Winter 2009
University of Michigan-Department of Mathematics
http://www.math.lsa.umich.edu/seminars/index.shtml
Ann Arbor, MI 48109-1043
March 9th – March 15th

Monday, March 9

3:10-4:00pm **Geometric Function Theory Seminar (Special time/location)** --- Markus Nieß (Kath. Universität Eichstätt-Ingolstadt) *Universal functions and power series* --- 4096 EH
3:10-4:00pm **Topics in Algebraic Geometry Seminar** --- TBA --- 2866 EH
3:10-5:00pm **Group Theory/Lie Theory/Number Theory Seminar** --- Andrew Snowden (Princeton) *A local proof of the local Jacquet-Langlands correspondence* --- 4096 EH
4:10-5:00pm **Student Combinatorics** --- Ryan Kinser (UM) *Möbius functions of posets and applications* --- 3866 EH
4:10-5:00pm **Several Complex Variables and Complex Dynamics Seminar** --- Jasmin Raissy (Universita de Pisa) *Simultaneous linearization in presence of resonances* --- 3096 EH
4:10-6:00pm **Geometry and Physics Seminar** --- TBA --- 4088 EH
5:15-6:30pm **Teaching Mathematics** --- Deborah Ball (UM) *Teachers and Teacher Education: Results from The National Mathematics Advisory Panel Report and Implications for Our Directions at the University of Michigan* --- 3096 EH

Tuesday, March 10

1:00-2:45pm **Algebraic Geometry Seminar (Special Seminar #1)** --- Hélène Esnault (Essen) --- *On abelian birational sections in char.0* **---** 3088 EH
2:10-3:00pm "**What is … " Seminar** --- Joseph Conlon (UM) *What is … stochastic control theory?* --- 3096 EH
2:45-4:30pm **Algebraic Geometry Seminar (Special Seminar #2)** --- Eckart Viehweg (Essen) --- *On Kobayashi geodesics in A_g* **---** 3088 EH
3:10-4:00pm **Algebra Seminar** --- TBA --- 3096 EH
3:10-4:00pm **Geometry Seminar** --- Alexandra Pettet (UM) *Twisting out fully irreducible automorphisms* --- 3866 EH
3:10-4:00pm **Student Seminar in Complex Dynamical Systems** --- TBA --- 4088 EH
4:10-5:00pm **Colloquium ---** Guido Mislin (Ohio State U) **–** *Bounded Cohomology* **---** 1360 EH
4:10-5:00pm **Student AIM Seminar** --- TBA --- 3088 EH

Wednesday, March 11

3:10-4:00pm **Geometric Function Theory Seminar** --- Jani Onninen (Syracuse University) *Dynamics of Quasiconformal Fields* --- 4096 EH
3:10-4:00pm **Student Representation Theory Seminar** --- Jiarui Fei (UM) --- TBA --- 3096 EH
3:10-4:00pm **Student Arithmetic Seminar** --- TBA --- 3088 EH
4:10-5:00pm **RTG Working Seminar in Several Complex Variables and Complex Dynamics** --- TBA --- 3096 EH
4:10-6:00pm **Algebraic Geometry Seminar** --- Alexander Beilinson (U. Chicago) --- *The period determinants on curves* **---** 3088 EH

Thursday, March 12

3:10-4:00pm **Student Algebraic Geometry Seminar (Special Day)** --- Jose Gonzalez (UM) *The cone theorem: a multiplier ideal perspective (continued)* --- Room TBA
3:10-4:00pm **Commutative Algebra Seminar** --- Hailong Dao (University of Kansas) *On injectivity of the map on class groups induced by ring extensions* --- 3096 EH
3:10-4:00pm **Topology Seminar** --- Not meeting this week --- 4088 EH

Thursday, March 12 … continued

3:10-4:00pm **Financial/Actuarial Mathematics Seminar** --- Kostas Kardaras (Boston U) *Numeraire invariant choices in financial modeling and financial equilibria in incomplete markets* --- 3088 EH

