



Telegraphic Reviews

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TELEGRAPHIC REVIEWS

Edited by **Arnold Ostebee**

with the assistance of the Mathematics Departments of
Carleton, Macalester, and St. Olaf Colleges

Telegraphic Reviews are designed to alert readers in a timely manner to new books appropriate to mathematics teaching and research. Special codes classify reviews by subject area and appropriate use:

T : Textbook	P : Professional Reading	1-4: Semester
C : Computer Software	L : Undergraduate Library	** : Special Emphasis
S : Supplementary Reading	13: Grade Level	?? : Questionable

Readers are advised that price information is subject to change. Selected books receive a second, more extensive review in the *Monthly*.

Books submitted for review should be sent to *Book Reviews Editor, American Mathematical Monthly, St. Olaf College, 1520 St. Olaf Avenue, Northfield, MN 55057-1098.*

General, S*(13-16), L.** *The Language of Mathematics: Making the Invisible Visible.* Keith Devlin. WH Freeman, 1998, viii + 344 pp, \$24.95. [ISBN 0-7167-3379-X] A "spin-off" (with far fewer glossy illustrations) of Devlin's masterful *Mathematics: The Science of Patterns* (TR, October 1997) aimed at a "much wider" audience. This worthy successor to Courant and Robbins' 1941 classic *What is Mathematics?* adds two new chapters on patterns of chance and of cosmology. Strangely, there are absolutely no references or suggestions for related reading. LAS

Mathematics Appreciation, S(15-16), L. *The Jungles of Randomness: A Mathematical Safari.* Ivars Peterson. Wiley, 1998, xiii + 239 pp, \$24.95. [ISBN 0-471-16449-6] The latest in Peterson's guided tours of mathematics. Beautifully produced, and very reader-friendly. BC

Logic, T(15-16: 1), L. *Logic for Mathematics and Computer Science.* Stanley N. Burris. Prentice Hall, 1998, xix + 420 pp. [ISBN 0-13-285974-2] Covers traditional logic (propositional logic; syntax, semantics and completeness of first-order logic), equational logic, and computational logic (resolution, unification, term rewrite systems, and skolemization). Includes historical remarks. Does not assume background in analysis or abstract algebra. KES

Foundations, T(16-17: 1), S, P, L. *A Course on Borel Sets.* S.M. Srivastava. Grad. Texts in Math., V. 180. Springer-Verlag, 1998, xvi + 261 pp, \$49.95. [ISBN 0-387-98412-7] Introduction to Borel sets and measurable selections. First two chapters provide all neces-

sary set-theoretic and topological background. Avoids use of forcing, large cardinals, games, constructibility, and recursive function theory. Exercises integral to text; often assumed later as theorems. LB

Foundations, T(13-14: 1), L. *An Introduction to Mathematical Reasoning: Numbers, Sets and Functions.* Peter J. Eccles. Cambridge Univ Pr, 1997, xii + 350 pp, \$24.95 (P); \$59.95. [ISBN 0-521-59718-8; 0-521-59269-0] Well-written text for transition course. Covers basic symbolic logic, methods of proof, finite and infinite sets, counting principles, elementary number theory. Proofs of many theorems preceded by paragraph on constructing the proof. Complete solutions for exercises. KES

Foundations, S(16-17). *A Primer of Abstract Mathematics.* Robert B. Ash. MAA, 1998, x + 181 pp, \$27.95 (P). [ISBN 0-88385-708-1] Very concise presentation of concepts and results in counting, number theory, set theory, linear algebra, linear operators. Exercises with complete solutions. Suggested audience: graduate students or professionals who need quick review of (or introduction to) these topics. KES

Combinatorics, T*(13-16: 1), S, L. *Combinatorics: A Problem Oriented Approach.* Daniel A. Marcus. MAA, 1998, x + 136 pp, \$28 (P). [ISBN 0-88385-710-3] An easy route into combinatorics through problem solving. Use first 50-75% in first/second year discrete math course, or with some supplementation in junior/senior combinatorics. Gets as far as generating functions and Polya-Redfield theory. DB

