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Quarterly of Applied Mathematics

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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."

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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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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.

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Single embellishments over individual letters are allowed; the only embellishment allowed above groups of letters is the overbar.

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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 that are unsuitable for reproduction will be returned to the author for redrawing. Legends accompanying figures should be written on a separate sheet.

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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.

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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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Mathematical Statistics—Basic Ideas and Selected Topics, Volume I. By Peter J. Bickel and Kjell A. Doksum, Prentice Hall, 2001, xviii + 556 pp.

This is the first volume of the second edition of the well-known text first published in one volume in 1977. Volume 2 is expected to be forthcoming in 2003. The authors trace the change in the science of statistics since the publication of their first edition to three forces: the generation of new types of data such as images, trees, and other types of combinatorial objects; the generation of enormous amounts of data; and the possibility of implementing computations of a once unthinkable magnitude. These changes are caused in part by the exponential increase in computing speed and the generation of data by techniques such as tomography and gene sequencing. As a consequence, the authors see the emphasis of statistical theory shifting away from the small sample optimality results that were a major theme of their first edition towards directions such as: asymptotic methods in non- and semiparametric models; models for time series and other complex data structures using sophisticated probability modeling relying on asymptotic approximations; methods of inference involving simulation as a key element such as bootstrap and Markov Chain Monte Carlo; development of techniques describable not in closed form but only through elaborate algorithms, for which existence proofs for solutions are essential; the study of the interplay between numerical and statistical considerations, and of the interplay between the number of observations and that of parameters of a model. Chapter headings: 1. Statistical models, goals, and performance criteria; 2. Methods of estimation; 3. Measures of performance; 4. Testing and confidence regions; 5. Asymptotic approximations; 6. Inference in the multiparameter case. There are two appendices: a review of basic probability theory and of certain additional basic topics in probability and statistics (such as conditioning, distribution theory for transformations of random variables and for normal samples, the bivariate and the multivariate normal distribution, moments of random vectors and matrices, convergence of random variables).

Wave Motion. By J. Billingham and A. C. King, Cambridge University Press, 2000, ix + 468 pp., $110.00 (hardback), $37.95 (paperback)

This is a volume in the series Cambridge Texts in Applied Mathematics and is designed as a textbook for advanced undergraduates. It is divided into three parts: linear waves (chapters 1–6), nonlinear waves (chapters 7–9), advanced topics (chapters 10–12). Chapter headings: 1. Basic ideas; 2. Waves on a stretched string; 3. Sound waves; 4. Linear water waves; 5. Waves in elastic solids; 6. Electromagnetic waves; 7. The formation and propagation of shock waves; 8. Nonlinear water waves; 9. Chemical and electromagnetic waves; 10. Burgers' equation: competition between wave steepening and wave spreading; 11. Diffraction and scattering; 12. Solitons and the inverse scattering transform.

Annual Review of Fluid Mechanics, Volume 33. Edited by John L. Lumley, Stephen H. Davis, and Helen L. Reed, Annual Reviews, Palo Alto, CA, 2002, vii + 713 pp.,

This volume features a personal and scientific appreciation, by T. J. Pedley, of James Lighthill, who had died on July 17, 1998, whilst swimming around the island of Sark, in the Channel Islands, entitled: *James Lighthill and his Contributions to Fluid Mechanics.* Other contributions to this volume concern: steady streaming, fluid mechanics of fire, thermocapillary instabilities, Robert Legendre and Henri Werlé, surface pressure measurements, Rossby wave hydraulics, spin-up of fluids, extrusion instabilities, turbulent relative dispersion, early work on fluid mechanics in the IC engine, mechanics of coastal forms, aerodynamics of high-speed trains, junction flows, fluid-structure interaction, compression system instability, spilling breakers, shelterbelts and windbreaks, drag due to lift, inertial effects in suspension and porous-media flows.

Lévy Processes—Theory and Applications. Edited by O. E. Barndorff-Nielsen, T. Mikosch, and S. I. Resnick, Birkhäuser, 2001, x + 415 pp.

A Lévy process is a continuous-time analogue of a random walk. Generalizations of it are Martingales, Markov processes, and diffusions. This volume consists of an introductory preface by the editors and state-of-the-art accounts of recent developments, with special emphasis on non-Brownian motion. There are eighteen chapters, divided into six parts: I. A tutorial on Lévy processes; II. Distributional, pathwise and structural results; III. Extensions and generalizations of Lévy processes; IV. Applications in physics; V. Applications in finance; VI. Numerical and statistical aspects.

