



Department of
Mathematical Sciences

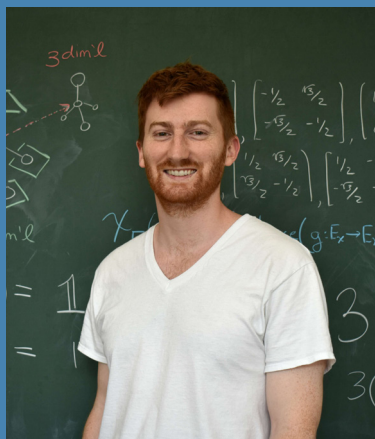
Colloquium

Alex Heaton

Postdoctoral Researcher

Max Planck Institute for Mathematics in Science

Friday,
Oct 4, 2019
EMS Building
Room E495
2:00 pm



Alex Heaton

UW-Milwaukee
Department of
Mathematical Sciences

EMS Building, Room E403
3200 North Cramer Street
Milwaukee, Wisconsin 5321
414-229-4836
math-staff@uwm.edu

An SOS Counterexample to an Inequality of Symmetric Functions

It is known that differences of symmetric functions corresponding to various bases are nonnegative on the nonnegative orthant exactly when the partitions defining them are comparable in dominance order. Special cases of these inequalities go back to Maclaurin, Newton, and Schur, for example. The only exception is the case of homogeneous symmetric functions where it is only known that dominance of the partitions implies nonnegativity of the corresponding difference of symmetric functions. It was conjectured by Cuttler, Greene, and Skandera in 2011 that the converse also holds, as in the cases of the monomial, elementary, power-sum, and Schur bases. In this talk, we describe a counterexample, showing that homogeneous symmetric functions break the pattern. We use a semidefinite program to find a positive semidefinite matrix whose factorization provides an explicit sums of squares decomposition of the polynomial $H_{44} - H_{521}$ as a sum of 41 squares. This certificate of nonnegativity disproves the conjecture, since a polynomial which is a sum of squares of other polynomials cannot be negative, and since the partitions 44 and 521 are incomparable in dominance order. This is joint work with Isabelle Shankar of UC-Berkeley.

Light refreshments will be served at 1:30pm in E424A.



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