EXISTENCE OF PRIMITIVE PAIRS WITH TWO PRESCRIBED TRACES OVER FINITE FIELDS

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Given $F = \mathbb{F}_{p^t}$, a field with p^t elements, where p is a prime power and $t \geq 7$ is a positive integer. Let $n \in \mathbb{N}$ and $f = f_1/f_2$ is a rational function, where f_1 and f_2 are distinct irreducible polynomials with $\deg(f_1) + \deg(f_2) = n \leq p^t$ in $F[x]$. We construct a sufficient condition on (p, t) which guarantees primitive pairing $(\epsilon, f(\epsilon))$ exists in F such that $\mathrm{Tr}_{\mathbb{F}_{p^t}/\mathbb{F}_p}(\epsilon) = a$ and $\mathrm{Tr}_{\mathbb{F}_{p^t}/\mathbb{F}_p}(f(\epsilon)) = b$ for any prescribed $a, b \in \mathbb{F}_p$. Further, we demonstrate for any positive integer $n \leq p^t$, such a pair definitely exists for large t. The scenario when $n = 2$ is handled separately and we verified that such a pair exists for all (p, t) except from possible 71 values of (p, t). A result for the case $n = 3$ is given as well.

TRIGONOMETRIC THIN SETS AND STATISTICALLY CHARACTERIZED SUBGROUPS

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In this article, we introduce a novel category of trigonometric thin sets, specifically referred to as "statistical Arbault sets". These sets encompass the classical Arbault sets [1] while also encompassing a substantial subcategory of **N**-sets (also called "sets of absolute convergence") [3]. In particular, this class specifically includes the varieties of **N**-sets which have been extensively used in the literature (see [1, 4]), but at the same time being distinct from the class of **N**-sets. We observe that this newly introduced class occupies a distinct position, lying precisely between the category of Arbault sets and the category of Weak Dirichlet sets.

The motivation for envisioning this potential class stems from the recent conceptualization of statistically characterized subgroups [2], expanding upon the notion of characterized subgroups. In this article, we demonstrate the existence of statistically characterized subgroups that elude characterization through any integer sequence, thereby establishing the "novelty" of this concept. This naturally paves the way for a new class of sets generated by the class of statistically characterized subgroups as basis which we name statistical Arbault sets.

References

[1] J. Arbault, Sur l/'ensemble de convergence absolue d/une série trigonométrique, Bull. Soc. Math. France 80 (1952), 253-317.

[2] D. Dikranjan, P. Das, K. Bose, Statistically characterized subgroups of the circle, Fund. Math., 249 (2020), 185-209.

[3] P. Fatou, Séries trigonométriques et séries de Taylor, Acta Math., 30 (1906), 335-400.

[4] S. Kahane, Antistable classes of thin sets in harmonic analysis, Illinois J. Math. 37 (1993), 186-223.

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VANISHING OF (CO)HOMOLOGIES AND CM MODULES OF MINIMAL MULTIPLICITY

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Let $(R, \mathfrak{m}, k)$ be a commutative Noetherian local ring. Let M be a CM (Cohen-Macaulay) R-module of dimension r. It is well-known that the multiplicity $e(M) \geq \mu(mM) + (1-r)\mu(M)$, where $\mu(M)$ denotes the minimal number of generators of M. When equality holds, M is said to have minimal multiplicity. For example, a module M of finite length has minimal multiplicity if and only if $\mathfrak{m}^2 M = 0$. In this article, we show that Cohen Macaulay modules with minimal multiplicity are Tor-test as well as Ext-test modules (depending on whether $e(M) < 2\mu(M)$ or $e(M) > 2\mu(M)$), which detect finiteness of projective and injective dimensions of a given module. Most notably, we verify the long-standing Auslander-Reiten conjecture for every CM module of minimal multiplicity. As consequences of the above results, we show a number of characterizations of various local rings.

