David R. Garth

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Positions Held

Truman State University
Professor of Mathematics, August 2012-Present
Associate Professor of Mathematics, August 2005-May 2011
Assistant Professor of Mathematics, August 2000-August 2005

Barton County Community College (Fort Riley, Kansas), Summer 2000
Mathematics Instructor

Kansas State University, August 1995-May 2000
Graduate Teaching Assistant

Iowa State University, August 1993 to August 1995
Graduate Teaching Assistant

Education

Kansas State University
Ph. D., Mathematics, May 2000
Thesis Title: Small Limit Points of Sets of Algebraic Integers
Advisor: Dr. Todd Cochrane

Iowa State University
M.S., Mathematics, December 1995
Thesis Title: Enumeration of Permutation Polynomials of Group Rings Over Finite Fields
Major Professor: Dr. Daniel Ashlock

Iowa State University
B.S., Mathematics, Minor in Computer Science, May 1993
Iowa State University, Ames, Iowa
Graduated with Distinction

Professional Affiliations

Mathematical Association of America
Member, 2001-present.

TEACHING EXPERIENCE

Truman State University

Courses taught (and textbook used in the most recent semester the course was taught):

- College Algebra. *College Algebra*, fourth edition, Stewart, Redlin, and Watson.
- Trigonometry. *Trigonometry*, Charles P. McKeague, fourth edition.
- Precalculus. *Precalculus*, fourth edition, Stewart, Redline, and Watson.
- Basic Statistics. *Statistics: Informed Decisions Using Data*, Michael Sullivan III.
- Liberal Arts Calculus. *Instructor notes*.
- Essentials of Calculus. *Applied Calculus*, Hughes-Hallet/Gleason/Lock/Flath/Et. Al.
- Analytic Geometry and Calculus I, II, and III, *Calculus*, third edition, John Rogawski and Colin Adams.
- Analytic Geometry and Calculus III (Online), *Calculus*, third edtion, John Rogawski and Colin Adams.
- Matrix Algebra. *Elementary Linear Algebra: A Matrix Approach*, second edition, Spence, Insel, and Friedberg.
- Foundations of Mathematics. *A Transition to Advanced Mathematics*, eighth edition Smith, Eggen, and St. Andre.
- Concrete Behavioural Foundations of Mathematics. *A Problem Solving Approach to Mathematics for Elementary School Teachers*, 13^{th} Edition, Rick Billstein et. al.
- Numerical Analysis. *Elementary Numerical Analysis*, third edition, Kendall Atkinson and Weiman Han
- Game Theory. *Game Theory: An Introduction*, second edition, E.N. Barron.
- Discrete Mathematics. *Discrete Mathematics*, fifth edition Richard Johnsonbaugh.
- Linear Algebra. *Linear Algebra*, fourth edition, Friedberg, Insel, Spence
- College Geometry. *The Foundations of Geometry and the Non-Euclidean Plane*, George E. Martin.
- Ordinary Differential Equations. *Fundamentals of Differential Equations*, eigth edition, Nagle, Saff, and Snider.
- Methods of Optimization. *Introduction to Operations Research*, Tenth Edition, Hillier and Lieberman.
- Topology, *Topology, Second Edition*, James R. Munkres.
- Algebraic Structures I. *Contemporary Abstract Algebra, Fourth Edition*, Joseph A. Gallian.
- Algebraic Structures II. *Contemporary Abstract Algebra, Fourth Edition*, Joseph A. Gallian.
- Number Theory. *Introduction to Number Theory*, Martin Erickson, Anthony Vazzana, David Garth.
- Advanced Calculus I. *Understanding Analysis, Second Edition*, Stephen Abbott.
- Advanced Calculus II. *Advanced Calculus*, Gerald B. Folland.
- Higher Geometry. *The Foundations of Geometry and the Non-Euclidean Plane*, George E. Martin.
- Complex Variables. *Basic Complex Analysis*, third edition, Jerrold Marsden.
- Advanced Linear Algebra. *Linear Algebra*, second edition, Kenneth Hoffman and Ray Kunze.
- Linear Regression. *Applied Regression Analysis*, fourth edition, Terry Dielman.

