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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.

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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, eta 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.

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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,

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

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 Flüssigkeiten*.

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.

CONTENTS

Fuzzy Sets, Natural Language Computations, and Risk Analysis. By K. J. Schmucker. Computer Science Press, Inc., Rockville, MD, 1984. 1 + 154 pp.

The theory of fuzzy sets calls into question the validity of the premise that probability theory provides the necessary and sufficient tools for dealing with the uncertainty and imprecision which underlie the concept of risk in decision analysis. It suggests that much of the uncertainty which is intrinsic in risk analysis is rooted in the fuzziness of the information which is resident in the database and, more particularly, in the fuzziness of the underlying probabilities. This book serves to introduce the reader to the theory of fuzzy sets and explains, with the help of many examples, the use of the linguistic approach—the concept of a linguistic variable whose values are not numbers but words or sentences in a natural or synthetic language. Chapter headings: 1. Review of set theory; 2. Fuzzy set theory; 3. Natural language computation; 4. Psychological considerations of fuzziness; 5. The fuzzy risk analyzer; 6. Future research.

Mathematical Essays; In honor of Su Buchin. Ed. By C. C. Hsiung World Scientific Pub. Co., Singapore, 1983. 1 + 275 pp. $35.00

This is a collection of research papers published in various mathematical journals by friends, colleagues, and former students of Professor Buchin Su in honor of his 80th birthday. They deal mainly with aspects of differential geometry and its applications.

Scattering Theory for Diffraction Gratings. By Calvin H. Wilcox. Springer-Verlag, New York, 1984. 1 + 159 pp.

This is volume 46 in the series Applied Mathematical Sciences. It is the purpose of this monograph to develop from first principles a theory of the scattering of acoustic and electromagnetic waves by periodic surfaces. In physical terms, the scattering of both time-harmonic and transient fields is analyzed. The corresponding mathematical model leads to the study of boundary value problems for the Helmholtz and d'Alembert wave equations in plane domains bounded by periodic curves. In the formalism adopted here these problems are intimately related to the spectral analysis of the Laplace operator, acting in a Hilbert space of functions defined in the domain adjacent to the grating. The intended audience for this monograph includes both those applied physicists and engineers who are concerned with diffraction gratings and those mathematicians who are interested in spectral analysis and scattering theory for partial differential operators. To make the subject accessible and useful to both applied scientists and mathematicians, the work is divided into two parts. Part 1, called Physical Theory, presents the basic physical concepts and results formulated in the simplest and most concise form consistent with their nature. Part 2, Mathematical Theory, develops the relevant concepts and results from functional analysis and the theory of partial differential equations and applies them to give complete proofs of the results formulated in Part 1.

Functional Equations: History, applications and theory. Ed. By J. Aczel. D. Reidel Pub. Co., Dordrecht, Holland, 1984. 1 + 229 pp. $47.50

This collection contains an introduction by the editor "On history, applications and theory of functional equations" as well as six essays and twelve papers on various aspects of functional equations and their applications.

Applications of Optimal Control Theory in Biomedicine. By George W. Swan. Marcel Dekker, Inc., New York, 1984. 1 + 277 pp. $55.00

This is volume 81 in the series Pure and Applied Mathematics. Each chapter of this book treats an application of engineering control theory to biomedicine, is self-contained and includes its own set of references. Chapter headings: 1. Mathematical theories of optimal control; 2. Overview of systems concepts; 3. Optimal control of diabetes mellitus; 4. Optimal management of thyroid disease; 5. Optimal administration of drugs; 6. Optimal control in cancer therapy; 7. Optimal control problems of the circulatory system; 8. Miscellaneous applications.

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Applied and Computational Complex Analysis: *Volume* 3. By Peter Henrici. John Wiley & Sons, New York, 1986. pp. xiii + 637.

