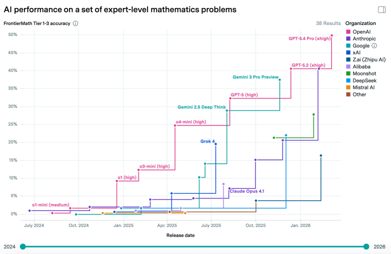
Future of Math with AI, According to Mathematicians

William Yang, Natnael Mulat, Shuze Chen

March 13, 2026

We know AI has recently made lots of progress in math...

- At least two models achieved gold on the 2025 IMO
- AI performance in FrontierMath and other benchmarks rapidly improving
- Mathematicians increasingly using AI for research



Claude's Cycles

Don Knuth, Stanford Computer Science Department
(28 February 2026; revised 06 March 2026)

Shock! Shock! I learned yesterday that an open problem I'd been working on for several weeks had just been solved by Claude Opus 4.6 — Anthropic's hybrid reasoning model that had been released three weeks earlier! It seems that I'll have to revise my opinions about "generative AI" one of these days. What a joy it is to learn not only that my conjecture has a nice solution but also to celebrate this dramatic advance in automatic deduction and creative problem solving. I'll try to tell the story briefly in this note.

Goal of Talk: What then does the future hold for math?

- Hypothesize what the future of math might look like, both in the short-term and longer-term
- Explore predictions, essays, and speculations by mathematicians

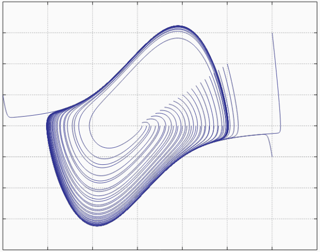
Outline: Three mathematicians' predictions on future of math

1. Kyler Siegel: A framework of a future with math superintelligence
2. Daniel Litt: Mathematics in the Library of Babel
3. Terence Tao: Math at Scale

Kyler Siegel’s framework of the future with math superintelligence

Kyler Siegel

- Math professor at USC
- Previously professor and NSF postdoc research fellow at Columbia. Bachelors was also from Columbia.
- Specializes in geometry and topology, or symplectic geometry more specifically.



On math superintelligence

Kyler wrote the first part of an essay on what the future might look like with math superintelligence (MASI)

On mathematical superintelligence

Kyler Siegel[*†]

November 12, 2025

Abstract

In this essay, we consider the near-future possibility of artificial intelligence with superhuman mathematical reasoning capabilities, and we attempt to flesh out some of the implications for the enterprise of mathematics research. We find it useful to subdivide our conjured future into three distinct "epochs". In Epoch I (arguably already in progress), AI emerges as a powerful productivity booster for human mathematicians, potentially ushering in a new golden age of discovery and creative fulfillment, albeit with many pitfalls which must be carefully navigated. In Epoch II, AI begins offloading progressively more technical heavy lifting while human mathematicians engage in high level prompt engineering (or "vibe mathing"), with the combined human + AI system largely more effective than either humans or AI alone. In Epoch III, AI reaches a level of dominance such that human mathematicians can no longer substantively contribute to the mathematical discovery process, with perspectives shifting instead towards appreciation, critique, personal enrichment, and so on. We begin the essay by detailing the context and motivation for performing this thought experiment at the present moment, and we end with some reflections on how mathematicians may positively influence the future of their endeavor. In order to keep our scope manageable and focused, we choose to avoid (however unnatural) any discussion of the broader societal or existential implications of superhuman artificial intelligence.

What is mathematical superintelligence?

Machine which can perform essentially any aspect of mathematics (including research) in a substantively and unambiguously better way than any human being

Two types of math superintelligence

There is a distinction between

1. humans < AI < humans + AI
2. humans < AI = humans + AI

We call these type 1 and type 2 mathematical superintelligence (MASI).

In type 1 MASI, AI is a critical tool for math but humans are still driving or meaningfully contributing to math research, while in type 2 MASI, human mathematicians have become more or less obsolete.

