Symmetric Functions Comps Gala

Next week, the three groups in the Combinatorics of Symmetric Functions comps seminar will be presenting their talks. Even more exciting, this will coincide with a visit to campus by Distinguished Research Visitor Sami Assaf, a C.L.E. Moore Instructor at M.I.T. and an expert in symmetric functions. The talks by Sami and the three comps groups will take place over two days. All of the talks will be in Olin 141, and dinner will be provided on Thursday for gala attendees. Here are the schedule and abstracts:

Plane Partitions
Speakers: Amy Becker, Lilly Betke-Brunswick, and Anna Zink, Carleton College
Time: Wednesday, May 11, 4:00-4:50 PM

Are you moving? Need help stacking your boxes in a corner? Our comps talk is the place for you. Plane partitions are just stacked boxes, but we will discuss the deep and exciting connections between plane partitions and symmetric functions. This includes using Schur functions and semi-standard Young tableaux to create generating functions for plane partitions. So pack your boxes and join us to learn more!

Dual Equivalence and Schur Positivity
Speaker: Sami Assaf, M.I.T.
Time: Wednesday, May 11, 5:00-5:50 PM

A quintessential problem in algebraic combinatorics is to prove that a given function is symmetric and Schur positive. An ideal solution to such a problem is to prove that the Schur coefficients count some explicit set of combinatorial objects. For example, the coefficient of a Schur function in a complete homogeneous symmetric function is the number of semi-standard Young tableaux with a given shape and weight. In this talk, we will show how to use the combinatorics of dual equivalence to find a combinatorial description of the Schur coefficients of a quasi-symmetric function. This talk will be application-driven, with the main application a derivation of the Schur expansion of Haglund’s quasi-symmetric expansion of the Macdonald polynomials.

An Open Problem in the Combinatorics of Macdonald Polynomials
Speakers: Gabe Davis, Aaron Maurer, and Julie Michelman, Carleton College
Time: Thursday, May 12, 4:00-4:50 PM

Macdonald polynomials are a class of polynomials with a certain nice symmetry. Although this symmetry has been proven algebraically, a combinatorial proof remains elusive. Such a proof would generalize known results about permutations in a two-dimensional way. We have found a combinatorial proof in a special case; in this talk we will describe our proof and discuss the problems that remain.

3+1-Free Posets and the Chromatic Symmetric Function
Speakers: Mary Bushman, Alex Evangelides, Nathan King, and Sam Tucker, Carleton College
Time: Thursday, May 12, 5:30-6:20 PM

In 1995, Richard Stanley made a conjecture about graphs and colorings which has mystified mathematicians ever since. We investigated different approaches people have taken to this conjecture using combinatorial techniques and facts about symmetric functions. In this talk we will introduce Stanley’s conjecture and describe two works which provide partial progress on the problem, as well as avenues of attack.
Going Green

In an effort to produce less waste, the Math Department will not be providing individually packaged drinks at future departmental functions. Instead, bring your own beverage in one of our cool new departmental water bottles! If you were at the Meet the New Majors event last week you probably already have one, but if you weren’t, stop by Deanna’s office and pick one up. These are exclusively for our departmental majors!

Math Jokes of the Week

Math majors love them! Humanities majors love them also! (Or so they tell me while slowly backing away, smiling nervously.) What are they? Hilarious math jokes, that’s what they are!

A set of smooth functions threw a party, and everyone was invited. They had great games set up like limbo (for the functions with horizontal asymptotes) and pin the delta on the epsilon. But sad little $e^x$ was sitting by herself, alone in the corner. Her close friend $e^{2x}$ came over and said to $e^x$, “Go over and integrate yourself into the crowd,” to which $e^x$ replied, sobbing, “It won’t make a difference!”

A math professor (certainly not at Carleton) is lecturing through a long and complicated proof. At one point, he says “It is obvious that Equation 32 follows from 31.” A student towards the back of the lecture hall asks “How is that obvious?” The professor looks back at the blackboard, starts to speak, and then falls silent as a look of costernation falls across his face. After ten minutes of silent pondering, he erases three blackboards and manically fills them with equations, derivations, and other expressions. After another half-hour of furious scribbling, he exclaims “AHA! It IS obvious!”

Q: What do you get when you cross a mountain climber with a mosquito?
A: Nothing; you can’t cross a scalar with a vector!

PROBLEMS OF THE WEEK

1. Early in the baseball season, players’ batting averages fluctuate considerably. For example, if your average after four official at-bats is .250 (because you got one hit), your next official at-bat will change this average by 150 points for the better or by 50 points for the worse, depending on whether or not you get a second hit. Suppose that as the result of an at-bat, a player’s average (rounded, as always, to three decimal places) went down by exactly 10 points. What are (theoretically) the smallest and the largest number of official at-bats that the player could have had after that particular at-bat?

2. Consider the circle $x^2 + y^2 = 1$. Note that $F_1(t) = (\cos t, \sin t), -\infty < t < \infty$ traces the circle infinitely many times, while $F_2(t) = \left( \frac{1-t^2}{1+t^2}, \frac{2t}{1+t^2} \right), -\infty < t < \infty$ traces the circle exactly once except for the point $(-1,0)$.

Now for the problem: Find rational functions (quotients of polynomials) $f(t), g(t)$ such that $F_3(t) = (f(t), g(t)), -\infty < t < \infty$ traces the circle exactly twice, with the possible exception of one point.

Frank Firke solved the first problem posed April 22, and Justin Troyka solved the first problem from last week; Justin should stop by CMC 217 some time to collect a B.B.O.P. item. No word yet on last week’s second problem…

- Mark Krusemeyer

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