Course Development: *The Paradoxes of Infinity*

- Developed this course as an interdisciplinary, writing enhanced course to study how the notion of infinity affects various disciplines and cultures. Particular attention in the course is given to the philosophical and mathematical paradoxes of the notion of the infinite, and how thinkers have dealt with these problems throughout the ages. The course deals with problems in the disciplines of Mathematics, Cosmology, Philosophy, and Religion.

Barton County Community College

Taught College Algebra, using the text, *College Algebra*, fourth edition, Charles P. McKeague.

Kansas State University

Teaching Assistant. Courses taught:

- College Algebra (recitation instructor)
- Trigonometry (recitation instructor)
- Calculus 1, 2, and 3 (recitation instructor)
- Ordinary Differential Equations (recitation instructor)
- Business Calculus (lecturer)

Mathematics Tutor

- Kansas State University, Department of Family Studies and Human Services, Spring 1999. Helped Head Start teachers from rural Kansas prepare for the Pre-Professional Skills Test using picturetell desktop video conferencing.

Mathematics Instructor

- Kansas State University Upward Bound Math Science Program, Summer 1997 and Summer 1998.

Iowa State University

Teaching Assistant. Courses taught:

- College Algebra (lecturer)
- Discrete Mathematics (instructor, with sole responsibility of the course)
- Business Calculus (instructor, with sole responsibility of the course)

RESEARCH

Interests

Analytic and Algebraic Number Theory, especially Pisot numbers and their generalizations; Diophantine Approximation.

Mentoring

Mathematics Capstone Projects

- Tia Welsh, “Group Actions, Permutations, and Card Tricks,” Spring 2002.
- Ray Shell, “Continued Fractions as an Approximation of Real Numbers,” Spring 2003.
- Keagan Thalin, “Summing a Series Using Complex Analysis,” Spring 2003.
- Patrick Cronin, “Chaotic Encryption,” Spring 2003.
- Jill Hartnett, “Polynomial Equations and Circulant Matrices,” Spring 2004.
- Sarah Quick, “The Spectra of Quadratic Pisot Numbers,” Spring 2005.
- Daniel Smith, “Recurrence Relations and Symmetric Polynomials,” Fall 2005.
- Amanda Knott, “Automatic Sequences,” Spring 2006.
- Will Rearick, “Unique Factorization in Quadratic Fields,” Spring 2007.
- Ashley Schachner, “The Fibonacci Numbers Modulo the Lucas Numbers,” Spring 2007.
- Christine Hibbeler, “Nonperiodic Tilings of the Plane,” Fall 2007.
- Meaghan Wilkinson, “Discrete Dynamical Systems,” Spring 2008.
- Alan Schrader, “The Rubik’s Cube,” Summer 2008.

