KEITA ALLEN

450 Memorial Drive ◇ Cambridge, MA 02139
+1 (708) · 378 · 1596 ◇ kta@mit.edu ◇ keita.mit.edu

RESEARCH INTERESTS

Algebra, topology, geometry, and their intersections.

EDUCATION

Massachusetts Institute of Technology — Cambridge, MA
Candidate for B.S. in Mathematics, GPA: 5.0/5.0 — *2019 – 2023*

· Participant in Interphase EDGE Summer Scholar Enrichment Program - Cohort of 2019

Southland College Prep Charter High School — Richton Park, IL
High School, GPA: 4.50/4.00 — *2015 – 2019*

Chicago Futabakai Japanese School Saturday School — Arlington Heights, IL
Supplementary School — *2006 – 2019*

· Engaged in Japanese study according to official Japanese curricula from grades K through 12.

RESEARCH EXPERIENCE

Towards the Milnor-Quillen Theorem on MU — MIT Math Dept.
Mentors: Arpon Raksit, Jeremy Hahn — *Spring 2022*

· Learning chromatic homotopy theory through a guided independent reading project. Texts referenced include Jacob Lurie's notes for Harvard Math 252x, and Rudyak's *On Thom Spectra, Orientability and Cobordism.*

Complexity Analysis of Computation of Homotopy Groups of Spheres — MIT Math Dept.
Mentors: Robert Burklund, Haynes Miller — *Summer 2021*

· Studied complexity of algorithm outlined by E.H. Brown in *Finite Computability of Postnikov Complexes*, which allows for the computation of the homotopy groups of any space obtained as the realization of a finite simplicial set.
· Gave explicit bounds on the runtime of this computation in the case of finite homotopy groups, and as particular examples of spaces with infinite homotopy groups, gave explicit bound on the computation of homotopy groups of odd-dimensional spheres.
· Preliminary draft available at `https://math.mit.edu/research/undergraduate/urop-plus/documents/2021/Allen.pdf`; polished preprint available soon.

New families of Dehn invariant 0 tetrahedra — MIT Math Dept.
Mentor: Bjorn Poonen — *January 2021*

· Researched problems surrounding tetrahedra adjacent to Hilbert's Third Problem, focusing on finding new families of tetrahedra with Dehn invariant 0.
· With a peer, wrote program which identifies (up to arbitrary precision), tetrahedra with Dehn invariant zero whose side lengths form a one-dimensional subspace of $\mathbb{R}$ (as a $\mathbb{Q}$-vector space).

Refining models surrounding zebrafish epiboly — MIT Math Dept.
Mentors: Alexander Mietke, Jörn Dunkel — *Fall 2019 – Spring 2020*

· Refined models describing collective swarming motion through mathematical/physical interpolation and computational simulation in MATLAB environment.

TEACHING

18.02/18.02A - Multivariable Calculus MIT Math Dept.
Teaching Assistant *January, Spring 2022*

- Teaching assistant for courses in multivariable calculus. Responsibilities include teaching recitations (two sections for 18.02A), holding office hours, grading, and helping students learn more generally.
- Evaluations:
  - **18.02A (IAP 2022)** *Stimulated interest:* 6.7/7.0, *Displayed thorough knowledge of subject material:* 7.0/7.0, *Helped me learn:* 7.0/7.0, *Overall:* 6.7/7.0.

MIT Talented Scholars Resource Room MIT Office of Minority Education
Tutoring Facilitator *Spring 2021 – Present*

- Tutoring MIT students in math subjects through one-on-one appointments, facilitated group study sessions, walk-in office hours, and exam reviews. Minimum commitment of four hours per week. Course facilitated include:
  - 18.01/A - Single-variable Calculus
  - 18.02/A - Multivariable Calculus
  - 18.03 - Differential Equations
  - 18.04 - Complex Variables
  - 18.06 - Linear Algebra
  - 18.600 - Probability and Random Variables
  - 18.701 - Algebra I
- Overall rating: 5.0/5.0.

Interphase EDGE MIT Office of Minority Education
Residential Calculus Facilitator *Summer 2020, 2021*

- Teaching assistant for course in multivariable calculus for rising MIT first-year students from underprivileged backgrounds.
- Responsible for crafting problem sets and recitation sheets, leading 1.5 hour-long recitations twice weekly, holding office hours, and holding exam review sessions. Please see my website (`https://keita.mit.edu`) for some of the material which I helped create.
- Hosted events as peer mentor/consultant for program participants in order to facilitate successful transition into MIT.

OTHER ACTIVITIES

Associate Advisor – MIT Office of the First Year Fall 2021 – Spring 2022

- Leading activities for advising group of first-year students and acting as peer mentor.

MIT Math Directed Reading Program (DRP) January 2021

- Read through M. Scott Osborne's Basic Homological Algebra (Graduate-level textbook).

Grader – MIT Department of Mathematics Spring 2020

- Graded problem sets for 18.03 (Differential Equations.)

HONORS

National Honor Society March 2019

Illinois State Scholar November 2018

Questbridge National College Match Finalist October 2018

Questbridge College Prep Scholar April 2018

SKILLS

Language	English (Native), Japanese (Native)
Programming & Markup	Comfortable with Python, TEX