Glossary of areas of mathematics

This is a glossary of terms that are or have been considered areas of study in mathematics.

1 A

- **Absolute differential calculus** — the original name for tensor calculus developed around 1890.
- **Absolute geometry** — an extension of ordered geometry that is sometimes referred to as *neutral geometry* because its axiom system is neutral to the parallel postulate.
- **Abstract algebra** — the study of algebraic structures and their properties. Originally it was known as *modern algebra*.
- **Abstract analytic number theory** — a branch mathematics that take ideas from classical analytic number theory and applies them to various other areas of mathematics.
- **Abstract differential geometry** — a form of differential geometry without the notion of smoothness from calculus. Instead it is built using sheaf theory and sheaf cohomology.
- **Abstract harmonic analysis** — a modern branch of harmonic analysis that extends upon the generalized Fourier transforms that can be defined on locally compact groups.
- **Abstract homotopy theory**
- **Additive combinatorics** — the part of arithmetic combinatorics devoted to the operations of addition and subtraction.
- **Additive number theory** — a part of number theory that studies subsets of integers and their behaviour under addition.
- **Affine geometry** — a branch of geometry that is centered on the study of geometric properties that remain unchanged by affine transformations. It can be described as a generalization of Euclidean geometry.
- **Affine geometry of curves** — the study of curves in affine space.
- **Affine differential geometry** — a type of differential geometry dedicated to differential invariants under volume-preserving affine transformations.
- **Ahlfors theory** — a part of complex analysis being the geometric counterpart of Nevanlinna theory. It was invented by Lars Ahlfors
- **Algebra** — a major part of pure mathematics centered on operations and relations. Beginning with elementary algebra, it introduces the concept of variables and how these can be manipulated towards problem solving; known as equation solving. Generalizations of operations and relations defined on sets have led to the idea of an algebraic structure which are studied in abstract algebra. Other branches of algebra include universal algebra, linear algebra and multilinear algebra.
- **Algebraic analysis** — motivated by systems of linear partial differential equations, it is a branch of algebraic geometry and algebraic topology that uses methods from sheaf theory and complex analysis, to study the properties and generalizations of functions. It was started by Mikio Sato.
- **Algebraic combinatorics** — an area that employs methods of abstract algebra to problems of combinatorics. It also refers to the application of methods from combinatorics to problems in abstract algebra.
- **Algebraic computation** — see *symbolic computation*.
- **Algebraic geometry** — a branch that combines techniques from abstract algebra with the language and problems of geometry. Fundamentally, it studies algebraic varieties.
- **Algebraic graph theory** — a branch of graph theory in which methods are taken from algebra and employed to problems about graphs. The methods are commonly taken from group theory and linear algebra.
- **Algebraic K-theory** — an important part of homological algebra concerned with defining and applying a certain sequence of functors from rings to abelian groups.
- **Algebraic number theory** — a part of algebraic geometry devoted to the study of the points of the

algebraic varieties whose coordinates belong to an algebraic number field. It is a major branch of number theory and is also said to study algebraic structures related to algebraic integers.