This is the third volume of a work aiming at presenting computational aspects and applications of complex analysis, the earlier volumes of which appeared in 1974 and 1977. This volume is subtitled Discrete Fourier Analysis-Cauchy Integrals-Construction of Conformal Maps-Univalent Functions, which are also, essentially, the titles of the chapters. The core of the book is represented by two topics: two-dimensional potential theory and the construction of conformal maps for simply and multiply connected regions. Under the heading Cauchy Integrals the author introduces the boundary value problems of complex analysis, with their numerous applications. Much of the algorithmic underpinning for these theories is provided by the discrete Fourier transform. The chapter on Univalent Functions culminates in an elementary account of L. de Branges' 1984 proof of the Bieberbach conjecture, a proof which applies much of the material presented earlier, especially in the areas of power series and ordinary differential equations. The general goals of the project are those expounded in the earlier volumes: the author tries to present, on a level that is mathematically precise, but nevertheless accessible to the nonspecialist, complex analysis not merely as a logical structure of great beauty and coherence, but also as a tool for modelling phenomena of the physical world, and as a source of algorithms for the efficient use of these models.

Equilibrium Capillary Surfaces. By Robert Finn. Springer-Verlag, New York, 1986. pp. xiii + 245. $57.00.

This is volume 284 of Grundlehren der mathematischen Wissenschaften, A Series of Comprehensive Studies in Mathematics. Capillary phenomena are manifestations of something that happens whenever two different materials are situated adjacent to each other and do not mix. Attempts to explain them go back at least to Leonardo da Vinci. In recent years, the impetus on the one hand of new mathematical developments on the minimal surface, and on the other hand of the practical demands of the space age technology and of medicine, have now led to renewed activity on several fronts. The present author's interest in the field was attracted by the circumstance that in some particular situations the procedures for matching expansions led inexplicably to incoherent answers. A direct study of the underlying equations showed that a discontinuous dependence on data occurs, which is governed by the particular nonlinearity in the equations, leading to a precise characterization of the criterion for singular behavior, to general bounds on solutions, and to asymptotically exact information in some cases. The material covered in this monograph is indicated by the table of contents: 1. Introduction. 2. The symmetric capillary tube. 3. The symmetric sessile drop. 4. The pendent liquid drop. 5. Asymmetric case; comparison principles and applications. 6. Capillary surfaces without gravity. 7. Existence theorems. 8. The capillary contact angle. 9. Identities and isoperimetric relations.

Sobolev Spaces. By Vladimir G. Maz'ja. Springer-Verlag, New York, 1985. pp. xix + 486. $59.00.

This is a volume in the Springer Series in Soviet Mathematics, translated by Tatyana O. Saposnikova, the author's wife. Sobolev spaces are classes of functions with derivatives in L_p. This work considers various aspects of such spaces, paying attention mainly to the imbedding theorems, which are a useful tool in functional analysis and in the theory of linear and nonlinear partial differential equations. Chapter headings: 1. Basic properties of Sobolev spaces. 2. Inequalities for gradients of functions that vanish on the boundary. 3. On summability of functions in the spaces $L_1^1(\Omega)$. 4. On summability of functions in the spaces $L_p^1(\Omega)$. 5. On continuity and boundedness of functions in Sobolev spaces. 6. On functions in the space $\mathrm{BV}(\Omega)$. 7. Certain function spaces, capacities and potentials. 8. On summability with respect to an arbitrary measure of functions with fractional derivatives. 9. A variant of capacity. 10. An integral inequality for functions on a cube. 11. Imbedding of the space $L_p^1(\Omega)$ into outer function spaces. 12. The imbedding $L_p^1(\Omega, v) \subset W_r^m(\Omega)$.

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Modeling Nature: Episodes in the History of Population Ecology. By Sharon E. Kingsland. The University of Chicago Press, Chicago, 1985. pp. ix + 267. $27.50.

"This book is about the places where the imagined world of the mathematician and the real world of the biologist intersect." The author shows how the introduction of mathematical models, similar to those used in population genetics, into ecological studies in the 1920's and 30's altered the field of population ecology. She also analyzes the relation between ecology and evolutionary biology. Chapter headings: 1. Prologue: the entangled bank. 2. The world engine. 3. The quantity of life. 4. Much ado. 5. Modeling nature. 6. Skeptics and converts. 7. The niche, the community, and evolution. 8. The eclipse of history.

Recent Advances in Planetary Meteorology. Edited by Garry E. Hunt. Cambridge University Press, Cambridge, 1985. pp. xi + 161. $39.50.

These are the proceedings of the Seymour Hess Memorial Symposium of the International Union of Geodesy and Geophysics General Assembly held in Hamburg, August 18–19, 1983. It consists of an introduction by the editor and seven papers on the major quantitative developments in planetary meteorology.

