Fonctions spéciales

Adhemar BULTHEEL, Pablo GONZALEZ-VERA, Erik HENDRIKSEN, Olav NJASTAD. — **Orthogonal rational functions.** — Cambridge monographs on applied and computational mathematics, vol. 5. — Un vol. relié, 15,5×23,5, de XIV, 403 p. — ISBN 0-521-65006-2. — Prix: £37.50. — Cambridge University Press, Cambridge, 1999.

This book generalizes the classical theory of orthogonal polynomials on the complex unit circle or on the real line to orthogonal rational functions whose poles are among a prescribed set of complex numbers. The first part treats the case where these poles are all outside the unit disk or in the lower half plane. Classical topics such as recurrence relations, numerical quadrature, interpolation properties, Favard theorems, convergence, asymptotics, and moment problems are generalized and treated in detail. The same topics are discussed for the different situation where the poles are located on the unit circle or on the extended real line. In the last chapter, several applications are mentioned including linear prediction, Pisarenko modeling, lossless inverse scattering, and network synthesis.

P.A. DEIFT. — **Orthogonal polynomials and random matrices: a Riemann-Hilbert approach.** — Courant lecture notes in mathematics, vol. 3. — Un vol. broché, 15×22,5, de 273 p. — ISBN 0-9658703-2-4. — Prix: US$20.00. — Courant Institute of Mathematical Sciences, New York, 1999.

Riemann-Hilbert problems. — Jacobi operators. — Orthogonal polynomials. — Continued fractions. — Random matrix theory. — Equilibrium measures. — Asymptotics for orthogonal polynomials. — Universality.

Equations différentielles ordinaires

D.W. JORDAN, P. SMITH. — **Nonlinear ordinary differential equations: an introduction to dynamical systems.** — Third edition. — Oxford applied and engineering mathematics, vol. 2. Un vol. broché, 15,5×23,5, de x, 550 p. — ISBN 0-19-856562-3. — Prix: £21.95. — Oxford University Press, Oxford, 1999.

The text of this third edition has been completely revised to bring it into line with current interest and research in the subject, including an expansion of the material on bifurcation and chaos. The book is directed towards practical application of the theory, with several hundred examples and problems covering a wide variety of applications. Prerequisites are kept to a minimum. Further topics covered include phase plane analysis, nonlinear damping, small parameter expansions and singular perturbations, subharmonic responses, stability, Liapunov methods, existence theory of limit cycles, Poincaré sequences and homoclinic bifurcation.

Equations aux dérivées partielles

Heinrich G.W. BEGEHR, Robert P. GILBERT, Guo-Chen WEN, (Editors). — **Partial differential and integral equations.** — International Society for Analysis, Applications and Computation, vol. 2. — Un vol. relié, 17×24,5, de x, 369 p. — ISBN 0-7923-5482-6. — Prix: Dfl. 280.00. — Kluwer Academic Publishers, Dordrecht, 1999.

Recent results on partial differential equations as well as with complex analytic methods, on singular integral equations and on related subjects are presented. Many of the contributions are survey articles. Topics ranging from elliptic, parabolic, hyperbolic, mixed-type equations and

systems to hyper-complex and quaternionic analysis, M-analytic, bianalytic, polyharmonic and functions of several complex variables are covered. Applications to mathematical physics are also included.

Mouez DIMASSI, Johannes SJÖSTRAND. — **Spectral asymptotics in the semi-classical limit.** — London Mathematical Society lecture note series, vol. 268. — Un vol. broché, 15×23, de XI, 227 p. — ISBN 0-521-66544-2. — Prix: £24.95. — Cambridge University Press, Cambridge, 1999.

In recent years there has been a very strong development in the mathematical theory, mainly thanks to methods of microlocal analysis. This book develops the basic methods, including the WKB-method, stationary phase and *h*-pseudodifferential operators. The applications include recent results on the tunnel effect, the asymptotics of eigenvalues in relation to classical trajectories and normal forms, plus slow perturbations of periodic Schrödinger operators appearing in solid state physics. No previous specialized knowledge in quantum mechanics or microlocal analysis is assumed, and only general facts about spectral theory in Hilbert space, distributions, Fourier transforms and some differential geometry are prerequisites.

Goro KATO, Daniele C. STRUPPA. — **Fundamentals of algebraic microlocal analysis.** — Pure and applied mathematics. A series of monographs and textbooks, vol. 217. — 1 vol. relié, 16×23,5, de X, 296 p. — ISBN 0-8247-9327-7. — Prix: US$145.00. — Marcel Dekker, New York, 1999.

