Workshop in Developments in Mathematics: Mathematical Analysis and Statistical Methods

PROGRAM

Starting at: 9am

Basic Concepts of Geometric function Theory with *q*-Calculus

Bilal Khan
Institute of Mathematics, Henan Academy of Sciences, Henan, PR China

Abstract

A q-analogue (or quantum analogue) represents a mathematical generalization in which a parameter q is systematically introduced into an expression, such that the original form is recovered as q approaches unity. This fundamental concept underpins the field of q-analysis, a vibrant branch of modern mathematics characterized by the replacement of classical derivatives with their q-differential counterparts. Q-analysis maintains deep interdisciplinary connections with diverse mathematical domains, including number theory, geometric function theory, combinatorics, quantum algebra, complex analysis, orthogonal polynomials, quantum field theory, and statistical mechanics. In this talk, I will present both the fundamental concepts of q-analysis and recent advancements with geometric function Theory of complex analysis.

Starting at: 9:40am

A study of analytic functions associated with different domains

Muhammad Ghaffar Khan
Kohat University of Sciences and Technology, Kohat, Pakistan

Abstract

In this presentation, we will discuss some subclasses of analytic functions associated with different domains. Further, we discuss geometric and analytic properties like radius problems , inclusion results, subordination results and some coefficient problems.

Starting at: 10:20am

A Step to Disclose the world of Geometric Function Theory Through Hypergeometric Functions

Muhammad Uzair Shah
East China Normal University, Shanghai China

Abstract

This presentation provides an introductory overview of geometric function theory with a focus on the role of hypergeometric functions in geometric function theory. A key highlight is the connection between hypergeometric functions and the resolution of the famous Bieberbach conjecture, now known as de Branges' theorem, which resolved the long-standing problem of bounding Taylor coefficients of univalent functions. We also discuss how these tools are used to derive coefficient estimates , offering insight into both the analytic and geometric behaviour of complex mappings. This talk aims to bridge classical analysis with modern developments in geometric function theory.

Starting at: 11:00am

On The Arithmetic Properties of Fourier Coefficients of Second Order Mock Theta Functions

Urooj Fatima and Ahmar Ali
University of Narowal, Punjab, Pakistan

Abstract

Inspired by McIntosh's research on mock theta functions, in this talk we proposes and investigates the arithmetic properties of the Fourier coefficients of the second-order mock theta functions A(q) and B(q).

We establish several new dissection formulas, which play a crucial role in deriving important Dedekind eta-function identities of level 18. These identities have direct applications in the study of color partition theory, offering new perspectives on partition congruences and combinatorial structures. Also, these results contribute to a deeper understanding of the arithmetic properties of mock theta functions and their connections to modular forms, combinatorics, and number theory.

Starting at: 11:40am

Systematic Sampling and Prime-Based Hypercubes: Concepts and Applications

Carla Francisco
University of Évora, Portugal

Abstract

Systematic sampling is a statistical methodology that combines the simplicity of random sampling with the structure of stratified techniques, making it efficient for large studies and monitoring efforts. Recent developments have uncovered connections between this approach and algebraic combinatorics, particularly through prime-based multi-alphabetic hypercubes, which generalize Latin squares. These structures ensure balance and orthogonality in experimental designs, allowing for clear analysis of main effects and interactions. The advancement of computational tools has further enhanced the practical utility of systematic sampling, supporting adaptive and real-time strategies, and underscoring its relevance across various scientific and industrial fields.