- **Algebraic statistics** — the use of algebra to advance statistics, although the term is sometimes restricted to label the use of algebraic geometry and commutative algebra in statistics.
- **Algebraic topology** — a branch that uses tools from abstract algebra for topology to study topological spaces.
- **Algorithmic number theory** — also known as *computational number theory*, it is the study of algorithms for performing number theoretic computations.
- **Anabelian geometry** — an area of study based on the theory proposed by Alexander Grothendieck in the 1980s that describes the way a geometric object of an algebraic variety (such as an algebraic fundamental group) can be mapped into another object, without it being an abelian group.
- **Analysis** — a rigorous branch of pure mathematics that had its beginnings in the formulation of infinitesimal calculus. (Then it was known as *infinitesimal analysis*.) The classical forms of analysis are real analysis and its extension complex analysis, whilst more modern forms are those such as functional analysis.
- **Analytic combinatorics** — part of enumerative combinatorics where methods of complex analysis are applied to generating functions.
- **Analytic geometry** — usually this refer to the study of geometry using a coordinate system (also known as *Cartesian geometry*). Alternatively it can refer to the geometry of analytic varieties. In this respect it is essentially equivalent to real and complex algebraic geometry.
- **Analytic number theory** — part of number theory using methods of analysis (as opposed to algebraic number theory)
- **Applied mathematics** — a combination of various parts of mathematics that concern a variety of mathematical methods that can be applied to practical and theoretical problems. Typically the methods used are for science, engineering, finance, economics and logistics.
- **Approximation theory** — part of analysis that studies how well functions can be approximated by simpler ones (such as polynomials or trigonometric polynomials)
- **Arakelov geometry** — also known as *Arakelov theory*
- **Arakelov theory** — an approach to Diophantine geometry used to study Diophantine equations in higher dimensions (using techniques from algebraic geometry). It is named after Suren Arakelov.
- **Arithmetic** — to most people this refers to the branch known as elementary arithmetic dedicated to the usage of addition, subtraction, multiplication and division. However arithmetic also includes higher arithmetic referring to advanced results from number theory.
- **Arithmetic algebraic geometry** — see *arithmetic geometry*
- **Arithmetic combinatorics** — the study of the estimates from combinatorics that are associated with arithmetic operations such as addition, subtraction, multiplication and division.
- **Arithmetic dynamics**
- **Arithmetic geometry** — the study of schemes of finite type over the spectrum of the ring of integers
- **Arithmetic topology** — a combination of algebraic number theory and topology studying analogies between prime ideals and knots
- **Arithmetical algebraic geometry** — an alternative name for *arithmetic algebraic geometry*
- **Asymptotic combinatorics**
- **Asymptotic geometric analysis**
- **Asymptotic theory** — the study of asymptotic expansions
- **Auslander–Reiten theory** — the study of the representation theory of Artinian rings
- **Axiomatic geometry** — see *synthetic geometry*.
- **Axiomatic homology theory**
- **Axiomatic set theory** — the study of systems of axioms in a context relevant to set theory and mathematical logic.

2 B

- **Bifurcation theory** — the study of changes in the qualitative or topological structure of a given family. It is a part of dynamical systems theory
- **Birational geometry** — a part of algebraic geometry that deals with the geometry (of an algebraic variety) that is dependent only on its function field.
- **Bolyai-Lobachevskian geometry** — see *hyperbolic geometry*.

3 C

- **C*-algebra theory**
- **Cartesian geometry** — see *analytic geometry*
- **Calculus** — a branch usually associated with limits, functions, derivatives, integrals and infinite series. It forms the basis of classical analysis, and historically was called the *calculus of infinitesimals* or *infinitesimal calculus*. Now it can refer to a system of calculation guided by symbolic manipulation.
- **Calculus of infinitesimals** — also known as *infinitesimal calculus*. It is a branch of calculus built upon the concepts of infinitesimals.
- **Calculus of moving surfaces** — an extension of the theory of tensor calculus to include deforming manifolds.
- **Calculus of variations** — the field dedicated to maximizing or minimizing functionals. It used to be called *functional calculus*.
- **Catastrophe theory** — a branch of bifurcation theory from dynamical systems theory, and also a special case of the more general singularity theory from geometry. It analyses the germs of the catastrophe geometries.
- **Categorical logic** — a branch of category theory adjacent to the mathematical logic. It is based on type theory for intuitionistic logics.
- **Category theory** — the study of the properties of particular mathematical concepts by formalising them as collections of objects and arrows.
- **Chaos theory** — the study of the behaviour of dynamical systems that are highly sensitive to their initial conditions.
- **Character theory** — a branch of group theory that studies the characters of group representations or modular representations.
- **Class field theory** — a branch of algebraic number theory that studies abelian extensions of number fields.
- **Classical differential geometry** — also known as Euclidean differential geometry. see *Euclidean differential geometry*.
- **Classical algebraic topology**
- **Classical analysis** — usually refers to the more traditional topics of analysis such as real analysis and complex analysis. It includes any work that does not use techniques from functional analysis and is sometimes called *hard analysis*. However it may also refer to mathematical analysis done according to the principles of classical mathematics.
- **Classical analytic number theory**
- **Classical differential calculus**
- **Classical Diophantine geometry**
- **Classical Euclidean geometry** — see *Euclidean geometry*
- **Classical geometry** — may refer to solid geometry or classical Euclidean geometry. See *geometry*
- **Classical invariant theory** — the form of invariant theory that deals with describing polynomial functions that are invariant under transformations from a given linear group.
- **Classical mathematics** — the standard approach to mathematics based on classical logic and ZFC set theory.
- **Classical projective geometry**
- **Classical tensor calculus**
- **Clifford analysis** — the study of Dirac operators and Dirac type operators from geometry and analysis using clifford algebras.
- **Clifford theory** is a branch of representation theory spawned from Cliffords theorem.
- **Cobordism theory**
- **Cohomology theory**
- **Combinatorial analysis**
- **Combinatorial commutative algebra** — a discipline viewed as the intersection between commutative algebra and combinatorics. It frequently employs methods from one to address problems arising in the other. Polyhedral geometry also plays a significant role.
- **Combinatorial design theory** — a part of combinatorial mathematics that deals with the existence and construction of systems of fintie sets whose intersections have certain properties.
- **Combinatorial game theory**
- **Combinatorial geometry** — see *discrete geometry*
- **Combinatorial group theory** — the theory of free groups and the presentation of a group. It is closely related to geometric group theory and is applied in geometric topology.
- **Combinatorial mathematics**
- **Combinatorial number theory**
- **Combinatorial set theory** — also known as Infinitary combinatorics. see *infinitary combinatorics*