Mathematics for Business, Management and Economics: A Systems Modelling Approach. By D. J. Harris. Ellis Horwood Limited, Chichester, 1985. pp. 1 + 392.

This is a volume in the Ellis Horwood series Mathematics and its Applications. It is primarily intended for undergraduates in management sciences, business studies and mathematical economics. Chapter headings: 1. Functional relationships and model building. 2. Differentiation and its applications. 3. Integration and its applications. 4. Matrix methods. 5. Computational methods. 6. Modelling with differential and difference equations.

Modern Concepts and Theorems of Mathematical Statistics. By Edward B. Manoukian. Springer-Verlag, New York, 1986. pp. xvi + 156. $29.80.

It was the aim of the author of this book to provide the student, the instructor, and the researcher in the field with a quick, comprehensive, and compact encyclopedic reference source on a very wide range of the field of modern mathematical statistics. It is a useful reference for almost every learner involved with mathematical statistics at any level, and may supplement any textbook on the subject. As the primary audience of this book, the author has in mind the beginning graduate student who finds it difficult to master the basic modern concepts by an examination of a limited number of existing textbooks. To make the book more accessible to a wide range of readers he has kept the mathematical language at a level suitable for those who have had only an introductory undergraduate course on probability and statistics, and basic courses in calculus and linear algebra. No sacrifice, however, is made to dispense with rigor. Chapter headings: 1. Basic definitions, concepts, results, and theorems. 2. Fundamental limit theorems. 3. Distributions. 4. Some relations between distributions.

Introduction to Set Theory. By Karel Hrbacek and Thomas Jech. Marcel Dekker, Inc. New York, 1984. pp. iii + 247. $39.75.

This is volume 85 in the series Pure and Applied Mathematics. It is the second revised and expanded edition of a text accepted for publication in Czech in 1968, but never actually published. It is an axiomatic development of set theory, but the treatment is not formal. It is shown that axiomatic set theory is powerful enough to serve as an underlying framework for mathematics. A substantial part of the book is devoted to the study of cardinal and ordinal numbers. Each section is accompanied by many exercises of varying difficulty. The final chapter is an outline of some recent developments in set theory and their significance for other areas of mathematics.

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Applied Differential Geometry. By William L. Burke. Cambridge University Press, Cambridge, 1985. pp. xvii + 414. $54.50 hardcover, $19.95 paperback.

This is a self-contained introduction to differential geometry and the calculus of differential forms. It is written primarily for physicists. The material complements the usual mathematical methods, which emphasize analysis rather than geometry. The reader is expected to have the standard physics background in mechanics, electrodynamics, and mathematical methods. Proofs are given only when they are especially instructive. Definitions, especially of mathematical structures, are given far more carefully than is the usual practice in physics. There are many physical applications: indeed, the examples form nearly half of the book. Chapter headings: 1. Tensors in linear spaces. 2. Manifolds. 3. Transformations. 4. The calculus of differential forms. 5. Applications of exterior calculus. 6. Classical electrodynamics. 7. Dynamics of particles and fields. 8. Calculus on fiber bundles. 9. Gravitation.

Spherical Astronomy. By Robin M. Green. Cambridge University Press, Cambridge, 1985. pp. xiv + 520.

Smart's Spherical Astronomy, first published in 1931, was last revised by the author in 1977. By 1984, a new standard equinox had been adopted, a new fundamental catalogue of the stars published, and the Astronomical Ephemeris had been revised. Most important of all, relativity has been recognized as fundamental to positional astronomy. Hence, the time had come for a new book to replace Smart's. The book is similar to Smart's in that it is intended as an undergraduate text and thus the methods used are mathematically fairly simple. It should, like Smart's, also be useful as a reference for graduate students and research workers in other fields. The relationship of positional astronomy and general relativity is treated at what is conceptually a fairly basic level. The methods of tensor calculus are employed on occasion but explained in an Appendix. Chapter headings: 1. Basic formulae. 2. The celestial sphere. 3. The reference frame. 4. Geocentric coordinates. 5. Direct measurement of right ascension and declination. 6. Two-body orbital motion. 7. Planetary and satellite orbits. 8. Heliocentric and barycentric coordinates. 9. Precession and nutation. 10. Time. 11. Proper motion and radial velocity. 12. Mean and apparent coordinates. 13. Astrographic plate measurements. 14. Stellar distances and movements. 15. Elements of radio astronomy. 16. Radio astrometry. 17. Planetary phenomena and surface coordinates. 18. Eclipses and occultations. 19. Binary stars.

