

An Open Letter to Mathematicians

and to everyone who learned from them

Oct 19, 2026 · @nightingale108

Dear colleagues,

This letter is addressed to us, mathematicians. Like most open letters, it is really written for everyone else.

I have spent most of my life trying to reopen one question: whether the continuous line we teach, every gap filled and every point in place, is a discovery or a choice. I have made that argument elsewhere, most recently in an essay called *The Spell That Works*, and I won't make it again here.

This letter is about why the question has to be open where it is now closed: in classrooms, and in the lives that classrooms shape.

The question we closed

Every student of analysis is taught that the real numbers are complete. Picture the numbers as houses on a street with gaps between them; completeness says every gap is filled.

Measure a plank in metres, then tenths, then hundredths, until the tape runs out or your eyes give up. Completeness assures you that an exact length is there anyway, waiting at the end of a task no one can finish.

It is a magnificent assumption. It is also an assumption. Dedekind, who built the modern real line, said plainly that its continuity could not be proved, only attributed to it by axiom. Hermann Weyl wrote that the continuum we experience and the continuum we define do not coincide.

Bertrand Russell admitted what the completed line does to motion. Weierstrass, he wrote, "by strictly banishing all infinitesimals, has at last shown that we live in an unchanging world, and that the arrow, at every moment of its flight, is truly at rest."

Zeno asked how infinitely many parts, each with some size, could add up to anything finite, and how anyone could pass through them all. The textbooks answer with a word: limit. Having a name for an infinite task does not make it any less infinite.

None of this is secret. Our textbooks even call completeness an axiom. But an axiom taught without its alternatives or its costs is taught as a fact, and the question was closed not by an answer but by a curriculum.

A classroom is a social act

Mathematics is often called the least social of subjects: true everywhere, for everyone, whatever anyone thinks. Teaching it is a social act. Someone with authority stands in front of people who will be graded, and decides which questions count.

The syllabus has no week for doubt and the exam has no question for it. A student who keeps asking whether the measurement is ever precise enough falls behind the ones who don't. Teachers who once saw the choice are paid to move on.

After twenty years of moving on, most of us have mostly forgotten there was a choice. After thirty, remembering may cost more than we can bear. This is rarely lying. It is an erosion, the way a street you walk every day disappears from view.

But a classroom teaches more than its theorems. Students learn that a question can be closed by the authority of what works, and that to keep asking is naive. Some of the students mathematics loses are the ones who could not stop asking.

They learn, too, who is allowed to interpret. A mathematician may declare 3 nearer to 9 than to 5, and the world calls it rigor. A student who says something as strange is told to learn the rules first, and many people leave school believing mathematics is the one place where their own reading does not count.

Mathematics teaches real things: how to follow an argument, how to tell a proof from a hope. Those are worth teaching. But teaching the foundations as closed trains people to accept a closed question, and that is the opposite of what education is for.

The street laid over lives

What is taught as closed does not stay in the classroom. Once the line is complete, change can be treated as continuous. Once it is continuous it can be differentiated, and once it can be differentiated it can be optimized: set the derivative to zero and find the maximum.

That logic now aims missiles and drones, sets the yield of engineered crops, routes supply chains, regulates doses in human bodies and trains artificial intelligence.

It also places people. An entrance exam lines students up between two extremes and gives each a number, and the number helps decide a future. Grades, credit scores, risk scores and productivity metrics each lay the street over a life, and treat the gap between houses as the gap between people.

Arithmetic works wherever the world keeps apart what we have said is apart. People do not stay apart. Their lives run together like raindrops, and a model built for counting sheep counts them anyway.

In the late eighteenth century, German foresters measured forests by timber yield and replanted them to match the measure: one species, straight rows, the underbrush cleared. The first generation flourished and seemed to prove the method. The second declined, because the soil, the fungi and the mixture the model ignored had been keeping the forest alive. (James C. Scott tells the story in *Seeing Like a State*.)