Discrete Mathematics, T*(17-18: 1, 2), L.**

Modern Graph Theory. Béla Bollobás. Grad. Texts in Math., V. 184. Springer-Verlag, 1998, xiii + 394 pp, \$59.95 (P). [ISBN 0-387-98491-7] More than twice the length of *Graph Theory: An Introductory Course*, from which it evolved, this up-to-date and in-depth introduction contains much recent material, including Szemerédi's Regularity Lemma, list colorings, phase transition in random graphs, random walks on graphs, the Tutte polynomial and its relatives in knot theory. Many exercises, graded by difficulty. Clearly written. No extensive prerequisites, but does require graduate-level mathematical maturity. LB

Discrete Mathematics, S(17–18: 1, 2), L. *Exercises in Graph Theory*. O. Melnikov, et al. Texts in Math. Sci., V. 19. Kluwer Academic, 1998, viii + 354 pp, \$149. [ISBN 0-7923-4906-7] Over a thousand exercises to accompany the authors' *Lectures on Graph Theory*, with answers, hints, and solutions. Organized in same order and uses same notation as text. Trees, independence and coverings, matchings, tours, planarity, colorings, degree sequences, connectivity, digraphs, hypergraphs. Could supplement many other introductory texts. LB

Number Theory, T(16–18: 1), S, P, L. *Elliptic Curves: Function Theory, Geometry, Arithmetic*. Henry McKean, Victor Moll. Cambridge Univ Pr, 1997, xiii + 280 pp, \$59.95. [ISBN 0-521-58228-8] An attractive, well-motivated presentation of the theory of elliptic curves, integrals, and functions. BC

Number Theory, T(16–17: 1), S, P, L. *Algorithmic Algebraic Number Theory*. M. Pohst, H. Zassenhaus. Ency. of Math. & Its Applic., V. 30. Cambridge Univ Pr, 1997, xiv + 499 pp, \$39.95 (P); \$115. [ISBN 0-521-59669-6; 0-521-33060-2] How do you actually compute a Galois group? Or the group of units, or the class group, of an algebraic number field? Answers these and other computational (and theoretical) questions. (1989 text edition, TR, August–September 1990.) BC

Number Theory, S(17–18), P. *Automorphic Forms on $SL_2(\mathbb{R})$* . Armand Borel. Tracts in Math., V. 130. Cambridge Univ Pr, 1997, x + 192 pp, \$47.95. [ISBN 0-521-58049-8] An introduction to the analytic theory of automorphic (and cusp) forms, with chapters on Eisenstein series and spectral decomposition. BC

Linear Algebra, T(14: 1), C. *Interactive Linear Algebra with MAPLE V*. Elias Deeba, Ananda Gunawardena. Springer-Verlag, 1998, xiii + 317 pp, \$49.95 (P), with CD-ROM. [ISBN 0-387-98240-X] Interactive computer lessons with exercises, laboratories, and an

adaptive testing system, supported by a GUI. Text is an edited version of the interactive lessons (which are on the CD-ROM). PG

Linear Algebra, T(14: 1). *Linear Algebra with Applications*. George Nakos, David Joyner. Brooks/Cole, 1998, xviii + 666 pp, \$54. [ISBN 0-534-95526-6] Over 400 examples. Emphasizes geometric insight, numerical methods, and a renewed interest in determinants. Each chapter ends with "miniprojects" and computer exercises. Standard ordering of topics. TH

Linear Algebra, T(13–14). *Introduction to Linear Algebra, Second Edition*. Gilbert Strang. Wellesley–Cambridge Pr, 1998, viii + 503 pp, \$62.50. [ISBN 0-9614088-5-5] The *Second Edition* for this excellent linear algebra text with theory and applications. (*First Edition*, TR, January 1994.) PF

Ring Theory, P. *Algebras and Modules, I & II*. Eds: Idun Reiten, Sverre O. Smalø, Øyvind Solberg. AMS, 1998. *I*, Canadian Math. Soc. Conf. Proc., V. 23, xiv + 198 pp, \$39 (P), [ISBN 0-8218-0850-8]; *II*, Canadian Math. Soc. Conf. Proc., V. 24, xxi + 569 pp, \$99 (P). [ISBN 0-8218-1076-6] Proceedings of 1996 workshops in Trondheim and Geiranger, Norway.

