John R. Doyle — Curriculum Vitæ

Contact Information

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Mathematical Sciences 530
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Education

Ph.D., Mathematics, University of Georgia — May 2014
Advisor: Robert Rumely
Dissertation: *Dynamics of quadratic polynomials over quadratic fields*

M.A., Mathematics, University of Georgia — Dec 2010

B.S., Mathematics, University of Georgia — May 2008
Summa cum laude, with highest honors
Minor: Spanish

Employment

Assistant Professor, Oklahoma State University	Fall 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

[21] John R. Doyle and Xander Faber. *New families satisfying the dynamical uniform boundedness principle over function fields*. Preprint. arXiv:2203.06205

[20] John R. Doyle and Trevor Hyde. *Polynomials with many rational preperiodic points*. Preprint. arXiv:2201.11707

[19] John R. Doyle, Paul Fili, and Bella Tobin. *Stochastic equidistribution and generalized adelic measures*. Preprint. arXiv:2111.08905

[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. Journal, published electronically (2022). arXiv:2108.10777

[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

Quadratic points on dynamical modular curves, Oregon Number Theory Days, Portland State University	Oct 2, 2021
Arithmetic and geometry of certain dynamical modular curves, Arithmetic Dynamics International Online Seminar (ADIOS)	Sept 9, 2020
Dynamical modular curves and uniform boundedness of preperiodic points, Louisiana State University, Algebra and Number Theory Seminar	Mar 3, 2020
Moduli spaces and uniform boundedness in arithmetic dynamics, Oklahoma State University, Colloquium	Feb 3, 2020
Moduli spaces for dynamical systems with level structure, Joint Mathematics Meetings, Special Session on Arithmetic Dynamics, Denver, CO	Jan 18, 2020
Moduli spaces for dynamical systems, Mini-Workshop on Arithmetic Dynamics, University of Calgary	Aug 21, 2019

Finite index theorems for unicritical polynomials over function fields, AMS Spring Central/Western Joint Sectional Meeting, Special Session on Arithmetic Dynamics	Mar 23, 2019
Moduli spaces for dynamical systems with level structure, University of Rochester, Algebra and Number Theory Seminar	Feb 27, 2019
Preperiodic points in complex and arithmetic dynamics, Reed College, Colloquium	Nov 1, 2018
Dynamical modular curves and uniform boundedness of preperiodic points, 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
Reduction of dynatomic curves, Mathematical Congress of the Americas, Special Session on Arithmetic Dynamics	July 25, 2017
Dynamical modular curves for quadratic polynomial maps, University of Georgia, Potential Theory and Arithmetic Dynamics: A conference in honor of Robert Rumely	Mar 25, 2017
Dynamical modular curves and applications, University of South Alabama, Colloquium	Jan 31, 2017
Dynamical modular curves for quadratic polynomial maps, Joint Mathematics Meetings, 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
Dynamical modular curves of small genus, 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

Conferences and Workshops

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

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

Louisiana Tech University

UNDERGRADUATE STUDENTS (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
Calculus III (MATH 2163)	Fall 2020
Introduction to Abstract Algebra (MATH 3613)	Fall 2020
Number Theory (MATH 4713/5713)	Fall 2021
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 ($\times 2$)†
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

Awards and Grants

NSF Algebra and Number Theory DMS-2001486/DMS-2112697 — May 2020 – Apr 2023
Moduli spaces and Galois theory in arithmetic dynamics ($116,762)

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