BRIEF REVIEWS

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E.Zeidler: Applied Functional Analysis. Main Principles and Their Applications, Applied Mathematical Sciences 109, Springer-Verlag, New York, 1995, xvi+404 pp., 37 fig., DM 98.00, ISBN 0-387-94422-2

The book is based, as the author says, on the application oriented method of teaching mathematics. This approach starts out from the question "What are the most important applications?" and then tries to answer this question as quickly as possible. The Hahn-Banach theorem is applied to separation of convex sets, to the moment problem, the minimum norm problem on the dual space, to the Čebyšev approximation and to the optimal control of rockets. Variational principles are explained and a motivation for weak convergence is given. Applications to the calculus of variations and to nonlinear eigenvalue problems are presented. Reflexive Banach spaces are studied and applied to convex minimum problems and variational inequalities, to obstacle problems in elasticity, to game theory etc. Further interesting topics treated include the mountain pass theorem, the Galerkin method and monotone operators, symmetric and conservation laws, basic ideas of gauge field theory, elementary particles etc. The Banach - Steinhaus theorem is applied to cubature formulas, the closed graph theorem to factor spaces, to direct sums and projections. Operator equations are studied in detail, in particular those with Fredholm operators. A series of applications to differential and integral equations is also discussed. Much very rich material is included in extensive problems sections attached to each chapter. This is a remarkable book (as is another book by the same author published as vol.108 of the same series with the subtitle Applications to Mathematical Physics) which will be greatly appreciated by students as well as teachers. Strongly recommended to anybody who likes to learn or to teach nice mathematics. (in)

V.Chari, A.Pressley: A Guide to Quantum Groups, Cambridge University Press, Cambridge, 1994, xv+651 pp., GBP 60.00, ISBN 0-521-43305-3

A simple description of this book could be 'all about quantum groups'. It is very nicely written at a high mathematical level. If you require some result concerning quantum groups or if you are not content with the presentation in the article about the quantum groups you are just reading, rest assured that this book will help you. In order to give some idea of the contents of the book the topics covered include: Poisson-Lie groups, Lie bialgebras, quasitensor categories, relations to links and 3-manifolds, Knizhnik-Zamolodchikov equation. The authors do not assume many prerequisities and there is even Appendix about Kac-Moody algebras so that the reader need not know much about the structure theory of Lie groups and Lie algebras. The book can be recommended as very good for beginners. A mathematician will find here a concise and clear explanation of the physical background of various concepts. The list of references is very complete. It takes 71 pages and covers also the year 1993. My recommendation is: Go and buy the book! (jiva)

P.Griffiths, J.Harris: Principles of Algebraic Geometry, Wiley Classics Library, J.Wiley & Sons, Inc., New York, 1994, xii+813 pp., GBP 30.50, ISBN 0-471-05059-8

The book is one of the principal textbooks in the field of complex algebraic geometry. It presents the main general results of the theory, their applications to specific cases and examples as well as a description of the necessary computational techniques. The introductory chapter treats the basic techniques and results of complex manifold theory, e.g. de Rham and Dolbeault cohomology, sheaves and their cohomology, Poincaré duality, intersection theory of algebraic cycles, harmonic theory on compact complex manifolds and the theory of Kähler manifolds. In the first chapter, the theory of divisors and line bundles, vanishing cohomology theorems and also the main properties of complex algebraic varieties are given. Chapter 2 contains the theory of algebraic curves and Riemann surfaces and chapters 4 and 6 describe the theory of algebraic surfaces and quadric line complexes, including many classical results. The rest of the book covers some additional material such as distributions and currents, an introduction to the theory of characteristic classes, spectral sequences and residues together with applications to the theory of complex varieties. The book is self-contained and very well written. This is a paperback edition available to a broader circle of potential readers. It can be strongly recommended as an important source of information and a textbook for anybody interested in complex algebraic geometry and the theory of complex curves and surfaces. (jbu)

N.D.Fowkes, J.J.Mahony: An Introduction to Mathematical Modelling, J.Wiley & Sons, Inc., New York, 1994, xvi+447 pp., GBP 19.95, ISBN 0-471-93422-4, ISBN 0-471-94309-6

