THURSDAY, APRIL 23
Lockett 235

3:15 – 3:35

Introduction to Knot Theory: Knot Invariants

Joel B.Geiger

What is a knot? When are two knots equivalent? The latter question is fundamental in low-dimensional topology, and knot invariants are the tools used to investigate this crucial question.

Since Vaughan Jones' discovery of the Jones polynomial in 1983, the theory of knots has seen exciting advancements and links diverse fields such as molecular biology, chemistry, quantum mechanics, computer science, and mathematical physics. In this talk we will explore the concept of knot equivalence and the tools, knot invariants, used to deduce whether knots are equivalent. We will introduce the crossing number of a knot and will discuss the Jones polynomial of an oriented knot diagram in this self-contained talk.

3:35 – 3:55

Introduction to Free Probability Theory

Xinyao Yang

Free Probability theory is a mathematical theory which studies non-commutative random variables. The "freeness" property is the analogue of the classical notion of independence, and it is connected with free products. We will introduce some basic definitions and notations to help understand this theory, and also give some interesting examples of this theory in the one-dimensional case related to the lattice of noncrossing partitions of the set.

3:55 – 4:15

Coloring Graphs of Thickness t

Daniel Guillot

In 1852 Francis Guthrie asked how many colors were required to color the countries on any map in such a way that no two adjacent countries receive the same color. An analogous question may be asked of graphs by considering colorings of the vertices of a graph. The solution is the Four Color Theorem, which was proved by Appel, Haken and Koch in 1977. In 1959 Ringel proposed a more general problem. Consider two maps on two spheres, say the earth and moon. If countries on the earth have counterparts to those on the moon, how many colors are required to color the map under the same constraints? The problem is analogous to coloring a graph of thickness 2 and may be generalized further to coloring graphs of thickness t. This remains an open problem. This talk will give an overview of graphs and graph colorings as well as an overview for how the known bounds for graphs of thickness t have been obtained.