Geometric Partial Differential Equations and Image Analysis. By Guillermo Sapiro, Cambridge University Press, 2001, xxv + 385 pp., $64.95

This book provides the basic mathematical background necessary for understanding the literature in geometric partial differential equations applied to image processing and computer vision. The idea of using pde's and curvature-driven flows in such applications is to deform a given curve, surface, or image with a partial differential equation and obtain the desired result as its solution. The scope of the work is indicated by its table of contents: 1. Basic mathematical background; 2. Geometric curve and surface evolution; 3. Geodesic curves and minimal surfaces; 4. Geometric diffusion of scalar images; 5. Geometric diffusion of vector-valued images; 6. Diffusion on non-flat manifolds; 7. Contrast enhancement; 8. Additional theories and applications. There is a bibliography with 430 items.

Lattice Gas Hydrodynamics. By Jean-Pierre Rivet and Jean Pierre Boon, Cambridge University Press, 2001, xix + 289 pp., $95.00

In lattice gas theory, which started around 1985, one imagines point-like particles residing on a regular lattice where they move from node to node and undergo collisions when their trajectories meet at the same node. Under certain conditions, this automaton shows global behavior very similar to that of real fluids. Starting from the recovery of Navier-Stokes equations, the field of lattice gas automata has broadened into the study of more general phenomena and is described in this monograph. Chapter headings: 1. Basic ideas; 2. Microdynamics: general formalism; 3. Microdynamics: various examples; 4. Equilibrium statistical mechanics; 5. Macrodynamics: Chapman-Enskog method; 6. Linearized hydrodynamics; 7. Hydrodynamic fluctuations; 8. Macrodynamics: projectors approach; 9. Hydrodynamic regimes; 10. Lattice gas simulations; 11. Guide for further reading.

An Atlas of Graphs. By Ronald C. Read and Robin J. Wilson, Oxford University Press, 1999, x + 454 pp., $140.00

This is a volume in the series Oxford Science Publications. It is the purpose of this *Atlas* to present pictures and information about graphs and digraphs for researchers in graph theory. It contains pictures of over 1000 graphs, tables giving the number of graphs or digraphs with a given property, and tables of parameters associated with many of the pictured graphs and digraphs. Table of contents: 1. Graphs; 2. Trees; 3. Regular graphs; 4. Types of graphs; 5. Planar graphs; 6. Special graphs; 7. Digraphs; 8. Signed graphs; 9. Ramsey numbers; 10. Polynomials.

Singularity Theory and Gravitational Lensing. By A. O. Petters, H. Levine, and J. Wambsganss, Birkhäuser, 2001, xxiv + 603 pp., $74.95

Gravitational lensing is the deflection of light by a gravitational field, first observed by Sir Arthur Eddington in 1919, confirming Einstein's theory of gravitation. Recent discoveries of gravitationally lensed quasars and galaxies have revived interest in the subject. This book explores both its astrophysical and its mathematical aspects, in the context of thin-screen (deflecting mass distribution lies on a plane) and weak-field (deflector causes small bending angles) lensing. These approximations work extremely well for the vast majority of the currently observed gravitational lensing events. This book is the first to develop a mathematical theory of such events under these assumptions. Table of contents: Part I. Introduction. 1. Historical highlights; 2. Central problems. Part II. Astronomical Aspects. 3. Basic physical concepts; 4. Physical applications; 5. Observations of gravitational lensing. Part III. Mathematical Aspects. 6. Time delay and lensing maps; 7. Critical points and stability; 8. Classification and genericity of stable lense systems; 9. Local lensing geometry; 10. Morse inequalities; 11. Counting lensed images: single-plane case; 12. Counting lensed images: multiplane case; 13. Total magnification; 14. Computing the Euler characteristic; 15. Global geometry of caustics. There is a bibliography of approximately 400 items.

Random Matrix Models and Their Applications. Edited by Pavel M. Bleher and Alexander R. Its, Cambridge University Press, 2001, x + 438 pp., $64.95

This is volume 40 in the series Mathematical Sciences Research Institute Publications. It contains 17 papers, which are surveys and research results based largely on lectures given at a Spring 1999 MSRI program. The main topics include: random matrix theory and combinatorics; scaling limits; universalities and phase transitions in matrix models; topologico-combinatorial aspects of the theory of random matrix models; scaling limits of correlations between zeros on complex and symplectic manifolds.