An Introduction to the Theory of Seismology. By K. E. Bullen and Bruce A. Bolt. Cambridge University Press, Cambridge, 1985. pp. xvii + 499. $69.50 hardcover, $24.95 paperback.

This is the fourth edition of Bullen's famous work first published in 1947. His death in 1976 prevented him from revising the 1963 edition, but he had prepared extensive notes while giving seismology courses in 1971 and 1973 and these have been used by Professor Bolt in making the present revisions. About sixty percent of this edition is new material. It preserves what remains most useful of the 1963 text but incorporates at the appropriate introductory level the necessary fundamental ideas to fill the most notable gaps. There are new chapters on the theory of seismic sources, seismic waves through anomalous zones, eigen-vibrations of the Earth, and strong-motion seismology. Other new material has been added. Chapter headings: 1. The scope of seismology. 2. Elasticity theory. 3. Vibrations and waves. 4. Body elastic waves. 5. Surface elastic waves and eigen-vibrations of a sphere. 6. Reflection and refraction of elastic waves. 7. Seismic rays in a spherically stratified earth model. 8. Amplitudes of the surface motion due to seismic waves in a spherically stratified earth model. 9. Seismometry. 10. Construction of travel-time tables. 11. The seismological observatory. 12. Seismic waves in anomalous structures. 13. Seismic waves and planetary interiors. 14. Long-period oscillations and the earth's interior. 15. Earthquake statistics and prediction. 16. The earthquake source. 17. Strong-motion seismology.

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Relative Invariants of Rings: The Noncommutative Theory. By F. Van Oystaeyen and A. Verschoren. Marcel Dekker, Inc. New York, 1984. pp. v + 286. $59.75.

This is volume 86 in the series Pure and Applied Mathematics. It presents new methods to infer information about the structure of a ring from knowledge of the structure of certain groups called relative invariants of the ring. Beginning with a full examination of the theory of relative Picard groups, it considers relative Azumaya algebras and the application of relative cohomology, the construction of new graded orders and central class groups of a maximal order over a Krull domain.

Linear Algebra Over Commutative Rings. By Bernard R. McDonald. Marcel Dekker, Inc. New York, 1984. pp. iii + 544.

This is volume 87 in the series Pure and Applied Mathematics. It arose from lectures ast the University of Oklahoma on topics related to linear algebra over commutative rings. The author's desire was to provide both an introduction and a survey of matrix theory over commutative rings. The first chapter is devoted to matrix theory over a commutative ring. Chapter II summarizes standard results on free modules. In Chapter III, the author examines the endomorphism rings of finitely generated free and projective modules, and, in Chapter IV, the structure theory of a projective module. In Chapter V the theory of a single endomorphism is discussed.

Geometry of Projective Algebraic Curves. By Makoto Namba. Marcel Dekker. Inc. New York, 1984. pp. iii + 409. $69.95 ($39.95 on orders of five or more, for classroom use only).

This is volume 88 in the series Pure and Applied Mathematics. It presents the theory of projective algebraic curves from the geometric point of view, beginning from the classical geometry of conics. Contents: Part I: Extrinsic geometry of the curves: 1. Projective geometry of curves. 2. Singular curves of lower degree. Part II: 3. Complex manifolds and projective varieties. 4. Compact Riemann surfaces. 5. Riemann–Roch theorem.

Tables of Dominant Weight Multiplicities for Representations of Simple Lie Algebras. By M. R. Bremner, R. V. Moody, and J. Patera. Marcel Dekker, Inc. New York, 1985. pp. iii + 339. $65.00.

This is volume 90 in the series Pure and Applied Mathematics. The bulk of this work is devoted to multiplicity tables, offering the multiplicities of the first 52 representations in each congruence class of simple Lie algebras of the rank $\leqslant 12$ and the first 104 representations of the other cases.

Real Linear Algebra. By Antal E. Fekete. Marcel Dekker, Inc. New York, 1985. pp. v + 426. $47.25.

