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 Hung Tong-Viet

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

Spring 2019

- **January 22**
  Organizational Meeting
  Title of Talk

  Abstract: Please come or contact the organizers if you are interested in giving a talk this semester or want to invite someone.

- **January 29**
  Ben Brewster (Binghamton University)
  The values of the Chermak-Delgado measure

  Abstract: Let G be a finite group. For $H\leq G$, $m_G(H) = |H|\ |C_G(H)|$. Let $m^*(G) = max\{m_G(H)\mid H\leq G\}$ and $CD(G) = \{H\leq G\mid m_G(H)=m^*(G)\}$. Then $CD(G)$ is a self-dual modular sublattice of the subgroup lattice of G. It is known that if $|G| > 1$, then not every subgroup of G is a member of $CD(G)$, that is, $|\{m_G(H)\mid H\leq G\}| > 1$. Following some ideas of M. Tarnauceanu, we examine possibilities for $|\{m_G(H)\mid H\leq G\}|$, its form and the distribution of subgroups of same measure.

- **February 5**
  Alex Feingold (Binghamton University)
  An introduction to Lie algebras

  Abstract: A Lie algebra is a vector space equipped with a bilinear product, denoted by $[\cdot,\cdot]$, such that $[x,x]=0$ and $[x,[y,z]] + [y,[z,x]] + [z,[x,y]] = 0$ (Jacobi Identity). I will give an introduction to the basic ideas and examples.

- **February 12**
  Canceled due to inclement weather

- **February 19**
  Daniel Rossi (Binghamton University)
  The structure of finite groups with exactly three rational-valued irreducible characters

  Abstract: Many results in the character theory of finite groups are motivated from the question: to what extent do the irreducible characters of a group G control the structure of G itself? Recently, it has been observed that certain results along these lines can be obtained when one looks not at the set of all irreducible characters of G, but only the subset of those characters taking values in some appropriate field. In this talk, I'll characterize the structure of finite groups which have exactly three rational-valued irreducible characters (for solvable groups, this characterization is due to J. Tent). I will attempt to give some of the flavor of the proof – which at one point includes a surprise cameo by the complex Lie algebra $sl(n)$.

- **February 26**
  Casey Donoven (Binghamton University)
  Thompson's Group V and Finite Permutation Groups

  Abstract: Thompson's group V is group of homeomorphisms of Cantor space. It acts by exchanging finite prefixes in infinite strings over a two-letter alphabet. Generalizations of V called V_n act on n-letter alphabets. I will present more generalizations that add the action of finite permutation groups to the finite prefix exchanges. For a finite permutation group G on n points, the group $V_n(G)$ marries the finite prefix exchanges with iterated permutations from G. The primary theorem I will present states that V_n is isomorphic to $V_n(G)$ if and only if G is semiregular (i.e. G acts freely). The proof involves the use of automata and orbit dynamics.

- **March 5**
  Matt Evans (Binghamton University)
  Spectra of cBCK-algebras

  Abstract: BCK-algebras are algebraic structures that come from a non-classical logic. Mimicking a well-known construction for commutative rings, we can put a topology on the set of prime ideals of a commutative BCK-algebra; the resulting space is called the spectrum. I will discuss some results/properties of the spectrum of such algebras. A particularly interesting spectrum occurs when the underlying algebra is a so-called BCK-union of a specific algebra. In this case, the spectrum is a spectral space, meaning it is homeomorphic to the spectrum of a commutative ring.

- **March 12**
  Hung Tong-Viet (Binghamton University)
  Real conjugacy class sizes and orders of real elements

  Abstract: In this talk, I will present some recent results concerning the structure of finite groups with restriction on the real conjugacy classes or on the orders of real elements.

- **March 19**
  Spring Break
  No Talk

Abstract: Text of Abstract

- **March 26**
  No Talk
  Title of Talk

  Abstract: Text of Abstract

- **April 2**
  John Brown (Binghamton University)
  A small step toward proving a character theory conjecture

  Abstract: In this talk we'll discuss a bit of the work done on a conjecture by Isaacs and others which states that the degree of any primitive character of a finite group G divides the size of some conjugacy class of G. We'll focus on the case that G is symmetric or alternating, with a view to showing that the result holds for every irreducible character of either group. If time permits we may discuss ideas for the next steps toward, as well as some of the obstructions to, a general result.

- **April 9**
  Jonathan Doane (Binghamton University)
  Restriction of Stone Duality to Generalized Cantor Spaces

  Abstract: Stone duality is a correspondence between Boolean algebras (BAs) and Boolean/Stone topological spaces. Dualizing the free BA $\textbf{F}(S)$ on set S yields a product space 2^S, where $2=\{0,1\}$ is discrete. We call 2^S a generalized binary Cantor space (GCS$_2$), and similarly define the spaces GCS$_n$ with $n\ge 2$. This talk introduces Stone duality and then answers the question ``what is dual to the class of GCS's?''

- **April 16**
  Casey Donoven (Binghamton University)
  Inverse Semigroups

  Abstract: The inverse of an element a of a semigroup S is an element b such that $aba=a$ and $bab=b$. We define an inverse semigroup to be a semigroup where each element has a unique inverse. I will discuss some introductory inverse semigroup theory, such as equivalent definitions, showing that the idempotents form a semilattice, and the Wagner-Preston Representation Theorem (analogous to Cayley's Theorem). Time permitting, I will present a theorem describing the minimum number of proper inverse subsemigroups needed to cover a finite inverse semigroup.

- **April 23**
  Joseph Cyr (Binghamton University)
  The Structure of Medial Quandles

  Abstract: A medial quandle is a left semigroup in which every polynomial is a multivariable endomorphism. In this talk I will explore a useful structure theorem which shows that any medial quandle can be written as a collection of smaller, easier to understand quandles tied together in what is called an “affine mesh.” This mesh provides a user-friendly way to describe the subdirectly irreducible algebras of the variety.

- **April 30**

Dikran Karagueuzian (Binghamton University)

Coalescence of Polynomials over Finite Fields

Abstract: A polynomial over a finite field may be compared to a random map from the finite field to itself. One way to match random maps to polynomials is to match certain invariants of the maps. One of these invariants is the coalescence, or variance of inverse image sizes. We generalize a coalescence result of Martins and Panario from the case where a Galois group is the symmetric group to an arbitrary Galois group. This is joint work with Per Kurlberg.

- **May 7**

Joshua Carey (Binghamton University)

Representation Theory of Affine Kac-Moody Lie Algebras (Candidacy Exam, Part 1)

Abstract: Affine Kac-Moody Algebras are infinite dimensional Lie Algebras that have significance in many areas of math as well as theoretical physics. Although they nicely generalize many properties of finite dimensional simple Lie Algebras, it is not so easy to find faithful representations. In this talk I will give some basic definitions and properties of Affine Kac-Moody Algebras and begin to discuss a nice representation using vertex operators.

- Pre-2014 semesters
- Fall 2014
- Spring 2015
- Fall 2015
- Spring 2016
- Fall 2016
- Spring 2017
- Fall 2017
- Spring 2018
- Fall 2018