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D-bar Operators in Commutative and Noncommutative Domains.

Atiyah, Patodi, and Singer, developed a global boundary condition (APS) in the 70's to help extend the index theorem of Dirac operators by showing they had compact inverses. However their condition was restricted to manifolds of certain type. Here we compute the inverse/pseudo inverse to the d-bar operator, $\frac{\partial}{\partial \bar{z}}$ in the classical disk and in the noncommutative disk subject to the APS boundary conditions and show said inverse/pseudo inverse is compact making the boundary problem an elliptic boundary value problem. Even in these two examples they fail to be the type of manifold that is required by the APS theory, hence the necessity to compute it by hand. Moreover no known APS theorem exists in the realm of noncommutative geometry. (Received August 09, 2013)