A CHARACTERISATION OF MATRIX RINGS

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We prove that a ring R is an $n \times n$ matrix ring (i.e., $R \cong \mathbb{M}_n(S)$, for some ring S) if and only if there exists a (von Neumann) regular element x in R such that $l_R(x) = Rx^{n-1}$. As applications we prove a few new results, strengthen some known results, and also provide easier proofs of a few other known results. For instance, we prove that if a ring R has elements x and y such that $x^n = 0$, $Rx + Ry = R$ and $Ry \cap l_R(x^{n-1}) = 0$, then R is an $n \times n$ matrix ring. This improves upon a result of P. R. Fuchs ['A characterisation result for matrix rings', Bull. Aust. Math. Soc. **43** (1991), 265–267] where it is proved assuming further that the element y is nilpotent of index two and $x + y$ is a unit. For an ideal I of a ring R we prove that the ring $\begin{pmatrix} R & I \\ R & R \end{pmatrix}$ is an 2×2 matrix ring if and only if R/I is so.

References

D. R. Goyal and D. Khurana, A characterisation of matrix rings, Bull. Austral. Math. Soc. 107 (2023), no. 1, 95–101.

SKEW FORMS AND GALOIS THEORY

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Let L/K be a cyclic extension of degree $n = 2m$. It is known that the space $Alt_K(L)$ of alternating K-bilinear forms (skew-forms) on L decomposes into a direct sum of K-subspaces A^{σ^i} indexed by the elements of $Gal(L/K) = \langle\sigma\rangle$. It is also known that the components A^{σ^i} can have nice constant-rank properties. We enhance and enrich these constant-rank results and show that the component A^{σ} often decomposes directly into a sum of constant rank subspaces, that is, subspaces all of whose non-zero skew-forms have a fixed rank r. In particular, this is always true when $-1 \notin L^2$. As a result we deduce a decomposition of $Alt_K(L)$ into subspaces of constant rank in several interesting situations. We also establish that a subspace of dimension $\frac{n}{2}$ all of whose nonzero skew-forms are non-degenerate can always be found in A^{σ^i} where σ^i has order divisible by 2. This constant rank subspace in $Alt_K(L)$ addresses the challenge of finding the largest non-degenerate subspace of $Alt_K(L)$. Moreover, the question of the maximum dimension of an n-subspace in $Alt_n(K)$ is closely related to the invariant $s_n(K)$, which is defined by examining the vanishing of subspaces of alternating bilinear forms on 2-dimensional subspaces of vector spaces.

An algebraic characterization of the affine three space in arbitrary characteristic

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Abstract

We give an algebraic characterization of the affine 3-space over an algebraically closed field of arbitrary characteristic. We will use this characterization to reformulate the following question. Let

$$A = k[X, Y, Z, T]/(XY + Z^{p^e} + T + T^{sp})$$

where $p^e sp$, spp^e, $e, s \geq 1$ and k is an algebraically closed field of positive characteristic p. Is $A = k^{[3]}$?

Rees algebra of maximal order Pfaffians and its diagonal subalgebras

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Abstract

For a homogeneous ideal I of a graded Noetherian ring A, the Rees algebra of I denoted by $\mathcal{R}(I)$ is a bigraded algebra defined as $\oplus_{i\geq 0} I^i$. It forms an important class of bigraded algebra, which contains a great deal of information about the powers of the ideal I. Geometrically, it corresponds to the blowup of the spectrum of A along the variety of I. In general, corresponding to a homogeneous ideal I of a ring A, finding the explicit defining equations of the Rees algebra is not easy. Some study has been done for certain classes of ideals like perfect ideals of grade 2, perfect Gorenstein ideals of grade 3, determinantal ideals etc. We are interested in extending the study to ideals generated by d-sequences and further to the larger class of ideals of linear type.

Given a skew-symmetric matrix X, the Pfaffian of X is defined as the square root of the determinant of X. We mainly look at the Pfaffian ideals generated by the maximal order Pfaffians of a generic skew-symmetric matrix since they correspond to a class of ideals of linear type. We in fact, prove that they form d-sequences and study the defining equations of the corresponding Rees algebras. We also consider certain sparse skew-symmetric matrices and identify the associated Pfaffian ideals as the vertex cover ideal of unmixed bipartite graphs.

For a bigraded K-algebra R, R_Δ denotes the diagonal subalgebra of R corresponding to the diagonal $\Delta = \{(ci, ei) \mid i \in \mathbb{Z}\}$ for $c, e \geq 0$. Some study is already done on the diagonals of Rees algebra of complete intersections and certain height two perfect ideals with linear presentation. We examine the Koszul and Cohen-Macaulay properties of the diagonal subalgebras of Rees algebras corresponding to the maximal order Pfaffian ideals.

