### Monday, November 20, 2017

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<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker &amp; Details</th>
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<tr>
<td>4:00pm-5:00pm</td>
<td>Complex Analysis, Dynamics and Geometry -- William Floyd (Virginia Tech) <em>Realizing Thurston maps as subdivision maps</em> -- 3096 East Hall</td>
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<tr>
<td>4:00pm-6:00pm</td>
<td>Geometry &amp; Physics -- Dmitry Zhakarov (Central Michigan) <em>Effective calculations in the tautological ring of curves</em> -- 4096 East Hall</td>
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<td>4:00pm-5:00pm</td>
<td>Integrable Systems and Random Matrix Theory -- Lu Wei (University of Michigan-Dearborn) <em>On the exact moments of von Neumann entropy of quantum bipartite systems</em> -- 1866 East Hall</td>
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<td>4:00pm-5:00pm</td>
<td>Student Combinatorics Seminar -- Various People (University of Michigan) <em>Bring Your Work to Work Day!</em> -- 3866 East Hall</td>
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<tr>
<td>4:10pm-5:30pm</td>
<td>Group, Lie and Number Theory -- Leo Goldmakher (Williams College) <em>The unreasonable effectiveness of the Polya-Vinogradov inequality</em> -- 4088 East Hall</td>
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<td>3:00pm-4:00pm</td>
<td>Student Geometry/Topology -- Bradley Zykoski (University of Michigan) <em>An Introduction to Khovanov Homology</em> -- 1866 East Hall</td>
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Abstracts for the week of November 19th, 2017 - November 25th, 2017

Complex Analysis, Dynamics and Geometry
Monday, November 20, 2017, 4:00pm-5:00pm
3096 East Hall
William Floyd (Virginia Tech)

Realizing Thurston maps as subdivision maps

A Thurston map is an orientation-preserving branched cover of the 2-sphere with finitely many postcritical points. We are interested in the problem of determining when a Thurston map \( f \) (or a sufficiently large iterate of \( f \)) is the subdivision map of a finite subdivision rule. Earlier work on this by Bonk-Meyer and by Cannon-Floyd-Parry gave an affirmative answer for sufficiently large iterates of an expanding Thurston map. I'll discuss more recent progress, both for realizability and for nonrealizability. This is joint work with Walter Parry and Kevin Pilgrim.

Geometry & Physics
Monday, November 20, 2017, 4:00pm-6:00pm
4096 East Hall
Dmitry Zhakarov (Central Michigan)

Effective calculations in the tautological ring of curves

The Deligne-Mumford moduli space \( \mathcal{M}_{g,n} \) of marked stable curves of genus \( g \) has been the subject of a large body of work, however, its intersection theory is far from being completely understood. Most recent work has been focused on describing the so-called tautological ring of \( \mathcal{M}_{g,n} \), defined by a natural collection of classes in the Chow or cohomology rings. Recently, two large collections of tautological relations were found, both conjectured by Pixton: the 3-spin relations, proved by Janda, Pandharipande, Pixton and Zvonkine, and the double ramification relations, proved by Clader and Janda. I will show how these relations can be used to effectively find boundary formulas for tautological classes of sufficiently high codimension. This is joint work with Clader, Grushevsky, Janda and Wang.
Integrable Systems and Random Matrix Theory  
Monday, November 20, 2017, 4:00pm-5:00pm  
1866 East Hall  
Lu Wei (University of Michigan-Dearborn)  
*On the exact moments of von Neumann entropy of quantum bipartite systems*

It was recently conjectured by Vivo, Pato, and Oshanin (Phys. Rev. E 93, 052106 (2016)) that for a quantum system of Hilbert dimension $mn$ in a pure state, the variance of the von Neumann entropy of a subsystem of dimension $m \leq n$ is given by

$$-\psi_1(mn+1)+\frac{m+n}{mn+1}\psi_1(n)-\frac{(m+1)(m+2n+1)}{4n^2(mn+1)},$$

where $\psi_1(\cdot)$ is the trigamma function. We give a proof of the above formula in this talk. We also discuss some possible approaches to obtain the exact higher moments.

Student Combinatorics Seminar  
Monday, November 20, 2017, 4:00pm-5:00pm  
3866 East Hall  
Various People (University of Michigan)  
*Bring Your Work to Work Day!*

Several students will give short presentations about topics related to combinatorics.
The Polya-Vinogradov inequality, an upper bound on character sums proved a century ago, is essentially best-possible. Unfortunately, it's also not so useful in applications, since it's nontrivial only on long sums (while in practice one usually needs estimates on sums which are as short as possible). The best tool we have to handle shorter sums is the Burgess bound, discovered in 1957; this is generally considered to supersede Polya-Vinogradov, both because its proof is "deeper" (building on results from algebraic geometry) and because it is more applicable.

In this talk I will introduce and motivate both of these bounds, and then describe the unexpected result (joint with Elijah Fromm, Williams ’17) that even a tiny improvement of the (allegedly weaker) Polya-Vinogradov inequality would imply a major improvement of the (supposedly superior) Burgess bound. I'll also talk about a related connection between improving Polya-Vinogradov and the classical problem of bounding the least quadratic nonresidue (joint with Jonathan Bober, University of Bristol).

This talk is intended as an introduction to Khovanov homology. I will emphasize the important role played by TQFT, the relationship between Khovanov homology and the Jones polynomial, and some applications, including Rasmussen’s s-invariant.