

ABSTRACT. Suppose M is a compact manifold with boundary ∂M . Let \tilde{M} be a normal covering of M . Suppose (A, T) is an elliptic differential boundary value problem on M with lift (\tilde{A}, \tilde{T}) to \tilde{M} . Then the von Neumann dimension of kernel and cokernel of this lift are defined. The main result of this paper is: These numbers are finite, and their difference, by definition the von Neumann index of (\tilde{A}, \tilde{T}) , equals the index of (A, T) . In this way, we extend the classical L^2 -index theorem of Atiyah to elliptic differential boundary value problems.