Spring 2019 Undergraduate Seminar

Department of Mathematics

Volume of polytopes via power series

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Date: Tuesday, April 9

Time: 12:00 - 12:50 pm

Location: Room 703, Thackeray Hall

Hopefully we know that $\sum_{i\geq 0} x^i = \frac{1}{1-x}$. Similarly one computes that $\sum_{i\leq 1} x^i = \frac{x^2}{x-1}$. Interestingly, $\frac{1}{1-x} + \frac{x^2}{x-1} = 1 + x$ which is the sum corresponding to the integers in the interval $[0, 1] = [0, \infty] \cap [-\infty, 1]$. We will explain generalization of this (called Brion's theorem) to integer points in convex polytopes of arbitrary dimension. Surprisingly, this gives a formula for the volume of a polytope in terms of summing up certain rational functions associated to vertices of the polytope. We also discuss related theorems of Lawrence-Varchenko and Brianchon-Gram about characteristic function of a convex polytope. Food and drinks will be provided!

Kiumars obtained his Bachelor in Mathematics from Sharif University of Technology (Tehran, Iran). He got his PhD from University of Toronto with Askold Khovanskii (which makes him mathematical grandson of legendary Vladimir Arnold). He works in combinatorial algebraic geometry exploring connections between algebraic geometry and combinatorics and convex geometry. He has never been pied in the face (so far).

SPEAKER(S) FOR NEXT WEEK:

Dr. Reza Pakzad

Organized by: Derek Orr, Tom Everest, Jeremiah Morgan, and Jeff Wheeler