The XXVIth Ohio State - Denison Mathematics Conference

ABSTRACTS

Denison University, Granville, Ohio
May 17-19, 2002

The XXVIth Ohio State - Denison Mathematics Conference

ABSTRACTS

ORGANIZERS

Group Theory:	Surinder SEHGAL, The Ohio State University, Columbus, Ohio
Theory of Rings and Modules:	S.K. JAIN, Ohio University, Athens, Ohio
	S. Tariq RIZVI, The Ohio State University, Lima, Ohio

Friday, May 17, 2002; Afternoon Session

1:00-1:30 PM	**Registration** (at Denison University); Coffee

GROUP THEORY SECTION
(Herrick Hall Auditorium, Denison University, Granville, Ohio)

1:30-1:50 PM	W. Kappe (SUNY, Binghamton) *Subgroups Defined By Identities Revisited*
2:00-2:20 PM	K. Johnson (Penn State, Ogonotz) *Burnside Rings And Characters (joint with E. Poimenidou)*
2:30-2:50 PM	Eirini Poimenidou (New College of Florida) *Totals Characters And Chebyshev Polynomials, (joint work with my student Homer Wolfe)*
3:00-3:20 PM	X. Hou (Wright State University) *Group Actions On Binary Resilient Functions*
3:30-3:50 PM	Anthony Evans (Wright State University) *Which Latin Squares Are Based On Groups?*
4:00-4:20 PM	Anthony Gaglion (US Naval Academy) *Taking Matters To Their Logical Conclusion - Going To The Ultralimit! Part (I): Classes*
4:30-4:50 PM	Joseph Evans (King's College, PA) *An Example Of A Permutable Subgroup Of A Direct Product*
5:00-5:20 PM	Clifton Ealy (Western Michigan University) *Bounding The Graph Theoretic Genus Of Finite Solvable Groups*

THEORY OF RINGS AND MODULES SECTION
(Olin Science Building Auditorium, Denison University)

1:30-1:50 PM	Toma Albu (Atılım University, Turkey) *Assassinators, Torsion Theoretic Krull Dimension, And Bijective Relative Gabriel Correspondence*
2:00-2:20 PM	Scott Annin (University of California - Berkeley) *Associated Primes In Skew Polynomial Rings*
2:30-2:50 PM	Jeffrey Bergen (DePaul University) *Invariants Of Skew Derivations*
3:00-3:20 PM	Philipp Rothmaler (The Ohio State University) *Inverse Limits Of Free Groups And Flat Modules*
3:30-3:50 PM	Pramod Kanwar (Ohio University) *Semiperfect Finitely $\sum$-CS Group Algebras*
4:00-4:20 PM	Alan Loper (The Ohio State University) *Integrally Closed Domains Between $\mathbb{Z}[x]$ and $\mathbb{Q}[x]$*
4:30-4:50 PM	Nguyen Viet Dung (Ohio University) *Krull-Schmidt Rings With Enough Idempotents*
5:00-5:20 PM	Yonk Uk Cho (Ohio University/Silla University, S. Korea) *Some Properties In Matrix Representations Of Endomorphism Rings*

Saturday, May 18, 2002; Morning Session

8:30-9:00 AM	**Coffee and Pastries; Registration**

GROUP THEORY SECTION
(Herrick Hall Auditorium)

9:00-9.20 AM	Akos Seress (The Ohio State University) *Short Presentations For Lie-Type Groups Of Rank One*
9:30-9:50 AM	Peter Brooksbank (The Ohio State University) *Recognising Finite Simple Groups*
10:00-10:20 AM	Mark Lewis (Kent State, OH) *Groups Whose Characters Degrees Have No Divisibility (Preliminary Report)*
10:30-10:50 AM	Donald White (Kent State, OH) *Character Degree Graphs Of Simple Groups*
11:00-11:20 AM	T. Wolf (Ohio University) *Character Degrees Of Solvable Groups And Their Sylow Subgroups*
11:30-11:50 AM	Lucia Sanus (Mexico) *Coprime Actions And Degrees Of Primitive Inducers Of Invariant Characters*

THEORY OF RINGS AND MODULES SECTION
(Olin Science Building Auditorium)

9:10-9:50 AM	Ed Formanek (Penn State University) *The Jacobian Conjecture In Two Variables*
10:00-10:20 AM	Günter Krause (University of Manitoba, Canada) *Noetherian Rings As Subrings Of Semisimple Artinian Rings*
10:30-10:50 AM	Yasuyuki Hirano (Okayama University, Japan) *On The Classes Of Cyclic Modules Over Some Rings*
11:00-11:20 AM	Mamoru Kutami (Yamaguchi University, Japan) *On Unit-Regular Rings Satisfying Weak Comparability*
11:30-11:50 AM	H. Marubayashi (Naruto University, Japan) *Non-Commutative Valuation Rings Of The Skew Polynomial Quotient Rings*
12:00-12:20 PM	Shoji Morimoto (Japan) *Relatively Flat Modules With Respect To A Class Of Modules*

12:30 PM	**LUNCH BREAK**

Saturday, May 18, 2002; Afternoon Session

	GROUP THEORY SECTION (Herrick Hall Auditorium)
1:30-1:50 PM	L. Kappe (SUNY Binghamton) *On Subgroups Related To The Tensor Center*
2:00-2:20 PM	R. Morse (Evansville IN) *Levi-Properties Of Directed Unions Of Group Varieties (preliminary)*
2:30-2:50 PM	Joe Kirtland(Marist College Poughkeepsie PA) *Finite Separable Metacyclic 2-Groups*
3:00-3:20 PM	Joanne Redden (Illinois College) *The Nonabelian Tensor Square Of 2-Engel Groups, A Progress Report*
3:30-3:50 PM	Michael Barry (Allegheny College, PA) *Bases For Fixed Points Of Unipotent Elements Acting On The Tensor Square And The Spaces Of Alternating And Symmetric 2-Tensors*
4:00-4:20 PM	Fernando Guzman (SUNY Binghamton) *The Laws Of Conjugation*

	THEORY OF RINGS AND MODULES SECTION (Olin Science Building Auditorium)
1:50-2:30 PM	Joachim Rosenthal (University of Notre Dame) *Public Key Crypto-Systems Built From Semi-Group Actions*
2:40-3:00 PM	Dinh Van Huynh (Ohio University) *On A Class Of Artinian Rings*
3:10-3:30 PM	Gary F. Birkenmeier (University of Louisiana at Lafayette) *FI-Extending Modules*
3:40-4:00 PM	J. K. Park (Busan National University, South Korea/ University of Louisiana-Lafayette) *FI-Extending Ring Hulls*
4:10-4:30 PM	Ivo Herzog (The Ohio State University) *The Existence Of Pure-Injective Envelopes*

	CONFERENCE BANQUET - Bombay Grille, Dublin
6:00 PM	**Cash Bar**
7:00 PM	**Buffet Dinner**

