Mathematics Colloquium

Universality for roots of derivatives of entire functions of Biological Systems

David Renfrew
Binghamton University

Friday, October 24, 2025
11:10 am – 12 pm
Building 38, Room 219

Abstract

We show for a large class of entire functions, f, that after proper rescaling, on compact sets, the derivatives of f converge to cosine, in particular their roots become evenly spaced. This proves a conjecture of Farmer and Rhoades [Trans. Amer. Math. Soc., 357(9):3789–3811, 2005] and Farmer [Adv. Math., 411:Paper No. 108781, 14, 2022] for our class of entire functions. A main ingredient of our proof is to show that high derivatives of high degree polynomials behave like Hermite polynomials, which we prove using the techniques from the newly developed field of finite free probability. This is joint work with Andrew Campbell and Sean O'Rourke.

About the speaker: David Renfrew graduated for Cal Poly, San Luis Obispo in 2008, and from UC Davis, with a Ph.D. in applied math in 2012. His Ph.D. advisor was Sasha Soshnikov. He is currently an Associate Prof. at Binghamton University, and is interested in Random Matrix Theory, as well its applications to Free Probability and analytic function theory.