Math 274 Title Elementary Differential Equations Institute

This is the first Supplementary volume to Kluwer's highly acclaimed Encyclopaedia of Mathematics. This additional volume contains nearly 600 new entries written by experts and covers developments and topics not included in the already published 10-volume set. These entries have been arranged alphabetically throughout. A detailed index is included in the book. This Supplementary volume enhances the existing 10-volume set. Together, these eleven volumes represent the most authoritative, comprehensive up-to-date Encyclopaedia of Mathematics available.

The SCAN conference, the International Symposium on Scientific Com puting, Computer Arithmetic and Validated Numerics, takes place bian nually under the joint auspices of GAMM (Gesellschaft fiir Angewandte Mathematik und Mechanik) and IMACS (International Association for Mathematics and Computers in Simulation). SCAN-98 attracted more than 100 participants from 21 countries all over the world. During the four days from September 22 to 25, nine highlighted, plenary lectures and over 70 contributed talks were given. These figures indicate a large participation, which was partly caused by the attraction of the organizing country, Hungary, but also the effec tive support system have contributed to the success. The conference was substantially supported by the Hungarian Research Fund OTKA, GAMM, the National Technology Development Board OMFB and by the J6zsef Attila University. Due to this funding, it was possible to subsidize the participation of over 20 scientists, mainly from Eastern European countries. It is important that the possibly first participation of 6 young researchers was made possible due to the obtained support. The number of East-European participants was relatively high. These results are especially valuable, since in contrast to the usual 2 years period, the present meeting was organized just one year after the last SCAN-xx conference.

This book provides the reader with the principal concepts and results related to differential properties of measures on infinite dimensional spaces. In the finite dimensional case such properties are described in terms of densities of measures with respect to Lebesgue measure. In the infinite dimensional case new phenomena arise. For the first time a detailed account is given of the theory of differentiable measures, initiated by S. V. Fomin in the 1960s; since then the method has found many various important applications. Differentiable properties are described for diverse concrete classes of measures arising in applications, for example, Gaussian, convex, stable, Gibbsian, and for distributions of random processes. Sobolev classes for measures on finite and infinite dimensional spaces are discussed in detail. Finally, we present the main ideas and results of the Malliavin calculus--a powerful method to study smoothness properties of the distributions of nonlinear functionals on infinite dimensional spaces with measures. The target readership includes mathematicians and physicists whose research is related to measures on infinite dimensional spaces, distributions of random processes, and differential equations in infinite dimensional spaces. The book includes an extensive bibliography on the subject.

Distills key concepts from linear algebra, geometry, matrices, calculus, optimization, probability and statistics that are used in machine learning.

It has been 15 years since the first edition of Stochastic Integration and Differential Equations, A New Approach appeared, and in those years many other texts on the same subject have been published, often with connections to applications, especially mathematical finance. Yet in spite of the apparent simplicity of approach, none of these books has used the functional analytic method of presenting semimartingales and stochastic integration. Thus a 2nd edition seems worthwhile and timely, though it is no longer appropriate to call it "a new approach". The new edition has several significant changes, most prominently the addition of exercises for solution. These are intended to supplement the text, but lemmas needed in a proof are never relegated to the exercises. Many of the exercises have been tested by graduate students at Purdue and Cornell Universities. Chapter 3 has been completely redone, with a new, more intuitive and simultaneously elementary proof of the fundamental Doob-Meyer decomposition theorem, the more general version of the Girsanov theorem due to Lenglart, the Kazamaki-Novikov criteria for exponential local martingales to be martingales, and a modern treatment of compensators. Chapter 4 treats sigma martingales (important in finance theory) and gives a more comprehensive treatment of martingale representation, including both the Jacod-Yor theory and Emery's examples of martingales that actually have martingale representation (thus going beyond the standard cases of Brownian motion and the compensated Poisson process). New topics added include an introduction to the theory of the expansion of filtrations, a treatment of the Fefferman martingale inequality, and that the dual space of the martingale space H^1 can be identified with BMO martingales. Solutions to selected exercises are available at the web site of the author, with current URL http://www.orie.cornell.edu/~protter/books.html.

Pressley assumes the reader knows the main results of multivariate calculus and concentrates on the theory of the study of surfaces. Used for courses on surface geometry, it includes intersting and in-depth examples and goes into the subject in great detail and vigour. The book will cover three-dimensional Euclidean space only, and takes the whole book to cover the material and treat it as a subject in its own right.