Sunday, MAY 19, 2002; Morning Session

8:30-9:00 AM	**COFFEE AND PASTRIES**
	GROUP THEORY SECTION (Herrick Hall Auditorium)
9:00-9:30 AM	Alex Turull (U. Florida) *Schur Indices Of Over-Groups Of Special Linear Groups*
9:30-9:50 AM	Ben Brewster (SUNY Binghamton) *Subgroups Satisfying The Frattini Argument*
10:00-10:20 AM	Joe Petrillo (SUNY Binghamton) *Covering And Avoidance In A Direct Product*
10:30-10:50 AM	John Best (SUNY Binghamton) *On 3/2-Transitive Groups*
11:00-11:20 AM	Michael Bacon (SUNY Oneonta) *Characteristic Subgroups And Nonabelian Tensor Powers. Preliminary Report*
11:30-11:50 AM	Tuval Foguel (N. Dakota) *On Twisted Subgroups And Bol Loops Of Odd Order*
12:00-12:20 PM	Qinhai Zhang (SUNY Binghamton) *The Influence Of Semipermutable Subgroups On The Structure Of Finite Groups*
	THEORY OF RINGS AND MODULES SECTION (Olin Science Building Auditorium)
9:00-9:20 AM	John Dauns (Tulane University) *Coherence*
9:30-9:50 AM	Gena Puninski (University of Manchester, UK) *Pure Injective Modules Over String Algebras*
10:00-10:20 AM	Cosmin Roman (The Ohio State University) *Baer And Quasi-Baer Modules* *A Preliminary Report.*
10:30-10:50 AM	Hans Schoutens (The Ohio State University) *Big Cohen-Macaulay Algebras*
11:00-11:20 AM	Sonia Rueda (University of Wisconsin-Milwaukee) *Representations Of Invariants Under Tori Of The Weyl Algebra*
11:30-11:50 AM	Mohammad Saleh (Birzeit University, Palestine/ Ohio University) *On The Direct Sums Of Singular Weakly Injective Modules*
12:00-12:20 PM	Markus Schmidmeier (Florida Atlantic University) *Subgroups Of Finite Abelian Groups*

Group Theory Abstracts

CHARACTERISTIC SUBGROUPS AND NONABELIAN TENSOR POWERS. PRELIMINARY REPORT

MICHAEL BACON, SUNY Oneonta

Abstract

The nonabelian tensor power of a group G is defined recursively by:

$$\bigotimes_1 G = G, \quad \bigotimes_2 G = G \otimes G, \ldots, \bigotimes_{n+1} G = \left(\bigotimes_n G\right) \otimes G,$$

where $G \otimes G$ is the nonabelian tensor square of a group. We extend and de velop the tensor power analogues of the concepts, such as the tensor center, introduced by G. El lis, L.C. Kappe, and D. Biddle as well as explore the relationship between $\bigotimes_n G$ and the lower central series $\gamma_n(G)$.

BASES FOR FIXED POINTS OF UNIPOTENT ELEMENTS ACTING ON THE TENSOR SQUARE AND THE SPACES OF ALTERNATING AND SYMMETRIC 2-TENSORS

MICHAEL BARRY, Allegheny College, PA

Abstract

If V is a vector space over a field K, then an element g of the general linear group $GL(V)$ acts on $V \otimes V$, on the space of alternating 2-tensors $\mathbf{A}(V)$, and on the space of symmetric 2-tensors $\mathbf{S}(V)$. For a unipotent element g, we exhibit bases for the subspace of fixed points of g acting on both $V \otimes V$ and $\mathbf{A}(V)$ which are valid for every field K, and a basis for the subspace of fixed points of g acting on $\mathbf{S}(V)$ which is valid for every field K with $\mathrm{char}(K) \neq 2$.

ON 3/2- TRANSITIVE GROUPS

JOHN BEST, SUNY Binghamton

Abstract

Every group G acts transitively on each set of its Sylow q-subgroups. It is an interesting and natural question to ask when this action becomes 3/2-transitive. By a result of Wielandt, every such group is either a Frobenius group or is primitive. In this talk we shall restrict ourselves to the non-Frobenius case. In particular, we shall examine when this can be done for the affine semi-linear groups over a finite field $GF(p^n)$. By exploiting a particular subgroup of the point-stabilizer ,and assuming the Sylow 2-subgroups of the point-stabilizer are not quaternion, we shall be able to determine when the action is 3/2-transitive .

SUBGROUPS SATISFYING THE FRATTINI ARGUMENT

BEN BREWSTER, SUNY Binghamton

Abstract

In the paper *Fitting functors in Finite Solvable Groups II, Math. Proc. Cambridge Phil. Soc. 101, 1987*, a question posed was whether a Fitting functor, which satisfies the cover-avoidance property, necessarily satisfies the Frattini argument. This question has been pursued to no avail since 1987. This talk presents some more data about the relationship between subgroups which satisfy the Frattini argument and those with the cover-avoidance property.

Definition 1. A subgroup U of G has the cover-avoidance property if U either covers or avoids every chief factor of G.

Definition 2. A subgroup U of G satisfies the Frattini argument if for every $K \lhd G$, $G = KN_G(U \cap K)$

Definition 3. A Fitting functor f assigns to each group G, a collection $f(G)$ of subgroups of G such that

(i) If α is an isomorphism from G onto H, $(f(G))^\alpha = f(H)$, and

(ii) If $K \lhd G$, then $\{X \cap K | X \varepsilon f(G)\} = f(K)$.

A result of J. Petrillo states that every subgroup of G has the cover-avoidance property if and only if G is supersolvable.

Proposition. (i) If every subgroup of G satisfies the Frattini argument, then G is supersolvable.

(ii) There exist supersolvable groups in which there are subgroups that do not satisfy the Frattini argment.

However, the open question posed above is more complicated because of knowledge about Fitting functors which satisfy the cover-avoidance property and subgroups which satisfy the Frattini argument in metanilpotent groups.

RECOGNISING FINITE SIMPLE GROUPS

PETER BROOKSBANK, The Ohio State University
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Abstract

Given a group G (specified by a small set of generators) isomorphic to a known finite simple group H, we wish to construct an effective isomorphism $\Psi\colon H \to G$. "Effective" means that we have efficient algorithms to compute $h\Psi$ for any given $h \in H$ and $g\Psi^{-1}$ for any given $g \in G$. One can think of "efficient" as meaning "polynomial in the size of the input", the latter depending upon the specific representation of G. An algorithm to construct an effective isomorphism $\Psi\colon H \to G$, for any suitable input group G, is called a constructive recognition algorithm for the simple group H and is of key importance to several algorithmic problems in group theory. We will briefly discuss an application to one such problem which has been the focus of much research over the past five years, namely to the problem of constructing a composition series for any given matrix group. We will also discuss some probabilistic and Lie theoretic results which underpin existing constructive recognition algorithms for the classical groups and summarise the current state of play.

BOUNDING THE GRAPH THEORETIC GENUS OF A FINITE SOLVABLE GROUP

CLIFTON EALY, Western Michigan University, Kalamazoo, MI
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Abstract

In this talk, I will discuss the graph theoretic genus of a group in general and then give upper and lower bounds for the genus of a finite solvable group.

WHICH LATIN SQUARES ARE BASED ON GROUPS?

ANTHONY B. EVANS, Wright State University, Dayton, Ohio.

Abstract

It is a well-known, elementary fact that the multiplication table of a finite group is a latin square. The question arises as to which latin squares are multiplication tables of groups. We will present some of the methods that have been used to answer this question.