- Dan Matheny, “Congruences of Hermitian Matrices,” Summer 2008.
- Megan McWhorter, “Fibonacci Numeration Systems and the Wythoff Array”, Spring 2009.
- Kathryn Schlafly, “Cryptography and Cryptanalysis,” Spring 2009.
- Whitney Wodstrchill, “Geometry of the Zeros of Polynomials,” Spring 2009
- Amanda Hamilton, “Inverses of Elements in Finite Fields,” Fall 2009
- Jennifer Harris, “Eigenvectors via Graph Theory,” Fall 2009
- Maria Sumner, “Abstract Numeration Systems,” Spring 2010
- Halleh Peterman, “The Column Sequences of the Wythoff Array,” Spring 2011
- Cody Schwent, “How to Beat Your Wythoff Games’ Opponent on Three Fronts,” Spring 2011
- Alexis Matthews, “Fair Approximations of Irrational Numbers,” Spring 2011
- Ethan Gabel, “Combinatorics on Words: a New Challenging Topic,” Spring 2011
- Seth Atkins, “Variance Stabilizing Transformations in Regression: Application to Baseball,” Spring 2011.
- Adam Roling, “The Monty Hall Problem,” Spring 2012.
- Todd Lesinski, “Nonlinear Optimization,” Fall 2012.
- Jennifer Kline, “A Graphical Analysis of Midy’s Theorem,” Spring 2013.
- Lauren Snyder, “Generating Prime Numbers,” Spring 2013
- Justin Corcoran, “RSA Cryptography: An Overview,” Spring 2013
- Stasia Montgomery, “The Mobius Inversion Formula,” Fall 2013.
- Andy Chapman, “Real World Applications of Linear Algebra,” Fall 2013.
- Kelly Bowden, “Diophantine Approximation: Examining the Farey Process and its Method on Producing Best Approximations,” Spring 2014.
- Evan Datz, “A Proof of the Three-Distance Theorem Using Farey Fractions,” Spring 2014.
- Abigail Faron, “A Series and its Associated Continued Fraction,” Spring 2014
- Amanda Hinkle, “Cyclic Numbers,” Spring 2014
- Stefanie Hughes, “Solving Lights Out with Linear Algebra,” Spring 2014
- Nicole Scheulen, “Some Mathematics Behind the Game of SET,” Spring 2015
- Thomas Cassily, “Pascal’s Triangle Reduced Modulo a Prime,” Spring 2015
- Max Highsmith, “Towers of Powers Modulo m,” Spring 2015
- Amanda Clevenger, “Markov Chains and Monopoly,” Spring 2016
- Taylor Elgin, “Snowflakes: A Discussion of Fractals,” Spring 2016
- Dylan Heiney, “Frieze Groups,” Spring 2016.
- Miranda Meyer, “Markov Chains and their Application to Baseball,” Spring 2016
- Gretta Stark, “Classical Mobius Inversion Formula and Applications,” Spring 2016
- Marisa Thome, “Using Farey Sequences to Analyze the Bisection Method,” Spring 2017
- Emily Desmond, “Derivation of Keplers Law of Planetary Motion,” Spring 2017
- Erin Leventhall, “The Friendship Theorem,” Spring 2017
- Melinda Mathews, “Trigonometric Representations of Fibonacci Numbers,” Spring 2017
- Katharine Siemer, “The Slice Group of the Rubik’s Cube,” Spring 2017
- Paxton Lemmons, “Circulant Graphs and Matrices,” Spring 2017
- Jackson Beckett, “Markov Chains: A Football Analysis,” Fall 2017
- Sara Holmes, “Cubic Equations,” Fall 2017
- Weiyi Wang, “The Catalan Numbers,” Fall 2017
- Hongyuan Yi, “A Proof of Marden’s Theorem,” Fall 2017
- Matthew Naeger, “Summing Divergent Series,” Spring 2018

- Sierra Carrel, "The Equivalence of Side-Angle-Side and Side-Angle-Angle in Absolute Geometry," Fall 2018
- Kangqi Huang, "Markov Chains," Spring 2019
- Sarah Kabacinski, "Graph Theory and its Connections to Linear Algebra," Spring 2019
- Vince Mazzola, "Exploration of Mathematical Origami," Fall 2019
- Yermeya Bagunu, "The Geometric Transformations of Musical Chords," Fall 2019
- Carl Deister, "An Analysis of Axiomatic Geometry," Fall 2019
- Karie Schmitz, "Exploring Preference Orderings Through Discrete Geometry," Fall 2019

