

Volume 39



CRM PROCEEDINGS & LECTURE NOTES

Centre de Recherches Mathématiques
Université de Montréal

Group Theory and Numerical Analysis

P. Winternitz
D. Gomez-Ullate
A. Iserles
D. Levi
P. J. Olver
R. Quispel
P. Tempesta
Editors

The Centre de Recherches Mathématiques (CRM) of the Université de Montréal was created in 1968 to promote research in pure and applied mathematics and related disciplines. Among its activities are special theme years, summer schools, workshops, postdoctoral programs, and publishing. The CRM is supported by the Université de Montréal, the Province of Québec (FCAR), and the Natural Sciences and Engineering Research Council of Canada. It is affiliated with the Institut des Sciences Mathématiques (ISM) of Montréal, whose constituent members are Concordia University, McGill University, the Université de Montréal, the Université du Québec à Montréal, and the Ecole Polytechnique. The CRM may be reached on the Web at www.crm.umontreal.ca.



American Mathematical Society
Providence, Rhode Island USA

Contents

Preface	vii
List of Participants	ix
Continuous Extension of the Discrete Cosine Transform, and Its Applications to Data Processing A. M. ATOYAN and J. PATERA	1
Symbolic Algorithms for the Painlevé Test, Special Solutions, and Recursion Operators for Nonlinear PDEs D. BALDWIN, <i>W. Hereman</i> , and <i>J. Sayers</i>	17
Continuum Limit of Lattice Approximation Schemes C. M. BENDER	33
Algebraic Structures on Ordered Rooted Trees and Their Significance to Lie Group Integrators <i>H. Berland</i> and B. OWREN	49
Aspects of Generalized Double-Bracket Flows A. M. BLOCH and <i>A. Iserles</i>	65
Eulerian and Semi-Lagrangian Schemes Based on Commutator-Free Exponential Integrators E. CELLEDONI	77
Second Order Linear ODEs: Two Non-Liouvilian Approaches E. S. CHEB-TERRAB	91
On Rational Solutions of the Fourth Painlevé Equation and Its Hamiltonian P. A. CLARKSON	103
Comparison of Symmetry Preserving Difference Schemes with Standard Numerical Methods C. CYR-GAGNON	119
Symbolic Computation of Polynomials Conserved Densities, Generalized Symmetries, and Recursion Operators for Nonlinear Differential-Difference Equations W. HEREMAN, <i>J. A. Sanders</i> , <i>J. Sayers</i> , and <i>J. P. Wang</i>	133
On the Numerical Analysis of Rapid Oscillation A. ISERLES	149

On Conservation Properties of Semidiscrete Canonical Hamiltonian Equations R. KOZLOV	165
Discrete Lie Symmetries for Difference Equations D. LEVI and <i>M. A. Rodríguez</i>	179
Trivializations, Factorizations, and Geometric Integration for Pseudo-Rigid Bodies D. LEWIS	191
Towards a Variational Complex for the Finite Element Method E. L. MANSFIELD and G. R. W. QUISPÉL	207
Models of Resonantly Driven Motion of Motor Proteins in 2D Potentials <i>J. Middleton</i> and J. A. TUSZYŃSKI	233
Determination of Approximate Symmetries of Differential Equations <i>J. Bonasia, F. Lemaire, G. Reid, R. Scott, and L. Zhi</i>	249
Discrete and Finite Fractional Fourier Transform K. B. WOLF	267
Some Nanotube-Like Systems and Their Discrete Equations W. J. ZAKRZEWSKI	277
Explicit Multipoint Rational Interpolation Padé Table for Exponential and Power Functions A. ZHEDANOV	285