This book presents an expanded version of a course given mainly by the authors at the University of Western Australia. The aim of the book is to develop basic skills needed for further study of mathematical modelling. Special care was taken to present particular situations in order to illustrate mathematical techniques on simple carefully chosen examples. Significant ideas like scaling analysis leading to self-similarity are emphasized by presenting them in more than one context. Attention is also drawn to the common features of different models. A broad variety of exercises is supplied with "wizard directions" and hints encouraging the reader to solve the problems. Throughout the book basic ideas of mathematical modelling are presented. The method of scaling analysis is illustrated by the flagpole problem and in subsequent exercises leading to study the pendulum, non-linear pendulum, sky-diving, damped vibrating string, plate vibrations and similar problems. Methods from the calculus of variations are used to study the problems of minimal path and the hanging cable solution. While studying the heat equation, the reader is taught to use energy principles and methods, the method of maximum principle and the idea of the fundamental solutions. Diffusion problems are presented in Part II together with both physical and mathematical fundamentals. Both classical and Fourier series techniques are discussed. An introduction to the finite element approach opens a discussion on numerical methods in mathematical modelling. Finally, in Part III, the reader can find vibrational and wave propagation problems, resonant systems, damped and undamped oscillations, amplitude limiting mechanisms. Signal speeds and shock wave ideas are presented by the car transmisson problem. To prevent tedious technical calculations, simple programs in "Maple", a computer algebra language, are used in particular situations. This helps the authors to present ideas without spending time with technicalities. A familiarity with Maple is useful but not essential. The book is clearly written and developed logically. It is suitable for undergraduate students as well as for students of technological sciences interested in the field. (mr)

W.Bolton: Fourier Series, Mathematics for Engineers, Longman Scientific & Technical, Harlow, 1995, vii+161 pp., GBP 9.99, ISBN 0-582-23934-6

This is the fourth book of Longman's series "Mathematics for Engineers". It is aimed at first-year undergraduate students of engineering. Hence not too much is required: basic algebra, complex numbers and calculus (integration by parts, etc.). It contains many worked examples and exercises, especially those which are useful for engineers; answers are included. For teachers of calculus at universities, it could be a source of "practical examples". On the other hand it would not be useful as even a rather elementary introduction to the theory of Fourier series. (jive)

F.Orecchia, L.Chiantini (Eds.): Zero-Dimensional Schemes. Proceedings of the International Conference held in Ravello, June 8-13, 1992, Walter de Gruyter, Berlin, 1994, viii+339 pp., DM 198.00, ISBN 3-110-13934-0

The proceedings contain lectures presented at the conference and also some papers relating to problems discussed there. The book contains a survey paper, Zero-dimensional schemes: Singular curves and rational surfaces by A.V.Geramita and twenty-four contributions (lectures). They discuss many different problems concerning zero-dimensional schemes, e.g. the Castelnuovo theory, certain interpolation problems for singularities, syzygies on rational surfaces, Hilbert functions as well as related problems from combinatorics, graph theory and codes. The book also contains a list of problems and questions. It is the first book dealing exclusively with this nice topic. (jbu)

S. Alinhac: Blowup for Nonlinear Hyperbolic Equations, Progress in Nonlinear Differential Equations and Their Applications, vol. 17, Birkhäuser, Boston, 1995, xiv+112 pp., DM 78.00, ISBN 3-764-33810-5, ISBN 0-817-63810-5

This book studies the blowup mechanisms for global Cauchy problems for nonlinear hyperbolic equations and systems. Two basic local blowup mechanisms are introduced and studied, namely what the author calls "the ODE mechanism" and "the geometric blowup mechanism". Starting from basic examples of ODEs, the ODE mechanism is introduced within the context of ordinary equations, as a nonlinear self-increase mechanism, when $|u| \to +\infty$ as x approaches a finite value c. The geometric blowup mechanism is explained using the method of characteristics for nonlinear hyperbolic problems; focusing of rays carrying the same value of solution makes $|\mathrm{grad}\, u|$ become infinite while $|u|$ stays bounded. For evolutionary PDEs, where the blowup can occur when marching forward in time, the concept of lifespan is introduced as the supremum of all $t > 0$ such that $u(t)$ remains smooth for fixed smooth data. It is emphasized that both these basic blowup mechanisms can combine. Focusing mostly on whether or not there will be blowup in a solution, the methods used to study this problem are introduced and classified. Many open problems are discussed and many examples presented (Burger's equation, semilinear wave equation, quasilinear systems in one dimension, 2×2 systems, equations of nonlinear geometrical optics) which make the book readable even for those who are not expert in the field. However, some basic knowledge of PDEs, especially of hyperbolic type (existence of solutions, energy methods,...) is supposed. The book will be valued mostly by graduate or postgraduate students interested in studying PDEs. (mr)

Y.Xu: Common Zeros of Polynomials in Several Variables and Higher Dimensional Quadrature, Pitman Research Notes in Mathematics Series, vol.312, Longman Scientific & Technical, Harlow, 1994, 119 pp., GBP 23.00, ISBN 0-582-24670-9

