John R. Doyle

Curriculum Vitæ

Contact Information

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Mathematical Sciences 530	Office phone:	(405) 744-5847	
Department of Mathematics	E-mail:	john.r.doyle@okstate.edu	
Oklahoma State University			
Stillwater, OK 74078 USA	Homepage:	<pre>math.okstate.edu/people/j</pre>	doyle/
Education			
Ph.D., Mathematics, University of Georgia	a		May 2014
Advisor: Robert Rumely			
Dissertation: Dynamics of quadratic pol	lynomials over qu	adratic fields	
M.A., Mathematics, University of Georgia	l		Dec 2010
B.S., Mathematics, University of Georgia			May 2008
Summa cum laude, with highest honor	S		
Minor: Spanish			
Employment			
Assistant Professor, Oklahoma State Univ	ersity	F	all 2020 – present

Assistant Professor, Louisiana Tech University	Fall 2017 – Sum 2020
Visiting Assistant Professor, University of Rochester	Fall 2014 – Spr 2017
Graduate Teaching Assistant, University of Georgia	Fall 2008 – Spr 2014

Research Interests

Arithmetic dynamics, algebraic number theory, arithmetic geometry

Publications and Preprints

- [23] John R. Doyle and Trevor Hyde. *Polynomials with many rational preperiodic points*. Preprint. arXiv:2201.11707
- [22] John R. Doyle, Paul Fili, and Bella Tobin. *Stochastic equidistribution and generalized adelic measures*. Preprint. arXiv:2111.08905
- [21] John R. Doyle and David Krumm. *Quadratic points on dynamical modular curves*. Res. Number Theory, to appear. arXiv:2301.00510
- [20] John R. Doyle, Vivian Olsiewski Healey, Wade Hindes, and Rafe Jones. *Galois groups and prime divisors in random quadratic sequences*. Math. Proc. Cambridge Philos. Soc. **176** (2024), no. 1, 95–122.
- [19] John R. Doyle and Xander Faber. *New families satisfying the dynamical uniform boundedness principle over function fields*. Math. Ann. **388** (2024), 985–1000.
- [18] John R. Doyle, Paul Fili, and Trevor Hyde. *Dynatomic polynomials, necklace operators, and universal relations for dynamical units.* New York J. Math. **28** (2022), 534–556.
- [17] Talia Blum, John R. Doyle, Trevor Hyde, Colby Kelln, Henry Talbott, and Max Weinreich. *Dynamical moduli spaces and polynomial endomorphisms of configurations*. Arnold Math. J. **8** (2022), 285–317.

- [16] John R. Doyle and Alex Rice. Multivariate polynomial values in difference sets. Discrete Anal. 2021:11, 46 pp.
- [15] Andrew Bridy, John R. Doyle, Dragos Ghioca, Liang-Chung Hsia, and Thomas J. Tucker. A question for iterated Galois groups in arithmetic dynamics. Canad. Math. Bull. 64 (2021), no. 2, 401–417.
- [14] Andrew Bridy, John R. Doyle, Dragos Ghioca, Liang-Chung Hsia, and Thomas J. Tucker. *Finite index theorems for iterated Galois groups of unicritical polynomials*. Trans. Amer. Math. Soc. **374** (2021), no. 1, 733–752.
- [13] John R. Doyle and Joseph H. Silverman. *Moduli spaces for dynamical systems with portraits*. Illinois J. Math. 64 (2020), no. 3, 375–465.
- [12] John R. Doyle. *Preperiodic points for quadratic polynomials over cyclotomic quadratic fields*. Acta Arith. **196** (2020), no. 3, 219–268.
- [11] John R. Doyle and Bjorn Poonen. Gonality of dynatomic curves and strong uniform boundedness of preperiodic points. Compos. Math. 156 (2020), 733–743.
- [10] John R. Doyle and Joseph H. Silverman. A uniform field-of-definition/field-of-moduli bound for dynamical systems on \mathbb{P}^N . J. Number Theory **195** (2019), 1–22.
- [9] John R. Doyle. *Dynamical modular curves for quadratic polynomial maps*. Trans. Amer. Math. Soc. **371** (2019), no. 8, 5655–5685.
- [8] John R. Doyle, Holly Krieger, Andrew Obus, Rachel Pries, Simon Rubinstein-Salzedo, and Lloyd West. *Reduction of dynatomic curves*. Ergodic Theory Dynam. Systems **39** (2019), no. 10, 2717–2768.
- [7] John R. Doyle. Preperiodic points for quadratic polynomials with small cycles over quadratic fields. Math. Z. 289 (2018), no. 1–2, 729–786.
- [6] John R. Doyle. Preperiodic portraits for unicritical polynomials over a rational function field. Trans. Amer. Math. Soc. 370 (2018), no. 5, 3265–3288.
- [5] John R. Doyle, Kenneth Jacobs, and Robert Rumely. *Configuration of the crucial set for a quadratic rational map*. Res. Number Theory **2** (2016), 2:11.
- [4] John R. Doyle. *Preperiodic portraits for unicritical polynomials*. Proc. Amer. Math. Soc. **144** (2016), no. 7, 2885–2899.
- [3] John R. Doyle and David Krumm. *Computing algebraic numbers of bounded height*. Math. Comp. **84** (2015), no. 296, 2867–2891.
- [2] John R. Doyle, Xander Faber, and David Krumm. *Preperiodic points for quadratic polynomials over quadratic fields*. New York J. Math. **20** (2014), 507–605.
- [1] Michael Ching and John R. Doyle. *Apollonian circle packings of the half-plane*. J. Comb. **3** (2012), no. 1, 1–48.

