

# The Two-Dimensional, $N=2$ Wess-Zumino Model on a Cylinder\*

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**Abstract.** We construct a family of supersymmetric, two-dimensional quantum field models. We establish the existence of the Hamiltonian  $H$  and the supercharge  $Q$  as self-adjoint operators. We establish the ultraviolet finiteness of the model, independent of perturbation theory. We develop functional integral representations of the heat kernel which are useful for proving estimates in these models. In a companion paper [1] we establish an index theorem for  $Q$ , an infinite dimensional Dirac operator on loop space. This paper and, another related one [2], provide the technical justification for our claim that  $Q$  is Fredholm, and for our computation of its index by a homotopy onto quantum mechanics.

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## I. Introduction

In this paper we construct a family of  $N=2$ , Wess-Zumino quantum field models on a cylinder  $T^1 \times \mathbb{R}$  [3]. The one-torus (circle) corresponds to periodic boundary conditions in space. We use a mixture of Hamiltonian and Euclidean methods to construct the generator  $H$  of time translations.

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