FIELDS WITH PRIMITIVE ELEMENTS HAVING PRIMITIVE IMAGE UNDER RATIONAL FUNCTIONS

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Let $\mathbb{F}_q$ be a finite field of order q and let $f(x) = f_1(x)/f_2(x) \in \mathbb{F}_q(x)$ be a rational function of degree sum n, that is, $n = n_1+n_2$ where $n_1 = deg(f_1(x))$ and $n_2 = deg(f_2(x))$. We say a rational function $f(x)$ is exceptional, if $f(x)$ is of the form $f(x) = cx^i(g(x))^d$, where i is any integer, $d > 1$ divides $q-1$, $c \in \mathbb{F}_q^\times$ and $g(x) \in \mathbb{F}_q(x)$ such that both numerator and denominator of $g(x)$ are co-prime to x. A generator of $\mathbb{F}_q^\times$ is referred as a primitive element of $\mathbb{F}_q$. For an (n_1, n_2)-rational function $f(x) \in \mathbb{F}_q(x)$ and $\alpha \in \mathbb{F}_q$ we call $(\alpha, f(\alpha))$, a primitive pair if both α and $f(\alpha)$ are primitive elements in $\mathbb{F}_q$. In this talk, we focus on the existence of a primitive element $\alpha \in \mathbb{F}_q$ such that $f(\alpha)$ is also primitive in $\mathbb{F}_q$ for a given non-exceptional $f(x) \in \mathbb{F}_q(x)$ with its degree sum greater than 1. We obtain a condition on q for the existence of such primitive elements when $q \equiv 3 \pmod 4$ and $f(x)$ belongs to the family of even or odd functions.

A NOTE ON RATLIFF-RUSH FILTRATION, REDUCTION NUMBER AND POSTULATION NUMBER OF $\mathfrak{M}$-PRIMARY IDEALS

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In this talk, we would like to answer some of the questions raised by T. Marley to understand the relationship between the reduction number and the postulation number of an $\mathfrak{m}$-primary ideal. Let $(R, \mathfrak{m})$ be a Cohen-Macaulay local ring of dimension $d \geq 2$ and I an $\mathfrak{m}$-primary ideal. Let $\mathrm{rd}(I)$ be the reduction number of I, $\mathrm{n}(I)$ the postulation number and $\rho(I)$ the stability index of the Ratliff-Rush filtration with respect to I. We prove that for $d = 2$, if $\mathrm{n}(I) = \rho(I) - 1$, then $\mathrm{rd}(I) \leq \mathrm{n}(I) + 2$ and if $\mathrm{n}(I) \neq \rho(I) - 1$, then $\mathrm{rd}(I) \geq \mathrm{n}(I) + 2$. For $d \geq 3$, if I is integrally closed, $\operatorname{depth} \operatorname{gr}(I) = d - 2$ and $\mathrm{n}(I) = -(d-3)$, then we prove that $\mathrm{rd}(I) \geq \mathrm{n}(I) + d$. Our main result is to generalize a result of T. Marley on the relation between the Hilbert-Samuel function and the Hilbert-Samuel polynomial by relaxing the condition on the depth of the associated graded ring with the good behaviour of the Ratliff-Rush filtration with respect to I mod a superficial sequence. From this result, it follows that for a Cohen-Macaulay ring of dimension $d \geq 2$, if $P_I(k) = H_I(k)$ for some $k \geq \rho(I)$, then $P_I(n) = H_I(n)$ for all $n \geq k$.