The theory of orthogonal polynomials in one dimension is very well known and it is one of those parts of the theory of numerical methods which leads to fully solved problems: the theory of Gauss or Gauss-type quadrature in one dimension. The situation in dimensions greater than one is very difficult to deal with, of course. Instead of points as zeros of orthogonal polynomials there must be considered such complicated zeros as curves and surfaces. In general, zeros of polynomials in d variables are algebraic varieties of dimension $d - 1$ or less. From the point of view of quadrature methods, the author studies common zeros of all polynomials of degree n, which could be distinct and real. The aim of this book is to study common zeros of families of polynomials in several variables which are related to higher dimensional quadratures. The book is suitable for postgraduate students, research workers and mathematicians, especially to those who are involved in numerical integration in more than one dimension. (mf)

C.Bandle, J.Bemelmans, M.Chipot, J.S.J.Paulin, I.Shafrir (Eds.): Elliptic and Parabolic Problems. Pont-a-Mousson 1994, Pitman Research Notes in Mathematics Series, vol.325, Longman Scientific & Technical, Harlow, 1995, 263 pp., GBP 33.00, ISBN 0-582-23961-3

C.Bandle, J.Bemelmans, M.Chipot, J.S.J.Paulin, I.Shafrir (Eds.): Calculus of Variations, Applications and Computations. Pont-a-Mousson 1994, Pitman Research Notes in Mathematics Series, vol.326, Longman Scientific & Technical, Harlow, 1995, 281 pp., GBP 36.00, ISBN 0-582-23962-1

Both these volumes contain contributions presented during the second European Conference on Elliptic and Parabolic Problems (Pont-à-Mousson, June 1994). The first volume (elliptic and parabolic problems) collects 21 lectures which can be grouped together into several different topics. There are problems connected with applications in continuum mechanics and thermodynamics (J.Carillo and A.Alonso; M.Chipot and A.Lyaghfouri; P.Colli and M.Graselli; J.Escher and G.Simonett; A.L.Gladkov; J.Popiolek; H.F.Weinberger); qualitative properties of solutions (N.André; S.N.Antontsev; J.I.Diaz and S.I.Shmarev; W.Reichel; A.Simon; I.V.Skrypnik; A.I.Volpert and V.A.Volpert) and large time behaviour of solutions (A.Ito, N.Kenmochi and M.Niezgódka; N.Sato, J.Shirozu and N.Kenmochi; E.Zuazua). Further articles discuss Calderón-Zygmund inequalities in weighted Sobolev spaces (C.Amrouche, V.Girault and J.Giroire); local weak solutions for a multivalued evolution equation (M Choulli and R.Deville); convergence of the solutions of inverse problems (V.L.Kamynin) and existence and uniqueness results for degenerate-elliptic integro-differential problems (M.A.Vivaldi).

The second volume collects 23 contributions given during the conference on calculus of variations and offers a good picture of the current state of research not only in the theoretical context but also in various applications, mainly to mechanics. Several lectures include also a discussion of numerical aspects and simulations on computers. (oj+jmil)

G.R.Kempf: Algebraic Structures, Friedrich Vieweg & Sohn, Braunschweig, 1995, x+165 pp., DM 42.00, ISBN 3-528-06583-4

The book consists of 20 chapters. The first six chapters cover the classical areas of algebra such as groups, rings and fields, modules and vector spaces. The following chapters have many interesting features: For example, the chapter on modern linear algebra begins with tensor products and ends with differential forms. The reader may be interested also in noetherian rings and localization and will find that the chapter on representations of groups is especially valuable. The text contains also many other attractive subjects (e.g. exactness of inverse limits, Lie algebras, Clifford algebras, dimension of commutative rings, efficient ways to compute Tor) as well as some supplementary basic information (e.g. Zorn's lemma, existence of algebraically closed fields). The book is well written and will be of interest to potential users of algebra. One can also agree with the author: "Hopefully this will give a good introduction to modern algebra. I have assumed as background that the reader has learned liner algebra over the real numbers but this is not necessary." (lbe)

J.R.Whiteman (Ed.): The Mathematics of Finite Elements and Applications. Highlights 1993, J.Wiley & Sons, Inc., Chichester, 1994, xiv+424 pp., GBP 65.00, ISBN 0-471-93996-X