AN EXAMPLE OF A PERMUTABLE SUBGROUP OF A DIRECT PRODUCT

JOSEPH EVANS, King's College, PA

Abstract

A subgroup S of a group G is a permutable subgroup of G if for all subgroups X of G, we have $SX = XS$. Previously, we conjectured that if M is a permutable subgroup of $G\times H$, then $(M\cap G)\times(M\cap H)$ is a permutable subgroup of $G \times H$. In this talk, we will present a counterexample to this conjecture. One of the groups used in this counterexample is not a group with a modular subgroup lattice, and we will explain why such a group cannot be used.

ON TWISTED SUBGROUPS AND BOL LOOPS OF ODD ORDER

TUVAL FOGUEL, N. Dakota

Abstract

In this talk we survey some results of Glauberman and Aschbacher that should be crucial in a the development of a Feit- Thompson theorem for Bol loops. We also detail the relationship between twisted subgroups, the Aschbacher radical, and Bol loops.

TAKING MATTERS TO THEIR LOGICAL CONCLUSION - GOING TO THE ULTRALIMIT! PART (I): CLASSES

ANTHONY GAGLION, US Naval Academy

Abstract

We introduce various types of sentences and the associated model classes of sets of sentences of each type, namely: first-order sentences $\longleftrightarrow$ axiomatic classes, universal sentences $\longleftrightarrow$ universally axiomatizable classes, quasi-identities $\longleftrightarrow$ quasivarieties. Finally we introduce the discriminating groups of Baumslag, Myasnikov and Remeslennikov as well as the squarelike groups of Fine, Gaglione, Myasnikov and Spellman with the goal in the sequel of outlining a proof that the class of squarelike groups is the least axiomatic class containing the class of discriminating groups.

GROUP ACTIONS ON BINARY RESILIENT FUNCTIONS

X. HOU, Wright State OH

Abstract

Let $G_{n,t}$ be the subgroup of $\mathrm{GL}(n, \mathbb{Z}_2)$ that stabilizes $\{x \in \mathbb{Z}_2^n : |x| \leq t\}$. We determine $G_{n,t}$ explicitly: For $1 \leq t \leq n-2$, $G_{n,t} = S_n$ when t is odd and $G_{n,t} = \langle S_n, \Delta \rangle$ when t is even, where $S_n < \mathrm{GL}(n, \mathbb{Z}_2)$ is the symmetric group of degree n and $\Delta \in \mathrm{GL}(n, \mathbb{Z}_2)$ is a particular involution. Let $\mathcal{R}_{n,t}$ be the set of all binary t-resilient functions defined on $\mathbb{Z}_2^n$. We show that the subgroup $\mathbb{Z}_2^n \rtimes (G_{n,t} \cup G_{n,n-1-t}) < \mathrm{AGL}(n, \mathbb{Z}_2)$ acts on $\mathcal{R}_{n,t}/\mathbb{Z}_2$. We determine the representatives and : sizes of the conjugacy classes of $\mathbb{Z}_2^n \rtimes S_n$ and $\mathbb{Z}_2^n \rtimes \langle S_n, \Delta \rangle$. These results allow us to compute the number of orbits of $\mathcal{R}_{n,t}/\mathbb{Z}_2$ under the above group action for $(n, t) = (5, 1)$ and $(6, 2)$.

BURNSIDE RINGS AND CHARACTERS

K. JOHNSON, Penn State Ogonotz

(joint work with E. POIMENIDOU)

Abstract

The following conjecture has been stated in our previous work: if χ is a faithful permutation character of a finite group G and $\{l_1, l_2, \ldots, l_r\}$ is the distinct set of values of χ on non-identity elements then

$$\chi(\chi - l_1)(\chi - l_2) \ldots (\chi - l_s)$$

is a character for all s. This conjecture has been proved previously in the case where $\{l_1, l_2, \ldots, l_r\}$ is the set of marks of the G-set X which corresponds to χ, and extensive computations have failed to produce a counterexample. We can now prove the conjecture in general for the case $s = 1$, and will discuss how to extend the proof. Our work originated in a discussion of the idea of sharpness of a general character, which we have extended to the idea of 0-sharp pairs of characters. Using a combinatorial argument we are able to show that 0-sharp pairs characters exist in S_n.

ON SUBGROUPS RELATED TO THE TENSOR CENTER

LUISE-CHARLOTTE KAPPE, SUNY at Binghamton

Abstract

The nonabelian tensor square of a group G, denoted by $G \otimes G$, is the group generated by the symbols $u \otimes v, u, v \in G$, and defined by the relations $uv \otimes w = ({}^u v \otimes {}^u w)(u \otimes w)$ and $u \otimes vw = (u \otimes v)({}^v u \otimes {}^v w)$, where ${}^v u = vuv^{-1}$. The tensor center of a group G is the set of elements a in G such that $a \otimes g = 1_\otimes$ for all $g \in G$. It is a characteristic subgroup of G contained in its center. We introduce tensor analogues of various other subgroups of a group such as centralizers and 2-Engel elements and investigate their embedding in the group as well as interrelationships between those subgroups.

SUBGROUPS DEFINED BY IDENTITIES REVISITED

WOLFGANG KAPPE, SUNY at Binghamton

Abstract

Let $f(y_0, y_1, \ldots, y_n)$ be a word in the variables $y_0, y_1, \ldots, y_n$. We say a subset $S(G)$ of G is defined by the identity f if

$$S(G) = \{x \in G | 1 = f(x, g_1, \ldots, g_n) \text{ for all } g_1, \ldots, g_n \in G\}.$$

Usually $S(G)$ is not a subgroup, but there are important examples f where it is: for $f(y_0, y_1) = y_0^{-1} y_1^{-1} y_0 y_1 = [y_0, y_1]$, the commutator word, $S(G)$ is the center of G, and for the 2-Engel word $f(y_0, y_1) = [[y_0, y_1], y_1]$, we obtain that $S(G)$ is the characteristic subgroup of right 2-Engel elements. More general examples are margins which always are characteristic subgroups. Various new subgroups defined by identities will be discussed.

FINITE SEPARABLE METACYCLIC 2-GROUPS

JOE KIRTLAND, Marist College Poughkeepsie PA

Abstract

A finite separable metacyclic 2-group G can be written as the semidirect product of a cyclic group with another cyclic group. Necessary and sufficient conditions are given for when all other split decomposition of G result in, up to isomorphism, this same semidirect product representation for G.

GROUPS WHOSE DEGREES HAVE NO DIVISIBILITY. PRELIMINARY REPORT

MARK LEWIS, Kent State

(joint work with ALEXANDER MORETÓ)

Abstract

Let G be a finite group, and let $\mathrm{cd}(G)$ be the set of character degrees of G. We assume that $\mathrm{cd}(G)$ has the property that 1 is the only degree which divides another degree in $\mathrm{cd}(G)$. We conjecture that this bounds the size of $|\mathrm{cd}(G)|$. In particular, if G is solvable, then we conjecture that $|\mathrm{cd}(G)| \leq 3$. We will this conjecture is true when G is solvable and every degree in $\mathrm{cd}(G)$ is square-free.