(σ, τ)-DERIVATIONS OF GROUP RINGS WITH APPLICATIONS

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In this contributory talk, I will talk about (σ, τ)-derivations of group rings which are interesting objects of study both in theory and practice concerning the vast applications of derivations in coding theory and other mathematics. Let R be a commutative unital ring, G be any group with the presentation $G = \langle X \mid Y \rangle$ (X the set of generators for G and Y the set of relators) and (σ, τ) be a pair of R-algebra endomorphisms of the group ring RG which are R-linear extensions of the group homomorphisms of RG. We will see a necessary and sufficient condition under which a map $f : X \to RG$ can be extended to a (σ, τ)-derivation of RG. We see an application of this characterization in classifying all σ-derivations of commutative group algebras over fields of positive characteristic. We further see a classification of inner (σ, τ)-derivations of the group ring $\mathbb{F}G$ of a finite group G over a field $\mathbb{F}$ of arbitrary characteristic. We finally see the application of the above-obtained results in answering the σ-derivation problem for dihedral group algebras over fields of arbitrary characteristic. This is done by classifying all inner and outer σ-derivations of dihedral group algebras.

ON COMBINATORIAL CHARACTERIZATION OF GENERATORS OF TORIC IDEAL OF WEIGHTED ORIENTED GRAPHS

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We give explicit combinatorial formula for generators of toric ideal of two weighted oriented cycles sharing a vertex. We provide explicit combinatorial formula for generators of toric ideal of two weighted oriented cycles connected by a path. Finally, we show combinatorial characterization of generators of toric ideal of the following weighted oriented graph D :

(i) D consists of arbitrary number of balanced cycles share a vertex.
(ii) D consists of arbitrary number of balanced cycles connected by a path.

COMPOSITION OF GENERALIZED DERIVATIONS ACT AS A JORDAN PRODUCT IN PRIME RINGS

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Let R be a prime ring of characteristic not equal to 2 and with Utumi quotient ring U, extended centroid C. Let F, G and H be generalized derivations on R. Let $f(r)$ be a multilinear polynomial on R over C which is non-central valued on R such that $FH(f(r)^2) = F(f(r))G(f(r)) + G(f(r))F(f(r))$ for all $r = (x_1 \ldots, x_n) \in R^n$ then one of the following holds:

1. R satisfies s_4.
2. there exist $\lambda, \mu \in C$, $b \in U$ such that $F(x) = \lambda x$, $G(x) = [b, x] + \mu x$ and $H(x) = [b, x] + 2\mu x$ for all $x \in R$.
3. there exist $\mu \in C$, $p, q, w \in U$ such that $F(x) = xp$, $G(x) = qx$ and $H(x) = (q + \mu)x + xw$ for all $x \in R$ with $pq \in C$ and $(w + \mu)p = pq$.
4. there exist $\mu \in C$, $c, p, q \in U$ such that $F(x) = px$, $G(x) = xq$ and $H(x) = (c + \mu)x + xq$ for all $x \in R$ with $qp \in C$ and $p(c + \mu) = qp$.
5. there exist $\mu, \alpha \in C$ such that $F(x) = \mu x$, $G(x) = \alpha x$ and $H(x) = 2\alpha x$ for all $x \in R$.
6. $f(x_1, \ldots, x_n)^2$ is central valued with one of the following:
   (a) there exist $\lambda, \mu \in C$, $b, c \in U$ such that $F(x) = \lambda x$, $G(x) = [b, x] + \mu x$ and $H(x) = [c, x] + 2\mu x$ for all $x \in R$.
   (b) there exist $p, q, c, w \in U$ such that $F(x) = xp$, $G(x) = qx$, $H(x) = cx + xw$ for all $x \in R$ with $pq \in C$ and $(c + w)p = pq + qp$.
   (c) there exist $p, q, c, w \in U$ such that $F(x) = px$, $G(x) = xq$, $H(x) = cx + xw$ for all $x \in R$ with $qp \in C$ and $p(c + w) = pq + qp$.
   (d) there exist $\alpha, \mu \in C$, $a, c, p \in U$ such that $F(x) = [a, x] + \mu x$, $G(x) = \alpha x$, $H(x) = [c, x] + xp$ for all $x \in R$ with $[a, p] + \mu p = 2\mu\alpha$.

IDEALS OF S-SEMIGROUPS

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Module over a near ring (N-group) is the generalization of vector space over an arbitrary field. Module over seminearring (S-semigroups) is the generalization of N-group. In the present work, we explicitly provide the notion of an ideal of S-semigroup. Then we define quotient structure and provide examples. Further we show there exists an order preserving one-one correspondence between congruences and ideals of S-semigroup. In addition, we prove classical isomorphism theorems in S-semigroups and illustrate them with suitable examples.

