

Curriculum Vitae: Preston Tranbarger

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Education

Texas A&M University

Bachelor of Science in Mathematics, Master of Science in Mathematics;

Current GPA: 3.900; Current Mathematics GPA: 3.872; Expected Graduation: Spring 2024

Currently finishing my last year in a 3+2 Bachelors & Masters of Science program in Mathematics at Texas A&M University. This is done through the university's FastTrack program, more information can be found here:

<https://www.math.tamu.edu/graduate/fasttrack/>.

Employment

Texas A&M University

Graduate Student Researcher; May 2023 - Present

Helping with a variety of research projects in the Texas A&M University mathematics department and beyond. See the below *Research Experience* section for more details.

Student Grader; August 2021 - December 2021, January 2023 - Present

Assisting professors by grading papers and providing feedback for hundreds of students across various courses including linear algebra, differential equations, and communications and cryptography (MATH 304, 308, and 470 respectively).

Assistant Student Editor; January 2022 - Present

Assisting a professor in editing practice problems for a fully online calculus textbook and developing fully interactive Geogebra applets to quiz students on their calculus knowledge.

Undergraduate Student Researcher; August 2021 - May 2023

Helped with a variety of research projects in the Texas A&M University mathematics department and beyond. See the below *Research Experience* section for more details.

Paid Intern; May 2020 - April 2022

Created a novel computer application intended to streamline various common methodologies of repeat photography by utilizing an array of modern programming techniques.

University of North Texas

Undergraduate Student Researcher; March 2020 - April 2021

Devised a novel methodology of solving linear Diophantine equations in addition to quantifying and highlighting the solution's intriguing and useful properties. See the below *Research Experience* section for more details.

Research Experience

Texas A&M University

Advisor: Dr. Matthew Young; August 2022 - Present;

Topic: Generalized Dedekind Sums Arising from Specialized Eichler-Shimura Type Integrals

As a follow up project to the summer 2022 REU at Texas A&M University, this research project generalizes the concept of Dedekind sums by examining Eichler-Shimura type integrals of higher weight holomorphic Eisenstein series attached to characters. Some interesting results arise, such as two diverging generalizations each preserving one of the two main properties of the weight two case.

*Contains more detailed information on many of the sections within this document.

Advisors: *Dr. Philip Yasskin, Dr. Wei Yan*; January 2022 - Present;

Topic: *Teaching Rotations Through Augmented Reality*

This research project examines the ability for augmented reality to serve as a supplemental instruction method to further develop student's geometric intuition on rotations in three dimensional space.

Advisor: *Dr. Matthew Young*; May 2022 - July 2022;

Topic: *REU in Number Theory, Fast Computation of Generalized Dedekind Sums*

Developed the first polynomial time algorithm to compute generalized Dedekind sums by utilizing a well engineered group rewriting process. This represents a significant improvement over previous exponential time algorithms.

Advisor: *Dr. Matthew Young*; August 2021 - May 2022;

Topic: *The Eigenvalue Distribution for Cubic Large Sieve Matrices*

This project sought to expand upon the results of Dunn and Radziwiłł in their paper *Bias in Cubic Gauss Sums: Patterson's Conjecture* by better understanding the eigenvalue distribution of the cubic large sieve matrix.

University of North Texas

Advisor: *Dr. Stephen Jackson*; March 2020 - May 2021;

Topic: *A Particular Solution to Linear Diophantine Equations*

This research project's purpose was to examine the properties of a novel recursive method of solving a specific class of linear Diophantine equations. Served mostly as an introduction to the research process in early undergraduate studies.

Publications

Writing in Progress

Generalized Dedekind Sums Arising from Specialized Eichler-Shimura Type Integrals

Publication due to ongoing research with Dr. Matthew Young between August 2022 and August 2023. Soon to be available on the arXiv.

Submitted, In Review

Fast Computation of Generalized Dedekind Sums (with J. Wang);

Submitted 10/8/2022 to *International Journal of Number Theory*

Publication due to the research produced during the summer 2022 REU at Texas A&M University. It is available on the arXiv here: <https://arxiv.org/abs/2210.01172>.

