

WEDNESDAY, AUGUST 13

All talks on Wednesday will be in *Eckhart 206*. Lunch and Tea will be in the tea room.

11:15am: Dimension and Curves in Matrix Groups (Daniel Feltey). I will define what a curve in a matrix group is and show that these curves lead to an important invariant, namely dimension, that will help distinguish between matrix groups. I will also discuss matrix exponentiation and how it relates to curves in matrix groups.

12:00pm: Lunch.

1:00pm: From Social Choice to the Fundamental Theorem of Algebra (Shmuel Weinberger). With some luck, we will weave a thread that connects the fundamental problem of politics: combining people's preferences to create a set of preferences for society to the fundamental theorem of algebra and the computational complexity of algorithms to find roots. The thread will be made out of topology.

2:15pm: Grad School Q&A.

4:00pm: Applications of Gröbner Bases (Sarah Bennett). Gröbner bases are generating sets for polynomial ideals that are useful in solving several different types of seemingly unrelated problems. I will show how they can be used to prove theorems from elementary geometry, determine whether a given graph has an n -coloring, and compute minimal polynomials of algebraic elements in field extensions.

4:45pm: Extensible automorphisms (Vipul Naik). An automorphism of a group is termed extensible if it can be extended to an automorphism for any bigger group containing it. All inner automorphisms are clearly extensible. Is the converse true?

The first part of the talk is focused on the Problem: it lays out definitions of homomorphism, automorphism, and inner automorphism, and then looks in excruciating detail at the (easy) proof that every inner automorphism is extensible. For this you should understand the definition of a group. The second part is focused on a solution: it introduces ideas of linear representation theory, and (with a bit of hand-waving and black boxes) proves a partial converse. For this, some representation theory is needed, unless you're willing to take my word for things.