LEVI-PROPERTIES OF DIRECTED UNIONS OF GROUP VARIETIES (PRELIMINARY)

ROBERT F. MORSE, Evansville, IN

Abstract

In this talk we will show that a class $\mathcal{C}$ is a directed union of group varieties if and only if the class is closed under subgroups, quotients, finite direct products and unrestricted direct products. Examples of such classes are the solvable and nilpotent groups. Levi-properties characterize classes of groups such that the normal closure of every element of a group in the class has a common property. If $\mathfrak{X}$ is a class of groups, then $L(\mathfrak{X})$ is the class of groups in which the group G is in $L(\mathfrak{X})$ when the normal closure of each element of G is an $\mathfrak{X}$-group. We say $L(\mathfrak{X})$ is the Levi-property generated by $\mathfrak{X}$. We will conclude the talk by showing that if a directed union of group varieties is a Levi-property generated by some $\mathfrak{X}$, this imposed structural constraints on $\mathfrak{X}$.

COVERING AND AVOIDANCE IN A DIRECT PRODUCT

JOE PETRILLO, SUNY Binghamton

Abstract

Let G be a group, H/K a chief factor of G, and U a subgroup of G. We say that U *covers* H/K if $H \leq UK$, and we say that U *avoids* H/K if $U \cap H \leq K$. If U covers or avoids each chief factor of G, then U is said to have the *cover-avoidance property* in G and is called a *CAP-subgroup*.
An investigation into the cover-avoidance property in a direct product has led to the following:
Conjecture: U is a CAP -subgroup of $G_1 \times G_2$ if and only if $\pi_i(U)$ and $U \cap G_i$ are CAP -subgroups of G_i, $i = 1, 2$.

TOTALS CHARACTERS AND CHEBYSHEV POLYNOMIALS

EIRINI POIMENIDOU, New College of Florida, Sarasota, FL
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(joint work with my student HOMER WOLFE)

Abstract

The *total* character τ of a finite group G is defined as the sum of all the irreducible characters of G. A question of K.W. Johnson asks when is it possible to express τ as a polynomial with integer coefficients in a single irreducible character. In this paper we give a complete answer to Johnson's question for all finite dihedral groups. In particular we show that when such a polynomial exists it is unique and it is the sum of certain Chebyshev polynomial of the first kind in any faithful irreducible character of the dihedral group G.

THE NONABELIAN TENSOR SQUARE OF 2-ENGEL GROUPS. A PROGRESS REPORT

JOANNE L. REDDEN, Illinois College

Abstract

The nonabelian tensor square $G \otimes G$ of a group G is the group generated by the symbols $g \otimes h$ with $g, h \in G$ and subject to the relations $gg' \otimes h = ({}^{g}g' \otimes {}^{g}h)(g \otimes h)$ and $g \otimes hh' = (g \otimes h)({}^{h}g \otimes {}^{h}h')$ for all $g, g', h, h' \in G$, where ${}^{g}h = ghg^{-1}$ is conjugation on the left. This group construction arose in work by Ronald Brown and Jean-Louis Loday in 1987. Group theoretic investigations since have focused on computing finite presentations of nonabelian tensor squares and on finding properties of the tensor square which depend on group theoretic properties of G. A group G is said to be 2-Engel if the commutator $[[x, y], y] = 1$ for all $x, y \in G$. We denote the free 2-Engel group of rank $n > 3$ by $\mathcal{E}(n, 2)$. Results of Bacon (1995) show that $\mathcal{E}(2, 2) \otimes \mathcal{E}(2, 2)$ is free abelian of rank 6 while Bacon, Kappe, and Morse (1997) show that $\mathcal{E}(3, 2) \otimes \mathcal{E}(3, 2)$ is a direct product $S \times A$, where S is nilpotent of class 2 and A is a free abelian group of rank 11. In this talk, we will report on computing the nonabelian tensor square of $\mathcal{E}(n, 2)$ for $n > 3$.

COPRIME ACTIONS AND DEGREES OF PRIMITIVE INDUCERS OF INVARIANT CHARACTERS

LUCIA SANUS, Mexico

Abstract

Let A and G be finite groups of coprime order. If : A acts on G, we write $\mathrm{Irr}_A(G)$ to denote the set of A-invariant irreducible characters of G. This set of characters has been widely studied. Also, the A-version of several usual character theoretic concepts has been defined. For instance, recall that an A-invariant character $\chi \in \mathrm{Irr}(G)$ is A-primitive if it is not induced from any A-invariant character of any A-invariant proper subgroup. We say that χ is A-monomial if it is induced from an A-invariant linear character of an A-invariant subgroup. I. M. Isaacs, M. L. Lewis and G. Navarro proved that if G is nilpotent then the degrees of any two A-primitive characters of A-invariant subgroups of G inducing χ coincide. We show that this result cannot be extended to supersolvable groups, but that it is possible to generalize it along other directions.

SHORT PRESENTATIONS FOR LIE-TYPE GROUPS OF RANK ONE

AKOS SERESS, The Ohio State University
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(joint work with ALEXANDER HULPKE)

Abstract

Motivated by algorithmic applications, we need presentations of length $O(\log^2|G|)$ for all simple groups G. For alternating groups, such short presentations were given by Carmichael 80 years ago, and the Lie-type groups of rank at least two were handled by Babai, Kantor, Goodman, Luks, and Pálfy in 1997. In this talk, we sketch a method which gives short presentations for rank one groups, except for the groups ${}^2G_2(3^{2m+1})$.

TAKING MATTERS TO THEIR LOGICAL CONCLUSION - GOING TO THE ULTRALIMIT! PART (II): CONSTRUCTIONS

DENIS SPELLMAN, Philadelphia

Abstract

Let X be a nonempty class of groups closed under isomorphism. A classical theorem of model theory (applied to groups) asserts that X is axiomatic (i.e. the model class of a set of first-order sentences) iff X is closed under both elementary equivalence and ultraproducts. The following two results have been proven in *Fine, Gaglione, Myasnikov and Spellman, Groups whose universal theory is axiomatizable by quasi-identities, J. Group Theory, To appear*:

(1) The class of squarelike groups is an axiomatic class containing the class of discriminating groups.

(2) The class of all groups G for which there exists a discriminating group H elementarily equivalent to G is the least axiomatic class containing the discriminating groups.

In the above cited paper it was posed as an open question whether or not the class of squarelike groups is the least axiomatic class containing the discriminating groups. Introducing the reduced product, ultraproduct and ultralimit constructions we outline a proof that the class of squarelike groups is the least axiomatic class containing the class of discriminating groups. The proof proceeds by showing that every squarelike group admits a discriminating ultralimit.

SCHUR INDICES OF OVER-GROUPS OF SPECIAL LINEAR GROUPS

ALEX TURULL, University of Florida

Abstract

Let G be a finite group containing a special linear group as a normal subgroup. Suppose that either G is contained in the general linear group, or in the extension of the special linear group by its diagonal automorphisms. Then, for each irreducible character of G, we describe its Schur index over every field. We use Clifford classes as a convenient tool to describe all these different Schur indices at once.

CHARACTER DEGREE GRAPHS OF SIMPLE GROUPS

DONALD L. WHITE, Kent State University, OH

Abstract

For a finite group G, denote by Irr(G) the set of ordinary irreducible characters of G. The degree of a character $\chi \in \mathrm{Irr(G)}$ is $\chi(1)$, the value of χ on the identity element of G. We define a graph $\Delta(G)$ associated with the character degrees of G as follows. The vertices of $\Delta(G)$ are the primes dividing the degrees of the irreducible characters of G. Two vertices p, q are joined by an edge if $pq \mid \chi(1)$ for some $\chi \in \mathrm{Irr(G)}$. This graph has been studied somewhat extensively for solvable groups, but much less for arbitrary finite groups. We will survey some recent results on the structure of $\Delta(G)$, where G is a finite simple group, including connectivity, bounds on the diameter, and groups for which $\Delta(G)$ has been completely determined.