Summer Research Projects

- Chacity Cooper, Truman State University McNair Program (2016), "An Analysis of Geometry Curriculum, Modern Geometry Textbooks, and Common Core State Standards."
- Andrew Belzer and Anna Staudacher, Truman State University Mathematical Biology Program (2014), "Plastron Respiration and Underwater Survival of Ticks (Acarine: Ixodidae)", with Dr. Laura Fielden.
- Andrew Belzer and Anna Staudacher, Truman State University Mathematical Biology Program (2013), "Plastron Respiration and Underwater Survival of Ticks (Acarine: Ixodidae)", with Dr. Laura Fielden.
- Maximilian Ernst (2010), "Cut and Project Tilings of the Plane," Truscholars Summer Undergraduate Research Program.
- Joseph Palmer (2007), "Self-Generating Sets, Morphisms, Automatic Sequences, and Sequences of Integers with Missing Blocks." This project was undertaken as part of Truman State University's Next STEP Program, supported by the National Science Foundation under Grant No. 0431664.
- Ha Ta (2007), "Sequences of Integers with Missing Blocks of Digits and Morphisms." This work was supported by an undergraduate research grant through Truman State University.
- Adam Gouge (2006), "Affinely Self-Generating Sets and Morphisms." This project was done through Truman State University's Next STEP Program, supported by the National Science Foundation under Grant No. 0431664.
- Kensey Riley (2006), "Cut-and-Project Tilings Generated Via the Gram-Schmidt Process." This work was supported by an undergraduate research grant through Truman State University.
- Kensey Riley (2005), "On the Frequency and Generation Properties of Sturmian and Cut-and-Project Sequences." This project was done through Truman State University's Next STEP Program, supported by the National Science Foundation under Grant No. 0431664.
- David Failing (2005), "On the Complexity and Construction Methods of Substitution Sequences." This project was done through Truman State University's Next STEP Program, supported by the National Science Foundation under Grant No. 0431664.

Publications (* indicates undergraduate student co-author)

"Self-Generating Numeration Systems and Generalized Wythoff Arrays," with Joseph Palmer, *Fibonacci Quarterly*, **54**, (2016), 72-78.

"Self-Generating Sets and Numeration Systems," with Joseph Palmer* and Ha Ta*, *Combinatorial number theory*, 41-56, *Walter de Gruyter*, Berlin, 2009.

"Polynomials Generated by the Fibonacci Sequence," with Donald Mills, and Patrick Mitchell, *Journal of Integer Sequences* **10** (2007), Article 07.6.8, 12pp (electronic).

"Affinely Self-Generating Functions and Morphisms," with Adam Gouge*. *Journal of Integer Sequences* **10** (2007), Article 07.1.5, 13pp (electronic).

"Comments on the Spectra of Pisot numbers," with Kevin Hare. *Journal of Number Theory* **121**, (2006), no 2, 187-203.

"Complex Pisot numbers of small modulus." *Compte Rendus Mathématique. Académie des Sciences. Paris*, **336** (2003), no. 12, 967-970.

"On a problem of Cohn for character sums," with Todd Cochrane and Zhiyong Zheng. *Journal of Number Theory* **81**, (2000), no. 1, 120-129

"On limits of PV k-tuples." *Acta Arithmetica* **90** (1999), no. 3, 291-299.

Presentations (* indicates undergraduate student co-author)

"Does AAS Imply SAS?", Missouri Section MAA Meeting, Lindenwood University, April 5, 2019.

"Adventures in Undergraduate Research in Pure Mathematics," Central States Mathematics Undergraduate Research Conference, Truman State University, April 16, 2016.

"Three Dimensional Graphics in LaTeX," given to Truman State University MAA Student Chapter, November 13, 2013.

"Three Mathematics Capstone Ideas," Truman State University Mathematics Colloquium, April 2013.

"Fair Approximations, Continued Fractions, and Sturmian Words," Missouri Section MAA Meeting, April 2013.

"Fractions, Pi, and Quasicrystals," Truman State University Faculty Research Conference, February 21, 2013.

