

CHRISTOPHER KEYES

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RESEARCH INTERESTS

Broad: number theory, arithmetic statistics, arithmetic geometry
Specific: higher degree points on curves, local solubility in families of varieties, local global principles, counting field extensions, modular curves, stacky curves

APPOINTMENTS

King's College London

2023 – current Heilbronn Research Fellow, Department of Mathematics

EDUCATION

Emory University

2023 Ph.D., Mathematics
Thesis title: *Topics in arithmetic statistics*
Advisor: David Zureick-Brown

2021 M.S., Mathematics

Tufts University

2018 B.S., Mathematics and Chemical Engineering, *Summa Cum Laude*
Senior honors thesis: *Growth of points on hyperelliptic curves*, Highest Honors.

PUBLICATIONS AND PREPRINTS

Preprints

5. Fields generated by points on superelliptic curves (joint with Lea Beneish). Submitted. ([preprint](#))

Publications

4. On the density of locally soluble superelliptic curves (joint with Lea Beneish). *Finite Fields and Their Applications*, Volume 85, Article 102128, 2023. ([journal](#), [preprint](#))
3. Mertens' theorem for Chebotarev sets (joint with Santiago Arango-Piñeros and Daniel Keliher). *International Journal of Number Theory*, Volume 18, Issue 8, 2022, pp. 1823-1842. ([journal](#), [preprint](#))
2. Growth of points on hyperelliptic curves. *Journal de Théorie des Nombres de Bordeaux*, Volume 34, Issue 1, 2022, pp. 271-294. ([journal](#), [preprint](#))
1. Bounding the number of arithmetical structures on graphs (joint with Tomer Reiter). *Discrete Mathematics*, Volume 344, Issue 9, 2021. ([journal](#), [preprint](#))

¹Updated January 28, 2024

GRANTS AND AWARDS

- 2024 BIRS Research in Teams workshop, for collaboration with Lea Beneish on [explicit local solubility and applications](#)
- 2023 Graduate Student Research Award, Emory University Math Department
- 2023 Marshall Hall Award for Outstanding Teaching, Emory University Math Department
- 2018 Ralph S. Kaye Memorial Prize, Tufts University Math Department
- 2018 Benjamin G. Brown Scholarship for Promise in Scientific Research, Tufts University
- 2017 Tufts Summer Scholars, Tufts University
- 2017 Class of 1898 Prize for Scholarly Ability and Intellectual Interest, Tufts University
- 2016 Stern Term Scholarship, Tufts University
- 2016 Karno Dean's Award for Academic Excellence and Leadership, Tufts University
- 2016 Honorable Mention, Mathematical Contest in Modeling
- 2014 National Merit Scholarship

INVITED TALKS

- 13. *TBD*. Number Theory Seminar, University of Cambridge, February 20, 2024.
- 12. *Explicit local solubility in families of varieties*. KCL Internal Number Theory Seminar, King's College London, November 30, 2023.
- 11. *Explicit local solubility in families of varieties*. Linfoot Seminar, University of Bristol, November 29, 2023.
- 10. *Local solubility in families of superelliptic curves*. UNT Algebra Seminar, University of North Texas, September 15, 2023.
- 9. *Local solubility in families of superelliptic curves*. UCI Number Theory Seminar, UC Irvine, January 19, 2023.
- 8. *Local solubility in families of superelliptic curves*. AMS Special Session on Arithmetic Statistics, Joint Math Meetings, January 6, 2023.
- 7. *Local solubility in families of superelliptic curves*. Number Theory Seminar, UC San Diego, November 21, 2022.
- 6. *Local solubility in families of superelliptic curves*. Number Theory Seminar, The Ohio State University, November 21, 2022.
- 5. *Local solubility in families of superelliptic curves*. Number Theory Seminar, University of Georgia, November 2, 2022.
- 4. *Local solubility in families of superelliptic curves*. Arithmetic Geometry and Number Theory Seminar, UC Berkeley, October 24, 2022.
- 3. *Local solubility in families of superelliptic curves*. Algebra, Geometry, and Number Theory Seminar, University of South Carolina, April 8, 2022.
- 2. *On the proportion of everywhere locally soluble superelliptic curves*. Secret AGeNTS, Tufts University (held virtually), November 18, 2021.
- 1. *Fields generated by points on superelliptic curves* (joint talk with Lea Beneish). UW Number Theory Seminar, University of Washington (held virtually), June 8, 2021.

