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Gromov-Witten Invariants in A1-homotopy Theory

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The number of degree d rational plane curves through 3d-1 generally chosen points is independent of the generally chosen points over the complex numbers. (There is 1 line through 2 points, 1 conic through 5, 12 rational degree 3 curves through 8...) An early success of Gromov–Witten theory was to give a recursive formula for these invariants. Over the real numbers, there are invariants due to Jean-Yves Welschinger, Cheol-Hyun Cho and Jake Solomon giving an open Gromov-Witten invariant equal to a signed count of real curves. It is a feature of A1-homotopy theory that analogous real and complex results can indicate the presence of a common generalization, valid over a general field. We develop an A1-degree, following Fabien Morel, which in certain cases is the pushforward in Hermitian K-theory. We compute the A1-degree of an evaluation map on the Kontsevich moduli space of stable rational maps to obtain a count of genus 0 curves on certain del Pezzo surfaces through the appropriate number of marked points. This count is valid for any field k of characteristic not 2 or 3. In particular, we define and compute some Gromov–Witten invariants over a finite field. This is joint work with Jesse Kass, Marc Levine, and Jake Solomon. Time permitting, the talk will include joint work with Erwan Brugallé.

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