QUANTUM CODES FROM SKEW CONSTACYCLIC CODES OVER THE RING
$\mathcal{R} = \mathbb{F}_q[u_1, u_2, ..., u_r]/\langle u_i^3 - u_i, u_iu_j - u_ju_i\rangle$

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In this article, we study skew constacyclic codes over the ring $\mathcal{R} = \mathbb{F}_q[u_1, u_2, ..., u_r]/\langle u_i^3 - u_i, u_iu_j - u_ju_i\rangle$, where $q = p^r$ and p is some odd prime. We define a Gray map on $\mathcal{R}$. We investigate the structural properties of skew constacyclic codes over $\mathcal{R}$ through a decomposition theorem. We provide some results on skew constacyclic codes over $\mathcal{R}$ and their duals. Furthermore, we characterize dual-containing skew constacyclic codes over the ring $\mathcal{R}$ and we also prove that the Gray image of dual containing skew constacyclic codes over the ring $\mathcal{R}$ is a dual containing quasi multi-twisted code over $\mathbb{F}_q$. Using CSS (Calderbank-Shor-Steane) construction, we prove the existence of some new and better quantum codes from these dual containing Gray images.

ISOTROPY GROUP OF LOTKA-VOLTERRA DERIVATIONS OF $K[X_1, \cdots, X_N]$

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In this paper, we study the isotropy group of Lotka-Volterra derivations of $K[x_1, \cdots, x_n]$, i.e., a derivation d of the form $d(x_i) = x_i(x_{i-1} - C_i x_{i+1})$. For $n = 3$ and $C_i = -1$ for all i, the isotropy group of d is isomorphic to the dihedral group of order 6. For $-C_1C_2C_3 + 1 \neq 0$ and $C_i \neq -1$ for some i then the isotropy group of d is isomorphic to a subgroup of dihedral group of order 6. When $-C_1C_2C_3 + 1 = 0$, the isotropy group of d is a finite abelian group. Moreover, when $C_i = -1$ and n is odd, we prove the result for n variables. We have shown that the isotropy group of d is isomorphic to the dihedral group of order $2n$.

ON THE DISTANCE TO THE NEAREST NON-PRIME POLYNOMIAL MATRIX

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In this manuscript, we explore the challenge of determining the closest non-prime polynomial matrix to a given left prime polynomial matrix, and their distance, known to be radius of primeness. This problem represents a broader context encompassing the task of finding the closest non-coprime polynomials to a set of initially coprime polynomials.

To tackle this problem effectively, we initially establish a critical link between the left primeness property of a polynomial matrix and the rank deficiency of a specific block Toeplitz matrix, which is derived from the original polynomial matrix. This equivalence allows us to reframe the original problem as one of seeking the nearest Structured Low-Rank Approximation (SLRA) for the associated block Toeplitz matrix. This reformulation is particularly useful when the leading coefficient matrix of the left prime polynomial matrix possesses a full row rank.

Furthermore, we substantiate that, when the leading coefficient matrix exhibits rank deficiency, it is possible to obtain a non-prime polynomial matrix extremely closely to a left prime polynomial matrix.

In our pursuit of solving the SLRA problem, we employ well-established numerical techniques like STLN (Structured Total Least Norm) and a regularized factorization approach, both of which are documented in the existing literature. To underline the effectiveness and applicability of our proposed algorithm, we present several numerical examples and make comparisons with results available in the literature.

RATLIFF-RUSH FLITRATION, HILBERT COEFFICIENTS AND REDUCTION NUMBER OF INTEGRALLY CLOSED IDEALS

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Let (R, m) be a Cohen-Macaulay local ring of dimension $d \geq 3$ and I an m-primary integrally closed ideal. We establish bounds for the third Hilbert coefficient $e_3(I)$ in terms of the lower Hilbert coefficients $e_i(I),\ 0 \leq i \leq 2$ and the reduction number of I. When $d = 3$, the boundary cases of these bounds characterize certain properties of the Ratliff-Rush filtration of I. These properties, though weaker than $depth G(I) \geq 1$, guarantee that Rossi's bound for reduction number $r_J(I)$ holds in dimension three. In that context, we prove a bound on a reduction number under some condition on the depth of the associated graded ring. In three dimension we prove an open problem related to Rossi's bound in case of integrally closed ideal under some restrictive condition on the Hilbert coefficients.

