

Kairi Giovanna Black

[my website](#)

Duke University, Department of Mathematics, Campus Box 90320, Durham, NC, 27708

Office: Gross Hall, Room 304B

Email: kairi.black@duke.edu

Pronouns: she, they

Citizenship: USA

Research Interests

I study postsecondary math pedagogy with particular interests in mathematical well-being, metacognition, embodied knowledge in mathematics, and teacher education. My mathematics dissertation work lies at the interface of analytic and algebraic number theory, so I also enjoy number theory as an opportunity for student engagement.

Education

2020 – 2025 PhD in Mathematics, Duke University, Durham, USA

- Thesis: *A refinement of the Stark conjectures over ATR fields* (advised by Samit Dasgupta)

2016 – 2020 Honors BS in Mathematics with highest distinction, University of Utah, Salt Lake City, USA

- Thesis: *Modularity and Fermat's Last Theorem* (advised by Stefan Patrikis)

Summer 2019 Budapest Semesters in Mathematics, Budapest, Hungary

Coursework: - Teaching college mathematics, teaching diverse learners, college teaching practice & observation
- Software practice, data structures and algorithms, advanced algorithms, theory of gerrymandering

Certificates: (2025) *Certificate in AI for Higher Education*, Digital Education Council

(2025) *Certificate in College Teaching*, Duke University

(2023) *Data Science Boot Camp*, Erdős Institute (I created [four Tableau dashboards](#) for a descriptive statistical analysis of the 2020 “Healthy Minds Study” survey of 90,000 U.S. undergraduates)

Honors & Awards

Fall 2025 *Bass Instructional Fellowship*, Duke University (\$15,937 to implement a course of my own design)

August 2024 *Teaching Excellence*, math graduate student award, Duke University

January 2024 *Professional Development Grant*, Duke University (\$2000 for [Mentoring in Math](#) activities)

August 2023 *Teaching Excellence*, math graduate student award, Duke University

Peer-reviewed Conference Proceedings

- [6] **Black, K.** (in press). If (critical) love is an answer, what is the (research) question? *Proceedings of the 28th Annual Conference on RUME*. (11 pages). SIGMAA on RUME.
- [5] **Black, K.**, Cristobal, J., Hagman, J., Fantin-Hardesty, K., Smith, W., & Tremaine, R. (in press). Tugging on Threads: A Loving Self-Critique of our (white) Comforts. *Proceedings of the 28th Annual Conference on RUME*. (9 pages). SIGMAA on RUME.
- [4] Benedict, J., Tremaine, R., **Black, K.**, Hagman, J., Kress, N., McNeil, R., & Pai, L. (in press). When We Say “Rigor” in Undergraduate Mathematics, What Do We Mean? *Proceedings of the 28th Annual Conference on RUME*. (6 pages). SIGMAA on RUME.
- [3] McNeill, R., Davis, C., **Black, K.**, Gutzwa, J., & McCall, M. (in press). Living as Abstract Nonsense: Ontological Tensions in Trans Experiences of Mathematics. *Proceedings of the 28th Annual Conference on RUME*. (9 pages). SIGMAA on RUME.
- [2] Hagman, J., McNeil, R., Tremaine, R., Pai, L., Kress, N., **Black, K.**, & Cristobal, J. (in press). Power Implicit in Discourses of Mathematical Rigor within an Equity-Oriented Improvement Community. *Proceedings of the 28th Annual Conference on RUME*. (9 pages). SIGMAA on RUME.
- [1] **Black, K.**, Akin, V., Viel, S., Scanlon, H., Tremaine, R., & Kress, N. (2025). Unnecessarily Hard: How Student Emotions, Course Components and Rigor Collide in Calculus. In S. Cook, B. Katz, & K. Melhuish (Eds.), *Proceedings of the 27th Annual Conference on RUME* (p. 1464). SIGMAA on RUME.

Peer-reviewed Contributions

- [1] Allman, Z., Asad, H. F., Atkinson, W. T., [and 29 others, including **Black, K.**]. (in press). Partnership Work as Practice of and Preparation for Navigating Complexity, Uncertainty, and Precarity. In A. Cook-Sather & B. Kane (Eds.), *International Journal for Students as Partners: Vol. 9.2*. (19 pages).

Scholarship in Other Mediums

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| Aug 2025 | Author of 3/28 pages: Bolick, M. A. (Ed.). (2025). <i>The ACT UP Math Guide to Uplifting Student Voices</i> [Zine]. https://scimath.unl.edu/sites/unl.edu.cas.csmce/files/media/file/2025_SaP_Zine-2.pdf |
| Febr 2020 | Author of article on perfect numbers , published in <i>Plus Magazine</i> for a general audience; co-author of two follow-up articles with the editors |

