide a basic introduction to set theory, the properties of real numbers, and a review of linear algebra. An elegant approach to eigenvector problems and the spectral theorem sets the stage for later results on volume and integration. Subsequent chapters present the major results of differential and integral calculus of several variables as well as the theory of manifolds. Additional topical coverage includes: Sets and functions Real numbers Vector functions Normed vector spaces First- and higher-order derivatives Diffeomorphisms and manifolds Multiple integrals Integration on manifolds Stokes' theorem Basic point set topology Numerous examples and exercises are provided in each chapter to reinforce new concepts and to illustrate how results can be applied to additional problems. Furthermore, proofs and examples are presented in a clear style that emphasizes the underlying intuitive ideas. Counterexamples are provided throughout the book to warn against possible mistakes, and extensive appendices outline the construction of real numbers, include a fundamental result about dimension, and present general results about determinants. Assuming only a fundamental understanding of linear algebra and single variable calculus, Analysis in Vector Spaces is an excellent book for a second course in analysis for mathematics, physics, computer science, and engineering majors at the undergraduate and graduate levels. It also serves as a valuable reference for further study in any discipline that requires a firm understanding of mathematical techniques and concepts.

Best Approximation in Normed Linear Spaces by Elements of Linear Subspaces Springer Science & Business Media

This book is the first of a set dedicated to the mathematical tools used in partial differential equations derived from physics. Its focus is on normed or semi-normed vector spaces, including the spaces of Banach, Fréchet and Hilbert, with new developments on Neumann spaces, but also on extractable spaces. The author presents the main properties of these spaces, which are useful for the construction of Lebesgue and Sobolev distributions with real or vector values and for solving partial differential equations. Differential calculus is also extended to semi-normed spaces. Simple methods, semi-norms, sequential properties and others are discussed, making these tools accessible to the greatest number of students – doctoral students, postgraduate students – engineers and researchers without restricting or generalizing the results.

Calculus on Normed Vector Spaces Springer Science & Business Media

This book presents Advanced Calculus from a geometric point of view: instead of dealing with partial derivatives of functions of several variables, the derivative of the function is treated as a linear transformation between normed linear spaces. Not only does this lead to a simplified and transparent exposition of "difficult" results like the Inverse and Implicit Function Theorems but also permits, without any extra effort, a discussion of the Differential Calculus of functions defined on infinite dimensional Hilbert or Banach spaces.The prerequisites demanded of the reader are modest: a sound understanding of convergence of sequences and series of real numbers, the continuity and differentiability properties of functions of a real variable and a little Linear Algebra should provide adequate background for understanding the book. The first two chapters cover much of the more advanced background material on Linear Algebra (like dual spaces, multilinear functions and tensor products.) Chapter 3 gives an ab initio exposition of the basic results concerning the topology of metric spaces, particularly of normed linear spaces.The last chapter deals with miscellaneous applications of the Differential Calculus including an introduction to the Calculus of Variations. As a corollary to this, there is a brief discussion of geodesics in Euclidean and hyperbolic planes and non-Euclidean geometry.