4:10-5:00pm **Differential Equations ---** Bin Cheng (UM) *Compressible Euler equations with external forcing* **---** 4088 EH

4:10-5:00pm **Math Club** --- Kevin Wilson (Princeton) *!++* --- 2nd floor Nesbitt Common Room

4:10-6:00pm **RTG Study Seminar** --- TBA --- 3866 EH

Friday, March 13

11:10-12:00pm **Theoretical Computer Science Seminar** --- Yi Li (UM) --- *Succincter* --- CSE 3941

3:10-4:00pm **Applied and Interdisciplinary Mathematics Seminar** --- Ian Hiskens (UM) *Practical Computational Tools for Hybrid Dynamical Systems* --- 1084 EH

3:10-4:00pm **Student Geometry/Topology** --- Cagatay Kutluhan (UM) --- *Another way of studying 3-manifolds* --- 3096 EH

4:10-5:00pm **Combinatorics** --- Alex Yong (UIUC) *Equivariant K-theory of Grassmannians* --- 3866 EH

UPCOMING EVENTS

Graduate Recruitment Weekend
March 20 - March 22, 2009

Departmental External Review
March 22-24, 2009

RTG Workshop on SCV and Geometry
April 10 - April 12, 2009

Ziwet Lectures
John Tyson (Virginia Polytechnic Institute & State University)
April 13-16, 2009

ABSTRACTS FOR THE WEEK OF MARCH 9 – MARCH 15, 2009

Geometric Function Theory Seminar (Special time/location)
Monday, March 9, 3:10-4:00pm
4096 EH
Markus Nieß (Kath. Universität Eichstätt-Ingolstadt)
Universal functions and power series

Roughly speaking, universality means „existence of a dense orbit“. Thus, in some sense, universal functions are „uncontrolled“. More precisely, we are considering functions g having the property that on any „suitable“ set, any „suitable“ function can be approximated by a subsequence of either translations, derivatives or partial sums of the power series expansion of g. The only known explicit functions having such properties are the Riemann Zeta-function and its relatives. This has been discovered by Voronin in 1975. A newer type of universality is linked with famous theorems of Jentzsch from 1917. Given a power series f with radius of convergence 1. He showed that every point on the boundary of the disk of convergence is a so-called limit point of zeros of the partial sums of f.

Group Theory/Lie Theory/Number Theory Seminar
Monday, March 9, 3:10-5:00pm
4096 EH
Andrew Snowden (Princeton)
A local proof of the local Jacquet-Langlands correspondence

The Jacquet-Langlands correspondence is an instance of the Langlands functoriality principle. In its local form, it gives a correspondence between representations of GL(n, F) and those of a division algebra over F, where F is a local field. I will recall what this is in detail, why it is useful and mention some of the existing proofs of it. All existing proofs for n>2 are essentially global in nature. I will then outline a new proof of the correspondence for GL(2), which is purely local and has a chance of generalizing to GL(n). This proof has two steps: The first step is a comparison of the Fourier transforms on M_2(F) and the non-split quaternion algebra over F. The second step shows that this comparison implies the correspondence.

Student Combinatorics
Monday, March 9, 4:10-5:00pm
3866 EH
Ryan Kinser (UM)
Random Graphs
Möbius functions of posets and applications

We will discuss Möbius inversion in a poset and some applications, e.g. homology of simplicial complexes and/or Möbius algebras.

Several Complex Variables and Complex Dynamics Seminar
Monday, March 9, 4:10-5:00pm
3096 EH
Jasmin Raissy (Universita de Pisa)
Simultaneous linearization in presence of resonances

In this talk I shall discuss the linearization problem of germs of biholomorphisms of C^n fixing the origin in presence of resonances. I shall describe certain arithmetic conditions on the eigenvalues of df_O and some restrictions on the resonances implying that such a germ is holomorphically linearizable if and only if there exists an invariant complex manifold with a specific additional structure. Most of the classical linearization results can be obtained as corollaries of this result. Then I shall describe a way to use that result in the problem of simultaneous linearization of germs of biholomorphisms of C^n fixing the origin in presence of resonances.