This is volume 91 in the series Pure and Applied Mathematics. It is based on the archives of Norman E. Steenrod and emphasizes an intuitive geometric approach. Chapter headings: 0. Introductory remarks concerning logic. 1. The sum and the scalar multiple of vectors. 2. The dot product of vectors. 3. The cross product and the box product of vectors. 4. The Lie algebra of vectors in three-dimensional space. 5. Lines and planes. 6. Linear operators. 7. The product of linear operators. 8. Invertible linear operators. 9. Kernel and image: The classification of linear maps. 10. Eigenvalues and eigenvectors: The classification of linear operators. 11. Symmetric, antisymmetric, and orthogonal operators. 12. Rotations and reflections: The classification of orthogonal operators. 13. The determinant and the trace of a linear operator. 14. The exponential functor.

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Multiple-Criteria Decision Making: Concepts, Techniques, and Extensions. By Po-Lung Yu. Plenum Press, New York, 1985. pp. xiv + 388. $49.50.

This is volume 30 in the series Mathematical Concepts and Methods in Science and Engineering. Its purpose is, on the one hand, to offer the reader an integral and systematic view of various concepts and techniques in MCDM at an introductory level, and, on the other hand, to provide a basic conception of the human decision mechanism. The book was written with a goal in mind that the reader should be able to assimilate and benefit from most of the concepts in the book if he has mathematical maturity equivalent to a course in operations research or optimization theory. Good training in linear and nonlinear programming is sufficient to digest most of the concepts in the book. Chapter headings: 1. Introduction. 2. Binary relations. 3. Pareto optimal of efficient solutions. 4. Goal setting and compromise solutions. 5. Value functions. 6. Some basic techniques for constructing value functions. 7. Domination structures and nondominated solutions. 8. Linear cases, MC- and MC2-simplex methods. 9. Behavioral bases and habitual domains of decision making. 10. Further topics.

Isolation and Aggregation in Economics. By Ekkehart Schlicht. Springer-Verlag, New York, 1985. pp. xi + 112. $22.50.

This book offers a discussion of certain central premises involved when economic analysis, in order to solve a given problem, is compelled to concentrate on the interaction of certain factors while disregarding a multitude of other influences. The argument is focused on the analysis of economic processes within a given institutional setting. Chapter headings: 1. The setting of argument. 2. On isolation. 3. The moving equilibrium method. 4. Econometric implications. 5. The nature of macroeconomic laws.

The Traveling Salesman Problem: A Guided Tour of Combinatorial Optimization. Edited by E. L. Lawler, J. K. Lenstra, A. H. G. Rinnooy Kan, and D. B. Shmoys. John Wiley & Sons, New York, 1985, pp. x + 465.

This is a volume in the Wiley-Interscience Series in Discrete Mathematics. The book was conceived as being able to serve both as a text for advanced courses in combinatorial optimization and as a standard reference for workers in the area. The authors selected the foremost authorities on the various aspects of the traveling salesman problem to write the various chapters, but wished to organize the book in such a manner as to make it appear as if it had been written by no more than four persons. Chapter headings: 1. History. 2. Motivation and modelling. 3. Computational complexity. 4. Well-solved special cases. 5. Performance guarantees for heuristics. 6. Probabilistic analysis of heuristics. 7. Empirical analysis of heuristics. 8. Polyhedral theory. 9. Polyhedral computations. 10. Branch and bound methods. 11. Hamiltonian cycles. 12. Vehicle routing.

Statistical Analysis of Measurement Errors. By John L. Jaech. John Wiley & Sons, New York, 1985. pp. xxiii + 293.

The common thread running through the variants of the general model discussed in this book, an Exxon Monograph, is statistical inference based on maximum likelihood. After an introductory chapter included to make the book somewhat self-contained, succeeding chapters develop the general experimental situation with increased complexity. Chapter 2 considers the case in which the measurement methods have equal precisions, while in later chapters, the models assume unequal precisions. Chapter 3 deals with $N = 2$ measurement methods. Chapters 4 and 5 deal with inference based on paired differences, for $N = 3$ in chapter 4 and for $N \geqslant 4$ in chapter 5. The original data form the basis for the statistical inference in chapter 6, for $N \geqslant 3$. A comparison of moment and maximum likelihood estimators is found in chapter 7, while chapter 8 gives a bibliography of works not referenced in earlier chapters. Chapter 9 gives an example of outputs from the computer programs, and also program listings.

