The (N = 1) Supersymmetric Sine-Gordon Model in Two Dimensions. I

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Abstract. In this paper and its companion (II) we prove that the Supersymmetric $N = 1$ massless Sine-Gordon field theory, at finite (space) volume, exists and is analytic in the coupling constant λ. Moreover at finite (space) volume is Witten index is = 1.

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Introduction

Supersymmetry has had in recent years a relevant impact in field theory both on the physical and on the mathematical side. Specifically a question which has deep connections with modern mathematics is the presence or not of a spontaneous breaking of the supersymmetry in some field theory models (Witten [1]). This question is connected to the study of the index of an operator (a Dirac operator in a infinite dimensional space). All this, apart from more phenomenological aspects, makes it interesting to perform a rigorous mathematical study of the supersymmetric field theory models. This problematic is thoroughly discussed in the papers of Jaffe et al. [2] where they study the $N = 1$ and $N = 2$ Wess-Zumino models.