G. D. M. Goel

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Education

2030	**(Expected) Ph.D. in Mathematics**, *Princeton University*, Princeton, NJ
2025	**MASt in Mathematics (Pure Mathematics)**, *University of Cambridge*, Cambridge, UK
	Part III of the Mathematics Tripos at Trinity College (*pass with distinction with distinguished performance*)
2024	**A.B.**, *Harvard University*, Cambridge, MA
	Double concentration in Mathematics & Germanic Languages and Literatures with secondary in Music (*GPA 4.0, summa cum laude, highest honors in mathematics*)
2019	*Pace Junior Science College Andheri (PJSC)*, Mumbai, India
2017	*Thakur Public School (TPS)*, Mumbai, India

Writings

Publications and Preprints

[1] The Chow Ring Classes of PGL_3 Orbit Closures in $\mathbb{G}(1,5)$. 2022. [arXiv Preprint]
Presented at the HCURA National Collegiate Research Conference (NCRC) 2023.

[2] On Powerful Integers Expressible as Sums of Two Coprime Fourth Powers (with Noam D. Elkies).
Res. Number Theory **9**, 78 (2023) (proceedings of ANTS-XV, 2022). doi: 10.1007/s40993-022-00415-9

Research Article(s) In Preparation

[3] Chow Classes of the Varieties of Secant and Tangent Lines to a Projective Variety. Advisor: Hannah Larson.

Theses

[4] Galois Cohomology (and the Isogeny Invariance of the Strong Birch and Swinnerton-Dyer Conjecture for Abelian Varieties). Part III Essay. Advisor: Jack Thorne.

[5] The Joys of the Atiyah-Singer Index Theorem. Undergraduate Senior Thesis. Advisors: Joe Harris and Dan Freed. Recipient of the Hoopes Prize, the Fay Prize, and the Friends Prize.

These and other expository articles are available on my webpage.

Teaching and Mentorship

2025 - 26	**Mentor, Directed Reading Program, Princeton**: supervised reading project on algebraic topology.

Ross Mathematics Program USA

Summer 2024	**Visiting Lecturer** at Ross/Ohio.
	Course Head, *Plane Algebraic Curves*. Designed and taught this course on classical algebraic geometry aimed at returning students and counselors. In addition, gave two other mini lecture series for counselors:
	Mathematical Ghostbusters: Despookifying Spectral Sequences (see lecture notes in progress) and
	Cohomology of Curves (see lecture notes).
Summer 2020	**Counselor** at Ross/Zoom. Led discussion sessions for high school students for a number theory course.
	Course Assistant, *Rational Points on Curves*, an advanced course for counselors taught by Stefan Patrikis.

Course Assistant, Department of Mathematics, Harvard University
Led discussion and review sessions, held office hours, graded homework, and prepared solutions.

Spring 2024	**Math 222: Lie Groups and Lie Algebras**, taught by Noam D. Elkies; see the course webpage.
Fall 2023	**Math 213A: Advanced Complex Analysis**, taught by Curt McMullen; see the course webpage.
Spring 2023	**Math 129: Number Fields**, taught by Salim Tayou.
Fall 2022	**Math 114: Analysis of Function Spaces, Measure and Integration**, taught by H. T. Yau.
Spring 2022	**Math 132: Differential Topology**, taught by Dennis Gaitsgory.
Fall 2021	**Math 55A: Honors Group Theory and Abstract Algebra**, taught by Denis Auroux.
	In addition, served as a volunteer course assistant for the following.
Spring 2021	**Math 132**, taught by Joe Harris.
Spring 2021	**Math 55B: Honors Real and Complex Analysis**, taught by Denis Auroux.
Fall 2021	**Math 55A**, taught by Denis Auroux.

Other

Summer 2020	**Course Head, Math 57, Math Online Summer Program** Taught group theory to high school students as part of a program organized by Alec Sun.
2018 - 19	**Teaching Assistant, Math Olympiad Program, PJSC** Taught students in grades 8 through 12 advanced math in preparation for the IMO.

Selected Talks Given

Invited

April 2024	**The Atiyah-Singer Index Theorem and Almost Complex Spheres**, Special talk by the Friends Prize Recipient, Harvard University
April 2024	**The Chow Ring Classes of PGL_3 Orbit Closures in $\mathbb{G}(1,5)$**, gradieNTAG, Simon Fraser University
March 2024	**Chow Classes of Varieties of Secant and Tangent Lines**, Special Student Algebraic Geometry Seminar, Stanford University

