

# Equations aux dérivées partielles

Objektyp: **Chapter**

Zeitschrift: **L'Enseignement Mathématique**

Band (Jahr): **47 (2001)**

Heft 1-2: **L'ENSEIGNEMENT MATHÉMATIQUE**

PDF erstellt am: **22.09.2024**

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examination of topics that are important, but often inaccessible without the aid of a symbolic computation package such as MAPLE Ample problems; those requiring MAPLE are indicated within boxes throughout each chapter, while non-MAPLE problems are presented at the end of each chapter. “Harder” Maple programming projects in Part II; MAPLE becomes a research tool and programming vehicle to solve challenging problems. Cross-platform CD-ROM with extensive Maple code; worksheets and additional related material also downloadable from Birkhäuser and author’s websites.

M.R. GROSSINHO, M. RAMOS, C. REBELO, L. SANCHEZ, (Editors). — **Nonlinear analysis and its applications to differential equations**. — Progress in nonlinear differential equations and their applications, vol. 43. — Un vol. relié, 16×24, de XIII, 380 p. — ISBN 0-8176-4188-2. — Prix: SFr. 158.00. — Birkhäuser, Boston, 2001.

The material is largely an outgrowth of autumn school courses and seminars held at the University of Lisbon and has been thoroughly refereed. Several topics in ordinary differential equations and partial differential equations are the focus of key articles, including: periodic solutions of systems with p-Laplacian type operators (J. Mawhin), bifurcation in variational inequalities (K. Schmitt), a geometric approach to dynamical systems in the plane via twist theorems (R. Ortega), asymptotic behavior and periodic solutions for Navier-Stokes equations (E. Feireisl), mechanics on Riemannian manifolds (W. Oliva), techniques of lower and upper solutions for ODEs (C. De Coster and P. Habets). A number of related subjects dealing with properties of solutions, e.g., bifurcations, symmetries, nonlinear oscillations, are treated in other articles.

### *Equations aux dérivées partielles*

J. BILLINGHAM, A.C. KING. — **Wave motion**. — Cambridge texts in applied mathematics. — Un vol broché, 15×23, de IX, 468 p. — ISBN 0-521-63450-4 (relié: 0-521-63257-9). — Prix: £24.95 (relié: £70.00). — Cambridge University Press, Cambridge, 2000.

This introduction to the mathematics of wave phenomena is aimed at advanced undergraduate courses on waves for mathematicians, physicists or engineers. Some more advanced material on linear and nonlinear waves is also included. The authors assume some familiarity with partial differential equations, integral transforms and asymptotic expansions as well as an acquaintance with fluid mechanics, elasticity and electromagnetism. The context and physics that underlie the mathematics are clearly explained at the beginning of each chapter. Worked examples and exercises are supplied throughout, with solutions available to teachers.

Michel CHIPOT. — **Elements of nonlinear analysis**. — Birkhäuser advanced texts, Basler Lehrbücher. — Un vol. relié, 17,5×24, de VI, 256 p. — ISBN 3-7643-6406-8. — Prix: SFr. 78.00. — Birkhäuser, Basel, 2000.

This textbook explores the vast field of nonlinear analysis by emphasizing the underlying ideas rather than the sophisticated refinements of the theory. Two classical examples from physics, namely elasticity and diffusion, serve to motivate the theoretical parts that are then applied to various aspects of elliptic and parabolic problems. In particular, existence, uniqueness, regularity and approximation of solutions for quasilinear and monotone problems are studied, as well as some new aspects of the calculus of variations including Young measures or approximation of minimizing sequences. The book is reasonably self-contained. Wherever possible, original proofs are given that are not to be found elsewhere. The text is geared towards graduate students and non-specialists in nonlinear analysis who wish to become acquainted with the basic ideas of the subject. The study of this book will enable the reader to access the many ramifications of the field.

Alexandre T. FILIPPOV. — **The versatile soliton.** — Un vol. relié,  $16,5 \times 24$ , de XIV, 261 p. — ISBN 0-8176-3635-8. — Prix: SFr. 88.00. — Birkhäuser, Boston, 2000.

The soliton, a solitary wave impulse preserving its shape and strikingly similar to a particle, is one of the most fascinating and beautiful phenomena in the physics of nonlinear waves. In this engaging book, the concept of the soliton is traced from the beginning of the last century to modern times, with recent applications in biology, oceanography, solid state physics, electronics, elementary particle physics, and cosmology. To appreciate the deep connections in this book between apparently different and diverse phenomena and ideas, the reader must be able to follow elementary mathematical computations.

K.-H. HOFFMANN, Q. TANG. — **Ginzburg-Landau phase transition theory and superconductivity.** — International series of numerical mathematics, vol. 134. — Un vol. relié,  $17,4 \times 24$ , de XII, 383 p. — ISBN 3-7643-6486-6. — Prix: SFr. 158.00. — Birkhäuser, Basel, 2001.

In this monograph, the authors collect, rearrange and refine recent research results in the complex G-L theory with or without immediate applications to the theory of superconductivity. The purpose is to present as many mathematically sound results as possible on various aspects of the PDE system, including rigorous mathematical analysis, formal asymptotics as well as numerical analysis. The book starts with some physical background material and discussions on the modelling and theoretical studies of physicists that invite further mathematical research. The authors then treat the mathematical scaling in a systematic way and analyze implications on various limit problems. After addressing the mathematical foundation and formal asymptotic analysis of vortex motion they move on to rigorous results on existence, regularity and long-time behavior of solutions, as well as the vortex location and law of motion.

