Joseph Vandehey

Curriculum Vitae

University of Texas at Tyler
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POSITIONS HELD

University of Georgia at Athens

Postdoctoral Research and Teaching Associate — Fall 2013 – Spring 2016

The Ohio State University

Zassenhaus Assistant Professor — Fall 2016 – Spring 2019

University of Texas at Tyler

Assistant Professor — Fall 2019 – Summer 2024

University of Texas at Tyler

Associate Professor — Fall 2024 –

EDUCATION

University of Oregon

Bachelor of Science, Mathematics — 2005 – 2008

University of Illinois at Urbana-Champaign

Ph. D. program, Mathematics — 2008 – 2013

RESEARCH INTERESTS

Number Theory and Ergodic Theory

Normal numbers, continued fractions and their applications to hyperbolic geometry, radix expansions and their variants, symbolic dynamics, Diophantine approximation, asymptotic analysis, exponential sums

PAPERS

[1] Containment in (s, t)-core partitions 2008

Undergraduate thesis at the University of Oregon under the direction of Professor Marie Vitulli

[2] On multiplicative functions with bounded partial sums 2012

Integers **12** no. 4, 741–755

[3] On certain statistical properties of continued fractions with even and with odd partial quotients (with F. Boca) 2012

Acta Arithmetica **156** no. 3, 201–221

[4] The normality of digits in almost constant additive functions 2013

Monatshefte für Mathematik **171** no. 3-4, 481–497

[5] On non-intersecting arithmetic progressions (with R. de la Bretèche and K. Ford) 2013
Acta Arithmetica **157**, 381-392

[6] On an incomplete argument of Erdős on the irrationality of Lambert series 2013
#A58 *Integers* **13**

[7] Error term improvements for van der Corput transforms 2014
Quaterly Journal of Mathematics **65**, no. 4, 1461–1502.

[8] A simpler normal number construction for simple Lüroth series 2014
The Journal of Integer Sequences Article 14.6.1, Vol. 17

[9] Some normal numbers generated by arithmetic functions (with P. Pollack) 2015
Canadian Mathematical Bulletin **58**, no. 1, 160–173

[10] Continued fractions on the Heisenberg group (with A. Lukyanenko) 2015
Acta Arithmetica **167**, 19-42

[11] Besicovitch, Bisection, and the normality of 0.(1)(4)(9)(16)(25)... (with P. Pollack) 2015
American Mathematical Monthly **122**, no. 8, 757–765

[12] Lagrange's Theorem for continued fractions on the Heisenberg group 2015
Bulletin of the London Mathematical Society **47**, no. 5, 866–882

[13] Normality preserving operations for Cantor series expansions and associated fractals part II (with D. Airey and B. Mance) 2015
New York Journal of Mathematics **21**, 1311–1326

[14] Diophantine properties of continued fractions on the Heisenberg group 2016
International Journal of Number Theory **12**, no. 2, 541–560

[15] Continued fraction normality is not preserved along arithmetic progressions (with B. Heersink) 2016
Archiv der Mathematik **106**, no. 4, 363–370

[16] New normality constructions for continued fraction expansions 2016
Journal of Number Theory **166**, 424–451

[17] Normal number constructions for Cantor series with slowly growing bases (with D. Airey and B. Mance) 2016
Czechoslovak Mathematical Journal **66(141)**, no. 2, 465–480

[18] Absolutely abnormal, continued fraction normal numbers 2016
Bulletin of Australian Mathematical Society **94**, no. 2, 217–223

[19] Non-trivial matrix actions preserve normality for continued fractions 2017
Compositio Mathematica **153**, no. 2, 274–293

[20] Uncanny subsequence selections that generate normal numbers 2017
Uniform Distribution Theory **12**, no. 2, 65–75

[21] On the binary digits of $\sqrt{2}$ 2018
#A30 *Integers* **18**

[22] Differencing methods for Korobov-type exponential sums 2019
Journal d'Analyse Mathématique **138**, no. 1, 405–439

[23] Towards a sharp converse of Wall's Theorem on arithmetic progressions 2019
Pacific Journal of Mathematics **300**, no. 2, 499–509

[24] A hot spot proof of the generalized Wall's theorem (with V. Bergelson) 2019
American Mathematical Monthly **126**, no. 10, 876–890

[25] A proof of the infinitude of primes via continued fractions 2020
Integers **20**, A19

[26] Intrinsic Diophantine approximation in Carnot groups and in the Siegel model of the Heisenberg group (with A. Lukyanenko) 2020
Monatshefte für Mathematik **192**, 651–676

[27] Preservation of normality by non-oblivious group selection (with O. Carton) 2021
Theory of Computing Systems **65**, 241–256

[28] Deterministic functions on amenable semigroups and a generalization of the Kamae-Weiss theorem on normality preservation (with V. Bergelson and T. Downarowicz) 2022
Journal d'Analyse Mathématique **148**, 213–286

[29] Calculations of the invariant measure for Hurwitz continued fractions (with G. Hiary) 2022
Experimental Mathematics **31**, no. 1, 324–336

[30] Ergodicity of Iwasawa continued fractions via markable hyperbolic geodesics (with A. Lukyanenko) 2023
Ergodic Theory and Dynamical Systems **43**, no. 5, 1666-1711.

