

Beyond series expansions : mathematical structures for the Susceptibility of the square Ising model.

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We recall the Fuchsian ordinary differential equations for the three and four-particle contributions $\chi^{(3)}$, and $\chi^{(4)}$, of the square Ising model susceptibility. An analysis of the properties of these Fuchsian differential equations is sketched.

For instance, we analyze the factorization properties of the corresponding linear differential operators, and analyze the singularities of the three and four-particle contributions $\chi^{(3)}$ and $\chi^{(4)}$, as well as the singularities of the associated Fuchsian ordinary differential equations, which actually exhibit new singularities.

We discuss the mathematical, as well as physical, interpretation of these new singularities. We sketch the analysis of the corresponding differential Galois groups. In particular we provide a simple, but efficient, method to calculate the so-called "connection matrices" (between two neighboring singularities). We provide a set of comments and speculations on the Fuchsian ordinary differential equations associated with the n -particle contributions $\chi^{(n)}$.