Over 220,000 entries representing some 56,000 Library of Congress subject headings. Covers all disciplines of science and technology, e.g., engineering, agriculture, and domestic arts. Also contains at least 5000 titles published before 1876. Has many applications in libraries, information centers, and other organizations concerned with scientific and technological literature. Subject index contains main listing of entries. Each entry gives cataloging as prepared by the Library of Congress. Author/title indexes.

This is a textbook for an introductory graduate course on partial differential equations. Han focuses on linear equations of first and second order. An important feature of his treatment is that the majority of the techniques are applicable more generally. In particular, Han emphasizes a priori estimates throughout the text, even for those equations that can be solved explicitly. Such estimates are indispensable tools for proving the existence and uniqueness of solutions to PDEs, being especially important for nonlinear equations. The estimates are also crucial to establishing properties of the solutions, such as the continuous dependence on parameters. Han's book is suitable for students interested in the mathematical theory of partial differential equations, either as an overview of the subject or as an introduction leading to further study.

A cumulative list of works represented by Library of Congress printed cards.

World Scientific Series in Applicable Analysis (WSSIAA) reports new developments of a high mathematical standard and of current interest. Each volume in the series is devoted to mathematical analysis that has been applied, or is potentially applicable to the solution of scientific, engineering, and social problems. The third volume of WSSIAA contains 47 research articles on inequalities by leading mathematicians from all over the world and a tribute by R.M. Redheffer to Wolfgang Walter — to whom this volume is dedicated — on his 66th birthday. Contributors: A Acker, J D Aczél, A Alvino, K A Ames, Y Avishai, C Bandle, B M Brown, R C Brown, D Brydak, P S Bullen, K Deimling, J Diaz, Á Elbert, P W Eloe, L H Erbe, H Esser, M Essén, W D Evans, W N Everitt, V Ferone, A M Fink, R Ger, R Girgensohn, P Goetgheluck, W Haussmann, S Heikkilä, J Henderson, G Herzog, D B Hinton, T Horiuchi, S Hu, B Kawohl, V G Kirby; N Kirchhoff, G H Knightly, H W Knobloch, Q Kong, H König, A Kufner, M K Kwong, A Laforgia, V Lakshmikantham, S Leela, R Lemmert, E R Love, G Lüttgens, S Malek, R Manásevich, J Mawhin, R Medina, M Migda, R J Nessel, Z Páles, N S Papageorgiou, L E Payne, J Pe…ariƒ, L E Persson, A Peterson, M Pinto, M Plum, J Popenda, G Porru, R M Redheffer, A A Sagle, S Saitoh, D Sather, K Schmitt, D F Shea, A Simon, S Sivasundaram, R Sperb, C S Stanton, G Talenti, G Trombetti, S Varošanec, A S Vatsala, P Volkmann, H Wang, V Weckesser, F Zanolin, K Zeller, A Zettl. Contents:On Free Boundary Problems for Quasi-Linear Elliptic PDE's: Uniqueness and Monotone Ordering of Convex Solutions (A Acker)Stabilizing the Backward Heat Equation Against Errors in the Initial Time Geometry (K A Ames & L E Payne)Two Integral Inequalities (B M Brown et al.)An Interpolation Inequality and Applications (R C Brown & D B Hinton)On Some Properties of the ?-Modulus (H Esser et al.)Majorization for Functions with Monotone Nth Derivatives (A M Fink)On First Order Differential Equations in Ordered Banach Spaces (S Heikkilä & V Lakshmikantham)Singular Hopf Bifurcation Problems and Rotating-Sliding Spiral Flows (G H Knightly & D Sather)Two Inequalities Resembling an Inequality of Gabushin (E R Love)Isoperimetric Inequalities in a Boundary Value Problem in an Unbounded Domain (R Sperb)On Functions whose Gradients have a Prescribed Rearrangement (G Talenti)A Free Boundary Value Problem with Strong Adsorption (V Weckesser)and other papers Readership: Applied mathematicians and engineers. keywords:Inequalities;Festschrift;Tribute

Stochastic calculus has important applications to mathematical finance. This book will appeal to practitioners and students who want an elementary introduction to these areas. From the reviews: "As the preface says, 'This is a text with an attitude, and it is designed to reflect, wherever possible and appropriate, a prejudice for the concrete over the abstract'. This is also reflected in the style of writing which is unusually lively for a mathematics book." --ZENTRALBLATT MATH

Resources in EducationOrdinary Differential EquationsAn Elementary Textbook for Students of Mathematics, Engineering, and the SciencesCourier Corporation

Developed from a first-year graduate course in algebraic topology, this text is an informal introduction to some of the main ideas of contemporary homotopy and cohomology theory. The materials are structured around four core areas: de Rham theory, the Cech-de Rham complex, spectral sequences, and characteristic classes. By using the de Rham theory of differential forms as a prototype of cohomology, the machineries of algebraic topology are made easier to assimilate. With its stress on concreteness, motivation, and readability, this book is equally suitable for self-study and as a one-semester course in topology.

