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Singularity Theory for Non-Twist KAM Tori American Mathematical Soc. Spectral triples for nonunital algebras model locally compact spaces in noncommutative geometry. In the present text, the authors prove the local index formula for spectral triples over nonunital algebras, without the assumption of local units in our algebra. This formula has been successfully used to calculate index pairings in numerous noncommutative examples. The absence of any other effective method of investigating index problems in geometries that are genuinely noncommutative, particularly in the nonunital situation, was a primary motivation for this study and the authors illustrate this point with two examples in the text. In order to understand what is new in their approach in the commutative setting the authors prove an analogue of the Gromov-Lawson relative index formula (for Dirac type operators) for even dimensional manifolds with bounded geometry, without invoking compact supports. For odd dimensional manifolds their index formula appears to be completely new.

American Mathematical Soc. The authors define combinatorial Floer homology of a transverse pair of noncontractible nonisotopic embedded loops in an oriented -manifold without boundary, prove that it is invariant under isotopy, and prove that it is isomorphic to the original Lagrangian Floer homology. Their proof uses a formula for the Viterbo-Maslov

index for a smooth lune in a -manifold.

Effective Hamiltonians for Constrained Quantum Systems American Mathematical Soc.

Today's era of intense globalization has unleashed dynamic movements of people, pathogens, and pests that overwhelm the static territorial jurisdictions on which the governance provided by sovereign states and their formal intergovernmental institutions is based. This world of movement calls for new ideas and institutions to govern people's health, above all in Africa, where the movements and health challenges are the most acute. This book insightfully explores these challenges in ways that put the perspectives of Africans themselves at centre stage. It begins with the long central and still compelling African health challenge of combating the pandemic of HIV/AIDS. It then examines the global governance responses by the major multilateral organizations of the World Bank and the World Trade Organization and the newer informal flexible democratically oriented ones of the Group of Eight. It also addresses the compounding health challenge created by climate change to assess both its intensifying impact on Africa and how all international institutions have largely failed to link climate and health in their governance response. It concludes with

several recommendations about the innovative ideas and institutions that offer a way to closing the great global governance gaps and thus improving Africans' health and that of citizens beyond.

Routledge

The authors study the complex geometry and coherent cohomology of nonclassical Mumford-Tate domains and their quotients by discrete groups. Their focus throughout is on the domains which occur as open -orbits in the flag varieties for and , regarded as classifying spaces for Hodge structures of weight three. In the context provided by these basic examples, the authors formulate and illustrate the general method by which correspondence spaces give rise to Penrose transforms between the cohomologies of distinct such orbits with coefficients in homogeneous line bundles.

Special Values of Automorphic Cohomology Classes American Mathematical Soc.

Assessments, understood as tools for tracking what and how well students have learned, play a critical role in the classroom. Developing Assessments for the Next Generation Science Standards develops an approach to science assessment to meet the vision of science education for the future as it has been elaborated in A Framework for K-12 Science Education (Framework) and Next Generation Science Standards (NGSS). These documents are brand new and the changes they call for are barely under way, but the new assessments will be needed as soon as states

and districts begin the process of implementing the NGSS and changing their approach to science education. The new Framework and the NGSS are designed to guide educators in significantly altering the way K-12 science is taught. The Framework is aimed at making science education more closely resemble the way scientists actually work and think, and making instruction reflect research on learning that demonstrates the importance of building coherent understandings over time. It structures science education around three dimensions - the practices through which scientists and engineers do their work, the key crosscutting concepts that cut across disciplines, and the core ideas of the disciplines - and argues that they should be interwoven in every aspect of science education, building in sophistication as students progress through grades K-12. Developing Assessments for the Next Generation Science Standards recommends strategies for developing assessments that yield valid measures of student proficiency in science as described in the new Framework. This report reviews recent and current work in science assessment to determine which aspects of the Framework's vision can be assessed with available techniques and what additional research and development will be needed to support an assessment system that fully meets that vision. The report offers a systems approach to science assessment, in which a range of assessment strategies are designed to answer different kinds of questions with appropriate degrees of specificity and provide

results that complement one another. Developing Assessments for the Next Generation Science Standards makes the case that a science assessment system that meets the Framework's vision should consist of assessments designed to support classroom instruction, assessments designed to monitor science learning on a broader scale, and indicators designed to track opportunity to learn. New standards for science education make clear that new modes of assessment designed to measure the integrated learning they promote are essential. The recommendations of this report will be key to making sure that the dramatic changes in curriculum and instruction signaled by Framework and the NGSS reduce inequities in science education and raise the level of science education for all students.

American Mathematical Soc.

The little -disks operad, , along with its variants, is an important tool in homotopy theory. It is defined in terms of configurations of disjoint -dimensional disks inside the standard unit disk in and it was initially conceived for detecting and understanding -fold loop spaces. Its many uses now stretch across a variety of disciplines including topology, algebra, and mathematical physics. In this paper, the authors develop the details of Kontsevich's proof of the formality of little -disks operad over the field of real numbers. More precisely, one can consider the singular chains on as well as the singular homology of . These two objects are operads in the category of chain complexes. The formality then states that there is a zig-zag of quasi-isomorphisms connecting these two operads. The formality also in some sense holds in the category of commutative differential graded algebras. The authors additionally prove a relative version of the formality for the inclusion of the little

-disks operad in the little -disks operad when .