Teaching Mathematics
Monday, March 9, 5:15-6:30pm
3096 EH
Deborah Ball (UM)
Teachers and Teacher Education: Results from The National Mathematics Advisory Panel Report and Implications for Our Directions at the University of Michigan

In this session, I will give some background on the National Mathematics Advisory Panel Report, on which I served as a member. I will explain the Panel's charge, provide a snapshot of the report's overall headlines, and then focus on what is said in particular about content preparation, professional education, teacher pay, and elementary mathematics "specialists." I will then offer some thoughts about what we are positioned to do to contribute to the improvement of mathematics teacher education here at U-M.

"What is … " Seminar
Tuesday, March 10, 2:10-3:00pm
3096 EH
Joseph Conlon (UM)
What is … stochastic control theory?

Control theory is concerned with the evolution of a dynamical system with parameters (the controls), which are to be optimized to minimize a cost function. The cost function is a function of the present state x of the dynamical system at the present time t, and its evolution up to some terminal time T. The dynamics may be deterministic or stochastic. In the case of deterministic dynamics, the optimal cost function C(x,t) satisfies a first order partial differential equation. In the case of stochastic dynamics it satisfies a second order parabolic PDE. In this seminar I will explain through simple examples how this comes about. I will also explain some connections with the Calculus of Variations and Hamiltonian Mechanics.

Geometry Seminar
Tuesday, March 10, 3:10-4:00pm
3866 EH
Alexandra Pettet (UM)
Twisting out fully irreducible automorphisms

By a theorem of Thurston, in the subgroup of the mapping class group generated by Dehn twists around two curves which _ll, every element not conjugate to a power of one of the twists is pseudo-Anosov. We prove an analogue of this theorem for the outer automorphism group of a free group. This is joint work with Matt Clay (University of Oklahoma).

Colloquium
Tuesday, March 10, 4:10-5:00pm
1360 EH
Guido Mislin (Ohio State U)
Bounded Cohomology

We will discuss various notions of boundedness for the cohomology of a Lie group and we will sketch a proof of a generalization of a theorem due to Gromov concerning the boundedness of primary characteristic classes. Applications to characteristic classes of flat bundles will be presented.

Geometric Function Theory Seminar
Wednesday, March 11, 3:10-4:00pm
4096 EH
Jani Onninen (Syracuse University)
Dynamics of Quasiconformal Fields

This talk will focus on a uniqueness theorem for autonomous systems of ODEs, $\dot{x}=f(x)$, where f is a Sobolev vector field with additional geometric structure, such as delta-monoticity or reduced quasiconformality. The talk is based on joint work with Tadeusz Iwaniec and Leonid V. Kovalev.

Financial/Actuarial Mathematics Seminar
Thursday, March 12, 3:10-4:00pm
3088 EH
Kostas Kardaras (Boston U)
Numeraire invariant choices in financial modeling and financial equilibria in incomplete markets

In this work, a set of very weak axioms is proposed to model consumption choice rules of agents that are numeraire-invariant. We obtain that this corresponds to logarithmic utility maximization, albeit in a stronger sense, under a subjective agent's probability. Further, the question of general equilibrium in an incomplete financial market model is undertaken, where economic agents have numeraire-invariant preferences. The market contains a borrowing and lending account in zero net supply, as well as a stock in positive unit net supply providing certain dividend stream, exogenously specified. A characterization of existence and uniqueness of equilibrium is provided in terms of stochastic differential equations. Importantly, the proposed framework naturally allows for equilibria where assets in positive net supply contain bubbles. This is true even in the case of complete markets with unconstrained acting agents, a fact appearing inconsistent with the traditional "representative agent" framework of asset-pricing theory.

Differential Equations
Thursday, March 12, 4:10-5:00pm
4088 EH
Bin Cheng (UM)
Compressible Euler equations with external forcing

Consider the Cauchy problem of compressible Euler equations coupled with pressure and external forcing: 1. the 2D Shallow Water equations with the Coriolis force; 2. the multi-D Euler-Poisson equations with repulsive/attractive Poisson force. I will discuss how these external forces affect regularity and asymptotics of classical solutions. Several newly developed analytical tools are employed, including critical thresholds, nonlinear invariants for wave interactions, etc. Such approaches take advantage of the specific nonlinear structure of compressible Euler equations, leading to sharper estimates than those obtained using energy methods and Fourier analysis.

