Department of Mathematics
University of Notre Dame

ALGEBRA SEMINAR

Speaker: Darlayne Addabbo
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Date: Tuesday, May 9, 2017
Time: 1:00 PM
Location: 127 Hayes-Healy Hall

Lecture Title:
Q-systems and Generalizations in Representation Theory

Abstract

In this talk, we will define tau-functions given as matrix elements for the action of loop groups, $\widehat{GL_n}$ on n-component fermionic Fock space. In the simplest case, $n = 2$, the tau-functions are equal to Hankel determinants and applying the famous Desnanot-Jacobi identity, one can see that they satisfy a Q-system. Since Q-systems are of interest in many areas of mathematics, it is interesting to study tau-functions and the discrete equations they satisfy for the $n > 2$ cases. In this talk, we will primarily focus on the $n = 3$ case. We have generalized this work by studying tau-functions equal to matrix elements for the action of infinite matrix groups on n-component fermionic Fock space. The $n = 2$ case, similarly to the $\widehat{GL_2}$ case, gives tau-functions which have a simple determinantal formula and the relations they satisfy are again obtained by applying the Desnanot-Jacobi identity. In this case, the tau-functions satisfy a T-system, which is a generalization of the Q-system obtained in the $\widehat{GL_2}$ case. The method of ultra-discretization provides a way to obtain from discrete integrable equations, combinatorial models that maintain the essential properties of the original equations. With some extra conditions, it is known that the Q-system can be ultra-discretized to obtain the famous Box and Ball system. In the second half of this talk, we present a new generalization of the Box and Ball system obtained by ultra-discretizing the T-system.

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