Invited Talks

The dynamical uniform boundedness principle over function fields, AMS Fall Southeast-	Oct 13, 2023
ern Sectional, Special Session on Number Theory and Friends, Mobile, AL	
Quadratic points on dynamical modular curves, Joint Mathematics Meetings, AMS-	Jan 4, 2023
AWM Special Session on Complex and Arithmetic Dynamical Systems,	
Boston, MA	
<i>Families satisfying the dynamical uniform boundedness principle,</i> Five College Number	Mar 29, 2022
Theory Seminar (virtual)	
The Mandelbrot Set: Dynamics, Analysis, Topology, and Combinatorics, OSU Graduate	Mar 26, 2022
Math Conference, Oklahoma State University	

<i>Quadratic points on dynamical modular curves,</i> Oregon Number Theory Days, Portland State University	Oct 2, 2021
Arithmetic and geometry of certain dynamical modular curves, Arithmetic Dynamics	Sept 9, 2020
International Online Seminar (ADIOS)	1
Dynamical modular curves and uniform boundedness of preperiodic points, Louisiana	Mar 3, 2020
State University, Algebra and Number Theory Seminar	
<i>Moduli spaces and uniform boundedness in arithmetic dynamics,</i> Oklahoma State University, Colloquium	Feb 3, 2020
<i>Moduli spaces for dynamical systems with level structure,</i> Joint Mathematics Meetings, AMS Special Session on Arithmetic Dynamics, Denver, CO	Jan 18, 2020
<i>Moduli spaces for dynamical systems</i> , Mini-Workshop on Arithmetic Dynamics, University of Calgary	Aug 21, 2019
<i>Finite index theorems for unicritical polynomials over function fields,</i> AMS Spring Central/Western Joint Sectional Meeting, Special Session on Arithmetic Dynamics	Mar 23, 2019
<i>Moduli spaces for dynamical systems with level structure,</i> University of Rochester, Al- gebra and Number Theory Seminar	Feb 27, 2019
Preperiodic points in complex and arithmetic dynamics, Reed College, Colloquium	Nov 1, 2018
<i>Dynamical modular curves and uniform boundedness of preperiodic points,</i> AMS Spring Eastern Sectional Meeting, Special Session on Arithmetic Dynamics	Apr 22, 2018
Preperiodic points in complex and arithmetic dynamics, Oklahoma State University, Colloquium	Mar 2, 2018
Dynamical modular curves and uniform boundedness of preperiodic points, Oklahoma State University, Number Theory Seminar	Mar 1, 2018
Dynamical modular curves and strong uniform boundedness, Brown University, Algebra Seminar	Nov 6, 2017
Dynamical modular curves and strong uniform boundedness, Texas A&M University, Number Theory Seminar	Nov 1, 2017
<i>Reduction of dynatomic curves</i> , Mathematical Congress of the Americas, Special Session on Arithmetic Dynamics	July 25, 2017
<i>Dynamical modular curves for quadratic polynomial maps,</i> University of Georgia, Po- tential Theory and Arithmetic Dynamics: A conference in honor of Robert Rumely	Mar 25, 2017
Dynamical modular curves and applications, University of South Alabama, Collo- quium	Jan 31, 2017
<i>Dynamical modular curves for quadratic polynomial maps,</i> Joint Mathematics Meetings, AMS Special Session on Discrete Structures in Number Theory	Jan 5, 2017
Preperiodic portraits for unicritical polynomials, Oklahoma State University, Number Theory Seminar	Apr 21, 2015
Preperiodic portraits for unicritical polynomials, Binghamton University, Arithmetic Seminar	Mar 9, 2015
<i>Dynamical modular curves of small genus,</i> Claremont Center for the Mathematical Sciences, Algebra/Number Theory/Combinatorics seminar	Feb 18, 2014
Preperiodic points for quadratic polynomials, II, University of California, Riverside, AMS Western Fall Sectional Meeting	Nov 3, 2013