Conferences and Presentations

Joint Mathematics Meetings 2024 (Presenter, Planned); 1/3-6/2024

Texas A&M Undergraduate Mathematics Research Expo (Presenter); 9/26/2023

MAA MathFest 2023 (Presenter); 8/2-5/2023

Texas Undergraduate Groups and Dynamics Conference (Presenter); 3/31-4/1/2023

TX-LA Undergraduate Mathematics Conference (Presenter); 3/25-26/2023

Southern Regional Number Theory Conference (Attendee); 3/11-12/2023

Joint Mathematics Meetings 2023 (Presenter); 1/4-7/2023

Texas Undergraduate Mathematics Conference (Presenter); 10/28-29/2022

Texas A&M Undergraduate Mathematics Research Expo (Presenter); 10/20/2022

Young Mathematicians Conference (Presenter); 8/12-14/2022

LAUNCH Undergraduate Research Summer Poster Session (Presenter); 8/3/2022

Service

Ongoing Service

Texas A&M University Math Club (Vice President); August 2022 - Present

Helped organize biweekly math club meetings and also developed the club's biweekly math problem solving competition as an outreach activity for undergraduates interested in higher mathematics.

Texas A&M University High School Math Competition (Grader/Power-Team Grader); November 2021, 2022, and 2023

Assisted in the grading of the yearly Texas A&M University High School Math Competition alongside graduate students and professors. Planning to participate once more in the grading process after the 2023 competition date is announced.

Texas A&M University Math Circle (Facilitator/Instructor); August 2021 - Present

The Texas A&M University Math Circle is an organization which seeks to help students grades 5-12 gain exposure to interesting topics which otherwise may not be presented in regular coursework. Assisting in both the facilitation and instruction of the learning environment created by the Texas A&M University Math Circle.

Awards/Distinctions

Honors Distinction; Texas A&M University Mathematics

Attained the honors distinction for my undergraduate degree at Texas A&M University.

Pi Mu Epsilon; Spring 2022 - Present

Member of the Pi Mu Epsilon national mathematics honor society.

Mary and Robert N. Walker Endowed Scholarship; Fall 2021 - Spring 2025

This scholarship is awarded to a freshman mathematics major by the Texas A&M University mathematics department. More information can be found here: <https://www.math.tamu.edu/undergraduate/scholarships/>.

Dean's Honor Roll; Texas A&M University; Fall 2021, Spring 2022

Attained the dean's honor roll for the Fall 2021 and Spring 2022 semesters by maintaining a 3.75 GPA across 15 undergraduate credit hours.

Other Relevant Skills

- My coursework history (as follows) in upper-division courses is fairly representative of my mathematical skill set
 - Analysis Courses: Real Analysis I, Introduction to Functions of a Complex Variable I, Honors Differential Equations, Honors Advanced Calculus I, Honors Principles of Analysis II, Graduate Theory of Functions of a Complex Variable I
 - Abstract Algebra Courses: Abstract Algebra I, Modern Algebra II, Graduate Abstract Algebra I, Graduate Abstract Algebra II, Graduate Seminar in Algebra: p -adic L -functions and Iwasawa Theory, Graduate Seminar in Algebra: Lie Algebras and their Representations, Graduate Special Topics in: Commutative and Homological Algebra.
 - Number Theory Courses: Number Theory, Directed Studies, Honors Research, Graduate Algebraic Number Theory, Graduate Combinatorics, Graduate Directed Studies, Graduate Special Topics in: Automorphic Forms their Representations and L -functions (auditing).
 - Statistics/Applied Mathematics: Mathematical Probability, Communications and Cryptography, Honors Elliptic Curve Cryptography
- Well versed in all of the following programming languages: C, C#, C++, HTML+CSS, Java, Javascript, Maple, Mathematica, Python, R, and SageMath in addition to a many number of libraries for each language.