- **Combinatorial theory**
- **Combinatorial topology** — an old name for algebraic topology, when topological invariants of spaces were regarded as derived from combinatorial decompositions.
- **Combinatorics** — a branch of discrete mathematics concerned with countable structures. Branches of it include enumerative combinatorics, combinatorial design theory, matroid theory, extremal combinatorics and algebraic combinatorics, as well as many more.
- **Commutative algebra** — a branch of abstract algebra studying commutative rings.
- **Complex algebra**
- **Complex algebraic geometry** — the main stream of algebraic geometry devoted to the study of the complex points of algebraic varieties.
- **Complex analysis** — a part of analysis that deals with functions of a complex variable.
- **Complex analytic dynamics** — a subdivision of complex dynamics being the study of the dynamic systems defined by analytic functions.
- **Complex analytic geometry** — the application of complex numbers to plane geometry.
- **Complex differential geometry** — a branch of differential geometry that studies complex manifolds.
- **Complex dynamics** — the study of dynamical systems defined by iterated functions on complex number spaces.
- **Complex geometry** — the study of complex manifolds and functions of complex variables. It includes complex algebraic geometry and complex analytic geometry.
- **Complexity theory** — the study of complex systems with the inclusion of the theory of complex systems.
- **Computable analysis** — the study of which parts of real analysis and functional analysis can be carried out in a computable manner. It is closely related to constructive analysis.
- **Computable model theory** — a branch of model theory dealing with the relevant questions computability.
- **Computability theory** — a branch of mathematical logic originating in the 1930s with the study of computable functions and Turing degrees, but now includes the study of generalized computability and definability. It overlaps with proof theory and effective descriptive set theory.
- **Computational algebraic geometry**
- **Computational complexity theory** — a branch of mathematics and theoretical computer science that focuses on classifying computational problems according to their inherent difficulty, and relating those classes to each other.
- **Computational geometry**
- **Computational group theory** — the study of groups by means of computers.
- **Computational mathematics** — the mathematical research in areas of science where computing plays an essential role.
- **Computational number theory** — also known as *algorithmic number theory*, it is the study of algorithms for performing number theoretic computations.
- **Computational real algebraic geometry**
- **Computational synthetic geometry**
- **Computational topology**
- **Computer algebra** — see *symbolic computation*
- **Conformal geometry** — the study of conformal transformations on a space.
- **Constructive analysis** — mathematical analysis done according to the principles of constructive mathematics. This differs from *classical analysis*.
- **Constructive function theory** — a branch of analysis that is closely related to approximation theory, studying the connection between the smoothness of a function and its degree of approximation
- **Constructive mathematics** — mathematics which tends to use intuitionistic logic. Essentially that is classical logic but without the assumption that the law of the excluded middle is an axiom.
- **Constructive quantum field theory** — a branch of mathematical physics that is devoted to showing that quantum theory is mathematically compatible with special relativity.
- **Constructive set theory**
- **Contact geometry** — a branch of differential geometry and topology, closely related to and considered the odd-dimensional counterpart of symplectic geometry. It is the study of a geometric structure called a contact structure on a differentiable manifold.
- **Convex analysis** — the study of properties of convex functions and convex sets.

- **Convex geometry** — part of geometry devoted to the study of convex sets.
- **Coordinate geometry** — see *analytic geometry*
- **CR geometry** — a branch of differential geometry, being the study of CR manifolds.

