JOINT MATH SEMINAR SERIES

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Empowering New York Gender Minority Mathematicians

SPEAKERS

Linda Keen (CUNY)

Siddhi Krishna (Columbia)

14 | APR

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At Stony Brook University

SCGP Room 102

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Linda Keen

Title: Dynamics of some interesting families of complex analytic functions.

Abstract:

We are going to look at the beginnings of a general program in complex dynamics to understand spaces of transcendental maps with finitely many singular values. They are the points over which the map is not a local homeomorphism. As we shall see in the talk, they control any stable periodic behavior. A fairly complete theory was first worked out for rational functions, but transcendental functions may have a new kind of singularity for which the rational analysis fails, asymptotic values, such as 0 and ∞ for e^z, where the branching is infinite.

The first interesting case is the relatively simple family, $\mathcal{F}_2$, of transcendental maps with exactly two asymptotic values *and no critical values.* $\mathcal{F}_2$ is to general transcendental maps what rational maps of degree 2 are to general rational maps, and just as understanding degree 2 rational maps was an essential first step in understanding rational maps, $\mathcal{F}_2$ is a good starting point for transcendental maps.

We will begin by briefly reviewing the story for rational maps of degree 2 and see how the story changes as we move to some well studied examples from $\mathcal{F}_2$: $e^z + c$, which is the analogue of $z^2 + c$, and $\lambda \tan z$ with its two *finite, symmetric* asymptotic values $\pm\lambda i$. This is work beginning in the '80s by, among others, Devaney, Goldberg, Rempe and Schleicher for $e^z + c$ and Devaney, W. Jiang, Keen and Kotus for $\lambda tan(z)$.

We turn then to more recent work, joint with Tao Chen, Nuria Fagella and Yunping Jiang, on isolating new subfamilies of $\mathcal{F}_2$ that show how the phenomena we saw in the examples recur and combine in interesting new ways. The art here, as shall be seen, is how one chooses to constrain the singular values.

Siddhi Krishna

Title: Unknot detection through the ages

Abstract:

Knot theory is a rich subject which ties together many areas, including topology, geometry, representation theory, and others. Knot invariants assign some auxiliary object (e.g. a surface, 3-manifold, 4-manifold, polynomial, vector space, group, etc) to a knot, such that the auxiliary object is independent of how the knot is presented. The simplest knot is called the unknot, and a foundational question within low-dimensional topology is "which knot invariants detect the unknot?" In this talk, I'll survey various answers to this question over the past 60 years, ranging from the algebraic, to the topological, to the computational. I will not assume any background in low-dimensional topology for this talk -- all are welcome!