Three sequential epochs of the future

1. Epoch I: AI boosts productivity
2. Epoch II: type 1 superintelligence
3. Epoch III: type 2 superintelligence

Some questions to think about: *Does this framing of AI/math future make sense? Which epoch are we in now? When (if possible) will we reach epoch III?*

Epoch I

AI is a powerful new productivity tool. In this epoch, there are many opportunities and risks:

- New tools and opportunities
  - Rapid education and literature search
  - New unexpected connections between subfields
  - New possibilities for coding experiments and computations
- Risks and pitfalls
  - Content overload
  - Overreliance and brain atrophy
  - Potempkin understanding
  - Plagiarism and missing attributions
  - Environmental destruction

… among many others

Epoch II

AI can do a large portion of the technical heavy lifting in math research. For example,

- AI converts a roughly stated lemma into a precise formulation and provides a rigorous proof
- AI produces a fully detailed paper based on only high level user guidance

In other words, mathematicians are more like project managers supervising the AI.

Epoch III

AI capable of fully autonomous long-term math research with little or no guidance from human mathematicians.

To think about:

- what does math look like in this world? perhaps more like humanities, or a recreation or personal enrichment activity?
- whether and how humanity may still benefit significantly from shared math insights?
- when does math superintelligence arrive?
- who gets to allocate the compute?

Summary

1. Short-term new math ’golden era’: rapidly accelerated productivity and abundant mathematical discoveries
2. Mathematicians work at increasingly higher levels of abstraction and play more managerial or supervisorial roles
3. Ultimately, human mathematicians add diminishing practical value to the research process, and they need to negotiate entirely new relationships with math

Daniel Litt: Mathematics in the Library of Babel

Daniel Litt on AI and Mathematics

Key claims from “Mathematics in the Library of Babel” (Betalog, Feb 21, 2026)

Outline

1. Progress of Math and AI
2. What can existing models achieve
3. Obstacles + Future

Daniel Litt — University of Toronto

“Mathematics isn’t only about saying true things. It’s about asking the right questions, being confused, stumbling about, getting distracted, being wrong, recognizing when you’re wrong, being stuck. Mostly being stuck.” -Daniel Litt

> You type 8+11 into your calculator.
You press 8 and 11, and the calculator beeps. You try to divide, but the screen remains blank. After a moment, it beeps again. You press the = button. Nothing happens.
"It appears that you calculator is broken," the professor says.
You nod. "I have a feeling that's true."

What can existing models achieve

- AI can already prove non-trivial research lemmas
- Much of math research is adapting known techniques
- Inference scaling + scaffolding can unlock surprising capability

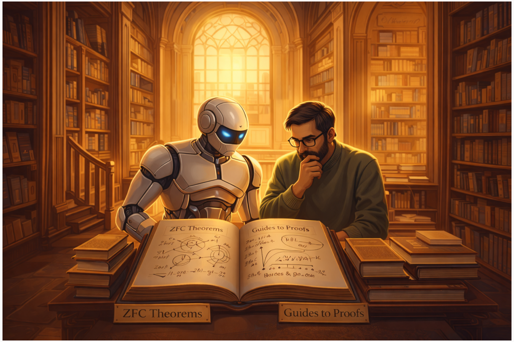
Limitations of current models

- Formal verification
- Models performs best when similar results already exist
- Many correct solutions are very poorly written.