Computing preperiodic graphs: toward an extension of Poonen's conjecture, University of Georgia, Arithmetic Dynamics Summer School Program	May 16, 2011
Additional Presentations	
Dynamical systems, Stillwater High School Math Club	Dec 15, 2023
The Axiom of Choice, Friends of the Forms (OSU student philosophy club)	Oct 4, 2023
How Big is Infinity?, OSU High School Math Day	Oct 3, 2023
Conferences and Workshops	
Joint Mathematics Meetings, San Francisco, CA	Jan 3 – 6, 2024
AMS Fall Southeastern Sectional Meeting, Mobile, AL	Oct 13 – 15, 2023
Joint Mathematics Meetings, Boston, MA	Jan 4 – 7, 2023
Equidistribution and Arithmetic Dynamics, Oklahoma State University	June 20 – 24, 2022
Oregon Number Theory Days, Portland State University	Oct 2, 2021
Moduli spaces for algebraic dynamical systems, AIM	Sept 27 – Oct 1, 2021
Joint Mathematics Meetings, Virtual	Jan 6 – 9, 2021
Joint Mathematics Meetings, Denver, CO	Jan 15 – 18, 2020
Sage Days 104: Arithmetic Dynamics, Saint Louis University	Nov 17 – 20, 2019
Mini-Workshop on Arithmetic Dynamics, University of Calgary	Aug 19 – 23, 2019
AMS Spring Central/Western Joint Sectional Meeting, University of Hawai'i at Mānoa	Mar 22 – 24, 2019
Hawai'i Number Theory (HINT) 2019, University of Hawai'i at Mānoa	Mar 18 – 21, 2019
Gulf States Math Alliance Conference, University of Texas at Arlington	Feb 15–17, 2019
AMS Spring Eastern Sectional Meeting, Northeastern University	Apr 21 – 22, 2018
Joint Mathematics Meetings, San Diego, CA	Jan 9 – 13, 2018
Mathematical Congress of the Americas, Montréal, QC	July 24 – 28, 2017
Potential Theory and Arithmetic Dynamics: A conference in honor of Robert Rumely, University of Georgia	Mar 25 – 26, 2017
Joint Mathematics Meetings, Atlanta, GA	Jan 4 – 7, 2017
The Galois theory of orbits in arithmetic dynamics, AIM	May 16 – 20, 2016
Upstate New York Number Theory Conference (VI), University of Rochester	Apr 30 – May 1, 2016
RTG Workshop in Arithmetic Dynamics, University of Michigan	Dec 3 – 6, 2015
Arithmetic 2015: Silvermania, Brown University	Aug 11 – 15, 2015
Upstate New York Number Theory Conference (V), Cornell University	Apr 10 – 12, 2015
Joint Mathematics Meetings, Baltimore, MD	Jan 15 – 18, 2014
Sage Days 55: Arithmetic and Complex Dynamics, Florida Institute of Technology	Nov 7 – 10, 2013

AMS Fall Western Sectional Meeting, University of California, Riverside	Nov 2 – 3, 2013
Georgia Algebraic Geometry Symposium, University of Georgia	Oct 18 – 20, 2013
Complex Dynamics (and related areas), University of Illinois at Chicago	June 5 – 7, 2013
Palmetto Number Theory Series XVIII, Wake Forest University	Sept 15 – 16, 2012
Global Arithmetic Dynamics, ICERM	Mar 19 – 23, 2012
Palmetto Number Theory Series XVI, Emory University	Sept 10 – 11, 2011
Arithmetic Dynamics Summer School Program, University of Georgia	May 16 – 27, 2011

Conference Organization

AMS Special Session on Recent Advances in Arithmetic Dynamics (JMM)	Jan 6 – 7, 2023
Organizers: Jacqueline Anderson, John R. Doyle, Joseph H. Silverman	
Equidistribution and Arithmetic Dynamics, Oklahoma State University	June 20 – 24, 2022
Organizers: John R. Doyle, Paul Fili, Igor Pritsker	
AMS Special Session on Current Trends in Arithmetic Dynamics (JMM)	Jan 9, 2021
Organizers: John R. Doyle, Trevor Hyde, Michelle Manes	

Research Experience for Undergraduates

Summer@ICERM 2019: Computational Arithmetic Dynamics

Sum 2019

Mentored two student research groups: One group worked on problems involving rational preperiodic points for certain families of polynomial maps. The other group studied finite orbit sets for *semigroup* dynamical systems.

