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SUGGESTIONS CONCERNING THE PREPARATION OF MANUSCRIPTS FOR THE QUARTERLY OF APPLIED MATHEMATICS

The editors will appreciate the authors’ cooperation in taking note of the following directions for the preparation of manuscripts. These directions have been drawn up with a view toward eliminating unnecessary correspondence, avoiding the return of papers for changes, and reducing the charges made for “author’s corrections.”

Manuscripts: Manuscripts should be typewritten double-spaced on one side only. Marginal instructions to the typesetter should be written in pencil to distinguish them clearly from the body of the text. The author should keep a complete copy.

The papers should be submitted in final form. Only typographical errors should be corrected in proof; composition charges for any major deviations from the manuscript will be passed on to the author.

Titles: The title should be brief but express adequately the subject of the paper. The name and initials of the author should be written as he/she prefers; all titles and degrees or honors will be omitted. The name of the organization with which the author is associated should be given in a separate line following his/her name.

Mathematical Work: As far as possible, formulas should be typewritten; Greek letters and other symbols not available on the average typewriter should be inserted using either instant lettering or by careful insertion in ink. Manuscripts containing pencilled material other than marginal instructions to the typesetter will not be accepted.

The difference between capital and lower-case letters should be clearly shown; care should be taken to avoid confusion between zero (0) and the letter O, between the numeral one (1), the letter l and the prime (’), between alpha and a, kappa and k, mu and u, nu and v, etc and n.

The level of subscripts, exponents, subscripts to subscripts, and exponents to exponents should be clearly indicated. Single embellishments over individual letters are allowed; the only embellishment allowed above groups of letters is the overbar.

Double embellishments are not allowed. These may be replaced by superscripts following the symbols.

Complicated exponents and subscripts should be avoided. Any complicated expression that recurs frequently should be represented by a special symbol.

For exponentials with lengthy or complicated exponents the symbol exp should be used, particularly if such exponentials appear in the body of the text. Thus,

\[ \exp[(a^2 + b^2)^{1/2}] \text{ is preferable to } e^{(a^2+b^2)^{1/2}}. \]

Fractions in the body of the text and fractions occurring in the numerators or denominators of fractions should be written with the solidus. Thus,

\[ \frac{\cos(x/2b)}{\cos(a/2b)} \text{ is preferable to } \frac{\cos x}{\cos y}. \]

In many instances the use of negative exponents permits saving of space. Thus,

\[ \int u^{-1} \sin u \, du \text{ is preferable to } \int \frac{\sin u}{u} \, du. \]

Whereas the intended grouping of symbols in handwritten formulas can be made clear by slight variations in spacing, this procedure is not acceptable in typeset formulas. To avoid misunderstanding, the order of symbols should therefore be carefully considered. Thus,

\[ (a + bx) \cos t \text{ is preferable to } \cos t(a + bx). \]

Figures: Figures should be drawn in black ink with clean, unbroken lines; do not use ball point pen. The paper should be of a nonabsorbant quality so that the ink does not spread and produce fuzzy lines. If the figures are intended for reduction, they should be drawn with heavy enough lines so that they do not become flimsy at the desired reduction. The notation should be of professional quality and in proportion for the expected reduction size. Figures which are unsuitable for reproduction will be returned to the author for redrawing. Legends accompanying figures should be written on a separate sheet.

Bibliography: References should be grouped together in a Bibliography at the end of the manuscript. References in text to the Bibliography should be made by numerals between square brackets.

The following examples show the desired arrangements: (for books—S. Timoshenko, Strength of materials, vol. 2, Macmillan and Co., London, 1931, p. 237; for periodicals—Lord Rayleigh, On the flow of viscous liquids, especially in three dimensions, Phil. Mag. (5) 36, 354–372 (1893)). Note that the number of the series is not separated by commas from the name of the periodical or the number of the volume.

Authors' initials should precede their names rather than follow them.