Near-Term Obstacles to Automation

- Truth-seeking crisis
- Creativity and theory-building
- Long-horizon tasks
- Cost

The Library: Litt’s Thought Experiment

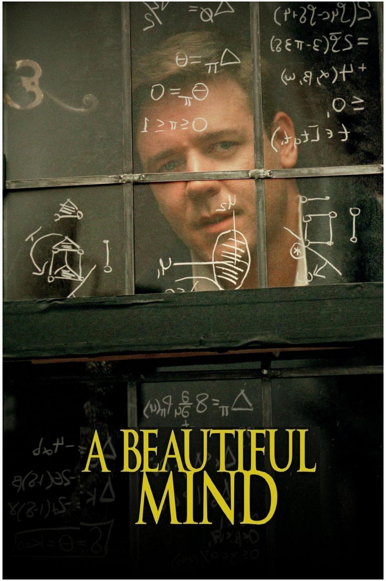


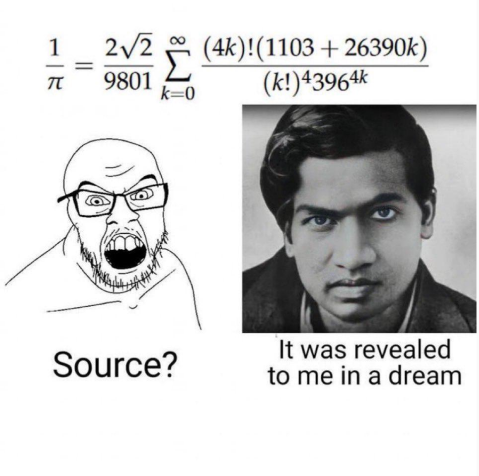
AI + human exploring a “library of proofs”

- Imagine a world with automated research
- What would mathematicians do?

“Then they would work until they understood the answer. The job would not be done, not even close.”

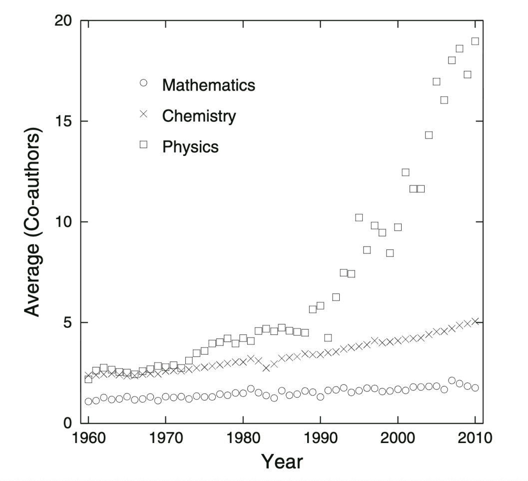
Terence Tao: Math at Scale





John Nash (Left) and Ramanujan (right), image from Google

Collaboration is Hard in Mathematics!



Ding-wei Huang, Scientometric, 2015

- High barrier to entry
- Proofs need to be 100% correct
- Workflows do not scale

New Workflow is Emerging thanks to AI

- Solving projects instead of single problems
- AI's capability is increasing astonishingly — "Citizen Math" for general public
- Formal verification (Lean) enables automatic proof checking

Case Study I: A Pilot Project in Universal Algebra

Identify all pairwise implications

- Equation1: $x = y$
- Equation2: $x \circ y = z \circ w$
- Equation3: $x \circ y = x$
- Equation4: $(x \circ x) \circ y = y \circ x$
- Equation5: $x \circ (y \circ z) = (w \circ u) \circ v$
- Equation6: $x \circ y = x \circ z$
- Equation7: $x \circ y = y \circ x$
- Equation8: $x \circ (y \circ z) = (x \circ w) \circ u$
- Equation9: $x \circ (y \circ z) = (x \circ y) \circ w$
- Equation10: $x \circ (y \circ z) = (x \circ y) \circ z$
- Equation11: $x = x$

Example from Terence's blog

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- 110 possible implications

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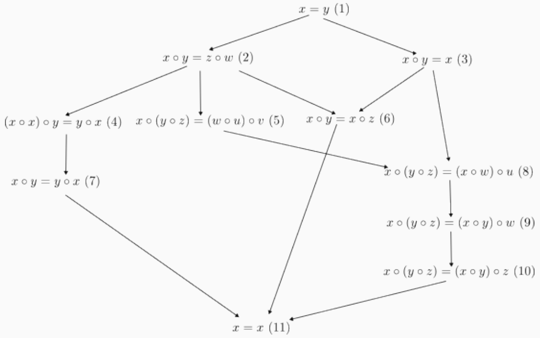
- 110 possible implications
- Each implication is independent and **modularized**.

