GEOMETRY, TOPOLOGY, AND PHYSICS SEMINAR

Normal functions and disk counting

Dave Morrison
UCSB

Friday, January 11, 2008, 4:00 p.m.
Room 6635 South Hall

Abstract: In 1990, Candelas, de la Ossa, Green, and Parkes used the then-new technique of mirror symmetry to predict the number of rational curves of each fixed degree on a quintic threefold. The techniques used in the prediction were subsequently understood in Hodge-theoretic terms: the predictions are encoded in a power-series expansion of a quantity which describes the variation of Hodge structures, and in particular this power-series expansion is calculated from the periods of the holomorphic three-form on the quintic, which satisfy the Picard–Fuchs differential equation.

In 2006, Johannes Walcher made an analogous prediction for the number of holomorphic disks on the complexification of a real quintic threefold whose boundaries lie on the real quintic, in each fixed relative homology class. (The predictions were subsequently verified by Pandharipande, Solomon, and Walcher.) This talk will report on recent joint work of Walcher and the speaker which gives the Hodge-theoretic context for Walcher's predictions. The crucial physical quantity 'domain wall tension' is interpreted as a Poincaré normal function, that is, a holomorphic section of the bundle of Griffiths intermediate Jacobians. And the periods are generalized to period integrals of the holomorphic three-form over appropriate 3-chains (not necessarily closed), which leads to a generalization of the Picard–Fuchs equations.

Information about future meetings of this seminar can be found at
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