On Coxeter polynomials of affine Lie algebras

Charalampos Evripidou

University of Cyprus

Abstract

A Coxeter transformation of a Lie algebra is a product of all the reflections in the simple roots of its root system. These elements were first studied by Coxeter for the finite Coxeter groups where he showed that their eigenvalues have remarkable properties. The affine Coxeter transformations are defined in the same way using the simple roots of an affine Lie algebra. We define the affine Coxeter polynomials and affine exponents of an affine Lie algebra corresponding to each conjugacy class of the Coxeter   transformations. In all cases except the $A_n^{(1)}$ series these polynomials and exponents are uniquely defined.

 In this talk I will describe how we can compute the affine Coxeter polynomials using Chebyshev polynomials. We give an explicit factorization of these polynomials as products of cyclotomic polynomials. Two interesting methods of computing the affine Coxeter polynomials and affine exponents using subsystems of the affine root system were given by Steinberg and Berman, Lee and Moody. These methods were applicable only for the bipartite cases. We extent these methods to the $A_n^{(1)}$ case.