AI, Mathematics, and Human Understanding

"How do mathematicians advance human understanding of mathematics?"

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- A Millennium Prize problem about modeling fluid flow and the stability of smooth solutions.
- September 2026: OpenAI announces a solution showing that smooth forcing can produce a singularity in finite time.

Progress on hundreds of open problems

In October 2026, OpenAI released AI-generated work reporting solutions or substantial progress on hundreds of open research problems across mathematics.

The results remain at different stages of verification.

How does a field absorb this much mathematics?

How do we train and evaluate mathematicans?

- Productive struggle develops judgment and independence.
- Accessible open problems give beginning researchers essential practice in doing original mathematics.
- How should we assess mathematical ability and contributions when AI can prove difficult results?

Potential benefits of AI in mathematics

- Faster discovery of new results.
- Formalizing proofs so computers can check them.
- Finding unexpected connections across mathematical fields.

How I use AI in my research

- Brainstorming
- Literature searches
- Strategy testing
- Coding

Brainstorming

- Generate possible questions and conjectures.
- Explore alternative approaches to a problem.
- Develop rough ideas through conversation.

Literature searches

- Search deeply inside papers.
- Find useful results outside a paper's main topic.
- Follow connections to a possible proof strategy.

Strategy testing

- Test proposed arguments on examples.
- Look for counterexamples and hidden assumptions.
- Revise approaches that do not work.

Coding

- Turn mathematical ideas into working programs.
- Run computations and compare approaches.
- Implement algorithms I could not code on my own.

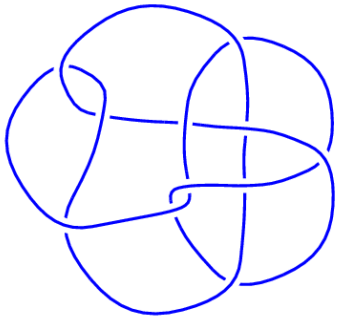
My practical setup

- ChatGPT/Codex, using a subscription I pay for myself.
- I ask it to create coding projects directly on my computer.
- Give it a specific goal, relevant context, and examples.
- Ask for runnable code, instructions, and checks against known examples.

A success in knot theory

For over a decade, I worked on a problem in knot theory, making significant incremental progress.

With AI's help, a collaborator and I have now solved it and are writing up the results.



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