DEGREES OF CHARACTERS OF SOLVABLE GROUPS AND THEIR SYLOW SUBGROUPS

T. WOLF, Ohio University, Athens, OH

Abstract

We show that the largest degree of an irreducible character of a sylow-p-subgroup of a solvable group is bounded by the largest power of p dividing the degree of an irreducible character of G.

THE INFLUENCE OF SEMIPERMUTABLE SUBGROUPS ON THE STRUCTURE OF FINITE GROUPS

QINHAI ZHANG, SUNY-Binghamton, Binghamton, NY

Abstract

A subgroup H of a group G is called *semipermutable* in G if it is permutable with all subgroups K of G with $(\mid H \mid, \mid K \mid) = 1$ and $s-$*semipermutable* if it is permutable with all *Sylow* $p-$subgroups of G with $(p, \mid H \mid) = 1$. In this paper, we classified such finite nonabelian simple groups which contain a nontrivial semipermutable subgroup, and obtained Schur-Zassenhause like theorem for $s-$se-mipermutable subgroups. Some conditions for a finite group to be solvable are followed by semipermutability.

Theory of Rings and Modules Abstracts

ASSASSINATORS, TORSION THEORETIC KRULL DIMENSION, AND BIJECTIVE RELATIVE GABRIEL CORRESPONDENCE

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(joint work with GÜNTER KRAUSE and MARK L. TEPLY)

Abstract

Let R be an associative ring with nonzero identity element and let τ be a hereditary torsion theory on the category Mod-R with the following property:

(†) $\operatorname{Ass}(M) \neq \emptyset$ for every τ-torsionfree right R-module $M \neq 0$.

We adopt this general setting of a ring with τ-Krull dimension satisfying property (†) as a means of unifying the methods used by Asensio and Torrecillas, Gordon and Robson, Kim and Krause, and Năstăsescu to investigate the structure of Δ-modules and tame modules, the bijectivity of the correspondence $[E] \mapsto \operatorname{Ass}(E)$ where $[E]$ is the isomorphism class of an indecomposable injective module E, and the structure of rings whose torsionfree (injective) modules satisfy various restrictions that arise naturally from these objects. Numerous results due to the aforementioned authors are shown to hold true for the larger class of rings with τ-Krull dimension that satisfies (†). Our approach is significant since this class of rings includes rings with Krull dimension, τ-noetherian rings (hence, τ-artinian rings and, of course, noetherian rings) and rings with τ-Krull dimension where one of the following is true: τ is ideal invariant (hence, commutative rings with τ-Krull dimension) or $[E] \mapsto \operatorname{Ass}(E)$ is bijective when restricted to the set $\{[E] \mid E$ is τ-torsionfree indecomposable injective$\}$.

ASSOCIATED PRIMES IN SKEW POLYNOMIAL RINGS

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Abstract

Associated prime ideals have long been known in commutative algebra for their important role center stage in the classical theory of primary decomposition. More recently, a noncommutative theory of associated primes has been developed in the hopes of extending the reach of this important notion. In this talk, I will discuss the behavior of the associated primes with respect to the formation of skew polynomial extensions and present some related results and examples on Laurent polynomials and power series as well. Time permitting, I will also describe the so-called attached primes, which are dual to associated primes, and discuss some interesting results on these primes under polynomial extensions as well.

INVARIANTS OF SKEW DERIVATIONS

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Abstract

If R is a ring, then an additive map δ is a skew derivation of R if

$$\delta(rs) = \delta(r)s + \sigma(r)s,$$

for all $r, s \in R$, where σ is an automorphism of R. We define the invariants of δ to be the set

$$R^{(\delta)} = \{r \in R \mid \delta(r) = 0\}.$$

Skew derivations are generalizations of derivations and automorphisms and arise naturally in the actions of pointed Hopf algebras. We examine the relationship between R and $R^{(\delta)}$. In particular, we consider the situations where $R^{(\delta)}$ is nilpotent, central, or satisfies a polynomial identity.

FI-EXTENDING MODULES

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(joint work with J.K. PARK and S. T. RIZVI)

Abstract

A module is called *FI-extending* if every fully invariant submodule is essential in a direct summand. We say a module M has a *FI-extending hull*, $\mathfrak{H}(M)$, if all of the following conditions are satisfied: (i) $\mathfrak{H}(M)$ is FI-extending; (ii) $\mathfrak{H}(M)$ is an essential extension of M; and (iii) if K is an FI-extending module such that $M \leq K \leq \mathfrak{H}(M)$, then $K = \mathfrak{H}(M)$. In this talk we explore the concept of a FI-extending hull. Furthermore we will consider the endomorphism ring of a FI-extending module and determine conditions for which it is biregular.

SOME PROPERTIES IN MATRIX REPRESENTATIONS OF ENDOMORPHISM RINGS

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Abstract

In this talk first we will introduce the rings in which all the additive endomorphisms or only the left multiplication endomorphisms are generated by ring endomorphisms and investigate their properties in matrix representations. This study was motivated by the work on the Sullivan's Problem. Next, for any ring R and right R-module M, as an analogue of AE-rings, we will introduce AM-modules and also investigate their properties in matrix representations.

COHERENCE

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Abstract

The theory of coherent rings and modules is extended to cardinal numbers $\aleph$. A ring R is $\aleph^{<}-$coherent if every $\aleph^{<}-$generated right ideal $L < R$ is $\aleph^{<}-$presented, i.e., L has a presentation with both strictly less than $\aleph$ generators and less than $\aleph$–relations. Immediate generalization from the finite $\aleph = \aleph_0$ case does not work. Finite induction from R to $R \oplus R, \ldots,$ to $R^{(n)}$ fails for $n \geq \aleph_0$. Tensor product arguments (e.g., for pure and absolutely pure modules) are only available in the usual finite case. The $\aleph^{<}-$coherent rings R are characterized in at least three I, II, III very different ways, but only for regular cardinals $\aleph \geq \aleph_0$.

Theorem I. For a ring R the following are all equivalent: (i) R is $\aleph^{<}-$coherent. (ii) For any $\aleph^{<}-$generated $L < R$ and $b \in R$, $\{r \in R \mid br \in L\} < R$ is $\aleph^{<}-$generated. (iii) For any $b \in R$, $b^{\perp} = \{r \in R \mid br = 0\} < R$ is $\aleph^{<}-$generated, and for any $\aleph^{<}-$generated $A, B < R$, also $A \cap B$ is $\aleph^{<}-$generated.

In the finite case $\aleph = \aleph_0$, the above becomes Chase's characterization of coherent rings.

Theorem II. R is $\aleph^{<}-$coherent $\iff$ $\forall\ \aleph^{<}-$presented M, and $\forall$ absolutely $\aleph^{<}-$pure A, $Ext^2_R(M, A) = 0$.

Theorem III. If $\aleph \leq \aleph_\omega$ and $|R| < \aleph_\omega$, then the following are all equivalent: (1) R is $\aleph^{<}-$coherent. (2) Quotients of absolutely $\aleph^{<}-$pure modules modulo $\aleph^{<}-$pure submodules are absolutely $\aleph^{<}-$ pure. (3) Quotients of injective modules modulo $\aleph^{<}-$pure submodules are absolutely $\aleph^{<}-$pure.

