Abstract

THESIS: Combinatorial Legendrian Knot Invariants: Representation Numbers

STUDENT: Justin A. Murray

DEGREE: Master of Science

COLLEGE: Sciences and Humanities

DATE: May 2019

PAGES: 28

The study of Legendrian knots lies within the larger fields of contact geometry and knot theory. The requirements for Legendrian invariance is strictly stronger than its topological analog, as there are Legendrian knots that are not Legendrian isotopic, but are isotopic as topological knots. As with topological knot theory, the classification problem, i.e. classify all knots up to Legendrian isotopy, is still a main problem in Legendrian knot theory.

We consider Legendrians lying within the standard contact structure $(\mathbb{R}^3, \xi_{std})$. One of the most powerful Legendrian knot invariants is a differential graded algebra, $(\mathcal{A}, \partial)$, introduced by Chekanov and Eliashberg. It has been shown that representation numbers, a normalized count of representations from $(\mathcal{A}, \partial)$, are a Legendrian knot invariant. This project addresses the Chekanov-Eliashberg differential graded algebra and representation numbers, and provides a definition for the 1-graded 2-colored ruling polynomials $R^1_{2,K}(q)$. We then show that $R^1_{2,K}(q)$ recovers the 1-graded total 2-dimensional representation number.