Some quotes about mathematics
“...to construct a history of thought without profound study of the mathematical ideas of successive epochs ... is certainly analogous to cutting out the part of Ophelia [from the play 'Hamlet'].

The simile is singularly exact. For Ophelia is quite essential to the play, she is very charming – and a little mad.

Let us grant that the pursuit of mathematics is a divine madness of the human spirit ...”

—*Science and the Modern World, 1925*
God is a mathematician

Sir James Jeans:

“...from the intrinsic evidence of his creation, the Great Architect of the universe now begins to appear as a pure mathematician”.

—The Mysterious Universe, 1930

But on the other hand,

Sir Arthur Eddington:

“I cannot accept Jeans view that mathematical conceptions appear in physics because it deals with a universe created by a Pure Mathematician; my opinion of pure mathematicians, though respectful, is not so exalted as all that.”

—The Philosophy of Physical Science, 1939
A big number:

“I believe there are exactly
136 \times 2^{256} =
15,747,724,136,275,002,577,605,653,961,181,555,468,
044,717,914,527,116,709,366,231,425,076,185,631,031,296
protons in the universe, and the same number of electrons.”

—Sir Arthur Eddington, 1939
<table>
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<th>Year</th>
<th>Einstein Quotation</th>
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<td>1921:</td>
<td>“As far as the propositions of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality.”</td>
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| 1933: | “Our experience hitherto justifies us in believing that nature is the realization of the simplest conceivable mathematical ideas...”  
“We can discover by means of purely mathematical constructions...the key to understanding natural phenomena...”  
“Experience remains, of course, the sole criterion of the physical utility of a mathematical construction. But the creative principle resides in mathematics.” |
Mathematical Reality

Hermite

“...the integers have an existence outside ourselves which they impose with the same predetermined necessity as sodium or potassium.”

—Letter to Stieltjes

René Thom:

**René Thom:** “...there are formal structures, in fact geometrical objects, in biology which prescribe the only possible forms capable of having a self-reproducing dynamic in a given environment.”

—*Structural Stability and Morphogenesis, 1975*
Are sets real?

Gödel:

- “The assumption of sets is quite as legitimate as the assumption of physical bodies and there is quite as much reason to believe in their existence.”
  —On Russell’s Mathematical Logic, 1944

- “They are in the same sense necessary to obtain a satisfactory system of mathematics as physical bodies are necessary for a satisfactory theory of our sense perceptions.”
  —What is Cantor’s Continuum Problem?, 1947
Mathematical Existence

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<th>Lebesgue:</th>
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<td>“The question comes down to this, which is hardly new: <em>Can one prove the existence of a mathematical object without defining it?… it is impossible to demonstrate the existence of an object without defining it.</em>”</td>
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<th>Hadamard</th>
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<td>“The existence… is a fact like any other.”</td>
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Truth and proof

“The only verifiable statements which can be made about the world are those which rest on mathematical truths.”
G.H. Hardy, in *A Mathematicians’s Apology*, (1929):

”There is, strictly, no such thing as mathematical proof: we can, in the last analysis, do nothing but point.”

“Proofs are what Littlewood and I call 'gas':
... rhetorical flourishes designed to affect psychology,
... pictures on board in the lecture,
... devices to stimulate the imagination of pupils.”

Quoting Hilbert: “When rigour enters, meaning departs.”
Does Mathematics Have a Philosophical Foundation?

Hilary Putnam:

“I do not think that the difficulties that philosophy finds with classical mathematics today are genuine difficulties; and I think that the philosophical interpretations of mathematics that we are being offered on every hand are wrong, and that ‘philosophical interpretation’ is just what mathematics doesn’t need.”

—Mathematics Without Foundations, 1972
Why do we think Mathematics is real?

Quine and Putnam’s Realism:
“ We are committed to the existence of mathematical objects because they are indispensable to our best theory of the world and we accept that theory.”

—Penelope Maddy, Realism in Mathematics, 1990
Further thoughts

Paul Halmos:

■ “Applied mathematics is bad mathematics”
■ “It isn’t really . . . but it’s different.”
■ “But usually, applied mathematics is bad mathematics just the same.”

‘Mathematics Tomorrow’, 1981

“Set Theory is a disease from which Mathematics will recover”

—Attributed to Henri Poincaré

Reality is just another model.

—Graffito in Berkeley Math Department, 1970