Contributed

Dec 2025	**The Weil Conjectures**, Princeton First-Year Seminar
Nov 2025	**Galois Theory Like You've Never Seen Before**, Princeton Graduate Student Seminar
October 2025	**On the degree of a modular map**, Princeton Algebraic Geometry Preprint Seminar
May 2025	**Bertrand's Postulate (or Why All of Maths is Cool)**, The Trinity Maths Society Easter Peer Talks
March 2025	**An Introduction to Moduli Spaces in Algebraic Geometry**, Part III Seminar Series, Lent 2025
July 2024	**Indra's Pearls: Symmetry, Recursion, and Beauty in Mathematics**, Ross/Ohio
June 2024	**What is Sharkovsky's Theorem, or why does period three imply chaos?**, What is . . . ? Seminar, OSU
June 2024	**Can You Solve It (It = A Quintic)? Topology Says No**, Ross/Ohio
May 2024	**(Almost) Complex Structures on 4-Manifolds**, Harvard University Math Table
Nov 2022	**Emmy Noether: Mathematician Extraordinaire**, HMMT Education Session
Aug 2022	**On Powerful Integers Expressible as Sums of Two Coprime Fourth Powers**, ANTS-XV, U. of Bristol
Feb 2022	**The Three-Sphere in Dante's *Divine Comedy***, HMMT Education Session
Nov 2021	**The Inverse [Quadratic] Central Potential and the Cubic Equation** Harvard Society of Physics Students (SPS), Undergraduate Chalk Talks Series
Aug 2021	**Galois Cohomology and Hilbert's Theorem 90**, Ross 2021, Dorm Lecture for *Rational Points on Curves*
Nov 2020	**What is Algebraic Geometry and Why Do We Care?**, HMMT Education Session
Oct 2019	**Fermat's Little Theorem and its Applications to Cryptography**, Harvard University Math Table
	A list of all talks given, along with some accompanying notes, can be found on my webpage.

Honors, Awards, and Research Funding

Academic

2025	**Tripos Prize**, "to students who have most distinguished themselves in the MASt in Mathematics."
2025	**Examination Prize**, Trinity College, Cambridge
2025	**Senior Scholarship**, Trinity College, Cambridge
2024	**Lt. Charles H. Fiske III Scholarship**, Harvard-Cambridge Scholarship to Trinity College, Cambridge
2024	**Sophia Freund Prize**, "awarded annually to the highest ranking undergraduate(s)."
2024	**David B. Mumford Mathematics Prize**, "to the most promising senior concentrator(s) in mathematics."
2023	**Phi Beta Kappa (PBK), Senior 48**, membership in national academic honor society.
2023, '22, '20	**John Harvard Scholarship**, awarded to students in the top 5% of their class.

For Writings

2024	**Captain Jonathan Fay Prize**, for [5], given to "top theses of Harvard College's graduating class".
2024	**Thomas Temple Hoopes Prize**, for [5], awarded for "outstanding scholarly work or research."
2024	**Friends Prize**, for the top two theses presented to The Friends of the Harvard Math Department, interviewed in the 2024 Harvard Math Newsletter.

Research Funding

2022	**Fellow, Herchel Smith Undergraduate Science Research Program**, for [1].
2022	**Fellow, Harvard College Program for Research in Science and Engineering (PRISE)**
2020	**Harvard College Research Program**, for [2].

Other

2024	**Caroline Isenberg Award**, Lowell House, Harvard
2023	**Elliot & Mary Perkins Prize**, Lowell House, Harvard
2019, '18	**Merit Award, Indian National Mathematics Olympiad (INMO)**
2017	**Thakur Ramnarayan Memorial Award, TPS**

Extracurricular Activities

2024	**Mentor, HARMONY, Harvard PBHA**: gave piano lessons to middle school students in Cambridge.
2022 - 24	**Member, Harvard MIHNUET**: performed music in hospices and senior living communities.
	Harvard Undegraduate Gender Inclusivity in Mathematics (HUGIIM)
2022 - 23	**Co-president**: Organized projects and socials, collaborated with other inclusivity organizations, and served as student representative in the Math Department Community Committee.
2021 - 22	**Mentorships Co-Chair**: Co-organized the *Math Includes* mentorship program.

Arts

2021 - 23	**Student Composer, Harvard Choruses New Music Initiative**
Feb 2022	***Bard, If A Picture Never Lies,* Harvard Classics Club**. See this article in the Harvard Crimson.

Choirs

Princeton University Chamber Choir ('25-); Early Music Princeton Singers ('25-); Cambridge University Schola Cantorum ('24-25); Emmanuel College Chapel Choir ('24-25); Harvard University Choir ('22-24) as a Ferris Choral Fellow ('23-24); Harvard Glee Club ('19-24) and Glee Club Lite ('21-22).

Other

Software:	Python, Java, C++, SageMath, Pari/GP, Macaulay2
Languages:	English (native), Hindi (native), German (C1), Spanish (B1), French (A1)