Generalized Jacobi Identities and Jacobi Elements of the Group Ring of the Symmetric Group

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The theory of Lie groups and algebras is an important and developing part of mathematics. Lie groups and algebras occur in different areas of science such as quantum physics, mathematical genetics, geometry and combinatorial group theory. Because of this, any simplification of computations in Lie algebras is useful and demanded. Concept of Jacobi subsets was introduced one year ago . Jacobi subsets generate "Jacobi-like" identities in Lie algebras. Fundamental properties of these subsets were studied and quite large class of them was introduced but all Jacobi subsets of S_n were not described. In this work we study more general question. We introduce Jacobi elements of the Group ring of the symmetric group that generate generalized Jacobi identities and provide a better description of Jacobi subsets. The main results of the work: 1. Description of all Jacobi elements on the language of equations on the coefficients of any Group ring element. 2. Proper description of all Jacobi subsets in combinatorial language. 3. List of all indecomposable Jacobi subsets of S_4 which gives an explicit description of all Jacobi subsets of S_4.

Awards Won:
Fourth Award of $500
American Mathematical Society: Second Award of $1,000