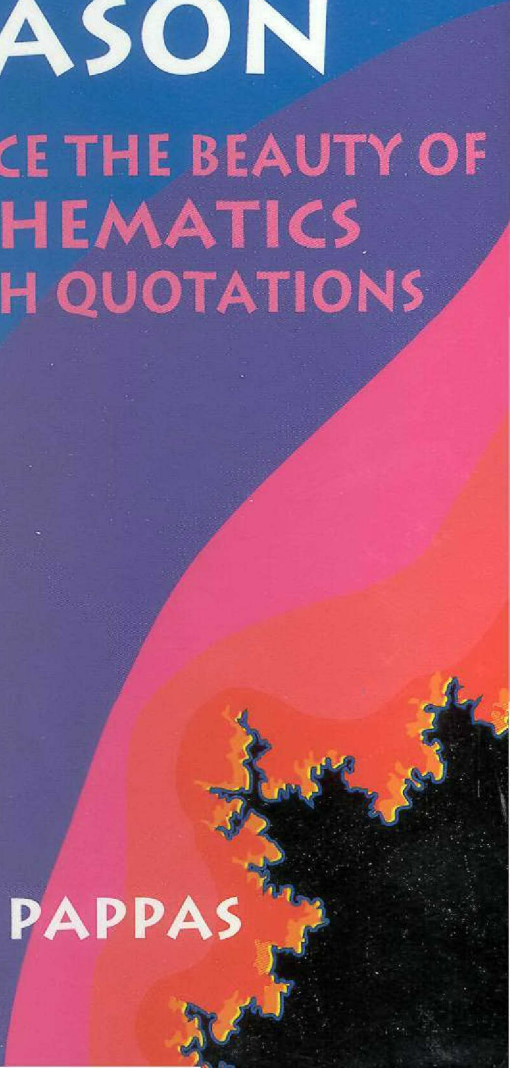


THE MUSIC OF REASON

EXPERIENCE THE BEAUTY OF
MATHEMATICS
THROUGH QUOTATIONS

THEONI PAPPAS



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BY THEONI PAPPAS

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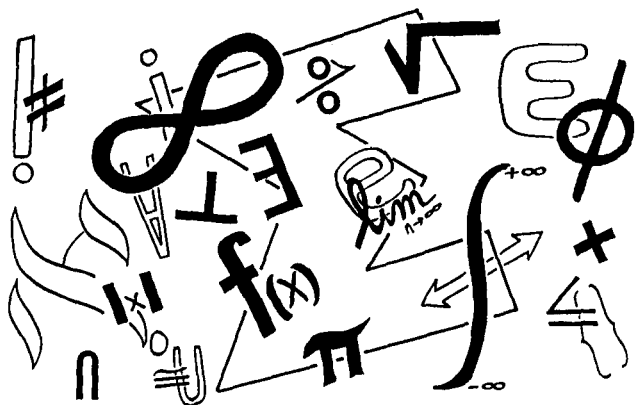
Mathematics

Mention the word *mathematics* and one rarely gets an indifferent response. Rather, the emotions range from fear and hate to love and delight. Some people boast with pride of their ignorance of mathematics. Others go to almost any means to avoid it. While a few become engrossed to the point of obsession.

What's so unusual about a subject that evokes such strong and diverse feelings?

Mathematics is a figment of the imagination. All its elements, objects, axioms, theorems, definitions ... describe objects which do not actually exist in our world. The worlds created by mathematicians are imaginary. They exist independently of anything in our world. Granted mathematics can be used to describe, explain and predict phenomena of the universe; but mathematical objects were not necessarily created with that purpose in mind.

What stimulates the mathematician's imagination? Perhaps an interesting pattern, an intriguing problem, a theorem or postulate, a challenge to determine a solution, an unanswered question, or simply curiosity and determination to discover a truth.



Over and over mathematical ideas conceived centuries earlier somehow find their niche or use in the future. Coincidental?

This, therefore, is mathematics: she reminds you of the invisible form of the soul; she gives to her own discoveries; she awakens the mind and purifies the intellect; she brings light to our intrinsic ideas; she abolishes oblivion and ignorance which are ours by birth.

—Proclus
(c. AD 410-485)

The study of mathematics is apt to commence in disappointment....we are told that by its aid the stars are weighed and the billions of molecules in a drop of water are counted. Yet, like the ghost of Hamlet's father, this great science eludes the efforts of our mental weapons to grasp it.