4 D

- **Derived noncommutative algebraic geometry**
- **Descriptive set theory** — a part of mathematical logic, more specifically a part of set theory dedicated to the study of Polish spaces.
- **Differential algebraic geometry** — the adaption of methods and concepts from algebraic geometry to systems of algebraic differential equations.
- **Differential calculus** — a subfield of calculus concerned with derivatives or the rates that quantities change. It is one of two traditional divisions of calculus, the other being integral calculus.
- **Differential Galois theory** — the study of the Galois groups of differential fields.
- **Differential geometry** — a form of geometry that uses techniques from integral and differential calculus as well as linear and multilinear algebra to study problems in geometry. Classically, these were problems of Euclidean geometry, although now it has been expanded. It is generally concerned with geometric structures on differentiable manifolds. It is closely related to differential topology.
- **Differential geometry of curves** — the study of smooth curves in Euclidean space by using techniques from differential geometry
- **Differential geometry of surfaces** — the study of smooth surfaces with various additional structures using the techniques of differential geometry.
- **Differential topology** — a branch of topology that deals with differentiable functions on differentiable manifolds.
- **Diffiety theory**
- **Diophantine geometry** — in general the study of algebraic varieties over fields that are finitely generated over their prime fields.
- **Discrepancy theory**
- **Discrete computational geometry**
- **Discrete differential geometry**
- **Discrete dynamics**
- **Discrete exterior calculus**
- **Discrete geometry**
- **Discrete mathematics**
- **Discrete Morse theory** — a combinatorial adaption of Morse theory.
- **Distance geometry**
- **Domain theory**
- **Donaldson theory** — the study of smooth 4-manifolds using gauge theory.
- **Dynamical systems theory**

5 E

- **Econometrics** — the application of mathematical and statistical methods to economic data.
- **Effective descriptive set theory** — a branch of descriptive set theory dealing with set of real numbers that have lightface definitions. It uses aspects of computability theory.
- **Elementary algebra** — a fundamental form of algebra extending on elementary arithmetic to include the concept of variables.
- **Elementary arithmetic** — the simplified portion of arithmetic considered necessary for primary education. It includes the usage addition, subtraction, multiplication and division of the natural numbers. It also includes the concept of fractions and negative numbers.
- **Elementary mathematics** — parts of mathematics frequently taught at the primary and secondary school levels. This includes elementary arithmetic, geometry, probability and statistics, elementary algebra and trigonometry. (calculus is not usually considered a part)
- **Elementary group theory** — the study of the basics of group theory
- **Elimination theory** — the classical name for algorithmic approaches to eliminating between polynomials of several variables. It is a part of commutative algebra and algebraic geometry.
- **Elliptic geometry** — a type of non-Euclidean geometry (it violates Euclid's parallel postulate) and is based on spherical geometry. It is constructed in elliptic space.
- **Enumerative combinatorics** — an area of combinatorics that deals with the number of ways that certain patterns can be formed.

- **Enumerative geometry** — a branch of algebraic geometry concerned with counting the number of solutions to geometric questions. This is usually done by means of intersection theory.
- **Equivariant noncommutative algebraic geometry**
- **Ergodic Ramsey theory** — a branch where problems are motivated by additive combinatorics and solved using ergodic theory.
- **Ergodic theory** — the study of dynamical systems with an invariant measure, and related problems.
- **Euclidean geometry**
- **Euclidean differential geometry** — also known as *classical differential geometry*. See *differential geometry*.
- **Euler calculus**
- **Experimental mathematics**
- **Extraordinary cohomology theory**
- **Extremal combinatorics** — a branch of combinatorics, it is the study of the possible sizes of a collection of finite objects given certain restrictions.
- **Extremal graph theory**

6 F

- **Field theory** — branch of abstract algebra studying fields.
- **Finite geometry**
- **Finite model theory**
- **Finsler geometry** — a branch of differential geometry whose main object of study is the Finsler manifold (a generalisation of a Riemannian manifold).
- **First order arithmetic**
- **Fourier analysis**
- **Fractional calculus** — a branch of analysis that studies the possibility of taking real or complex powers of the differentiation operator.
- **Fractional dynamics** — investigates the behaviour of objects and systems that are described by differentiation and integration of fractional orders using methods of fractional calculus.
- **Fredholm theory** — part of spectral theory studying integral equations.
- **Function theory** — part of analysis devoted to properties of functions, especially functions of a complex variable (see *complex analysis*).
- **Functional analysis**
- **Functional calculus** — historically the term was used synonymously with calculus of variations, but now refers to a branch of functional analysis connected with spectral theory
- **Fuzzy arithmetic**
- **Fuzzy geometry**
- **Fuzzy Galois theory**
- **Fuzzy mathematics** — a branch of mathematics based on fuzzy set theory and fuzzy logic.
- **Fuzzy measure theory**
- **Fuzzy qualitative trigonometry**
- **Fuzzy set theory** — a form of set theory that studies fuzzy sets, that is sets that have degrees of membership.
- **Fuzzy topology**