Striking the perfect balance between analytic and algebraic aspects, this book features a complete review of hyperfunction-microfunction theory and the theory of D-modules, traces developments leading from the creation of hyperfunctions to the modern algebraic treatment of microlocal analysis, examines microfunctions and hyperfunctions in one variable and several variables, both function theoretically and sheaf theoretically, defines hyperfunctions using sheaf cohomology, analyzes the differentiable case of microfunctions, describes hyperfunctions as the sums of boundary values of holomorphic functions, covers the fundamental Sato structure theorem for systems of differential equations, proves most of the relevant work of Sato, Kawai, and Kashiwara.

Dumitru MOTREANU, Nicolae H. PAVEL. — **Tangency, flow invariance for differential equations, and optimization problems.** — Pure and applied mathematics, vol. 219. — Un vol. relié, 16×23, de X, 479 p. — ISBN 0-8247-7341-1. — Prix: US$195.00. — Marcel Dekker, New York, 1999.

Featuring many results that are exclusive to the authors, the book discusses basic results of the flow invariance of a closed or locally closed set S of a Banach space (or manifold) with respect to differential equations... describes the unifying effects and geometric significance of the theory... examines the integral surface of a quasi-linear partial differential equation... covers classical theory that demonstrates the equivalence of the theorems of Brouwer and Miranda in terms of Bouligand-Nagumo fields... explores the multidisciplinary applications of nonlinear analysis... explains optimal control via tangential cones and closed-range operators... etc.

John OCKENDON, Sam HOWISON, Andrew LACEY, Alexander MOVCHAN. — **Applied partial differential equations.** — Un vol. broché, 15,5×23,5, de XI, 425 p. — ISBN 0-19-853243-1. — Prix: £25.00. — Oxford University Press, Oxford, 1999.

This is a clearly written guide to the theory and applications of PDEs. Its central aim is to set out, in an informal yet logical manner, a mathematical framework within which to assess any given PDE. Space is devoted as much to explicit methods of solution as to more general qualitative ideas, the most important of which is the concept of well-posedness. This attribute is vital in

deciding the accuracy to which the problem can be solved numerically, and it becomes increasingly important as the power of computer software grows.

David L. POWERS. — **Boundary value problems.** — Fourth edition. — Un vol. relié, 16,5×23,5, de XI, 528 p. — ISBN 0-12-563734-9. — Prix: US$69.95. — Academic Press, San Diego, 1999.

This new edition achieves two objectives. The main goal is solving boundary value problems involving partial differential equations. Separation of variables provides a uniform method for attacking important cases of the heat, wave, and potential equations. D'Alembert's solution of the wave equation and the distributed-source solution for the heat equation illustrate other techniques. In addition, there is a chapter on Laplace transform and one on numerical methods, including use of spreadsheets. The second objective is to tie together the mathematics developed and the learner's physical intuition. This is accomplished by deriving several of the mathematical models, by using some physical reasoning in the mathematical development, by interpreting mathematical results in physical terms, and by studying the heat, wave, and potential equations separately.

Jean-Emile RAKOTOSON, Jean-Michel RAKOTOSON. — **Analyse fonctionnelle appliquée aux équations aux dérivées partielles.** — Mathématiques. — Un vol. broché, 15×22, de 230 p. — ISBN 2-13-049838-8. — Prix: FF 178.00. — Presses Universitaires de France, Paris, 1999.

Les auteurs ont mis l'accent sur le côté pédagogique en détaillant autant que possible les démonstrations des théorèmes, en utilisant pour ces preuves des procédés simples basés en général sur l'usage des suites (exemple: le procédé diagonal de Cantor, la méthode de Galerkin), en illustrant par des exemples détaillés l'application des théorèmes principaux (théorème de Lax-Milgram, théorèmes de compacité, théorème de J.-L. Lions), en motivant autant que possible l'introduction de certains chapitres, sans oublier l'introduction de certaines méthodes de résolutions numériques (méthode des éléments finis, méthodes spectrales). Enfin, le tout est complété par des exercices variés dont certains comportent des corrections détaillées.

Bert-Wolfgang SCHULZE, Boris STERNIN, Victor SHATALOV. — **Differential equations on singular manifolds: semiclassical theory and operator algebras.** — Mathematical topics, vol. 15 — Un vol. relié, 18×24, de 376 p. — ISBN 3-527-40086-9. — Prix: DM 198.00. — Wiley-VCH, Berlin, 1998.