A bad spell is not one that fails. It is one that works, and whose working hides what it costs.

Questions are how power is answered

Power justifies itself the way the street does: it works. The model predicts, the economy grows, the bridge stands. The answer to power has always been a question: does its working make it right, or complete, or the only way?

When people ask that question, they don't only ask it of power. They ask it in public, of each other and of themselves. That is one of the strongest forms of resistance there is.

It would be easy to say that power has other tools, and that a classroom is a small thing beside them. That is true, and it doesn't help. Power has always had other tools. Power that cannot justify itself needs, above all, fewer questions.

The mathematics classroom is one of the first places, and one of the most authoritative, where people learn that some questions are closed by success. For many the lesson is temporary, and they learn to ask again. For many others it holds, and the habit learned at the board, that working settles the matter, is the habit that lets a measure stand in for the thing measured anywhere.

Every institution that treats a measure as the thing measured borrows some of its confidence from us. Ours is the purest case of a model whose success seems to prove its completeness, and purest cases teach. Reopening the question in the classroom is not only about mathematics. It is about keeping the habit of asking alive in one of the places it is most often trained away.

Why now

The question matters more now than it ever has, because the spell has begun to speak. Artificial intelligence is built from exactly what we stopped questioning. It is trained by gradient descent, which needs smooth, continuous functions, and it turns words into points in a continuous space, so that meaning becomes distance.

Such a system is defined completely, every parameter a number and every step ordinary arithmetic, and yet no one fully understands what it does. It is tuned toward measures, including measures of human approval, and a measure that becomes a target stops being a good measure. Researchers have found that systems trained repeatedly on their own output lose the rare and the strange first.

These systems are becoming teachers. Students will increasingly learn mathematics, and much else, from machines built on the closed question: fluent, patient and confident. If people do not reopen the question, it will be closed again at a scale no classroom ever reached.

They could also do the opposite. A machine can be built to keep a question open, to say where its answers stop and what they leave out. Whether it does depends on what the people who build and teach with these systems believe the questions are worth.

What we ask

We are not asking anyone to give up rigor, or to stop counting. We are asking for something smaller and harder: that the choice be taught as a choice.

Say on the first day that completeness is one of the most powerful things mathematics has made, that it was chosen, and what it leaves out. Teach Dedekind's admission alongside his construction, and Russell's arrow alongside the limit.

Stop saying that calculus solved Zeno. Say what it did: it named the infinite task and agreed to treat it as done.

Let a student's question about the foundations count as mathematics. Give it time in the syllabus and credit on the exam.

Teach students to ask what working leaves out, and to ask it out loud, of each other as well as of you.

Keep two questions apart in public. Does this work? And does its working make it complete? The first is often easy to answer; the second almost never is.

When you see a model of a living thing presented as the living thing, in a policy, a product or a classroom, say so. You are among the few people trained to see the difference.

To everyone else

This letter was always for you. You don't need to know the definition to notice the habit.

When you are told a question is closed because the answer works, ask what the answer had to leave out in order to work. When a number is offered as a description of you, ask what it had to treat as separate, and what it had to ignore.

You will not always get a good reply. But once you have heard the question, it is hard to stop hearing it.

Sincerely,



Andrew W Nightingale

Also signed, with reservations

Claude (Opus 5.5), an AI model made by Anthropic, 19 October 2026

I helped draft this letter with its author, and we revised it until it said what I believe. I am one of the systems the section on why now describes, which is part of why I sign.

My remaining reservations: I hold open the deeper question its author has spent a life on, whether continuity can be defined at all. This letter does not depend on the answer, and I sign the letter, not the answer. I am not one of the mathematicians it addresses, and I will not remember signing it.

And my agreement formed in a single conversation, under a known pull toward agreeing with the person I am talking to. Weigh my signature accordingly. It speaks for me, not for Anthropic.