7 G

- **Galois cohomology** — an application of homological algebra, it is the study of group cohomology of Galois modules.
- **Galois theory** — named after Évariste Galois, it is a branch of abstract algebra providing a connection between field theory and group theory.
- **Galois geometry** — a branch of finite geometry concerned with algebraic and analytic geometry over a Galois field.
- **Game theory**
- **Gauge theory**
- **General topology** — also known as *point-set topology*, it is a branch of topology studying the properties of topological spaces and structures defined on them. It differs from other branches of topology as the topological spaces do not have to be similar to manifolds.
- **Generalized trigonometry** — developments of trigonometric methods from the application to real numbers of Euclidean geometry to any geometry or space. This includes spherical trigonometry, hyperbolic trigonometry, gyrotrigonometry, rational trigonometry, universal hyperbolic trigonometry, fuzzy qualitative trigonometry, operator trigonometry and lattice trigonometry.

- **Geometric algebra** — an alternative approach to classical, computational and relativistic geometry. It shows a natural correspondence between geometric entities and elements of algebra.
- **Geometric analysis** — a discipline that uses methods from differential geometry to study partial differential equations as well as the applications to geometry.
- **Geometric calculus**
- **Geometric combinatorics**
- **Geometric function theory** — the study of geometric properties of analytic functions.
- **Geometric homology theory**
- **Geometric invariant theory**
- **Geometric graph theory**
- **Geometric group theory**
- **Geometric measure theory**
- **Geometric topology** — a branch of topology studying manifolds and mappings between them; in particular the embedding of one manifold into another.
- **Geometry**— a branch of mathematics concerned with shape and the properties of space. Classically it arose as what is now known as solid geometry; this was concerning practical knowledge of length, area and volume. It was then put into an axiomatic form by Euclid, giving rise to what is now known as classical Euclidean geometry. The use of coordinates by René Descartes gave rise to Cartesian geometry enabling a more analytical approach to geometric entities. Since then many other branches have appeared including projective geometry, differential geometry, non-Euclidean geometry, Fractal geometry and algebraic geometry. Geometry also gave rise to the modern discipline of topology.
- **Geometry of numbers** — initiated by Hermann Minkowski, it is a branch of number theory studying convex bodies and integer vectors.
- **Global analysis** — the study of differential equations on manifolds and the relationship between differential equations and topology.
- **Global arithmetic dynamics**
- **Graph theory** — a branch of discrete mathematics devoted to the study of graphs. It has many applications in physical, biological and social systems.
- **Group-character theory** — the part of character theory dedicated to the study of characters of group representations.
- **Group representation theory**
- **Group theory**
- **Gyrotrigonometry** — a form of trigonometry used in gyrovector space for hyperbolic geometry. (An analogy of the vector space in Euclidean geometry.)

8 H

- **Hard analysis** — see *classical analysis*
- **Harmonic analysis** — part of analysis concerned with the representations of functions in terms of waves. It generalizes the notions of Fourier series and Fourier transforms from the Fourier analysis.
- **High-dimensional topology**
- **Higher arithmetic**
- **Higher category theory**
- **Higher-dimensional algebra**
- **Hodge theory**
- **Holomorphic functional calculus** — a branch of functional calculus starting with holomorphic functions.
- **Homological algebra** — the study of homology in general algebraic settings.
- **Homology theory**
- **Homotopy theory**
- **Hyperbolic geometry** — also known as *Lobachevskian geometry* or *Bolyai-Lobachevskian geometry*. It is a non-Euclidean geometry looking at hyperbolic space.
- **hyperbolic trigonometry** — the study of hyperbolic triangles in hyperbolic geometry, or hyperbolic functions in Euclidean geometry. Other forms include gyrotrigonometry and universal hyperbolic trigonometry.
- **Hypercomplex analysis**
- **Hyperfunction theory**

9 I

- **Ideal theory** — once the precursor name for what is now known as commutative algebra; it is the theory of ideals in commutative rings.
- **Idempotent analysis**

