The Algebra Seminar

Unless stated otherwise, the seminar meets Tuesdays in room WH-100E at 2:50 p.m. There will be refreshments served at 4:00 in room WH-102.

Organizers: Alex Feingold and Marcin Mazur

To receive announcements of seminar talks by email, please join the seminar's mailing list.

Fall 2017

- **August 29**
  Organizational meeting

- **September 5**
  Dikran Karagueuzian (Binghamton University)
  Categories for the Skeptical Mathematician

  Abstract: Many find it hard to see the mathematical content in Category Theory. I will discuss ways of understanding this content and how I recently decided that it is relevant to a problem in Commutative Algebra which I have studied.

- **September 12**
  Hung Tong-Viet (Binghamton University)
  Real class sizes

  Abstract: An element x in a finite group G is said to be **real** if there exists an element $g\in G$ such that $x^g=x^{-1}$. A real conjugacy class of G is a conjugacy class which contains some real element and a real class size is the size of a real conjugacy class. Several arithmetic properties of the real class sizes can conveniently be stated using graph theoretic language. The **prime graph** on the real class sizes of a finite group G, denoted by $\Delta^*(G)$, is a simple graph with vertex set $\rho^*(G)$, the set of primes dividing some real class size of G, and there is an edge between two vertices p and q if the product pq divides some real class size. In this talk, I will outline the proof that if the prime graph on the real class sizes of a finite group is disconnected, then the group is solvable.

- **September 19**
  Phillip Wesolek (Binghamton University)
  Elementary amenability and bounded automata groups

  Abstract: (Joint work with Kate Juschenko) The bounded automata groups are a natural family of groups, which are defined by a finite amount of information in the form of a certain type of finite automaton. A remarkable property of bounded automata groups is that they are necessarily amenable. On the other hand, the elementary amenable groups are groups that are amenable for `elementary reasons' and thus are somewhat uninteresting. One is thereby motivated to identify the non-elementary amenable bounded automata groups. We isolate three natural families of bounded automata groups, and in each family, we identify the elementary amenable groups.

- **September 26**
  Matt Evans (Binghamton University)
  Natural Dualities and BCK-algebras

  Abstract: BCK-algebras are generalizations of Boolean algebras. There is a well-known natural duality between Boolean algebras and Stone spaces (totally disconnected, compact, Hausdorff spaces), and one might wish to develop a similar type of duality for the class of BCK-algebras. In this talk I will briefly review some category theory before defining “natural duality,” and then discuss some progress on dualizing bounded commutative BCK-algebras.
  - **This talk has been canceled due to illness of the speaker**.

- **October 3**
  Joe Cyr (Binghamton University)
  Subdirectly Irreducible Medial Quandles of Set Type

  Abstract: This talk will be a continuation of my seminar talk last semester on medial quandles (though no prior knowledge will be assumed). We will explore some important aspects of the structure of this class of algebras and find that the subdirectly irreducibles of set type are quasi-reductive. This then allows one to fully classify this class of subdirectly irreducible medial quandles.

- **October 10**
  Luise-Charlotte Kappe
  On covering numbers of groups

  Abstract: A set of proper subgroups is a cover for a group if its union is the whole group. The minimal number of subgroups needed to cover a group is called its covering number. No group is the union of two proper subgroups. Tomkinson showed that the covering number of a solvable group has the form prime-power-plus-one and for each such integer there exists a solvable group having this integer as a covering number. In addition he showed that 7 is not a covering number. So far it has been shown that the integers < 27, which are not covering numbers, are 2,7,11,19,21,22 and 25. We extend this list by determining all integers < 129 which are covering numbers. This is joint work with Martino Garonzi and Eric Swartz.