CONTRIBUTED TALKS

8. *Local solubility in families of superelliptic curves*. Connecticut Number Theory Conference (CTNT), University of Connecticut, June 10, 2022.
7. *On the proportion of everywhere locally soluble superelliptic curves*. Upstate Number Theory Conference, Union College, October 23, 2021.
6. *Fields generated by points on superelliptic curves*. Young Researchers in Algebraic Number Theory (Y-RANT), University of Bristol (held virtually), August 19, 2021.
5. *Mertens' product theorem for primes in Chebotarev sets*. Front Range Number Theory Day, held virtually, April 24, 2021.
4. *An upper bound for the number of arithmetical structures on a graph*. Mid-Atlantic Seminar on Numbers (MASON) V, held virtually, March 27, 2021.
3. *An upper bound for the number of arithmetical structures on a graph*. Palmetto Joint Arithmetic, Modularity, and Analysis Series (PAJAMAS), University of South Carolina, December 6, 2020.
2. *Growth of points on hyperelliptic curves*. Tufts Undergraduate Research Symposium, Tufts University, May 3, 2018.
1. *Growth of points on hyperelliptic curves*. Palmetto Number Theory Series (PANTS) XXVIII, University of Tennessee Knoxville, September 17, 2017.

TEACHING EXPERIENCE

Emory University

- 2020 – 2021 Instructor of record, Math 111 Calculus I, 2 sections, 68 students total
- 2019 – 2020 Teaching Assistant, Math 221 Linear Algebra, 4 sections, 104 students total
- 2018 – 2019 Grader, Math 250 Foundations of Mathematics, 3 sections
- Spring 2019 Grader, Math 212 Differential Equations
- Fall 2018 Grader, Math 328 Number Theory
- 2018 – 2019 Tutor, weekly calculus workshops

Tufts University

- 2017 – 2018 Tutor, various courses including mathematical modeling, linear algebra, discrete mathematics, differential equations, calculus I - III

ORGANIZATION

Seminars

- 2020 – 2023 Co-organizer of *RANT*, Emory's weekly graduate student seminar in algebra and number theory, with Alexis Newton ([seminar website](#))
- Spring 2023 Co-organizer of *Geometric Arithmetic Statistics at Emory Seminar (GASES)*, with Santiago Arango Piñeros and David Zureick-Brown ([seminar website](#))
- Fall 2023 Co-organizer of *Emory ARithmetic Statistics Student Seminar (EARSSS)*, with Santiago Arango Piñeros and David Zureick-Brown ([seminar website](#))

Emory Math Directed Reading Program

Created and organized a directed reading program matching undergraduates with graduate students to read and discuss a mathematical text, serving 46 students total (Spring 2021 – Spring 2023). See [this webpage](#).

Total of 9 students mentored in multiple topics:

Spring 2023 *Clutch hitting*, Aileen He
Spring 2022 *Sports analytics*, Ezra Arovas
Fall 2021 *Elliptic curves*, 3 students
Spring 2021 *p-adic numbers*, 4 students

OUTREACH

Julia Robinson Math Festival

Co-organized (with Riti Bahl) math exploration event at Emory University on August 27, 2022, attended by about 150 middle and high school students and their families. Responsibilities included selecting and preparing activities, recruiting 15 volunteers, and leading volunteer training on the day of the festival.

Math Circle

Worked as an instructor with [Emory Math Circle](#) to plan and lead math exploration activities for middle and high school students in the Atlanta community.

2022 – 2023 Instructor, Emory Math Circle, High School Level B, 2 semesters, 52 students total
2021 – 2022 Instructor, Emory Math Circle, High School Level A, 2 semesters, 30 students total
2019 – 2020 Instructor, Emory Math Circle, Middle School Level C, 3 semesters, 91 students total
Summer 2019 Assistant, Emory Math Circle Week of Mathematical Exploration
Fall 2018 Instructor, Emory Math Circle, Middle School Level A, 25 students

Other Outreach Activities

Spring 2022 Staff writer for *Learning Through the Ranks* at [MAA's Math Values Blog](#)
Fall 2021 Staff writer, [AMS grad blog](#)
2015 – 2017 Fellow, Tufts STOMP

PROFESSIONAL SERVICE

Refereeing

- Advances in Mathematics
- Journal of the American Mathematical Society (quick opinion)
- Mathematics of Computation
- Nagoya Mathematical Journal
- Philosophical Transactions of the Royal Society A
- Research in the Mathematical Sciences

Reviews

- MathReviews

COMPUTING

Familiar with Sage, Magma, Python, C++, MATLAB