Algebra, T(17–18: 1), S, L. *Categories for the Working Mathematician, Second Edition*. Saunders Mac Lane. Grad. Texts in Math., V. 5. Springer-Verlag, 1998, xii + 314 pp, \$54.95. [ISBN 0-387-98403-8] Adds two chapters: one on monoidal categories and coherence theorems; one on 2-categories and higher-dimensional categories. Updated bibliography; minor revisions to earlier chapters. (*First Edition*, TR, June–July 1972.) LB

Algebra, T(18: 1), P. *Linear Algebraic Groups, Second Edition*. T.A. Springer. Progress in Math., V. 9. Birkhäuser Boston, 1998, xi + 334 pp, \$64.95. [ISBN 0-8176-4021-5] Thoroughly revised; extends theory to arbitrary fields. (*First Edition*, TR, April 1982.) TH

Algebra, T(18: 1, 2), P. *Character Theory of Finite Groups*. Bertram Huppert. Expos. in Math., V. 25. Walter de Gruyter, 1998, vi + 618 pp, \$328. [ISBN 3-11-015421-8] Self-contained treatment with recent achievements (especially in degree problems, conjugacy class length). Numerous examples. TH

Algebra, T(18: 1, 2), P. *Characters of Finite Groups. Part 2*. Ya. G. Berkovich, E.M. Zhmud'. Transl. of Math. Mono., V. 181. AMS, 1999, xxv + 332 pp, \$115. [ISBN 0-8218-0532-0] Second of a two-part text on characters of

representations of finite groups over complex fields. TH

Algebra, P. *Algebra in the Stone-Čech Compactification: Theory and Applications.* Neil Hindman, Dona Strauss. Expos. in Math., V. 27. Walter de Gruyter, 1998, xiii + 485 pp, \$128.95. [ISBN 3-11-015420-X] The algebra of the Stone-Čech compactification of a discrete semigroup and its applications to Ramsey theory and topological dynamics. DB

Calculus, T*(13-14), S, L.** *Basic Calculus: From Archimedes to Newton to its Role in Science.* Alexander J. Hahn. Springer-Verlag, 1998, xiv + 545 pp, \$59.95. [ISBN 0-387-94606-3] Rich in examples of how calculus has been/is being used. Would be difficult as a text: loses forest for the trees. Suitable for honors course with students who had calculus in high school, know the techniques, seek deeper understanding. DB

Calculus, S(13). *Calculus.* Elliot C. Gootman. Coll. Rev. Ser. Math. Barron's Educational Ser., 1997, viii + 342 pp, \$13.95 (P). [ISBN 0-8120-9819-6] Supplement for a standard calculus course. Algebra and geometry reviews distributed throughout the text. PF

Differential Equations, T(17), P, L. *Ordinary Differential Equations.* Wolfgang Walter. Transl: Russell Thompson. Grad. Texts in Math., V. 182. Springer-Verlag, 1998, xi + 380 pp, \$49.95. [ISBN 0-387-98459-3] Rigorous development of the theory of ordinary DEs. Uses holomorphic functions, functional analysis, and differential inequalities. Supplemental sections use Lebesgue theory and Schauder's fixed point theorem. PG

Differential Equations, T(14: 1), L. *Differential Equations with Computer Lab Experiments, Second Edition.* Dennis G. Zill. Brooks/Cole, 1998, xiii + 463 pp, \$80.95. [ISBN 0-534-35173-5] Begins with qualitative study of DEs. Topics: first- and higher-order DEs, systems, phase portraits and stability, Laplace transforms, and series solutions. Routine exercises, computer labs, projects, discussion problems, and applications. (*First Edition*, TR, November 1995.) PG