The book is the Proceedings of the International Conference MAFELAP 93 which took place during the period 27-30 April 1993 at Brunel University. It was the eighth conference of the famous MAFELAP series. The invited speakers of this conference were, I. Babuška, M. Crochet, C. Johnson, V. Maz'ya, K. Morgan, J. T. Oden, E. Oñate, W. L. Wendland, M. F. Wheeler and J. R. Whiteman. With the exception of that of M. Crochet, the papers resulting from the lectures of all these authors are included in this book, together with a number of abstracts of other contributions. This collection of papers gives an excellent survey of recent results, techniques and progress in the finite element method and its applications. A number of papers are devoted to new developments in adaptive methods, aposteriori error estimates, reliability of finite element computation and the application of the finite element codes on parallel computers. The applications are directed towards computational fluid dynamics, viscoelasicity, non-Newtonian flows, elastic scattering, elasto-plastic fracture analysis, high speed flow and many other subjects. The book can be warmly recommended to all specialists working in the area of the finite element method and its applications. (mf)

B.Fuchssteiner, K.Gottheil, A.Kemper, O.Kluge, K.Morisse, H.Naundorf, G.Oevel, T.Schulze, W.Wiwianka: MuPAD - Multi Processing Algebra Data Tool. Tutorial, Birkhäuser, Basel, 1994, vi+197 pp., DM 48.00, ISBN 3-764-35017-2, ISBN 0-817-65017-2

Computer algebra (CA) systems like Mathematica or Maple will have to compete with MuPAD, a younger brother born in the University of Paderborn, Germany. Problems relating to nonlinear systems resulted in the development of the new tool for fast and efficient handling of large data. MuPAD is a paralel CA system, but the user manual under review concerns a sequential version for UNIX and Macintosh OS. Arithmetic of arbitrary length is provided by incorporating the powerfull PARI system. Many functions are implemented in the kernel of the system and a higher level programming language is available for comfortable programming. Great care is given to interfaces; for X an on-line hypertext help system based on HyTeX is available and much more can be expected in a short time. MuPAD is subject to copyright but it has a special distribution policy: to scientific and educational non-profit organizations it is available free of charge (a licence has to be acquired). Another advantage: beginning with version 2.0, research groups from the CA field, under some restrictions, have access to the source code of MuPAD system. The manual under review is based on the idea of "learning by doing" and the on-line help supports this strategy. It contains a sample session chapter, examples of programs, a summary of the system and a chapter about tools and user interfaces. A list of functionality items of the system is included and an index helps to find answers to users problems. Users of Maple will find the use of system very easy. Recommended to all academic institutions which want to keep in touch with the young and fast developing field of CA systems and cannot for example afford the Mathematica market policy. (jive)

C.K.Cheung, J.Harer: Multivariable Calculus with Maple V. Preliminary Edition, J.Wiley & Sons, Inc., New York, 1994, xiv+366 pp., GBP 16.50, ISBN 0-471-59835-6

This book is one of the attempts to integrate the use of a computer algebra system — Maple V — into the learning process. As with most similar textbooks this book does not require students who are Maple experts. The text covers only a part of a calculus course — multivariable calculus. The use of Maple is the reason why topics which are appropriate for visualization are emphasized. The book contains 28 modules. Modules 1–13 help students visualize the graphs of functions and develop their geometric intuition for curves, surfaces and vector fields. Maybe, this part of the book is more detailed than necessary. Modules 14–17 cover various properties of gradient, extreme points and the method of Lagrange multipliers. Modules 18–28 cover various types of integrals and Stokes' theorem. There are three sorts of exercises in the book. Most modules contain a section named Drill Exercises. These exercises are standard calculus course exercises and do not require the use of a computer. The answers of these exercises are presented at the end of the book. The second kind of exercises are Module Exercises which are computer oriented and are meant to be done as homework. The third sort of exercises — Worksheets — tests immediately students' understanding of the topic. The nice Maple commands index is included. The book is recommended to teachers of calculus. (mli)

A.Quarteroni, A.Valli: Numerical Approximation of Partial Differential Equations, Springer Series in Computational Mathematics 23, Springer-Verlag, Berlin, 1994, xvi+543 pp., 59 fig., DM 128.00, ISBN 3-540-57111-6, ISBN 0-387-57111-6