In quoted titles of books or papers, capital letters should be used only where the language requires this. Thus, On the flow of viscous fluids is preferable to On the Flow of Viscous Fluids, but the corresponding German title would have to be rendered as Über die Stromung zaher Fliessigkeiten.

Titles of books or papers should be quoted in the original language (with an English translation added in parentheses, if this seems desirable), but only English abbreviations should be used for bibliographical details such as ed., vol., no., chap., p.

Footnotes: As far as possible, footnotes should be avoided. Footnotes containing mathematical formulas are not acceptable.

Abbreviations: Much space can be saved by the use of standard abbreviations such as Eq., Eqs., Fig., Sec., Art., etc. These should be used, however, only if they are followed by a reference number. Thus, “Eq. (25)” is acceptable but not “the preceding Eq.” Moreover, if any one of these terms occurs as the first word of a sentence, it should be spelled out.

Special abbreviations should be avoided. Thus “boundary conditions” should always be spelled out and not be abbreviated as “b.c.” even if this special abbreviation is defined somewhere in the text.
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NEW BOOKS ................................................ 668, 720, 734, 782, 788, 794, 808, 816

This is volume 1 of the Series in Pure Mathematics. It is an expanded version of the author's lectures at Michigan State University during 1982-1983. It provides a detailed account of results on the subject which has been developed over the last fifteen years.


The aim of this book is to present the new geometrical ideas that are revolutionizing dynamical systems theory in a readable and richly illustrated form for engineers and scientists, analysts and experimentalists of all disciplines, who are concerned to model and understand the time evolution of real systems. Continuous and discrete dynamical systems, described respectively by ordinary differential equations and finite difference equations (iterated maps), are considered in the book, and attention is focused predominantly on the typical dissipative systems, familiar from the damped, energy-absorbing systems of macroscopic physics. Very little analytical knowledge is required from the reader, except a little familiarity with simple differential equations. The topological principles governing the dynamical trajectories in phase space are introduced coherently and systematically in examples of gradually increasing complexity accompanied by over 200 diagrams, most of which come directly from computer solutions of basic archetypal equations. Chapter headings: 1. Introduction. 2. An overview of nonlinear phenomena. 3. Point attractors in autonomous systems. 4. Limit cycles in autonomous systems. 5. Periodic attractors in driven oscillators. 6. Chaotic attractors in forced oscillators. 7. Stability and bifurcations of equilibria and cycles. 8. Stability and bifurcation of maps. 9. Chaotic behaviour of one- and two-dimensional maps. 10. The geometry of recurrence. 11. The Lorenz system. 12. Rosser's band. 13. Geometry of bifurcation. 14. Subharmonic resonances of an offshore structure. 15. Chaotic motions of an impacting system. 16. The particle accelerator and Hamiltonian dynamics. 17. Experimental observations of order and chaos.


The twenty papers in this volume are organized under three headings: Galaxies and Cosmology, Axisymmetric Systems, and Relativity.


These are the proceedings of an international conference on supercomputers held at the University of Texas at Austin in March of 1985. There are 26 papers dealing with high-level languages, cosmology, biology, seismology, elementary particles, field theory, magnetism, superconductivity, quantum chemistry, and reservoir engineering.


This is a volume in Pure and Applied Mathematics—A Series of Monographs and Textbooks. It is divided into five chapters. Chapter 1 deals mainly with the elementary properties of positive operators. It covers extension properties of positive operators, order projections, order continuous operators, and positive linear functionals. Chapter 2 studies three specific classes of operators: the components of a positive operator, the lattice homomorphisms, and the orthomorphisms. Chapter 3 considers topological aspects of vector spaces. It covers topological vector spaces, weak topologies on Banach and Riesz spaces. The fourth chapter is devoted to Banach lattices. The fifth chapter of the book deals with compactness properties of positive operators. This is the most important chapter of the book. It makes a thorough study of compact, weakly compact, and Dunford–Pettis operators on Banach lattices.