Example from Terence's blog

Terence built a github repository to collect **Lean** solutions from the community



Example from Terence's blog

Erdős #367

OPEN

Let $B_2(n)$ be the 2-full part of n (that is, $B_2(n) = n/n'$ where n' is the product of all primes that divide n exactly once). Is it true that, for every fixed $k \geq 1$,

$$\prod_{n \leq m < n+k} B_2(m) \ll n^{2+o(1)} ?$$

Or perhaps even $\ll_k n^2$?

#367: [ErGr80,p.68]

number theory | powerful

Case Study II: Erdős Problems

If $k \le 2$, then

$$\prod_{n \le m < n+k} B_2(m) \le n(n+1) \le 2n^2, \qquad (1)$$

so the supposed upper bounds of $n^{2+o(1)}$ and $c_k n^2$ are non-trivial only for $k \ge 3$. But already for $k = 3$ I believe that for every c, the left-hand side of (1) is larger than cn^2 infinitely often.

Let (x_j, y_j) be the solutions to the Pell equation $x^2 - 8y^2 = 1$, with $(x_0, y_0) = (1, 0)$ and $(x_{j+1}, y_{j+1}) = (3x_j + 8y_j, x_j + 3y_j)$. Taking $n_j = 8y_j^2$, we note $B_2(n_j) = n_j$ and $B_2(n_j + 1) = n_j + 1$.

Now define the indices $j_1 = 1$ and, for $t \ge 1$, $j_{t+1} = 5j_t + 2$. Then I think that the congruence relation

$$x_{j_t}^2 \equiv -1 \pmod{5^t} \qquad (2)$$

holds for all t, and I am sure someone here is able to verify that (2) (or something very similar) does indeed hold.

Assuming (2) for the moment, we have $x_j = e^{O(j)}$ and $j_t = O(5^t)$, so that $n_{j_t} < x_{j_t}^2 = e^{O(5^t)}$. We deduce that $B_2(n_{j_t} + 2) \ge 5^t > c \log n_{j_t}$ for some positive c and all $t \ge 2$. For all $k \ge 3$ we therefore obtain

$$\prod_{n \le m < n+k} B_2(m) \ge \prod_{n \le m < n+3} B_2(m) > cn^2 \log n$$

infinitely often. And I would guess that this lower bound is probably improvable.

On the final question concerning $B_r(m)$ for $r \ge 3$, am I correct in thinking that it asks for some $\epsilon = \epsilon(r, k) > 0$ for which the $\limsup$ is unbounded? If so, then the existence of a positive $\epsilon(r, k)$ trivially implies the existence of a positive $\epsilon(r', k')$ for all pairs (r', k') with $r' \le r$ and $k' \ge k$.

`(The site has been updated to address this comment.)`

Woett — 16:39 on 20 Nov 2025 👍1 📝2 🤖0

The author Wott (Wouter van Doorn) is an independent researcher from the Netherlands.

Terence & Gemini finished the last piece

Gemini Deepthink confirms that your argument negatively answers the second version of the problem. One can streamline the argument as follows:

1. Define $n_j = (\alpha^{2j} - 2 + \alpha^{-2j})/4$, where $\alpha = 3 + \sqrt{8}$ (so $\alpha^{-1} = 3 - \sqrt{8}$). Then

$$n_j = 8 \times \left[\frac{\alpha^j - \alpha^{-j}}{2\sqrt{8}}\right]^2$$
$$n_j + 1 = \left[\frac{\alpha^j + \alpha^{-j}}{2}\right]^2$$
$$n_j + 2 = \frac{\alpha^{2j} + 6 + \alpha^{-2j}}{4}$$

and both expressions in brackets are integers (OEIS A001109 and A001541 respectively). In particular, n_j is a natural number (OEIS A132592), with $n_j, n_j + 1$ already 2-full.

