# Clyde Kertzer

**University of Colorado, Boulder**

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## EDUCATION

*B.S.* Mathematics (Honors), *summa cum laude* — expected May 2025
University of Colorado, Boulder
**Honors Thesis:** *Parameterizations of Descartes Quadruples*
Advisors: Katherine Stange & James Rickards

## PUBLICATIONS

*Symmetries in Apollonian circle packings (Submitted)*

*The Local-Global Conjecture for Apollonian circle packings is false*
With Summer Haag, James Rickards, and Katherine E. Stange
Annals of Mathematics (2) 200(2): 749-770 (September 2024)

## RESEARCH EXPERIENCE

*Developing Inquiry Based Learning (IBL) Presentations* — Fall 2024

- Developed an interactive geometry & number theory talk
- Advisor: Emily Montelius

*Gallery of Theorems* — Spring 2024

- Aim: Represent mathematics concepts using artistic mediums
- Further developed Numberscope visualizer, greatly increasing functionality
- Advisor: Professor Sarah Peterson

*Honors Thesis - Circle Packings & Descartes Quadruples* — Fall 2023 - Spring 2024

- Developed honors thesis on Descartes quadruples of Apollonian circle packings
- Advisors: Professor Katherine Stange & Professor James Rickards

*CU Boulder REU - Apollonian Circle Packings* — Summer 2023

- Disproved the Local-Global Conjecture for Apollonian Circle Packings
- Results led to an article in Quanta Magazine
- Advisors: Professor Katherine Stange & Professor James Rickards

*Numberscope - Research Assistant and Developer* — Fall 2022

- Developed the Numberscope website to improve user experience
- Programmed visualizer representing Collatz length of user-selected sequences from the OEIS using a scaled color gradient & a modular-controlled array
- A collage of my visualizer won the 2023 CU Arts & Sciences art contest
- Advisor: Professor Katherine Stange

**READING COURSES**

*Algebraic Number Theory & Reciprocity Laws* — Fall 2024
- *Reciprocity Laws* (Lemmermeyer)
- Advisor: Professor David Grant

*Lie Algebras* — Fall 2024
- *Introduction to Lie Algebras and Representation Theory* (Humphreys)
- Advisor: Professor Richard Green

*Number Theory & Elliptic Curves* — Spring 2023
- *Rational Points on Elliptic Curves* (Silverman & Tate)
- Advisor: Professor David Grant

*Introduction to Number Theory & Quadratic Reciprocity* — Fall 2021
- *Introduction to the Theory of Numbers* (Niven, Zuckerman, & Montgomery)
- Advisor: Professor Paul Hagelstein

**WORK EXPERIENCE**

*Mathnasium Tutor* — Dec 2024 - Present

*Math Tutor - Prep Academy* — Aug 2024 - Present

*Math Tutor - Private* — Aug 2019 - Present
algebra 1/2, geometry, precalc, calc 1/2/3, linear algebra, analysis

*Grader - CU Boulder*
- Probability Theory - Professor Eric Stade — Fall 2024
- Analysis 1 - Professor Alonso Delfin — Summer 2024
- Discrete Mathematics - Professor James Rickards — Spring 2024
  Analysis 1 - Professor Sean O'Rourke
- Linear Algebra - Professor David Grant — Fall 2023
  Discrete Mathematics - Professor Nat Thiem
  Analysis 1 - Professor James Rickards
- Discrete Mathematics - Professor David Grant — Spring 2023

**CONFERENCES**

*CTNT*, UConn, CT — Jun 14-16, 2024
Gave a talk on local-global of Apollonian circle packings

*CU Topology Day*, Boulder, CO — Apr 23, 2024

*Undergraduate Research Expo*, Boulder CO — Apr 20, 2024
Presented a poster on local-global of Apollonian circle packings

*Front Range Number Theory Day*, Boulder, CO — Apr 13, 2024

*Joint Mathematical Meetings*, San Francisco, CA — Jan 3-6, 2024
Presented a poster on local-global of Apollonian circle packings

*Math For All*, Boulder, CO — Apr 6, 2024
Presented a poster on local-global of Apollonian circle packings

**TEACHING & TALKS**

*21st Century Mathematics - an online math teachers conference* — Jun 28, 2024
With Summer Haag & Katherine Stange | slides