—Alfred North Whitehead
(1861-1947)

Mathematics may be defined as the subject in which we never know what we are talking about, nor whether what we are saying is true.

—Bertrand Russell
(1872-1970)

$\{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$

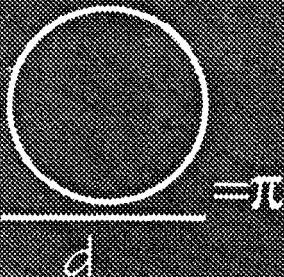
$\sqrt{2}, \sqrt{3},$

$\sqrt{5}, \sqrt{7},$

\dots

$\{\} = \emptyset$

$\sqrt{-1} = i$



*I am one and two,
1/2 and 29/30,
0.03 and 6.3333,
-8 and e,
a million and a
googol,
7 and π ;*

I am i and $5+3i$;

*I am nothing and
zero;*

*I am the set of all
numbers;*

I am the empty set;

The essence of mathematics is its freedom.

— **Georg Cantor**
(1845-1918)

I can rejoice over this perfection and bear witness to it with a clear conscience, for it was not I who invented it or even discovered it. The laws of mathematics are not merely human inventions or creations. They simply are; they exist quite independently of the human intellect. The most that any ...with a keen intellect can do is to find out that they are there and to take cognizance of them.

—**M. C. Escher**
(1898-1972)

It may well be doubted whether, in all the range of science, there is any field so fascinating to the explorer—so rich in hidden treasures—so fruitful in delightful surprises—as Pure Mathematics.

—**Charles Dodgson**
(Lewis Carroll 1832-1898)

$$5 + 3 = 8$$

$$17 - 9 = 8$$

*I am adding and
subtracting,
multiplying and
dividing;*

$$23 \times 7 = 161$$

$$3x^2 - 7x + 8 = 0$$

*I am a quadratic
equation,
a polynomial,
a coefficient,
a power and
exponent;*

I am squares, fractals...

*I am a point,
a line, a plane;*

I am space,

*The beauty in mathematics is seeing the truth
without effort.*

—**George Polya**
(1887-1985)

*...there is no more a math mind, than there is a
history or an English mind...*

—**Gloria Steinem**
(1935-)
Moving Beyond Words

In mathematics there are no true controversies.

—**Karl Friedrich Gauss**
(1777-1855)

*When we cannot use the compass of mathematics or
the torch of experience ... it is certain we cannot
take a single step forward.*

—**Voltaire**
(1694-1778)

The charm (of mathematics) lies chiefly...in the absolute certainty of its results; for that is what, beyond all mental treasures, the human intellect craves for. Let us be sure of something! More light, more light!

—Charles Dodgson
(Lewis Carroll 1832-1898)

Mathematics consists of proving the most obvious thing in the least obvious way.

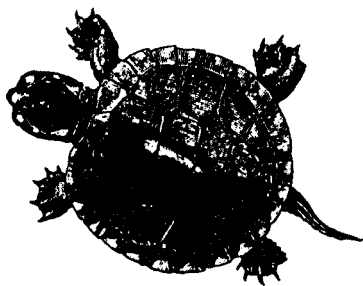
—Henri Poincaré
(1854-1912)

Mathematics seems to endow one with something like a new sense.

—Charles Darwin
(1809-1892)

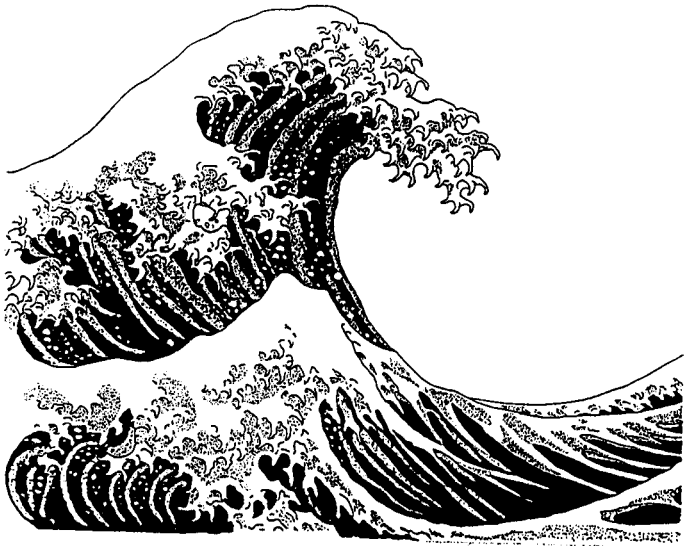
Mathematics takes us into the region of absolute necessity, to which not only the actual world, but every possible world, must conform.