"Fair Approximations, Continued Fractions, and Sturmian Words," Kansas State University Number Theory Seminar, October 2011.

"Fractal Numeration Systems," Missouri Section MAA Meeting, April 2008.

"Self-Generating Sets and Numeration Systems," (with Joseph Palmer*), INTEGERS Conference, 2007.

"Tilings, Infinite Words, and Long Range Order," (with Kensey Riley*), Expository Talk Series, University of Missouri at Kansas City, September 2005.

"Fibonacci Numbers, the Golden Ratio, and Quasicrystals," Mathematics Colloquium, Truman State University, March 2005.

"New Results on the Spectra of Pisot Numbers," Number Theory Seminar, University of Waterloo, Ontario, January 2005.

"Who Turned the Lights Out," Mathematics Colloquium, Truman State University, Spring 2002.

"A Cool Proof of the Mean Value Theorem (and Generalizations)," Mathematics Colloquium, Truman State University, Fall 2000.

"Limit Points of Sets of Algebraic Integers," 2000 Joint Mathematics Meetings, Washington D.C.

"Limit Points of Algebraic Integers with 2 Conjugates Outside the Unit Circle," 1999 Illinois Number Theory Conference, University of Illinois at Urbana-Chapmaign.

SERVICE

Departmental Service

Faculty advisor for Kappa Mu Epsilon (KME), Spring 2013-Present.

- Kappa Mu Epsilon is a national mathematics honor society. My main role as the faculty advisor is to meet with the student officers of the organization to help plan events, ranging from weekly meetings, to social events, to the annual initiation ceremony.

Peer Review Committee, Fall 2016.

Sabbatical Review Committee, Fall 2013.

- On this committee I Reviewed sabbatical applications and made recommendations on each of the candidates' applications.

Faculty Search Committee, Summer 2017, Summer 2012 and Summer 2003.

Endowed Scholarship Selection Committee, Spring 2003-Spring 2005, Spring 2008-Present

- My role on this committee is to review scholarship applications for the various endowed scholarships and select recipients according to the criteria for those scholarships.

Special Speakers Committee, Fall 2001-Spring 2008, and Fall 2010-2013.

- Along with Phil Ryan, I helped organize colloquium talks for the department. The speakers for these talks included faculty both within the department and from other universities, such as the University of Missouri, the University of Iowa, Iowa State University, and even a Truman alumni speaker from the University of Southern California.

Departmental Liberal Studies Program Committee, Fall 2000-2013; Chair, Fall 2002-Spring 2006, Fall 2009-Spring 2013

University Service

Summer School Committee, Fall 2019

- The task of this committee was to examine the current summer school compensation model, and make recommendations to the provost of any suggested changes to the model.

Next Steps Team 3 member, Spring 2016 through Spring 2017.

- The charge of this team is to refine the summer and interim session goals and design plan to meet these goals, considering retention, degree progression, enhanced learning/high impact experiences, and increased revenue opportunities.

Search Committee member for the Exercise Science department, Spring 2016.

Spectra Program Director, PRISM Grant Principal Investigator (NSF DMS #0928013), 2013-2015.

- I replaced Jason Miller as the Principal Investigator on this grant, which aimed to increase the number of students at Truman who pursue and earn a STEM degree. The program consisted of three components: providing innovative interdisciplinary courses, academic support, and research and scholarship opportunities. Most of my work in this role surrounded the SPECTRA Summer Scholars program, in which enthusiastic incoming freshmen were brought to campus for eight weeks to take classes and bring up their level of preparation for college level math and chemistry.

External Reviewer for the Exercise Science departmental five year review, Fall 2015.

Search Committee member for the Statistics department, summer 2017 and summer 2015.

Search Committee member for the Education department, Fall 2017 through Spring 2018.

Allen Fellowship Committee, 2010 (confidential)

- On this committee I read nominations and applications for the Allen Fellowship, and helped select the recipients of the award.