[31] Arithmetic functions that remain constant on runs of consecutive integers (with N. Lebowitz-Lockard) 2023
The Journal of Integer Sequences Article 23.8.4, Vol. 26

[32] Convergence of improper Iwasawa Continued Fractions (with A. Lukyanenko) 2024
International Journal of Number Theory **20**, no. 2, 299–326

[33] New ways to balance numbers (with N. Lebowitz-Lockard) 2024
Ars Combinatorica **160**: 211–229

[34] Digital problems in the theory of partitions 2024
Integers **24A**, A18

[35] On the Borel complexity of continued fraction normal, absolutely abnormal numbers (with S. Jackson and B. Mance)
Preprint: `http://arxiv.org/abs/2111.11522` (Accepted to *Advances in Mathematics*)

[36] Serendipitous decompositions of higher-dimensional continued fractions (with A. Lukyanenko)
Preprint: `https://arxiv.org/abs/2303.02249` (Accepted at *Conformal Geometry and Dynamics*)

[37] Non-standard binary representations and the Stern sequence (with K. Anders, M. Dawsey, and R. Gupta)
Preprint: `https://arxiv.org/abs/2308.07448` (Accepted at *The Electronic Journal of Combinatorics*)

[38] On the kth smallest part of a partition into distinct parts (with R. Gupta and N. Lebowitz-Lockard)

Preprint: `https://arxiv.org/abs/2402.12549` (Accepted at the Ramanujan Journal)

[39] On the number of partitions of a number into distinct divisors (with N. Lebowitz-Lockard)

Preprint: `https://arxiv.org/abs/2402.08119` (Accepted at *Notes on Number Theory and Discrete Mathematics*)

[40] Squares in polynomial product sequences (with P. Spiegelhalter)

Preprint: `http://arxiv.org/abs/1107.1730` (submitted)

[41] On the joint normality of certain digit expansions

Preprint: `http://arxiv.org/abs/1408.0435` (submitted)

[42] Non-standard quaternary representations and the Fibonacci number (with K. Anders, M. Dawsey, N. Lebowitz-Lockard, and R. Gupta)

Preprint: `http://arxiv.org/abs/2505.04589` (submitted)

[43] On a problem of Mendès France on simple continued fraction normality

(In preparation)

[44] Three-dimensional Continued Fractions (with F. Filozov)

(In Preparation. REU project.)

[45] On the fraction of winning positions in a two-player game (with N. Lebowitz-Lockard)

(Submitted)

SELECTED PRESENTATIONS

Integers Conference 2011 (University of West Georgia) October 26, 2011

'On Multiplicative Functions with Bounded Partial Sums'

UGA Math Club (University of Georgia at Athens) October 16, 2013

'The abnormality of normal numbers'
Video link: `http://www.youtube.com/watch?v=G3MwnMo7tio`

Integers Conference 2013 (University of West Georgia) October 26, 2013

'Combinatorial methods in normal number proofs'

2014 Midwest Number Theory Conference for Graduate Students and Recent PhDs (University of Illinois at Urbana–Champaign) June 3, 2014

'Heisenberg points with periodic continued fraction expansions'

Palmetto Number Theory Series XXII (South Carolina State University) September 6, 2014

'Periodic multi-dimensional continued fractions'

Illinois Number Theory Conference (University of Illinois at Urbana-Champaign) August 13-14, 2015

'Comparing different types of normality'

UGA Math Club (University of Georgia at Athens) September 3, 2015

'The great mechanical planetarium'

Radical Pi (The Ohio State University) September 21, 2016

'Continued fractions and the great mechanical planetarium'

Integers Conference 2016 (University of West Georgia) October 7, 2016
'Breaking decimal normality with continued fractions'

Math Club at UT Tyler September 25, 2019
'The most beautiful theorem in the world'

Math Club at UT Tyler March 3, 2021
'Wrong addition, question marks, and the devil's staircase'

Texas Number Theory and Combinatorics Seminar September 16, 2021
'Descriptive set complexity and normality of numbers'

Math Club at UT Tyler October 6, 2021
'Modeling the shape of a pandemic'

Math Club at UT Tyler December 1, 2021
'Cryptocurrency: What it is, and why you should probably avoid it'

Texas Number Theory and Combinatorics Seminar February 10, 2022
'Continued fractions...in the octonions!?'