Partial Differential Equations, T(16: 1), L. *Introduction to Partial Differential Equations: A Computational Approach.* Aslak Tveito, Ragnar Winther. Texts in Appl. Math., V. 29. Springer-Verlag, 1998, xv + 392 pp, \$54.95. [ISBN 0-387-98327-9] Thorough treatment of Poisson's equation in one- and two-dimensions (including discussions of a Green's function, finite difference approximation, and

general eigenvalue problems). Treats one-dimensional heat and wave equations similarly. Discusses convergence of Fourier series. Includes exercises and projects. PG

Partial Differential Equations, T(17: 1), C, P, L. *Partial Differential Equations for Computational Science: With Maple and Vector Analysis.* David Betounes. Springer-Verlag, 1998, xix + 517 pp, \$64.95, with CD-ROM. [ISBN 0-387-98300-7] Sophisticated introduction to PDEs. Emphasizes use of computer for visualization and interpretation of solutions to heat, wave, and Poisson's equations. Also discusses Sturm-Liouville problem and Stokes equations (e.g., Maxwell's equations and Navier-Stokes equations). PG

Numerical Analysis, P, L. *Methods for Solving Systems of Nonlinear Equations, Second Edition.* Werner C. Rheinboldt. CBMS-NSF Reg. Conf. Ser. in Appl. Math., V. 70. SIAM, 1998, ix + 148 pp, \$34 (P). [ISBN 0-89871-415-X] Extensively revised and expanded (*First Edition*, TR, April 1975). Additions include an introduction to the theory of inexact Newton methods, basic theory of continuation methods, and new material on minimization methods. AO

Numerical Analysis, T(15: 1), C, L. *Numerical Methods, Second Edition.* J. Douglas Faires, Richard Burden. Brooks/Cole, 1998, xi + 594 pp, \$60, with disk. [ISBN 0-534-35187-5] Emphasizes the application of approximation techniques to problems from engineering, physical, and computer sciences. Motivates and describes techniques from an implementation standpoint. Uses Maple. PG

Numerical Analysis, P. *Domain Decomposition Methods 10.* Eds: Jan Mandel, Charbel Farhat, Xiao-Chuan Cai. Contemp. Math., V. 218. AMS, 1998, xii + 554 pp, \$110 (P). [ISBN 0-8218-0988-1] Proceedings of a 1997 conference held at the University of Colorado at Boulder.

Analysis, T(18), P. *Wavelets: Theory and Applications.* A.K. Louis, P. Maaß, A. Rieder. Wiley, 1997, xvii + 324 pp, \$99.75. [ISBN 0-471-96792-0] Translation of 1994 German edition. Continuous and discrete wavelet transforms, applications to signals, data compression, boundary value problems. SN

Analysis, T(16-17: 1, 2), L. *Lectures on the Hyperreals: An Introduction to Nonstandard Analysis.* Robert Goldblatt. Grad. Texts in Math., V. 188. Springer-Verlag, 1998, xiv + 289 pp, \$49.95. [ISBN 0-387-98464-X] Accessible introduction to nonstandard analysis. Many examples. Good for those without formal logic background. Rigorous construction

of the hyperreals followed by development of one-variable calculus, analysis, and topology from the nonstandard perspective. SN

Geometry, T(15–17). *Projective Geometry: From Foundations to Applications.* Albrecht Beutelspacher, Ute Rosenbaum. Cambridge Univ Pr, 1998, x + 258 pp, \$24.95 (P); \$64.95. [ISBN 0-521-48364-6; 0-521-48277-1] An axiomatic approach to projective geometry with many applications throughout. PF

Geometry, T(15–17), L. *Foundations of Convex Geometry.* W.A. Coppel. Australian Math. Soc. Lect. Ser., V. 12. Cambridge Univ Pr, 1998, xiv + 222 pp, \$39.95 (P). [ISBN 0-521-63970-0] A coordinate-free, axiomatically evolving treatise on geometry. PF