Continued on page 720

This is volume 289 of the series Courses and Lectures of the International Center for Mathematical Sciences, Udine, Italy, and constitutes the proceedings of a seminar held September 3-4, 1984. The proceedings are grouped into two parts: ten papers related to theory, and nine papers related to the modelling of multi-objective problems. The topics covered in the first part are: value functions both in a deterministic and in a stochastic setting, scalarization, duality, linear programming, dynamic programming and stability; the second part covers comparison of mathematical models, interactive decision making, weight assessment, scalarization models and applications (i.e., compromise and goal programming, etc.).


The authors base the concept of fuzziness on that of the interval of confidence, extending into the range of levels between 0. and 1. Fuzzy arithmetic is here considered as a domain of fuzzy set theory. The authors introduce random data into their discussions and show how they differ from fuzzy material, and how random data and fuzzy material can be used together. Chapter headings: 1. Definitions and main properties of fuzzy numbers. 2. A large sample of novel concepts and tools. 3. Arithmetic and combinatorics with uncertain numbers. 4. Some complements.


This is volume 10 of the Scientific American Library. It is a beautifully illustrated account of the Second Law of Thermodynamics, addressed to the general reader without mathematical background, but also well suited for the scientifically sophisticated who will enjoy the original insights and new angles provided by the author, an Oxford chemist. Chapter headings: 1. Nature's dissymmetry. 2. The signpost of change. 3. Collapse into chaos. 4. The enumeration of chaos. 5. The potency of chaos. 6. Transformations of chaos. 7. Powers of temperature. 8. Constructive chaos. 9. Patterns of chaos.


This is volume 30 of Lecture Notes in Statistics. It discusses the Markov model for the precipitation intensity of air pollutants and computes the distribution of the residence time of an aerosol particle. Chapter headings: 1. Introduction. 2. Some basic probability. 3. The general model. 4. Residence times and mean concentrations. 5. The variance of the concentrations. 6. The Gibbs and Slinn approximation. 7. Precipitation scavenging. 8. The concentration process.


Continued from page 720


This is a volume in the Wiley Series in Probability and Mathematical Statistics. It is its purpose to present recently developed theories for analyzing a data set resulting from designed experiments with missing data, giving complete results in analyzing experiments with arbitrary patterns. The treatment is theoretical but many examples along with computer programs are provided to clarify the concepts. There are many references at the end of each chapter, but there is no author index. Also, it seems that the references to the sources quoted in the preface are missing. Chapter headings: 1. Prologue. 2. One factor experiments: comparing treatments. 3. Experiments involving two factors. 4. Complete 2n factorial experiments. 5. Additive two-way classification with missing observations: estimability and analysis. 6. Additive three-way classification with missing observations: estimability and analysis. 7. n-way classifications with missing observations: estimability and analysis. 8. Generalized inverses for classification models. 9. Minimally connected factorial experiments and the problem of selecting a factorial experiment.

*Mathematical Methods in Medicine.* By Richard Bellman. World Scientific, Heyden & Sons, Singapore, 1983. 1 + 246 pp. $33.00 hardcover, $18.00 softcover


This introduction to Monte Carlo Methods seeks to identify and study the unifying elements that underly their effective application. It focuses on two basic themes. The first is the importance of random walks as they occur both in natural stochastic systems and their relationship to integral and differential equations. The second theme is that of variance reduction in general and importance sampling in particular as a technique for efficient use of the methods. Random walks are introduced with an elementary example in which the modelling of radiation transport arises directly from a schematic probabilistic description of the interaction of radiation with matter. Building on that example, the relationship between random walks and integral equations is outlined. The applicability of these ideas to other problems is shown by an introduction to the solution of the Schrödinger equation by random walks. The detailed discussion of variance reduction includes Monte Carlo evaluation of finite-dimensional integrals. Special attention is given to importance sampling, partly because of its intrinsic interest in quadrature, partly because of its general usefulness in the solution of integral equations.


