



Hypergeometric Sum/Integral Transformations: Bridging Gauge Theories and Spin Models

Mustafa Mullahasanoglu

Boğaziçi University, Department of Physics, Istanbul, Türkiye
e-mail: mustafa.mullahasanoglu@std.bogazici.edu.tr

Abstract

This talk explores the profound and unifying role of hypergeometric sum/integral transformations in modern mathematical physics. We discuss how identities associated with the A_n and BC_n root systems act as a powerful mathematical structure between distinct areas of physics [1]. We demonstrate that a range of mathematical techniques, such as Bailey lemma [2] and asymptotic properties [3], significantly broaden the conceptual and analytical framework available for the study of physics.

We demonstrate how these transformation formulas provide equalities between the supersymmetric indices of dual gauge theories and encode the integrability and symmetry properties of two-dimensional lattice models in statistical mechanics. By bridging gauge theories and the Yang-Baxter equation (YBE), which is called gauge/YBE correspondence [4, 5, 6, 7], we highlight how the language of advanced special functions and their associated sum/integral identities provides a deep, unifying framework.

Keywords: Hypergeometric functions, transformation formulas, gauge theories, integrability.

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