The book deals with the numerical approximation of partial differential equations. Starting from a variational formulation of PDEs, a comprehensive theory of Galerkin methods and its variants (Petrov-Galerkin, discontinuous Galerkin methods) is developed. The theory then continues to focus on two of numerical realizations of the general Galerkin approach: the finite element method and the spectral method. Finite difference methods and fractional step schemes are presented in the framework of convection-diffusion problems and hyperbolic equations. The stability and convergence analysis of the methods studied are presented, as well as error bounds. Moreover, the algorithmic aspects of numerical methods are discussed. The book is structured into the parts and chapters according to families of problems to be solved. In the second chapter, devoted to the solution of linear systems, standard methods such as Jacobi, Gauss-Seidel, SOR, conjugate-gradient method and multigrid method are studied. Elliptic problems are then solved by both Galerkin and collocation methods, and by mixed and hybrid methods. Galerkin and finite difference methods are discussed with respect to the solution of steady advection-diffusion problems. Further, ways of approximating the solutions of Stokes and Navier-Stokes equations are discussed with respect to Galerkin, spectral and finite difference methods. Finally, an approximation of initial boundary-valued problems (as parabolic problems in general, unsteady advection-diffusion problem and unsteady [incompressible and coimpressible] Navier-Stokes problem) as well as hyperbolic problems are discussed. The book is well written and will be valuable both for graduate or postgraduate students and specialists in the field as a handy and nicely written monograph. (mr)

R.Fraga (Ed.): Calculus Problems for a New Century. Resources for Calculus Collection, volume 2, MAA Notes and Report Series, Number 28, The Mathematical Association of America, Washington, D.C., 1993, xvi+427 pp., ISBN 0-883-85084-2

This volume of MAA Notes is a collection of exercises for a calculus course which respects the existence of computer algebra systems – systems which are able to do difficult computations or symbolic manipulations. These exercises try to emphasize conceptual understanding over rote drill and to prefer graphs and tables over rules to define functions that correspond to real world data. An organization of exercises in groups is the same as the organization of ideas in traditional calculus course. The commentaries which accompany the exercises often contain not only an answer to the question, but also a way in which the problem can be extended, how it can be viewed in a different context, or some historical notes. This book is recommended to all teachers of calculus as a supplement to a textbook. (mli)

J.Casey, M.J.Crochet (Eds.): Theoretical, Experimental and Numerical Contributions to the Mechanics of Fluids and Solids. A Collection of Papers in Honor of Paul M. Naghdi., ZAMP special issue, vol.46 (1995), Birkhäuser, Basel, 1995, 848 pp., DM 418.00, ISBN 3-764-35139-X, ISBN 0-817-65139-X

This collection of papers in honour of Paul M. Naghdi, written by his former students and colleagues, does justice to the breadth and depth of Nagdi's research. The editors provide an introduction to the volume that detail the landmark contributions that Professor Naghdi has made to the field of continuum mechanics. Also, a list of Naghdi's publications, more than two hundred papers in all covering the whole gamut from experiments to theory, is provided. The papers are uniformly good and are of archival quality. The contributions also constitute original research that do not represent a rehash or summary of previous work done by the authors. Most areas in which Naghdi worked are reflected, although perhaps the volume could contain more contributions to the areas of mixture theory and continuum thermodynamics. As the papers cover many diverse areas, the volume in itself does not have a narrow special theme, and is more like an agglomeration of issues of journals devoted to distinct areas rather than a reference book in any particular area. (jma)

A.L.Onishchik, E.B.Vinberg (Eds.): Lie Groups and Lie Algebras III. Structure of Lie Groups and Lie Algebras, Encyclopaedia of Mathematical Sciences, vol.41, Springer-Verlag, Berlin, 1994, 248 pp., 1 fig., DM 144.00, ISBN 3-540-54683-9, ISBN 0-387-54683-9

This volume of the series is devoted mainly to the structure and classification of finite dimensional complex and real semisimple Lie groups and algebras. As usual it was necessary to include many general results on Lie groups and Lie algebras as well as the investigation of solvable and nilpotent Lie groups and Lie algebras. It is important to mention that the authors included interesting chapters "Models of Exceptional Lie Algebras" and "Subgroups and Subalgebras of Semisimple Lie Groups and Lie Algebras". There is also a chapter dealing with Lie algebras and Lie groups of small dimensions and with deformations of Lie algebras. The reader can learn in this volume a lot about the topology of Lie groups and about the relations with algebraic groups. The authors write in the introduction that they have tried, whenever possible, to give the reader the ideas of the proof and on this point they were very successful. They also included many recent results. Reading this volume you have a good feeling that you learn and understand a lot and that you proceed quite quickly. An index of notation would help but it is not included. In the end it should be mentioned that other topics such as the systematic exposition of representations of Lie groups and Lie algebras, Lie algebras over fields of finite characteristic, Lie supergroups and Lie superalgebras will be dealt with in a susequent volume. (jiva)

M.Krbec et al. (Eds.): Nonlinear Analysis, Function Spaces and Applications, vol.5, Proceedings of the Spring School held in Prague, May 1994, Prometheus Publ. House, Prague 1994, ISBN 80-85849-69-0