On the relationship Between different Automorphism Groups of a Finitely Generated Group

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Abstract. Let G be a group and let $\mathrm{Aut}(G)$ denote the group of all automorphisms of G. An automorphism α of G is called a class-preserving automorphism if for each $x \in G$, there exists an element $g_x \in G$ such that $\alpha(x) = g_x^{-1} x g_x$; and is called an inner automorphism if for all $x \in G$, there exists a fix element $g \in G$ such that $\alpha(x) = g^{-1} x g$. The group of all inner automorphisms of G is denoted by $\mathrm{Inn}(G)$ and by $\mathrm{Aut}_c(G)$, we denote the group of all class-preserving automorphisms of G. An automorphism φ of G is called a central automorphism if it commutes with all inner automorphisms of G; or equivalently $g^{-1}\varphi(g) \in Z(G)$, the center of G, for all $g \in G$. The group of all central automorphisms of G is denoted as $\mathrm{Aut}^z(G)$. An automorphism α is called an autocentral automorphism if $g^{-1}\alpha(g) \in L(G)$ for all $g \in G$, where $L(G)$ denote the absolute center of G. In this paper, we will discuss the relationship between various automorphism groups of a finitely generated.

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Keywords: Central Automorphism, Absolute Central Automorphism, Commuting automorphisms.

EXISTENCE OF S-PRIMARY DECOMPOSITION IN S-NOETHERIAN RINGS

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Let A be a commutative ring with identity and $S \subseteq R$ be a multiplicative set. An ideal Q of A (disjoint from S) is said to be S-primary if there exists an $s \in S$ such that for all $x, y \in A$ with $xy \in Q$, we have $sx \in Q$ or $sy \in rad(Q)$ (radical of Q). Also, we say that an ideal of A is S-primary decomposable or has an S-primary decomposition if it can be written as finite intersection of S-primary ideals. In this paper, our initial objective is to provide an example of an S-Noetherian ring in which an ideal cannot be decomposed into primary components. Subsequently, our primary goal is to establish both the existence and uniqueness of S-primary decomposition in S-Noetherian rings, which serves as an extension of a historical theorem known as the Lasker-Noether theorem.

ON AUSLANDER'S DEPTH FORMULA

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In 1961, Auslander proved the depth formula for a pair of Tor-independent modules over a local ring provided one of the module has finite projective dimension. This formula was shown to hold for Tor-independent modules over complete intersection local rings by Huneke and Wiegand. However, it is still unknown, even over Gorenstein local rings, whether or not the depth formula holds for all Tor-independent modules.

In this talk, we show that if Auslander's depth formula holds for Tor-independent modules over Cohen-Macaulay local rings of dimension 1, then it holds for Tor-independent modules over all Cohen-Macaulay local rings. More generally, we show that the depth formula for Tor-independent modules which have finite Cohen-Macaulay dimension over depth 1 local rings implies the depth formula for such modules over all positive depth local rings.

HAMMOCKS FOR NON-DOMESTIC STRING ALGEBRAS

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Let Λ be an algebraically closed field. The field "representation theory of finite-dimensional algebras over Λ" deals with the study of representations (modules) over those algebras and the morphisms between them. What sets these algebras apart is that they can be viewed, upto Morita Equivalence, as *bound quivers algebras*–quotient of a path algebra over a finite quiver by an admissible ideal. String algebras form an important subclass, over which the finite-dimensional indecomposable representations and irreducible morphisms between them are classified. The factorization of such morphisms in string algebras can be well understood in terms of some order-theoretic structures known as "hammocks", which paves the way for a nice interplay between algebra and discrete mathematics.

In this talk, I will present a structural result for hammocks for string algebras. More precisely, we will see that the order type (= isomorphism class) of the simplest version of a hammock for string algebras is a *finite description* linear order. The class of finite description linear orders is the smallest class of linear orders containing **0**, **1**, and that is closed under isomorphisms, finite order sum, anti-lexicographic product with ω and ω^*, and shuffle of finite subsets.