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Treatise on the Shift Operator: Spectral Function Theory. By N. K. Nikol'skii. Springer-Verlag, New York, 1986. pp. xi + 491. $64.50.

This is volume 273 of Grundlehren der mathematischen Wissenschaften, A Series of Comprehensive Studies in Mathematics and also part of the Springer Series in Soviet Mathematics. It is a translation, by Jaak Peetre, of the original 1980 Russian edition, an elementary introduction to nonclassical spectral theory. After the basic definitions and a reduction to the study of the functional model, the discussion is centered around the simplest variant of such a model which, formally speaking, comprises only the class of contraction operators with a one-dimensional rank of nonunitarity. The main emphasis is on the technical side of the subject, the book being mostly devoted to a development of the analytical machinery of spectral theory rather than to this discipline itself. The book is organized into eleven "Lectures": 1. Invariant subspaces. 2. Individual theorems for the oeprator S^*. 3. Compressions of the shift and the spectra of inner functions. 4. Decomposition into invariant subspaces. 5. The triangular form of the truncated shift. 6. Bases and interpolation (statement of the problem). 7. Bases and interpolation (solution). 8. Operator interpolation and the commutant. 9. Generalized spectrality and interpolation of germs of analytic functions. 10. Analysis of the Carleson–Vasyunin condition. 11. On the line and in the halfplane.

Nonlinear Functional Analysis and its Applications: 1. *Fixed Point Theorems*. By Eberhard Zeidler. Springer-Verlag, New York, 1986. pp. xxi + 897. $98.00.

This is volume 1 of a comprehensive treatise on nonlinear functional analysis, accessible to a broad audience of mathematicians, natural scientists, and engineers with a command of the basics of linear functional analysis only. The original German language version was published in three parts as Teubner texts in 1976, 1977, and 1978, and the present English edition was translated from a completely rewritten manuscript which represents a significant enlargement and revision of the original version. The material is organized into five parts: I. Fixed point theorems. II. Monotone operators. III. Variational methods and optimization. IV/V. Applications in mathematical physics. The present volume is divided into seventeen chapters: 1. The Banach fixed-point theorem and iterative methods. 2. The Schauder fixed-point theorem and compactness. 3. Ordinary differential equations in B-spaces. 4. Differential calculus and the implicit function theorem. 5. Newton's method. 6. Continuation with respect to a parameter. 7. Positive operators. 8. Analytic bifurcation theory. 9. Fixed-points of multivalued maps. 10. Nonexpansive operators and iterative methods. 11. Condensing maps and the Bourbaki–Kneser fixed-point theorem. 12. The Leray–Schauder fixed-point index. 13. Applications of the fixed-point index. 14. The fixed-point index of differentiable and analytic maps. 15. Topological bifurcation theory. 16. Essential mappings and Borsuk antipodal theorem. 17. Asymptotic fixed-point theorems.

Transactions of the Ninth Prague Conference on Information Theory, Statistical Decision Functions, Random Processes. Vol. A. D. Reidel Pub. Co., Dordrecht, Holland, 1983. 13 + 332 pp. $50.00

This is the first of two volumes reporting on a conference, held at Prague, June 28 through July 2, 1982. This volume contains the texts of ten invited papers and thirty-two communications.

Transactions of the Ninth Prague Conference on Information Theory, Statistical Decision Functions, Random Processes. Vol. B. D. Reidel Pub. Co., Dordrecht, Holland, 1983. 11 + 310 pp. $50.00

This is the second of two volumes reporting on a conference, held at Prague from June 28 through July 2, 1982. It contains the texts of forty-six papers.

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Operators and Function Theory. Edited by S. C. Power. D. Reidel Publishing Company. Boston, 1985. pp. xvi + 383.

This is a volume in the NATO Advanced Science Institutes Series, the proceedings of the Institute held at Lancaster, U. K., July 16–26, 1984, which was organized to provide an overview of the main line of developments linking Hilbert space operators with analytic function theory. The volume provides the texts of the eleven main lectures.

