

KEITA ALLEN (HE/HIM)

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EDUCATION

Massachusetts Institute of Technology

Candidate for Ph.D. in mathematics.

- Advisor: Jeremy Hahn.

Cambridge, MA

2023 – Present

Massachusetts Institute of Technology

B.S. in mathematics, GPA: 5.0/5.0.

Cambridge, MA

2019 – 2023

Southland College Prep Charter High School

High school diploma.

Richton Park, IL

2015 – 2019

SHORT-TERM VISITS

Nagoya University Graduate School of Mathematics

Visiting researcher with Lars Hesselholt

Nagoya, Japan

Summer 2023

AWARDS AND FELLOWSHIPS

National Defense Science and Engineering Graduate (NDSEG) Fellowship

2023 – 2026

MIT Math Dept. Teaching and Learning Award

Presented by MIT Math Dept. for excellence in undergraduate teaching.

May 2022

Questbridge National College Match Finalist

October 2018

UNDERGRADUATE PROJECTS

Computing the homology of the motivic lambda algebra.

Mentors: Mark Behrens, Peter May

The University of Chicago REU

Summer 2022

- Investigated generalizations of the Curtis algorithm (for computing the E_2 page of the Adams spectral sequence) to computing the E_2 page of the motivic Adams spectral sequences, over the base fields \mathbb{C} and \mathbb{R} .
- Wrote computer program to facilitate generation of Curtis tables, which allow us to reconstruct the motivic Adams E_2 pages. Some code is available at <https://github.com/ktallen/PyLambdaCalc>.
- Preliminary draft available at <http://math.uchicago.edu/~may/REU2022/REUPapers/Allen.pdf>; paper presents a Curtis algorithm for computing the \mathbb{C} -motivic Adams E_2 page.

Complexity of computing the homotopy groups of spheres.

Mentors: Robert Burklund, Haynes Miller

MIT Math Dept.

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>.

RESEARCH TALKS

Computing the homology of the \mathbb{C} -motivic lambda algebra.
Leadership Alliance National Symposium

July 2022
Virtual

EXPOSITORY TALKS

The even filtration.
Talbot workshop

August 2024
MIT

The Galois cohomology of \mathcal{O}_C .
Babytop seminar

March 2024
MIT

Formal groups and equivariant homotopy theory.
Zygotop seminar

March 2024
Harvard University

The Hopf condition for bilinear forms.
Zygotop seminar

December 2023
Harvard University

Chromatic homotopy theory and p -divisible groups.
Babytop seminar

September 2023
MIT

The lambda algebra in classical and motivic homotopy theory.
The University of Chicago REU

August 2022
The University of Chicago

TEACHING

18.02 (multivariable calculus)
Undergraduate TA

MIT Math Dept.
Spring 2022

- Taught twice-weekly recitation section, created problems for recitation, held office hours and review sessions, and graded. Please find some of the material I created [here](#).
- Student evaluations: *Stimulated interest: 6.8/7.0, Displayed thorough knowledge of subject material: 6.9/7.0, Helped me learn: 7.0/7.0.*

18.02A (accelerated multivariable calculus)
Undergraduate TA

MIT Math Dept.
January 2022

- Taught two twice-weekly recitation sections, held office hours and graded.
- Student evaluations: *Stimulated interest: 6.7/7.0, Displayed thorough knowledge of subject material: 7.0/7.0, Helped me learn: 7.0/7.0.*

MIT Talented Scholars Resource Room
Tutoring Facilitator

MIT Office of Minority Education
Spring 2021 – Fall 2022

- Tutored MIT students in math subjects through one-on-one appointments, facilitated group study sessions, walk-in office hours, and exam reviews. Courses tutored include:

18.01/A	<i>single variable calculus</i>	18.02/A	<i>multivariable calculus</i>	18.03	<i>differential equations</i>
18.04	<i>complex variables</i>	18.06	<i>linear algebra</i>	18.600	<i>probability</i>
18.701	<i>abstract algebra I</i>				

- Overall rating: 5.0/5.0.

Interphase EDGE

Residential Calculus Facilitator

MIT Office of Minority Education

Summer 2020, 2021

- TA for course in multivariable calculus, during residential program for rising MIT first-year students from underprivileged backgrounds.
- Responsible for crafting problem sets and recitation sheets, recitations twice weekly, holding office hours, and holding exam review sessions. Please find some of the material I helped create [here](#).
- Hosted events as peer mentor/consultant for program participants in order to facilitate successful transition into MIT.

OTHER ACTIVITIES

MIT UROP (Undergraduate Research Opportunities Program)

Fall 2024

- Mentor for undergraduate research project on topological Hochschild homology/topological cyclic homology.

MIT Math Directed Reading Program

January 2024

- Mentor for undergraduate in guided reading of Voisin's *Hodge theory and complex algebraic geometry I*.

MIT GUMMI

Grad-Undergrad Math Mentoring Initiative

Fall 2023 – Present

Board member

- Providing advice to undergraduates interested in math.

Associate Advisor – MIT Office of Minority Education

Fall 2021 – Spring 2023

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

Chroma 2022

Harvard/MIT summer seminar in stable/chromatic homotopy theory.

Summer 2022

Co-organizer

- Helped organize an undergraduate-focused seminar in stable/chromatic homotopy theory. Covered foundational topics in stable homotopy theory, building towards the chromatic point of view.

Grader – MIT Math

Spring 2020

- Graded problem sets for 18.03 (differential equations).

SKILLS

Language

English (Native), Japanese (Native)

Programming & Markup

Comfortable with Python, TeX