1059-58-16 **Daniel F Cibotaru** (cibotaru.1@nd.edu), Department of Mathematics, University of Notre Dame, Notre Dame, IN 46556, and **Liviu I Nicolaescu*** (nicolaescu.1@nd.edu), Department of Mathematics, University of Notre Dame, Notre Dame, IN 46556. *Riemann-Roch and Morse theory.*

To each Morse function f on a Riemann surface Σ and any level set $\Sigma_t = f^{-1}(t)$ of f we associate an integer i_t such that i_t is zero for all by finitely many t's and $\sum_t i_t$ equals the index of the Dolbeault operator on Σ. When t is a regular value of f the integer i_t is described as a local spectral flow, and can be expressed in terms of the mean curvature of Σ_t. When t is a critical value, then i_t is equal to the Kashiwara-Wall index of a triplet of lagrangians spaces canonically and explicitly determined by the geometry of the singular level set Σ_t. The proof is based on a degenerative study of Atiyah-Patodi-Singer boundary value problems of "short" cobordisms of the form $f^{-1}\big([t-\varepsilon, t+\varepsilon]\big)$, $\varepsilon \searrow 0$. (Received January 06, 2010)