THE UNIVERSITY   **OF HONG KONG**

Institute of Mathematical Research
Department of Mathematics

Geometry Seminar

Why do matrices commute? Algebraic geometry meets statistical mechanics

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Abstract

The matrix equation $M^2 = 0$ implies the linear equation $Tr(M) = 0$, even though a linear equation can't be derived algebraically from quadratics. Are there similar secret equations implied by $XY = YX$?

This question was posed in the '80s, and still nobody knows. Even the (normalized) volume of this space $\{(X, Y) : XY = YX\}$ is very difficult to compute for large matrices, and until recently was only known to start 1, 3, 31, 1145.

I'll talk about a bunch of related spaces of matrices, some of which are provably harder and some easier to understand than the commuting scheme $\{(X, Y) : XY = YX\}$, and the volumes of these spaces. Then I'll explain how physicists came up with the same set of numbers from a statistical mechanical model (making them much easier to compute), and why they are indeed the same.

Some of this work is joint with Paul Zinn-Justin.

Date: October 10, 2011 (Monday)

Time: 4:00 – 5:00pm

Place: Room 210, Run Run Shaw Bldg., HKU

All are welcome