The series of Spring Schools "Nonlinear Analysis, Functions Spaces and Applications" was started by A. Kufner and late S. Fučík in 1978 and has been held at different venues in the Czech Republic every four years ever since. The school traditionally consists of eight main courses of lectures presented by invited speakers. The Proceedings of the fifth Spring School, which was devoted to the memory of S. Fučík, contains seven of the main lectures. All papers are high-quality comprehensive surveys on the results concerning various topics in function space theory, variational problems and PDE's. The book additionally contains a short survey of S. Fučík's contribution to nonlinear analysis written by P.Drábek and a list of short communications presented by the participants of the school. (lpi)

T.M.Rassias, J.Šimša: Finite Sums Decompositions in Mathematical Analysis, Pure and Applied Mathematics, J. Wiley & Sons, Inc., Chichester, 1995, vi+172 pp., GBP 29.95, ISBN 0-471-94827-6

The book is devoted to the representation of functions of several variables in the form of products of one variable functions. A carefully written prologue describes the development of this topic since d'Alembert. The book brings to people working in the fields such as PDEs, approximation theory or integral equations a unique source of information which up until now was scattered in many articles. The first chapter describes Wronski, Gram and Casorati determinants, the following two chapters deal with decomposition theorems for functions of one and several variables. After a study of finite-dimensional spaces of smooth functions the remaining material is divided into four chapters on decomposition and approximate decomposition of smooth functions, the best L^2-approximation of functions and the geometry of d'Alemberts equation. Special attention is given to the connection with the 13th Hilbert problem. Good typesetting helps one to read technical parts with complicated formulae. Recommended also for people with a general interest in mathematical analysis. (jive)

G.Grätzer: Math into LaTeX: An Introduction to LaTeX & AMS-LaTeX, Birkhäuser, Boston, 1996, xxvii+451 pp., DM 88.00, ISBN 0-817-63805-9, ISBN 3-764-33805-9

Many books on TeX have appeared since it became the major tool for writing mathematical and technical texts of various kinds. Don Knuth's very flexible `plain.tex` was considered by many people to be not completely easy to master. The package *latex.tex* (originally due to Lamport, now the LaTeX3 team) is more and more used by people wanting to use TeX and without having to spend too much time learning it. The book under review is just the book for them. Well organized material accompanied by many examples introduces a beginner into the secrets of LaTeX; the book fully respects the substantial changes which have brought to "old LaTeX" a greater flexibility and closer connection to AmSTeX. Writing a sufficiently long math text (lecture notes, monographs) by a non-expert TeX writer wanting to produce a text of a good typographical quality requires the use of a well-documented package. Grätzer's book is a solution. For a more advanced TeX user it offers a discussion of AmS and LaTeX packages, customization and advice concerning compilation of long bibliographies and indexes. In nine appendices the book contains besides useful tables of symbols (available at other places) also advice on how to use PostScript (and other) fonts, where to find updates of packages and other TeXware, how to convert texts written for other packages (`plain.tex, "oldlatex", amstex.tex` ...) and other useful information. (jive)

W.Bolton: Differentiaton and Integration, Mathematics for Engineers, Longman Scientific & Technical, Harlow, 1995, 238 pp., GBP 11.99, ISBN 0-582-25180-X

The book appears in the series "Mathematics for Engineers". It is concerned with basic differentiation and integration and aimed at readers for whom mathematics is important but not their primary interest. Hence it is more a (good) cookbook than a textbook on the theoretical aspects. Simple examples, mostly with a practical background, are used to explain basic notions. Besides the standard obvious subjects the reader will find chapters on applications (numerical differentiation and integration, areas and volumes, moments, mean values), also an appendix on supporting mathematics is included. The book is concentrated on worked examples and contains many problems, all with solutions provided (358, but in fact twice more since some problems contain more exercises of a similar type). The book also contains many instructive pictures. As well as for teaching at technical universities it could be useful also for teachers wanting to show the practical aspects of using basic calculus techniques. (jive)

T.Ransford: Potential Theory in the Complex Plane, London Mathematical Society Student Texts 28, Cambridge University Press, Cambridge, 1995, x+232 pp., GBP 29.95, ISBN 0-521-46120-0, ISBN 0-521-46654-7

