Mathematics Research Experience for Undergraduates at Amherst College, Summer 2022

Description: Rob Benedetto invites two Amherst College students who are US citizens or permanent residents to work with him for 8 weeks in Summer 2022 on a Mathematics REU (Research Experience for Undergraduates) project. The focus of the project will be certain topics in Arithmetic Dynamics, a subfield of Number Theory.

Dates: Monday, June 13 to Friday, August 5. The first two weeks will be spent learning relevant background material, and the rest will be devoted to research.

Funding and Housing: Participants will be paid a stipend of $600 per week for the 8 weeks ($4,800 total), plus funds to pay for the cost of a dorm room and meal plan on campus. Participants must apply for Amherst College housing themselves.

Prerequisites: Participants must have taken, and demonstrated strong ability in, Math 350 (Groups, Rings and Fields) before the start of the project. Preference will be given to students who have also done well in other courses in pure mathematics, especially at the 300-level or higher.

Eligibility: This project will be funded by the National Science Foundation (NSF). NSF funding rules for REU projects state that participants must be US citizens or permanent residents, and must be current undergraduate students (e.g., no 2022 graduates). The program is a full-time commitment (40 hours per week). Women and students from under-represented minority groups are encouraged to apply.

To apply: Email Prof. Benedetto at rlbenedetto@amherst.edu providing:

1. An unofficial transcript (e.g., print-to-PDF of your online transcript), and

2. The names of two Amherst math professors (or former Amherst math professors) you have taken courses from or worked closely with. (No rec letters required.)

If there is a math professor at another institution who knows your abilities better, you may ask that outside math professor to send Prof. Benedetto a recommendation letter. (Note: again, no rec letters are needed from Amherst math professors.)


Accepted applicants will have until Friday, March 4, 2022 to accept or decline their offers.

Topic: Let \( f(x) \in \mathbb{Q}[x] \) be a polynomial of degree \( d \geq 2 \) with rational coefficients, and let \( a \in \mathbb{Q} \). What is the smallest field that contains all \( d \) points of the inverse image \( f^{-1}(a) \)? What about the \( d^2 \) points in the second inverse image \( f^{-2}(a) \)? And in general, what can we say about the smallest field \( K_n \) containing all \( d^n \) points of \( f^{-n}(a) \)? One key object of interest is the Galois group \( G_n \) associated with the field \( K_n \). The group \( G_n \) permutes the \( d^n \) elements of \( f^{-n}(a) \). A central aim of this project will be to understand how \( G_n \) acts on these \( d^n \) elements in various special cases.