Proposition. A ring R is right $\aleph^{<}-$Noetherian if and only if every $\aleph^{<}-$generated right R-module is $\aleph^{<}-$coherent. Hence any $\aleph^{<}-$ Noetherian ring R_R is $\aleph^{<}-$coherent.

KRULL-SCHMIDT RINGS WITH ENOUGH IDEMPOTENTS

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(joint work with JOSE LUIS GARCIA)

Abstract

Rings with enough idempotents appear naturally as the functor rings of locally finitely presented additive categories, and have several applications in the representation theory of artinian rings and algebras. A ring R with enough idempotents is called Krull-Schmidt if every finitely presented left R-module is a finite direct sum of modules with local endomorphism rings. We show that the classical theory of transpose and the theory of local duality can be generalized from unitary rings to Krull-Schmidt rings with enough idempotents. Based on these methods, we study the existence of almost split morphisms and Auslander-Reiten sequences over Krull-Schmidt rings with enough idempotents, and apply the results for the study of pure semisimple Grothendieck categories, i.e. Grothendieck categories having pure global dimension zero.

THE JACOBIAN CONJECTURE IN TWO VARIABLES

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Abstract

I will describe two interesting approaches to the two-variable Jacobian Conjecture. The first, due to S. Abhyankar, is based on the Newton polygon. The second, due to Y. Zhang, uses Newton-Puiseux expansions and valuation theory. Both show that a counterexample would have to be extremely strange, but do not quite succeed in proving the conjecture.

THE EXISTENCE OF PURE-INJECTIVE ENVELOPES

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Abstract

Let C denote a locally finitely presented additive category. Such categories were introduced by Crawley-Boevey to provide the most general additive setting in which a theory of purity may be developed. Using a result of Enochs, Estrada, Garcia Rozas and Oyonarte on the existence of cotorsion envelopes in functor categories, we prove that every object in C has a pure-injective envelope. This generalizes the theorem of Kielpinski and Warfield which asserts the existence of pure-injective envelopes in the category of modules over a ring R.

ON THE CLASSES OF CYCLIC MODULES OVER SOME RINGS

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Abstract

If R is a semisimple Artinian ring, then R has only finitely many cyclic left R-modules up to isomorphism. It is well-known that holonomic modules over a Weyl algebra are cyclic. If R is a directly infinite simple ring, then the class of cyclic left R-modules coincides with the class of finitely generated left R-modules. We consider when the class of cyclic modules contains some interesting class of modules.

ON A CLASS OF ARTINIAN RINGS

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(joint work with S. TARIQ RIZVI)

Abstract

In an earlier paper we described the structure of rings over which every countably generated right module is a direct sum of a projective module and a quasi-continuous module. In particular such a ring is right artinian, and every right module is a direct sum of a projective module and a quasi-injective module. In this talk we will show that these rings are also left artinian, but not every left module is a direct sum of a projective module and a quasi-injective module.

SEMIPERFECT FINITELY $\sum$-CS GROUP ALGEBRAS

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(joint work with K.I. BEIDAR, S.K. JAIN and J.B. SRIVASTAVA)

Abstract

The conditions under which a semiperfect group algebra of a nilpotent group is finitely Σ-CS are studied. It is shown that a local group algebra KG is finitely Σ-CS if and only if char(K)=p and G is a finite p-group and that a semiperfect group algebra KG of a nilpotent group is finitely Σ-CS if and only if G is a finite group.

NOETHERIAN RINGS AS SUBRINGS OF SEMISIMPLE ARTINIAN RINGS

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Abstract

Conditions will be discussed (some necessary, some sufficient, some both) that allow an embedding of a noetherian ring in a semisimple artinian one.

ON UNIT-REGULAR RINGS SATISFYING WEAK COMPARABILITY

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Abstract

The notion of weak comparability was first introduced by K.C. O'Meara (1991) to prove that simple directly finite regular rings satisfying weak comparability are unit-regular. Following that, the property of weak comparability has been studied in other many papers. In this talk, we shall investigate the connection of weak comparability and the property *special* (DF). First we prove that unit-regular rings R satisfying weak comparability have the property that $2(xR) \prec 2(yR)(x, y \in R)$ implies $xR \prec yR$. Using this result, we show that all matrix rings of factor rings of unit-regular rings satisfying weak comparability have the property *special* (DF). However, unfortunately unit-regular rings satisfying weak comparability do not have the property (DF) in general. Next we give a new condition (C) which is seemed to be a natural, slight strengthening of weak comparability, and show that a stably finite regular ring R satisfies the condition (C) if and only if R is simple unit-regular with s-comparability for some positive integer s, from which we see that every stably finite regular ring satisfying the condition (C) has the property (DF).
Definition. A regular ring R satisfies *weak comparability* if for each nonzero $x \in R$, there exists a positive integer n such that $n(yR) \lesssim R$ $(y \in R)$ implies $yR \lesssim xR$, where the n depends on x.
Definition. A regular ring R is said to have the property (DF) (resp. *special* (DF)) provided that $P \oplus Q$ (resp. $P \oplus P$) is directly finite for every directly finite projective R-modules P and Q.
Definition. A regular ring R satisfies *the condition* (C) provided that for each nonzero $x \in R$, there exists a positive integer n such that $R \not\lesssim n(yR)$ $(y \in R)$ implies $yR \lesssim xR$, where the n depends on x.

INTEGRALLY CLOSED DOMAINS BETWEEN $\mathbb{Z}[X]$ AND $\mathbb{Q}[x]$

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Abstract

In this talk we give a complete classification of the integrally closed domain which lie between $\mathbb{Z}[x]$ and $\mathbb{Q}[x]$.

NON-COMMUTATIVE VALUATION RINGS OF THE SKEW POLYNOMIAL QUOTIENT RINGS

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Abstract

Let R be a non-commutative valuation ring of a simple Artinian ring Q with an automorphism a and let $Q(X, a)$ be the quotient ring of the skew polynomial ring $Q[X, a]$.

" Find out all non-commutative valuation rings of $Q(X, a)$ lying over R"

This is very difficult problems to solve. We shall construct a natural non-commutative valuation ring S of $Q(X, a)$ lying over R which is characterized in terms of the indeterminate X and the coefficient ring Q. Further, it is classified the given automorphism a into five types in order to study the structure of the value group of S. We give examples of commutative valuation rings of fields which belong to each five types. P.I. non-commutative valuation rings have so many nice ideal theoretic properties. However, some of the examples are used to get counter-examples of non-commutative valuation rings in which some nice ideal theoretic properties are not necessarily held.

RELATIVELY FLAT MODULES WITH RESPECT TO A CLASS OF MODULES

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Abstract

R means a ring with identity and modules mean unitary R-modules. Let C be a class of left R-modules. We define (weakly) C -injective module, (weakly) C -projective module, and (weakly) C -flat module and investigate relations between these modules.

