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Asymptotic behavior of determinants of structured matrices

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Abstract

The expressions for most of the corretation functions in integrable models invole determinants of the so-called structures matrices. The spin spin correlation function of the 2D ising model is a toeplitz determinant, the spin time dependent auto-correlation function of the XX chain in a critical transverse magnetic field is a Fredholm determinants of a truncated Wiener–Hopf operator,... Fredholm determinants of integral operators also characterize may quantities in the random matrix theory.

In general, obtaining long distance/time asymptotics of the forementioned correlators demands the knowledge of the large size behavior of such determinants. I this talk I will present a technique based on an asymptotic solution of a matrix Riemann–Hilbert problem that allows to derive, in a quite systematic way, the large size asymptotics of truncated Wiener–Hopf determinants with Fischer–Hartwig symbols as well as the asymptotic inverse of such operators. As a by product of the method it is also possible to derive the large size asymptotics of Toeplitz determinants with Fischer–Hartwig symbols. Finally, I will show how the asymptotics of the Fredholm determinant of the so-called generalized sine kernel allows to obtain the asymptotic behavior of multiple integrals describing some correlation functions of massless quantum integrable models.