Trends in Mathematics

Sandeep Singh
Mehmet Ali Sarigöl
Alka Munjal
Editors

Algebra, Analysis, and Associated Topics

Birkhäuser

Trends in Mathematics

Trends in Mathematics is a series devoted to the publication of volumes arising from conferences and lecture series focusing on a particular topic from any area of mathematics. Its aim is to make current developments available to the community as rapidly as possible without compromise to quality and to archive these for reference.

Proposals for volumes can be submitted using the Online Book Project Submission Form at our website www.birkhauser-science.com.

Material submitted for publication must be screened and prepared as follows: All contributions should undergo a reviewing process similar to that carried out by journals and be checked for correct use of language which, as a rule, is English. Articles without proofs, or which do not contain any significantly new results, should be rejected. High quality survey papers, however, are welcome.

We expect the organizers to deliver manuscripts in a form that is essentially ready for direct reproduction. Any version of TEX is acceptable, but the entire collection of files must be in one particular dialect of TEX and unified according to simple instructions available from Birkhäuser.

Furthermore, in order to guarantee the timely appearance of the proceedings it is essential that the final version of the entire material be submitted no later than one year after the conference.

Sandeep Singh • Mehmet Ali Sarigöl • Alka Munjal
Editors

Algebra, Analysis, and Associated Topics

Birkhäuser

Editors
Sandeep Singh
Department of Mathematics
Akal University
Talwandi Sabo, Punjab, India

Mehmet Ali Sarigöl
Department of Mathematics
Pamukkale University
Denizli, Turkey

Alka Munjal
Galgotias University
Greater Noida, Uttar Pradesh, India

ISSN 2297-0215 ISSN 2297-024X (electronic)
Trends in Mathematics
ISBN 978-3-031-19081-0 ISBN 978-3-031-19082-7 (eBook)
https://doi.org/10.1007/978-3-031-19082-7

Mathematics Subject Classification: 08-xx, 11-xx, 05Cxx

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2022
This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This book is published under the imprint Birkhäuser, www.birkhauser-science.com by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Dedicated to God

Preface

Analysis and algebra are two key branches of Mathematics. Analysis is a branch of Mathematics which studies continuous changes and includes the theories of integration, differentiation, measure, limits, analytic functions, and infinite series while algebra is the study of algebraic structures, groups, rings, modules, fields, vector spaces, and lattices. A basic premise of this book is that quality assurance is effectively achieved through the selection of quality research articles. This book comprises the contribution of various researchers in 15 chapters. Each chapter identifies the existing challenges in the areas of Algebra, Analysis, and related topics. These chapters are representing the importance of existing results and helpful for generating new ideas for various research problems of pure Mathematics.

This book provides the technique suitable for solving the problem with sufficient mathematical background, and discussions on the obtained results with physical interruptions to understand the domain of applicability of Analysis and Algebra. This book discusses new results in cutting-edge areas of several branches of mathematics and applications, including analysis, algebra number theory, etc. Also, algebra and combinatorics are core areas of mathematics which find broad applications in the sciences and in other mathematical fields. Literature survey is also provided in each of chapter which reveals the challenges, outcomes, and developments of higher- level mathematics in this decade.

The book comprised of the following interesting topics of Pure Mathematics:

- Maximal Rotational Hypersurfaces
- k-Horadam Sequences
- Lauricella Function
- Absolute Nörlund Summable Factor
- Derivations and Special Functions over Fields
- Central Automorphism of a Group
- Brandt Semigroup B_n
- Δ Convergence in $CAT(0)$ Spaces
- Quantum Dynamical Semi-Group
- Cardinality of Sum-Sets

- Cantor Dyadic Groups
- $\mathcal{I}_2$-Statistical Limit Points and Cluster Points
- Bessel and Whittaker Functions
- Neutrosophic e Space

This book promotes a vision of pure mathematics as integral to modern science and engineering. Theoretically oriented readers will find an overview of Mathematics and its applications. Readers will find a variety of current research topics with sufficient discussion in terms of physical point of view to adapt for solving the particular application. The book stimulates the advancement of mathematics and its applications.

As editors, we would like to express our sincere thanks to the Akal University for providing us excellent facilities and support for further research. We are also grateful to all referees for spending their valuable time to reviews the chapters. The editors are thankful to Chris Eder Associate Editor at Springer, for his continuous support toward the publication of this book.

Talwandi Sabo, India — Sandeep Singh
Denizli, Turkey — Mehmet Ali Sarigöl
Greater Noida, India — Alka Munjal
June 2022

Contents

1 **Maximal Rotational Hypersurfaces Having Spacelike Axis, Spacelike Profile Curve in Minkowski Geometry** 1
Erhan Güler and Ömer Kişi

2 **On the Generalized k-Horadam-Like Sequences** 11
Kalika Prasad, Hrishikesh Mahato, and Munesh Kumari

3 **New Results on $(p_1, p_2, \cdots, p_n, k)$ Analogue of Lauricella Function with Transforms and Fractional Calculus Operator** 27
Anil Kumar Yadav, Rupakshi Mishra Pandey, and Vishnu Narayan Mishra

4 **Absolute Linear Method of Summation for Orthogonal Series** 41
Alka Munjal

5 **Derivations and Special Functions Over Fields** 55
Yashpreet Kaur

6 **On Equalities of Central Automorphism Group with Various Automorphism Groups** 71
Harpal Singh and Sandeep Singh

7 **Automorphism Group and Laplacian Spectrum of a Graph Over Brandt Semigroups** 85
Sandeep Dalal

8 **Unified Iteration Scheme in $CAT(0)$ Spaces and Fixed Point Approximation of Mean Nonexpansive Mappings** 97
Nisha Sharma, Kamal Kumar, Laxmi Rathour, Alka Munjal, and Lakshmi Narayan Mishra

9 **Semigroups of Completely Positive Maps** 115
Preetinder Singh

10 On Sumset Problems and Their Various Types 135
Ramandeep Kaur and Sandeep Singh

11 Vector-Valued Affine Bi-Frames on Local Fields 151
M. Younus Bhat, Owais Ahmad, Altaf A. Bhat, and D. K. Jain

12 A New Perspective on $\mathcal{I}_2$-Statistical Limit Points and $\mathcal{I}_2$-Statistical Cluster Points in Probabilistic Normed Spaces 167
Ömer Kişi and Erhan Güler

13 Evaluation of Integral Transforms in Terms of Humbert and Lauricella Functions and Their Applications 183
Abdelmajid Belafhal, Halima Benzehoua, and Talha Usman

14 Some Spaces in Neutrosophic e-Open Sets 213
A. Vadivel, P. Thangaraja, and C. John Sundar

15 Generalized Finite Continuous Ridgelet Transform 227
Nitu Gupta and V. R. Lakshmi Gorty