This is volume 27 of Lecture Notes in Statistics. It is intended to give an account of the theory of infinitely divisible statistical experiments, starting with LeCam's basic result of 1974 (a presentation of which is included), as well as new developments in the field. The book consists of four chapters, written by different authors, as follows: 1. Limits of triangular arrays of experiments, by H. Milbrodt and H. Strasser. 2. The Lévy-Khintchine formula for infinitely divisible experiments, by A. Janssen. 3. Representation of Poisson experiments, by H. Milbrodt. 4. Statistical experiments with independent increments.
Continued from page 734


This is volume 271 of Lecture Notes in Economics and Mathematical Systems. The introduction surveys the history of the Cowles Commission, and the others review the work of the commission under the three headings: Simultaneous Equations, Activity Analysis, and Related Topics.


This is a volume in the Oxford Applied Mathematics and Computing Science Series. The graduate M.Sc. program in Applied Mathematics at Oxford University contains a full-year course which develops the theory and applications of partial differential equations through the solution of a series of applicable problems. Most of the problems, which may vary from year to year, have arisen from industrial research through the Oxford Study Groups with Industry, and particular attention has been paid to the formulation of each problem. This book is based on the experiences of the author and his colleagues in teaching this course and in developing the Study Group project. Its objectives are to demonstrate the skills of formulating problems in Applied Mechanics at the same time as coherently developing the theory and methods of partial differential equations. The book is not intended as a research monograph on industrial problems nor as a standard text on differential equations, which, however, are its main mathematical themes. Rather, it is an attempt to demonstrate the power of mathematics and the diversity of its application, in the hope of stimulating readers with some background knowledge of Applied Analysis and Mechanics into constructing their own models of new situations. It is designed to be a coherent text so that each problem described develops the theme, and each extension of the theme leads on to a new problem.


The invaluable feature of this as well as earlier volumes edited by Professor Masani is the placement of the bulk of Wiener’s profound contributions (not only to the many areas of mathematics, but also to philosophy, relativity, quantum mechanics, communication engineering, the physiology of the heart and nervous system, brain wave encephalography, sensory prosthesis—in short, the field now known as cybernetics) in the context of present day research by means of commentaries, tracing both their genesis and aftermath, written by eminent contemporary scholars. This volume contains the following sections: Pre-Cybernetical Papers, Cybernetical Papers (computing machines, teleology, information theory, time and organization, homeostasis, prosthesis, scientific models, and physiology); Cybernetics: Science and Society; Aesthetics and Literary Criticism; Educational Articles: Reports and Miscellaneous Articles; Encyclopedia Articles; Book Reviews, Prefaces and Abstracts; Obituaries. There is also an Introduction by P. Masani and a Bibliography of Norbert Wiener.


This is a volume in Springer Texts in Statistics. The book attempts to give a sound overview of most of the well-known and widely used methods of analyzing and portraying data graphically. Throughout the book the emphasis is on exploratory techniques. Working computer programs are provided in almost every case. Graphic representations are illustrated throughout by making use of real-life data. Two such data sets are used throughout the text. Chapter headings: 1. The role of graphics in data exploration. 2. Graphics for univariate and bivariate data. 3. Graphics for selecting a probability model. 4. Visual representation of multivariate data. 5. Cluster analysis. 6. Multidimensional scaling. 7. Graphical representations in regression analysis. 8. CHAID and XAID: Exploratory techniques for analyzing extensive data sets. 9. Control charts. 10. Time series representations. 11. Further useful graphics.

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By computerized tomography (CT) is meant the reconstruction of a function from its line or plane integrals, irrespective of the field where this technique is applied. This book collects some mathematics which is of interest both to the research mathematician who wants to understand the theory and algorithms of CT and to the practitioner who wants to apply CT in his special field of interest. The author restricts himself to the original problem of CT, and does not discuss the statistical aspects of the subject. The necessary mathematical background is reviewed in the last chapters. Chapter headings: 1. Computerized tomography. 2. The Radon transform and related transforms. 3. Sampling and resolution. 4. Ill-posedness and accuracy. 5. Reconstruction algorithms. 6. Incomplete data. 7. Mathematical tools.


