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Kauffman bracket polynomial of the $(3, q)$ torus knot

Dissanayake A.A.A.W.N.* and Almeida S.V.A.

Department of Mathematics, University of Kelaniya, Kelaniya, Sri Lanka

Knot polynomials are polynomials associated with knot projections, capturing essential knot properties that remain unchanged through ambient isotopy. In simple terms, if a knot K possesses an invariant α, this invariant, it remains consistent across all its projections. In this research, we delve into the concept of knot polynomials and elucidate the methods for determining them for a given knot projection. Our focus primarily centers on torus knots, which are knots resting on an unknotted torus without crossing over or under themselves. Extensive research in this field concentrates on establishing various polynomial representations, including the Kauffman Bracket polynomial and the Bracket polynomial for $(2, q)$-torus knots, well-known representations like the Alexander polynomial, Conway polynomial, and Jones polynomial for (p, q)-torus knots. The primary emphasis lies in the computation of the Kauffman bracket polynomial for $(3, q)$-torus knots and the formulation of a general expression for the Kauffman bracket polynomial for $(3, q)$-torus knots. Furthermore, this research work explores an innovative approach for resolving specific crossings within $(3, q)$-torus knots and obtains the formula for the Kauffman bracket polynomial of $(3, q)$-torus knots, $K\big(T(3, q)\big)$ given by $K\big(T(3, q)\big) = (-1)^{q+1}A^{5(q-1)} + (-1)^{q+1}A^{5(q-3)+2} + (-1)^{q}A^{(q-9)}$where 3 and q are coprime with $q \geq 4$.

Keywords: Torus Knots, Knot Polynomial, Projections, Crossings, Isotopy, Kauffman Bracket-Polynomial, Recursive formula

*Corresponding author: wayani6586V@gmail.com