*CTNT 2024 - The Local-Global Conjecture* — Jun 15, 2024
With Summer Haag | slides

*Honors Thesis Defense* — Apr 10, 2024
Title: *Parameterizations of Descartes Quadruples*

*IISER Bhopal - "Problems of Old" (online)* — Oct 10, 2023
talk | slides

*Lecturer - Linear Algebra (MATH 3125) for Professor Green*
Matrix equations & homogeneous linear systems — Sep 8, 2023
Vectors & Solutions to linear systems — Sep 1, 2023

*CU Boulder REU - Apollonian Circle Packings* — Jun 15, 2023
slides

*Fairview High School - Number Theory Club* — Mar 9, 2022
Modular arithmetic & quadratic residues | slides

**LEADERSHIP & OUTREACH**

*Weekly teaching at Boulder High School through AVID* — Fall 2024

*COSMOS Math Club Leadership* — Summer 2024 - Present

*Teaching at Mesa Elementary School*
Divisibility tricks — Nov 22, 2024
Square numbers & Pythagorean triples — Oct 21, 2024
Prime factorization & basics of cryptography — Aug 27, 2024
Infinity & infinite sums — Mar 24, 2023

*College Day Student Panel - Speaker* — Aug 28, 2024
Representing the mathematics major

*Undergraduate Involvement Panel - Speaker* — Feb 14, 2024
Cosmos Math Club

**COURSEWORK**

MATH 6180 - *Graduate* Algebraic Number Theory — Spring 2025 (Upcoming)
MATH 6220 - *Graduate* Topology 2
MATH 6250 - *Graduate* Theory of Rings
MATH 6320 - *Graduate* Real Analysis 2
MATH 8174 - *Graduate* Algebraic Lie Theory

MATH 3170 - Combinatorics — Fall 2024
MATH 6310 - *Graduate* Real Analysis 1

MATH 6210 - *Graduate* Topology 1
EDUC 4050 - Knowing and Learning in Mathematics

MATH 4330 - Fourier Analysis — Spring 2024
MATH 6140 - *Graduate* Algebra 2
MATH 6350 - *Graduate* Functions of a Complex Variable 1
MATH 8114 - *Graduate* Ergodic Theory & Number Theory
MATH 8174 - *Graduate* Mathematical Cryptography

MATH 4440 - Mathematics of Coding and Cryptography — Fall 2023
MATH 6130 - *Graduate* Algebra 1
MATH 6190 - *Graduate* Analytic Number Theory

MATH 3210 - Euclidean & Non-Euclidean Geometry — Spring 2023
MATH 4140 - Abstract Algebra 2 - Representation Theory

MATH 4001 - Analysis 2 — Fall 2022
MATH 6110 - *Graduate* Intro to Number Theory

MATH 3140 - Abstract Algebra 1 — Summer 2022

MATH 3001 - Analysis 1 — Spring 2022 (CU Boulder)
MATH 3110 - Intro to Number Theory
MATH 3450 - Intro to Complex Variables

MTH 2311 - Linear Algebra — Fall 2021 (Baylor University)
MTH 3300 - Foundations of Mathematics
MTH 3325 - Ordinary Differential Equations

## AWARDS

*Robert and Wanda Gunning Endowed Fund* — Fall 2024 - Spring 2025
$2,500 per year

*President Joseph A. Sewall Award* — Spring 2022 - Spring 2025
$5,000 per year

*Invitation to Excellence* (Baylor) — Fall 2021
$20,000 per year

## MEDIA

*Two Students Unravel a Widely Believed Math Conjecture*
Article about *The Local-Global Conjecture for Apollonian circle packings is false*
Quanta Magazine

*CU students follow their noses, disprove math conjecture*
Article about *The Local-Global Conjecture for Apollonian circle packings is false*
CU Arts & Sciences Magazine

**LANGUAGES**

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|---|---|---|---|
| **LaTeX** | Fluent | **Javascript** | Intermediate |
| **Sage** | Intermediate | **Typescript** | Intermediate |
| **Pari/GP** | Intermediate | **HTML** | Beginner |
| **Magma** | Beginner | | |

**EXTRACURRICULARS**

*Cosmos Math Club* — Spring 2022 - Fall 2024
Student Lead

*Math Club QED* — Spring 2022 - Fall 2024

*Mobius Math Society (Baylor)* — Fall 2021