OJECTIVITY AND COJECTIVITY

BRUNO J. MÜLLER, McMaster University, Hamilton, Canada
(joint work with S.H. MOHAMED)

FI-EXTENDING RINGS HULLS

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(joint work with G. F. BIRKENMEIER and S. T. RIZVI)

Abstract

A ring R is called *right fully invariant extending* (or simply, *right FI-extending*) if every two-sided ideal of R is right essential in a right direct summand of R. We say a ring T is a *right essential ring of quotients* of R if R is a subring of T and R_R is essential in T_R. For a ring R, we call a right essential ring of quotients $\mathfrak{H}_r(R)$ of R a *right FI-extending ring hull* of R if: (1) $\mathfrak{H}_r(R)$ is a right FI-extending ring; and (2) if T is a right FI-extending right essential ring of quoteints of R such that $T \subseteq \mathfrak{H}_r(R)$, then $T = \mathfrak{H}_r(R)$. Various properties of the right FI-extending ring hull are investigated and relationships to the quasi-Baer hull of a ring are considered. Moreover, we discuss the existence of a right FI-extending ring hull of a ring R whose injective hull has no ring structure which is compatible with that of R.

PURE INJECTIVE MODULES OVER STRING ALGEBRAS

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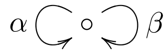
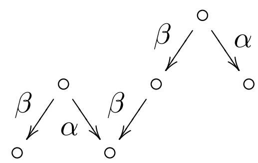
Abstract

String algebras over a field $\Bbbk$ form a particular class of path algebras of quivers with relations. A typical example is given by a Gelfand–Ponomarev algebra

$G_{n,m}$



i.e. by an algebra with generators α, β and relations $\alpha\beta = \beta\alpha = \alpha^n = \beta^m = 0$, $n + m \geq 5$. Every string algebra is known to be *tame* i.e. it is possible to classify indecomposable finite dimensional A-modules. For instance



is a *string* module over $G_{2,3}$ given by the string $\beta\alpha^{-1}\beta^2\alpha^{-1}$. Because the number of strings of fixed length over $G_{n,m}$ is not uniformly bounded, this algebra is *non-domestic.*

Recall that a module M over a finite dimensional algebra A is *pure injective* if M is a direct summand of a direct product of finite dimensional A-modules. M is *superdecomposable* if M contains no indecomposable direct summand.

Proposition. Let A be a non-domestic string algebra over a countable field $\Bbbk$. Then there exists a superdecomposable pure injective module over A.

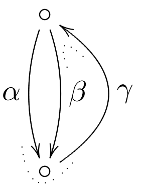
This proposition refutes a conjecture of Ringel (*C.M. Ringel, Infinite length modules. Some examples as introduction, Trends in Math., Birkhäuser, 2000, 1–73*) and also gives a partial answer to Problem 13.28 in *C.U. Jensen, H. Lenzing, Model theoretic algebra, Gordon and Breach, Algebra, logic and applications,* **2**, *1989.*

Note that a superdecomposable pure injective module over a domestic string algebra would not exists if the following conjecture (see *J. Schröer, Hammocks for string algebras. Doctoral thesis, 1997*) were true.

Conjecture. Let A be a domestic string algebra and let n be the maximal length of a path in the bridge quiver of A. Then the Krull–Gabriel dimension of A is equal to $n + 2$.

Let us consider the following (domestic) string algebra

R_1



There are two bands over R_1: $C = \alpha\beta^{-1}$ and $C^{-1} = \beta\alpha^{-1}$. Note that

$$w = {}^{\infty}(\beta^{-1}\alpha)\gamma(\beta\alpha^{-1})^{\infty}$$

is a unique (up to inversion) two-sided string over w.

From w we obtain an arrow

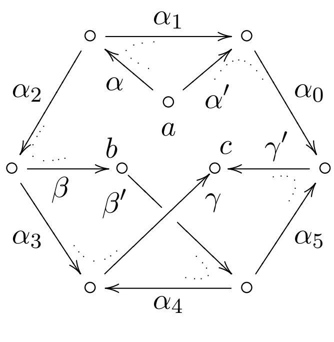
$$\alpha\beta^{-1} \xrightarrow{\alpha\gamma} \beta\alpha^{-1}$$

and inverting this

$$\alpha\beta^{-1} \xrightarrow{\gamma^{-1}\alpha^{-1}} \beta\alpha^{-1}$$

Thus the bridge quiver of R_1 is $C \xrightarrow{2} C^{-1}$.

We say that a string algebra A is 1^*-*domestic*, if there exists a unique band C over A such that C does not contain repetitions of a vertex. A typical example is given by the following algebra:



Proposition. Let A be a 1^*-domestic string algebra. Then the Krull–Gabriel dimension of A is equal to 3 if there exists an arrow $C \to C^{-1}$ in the bridge quiver of A. Otherwise the Krull–Gabriel dimension of A is equal to 2.

BAER AND QUASI-BAER MODULES

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Abstract

We introduce the notions of Baer and Quasi-Baer modules and study these concepts in the general module theoretic settings. We call an R-module M *Baer module* if the left annihilator of any submodule of M is generated by an idempotent endomorphism in the ring of R-endomorphisms of M. M is called a *quasi-Baer module* if the left annihilator of any fully invariant submodule of M is generated by an idempotent in the ring of R-endomorphisms. It is easy to see that these modules generalize the well-known concepts of Baer and quasi-Baer rings respectively. We investigate properties of these modules including their connections to other classes of modules, such as the extending and the FI-extending modules and provide several characterizations. We obtain results about the inheritance of the Baer and the quasi-Baer properties from modules to direct summands, direct sums and endomorphism rings. Several examples and applications of our results are provided.

PUBLIC KEY CRYPTO-SYSTEMS BUILT FROM SEMI-GROUP ACTIONS

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(joint work with GERARD MAZE and CHRIS MONICO)

Abstract

Cryptography has a long history and its main objective is the transmission of data between two parties in a way which guarantees the privacy of the information. There are other interesting applications such as digital signatures, the problem of authentication and the concept of digital cash to name a few. The proliferation of computer networks resulted in a large demand for cryptography from the private sector.

Many cryptographic protocols such as the Diffie-Hellman key exchange and the ElGamal protocol rely on the hardness of the discrete logarithm problem in a finite group.

In this talk we will give a generalization of the usual Diffie-Hellman key exchange and ElGamal protocols. Crucial for this generalizations will be semi-group actions on finite sets. Our main focus point will be semi-group actions built from semi-rings and several new examples will be provided.

INVERSE LIMITS OF FREE GROUPS AND FLAT MODULES

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Abstract

Based on a general model-theoretic analysis of inverse limits of structures I will discuss the preservation of certain algebraic properties in inverse limits of free groups and in inverse limits of flat modules.

REPRESENTATION OF INVARIANTS UNDER TORI OF THE WEYL ALGEBRA

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Abstract

Let G be an algebraic torus of dimension l acting on the Weyl algebra A. Let A^G be the subring of A of invariants under the action of G. We investigate actions of the torus for which A^G has enough simple finite dimensional representations, in the sense that the intersection of the kernels of all the simple finite dimensional representations is zero. We consider actions of the torus that are directly related with a finite fan. We construct a family of A^G-modules whose members will be finite dimensional if the fan has the appropriate characteristics. We will prove that A^G has enough simple finite dimensional representations if and only if the weights of the action are not zero.