STUDENTS

Rational preperiodic points: Meghan Grip (U. Rochester), Emily Rachfal (Kenyon College), Olivia Schwager (Muhlenberg College), Matt Torrence (Gettysburg College)

Semigroup dynamics: Talia Blum (MIT), Colby Kelln (U. Michigan), Henry Talbott (Brown U.)

Students Advised

Oklahoma State University

Mohammed Almutarrid (Ph.D.)	[Current]
Logan Caughlin (MS)	[Current]
Louisiana Tech University (Senior Capstone)	
Can Hong: The theory of cryptography in Bitcoin	Spr 2020
Bryan McCormick: The axiom of choice and related topics	Spr 2020
Luke Seaton: Periodic points and Sharkovsky's theorem	Spr 2020
Katherine Willrich: Pisano periods: a comparison study	Spr 2019

Courses Taught

Oklahoma State University	Fall 2020 – present
Calculus I (MATH 2144)	Fall 2021, Fall 2022 (×2)
Calculus II (MATH 2153)	Fall 2023, Spr 2024
Calculus III (MATH 2163)	Fall 2020
Introduction to Abstract Algebra (MATH 3613)	Fall 2020
Abstract Algebra I (MATH 4613/5003)	Fall 2023
Abstract Algebra II (MATH 4623/5013)	Spr 2024
Number Theory (MATH 4713/5713)	Fall 2021
Arithmetic Dynamics (MATH 5010; topics course)	Spr 2023
Algebra I (MATH 5613)	Spr 2021, Spr 2022
Louisiana Tech University	Fall 2017 – present
Discrete Mathematics (MATH 311)	Win 2019
Introduction to Abstract Algebra (MATH 408)	Fall 2017, Fall 2018, Fall 2019
Theory of Functions of Complex Variables (MATH 455)	Spr 2019
Number Theory (MATH 460)	Spr 2018, Spr 2020
Introduction to Real Analysis (MATH 482)	Win 2020
Abstract Algebra II (MATH 490/584)	Win 2018
University of Rochester	Fall 2014 – Spring 2017
Calculus II (MTH 142)	Fall 2014, Spr 2016
Calculus IA (MTH 161)	Spr 2015, Fall 2015 ^{$+$} , Fall 2016 (×2) ^{$+$}
Linear Algebra with Differential Equations (MTH 165)	Fall 2014
Transition to Advanced Mathematics (MTH 200W)	Spr 2016, Spr 2017
Number Theory with Applications (MTH 230)	Fall 2015
Introduction to Cryptography (MTH 233)	Spr 2017
Introduction to Algebra I (MTH 236)	Spr 2015
Independent Study in Arithmetic Dynamics (MTH 391)	Fall 2016

⁺ *I was responsible for coordinating all sections of MTH 161 and was co-instructor of CAS 352–355, where we met weekly with workshop leaders to discuss both pedagogy and specific content to be covered in the workshops.*

University of Georgia	Fall 2008 – Spring 2014
Precalculus (MATH1113)	Fall 2009, Fall 2011
Analytic Geometry and Calculus (MATH2200)	Spr 2010
Calculus I for Science and Engineering (MATH2250)	Spr 2012, Sum 2012, Fall 2013, Spr 2014
Calculus II for Science and Engineering (MATH2260)	Sum 2013
Service (outside of department)	
University	
Academic Integrity Facilitator	Fall 2023–
College	
Reviewer for Wentz Research Scholars Program	Spr 2023
Awards and Grants	
NSF DMS-2302394 Moduli spaces and Galois theory in arithmetic dynamics (\$136.482	June 2023 – May 2026
NSF DMS-2001486/DMS-2112697 Moduli spaces and Galois theory in arithmetic dynamics (\$116.762	May 2020 – Apr 2023
AMS-Simons Travel Grant	July 2016 – June 2018
University Outstanding Teaching Assistant Award (UGA)	2013
B. J. Ball Scholarship (UGA)	2012
VIGRE Fellowship (UGA)	2008, 2010, 2012