The material in this book is an enlarged version of a short course given to graduate students in the Nuclear Physics Laboratory, Oxford. The emphasis is on practical applications and how to use statistics to obtain the best results from one's data and to know the limitations of the results. Chapter headings: 1. Experimental errors. 2. Probability and statistics. 3. Distributions. 4. Parameter fitting and hypothesis testing. 5. Detailed examples of fitting procedures. 6. Monte Carlo calculations.


This book grew out of a series of seminars at Columbia University. There are 15 papers, grouped under the headings Performance Analysis and Communication in Distributed Systems.


This is volume 31 of the series Mathematical Concepts and Methods in Science and Engineering. The purpose of this text is to familiarize computer users with a simple and practical method for obtaining partial derivatives of complicated mathematical expressions. The text illustrates the use of automatic derivative evaluation subroutines to solve a wide range of nonlinear least-squares, optimal control, system identification, two-point boundary value problems, and integral equations. The numerical values of the derivatives are evaluated exactly, except for roundoff, using simple FORTRAN or BASIC subroutines. These derivatives are divided automatically behind the scenes, from the equivalent of analytical expressions, without any effort from the user. In many cases, such as in optimization problems, the user of the program need only to enter an analytical expression into the program. The derivatives, as well as complete solutions, are then evaluated automatically. Chapter headings: 1. Methods for numerical differentiation. 2. Nonlinear least squares. 3. Optimal control. 4. System identification. 5. Sukhanov's variable initial value method for boundary value problems. 6. Nonlinear integral equations.

This is a volume in the Wiley Series in Probability and Mathematical Statistics. The authors state that the original aim of this book was a discussion of weak approximate results for Markov processes, but that the scope has widened to include characterization results as well as convergence properties. The three techniques discussed for proving convergence problems are: those based on operator semigroup convergence theorems; those based on the martingale characterization of Markov processes; and those depending on the representation of the processes as solutions of stochastic equations. Chapter headings: 1. Operator semigroups. 2. Stochastic processes and martingales. 3. Convergence of probability measures. 4. Generators and Markov processes. 5. Stochastic integral equations. 6. Random time changes. 7. Invariance principles and diffusion approximations. 8. Examples of generators. 9. Branching processes. 10. Genetic models. 11. Density dependent population processes. 12. Random evolutions.


This volume in the Springer Series in Computational Mathematics is an extended version of a text first published in 1979 as volume 749 of the Springer Lecture Notes in Mathematics. It is its purpose to provide a fairly comprehensive treatment of the most recent developments in the field. The authors restrict themselves to stationary problems, and do not discuss implementation of the methods, which are discussed in other texts. The text is self-contained, with proofs of all theoretical results required. Chapter headings: 1. Mathematical foundations of the Stokes problem. 2. Numerical solution of the Stokes problem in the primitive variables. 3. Incompressible mixed finite element methods for solving the Navier–Stokes problem. 4. Theory and approximation of the Navier–Stokes problem.


This is a volume in the series Cambridge Monographs on Mechanics and Applied Mathematics. In it, the author develops a framework for understanding the behavior and dynamics of magnetic fluids. Magnetic fluids, like iron, become magnetized in the presence of an external magnetic field, but also exhibit properties characteristic of fluids. The treatment is self-contained and builds stepwise on the theory of electromagnetism, fluid mechanics, and thermodynamics. The author also discusses some unusual associated phenomena such as remote positioning, levitation of dense objects, prevention of flow instabilities, and the self-organization of the magnetic fluid into patterns. Chapter headings: 1. Introduction. 2. Magnetic fluids. 3. Electromagnetism and fields. 4. Stress tensor and the equation of motion. 5. The ferrohydrodynamic Bernoulli equation. 6. Magneto-caloric energy conversion. 7. Ferrohydrodynamic instabilities. 8. Magnetic fluids and asymmetric stress. 9. Magnetic two-phase flow.