Annual Review of Fluid Mechanics. Edited by Milton van Dyke, J. V. Wehausen, and John L. Lumley. Annual Reviews Inc. Palo Alto, California, USA, 1986. pp. vii + 522. $32.00.

As most volumes in this distinguished series, volume 18 leads off with an article of reminiscences, in this case one by Professor J. T. Stuart, F.R.S., on the recently deceased Keith Stewartson, his life and work. Among the other articles, John Guckenheimer discusses strange attractors in fluids and their relation to turbulence. The other authors are: Hans Hornung, R. W. Griffith, Greg Holloway, Rodney J. Sobey, J. Cousteix, F. T. Smith, J. H. B. Smith, Dennis J. Evans, William G. Hoover, William D. Grant, Ole S. Madsen, M. E. Glicksman, S. R. Coriell, G. B. McFadden, P. L. Roe, Justin E. Kerwin, S. A. Maslowe, Peter B. Rhines.

Dynamical Systems: a Differential Geometric Approach to Symmetry and Reduction. By Giuseppe Marmo, Eugene J. Saletan, Alberto Simoni, and Bruno Vitale. John Wiley & Sons, New York, 1985. pp. xii + 377. $64.95.

One of the objects of this book is to present to the physicist reasonably conversant with classical mechanics some aspects of the more contemporary mathematical treatment of the subject, that is, from the global or intrinsic point of view of differential geometry. Another object is to show how a dynamical system is sometimes reduced to a system of lower dimension, often by taking into account its symmetries and invariance. Part I, on the foundations of mechanics (chapters 1–15), is meant to be self-contained. Part II is concerned more specifically with invariance, symmetry and reduction. Section A, on reduction (chapters 16–20) introduces foliations. In section B (chapters 21–26) the structures of groups and algebras is added and the resultant enrichment is discussed.

Polytopes, Graphs and Optimisation. By V. A. Yemelichev. Cambridge Univ. Press, Cambridge, 1984. 1 + 400 pp. $49.50

The first result in the combinatorial theory of polytopes is the formula connecting the number of vertices, edges, and faces of a three-dimensional polytope, obtained by Euler in 1736. Poincaré gave the generalization of this result for convex polytopes of any dimension. The study of the figures formed by the vertices and edges of any three-dimensional polytope led to graph theory. The contemporary combinatorial theory of polytopes is concerned with extremal properties of polytopes and studies the set of faces of all dimensions as a simple complex. Many problems of current interest in the study of polytopes arose under the mutual influence of two important areas of applied mathematics—the theory of systems of inequalities and optimization theory. The authors of the present monograph believe that a more important problem now is the solution of combinatorial problems which are presented in analytical form using systems of linear inequalities rather than in purely geometrical and topological form. The basic objects of study in this book are combinatorial problems in the theory of linear irregularities with both real and integer variables and coefficients. General as well as special systems of linear inequalities are studied. The study of the combinatorial properties of polytopes is in this monograph closely interrelated with optimization problems which have important applications. Chapter headings: 1. Convex polytopes; 2. Graphs of polytopes; 3. Combinatorial properties of the face complex of a polytope; 4. Integral points of polyhedra; 5. Permutation polytopes; 6. Classical transportation polytopes; 7. Transportation polytopes with side conditions; 8. Multi-index transportation polytopes.

Elements of Digital Satellite Communication. Volume II: Channel Coding and Integrated Services, Digital Satellite Networks. By William W. Wu. Computer Science Press, Md., 1985. pp. xiiii + 642.

The first volume of this two volume set was entitled System Alternatives, Analyses and Optimization. In this volume, the author continues to explore and to analyze selected subjects that are pertinent to either present or future digital satellite communication. The emphasis is on methodology and unified analyses.

Introduction to Linear and Convex Programming. By Neil Cameron. Cambridge University Press, Cambridge, 1985. pp. 1 + 149. $34.50 (hardcover), $12.95 (paperback).

This is volume 1 in the Australian Mathematical Society Lecture Series. It has grown from courses given at Monash University, Melbourne, and is suitable as a textbook for third year undergraduate students. It aims at optimization, and also at studying linear algebra, euclidean space geometry, and some analysis in an applied context, preliminary to a study of functional analysis. Chapter headings: 1. Geometry and linear algebra. 2. Linear programming. 3. Elementary convex analysis. 4. Nonlinear programming.

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