Rafael José IORIO, Jr, Valéria DE MAGALHÃES IORIO. — **Fourier analysis and partial differential equations.** — Cambridge studies in advanced mathematics, vol. 70. — Un vol. relié,  $16 \times 23,5$ , de XI, 411 p. — ISBN 0-521-62116-X. — Prix: £45.00. — Cambridge University press, Cambridge, 2001.

The first part of the book consists of some very classical material, followed by a discussion of the theory of periodic distributions and the periodic Sobolev spaces. The authors then turn to the study of linear and nonlinear equations in the setting provided by periodic distributions. They assume only some familiarity with Banach and Hilbert spaces and the elementary properties of bounded linear operators. After presenting a fairly complete discussion of local and global well-posedness for the nonlinear Schrödinger and the Korteweg-de Vries equations, they turn their attention, in the two final chapters, to the nonperiodic setting, concentrating on problems that do not occur in the periodic case.

Antonino MAUGERI, Dian K. PALAGACHEV, Lubomira G. SOFTOVA. — **Elliptic and parabolic equations with discontinuous coefficients.** — Mathematical research, vol. 109. — Un vol. relié,  $17,5 \times 24,5$ , de 256 p. — ISBN 3-527-40135-0. — Prix: DM 198.00. — Wiley-VCH, Berlin, 2000.

This book unifies the different approaches in studying elliptic and parabolic partial differential equations with discontinuous coefficients. To the enlarging market of researchers in applied sciences, mathematics and physics, it gives concrete answers to questions suggested by non-linear models. Providing an up-to-date survey on the results concerning elliptic and parabolic operators on a high level, the authors serve the reader in doing further research. Being themselves active researchers in the field, the authors describe both on the level of good examples and precise analysis, the crucial role played by such requirements on the coefficients as the Cordes

condition, Campanato's nearness condition, and vanishing mean oscillation condition. They present the newest results on the basic boundary value problems for operators with VMO coefficients and non-linear operators with discontinuous coefficients and state a lot of open problems in the field.

## *Systemes dynamiques et theorie ergodique*

Steve ALPERN, V.S. PRASAD. — **Typical dynamics of volume preserving homeomorphisms.** — Cambridge tracts in mathematics, vol. 139. — Un vol. relié,  $16 \times 23,5$ , de XIX, 216 p. — ISBN 0-521-58287-3. — Prix: £30.00. — Cambridge University Press, Cambridge, 2000.

This book provides a self-contained introduction to typical properties of homeomorphisms. Examples of properties of homeomorphisms considered include transitivity, chaos and ergodicity. A key idea here is the interrelation between typical properties of volume preserving homeomorphisms and typical properties of volume preserving bijections of the underlying measure space. The authors consider volume preserving homeomorphisms of the unit  $n$ -dimensional cube, and they go on to prove fixed point theorems (Conley-Zehnder-Franks). Parts II and III consider further questions, in a leisurely fashion, for compact manifolds and sigma compact manifolds respectively.

Alan F. BEARDON. — **Iteration of rational functions: complex analytic dynamical systems.** — Graduate texts in mathematics, vol. 132. — Un vol. broché,  $15,5 \times 23,5$ , de XVI, 280 p. — ISBN 0-387-95151-2. — Prix: DM 89.00. — Springer, New York, 2000.

This book makes available a comprehensive, detailed, and organized treatment of the foundations of the theory of iteration of rational functions of a complex variable. The material covered extends from the original memoirs of Fatou and Julia to the recent and important results and methods of Sullivan and Shishikura. Many of the details of the proofs have not occurred in print before. The theory of dynamical systems and chaos has recently undergone a rapid growth in popularity, in part due to the spectacular computer graphics of Julia sets, fractals, and the Mandelbrot set. This text focuses on the specialized area of complex analytic dynamics, a subject that dates back to 1916 and is currently a very active area in mathematics.

Andreas JUHL. — **Cohomological theory of dynamical zeta functions.** — Progress in mathematics, vol. 194. — Un vol. relié,  $17 \times 24$ , de x, 709 p. — ISBN 3-7643-6405-X. — Prix: SFr. 198.00. — Birkhäuser, Basel, 2001.

The book treats various aspects of the idea to understand the analytical properties of meromorphic zeta functions on the basis of appropriate analogs of the Lefschetz fixed point formula in which the periodic orbits of the flow take the place of the fixed points. The book describes the present state of the research in a new field on the cutting edge of global analysis, harmonic analysis and dynamical systems. It should be appealing not only to the specialists on zeta functions which will find their object of favourite interest connected in new ways with index theory, geometric quantization methods, foliation theory and representation theory. There are many unsolved problems and the book hopefully promotes further progress the lines indicated here.

Stephen LYNCH. — **Dynamical systems with applications using MAPLE.** — Un vol. broché,  $15,5 \times 23,5$ , de XIII, 398 p. — ISBN 0-8176-4150-5. — Prix: SFr. 98.00. — Birkhäuser, Boston, 2001.

A short tutorial in MAPLE is provided at the beginning of the book to facilitate understanding of the theory and to deal with the numerous examples, diagrams, and exercises. The main