This is a volume in the Cambridge Monographs on Mechanics and Applied Mathematics. It is a comprehensive, up-to-date and coherent account of theory and experiment on wave-interaction phenomena, both in fluids at rest and in shear flows. On the one hand, this includes water waves, their evolution and interaction and associated wave-driven mean flows; on the other, phenomena of nonlinear hydrodynamic stability, especially those leading to the onset of turbulence. Close similarities and crucial differences exist between these two classes of phenomena, and their treatment in this single study provides a bridge between more specialised, but related, disciplines. Chapter headings: 1. Introduction. 2. Linear wave interaction. 3. Introduction to nonlinear theory. 4. Waves and mean flows. 5. Three-wave resonance. 6. Evolution of a nonlinear wave train. 7. Cubic three- and four-wave interactions. 8. Strong interactions, local instabilities and turbulence: a postscript.

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Dr. Budden’s “Radio waves in the ionosphere” (RWI) was first published in 1961. Advances since then which have affected the study of radio propagation include: the use of space vehicles and rockets, the advances in plasma physics, and the use of computers. Also, some important textbooks have appeared since then. (e.g., Stix; Rawer and Suchy; Ginzburg). The study of W.K.B. solutions (of importance in ray theory), and of ordinary linear homogeneous differential equations have advanced greatly. The present volume covers roughly the same topics as RWI but most of them have been treated differently, making this a new book with a new title. The stress throughout is on understanding the basic physical principles. Chapter headings: 1. The ionosphere and magnetosphere. 2. The basic equations. 3. The constructive relations. 4. Magnetoionic theory: Polarisation and refractive index. 5. Magnetoionic theory: Rays and group velocity. 6. Stratified media. The Booker quartic. 7. Slowly varying medium. The W.K.B. solutions. 8. The Airy integral function and the Stokes phenomenon. 9. Integration by steepest descents. 10. Ray tracing in a loss-free stratified medium. 11. Reflection and transmission coefficients. 12. Ray theory results for isotropic ionosphere. 13. Ray theory results for anisotropic plasmas. 14. General ray tracing. 15. Full wave solutions for isotropic ionosphere. 16. Coupled wave equations. 17. Coalescence of coupling points. 18. Full wave methods for anisotropic stratified media. 19. Applications of full wave methods.


These are the proceedings of the Third Course of the International School of Advanced Geodesy, held April 25th to May 10th, 1984 in Erice, Italy. There are eighteen papers, dealing mainly with the zero, first, second, and third-order design problems of optimization theory. The zero-order design deals with the estimability problem, in other words, with the definition of which parameters are estimable from a given set of observations. The first-order design deals with the problem of varying location of the points of a given network as well as the existence and the type of the observations that can be performed between them. The second-order design is focused on the problem of the choice of the weights to be given to the various possible observations in the network, in order that the estimates of the coordinates exhibit prefixed statistical properties, such as equal variance for the estimates of all the coordinates or uncorrelated estimates of some of the coordinates. The third-order design deals with the optimal introduction of new points and measurements in order to improve the characteristics of a network; it is the so-called densification problem.


This is a companion volume to “Quantum Field Theory and Statistical Mechanics”. The papers have been grouped into the following areas: 1. Construction of \( P(\phi) \), 2. Phase cell localization and \( \phi \) stability. 3. Phase transitions exist. 4. Phase transitions and critical behavior. 5. Particle structure. 6. Bounds on coupling constants. 7. Confinement and instantons. 8. Reflection positivity.

This is a textbook for the undergraduate course in the classical theory of dynamics for physicists or mathematicians, up to and including variational principles as well as Hamilton–Jacobi theory.


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