Generalized Descriptive Set Theory and Classification Theory American Mathematical Soc.

Shock Waves in Conservation Laws with Physical ViscosityAmerican Mathematical Soc.

Disease, Governance, Climate Change American Mathematical Soc.

Hua's fundamental theorem of geometry of matrices describes the general form of bijective maps on the space of all m\times n matrices over a division ring \mathbb{D} which preserve adjacency in both directions. Motivated by several applications the author studies a long standing open problem of possible improvements. There are three natural questions. Can we replace the assumption of preserving adjacency in both directions by the weaker assumption of preserving adjacency in one direction only and still get the same conclusion? Can we relax the bijectivity assumption? Can we obtain an analogous result for maps acting between the spaces of rectangular matrices of different sizes? A division ring is said to be EAS if it is not isomorphic to any proper subring. For matrices over EAS division rings the author solves all three problems simultaneously, thus obtaining the optimal version of Hua's theorem. In the case of general division rings he gets such an optimal result only for square matrices and gives examples showing that it cannot be extended to the non-square case.

Moving Health Sovereignty in Africa American Mathematical Soc.

This paper quantifies the speed of convergence and higher-order asymptotics of fast diffusion dynamics on Rn to the Barenblatt (self similar) solution. Degeneracies in the parabolicity of this equation are cured by re-expressing the dynamics on a manifold with a cylindrical end, called the cigar. The nonlinear evolution becomes differentiable in H ö lder spaces on the cigar. The

linearization of the dynamics is given by the Laplace-Beltrami operator plus a transport term (which can be suppressed by introducing appropriate weights into the function space norm), plus a finite-depth potential well with a universal profile. In the limiting case of the (linear) heat equation, the depth diverges, the number of eigenstates increases without bound, and the continuous spectrum recedes to infinity. The authors provide a detailed study of the linear and nonlinear problems in H ö lder spaces on the cigar, including a sharp boundedness estimate for the semigroup, and use this as a tool to obtain sharp convergence results toward the Barenblatt solution, and higher order asymptotics. In finer convergence results (after modding out symmetries of the problem), a subtle interplay between convergence rates and tail behavior is revealed. The difficulties involved in choosing the right functional spaces in which to carry out the analysis can be interpreted as genuine features of the equation rather than mere annoying technicalities.

American Mathematical Soc.

The authors consider the Hodge Laplacian \Delta on the Heisenberg group H_n, endowed with a left-invariant and U(n)-invariant Riemannian metric. For 0\le k\le 2n+1, let \Delta_k denote the Hodge Laplacian restricted to k-forms. In this paper they address three main, related questions: (1) whether the L^2 and L^p-Hodge decompositions, 1

American Mathematical Soc.

Many stochastic differential equations (SDEs) in the literature have a superlinearly growing nonlinearity in their drift or diffusion coefficient. Unfortunately, moments of the computationally efficient Euler-Maruyama

approximation method diverge for these SDEs in finite time. This article develops a general theory based on rare events for studying integrability properties such as moment bounds for discrete-time stochastic processes. Using this approach, the authors establish moment bounds for fully and partially drift-implicit Euler methods and for a class of new explicit approximation methods which require only a few more arithmetical operations than the Euler-Maruyama method. These moment bounds are then used to prove strong convergence of the proposed schemes. Finally, the authors illustrate their results for several SDEs from finance, physics, biology and chemistry.

American Mathematical Soc.

For a finite real reflection group W and a W-orbit $\mathcal{O}$ of flats in its reflection arrangement--or equivalently a conjugacy class of its parabolic subgroups--the authors introduce a statistic $\operatorname{noninv}_\mathcal{O}(w)$ on w in W that counts the number of ``$\mathcal{O}$-noninversions'' of w. This generalizes the classical (non-)inversion statistic for permutations w in the symmetric group $\mathfrak{S}_n$. The authors then study the operator $\nu_\mathcal{O}$ of right-multiplication within the group algebra $\mathbb{C} W$ by the element that has $\operatorname{noninv}_\mathcal{O}(w)$ as its coefficient on w.

Shock Waves in Conservation Laws with Physical Viscosity American Mathematical Soc.

The author develops a homology theory for

Smale spaces, which include the basics sets for an Axiom A diffeomorphism. It is based on two ingredients. The first is an improved version of Bowen's result that every such system is the image of a shift of finite type under a finite-to-one factor map. The second is Krieger's dimension group invariant for shifts of finite type. He proves a Lefschetz formula which relates the number of periodic points of the system for a given period to trace data from the action of the dynamics on the homology groups. The existence of such a theory was proposed by Bowen in the 1970s. American Mathematical Soc.