Operations Research, P, L. *Operations Research in Transportation Systems: Ideas and Schemes of Optimization Methods for Strategic Planning and Operations Management.* Alexander S. Belenky. Appl. Optim., V. 20. Kluwer Academic, 1998, viii + 440 pp, \$195. [ISBN 0-7923-5157-6] Survey of optimization methods including linear and nonlinear programming, integer programming, network flow problems, stochastic programming, optimal control, and game theory. Each chapter concludes with an extensive bibliography. AO

Optimization, T(15–16), S, L. *Cake-Cutting Algorithms: Be Fair If You Can.* Jack Robertson, William Webb. AK Peters, 1998, x + 181 pp, \$38. [ISBN 1-56881-076-8] An elementary introduction to algorithms for fair division of any homogeneous divisible “cake.” Six informal chapters introduce problems and strategies; a seventh summarizes results; the final four provide proofs. Exercises (with solutions at the back) and projects make this nice monograph ideal for a seminar. LAS

Optimization, P. *Convex Analysis and Global Optimization.* Hoang Tuy. Nonconvex Optim. & Its Applic., V. 22. Kluwer Academic, 1998, xi + 339 pp, \$136. [ISBN 0-7923-4818-4]

Probability, T(16–17), S, P, L. *Integral, Probability, and Fractal Measures.* Gerald A. Edgar. Springer-Verlag, 1998, x + 286 pp, \$39.95. [ISBN 0-387-98205-1] A continuation of the author’s *Measure, Topology, and Fractal Geometry*. Gives a solid, measure-theoretic grounding for the study of fractals, including random fractals. BC

Statistics, P. *Advances in Stochastic Models for Reliability, Quality and Safety.* Eds: Waltraud Kahle, et al. Stat. for Industry & Tech. Birkhäuser Boston, 1998, xxvii + 382 pp, \$79.95. [ISBN 0-8176-4049-5] 24 papers from a 1997 workshop held in Magdeburg, Ger-

many. In 4 parts: Lifetime Analysis; Reliability Analysis; Network Analysis; Process Control.

Computer Science, T?(14–16: 1), S, P. *Purely Functional Data Structures.* Chris Okasaki. Cambridge Univ Pr, 1998, x + 220 pp, \$39.95. [ISBN 0-521-63124-6] Conceptual discussion, and interesting techniques, for implementing data structures in functional languages. Good discussion of distinctions between imperative (ephemeral) and functional (persistent) structural features, role of lazy evaluation, amortization, lazy rebuilding, data structure bootstrapping. Examples in Standard ML, with Haskell appendix. RM

Applications (Biological Science), S(16–17), P, L. *An Introduction to Structured Population Dynamics.* J.M. Cushing. CBMS–NSF Reg. Conf. Ser. in Appl. Math., V. 71. SIAM, 1998, xiii + 193 pp, \$36 (P). [ISBN 0-89871-417-6] Theory and applications of discrete and continuous structured population models. (Models which allow some characteristics of individual organisms to be incorporated into the study of population dynamics.) Focuses on asymptotic dynamics of deterministic models. AO

Applications (Engineering), T(15: 2), L. *Advanced Engineering Mathematics.* Dean G. Duffy. CRC Pr, 1998, 634 pp. [ISBN 0-8493-7854-0] Begins with discussion of complex variables, providing background for Fourier, Laplace, and z-transforms. Includes topics in multivariable calculus (e.g., Sturm–Liouville problem, heat, wave, and Laplace equations). Concludes with vector calculus (e.g., surface integrals, Stoke’s theorem, and the use of eigenvalues in ODEs). PG

Applications, T?(15–16), S*, P, L. *The Computational Beauty of Nature: Computer Explorations of Fractals, Chaos, Complex Systems, and Adaptation.* Gary William Flake. MIT Pr, 1998, xviii + 493 pp, \$45. [ISBN 0-262-06200-3] Intriguing, in-depth overview of the role of computer explorations and simulation for understanding complex natural phenomena. Emphasis on fractals and chaos, with the theme that the computational properties of interactions underlie notions of beauty and interestingness of nature. Web resources available for simulation software, etc. RM

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