Math Club
Thursday, March 12, 4:10-5:00pm
2nd floor Nesbitt Common Room
Kevin Wilson (Princeton)
!++

Like π and e, the numbers n! = n · (n-1) · ··· · 2 · 1 seem to appear everywhere in mathematics. Consequently, it has many interesting properties. For example, suppose a0, a1, … , an are any (n+1) integers. Then Πi<j(ai- aj) is divisible by 0! · 1! · ··· · n!. In his undergraduate thesis Bhargava introduced a generalization of the factorial function that enjoys many similar properties, including the habit of showing up everywhere. In this talk, I will introduce this function and demonstrate some of these properties as well as some of its applications in number theory.

Theoretical Computer Science Seminar
Friday, March 13, 11:10-12:00p
CSE 3941
Yi Li (UM)
Succincter

We can represent an array of n values from {0,1,2} using bits (arithmetic coding), but then we cannot retrieve a single element efficiently. Instead, we can encode every block of t elements using bits, and bound the retrieval time by t. This gives a linear trade-off between the redundancy of the representation and the query time. In fact, this type of linear trade-off is ubiquitous in known succinct data structures, and in data compression. The folk wisdom is that if we want to waste one bit per block, the encoding is so constrained that it cannot help the query in any way. Thus, the only thing a query can do is to read the entire block and unpack it. We break this limitation and show how to use recursion to improve redundancy. It turns out that if a block is encoded with two bits of redundancy, we can decode a single element, and answer many other interesting queries, in time logarithmic in the block size. Our technique allows us to revisit classic problems in succinct data structures, and give surprising new upper bounds. We also construct a locally-decodable version of arithmetic coding.

Applied and Interdisciplinary Mathematics Seminar
Friday, March 13, 3:10-4:00pm
1084 EH
Ian Hiskens (UM)
Practical Computational Tools for Hybrid Dynamical Systems

Analytical investigations of real-world, hybrid dynamical systems are technically challenging. Consequently, simulation plays a vital role in their analysis. Simulation typically addresses forward problems though, offering limited insights into parametric influences. The talk will address this issue, presenting computationally efficient algorithms that extend the capabilities of simulation. The starting point is a model that captures the intricacies of hybrid systems, yet is suited to numerical integration. It will be shown that trajectory sensitivities are well defined for hybrid systems, and can be computed efficiently. These sensitivities allow the mapping of parameter uncertainty into approximate error bounds on nominal (piecewise smooth) trajectories. Furthermore, they provide gradient information that facilitates the solution of inverse problems. A range of algorithms will be presented, including shooting methods for locating (possibly non-smooth) limit cycles and grazing phenomena, and optimization algorithms for parameter estimation and controller tuning. Illustrations will be drawn from various application areas.

Student Geometry/Topology
Friday, March 13, 3:10-4:00pm
3096 EH
Cagatay Kutluhan (UM)
Another way of studying 3-manifolds

I will talk about some applications of Floer homology to the topology of 3-manifolds. I will start with the notion of Morse homology, with which perhaps the audience is more familiar, and then I will describe the common framework of Floer homologies by establishing analogy with Morse homology. In particular, I will focus on one type of Floer homology, so-called monopole Floer homology.

Combinatorics
Friday, March 13, 4:10-5:00pm
3866 EH
Alex Yong (UIUC)
Equivariant K-theory of Grassmannians

The combinatorics of the cohomology ring of Grassmannians has long been known to be governed by the Littlewood-Richardson rule, which was (re)formulated and proved by Schützenberger in the 1970's via the theory of jeu de taquin. I'll describe our recent extensions of his rule to equivariant cohomology and (separately) to K-theory. Then I'll give a conjectural unification to equivariant K-theory. This is joint work with Hugh Thomas.