In this book, new methods in the theory of differential equations on manifolds with singularities are presented. The semiclassical theory in quantum mechanics is employed, adapted to operators that degenerate in a typical way. The degeneracies may be induced by singular geometries, e.g. conical or cuspidal ones. A large variety of non-standard degenerate operators is also discussed. The semiclassical approach yields new results and unexpected effects, also in classical situations. For instance, full asymptotic expansions for cuspidal singularities are constructed, and nonstationary problems on singular manifolds are treated. Moreover, finiteness theorems are obtained by using operator algebra methods in a unified framework. Finally, the method of characteristics for general elliptic equations on manifolds with singularities is developed in the book.

Alwyn SCOTT. — **Nonlinear science: emergence & dynamics of coherent structures.** — With contributions from Mads Peter SØRENSEN and Peter Leth CHRISTIANSEN. — Oxford applied and engineering mathematics, vol. 1. — Un vol. relié, 17×24, de XVII, 474 p. — ISBN 0-19-850107-2. — Prix: £39.95. — Oxford University Press, Oxford, 1999.

The study of nonlinear systems has quietly revolutionized the realm of science over recent years. It is now known that for nonlinear systems new structures emerge that have their own

features, lifetimes, and peculiar ways of interacting. This book provides an introduction to this complex area of study. It covers a variety of topics, including soliton theory, nonlinear lattices, excitable media, perturbation theory, and the theory of quantum lattices, with a strong emphasis on the applications to experimental reality. It is designed to serve as both a textbook and as a general reference for students and researchers of nonlinear dynamics.

Dennis SERRE. — **Systems of conservation laws, 1: Hyperbolicity, entropies, shock waves.** — Translated by I.N. Sneddon. — Un vol. relié, 18×25,5, de XXII, 263 p. — ISBN 0-521-58233-4. — Prix: £40.00. — Cambridge University Press, Cambridge, 1999.

This book sets up the foundations of the modern theory of conservation laws describing the physical models and mathematical methods, leading to the Glimm scheme. Building on this the author then takes the reader to the current state of knowledge in the subject. In particular, he studies in detail viscous approximations, paying special attention to viscous profiles of shock waves. The maximum principle is considered from the viewpoint of numerical schemes and also in terms of viscous approximation. Small waves are studied using geometrical optics methods. Finally, the initial-boundary problem is considered in depth.

Systèmes dynamiques et théorie ergodique

Clark ROBINSON. — **Dynamical systems: stability, symbolic dynamics, and chaos.** — Second edition. — Studies in advanced mathematics. — Un vol. relié, 19×26, de 506 p. — ISBN 0-8493-8495-8. — Prix: DM 165.00. — CRC Press, Boca Raton, 1999, distributed by Springer, Berlin.

The book treats the dynamics of both iteration of functions and solutions of ordinary differential equations. This second edition provides a revised discussion of the saddle node bifurcation, a new section on the horseshoe for a flow with a transverse homoclinic point, material on horseshoes for nontransverse homoclinic points, indicating recent extensions to the understanding of how horseshoes arise, information proving the ergodicity of a hyperbolic toral automorphism, a new chapter on Hamiltonian systems.

Approximations et développements en série

Gheorghe MICULA and Sanda MICULA. — **Handbook of splines.** — Mathematics and its applications, vol. 462. — Un vol. relié, 16,5×24,5, de XVI, 604 p. — ISBN 0-7923-5503-2. — Prix: Dfl. 495.00. — Kluwer Academic Publishers, Dordrecht, 1999.

The purpose of this book is to give a comprehensive approach to the theory of spline functions, from the introduction of the phrase "spline" by I.J. Schoenberg in 1946 to the newest theories of spline-wavelets or spline-fractals, emphasizing the significance of the relationship between the general theory and its applications. In addition, it provides new material on spline function theory, as well as a fresh look at basic methods in spline functions. An extensive reference section is provided.

Analyse de Fourier, analyse harmonique abstraite

Michael W. FRAZIER. — **An introduction to wavelets through linear algebra.** — Undergraduate texts in mathematics. — Un vol. relié, 16,5×24,5, de XVI, 501 p. — ISBN 0-387-98639-1. — Prix: DM 98.00. — Springer, New York, 1999.

This introduction to wavelets assumes a basic background in linear algebra (reviewed in Chapter 1) and real analysis at the undergraduate level. Fourier and wavelet analyses are first