AMERICAN MATHEMATICAL SOCIETY MathSciNet[®] Mathematical Reviews on the Web

Previous Up Next Article

Citations

From References: 23 From Reviews: 5

MR1619529 (99m:14074) 14J32 (14D05 14M25 14N10 32G20) Batyrev, Victor V. (D-TBNG-MI); Ciocan-Fontanine, Ionuţ (1-OKS); Kim, Bumsig (S-MLI); van Straten, Duco (D-MNZ)

Conifold transitions and mirror symmetry for Calabi-Yau complete intersections in

Grassmannians. (English summary)

Nuclear Phys. B 514 (1998), no. 3, 640–666.

This article exploits the idea of using conifold transitions to construct mirror manifolds for Calabi-Yau complete intersections in Grassmannians. The idea of using conifold transitions is the following. Suppose we have two CY manifolds X and Y which are related by a conifold transition; i.e. there is a degeneration X_0 of X with only finitely many nodes as singularities such that Y is a small desingularization of X_0 . Now suppose further that the mirror partner Y^* of Y is known. Then morally one should find the mirror partner X^* of X by the mirror reflected construction. This means that X^* should be the desingularization of a suitable degeneration Y_0 of Y.

This rationale is used by the authors in the context of Calabi-Yau complete intersections in Grassmannians. Here the conifold transition can be used to produce associated Calabi-Yau varieties in smooth toric varieties for which a mirror construction is known. The mirror of the original variety is then conjectured to be the desingularization of a suitable degeneration. In order to produce the degeneration of the original variety for the conifold transition the flat degeneration of the ambient Grassmannian to a Gorenstein toric Fano variety constructed by Sturmfels is used.

In order to calculate the instanton numbers or the Gromov-Witten numbers the authors use a version of the trick with factorials. This method allows them to compute these numbers without recurrence to the mirror manifold. To this end, they conjecture a general formula for the normalised solution of the quantum D-module of Grassmannians, which agrees with the Lax operator construction of T. Eguchi, K. Hori and C. S. Xiong [Internat. J. Modern Phys. A **12** (1997), no. 9, 1743–1782; MR1439892 (99a:32027)]. In fact, the series is obtained by a specialisation of the series associated to the small desingularization of the degeneration of the Grassmannian mentioned above. This conjecture is proved for the Grassmannians containing complete intersection Calabi-Yau threefolds by direct calculation. This result together with the Lefschetz hyperplane section theorem for homogeneous varieties by Kim allows the authors to give explicit formulas for the virtual number of rational curves on a general complete Calabi-Yau threefold in a Grassmannian. Reviewed by *Ralph Martin Kaufmann*

© Copyright American Mathematical Society 1999, 2011