TEXAS ★ STATE
MATHEMATICS

Differential Equations and Applied Math Seminar

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12-1pm February 3rd, 2023

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Title: Furstenberg Theorem and its generalizations

Abstract: Let us consider the growth rate of the norm of a power of a 2×2 matrix. Asymptotically it will either grow exponentially fast (hyperbolic case), or polynomially, or will not grow at all (elliptic case). What if one takes two matrices and starts to multiply them in a random order? Is the growth rate of the norm of such random products going to be well defined, and what one can say about it? It turns out that even if both of the matrices are elliptic, the random products most likely will grow exponentially fast, unless in an extremely degenerate case (e.g. when both matrices are rotations). Formal statement about positivity of an exponential growth rate (Lyapunov exponent) in this setting is a famous Furstenberg Theorem on random matrix products. In a series of works with Victor Kleptsyn we obtained a few generalizations of this result. For example, even if each matrix in a random product is chosen with respect to its own distribution, one can still ensure that the norms of the random product will grow exponentially fast, with a well define non-random pattern of growth, which can be considered as a non-stationary version of Lyapunov exponent.

Interested faculty, graduate and undergraduate students are encouraged to attend.