Math Club at UT Tyler February 23, 2022
'Did a butterfly in Brazil cause the Texas winter storm of 2021?'

UT Tyler Mathematics Colloquium March 25, 2022
'Serendipitous decompositions for quaternionic continued fractions'

Math Club at UT Tyler April 20, 2022
'Nerf warlocks plz, Blizz: Why it's hard to make video games fair'

Texas Number Theory and Combinatorics Seminar September 20, 2022
'Digital problems in partitions'

Math Club at UT Tyler September 28, 2022
'Secrets of the great mechanical plentarium'

Math Club at UT Tyler November 30, 2022
'The wide, wild, weird, wonderful, wacky world of twisty puzzles'

Math Club at UT Tyler February 1, 2023
'Better photography... through fractals!?'

Math Club at UT Tyler March 29, 2023
'The world's most powerful computer... Inside a card game?'

Integers Conference 2023 (University of Georgia at Athens) May 19, 2023
'Normal Numbers and Finite Automata'

Math Club at UT Tyler September 13, 2023
'E Pluribus Hugo: How the mathematics of voting impacted science fiction'

Math Club at UT Tyler October 18, 2023
'Einstein's hat: The big mathematical discovery of 2023'

Math Club at UT Tyler March 27, 2024
'The mathematics and ethics of generative AI'

Math Club at UT Tyler September 11, 2024
'When multiplication by 2 is a hard thing to do'

Math Club at UT Tyler October 9, 2024
'Lies, damned lies, and polling: what math can and can't tell us about politics'

Math Club at UT Tyler January 29, 2025
'Why everyone is kinda-sorta okay at pool'

Math Club at UT Tyler April 2, 2025
'Every day I'm shuffling...'

Invited Talks

Spring Southeastern Sectional Meeting, Special Session on Modern Methods in Analytic Number Theory March 2, 2013
'Exponential sums, the van der Corput transform, and Cornu spirals'

University of South Carolina, Number Theory Seminar October 4, 2013
'Continued fractions on the Heisenberg group'

University of North Texas, RTG Logic and Dynamics Seminar November 22, 2013
'Normal number construction for Lüroth series'

The Ohio State University, Number Theory Seminar February 3, 2014
'The unexpected strength of continued fractions on the Heisenberg group'

Georgia Southern University, Colloquium November 14, 2014
'The unexpected strength of continued fractions on the Heisenberg group'

Spring Southeastern Sectional Meeting, Special Session on Analytic Methods in Elementary Number Theory March 29, 2015
'New constructions of normal continued fraction expansions'

Central Fall Sectional Meeting, Special Session on Metric Spaces: Geometry, Group Theory, and Dynamics October 4, 2015
'Continued fractions and the Heisenberg group'

University of Illinois, Number Theory Seminar Oct. 13, 2016
'Analyzing rationals by simpler rationals'

Workshop on "Normal numbers: arithmetic, computational and probabalistic aspects" at the Erwin Shrödinger International Institute for Mathematics and Physics Nov. 16, 2016
'Skew-products, automata, and normality'

Eastern Illinois University, Number Theory Seminar Oct. 6, 2017
'Normality vs. determinism'

University of Illinois, Number Theory Seminar Oct. 11, 2018
'Higher-dimensional frontiers in continued fractions'

University of Illinois, Graduate Student Number Theory Seminar Oct. 11, 2018
'Combinatorial methods for ergodic proofs'

University of North Texas, Millican Colloquium Sept. 16, 2019
'Continued fractions, normality, and the difficulty of multiplying by 2'

One World Numeration Seminar May 18, 2021
'Solved and unsolved problems in normal numbers'

Central Fall Sectional Meeting, Special Session on The Intersection of Number Theory and Combinatorics September 17, 2022
'Normal Numbers and Finite Automata'

George Mason University, Geometry MMA Seminar October 17, 2022

'Relating the dynamics of normal numbers for varying numeration systems'

Southeastern Fall Sectional Meeting October 15, 2023

'Serendipitous decomposition of higher-dimensional continued fractions'

Numeration Conference, Utrecht University June 6, 2024

'One digit, two digits, big digit, small digit'

George Mason University, Geometry MMA Seminar October 21, 2024

'The ups and downs of negativo-affirmative arithmetick'

Joint Mathematics Meeting, Special Session on Partition Theory and q-Series January 8, 2025

'On the kth smallest part of a partition into distinct parts'

TEACHING EXPERIENCE

Teaching Assistant, University of Illinois at Urbana-Champaign

Math 221: Calculus I	Fall 2008
Math 117: Elementary Mathematics	Spring 2009
Math 241: Calculus III - Calculus and Mathematica ($\star$, †)	Fall 2009
Math 241: Calculus III ($\star$)	Spring 2010
Math 220: Calculus I	Fall 2010
Math 231: Calculus II ($\star$)	Spring 2011
Math 220: Calculus I (†)	Fall 2011