Joseph and Hodges-Levasseur (in the A case) described the spectra of all quantum function algebras on simple algebraic groups in terms of the centers of certain localizations of quotients of by torus invariant prime ideals, or equivalently in terms of orbits of finite groups. These centers were only known up to finite extensions. The author determines the centers explicitly under the general conditions that the deformation parameter is not a root of unity and without any restriction on the characteristic of the ground field. From it he deduces a more explicit description of all prime ideals of than the previously known ones and an explicit parametrization of .

Nonlinear Stability of Ekman Boundary Layers in Rotating Stratified Fluids American Mathematical Soc.

Introduction Statement of the results Mixing time preliminaries Outline of the proof of Theorem 2.1 Random graph estimates Supercritical case Subcritical case Critical Case Fast mixing of the Swendsen-Wang process on trees Acknowledgements Bibliography

Combinatorial Floer Homology American Mathematical Soc.

Let F be a non-Archimedean local field. Let \mathcal{W}_{F} be the Weil group of F and

\mathcal{P}_{F} the wild inertia subgroup of \mathcal{W}_{F}. Let \widehat {\mathcal{W}}_{F} be the set of equivalence classes of irreducible smooth representations of \mathcal{W}_{F}. Let \mathcal{A}^{0}_{n}(F) denote the set of equivalence classes of irreducible cuspidal representations of \mathrm{GL}_{n}(F) and set \widehat {\mathrm{GL}}_{F} = \bigcup _{n\ge 1} \mathcal{A}^{0}_{n}(F). If \sigma \in \widehat {\mathcal{W}}_{F}, let ^{L}{\sigma }\in \widehat {\mathrm{GL}}_{F} be the cuspidal representation matched with \sigma by the Langlands Correspondence. If \sigma is totally wildly ramified, in that its restriction to \mathcal{P}_{F} is irreducible, the authors treat ^{L}{\sigma} as known. From that starting point, the authors construct an explicit bijection \mathbb{N}:\widehat {\mathcal{W}}_{F} \to \widehat {\mathrm{GL}}_{F}, sending \sigma to ^{N}{\sigma}. The authors compare this "na ï ve correspondence" with the Langlands correspondence and so achieve an effective description of the latter, modulo the totally wildly ramified case. A key tool is a novel operation of "internal twisting" of a suitable representation \pi (of \mathcal{W}_{F} or \mathrm{GL}_{n}(F)) by tame characters of a tamely ramified field extension of F, canonically associated to \pi. The authors show this operation is preserved by the Langlands correspondence.
American Mathematical Soc.
Descriptive set theory is mainly concerned

with studying subsets of the space of all countable binary sequences. In this paper the authors study the generalization where countable is replaced by uncountable. They explore properties of generalized Baire and Cantor spaces, equivalence relations and their Borel reducibility. The study shows that the descriptive set theory looks very different in this generalized setting compared to the classical, countable case. They also draw the connection between the stability theoretic complexity of first-order theories and the descriptive set theoretic complexity of their isomorphism relations. The authors' results suggest that Borel reducibility on uncountable structures is a model theoretically natural way to compare the complexity of isomorphism relations.

American Mathematical Soc.

The authors develop elements of a general dilation theory for operator-valued measures. Hilbert space operator-valued measures are closely related to bounded linear maps on abelian von Neumann algebras, and some of their results include new dilation results for bounded linear maps that are not necessarily completely bounded, and from domain algebras that are not necessarily abelian. In the non-cb case the dilation space often needs to be a Banach space. They give applications to both the discrete and the continuous frame theory. There are natural associations between the theory of frames (including continuous frames and framings), the theory of operator-valued measures on sigma-algebras of sets, and the theory of continuous linear maps

between -algebras. In this connection frame theory itself is identified with the special case in which the domain algebra for the maps is an abelian von Neumann algebra and the map is normal (i.e. ultraweakly, or weakly, or w*) continuous.

American Mathematical Soc.

A stationary solution of the rotating Navier-Stokes equations with a boundary condition is called an Ekman boundary layer. This book constructs stationary solutions of the rotating Navier-Stokes-Boussinesq equations with stratification effects in the case when the rotating axis is not necessarily perpendicular to the horizon. The author calls such stationary solutions Ekman layers. This book shows the existence of a weak solution to an Ekman perturbed system, which satisfies the strong energy inequality. Moreover, the author discusses the uniqueness of weak solutions and computes the decay rate of weak solutions with respect to time under some assumptions on the Ekman layers and the physical parameters. The author also shows that there exists a unique global-in-time strong solution of the perturbed system when the initial datum is sufficiently small. Comparing a weak solution satisfying the strong energy inequality with the strong solution implies that the weak solution is smooth with respect to time when time is sufficiently large.

Operator Theory, Operator Algebras, and Applications American Mathematical Soc.

Consider a Hamiltonian action of a compact connected Lie group on a symplectic manifold . Conjecturally, under suitable

assumptions there exists a morphism of cohomological field theories from the equivariant Gromov-Witten theory of to the Gromov-Witten theory of the symplectic quotient. The morphism should be a deformation of the Kirwan map. The idea, due to D. A. Salamon, is to define such a deformation by counting gauge equivalence classes of symplectic vortices over the complex plane . The present memoir is part of a project whose goal is to make this definition rigorous. Its main results deal with the symplectically aspherical case.