

Book Reviews

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BOOK REVIEWS

J. F. Rodrigues, G. Seregin, J. M. Urbano (eds.): TRENDS IN PARTIAL DIFFERENTIAL EQUATIONS OF MATHEMATICAL PHYSICS. Birkhäuser, Basel, 2005, ISBN 3-7643-7165-X, 296 pages, EUR 108.–.

This volume is the proceedings of the International Conference on “Trends in Partial Differential Equations of Mathematical Physics” held on the occasion of 70th birthday of Vselovod Alekseevich Solonnikov in Óbidos (Portugal), from June 7 to 10, 2003.

The conference consisted of thirty eight invited and contributed lectures and about sixty participants from fifteen countries. The book contains twenty original contributions, selected from the invited talks.

Here is the list of titles of particular articles:

1. Stopping a viscous fluid by a feedback dissipative field: Thermal effects without phase changing.
2. Ultracontractive bounds for nonlinear evolution equations governed by the subcritical p -Laplacian.
3. Weighted L^2 -spaces and strong solutions of the Navier-Stokes equations in \mathbb{R}^3 .
4. A limit model for unidirectional non-newtonian flows with nonlocal viscosity.
5. Problem of thermocapillary convection for two incompressible fluids separated by a closed interface.
6. Some mathematical problems in visual transduction.
7. Global regularity in Sobolev spaces for elliptic problems with p -structure on bounded domains.
8. Temperature driven mass transport in concentrated saturated solutions.
9. Solvability of a free boundary problem for the Navier-Stokes equations describing the motion of viscous incompressible nonhomogeneous fluid.
10. Duality principles for fully nonlinear elliptic equations.
11. On the Bénard problem.
12. Exact boundary controllability for quasilinear wave equations.
13. Regularity of Euler equations for a class of three-dimensional initial data.
14. A model of a two-dimensional pump.
15. Regularity of a weak solution to the Navier-Stokes equation in dependence on eigenvalues and eigenvectors of the rate deformation tensor.
16. Free work and control of equilibrium configurations.
17. Stochastic geometry approach to the kinematic dynamo equation of magnetohydrodynamics.
18. Quasi-Lipschitz conditions in Euler flows.
19. Interfaces in solutions of diffusion-absorption equations in arbitrary space dimension.
20. Estimates for solutions of fully nonlinear discrete schemes.

Ivan Straškraba, Praha

Mariano Giaquinta, Giuseppe Modica: MATHEMATICAL ANALYSIS. APPROXIMATION AND DISCRETE PROCESSES. Birkhäuser, Boston, 2004, xii+388 pages, ISBN 0-8176-4337-0, EUR 64.–.

The book is self-contained, its aim is to introduce basic ideas for studying approximation processes and, more generally, discrete processes at the graduate level. To this end, only a knowledge of calculus and the functions of one variable is required. The exposition is systematic and rigorous, historical ideas are presented and their connections with the relevant topics are shown. The authors also provide interesting and useful connections developed between analysis and other mathematical disciplines, in this case, numerical analysis and probability theory. The text is replete with beautiful illustrations.

The book is divided into two parts. The first starts with the numerical systems of reals, of integers as a subset of the reals, and of complex numbers. The notion of sequences is presented and their convergence is discussed in terms of discrete processes. The exposition continues with the elements of combinatorial calculus and the mathematical notion of infinity. Finally, the fundamental theorem of algebra is proved and some elementary properties of polynomials, rational functions and trigonometric polynomials are given. The second part is dedicated to discrete processes. It starts with a study of numerical series and of power series. The text is closed with a chapter which serves as an introduction to the study of discrete dynamical systems, and with a list of mathematicians and other scientists mentioned in the book. Any chapter of the book (except the last one) includes a short summary and a large number of exercises.

The book may be used in graduate seminars and courses or as a reference text by mathematicians, physicists and engineers.

Bohumír Opic, Praha

H. Amann, J. Escher: ANALYSIS II. Birkhäuser, Basel, 2008, 410 pages, EUR 75.–.

The second volume of Analysis deals with the integration in one variable (Chapter VI), the multidimensional differential calculus (Chapter VII) and the theory of line integrals (Chapter VIII). The book combines a classical topic with a modern presentation.

In Chapter VI the authors develop the theory of Cauchy-Riemann integral. Then they explore the connection between integrals and sums. They derive the Euler-Mclaurin sum formula and point out some of its consequences. The Fourier series are studied in the general framework of the theory of orthogonality in Hilbert spaces. The last section of Chapter VI is devoted to the theory of gamma function.

Chapter VII is devoted to the differential calculus of functions of several variables. The authors develop the differential calculus for maps between Banach spaces. The classical formulas for the derivatives in the usual coordinate representation follow easily from the general results. At the end of this chapter submanifolds of \mathbb{R}^n are characterized.

Chapter VIII treats differential forms of the first order. In this context the foundation of the curvilinear integration is given. The fundamental theorem of line integrals is proved, which characterizes the vector fields that can be obtained as the gradient of potentials. The line integrals are used in the study of holomorphic and meromorphic functions.

Dagmar Medková, Praha