($\star$) Made UIUC's "List of teachers ranked as excellent" based on exceptional student evaluations.
(†) Stand-alone course

Postdoctoral Research and Teaching Associate, University of Georgia at Athens

Math 2250: Calculus I	Fall 2013
Math 2260: Calculus II	Spring 2014
Math 3200: Introduction to Higher Mathematics	Spring 2014
Math 2250: Calculus I	Fall 2014
Math 4400/6400: Number Theory	Spring 2015
Math 8440: Number Theory and Dynamical Systems	Fall 2015
Math 2260: Calculus II	Spring 2016

Zassenhaus Assistant Professor, The Ohio State University

Math 4551: Vector Analysis	Fall 2016
Math 4551: Vector Analysis	Spring 2017
Math 4573: Elementary Number Theory	Spring 2017
Math 3345: Foundations of Higher Mathematics	Fall 2017
Problem-solving seminar	Fall 2017
Math 5152: Introduction to Number Theory	Spring 2018
Math 1172: Engineering Mathematics A	Fall 2018
Problem-solving seminar	Fall 2018
Math 4573: Elementary Number Theory	Spring 2019

Assistant Professor, University of Texas at Tyler

Math 2413: Calculus I	Fall 2019
Math 2413: Calculus I	Spring 2020
Math 2413: Calculus I	Summer 2020
Math 1332: Math for Liberal Arts Majors	Fall 2020
Math 4301/5301: Number Theory	Fall 2020
Math 2414: Calculus II	Spring 2021
Math 3425: Foundations of Mathematics	Spring 2021
Math 2413: Calculus I	Fall 2021
Honors 2413: Honors Calculus I	Fall 2021
Math 3315: Linear Algebra and Matrix Theory	Fall 2021
Math 2414: Calculus II	Spring 2022
Honors 2414: Honors Calculus II	Spring 2022
Math 3404: Multivariate Calculus	Summer 2022
Math 2415: Multivariate Calculus ($\star$)	Fall 2022
Honors 2415: Honors Multivariate Calculus	Fall 2022
Math 3336: Abstract Algebra I	Spring 2023
Math 3425: Foundations of Mathematics	Spring 2023
Math 3305: Ordinary Differential Equations	Fall 2023
Math 3345: Real Analysis	Fall 2023
Math 3373: Advanced Ordinary Differential Equations	Spring 2024
Math 2415: Multivariate Calculus	Spring 2024
Math 2414: Calculus II	Summer 2024

($\star$) Multivariate Calculus changed course number in Fall 2022.

Associate Professor, University of Texas at Tyler

Math 2415: Multivariate Calculus	Fall 2024
Math 2415: Honors Multivariate Calculus	Fall 2024
Math 4301/5301: Number Theory	Fall 2024
Math 2413: Calculus I	Spring 2025
Math 3373: Advanced Ordinary Differential Equations	Spring 2025

UNIVERSITY SERVICE

Committee work, University of Texas at Tyler

Putnam exam — Member	2019-2020
Math Club at UT Tyler — Member	2019-2020
Curriculum committee — Member	2019-2020, 2021–
Ad hoc PhD committee — Member	2020-
Graduate committee — Member	2020-2022
Math Club at UT Tyler — Chair	2020-
Faculty Senate — Member	2022–2024
Postdoc committee — Member	2022–2024
AI committee — Member	2024–
Curriculum committee — Chair	2024–

ADDITIONAL ACTIVITIES

Supervisor for Illinois Geometry Lab group 2012–2013

Organizer for Midwest Number Theory Conference for Graduate Students and Recent Ph.D.s Fall 2012

UGA Math Camp Summer 2014

Organizer for special session on "Connections in Number Theory" at AMS Southeastern Sectional Meeting Fall 2014

YouTube channel: "Math and Tea" Summer 2016–

Coordinator for the Ohio State University Putnam team 2017–2018

Teacher at the Ross Mathematics Program for pre-college students 2017–2019

Organizer for special session on "Geometry and Dynamics of Continued Fractions" at the Joint Mathematics Meetings January 2019

Research Experience for Undergraduates project leader – "Continued fractions" at UT Tyler Summer 2023

Organizer for special session on "Dynamics of Continued Fractions and Related Systems" at the Joint Mathematics Meetings January 2025

MENTORSHIP

Noah Lebowitz-Lockard	Postdoctoral fellow	2022–2024

REFERENCES

Florin Boca
Department of Mathematics
University of Illinois
Urbana, IL 61801
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Kevin Ford
Department of Mathematics
University of Illinois
Urbana, IL 61801
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The Ohio State University
Columbus, OH 43210
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University of Georgia
Athens, GA 30602
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Katie Anders
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David Milan (teaching)
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