ON THE DIRECT SUMS OF SINGULAR WEAKLY INJECTIVE MODULES

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Abstract

A right R-module M is called a generalized $q.f.d.$ module if every M-singular quotient has finitely generated socle. In this note we give several characterizations to this class of modules by means of weak injectivity, tightness, and weak tightness. For some classes of modules from a class $\mathcal{K}$ of modules in $\sigma[M]$ we study when the direct sums are weakly injective (resp., tight, weakly tight) in $\sigma[M]$. In particular, it is shown that a module M is $g.q.f.d.$ iff every direct sums of M-singular M-injective modules in $\mathcal{K}$ is weakly injective iff every direct sums of M-singular weakly tight is weakly tight iff every direct sums of the injective hulls of M-singular simples is weakly R-tight.

SUBGROUPS OF FINITE ABELIAN GROUPS

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(joint work with Dr. RINGEL, Bielefeld University, Germany)

Abstract

We consider pairs (U', U) consisting of a finite abelian p^n -bounded group U and a subgroup U' in U . The category $S(n)$ of these pairs is a Krull-Schmidt category although not an abelian category; research by Hunter, Richman, and Walker ('78, '99) has shown that $S(n)$ has $2, 5, 10, 20, 50$ indecomposable objects if $n = 1, 2, ...,$ resp. The aim of this talk is to present a formula for the number of indecomposables, which is obtained by studying the Auslander-Reiten translation in submodule categories.

BIG COHEN-MACAULAY ALGEBRAS

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Abstract

In the 80's, Hochster has demonstrated the key role played by the notion of a big Cohen-Macaulay module (big CM module) in homological algebra. A big CM module is a module over a Noetherian local ring such that a system of parameters becomes regular on the module–'big' alludes here to the fact that such a module is in general not Noetherian. More recently, in joint work with Huneke, he observed that in prime characteristic, the absolute integral closure of a local domain is a big CM algebra. This yields a canonical and functorial construction. The same authors managed to obtain some version of this in zero characteristic as well, but the good properties of absolute integral closure are lost. I will show that an easy non-standard argument produces a canonical construction for affine local rings over the complex numbers, which inherits all the good properties from the absolute integral closure. For instance, these big CM algebras have the property that the sum of any number of prime ideals is either a prime ideal or the unit ideal.

The following speech was given on May 18, 2002 at the dinner banquet of the XXVI-th OSU-Denison Conference honoring Wolfgang Kappe on the occasion of his retirement.

REFLECTIONS ON THE FORTY-YEAR CAREER OF A HUSBAND-AND-WIFE TEAM OF MATHEMATICIANS

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"It's a wonderful life" was the title of a talk I gave a month ago at the MAA Seaway Section meeting. Its subtitle: reflections on the career of a mathematician. This time my subtitle is: Reflections on the forty-year career of a husband-and-wife team of mathematicians. Very appropriately so, since we are celebrating our fortieth wedding anniversary in two weeks!

In my last talk I reflected first on potential and actual role models before reflecting on my own career. Starting with Hypathia around 300 BC, it took me fifty minutes to go through the centuries. Don't worry, this time it can be done in fifteen minutes. There is just one role model who lived in the generation of my parents, a husband-and-wife team of research mathematicians who had each their own Ph.D. students and raised a family. I am talking of Bernhard and Hanna Neumann. Bernhard is still alive today, soon celebrating his ninety-third birthday. Hanna, born in 1914, died prematurely in 1971. Bernhard had to emigrate from Germany in 1933. Hanna followed him five years later to Great Britain. Their first years together were the turbulent times of World War II. For a long time they held academic jobs but in different cities, she in Hull, he in Manchester. In 1958 Hanna finally succeeded in joining Bernhard in Manchester. During that time they raised a family of five children. Finally, in 1963 they found jobs at the same university, the National University of Australia in Canberra.

Compared to the Neumann's, we were lucky. We had always our jobs at the same university and only had to pull up our stakes once going from Germany to the US, by the way, the same year the Neumann's moved to Australia. But let's start at the beginning:

"Once upon a time" Wolfgang and Liselotte met where all mathematicians meet, that mythical place Oberwolfach. By the end of 1959 we both had gravitated to the Black Forest area within a month of each other, Wolfgang as one of the mathematicians in residence in Oberwolfach while writing his dissertation with Reinhold Baer in Frankfurt, and me starting my dissertation with Theodor Schneider in Freiburg.

I heard about Wolfgang for the first time when Schneider mentioned that Kappe and Kegel, the two resident assistants in Oberwolfach, are named after two geometric objects, namely the cap of a sphere and the cone. Wolfgang heard about me for the first time from Erich Glock, my future brother-in-law and also a mathematician in residence in Oberwolfach. Once coming back from a visit in Freiburg, Erich reported that Theodor Schneider had brought along "ein Fraeulein Menger". Wolfgang replied as any Berliner would have: " Na und! (= so what!). During my first year in Freiburg I came up to Oberwolfach a couple of times and we met on those occasions. In Spring 1961 I was appointed to the newly created position of a library assistant at Oberwolfach which I could take care of mainly from Freiburg. But on occasion I had to visit the institute for a few days at a time. Also, Theodor Schneider instructed me to help with the meetings while Wolfgang was preparing for his Ph.D. exam. The latter one did not quite work out as intended. In other words, we got to know each other during that time and my presence became a pleasant obstacle in Wolfgang's endeavor to prepare for the exam. After a few delays however, Wolfgang defended his dissertation in July 1961 and by that time we were already in agreement that we should get married once I finished my Ph.D. which happened in May 1962. We got married on June 1 of that year in Nuernberg.

Good that nature prevented us from reflecting on what marriage would do to our careers. It was the single biggest mistake we could make, in particular, if we wanted to stay in Germany. At that time each of us had good positions, Wolfgang as a postdoc in Frankfurt and me as an assistant in Freiburg. I could have kept it and commuted to Frankfurt. But we decided to live together. I moved to Frankfurt and became a "Hilfsassistent".

Baer ran a tight ship in Frankfurt. International celebrities came through town and gave talks and he wanted everyone to be there. Others occasionally would miss such events and did not get noticed. If one or both of us were missing, Baer always noticed and told us so at the next opportunity, because he could not introduce us to the visitor as the husband-and-wife team and me in particular as "Frau Dr. Dr. Kappe", one my own degree, the other my husband's, as is customary in Germany. A few years later in Oberwolfach, Baer scheduled talks back-to-back, first the Neumann's, then us.

Soon my husband's post doc would run out, and we started looking around for places to go. Opportunities came up, for one of us there, for the other somewhere else. We tried to stay optimistic, but Reinhold Baer knew better and gave us the advice to go to the US. He reasoned that the climate for a husband-and-wife team to succeed was better in the US. That was forty years ago and nothing has changed in Germany since then in this respect. Baer introduced us to Zassenhaus on the occasion of a visit to Oberwolfach. Zassenhaus just had moved from Notre Dame to Ohio State. We got our immigration visa just for the asking, got a plane ticket and landed in the US on September 16, 1963. Fresh off the plane, we started teaching a few days later. All of you who came here as graduate students at least had some idea how life would be as a college teacher. For us it was all new, it was a culture shock. It was sink or swim and we decided to swim. Thanks to the help of two people, Hans Zassenhaus who introduced us to academic life in the States, and Arno Cronheim, a long-time friend of Wolfgang, who introduced us to the daily life, we managed to swim. Above all it was very essential that we lived through this together and we were there for each other.

I could go on to report on the next 38 years of our marriage, but let me just conclude as in the fairy tale: "... and they lived happily ever after".