Phillip W. Yoon

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Education

Hunter College, City University of New York 2025–2027 (expected)
M.A. in Mathematics *New York, NY*

University of Pennsylvania, Graduate School of Education 2022–2024
M.S.Ed. in Independent School Teaching Residency *Philadelphia, PA*

Northern Illinois University 2021–2022
Graduate (M.A.) coursework in philosophy, 18 credits (non-degree) *DeKalb, IL*

Johns Hopkins University 2017–2021
B.A. in Mathematics and Philosophy, General Honors *Baltimore, MD*
Study abroad: Budapest Semesters in Mathematics, Summer 2019.

Research Interests

Commutative and homological algebra, especially monomial ideals, Betti numbers, and combinatorial or topological methods in algebra. Secondary interests include noncommutative algebra, algebraic combinatorics, representation theory, and solvable lattice models.

Publications

1. Noah Ripke and **Phillip Yoon**, "Characteristic Independence of Betti Numbers of Monomial Ideals in Five Variables," *Journal of Pure and Applied Algebra* **230** (2026), 108354.

Research Experience

NSF REU/RET in Mathematics, California State University, Chico June–August 2026
Researcher, Commutative Algebra and Combinatorics Group *Chico, CA*

- Conducted research under the supervision of Guillermo Alesandroni on characteristic dependence of Betti numbers of monomial ideals.
- Proved with a coauthor that the multigraded, graded, and total Betti numbers of monomial ideals in five variables are independent of the characteristic of the base field; led the drafting and revision of the resulting manuscript.
- Developed a homological and combinatorial proof based on Hochster's formula; wrote Python code reducing 7,580 squarefree ideals to 210 representatives up to variable relabeling and carried out computational verification in Macaulay2.

Hunter College, City University of New York October 2025–present
Independent Research in Combinatorics on Words and Noncommutative Algebra *New York, NY*

- Conducting ongoing joint research with Be'eri Greenfeld on growth phenomena in associative and monomial algebras and their connections with combinatorics on words.
- Developed original results using hereditary languages, and combinatorial constructions of languages with prescribed growth properties; manuscript in preparation.
- Presented part of this work at Hunter College's student research colloquium.

Polymath Jr., University of Minnesota June–August 2025
Research Participant *Remote*

- Investigated recursive partition functions for lattice models related to quantum superalgebras under the mentorship of Ben Brubaker.
- Contributed to a collaborative project involving color and supercolor variants and local recurrence relations; presented this work at the 2026 Joint Mathematics Meetings.

Research Talks and Presentations

"Characteristic Independence of Betti Numbers of Monomial Ideals in Five Variables" September 2026
Invited talk, Route 81 Conference on Commutative Algebra and Algebraic Geometry, Syracuse University, Syracuse, NY. Joint work with Noah Ripke.

"What Does Small Growth Tell Us About Algebras?" April 2026
Hunter Mathematics and Statistics Colloquium: Student Research Presentations, Hunter College, New York, NY.

"Lattice Models for Quantum Superalgebras: Color and Supercolor" January 2026
Joint Mathematics Meetings, Washington, DC

"Finding Equations for Parametrized Curves of an Affine Variety" May 2025
Poster presentation, CUNY Directed Reading Program, The Graduate Center, CUNY, New York, NY.

Additional Mathematical Experience

CUNY Directed Reading Program, The Graduate Center January–May 2025
Algebraic Geometry and Computational Commutative Algebra *New York, NY*

- Read selected material from Cox, Little, and O'Shea's *Ideals, Varieties, and Algorithms* with graduate mentor Valeriy Sergeev; completed an expository project and final presentation.

Teaching Experience

Hunter College, City University of New York Fall 2026
Adjunct Lecturer, appointed *New York, NY*

- Instructor of record for Precalculus (MATH 12550).

Columbia Grammar and Preparatory School August 2025–June 2026
Teacher of Mathematics *New York, NY*

- Courses taught: AP Calculus AB and Precalculus.

New York City College of Technology, CUNY August–December 2024
Adjunct Lecturer *Brooklyn, NY*

- Courses taught: College Algebra and Trigonometry (MAT 1275CO) and Precalculus (MAT 1375).

Trinity School August 2022–June 2024
Mathematics Teaching Fellow *New York, NY*

- Courses taught: Prealgebra and Honors Algebra I.

Johns Hopkins University August 2018–May 2021
Teaching Assistant and Tutor *Baltimore, MD*

- Supported Discrete Mathematics (EN.553.171), Probability and Statistics (EN.553.211), Calculus II (AS.110.109), and Linear Algebra (AS.110.201).

Awards and Honors

- John Arthur Loustau Scholarship, Hunter College, CUNY, 2026.
- Gail J. McGovern Scholarship, Johns Hopkins University, 2018–2020.
- Honorable Mention, International Olympiad on Astronomy and Astrophysics, 2016.

Service and Outreach

- Member, AI Committee, Columbia Grammar and Preparatory School, 2025–2026.
- MATHCOUNTS Coach, Trinity School, 2022–2024.
- Co-organizer, Johns Hopkins Mathematics Tournament, 2018–2020.

Languages and Technical Skills

Languages: English, Korean, Japanese.
Technical: LaTeX, Python, Macaulay2.

Additional Professional Experience

xAI January–August 2025
AI Tutor *Remote*

- Evaluated and improved AI-generated mathematical reasoning and written solutions.

Last updated July 30, 2026.