

My favorite theorems

Bogdan Grechuk • 2 Jan 2026

One of the recurring themes of this blog will be descriptions of my favorite theorems of the 21st century. I will begin with a special category, *Between the Centuries*, devoted to theorems that were proved in the late 20th century but published in the early 21st century. After that, I will proceed year by year—starting with 2001, then 2002, and so on.

For each year, I will select my favorite theorem in the following subject areas:

- Number Theory
- Combinatorics
- Analysis
- Algebra
- Geometry and Topology
- Probability and Statistics
- Algorithms and Complexity

In addition, I will choose a single *favorite theorem of the year* across all of mathematics.

This post will serve as a central index for the series, collecting links to all of my selected theorems in one place as the project develops.

Between the Centuries

Number Theory: [The Modularity Theorem](#)

Combinatorics: [Cycle decompositions of complete graphs](#)

Analysis: [On the zero set of linear recurrences](#)

Algebra: [All braid groups are linear](#)

Geometry and Topology: [The proof of Kepler's conjecture](#)

Probability and Statistics: [The intersection exponent for planar random walks](#)

Algorithms and Complexity: [The impossibility to beat random assignment in k-SAT](#)

Overall in mathematics: [The proof of Kepler's conjecture](#)

Theorems of the year 2001

Number Theory: [On the sets of simple sums and products of integers](#)

Combinatorics: [The Graph Minors Theorem](#)

Analysis: [The hot spot conjecture for lip domains](#)

Algebra: [Positive noncommutative polynomials are sums of squares](#)

Geometry and Topology: [On upper bounds for sphere packings](#)

Probability and Statistics: [On the cover times for simple random walk](#)

Algorithms and Complexity: [Efficient approximation of the permanent](#)

Overall in mathematics: [The Graph Minors Theorem](#)

Theorems of the year 2002

Number Theory: [The proof of Catalan's conjecture](#)

Combinatorics: [The strong perfect graph theorem](#)

Analysis: [Large Euclidean pieces of finite metrics](#)

Algebra: [Groups of non-uniform exponential growth](#)

Geometry and Topology: [Efficient Steiner symmetrizations](#)

Probability and Statistics: [The growth of diffusion in the 2D ASEP](#)

Algorithms and Complexity: [On the Frobenius Coin Problem](#)

Overall in mathematics: [The strong perfect graph theorem](#)