Attendance Policy Committee, 2002; Chair, Spring 2008-Spring 2009

- On two separate occasions, this committee was formed as a subcommittee of Undergraduate Council to campus concerns raised about the University Attendance Policy. Our charge was to draft a new policy to address these concerns and remove any potential ambiguity in the existing policy. My role on this committee was to organize meetings, receive input, and draft the wording of the new policy.

Undergraduate Council Representative, Fall 2003-Spring 2009

Student Research Conference Committee, Fall 2007-Spring 2009

- The main duties of this committee were to plan for the annual Student Research Conference. My job was to review the abstracts of projects coming from math, computer science, and statistics projects, to communicate with students about their talks, and to find moderators for the various math sessions at the conference.

Reviewed applications for the summer 2008 STEP program.

Reviewed proposals for summer 2008 University research stipends.

University Athletics Committee, Spring 2003-Fall 2006

- The University Athletics Committee meets regularly to discuss issues related to varsity athletics, ranging from the consideration of complaints from students and faculty, to making sure that the university is in compliance with NCAA regulations.

Reviewer for divisional projects that come under the scope of the Institutional Review Board, Spring 2001-Spring 2002.

Participated in the freshman interview project, 2001.

Served as a reader for the SWE, Fall 2000

- The Sophomore Writing Experience, which was discontinued a not long after I came to Truman, required all students to write an essay in a short time frame. In the Fall of 2000 I helped grade the essays.

Professional and Community Service

Chair Elect, Missouri Section of the MAA, April 2019-Present.

- The Chair Elect assumes the responsibilty of Chair after one year of serving as the Chair Elect, and assumes the responsibility of organizing the next Section Meeting.

MoBEAM Task Force Member, Fall 2019-Present

- This task force was created to examine and make recommendations regarding the secondary mathematics requirements in Missouri to see how well the current curriculum aligns with the newly created Math Pathways courses.

Math Advisory Committee, January 2019-Present

- The charge of this committee is to advise universities and community colleges that are wanting to create more alternative mathematics pathway courses, as well as review future proposals for courses to count as alternative mathematics pathways in the Core 42.

Math Pathways Task Force Member, Fall 2014-October 2018

- This task force was implemented by the Missouri Department of Education in response to House Bill 1042, which charges all public institutions in Missouri to "replicate best practices in remedial education." The Math Pathways Task Force, in particular, was formed to work toward the alignment of gateway courses in mathematics with individual academic programs of study.

Science on Saturday, November 2017

- Organized and taught a workshop entitled *Mathemagic* for the Science on Saturday program. I also recruited student volunteers from KME to help with the event.

Site Coordinator for the MCTM elementary and middle school math competition, February 2019, February 2018, December 2016, and February 2016.

- Hosted a regional math competition for elementary and middle school students from 8 school districts around northeast Missouri. The contest was one of the qualifying sites for the state wide Missouri Council of Teachers of Mathematics state competition.

Nominating Committee Chair, Missouri Section MAA, Fall 2013.

- The job of this committee was to take nominations for the new Governer of the Missouri Section of the MAA.

Departmental Liaison for the Missouri Section of the MAA, Fall 2009-Present.

Referee for *Discrete Mathematics*, Spring 2018

Referee for *Mathematics Magazine*, Fall 2016

Referee for *Applied Mathematics and Computation*, Fall 2012.

Referee for the *American Mathematical Monthly*, Spring 2011.

Referee for the *Journal of Integer Sequences*, Summer 2010.

Project NExT consultant, Fall 2009-Spring 2010.

Missouri Section Chair, Mathematical Association of America, 2008-2009

- My main job as the Missouri Section Chair was to organize the annual conference of the Missouri Section of the MAA, which was held on the Truman campus in 2009.

HONORS AND AWARDS

- Order of Omega, 2005, Golden Apple Award
- 1999 Stromberg Outstanding Graduate Student in Teaching Award.