- **October 17**
  Mark Skandera (Lehigh) (joint with the Combinatorics Seminar, 1:15 - 2:15 PM, WH-100E)
  Evaluations of Hecke Algebra Traces at the Wiring Diagram Basis

  Abstract: The (type A) Hecke algebra $H_n(q)$ is a certain module over $\mathbf{Z}[q^{1/2},q^{-1/2}]$ which is a deformation of the

group algebra of the symmetric group. The $\mathbf{Z}[q^{1/2},q^{-1/2}]$-module of its trace functions has rank equal to the number of integer partitions of n, and has bases which are natural deformations of those of the trace module of the symmetric group algebra. While no known closed formulas give the evaluation of these traces at the natural basis elements of $H_n(q)$, or at the Kazhdan-Lusztig basis, I present a combinatorial formula for the evaluation of traces induced by the sign character at a certain wiring diagram basis of $H_n(q)$.

- **October 24**
  Hung Tong-Viet (Binghamton University)
  2-parts of real class sizes

  Abstract: An element x in a finite group G is said to be **real** if x and x^{-1} are G-conjugate. A conjugacy class of G is said to be real if it contains real elements. A real class size is the size of a real conjugacy class. In this talk, I will discuss some results on the normal structures of groups with restrictions on the 2-parts of the real class sizes.

- **October 31**
  Eran Crockett (Binghamton University)
  The dualizability problem for nilpotent algebras

  Abstract: A finite algebra is dualizable if there is a certain dual representation of a category of algebras in a category of topological relational structures. After giving a careful definition of this concept, we ask which finite algebras are dualizable. In particular, I exhibit a class of dualizable nilpotent algebras and ask whether algebras in a generalization of this class are also dualizable.

- **November 7**
  Hung Nguyen (The University of Akron)
  On the average of character degrees

  Abstract: We use the notion of average character degrees to improve some classical results in the character theory of finite groups such as the Ito-Michler theorem, Thompson’s theorem and Navarro-Tiep’s theorem.

- **November 14**
  Victor Protsak (Cornell University)
  Representations of $\mathfrak{gl}(n)$: a theme and variations

  Abstract: Finite-dimensional representation theory of $\mathfrak{gl}(n)$, the general linear Lie algebra of $n\times n$ matrices, has three well-known aspects: algebraic (highest weight theory and characters), algebro-geometric (flag varieties and standard monomials) and combinatorial (Gelfand-Tsetlin theory and Young tableaux). Perhaps less familiar is the noncommutative linear algebra aspect, rooted in the universal enveloping algebra and involving Capelli determinants and characteristic identities. We will review these aspects of representation theory of $\mathfrak{gl}(n)$ and explore generalizations in two different directions: infinite-dimensional modules over $\mathfrak{gl}(n)$ and integrable modules over the infinite general linear Lie algebra $\mathfrak{gl}(\infty)$.

- **November 21**
  Ian Payne (McMaster University)
  Subdirectly Irreducible Algebras: Big and Small

Abstract: Given a finite algebra, there is a class called its “generated variety”. For example, it can be shown that the variety generated by the two-element group is precisely the class of groups of exponent two. In any generated variety, there is a subclass of “subdirectly irreducible” members. This subclass depends only on the generating algebra, and universal algebraists are interested in knowing how large the subclass is for a given algebra. This main goals of this talk are to say what subdirectly irreducible algebras are, explain why they are of interest, and discuss some known results about the number of subdirectly irreducible members in some generated varieties.

- **November 28**
  Upstate Descriptive Set Theory and Group Theory Day
  Several Talks 1:00 - 6:00

  Abstract: Please follow this link for details about the special talks: Website for this meeting

- **December 5**
  Matt Evans (Binghamton University)
  Natural Dualities and BCK-algebras

  Abstract: BCK-algebras are generalizations of Boolean algebras. There is a well-known natural duality between Boolean algebras and Stone spaces (totally disconnected, compact, Hausdorff spaces), and one might wish to develop a similar type of duality for the class of BCK-algebras. In this talk I will briefly review some category theory before defining “natural duality,” and then discuss some progress on dualizing bounded commutative BCK-algebras.

- Pre-2014 semesters
- Fall 2014
- Spring 2015
- Fall 2015
- Spring 2016
- Fall 2016
- Spring 2017