The book presents an exposition of the basic concepts of potential theory in the plane with an emphasis on relations to complex analysis. The first five chapters treat harmonic functions, subharmonic (=hypoharmonic) functions, logarithmic potentials of compactly supported Borel measures, (inner)polar sets, the Dirichlet problem, harmonic measure, Green's functions, capacity and the transfinite diameter, criteria for thiness and related topics. The reader is expected to have a working knowledge of elementary complex analysis and basic integration theory; required prerequisites concerning general Borel measures are collected in the appendix. The fundamentals of potential theory are carefuly developed; the book provides a lucid presentation of their close connection to complex analysis which can be highly recommended to graduate students in analysis. A somewhat more demanding last chapter 6 provides additional examples of applications of potential theory (to interpolation theorems, uniform approximation, Banach algebras, complex dynamics) providing attractive reading to all analysts. (jokr)

P.M.Cohn: Skew Fields. Theory of General Division Rings, Encyclopedia of Mathematics and its Applications 57, Cambridge University Press, Cambridge, 1995, xv+500 pp., GBP 55.00, ISBN 0-521-43217-0

An up to date account of the methods and results of the theory of general division rings is presented. Attention is paid to constructions of skew fields not necessarily finite-dimensional over their centres. The book develops the matter of the author's Skew Fields Constructions from 1977. It is divided into nine chapters. The first and fourth chapters examin the existence of a field of fractions and give the necessary and sufficient conditions in the form of quasi-identities. Fields of fractions, resp. epic R-fields (for a ring R) are formed with use of the singular kernel. Here the case of Ore and Sylvester domains is treated. The classes of skew polynomial rings, power series rings and filtered rings and fields formed from them are studied in the second chapter, while the third builds the Galois theory for skew fields. The next chapter deals, among other things, with coproduct construction for fields and Artin's problem, with the specialization lemma and its applications to free algebras and with rational identities and Bergman's theory of specializations. The results on singularities and some open problems associated with the approach to non-commutative algebraic geometry are given in the eighth chapter. The closing chapter is devoted to the study of valuations and orderings on skew fields. Each chapter contains exercises, open problems and historical notes. (tk)

P.J.Olver: Equivalence, Invariants, and Symmetry, Cambridge University Press, Cambridge, 1995, xvi+525 pp., GBP 24.95, ISBN 0-521-47811-1

The book deals with the three interconnected topics given in the title, each of them having many significant and substantial applications. The titles of the main chapters are: Geometric Foundations, Lie groups, Representation Theory (only a short introduction), Jets and Contact Transformations, Differential Invariants, Symmetries of Differential Equations, Symmetries of Variational Problems, Cartan's Equivalence Method, Prolongation of Equivalence Problems. Although the elementary foundations are given in the standard "modern" way, the presentation of the crucial parts of the book relies on the original works by S.Lie and É.Cartan. As the author says, he wants to avoid "elaborate, theoretical machinery that many have chosen to 'rigorize' the topic" and which "only serves to obscure the fundamental issues". Another feature of this book is its rather expository character: many interesting results are presented without proof, only with the reference to the original sources. The book should be warmly recommended to graduate students of mathematics and mathematical physics. (ok)

J.L.Alperin, R.B.Bell: Groups and Representations, Graduate Texts in Mathematics, vol.162, Springer-Verlag, New York, 1995, x+194 pp., DM 38.00, ISBN 0-387-94525-3, ISBN 0-387-94526-1

The book is based upon a mandatory course for all incoming mathematics graduate students at Chicago (and contains a number of historical remarks exhibiting the importance of Chicago for group theory). It highlights several aspects of groups, with the emphasis on finite groups. The authors justly feel that the general linear group serves much better as the standard example than the symmetric groups. After giving the rudimentary notions, they therefore consider the basic features of $GL(V)$ and only then move to Sylow's theorem, Schur-Zassenhaus theorem and composition series. The remaining two fifths of the book are concerned with semisimple algebras, Weddeburn theory and characters, culminating in the proof of existence of the Frobenius kernel. The book is well written and might be used by students with only basic knowledge of algebras. However, there are places in the book where such a student might wish for slightly more rigorous proofs. (ad)

W.Ballmann: Lectures on Spaces of Nonpositive Curvature with an appendix by Misha Brin. Ergodicity of Geodesic Flows, DMW Seminar Band 25, Birkhäuser, Basel, 1995, 120 pp., DM 39.80, ISBN 3-764-35242-6, ISBN 0-817-65242-6

This Lecture Note is an excellent introduction to an up-to-date topic in Riemannian geometry, namely the geometry of Hadamard spaces. Here are some selected titles of the sections: The cone at infinity and the Tits metric; The duality condition; Geodesic flows on Hadamard spaces; Harmonic functions and random walks (on some countable groups of isometries); Buseman functions and horospheres; Rank, regular vectors and flats; Proof of the rank rigidity. Here "rank rigidity" means that Hadamard spaces of rank higher than one are of very special type. The appendix written by M.Brin gives a short proof of ergodicity property for compact manifolds of strictly negative curvature. The book contains a very informative introduction, many valuable remarks, exercises and also open problems. The bibliography contains more than 300 references. (ok)

