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**Master Thesis Defense**

Entitled

*INVARIANTS OF 3-BRAID AND 4-BRAID LINKS*

by

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Date & Venue

Wednesday, 31 May 2023 at 4:00 PM

Abstract

In this thesis, we establish a connection between the Chebyshev polynomial of the first kind and the Jones polynomial of generalized weaving knots of type  $W(3, n, m)$ . Through our analysis, we demonstrate that the coefficients of the Jones polynomial of weaving knots are essentially the Whitney numbers of Lucas lattices allowing us to find an explicit formula for the Alexander polynomial of weaving knots of type  $W(3, n)$ . In addition to confirming Fox's trapezoidal conjecture, we also compute the roots of the Alexander Polynomial of weaving knots of type  $W(3, n)$  as they relate to Hoste's conjecture. Furthermore, we compute the signatures of a family of alternating knots and establish useful theorems about some properties related to trapezoidal polynomials. We used these findings to prove that for alternating knots obtained from the closure of two different classes of 4-braid knots the Alexander Polynomials satisfy Fox's trapezoidal conjecture.

**Keywords:** Alexander polynomial, Jones polynomial, Trapezoidal conjecture, alternating knots, weaving knots, 4-braids.