Modelling Extremal Events for Insurance and Finance. By Paul Embrechts, Claudia Klüppelberg, and Thomas Mikosch, Springer-Verlag, 1997, xv + 645 pp.

This is volume 33 in the series Applications of Mathematics—Stochastic Modelling and Applied Probability. It presents an introduction to the mathematical and statistical theory underlying Extreme Value Theory, with the main target group of readers being in the financial industry, which has been less exposed to EVT methodology than, say, hydrologists and reliability engineers. Table of Contents: 1. Risk theory; 2. Fluctuations of sums; 3. Fluctuations of maxima; 4. Fluctuations of upper order statistics; 5. An approach to extremes via point processes; 6. Statistical methods for extreme events; 7. Time series analysis for heavy-tailed processes; 8. Special topics. There are appendices on basic mathematical tools. The bibliography contains 646 items.

The Odd Quantum. By Sam Treiman, Princeton University Press, 1999, viii +262 pp.

This book is aimed at scientists in non-quantum-mechanical disciplines as well as nonscientists, who are not put off by equations and technical particulars. Its aim is to convey something of the actual substance, methods, and oddities of quantum mechanics, yet to be not overly technical or professional. Although quantum mechanics is the main theme of the book, there are also brief reviews of classical mechanics and electromagnetism, special relativity theory, particle physics, and other topics.

The Geometric Universe—Science, Geometry, and the Work of Roger Penrose. Edited by S. A. Huggett, L. J. Mason, K. P. Tod, S. T. Tsou, and N. M. J. Woodhouse, Oxford University Press, 1998, xviii + 431 pp.

This volume contains the texts of the 17 plenary lectures and 16 shorter lectures, delivered at the symposium "Geometric Issues in the Foundations of Science" held over 5 days in June 1996 in St. John's College, Oxford, in honour of Sir Roger Penrose in his 65th year. It begins with a "Laudation" by John A. Wheeler and the text of Sir Michael Atiyah's opening lecture, setting the scene for the symposium by giving an overview of the interaction between geometry and physics, and of him and Sir Roger, from which many important developments in mathematics and mathematical physics have emerged. There follow the texts of lectures in pure mathematics, including geometry, both classical differential geometry and noncommutative geometry, topology including knot invariants and the application of gauge theory and developments from string theory. Lectures on applied mathematics include integrable systems and general relativity. Lectures on theoretical physics include string theory, quantum gravity and the foundations of quantum mechanics, and in experimental physics there are talks on quasi-crystals and astrophysics. There are also lectures on quantum computation, quantum cryptography and the possible role of micro-tubules in a theory of consciousness. The volume ends with the text of Sir Roger's closing lecture, a review of twister theory, the problems currently confronting the theory, and prospects for their solution.

Theory and Applications of Partial Differential Equations. By Piero Bassanini and Alan R. Elcrat, Plenum Press, 1997, ix + 439 pp., $115.00

This is volume 46 in the series Mathematical Concepts and Methods in Science and Engineering. It introduces the basic ideas of the subject in the context of the pde's of mathematical physics, including more advanced subjects such as the De Giorgi-Nash-Moser theorem and Dirichlet problems for nonlinear elliptic equations. Table of Contents: 1. Introduction to partial differential equations; 2. Wave equation; 3. Heat equation; 4. Laplace equation; 5. Elliptic pde's of second order; 6. Abstract evolution equations; 7. Hyperbolic systems of conservation laws in one space variable; 8. Distributions and Sobolev spaces.

Statistical Methods for Speech Recognition. By Frederick Jelinek, The MIT Press, 1998, xxi + 283 pp., $35.00

This is a volume in the series Language, Speech and Communication. It is not a text book of speech recognition, but only of its statistical aspects, in particular, those that have proven so fruitful in the field: hidden Markov models, data clustering, smoothing of probability distributions, the decision tree method of equivalence classification, the use of information measures such as goodness criteria, and maximum entropy probability estimation. Table of Contents: 1. The speech recognition problem; 2. Hidden Markov models; 3. The acoustic model; 4. Basic language modeling; 5. The Viterby search; 6. Hypothesis search on a tree and the fast match; 7. Elements of information theory; 8. The complexity of tasks—the quality of language models; 9. The expectation-maximization algorithm and its consequences; 10. Decision trees and tree language models; 11. Phonetics from orthography: spelling-to-base form mappings; 12. Triphones and allophones; 13. Maximum entropy probability estimation and language models; 14. Three applications of maximum entropy estimation to language modeling; 15. Estimation of probabilities from counts and the back-off method.