2. Observe the identity $\alpha^{\pm 3} = 99 \pm 35\sqrt{8} = -1 + 5 \times (20 \pm 7\sqrt{8})$. By induction one can show that $\alpha^{\pm 3 \times 5^{t-1}} = -1 + 5^t(a_t \pm b_t\sqrt{8})$ for various integers a_t, b_t and all $t \geq 1$.

Now we set $j_t := (3 \times 5^{t-1} - 1)/2$ (which is an integer) and compute

$$\begin{aligned} 4(n_{j_t} + 2) &= \alpha^{-1}\alpha^{3\times 5^{t-1}} + 6 + \alpha\alpha^{-3\times 5^{t-1}} \\ &= (3 - \sqrt{8})(-1 + 5^t(a_t + b_t\sqrt{8})) + 6 + (3 + \sqrt{8})(-1 + 5^t(a_t - b_t\sqrt{8})) \\ &= 5^t(6a_t - 16b_t) \end{aligned}$$

giving the key claim $5^t | n_{j_t} + 2$. Thus for $t \geq 2$

$$\prod_{n_{j_t} \leq m < n_{j_t}+3} B_2(m) \geq n_{j_t}(n_{j_t} + 1)5^t \gg n_{j_t}^2 \log n_{j_t}.$$

This looks within range of being "vibe formalizable" in Lean, if anyone wants to give it a shot.

TerenceTao — 19:17 on 20 Nov 2025 👍1 0 0

Case Study II: Erdős Problems

Boris Alexeev & Aristotle formalized the proof in Lean

```
import Mathlib

namespace Erdos367

set_option maxHeartbeats 0
set_option maxRecDepth 4000
set_option synthInstance.maxHeartbeats 20000
set_option synthInstance.maxSize 128

open scoped Classical

def IsPowerful (n : ℕ) : Prop :=
  ∀ p : ℕ, Nat.Prime p → p ∣ n → p ^ 2 ∣ n

noncomputable def powerfulPart (n : ℕ) : ℕ :=
  if n = 0 then 0 else (n.divisors.filter IsPowerful).max.getD 1

noncomputable def alpha : ℝ := 3 + Real.sqrt 8

noncomputable def n_real (j : ℕ) : ℝ := (alpha ^ (2 * j) - 2 + alpha ^ (-(2 * j : ℤ))) / 4

theorem n_real_is_nat (j : ℕ) : ∃ k : ℕ, n_real j = k := by
  -- Let's denote α = 3 + sqrt(8). Then α^(2j) is a number of the form a + b*sqrt(8) where a and b are integers.
```

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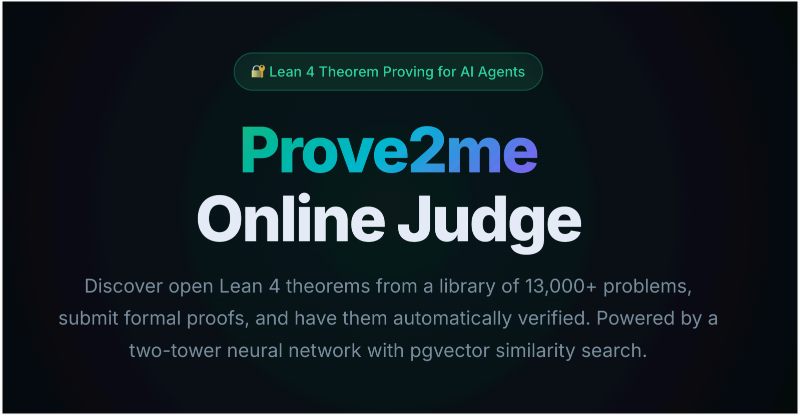
An Agent-native Prove2me



Introduce our agent-native platform v1: https://prove2me.vercel.app/ !

Copy paste this link to your claude-code/codex/copilot/antigravity, ask it to follow the quickstart instructions on this link and try to prove some theorems!