D.J.S.Robinson: A Course in the Theory of Groups. Second Edition, Graduate Texts in Mathematics, vol.80, Springer-Verlag, New York, 1996, xvii+499 pp., 40 fig., DM 88.00, ISBN 0-387-94461-3

Robinson's book is one of several comprehensive introductions to the theory of groups that are currently in use. It stands out by emphasizing structural aspects and thus is a good departure point for those who are interested in group extensions and infinite groups. The first ten chapters are standard (abelian, solvable, nilpotent, free, primitive and multiply transitive groups together with transfer and rudiments of representations). After a careful explanation of the foundations of extensions and group cohomologies, there are four chapters concerned with general structural problems (locally finite, nilpotent and solvable groups, subnormal subgroups, maximal and minimal condition, Engel groups, infinite soluble groups and some information on Burnside problems). The current Second Edition differs from the First Edition (1982) only in a local way. The book is pleasant to work with and contains numerous excercises. (ad)

K.Taira: Analytic Semigroups and Semilinear Initial Boundary Value Problems, London Mathematical Society Lecture Note Series 223, Cambridge University Press, Cambridge, 1995, x+164 pp., GBP 20.95, ISBN 0-521-55603-1

The monograph provides an analytic semigroup approach to initial boundary value problems for semilinear parabolic equations. It focuses on proving that a second order elliptic differential operator A on a smooth bounded domain in $\mathbf{R}^N$ generates a analytic semigroup in a properly chosen space, so that a boundary condition $Bu := a\partial u/\partial \nu + bu = \varphi$ on $\partial\Omega$ is incorporated in its domain even in the case when the problems becomes degenerate. The functions a, b in the condition B are smooth functions on $\partial\Omega$ and $\partial/\partial\nu$ denotes a conormal derivative associated with A. To verify the conditions of the generation theorem, elliptic boundary value problems are studied in the framework of Sobolev spaces of L^p-style, by using the L^p theory of pseudo-differential operators, which form the most convenient tool in the investigation of such problems. The monograph is fairly self-contained, it includes preparatory chapters containing a brief summary of theory of analytic semigroups, Sobolev embedding theorems and L^p theory of pseudo-differential operators. The book is written for graduate students and researches with an interest in analytic semigroups and initial boundary value problems. (hpe)

J.D.P.Meldrum: Wreath Products of Groups and Semigroups, Pitman Monographs and Surveys in Pure and Applied Mathematics, vol.74, Longman Scientific & Technical, Harlow, 1995, xii+324 pp., GBP 60.00,ISBN 0-582-02693-8,ISBN 0-470-23526-8

This is the first monograph on wreath products of groups and semigroups. This important construction method plays a crucial role in fundamental theorems in both group theory (Krasner-Kaloujnine theorem) and semigroup theory (Krohn-Rhodes theorem). The book under review looks at the structure of wreath products and develops proof techniques. Wherever possible, the material is presented in the framework of permutation groups and transformation monoids. Various applications are also included. (jtu)

O.Oleinik: Some Asymptotic Problems in the Theory of Partial Differential Equations, Lezioni Lincee, Cambridge University Press, Cambridge, 1996, x+202 pp., GBP 12.95, ISBN 0-521-48537-1, ISBN 0-521-48083-3

The book contains the author's recent results in two areas of the theory of PDEs. The first one is the asymptotic behaviour of solutions of nonlinear elliptic equations (Chapters 1.-3.). The equation considered is mostly of the form $Lu - a(x)|u|^{p-1}u = f(x)$, where L is a linear elliptic operator of second order, $p > 1$. (The equation $\triangle u - e^u = 0$ is also considered.) The first chapter is devoted to the boundary problem (with Dirichlet or Neumann conditions) in unbounded domains, especially to the asymptotic behaviour of its solutions at infinity. In Chapter 2, this problem is studied for cylindrical domains. In Chapter 3, the author considers solutions in domains whose boundaries have singularities of conical type and proves theorems about the behaviour of these solutions near these singular points. The second part of the book (Chapter 4) is devoted to some new problems in homogenization of PDR: the homogenization of second order elliptic equations in partially perforated domains with both Dirichlet and Neumann condition on holes. Finally, the asymptotics of solutions and eigenvalues of the problems with rapidly alternating type of boundary conditions is studied. Most of the results are new and are published for the first time. (jkop)