Skillfully organized introductory text examines origin of differential equations, then defines basic terms and outlines the general solution of a differential equation. Subsequent sections deal with integrating factors; dilution and accretion problems; linearization of first order systems; Laplace Transforms; Newton's Interpolation Formulas, more.

This book examines equity from the standpoint of mathematics education - an excellent forum for the topic, since the results are quantifiable and the disparity in performance is stark.

From economics and business to the biological sciences to physics and engineering, professionals successfully use the powerful mathematical tool of optimal control to make management and strategy decisions. Optimal Control Applied to Biological Models thoroughly develops the mathematical aspects of optimal control theory and provides insight into the application of this theory to biological models. Focusing on mathematical concepts, the book first examines the most basic problem for continuous time ordinary differential equations (ODEs) before discussing more complicated problems, such as variations of the initial conditions, imposed bounds on the control, multiple states and controls, linear dependence on the control, and free terminal time. In addition, the authors introduce the optimal control of discrete systems and of partial differential equations (PDEs). Featuring a user-friendly interface, the book contains fourteen interactive sections of various applications, including immunology and epidemic disease models, management decisions in harvesting, and resource allocation models. It also develops the underlying numerical methods of the applications and includes the MATLAB® codes on which the applications are based. Requiring only basic knowledge of multivariable calculus, simple ODEs, and mathematical models, this text shows how to adjust controls in biological systems in order to achieve proper outcomes.

This book offers a rigorous and self-contained presentation of stochastic integration and stochastic calculus within the general framework of continuous semimartingales. The main tools of stochastic calculus, including Itô’s formula, the optional stopping theorem and Girsanov’s theorem, are treated in detail alongside many illustrative examples. The book also contains an introduction to Markov processes, with applications to solutions of stochastic differential equations and to connections between Brownian motion and partial differential equations. The theory of local times of semimartingales is discussed in the last chapter. Since its invention by Itô, stochastic calculus has proven to be one of the most important techniques of modern probability theory, and has been used in the most recent theoretical advances as well as in applications to other fields such as mathematical finance. Brownian Motion, Martingales, and Stochastic Calculus provides a strong theoretical background to the reader interested in such developments. Beginning graduate or advanced undergraduate students will benefit from this detailed approach to an essential area of probability theory. The emphasis is on concise and efficient presentation, without any concession to mathematical rigor. The material has been taught by the author for several years in graduate courses at two of the most prestigious French universities. The fact that proofs are given with full details makes the book particularly suitable for self-study. The numerous exercises help the reader to get acquainted with the tools of stochastic calculus.

Irwin mirrors the aesthetic impact of the genre by creating in his study the dynamics of a detective story—the uncovering of mysteries, the accumulation of evidence, the tracing of clues, and the final solution that ties it all together.

Partial Differential Equations presents a balanced and comprehensive introduction to the concepts and techniques required to solve problems containing unknown functions of multiple variables. While focusing on the three most classical partial differential equations (PDEs)—the wave, heat, and Laplace equations—this detailed text also presents a broad practical perspective that merges mathematical concepts with real-world application in diverse areas including molecular structure, photon and electron interactions, radiation of electromagnetic waves, vibrations of a solid, and many more. Rigorous pedagogical tools aid in student comprehension; advanced topics are introduced frequently, with minimal technical jargon, and a wealth of exercises reinforce vital skills and invite additional self-study. Topics are presented in a logical progression, with major concepts such as wave propagation, heat and diffusion, electrostatics, and quantum mechanics placed in contexts familiar to students of various fields in science and engineering. By understanding the properties and applications of PDEs, students will be equipped to better analyze and interpret central processes of the natural world.

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.

This textbook is a completely revised, updated, and expanded English edition of the important Analyse fonctionnelle (1983). In addition, it contains a wealth of problems and exercises (with solutions) to guide the reader. Uniquely, this book presents in a coherent, concise and unified way the main results from functional analysis together with the main results from the theory of partial differential equations (PDEs). Although there are many books on functional analysis and many on PDEs, this is the first to cover both of these closely connected topics. Since the French book was first published, it has been translated into Spanish, Italian, Japanese, Korean, Romanian, Greek and Chinese. The English edition makes a welcome addition to this list.

Homework help! Worked-out solutions to select problems in the text.