

Preface

The NSF-CBMS conference on Tropical Geometry and Mirror Symmetry was held at Kansas State University during the period December 13–17, 2008. It was organized by Ricardo Castaño-Bernard, Yan Soibelman, and Ilia Zharkov. During this time, I gave ten hours of lectures. In addition, talks were given by M. Abouzaid, K.-W. Chan, C. Doran, K. Fukaya, I. Itenberg, L. Katzarkov, A. Mavlyutov, D. Morrison, Y.-G. Oh, T. Pantev, B. Siebert, and B. Young.

My talks were meant to give a snapshot of a long-term program currently being carried out with Bernd Siebert aimed at achieving a fundamental conceptual understanding of mirror symmetry. Tropical geometry emerges naturally in this program, so in the lectures I took a rather ahistorical point of view. Starting with the tropical semi-ring, I developed tropical geometry and explained Mikhalkin's tropical curve-counting formulas, outlining the proof given by Nishinou and Siebert. I then explained my recent work in connecting this to the mirror side. Finally, I sketched the ideas behind recent work by myself and Siebert on constructing degenerations of Calabi-Yau manifolds from affine manifolds with singularities.

This monograph follows the structure of the lectures closely, filling in many details which were not given there. Like the lectures, this monograph only represents a snapshot of an evolving program, but I hope it will be useful to those who may wish to become involved in this program.

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Mark Gross, La Jolla, 2010