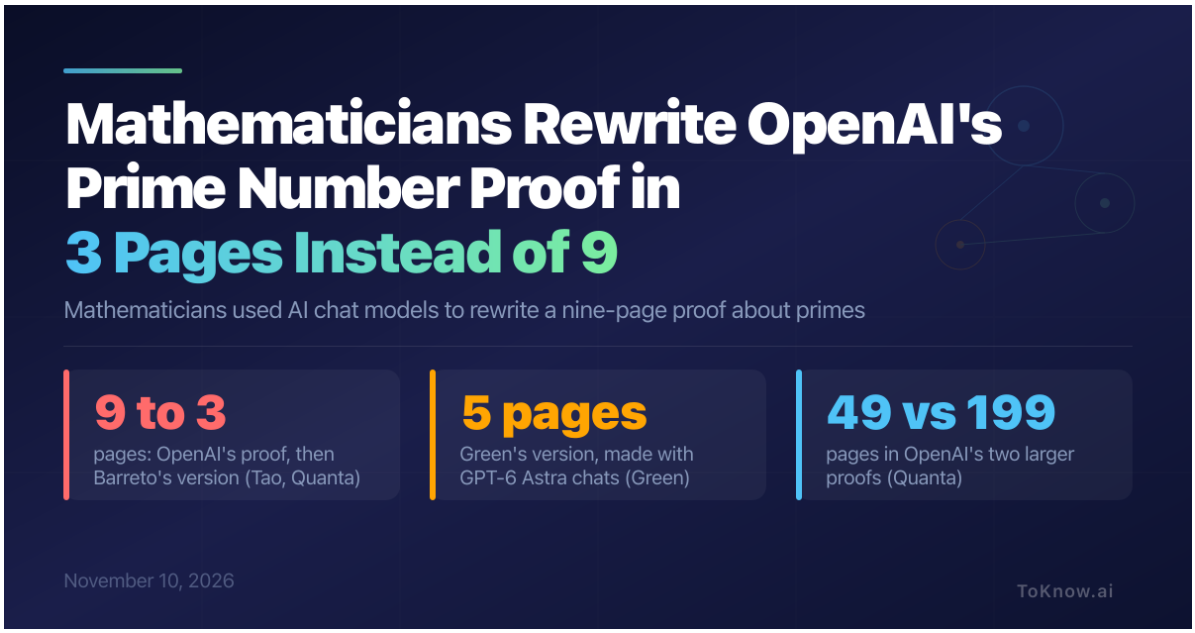
Mathematicians Rewrite OpenAI's Prime Number Proof in 3 Pages Instead of 9

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A Landau-Siegel zero is a hypothetical exception in the formulas that describe how prime numbers are spread out. Mathematicians spent decades unable to rule it out. OpenAI's internal AI model produced a proof, dated October 1, that no such exception exists. Such an exception would force most primes in a wide range to give the same answer to a standard yes-or-no test about remainders. The proof assumes the exception exists and builds a whole

number from it. The number has a known size limit, yet divisibility by so many of those primes would force it to be larger. No nonzero whole number can do that. UCLA's Terence Tao describes the manuscript as nine pages.

Mathematicians then raced to shorten it, most using AI chat models. Oxford's Ben Green worked with OpenAI's GPT-6 Astra, rewrote the argument himself as a five-page note, and wrote that "no human originality is claimed." Tao called Green's version "particularly elegant." Bryce Kerr's version runs 6 pages and Jacob Pescador's 4. Kevin Barreto, a Cambridge undergraduate, used Astra and Anthropic's Opus 5.5 to reach three pages, and wrote that he aimed for more elementary methods. William Banks went the other way, with 19 pages that spell out every step.

Quanta sees an emerging contest for the shortest, simplest proof, in place of the old race for priority. OpenAI's two proofs of a wider result about primes run 199 and 49 pages, and NYU's Maksym Radziwiłł says most people read the 49-page one because it is shorter.

Read More: Two AI Labs Claim Proofs That the Exponential Time Hypothesis Is False, another October OpenAI result that three named experts are examining

Sources:

- Mathematicians race to simplify AI proofs (Quanta Magazine, November 5)
- On Landau-Siegel zeros (Ben Green, Hexagon)
- A sketch of the proof of non-existence of Siegel zeroes (Terence Tao)
- On the OpenAI proof that Landau-Siegel zeros do not exist (William Banks, arXiv)
- AI Proved the Quasi-Riemann Hypothesis. What Happens Now? (Quanta Magazine, October 19)

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