Teaching Experience

| | <u>Duke University</u> | <u>Role</u> | <u>Comments</u> |
|-------------|-------------------------------|--------------------|------------------------------|
| Fall 2025 | The Art of Proof | Course Instructor | inquiry-based course |
| Fall 2024 | Calculus II | Course Instructor | coordinated course |
| Fall 2023 | Calculus II | Course Instructor | coordinated course |
| Fall 2022 | Calculus and Functions II | Course Instructor | mastery-based course |
| Spring 2022 | Calculus and Functions II | Lab Instructor | mastery-based course |
| Fall 2021 | Calculus I | Lab Instructor | co-teaching structure |
| Febr 2024 | Teaching College Math | One guest lecture | graduate level |
| Oct 2025 | Python Programming in Math | One guest lecture | on number theory |
| March 2024 | Stark's Conjectures | One guest lecture | graduate level |
| | <u>University of Utah</u> | | |
| Spring 2020 | Calculus II | Teaching Assistant | large flipped lecture course |
| Sp18 – Sp20 | Real analysis | Teaching Assistant | work in dedicated help room |
| F17 – Sp20 | College algebra thru calculus | Math Center TA | |

Curriculum Development

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| Fall 2025 | The Art of Proof | designed intro to proofs IBL course for non-math majors |
| Summ 2025 | Teacher training materials | wrote 9 of 16 pages of teaching handbook for math grad students |
| Fall 2024 | Calculus II | co-designed three new lectures and a new course schedule |
| Fall 2022 | Calculus and Functions II | designed a lab to connect to modern mathematicians' research |

Service to the Profession

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| Fall 2025 | Reviewer of three (3) submissions to <i>Proceedings of the 28th Annual Conference on RUME</i> |
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Leadership Roles

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| Sp24 – F24 | Graduate student representative on the Duke Math teaching committee |
| Fall 2024 | Co-lead for Duke ACT UP Math team, a (formerly) NSF-funded project on instruction of calculus |
| F23 – Sp25 | Mentorship Program Coordinator for Duke's chapter of the Association for Women in Math (AWM) |
| F22 – Su25 | Graduate student representative on the Duke Math DEI committee |
| F22 – Sp24 | President of Duke's chapter of the American Mathematical Society (AMS) |

Co-organiser for...

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| Sp24 – F25 | ... five (5) Duke Math trainings / colloquia on mentorship, communication, and culture |
| F22 – Sp24 | ... WINTER, a graduate student learning seminar at Duke |
| March 2023 | ... Duke's "Prospective Graduate Student Open House" |
| Febr 2023 | ... TAGMaC, a tri-university graduate student conference |

Mentorship

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| Sp22 – Sp25 | Math tutor for 4 Duke SPIRE Fellows, a program which supports marginalised STEM students |
| Sp24 | Mentor of 1 first-year graduate student in department peer-to-peer mentorship program |
| F21 – Sp23 | Mentor in 3 vertically-integrated AWM mentorship groups (each group had 2 or more undergraduates) |
| Spring 2021 | Mentor of 1 undergraduate student in Mexico through a virtual reading course (the Twoples program) |

Invited Speaking

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| April 2025 | Louisiana State University (invited talk), "A refinement of the Stark conjectures over ATR fields" |
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Panelist for...

- Sp22 – F24 ... five (5) Duke Math internal panels for graduate students
- Oct 2023 ... the *Graduate Research Opportunities Workshop* (for marginalized genders in math)
- Nov 2021 ... Duke & Wake Forest’s AWM “Math Grad School Panel”

| | Other Presentations | Presentation Topic |
|-----------|---|---|
| Febr 2025 | <i>Research in Undergraduate Math Education</i> | Student experiences of rigor in early calculus (poster) |
| June 2025 | <i>Queer and Trans in Mathematics Workshop</i> | Intentional communication, curiosity, and empowerment |

Math Conferences

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| Febr 2025 | <i>Triangle Area Graduate Math Conference</i> | A refinement of the Stark conjectures over ATR fields |
| June 2024 | <i>Spec(Q-bar(2πi))</i> | A continuation of the Shintani-Barnes cocycle * |
| Febr 2023 | <i>Triangle Area Graduate Math Conference</i> | Duality of Dirichlet L-functions & character sums |
| Jan 2019 | <i>Joint Math Meetings</i> | Searching for toric rings with USTP * |

Internal Math Seminars

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| F22 – F23 | WINTER, Duke student NT seminar | 13 presentations on various topics |
| Sum 2021 | On <i>Multiplicative Number Theory</i> | 5 on analytic theory of L-functions |
| F19 – Sp20 | On modularity and Fermat’s Last Theorem | 9 on a variety of resources |
| Fall 2019 | On <i>Fourier Analysis on Number Fields</i> | 2 on the arithmetic of number fields |

Pedagogy Reading Groups

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| F24 – Sp25 | Reading group on “assessing student learning in quantitative courses in the age of AI” | |
| F21 – Sp22 | Reading group on <i>Mathematics for Human Flourishing</i> | |
| Sp21 – F21 | Reading group on <i>The Philosophy of Mathematics Education Today</i> | |

Other Skills

- Languages: English (native), Spanish (proficient)
- Computer Skills: (excellent) LaTeX, Gradescope
(proficient) Python/Sage, Jupyter Notebooks, Excel, Canvas
(basic) Tableau, Git, HTML, Mathematica
- Hobbies: Rock climbing, gardening, cooking, sewing

* denotes a short (forty minutes or less) presentation