Asymptotic normality criteria of coefficients of a polynomial and their applications in combinatorics

杜志斌
Academia Sinica

The asymptotic distribution theory for coefficients of a polynomial is an active topic in asymptotic analysis. In 1967, Harper proposed a criterion to measure the asymptotic normality of a series of numbers, when he researched the asymptotic behavior of Stirling numbers of the second kind. In this talk, we will discuss some further asymptotic normality criteria of coefficients of a polynomial with all real roots or purely imaginary roots (including 0). These new asymptotic normality criteria turn out to be very efficient and have abundant applications in combinatorics, mainly including the coefficients of a series of characteristic polynomials of adjacency matrix, Laplacian matrix, signless Laplacian matrix, skew-adjacency matrix, chromatic polynomial, and some graph numbers, such as matching numbers, independence numbers, clique numbers. Among which, we generalize and verify some conjectures about asymptotic normality in combinatorics, e.g., the matching numbers proposed by Godsil and Kahn, the (signless) Laplacian coefficients claimed by Wang *et al.*