—Bertrand Russell
(1872-1970)



*I am the pattern on
a tortoise shell,
a spider's web,
the shape of a leaf;*

*I am the sound of music,
the crest of a wave;*

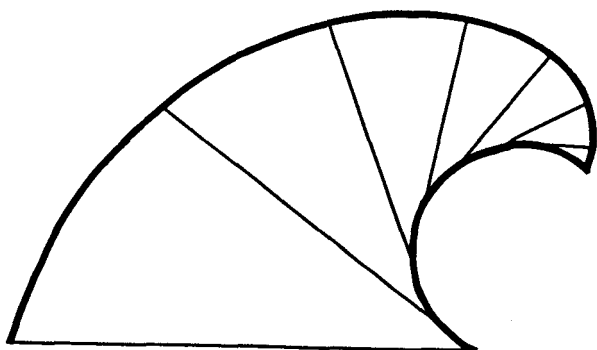


In mathematics I can report no deficiency, except it be that men do not sufficiently understand the excellent use of Pure Mathematics.

—**Francis Bacon**
(1561-1626)

*Mathematics is the gate and key of the sciences....
Neglect of mathematics works injury to all
knowledge, since one who is ignorant of it cannot
know the other sciences or the things of this world.
And what is worst, those who are thus ignorant are
unable to perceive their own ignorance and so do
not seek a remedy.*

—**Roger Bacon**
(1214-1294)



*I am the curve of a shark's fin,
the arc of a pendulum
and a unit of time;*

Beside the mathematical arts there is no infallible knowledge except it be borrowed from them.

—**Robert Recorde**
(1510-1558)

A traveler who refuses to pass over a bridge until he has personally tested the soundness of every part of it is not likely to go far; something must be risked, even in mathematics.

—**Horace Lamb**
(1913-)

If a man's wit be wandering, let him study mathematics.

—**Francis Bacon**
(1561-1626)

Do not imagine that mathematics is hard and repulsive to common sense.

— **Sir William Thomson, Lord Kelvin**
(1824-1907)

The true spirit of delight...is to be found in mathematics as surely as in poetry.

— **Bertrand Russell**
(1872-1970)

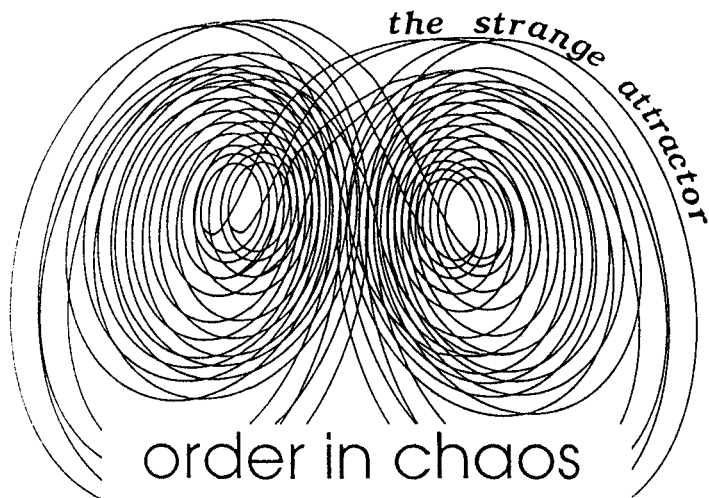
Mathematics is thought moving in the sphere of complete abstraction from any particular instance of what it is talking about.

— **Alfred North Whitehead**
(1862-1947)

I am unreal worlds;

I am order;

I am chaos;



I am MATHEMATICS.

— Theoni Pappas
(1944-)

Mathematics & the Imagination

Imagination is the creative force of an individual. It is the means by which we tackle problems — be they everyday problems or crucial global problems. Without imagination new solutions are difficult to come by. Without imagination a writer cannot create, a composer must give up music and an artist can only paint what he or she can see. Without imagination, mathematics would not exist.

From the creation of the first elements of mathematics — the natural numbers — mathematicians created fiction. Most people don't consider numbers a figment of the imagination because we immediately conceptualize a quantity when we hear a number such as "five". Many different symbols have been invented to stand for "five" — but regardless of the symbols used the quantity conjured up in the mind is the same for everyone.