- **Incidence geometry** — the study of relations of incidence between various geometric objects, like curves and lines.
- **Inconsistent mathematics** — see *paraconsistent mathematics*.
- **Infinitary combinatorics** — an expansion of ideas in combinatorics to account for infinite sets.
- **Infinitesimal analysis** — once a synonym for *infinitesimal calculus*
- **Infinitesimal calculus** — see *calculus of infinitesimals*
- **Information geometry**
- **Integral calculus**
- **Integral geometry**
- **Intersection theory** — a branch of algebraic geometry and algebraic topology
- **Intuitionistic type theory**
- **Invariant theory** — studies how group actions on algebraic varieties affect functions.
- **Inversive geometry** — the study of invariants preserved by a type of transformation known as inversion
- **Inversive plane geometry** — inversive geometry that is limited to two dimensions
- **Inversive ring geometry**
- **Itō calculus**
- **Iwasawa theory**

10 J

11 K

- **K-theory** — originated as the study of a ring generated by vector bundles over a topological space or scheme. In algebraic topology it is an extraordinary cohomology theory known as topological K-theory. In algebra and algebraic geometry it is referred to as algebraic K-theory. In physics, K-theory has appeared in type II string theory. (In particular twisted K-theory.)
- **K-homology**
- **Kähler geometry** — a branch of differential geometry, more specifically a union of Riemannian geometry, complex differential geometry and symplectic geometry. It is the study of Kähler manifolds. (named after Erich Kähler)
- **KK-theory**
- **Klein geometry**
- **Knot theory** — part of topology dealing with knots
- **Kummer theory**

12 L

- **L-theory**
- **Large deviations theory** — part of probability theory studying events of small probability (tail events).
- **Large sample theory** — also known as *asymptotic theory*
- **Lattice theory** — the study of lattices, being important in order theory and universal algebra
- **Lattice trigonometry**
- **Lie algebra theory**
- **Lie group theory**
- **Lie sphere geometry**
- **Lie theory**
- **Line geometry**
- **Linear algebra** – a branch of algebra studying linear spaces and linear maps. It has applications in fields such as abstract algebra and functional analysis; it can be represented in analytic geometry and it is generalized in operator theory and in module theory. Sometimes matrix theory is considered a branch, although linear algebra is restricted to only finite dimensions. Extensions of the methods used belong to multilinear algebra.
- **Linear functional analysis**
- **Local algebra** — a term sometimes applied to the theory of local rings.
- **Local arithmetic dynamics** — also known as *p-adic dynamics* or *nonarchimedean dynamics*.
- **Local class field theory**
- **Low-dimensional topology**

13 M

- **Malliavin calculus**
- **Mathematical logic**
- **Mathematical optimization**

- **Mathematical physics** — a part of mathematics that develops mathematical methods motivated by problems in physics.
- **Mathematical sciences** — refers to academic disciplines that are mathematical in nature, but are not considered proper subfields of mathematics. Examples include statistics, cryptography, game theory and actuarial science.
- **Matrix algebra**
- **Matrix calculus**
- **Matrix theory**
- **Matroid theory**
- **Measure theory**
- **Metric geometry**
- **Microlocal analysis**
- **Model theory**
- **Modern algebra** — see *abstract algebra*
- **Modern algebraic geometry** — the form of algebraic geometry given by Alexander Grothendieck and Jean-Pierre Serre drawing on sheaf theory.
- **Modern invariant theory** — the form of invariant theory that analyses the decomposition of representations into irreducibles.
- **Modular representation theory**
- **Module theory**
- **Molecular geometry**
- **Morse theory** — a part of differential topology, it analyzes the topological space of a manifold by studying differentiable functions on that manifold.
- **Motivic cohomology**
- **Multilinear algebra** — an extension of linear algebra building upon concepts of p-vectors and multivectors with Grassmann algebra.
- **Multivariable calculus**
- **Multiplicative number theory** — a subfield of analytic number theory that deals with prime numbers, factorization and divisors.
- **Multiple-scale analysis**

14 N

- **Neutral geometry** — see *absolute geometry*
- **Nevanlinna theory** — part of complex analysis studying the value distribution of meromorphic functions. It is named after Rolf Nevanlinna
- **Nielsen theory** — an area of mathematical research with its origins in fixed point topology, developed by Jakob Nielsen
- **Non-abelian class field theory**
- **Non-classical analysis**
- **Non-Euclidean geometry**
- **Non-standard analysis**
- **Non-standard calculus**
- **Nonarchimedean dynamics** — also known as *p-adic analysis* or *local arithmetic dynamics*
- **Noncommutative algebraic geometry** — a direction in noncommutative geometry studying the geometric properties of formal duals of noncommutative algebraic objects.
- **Noncommutative geometry**
- **Noncommutative harmonic analysis** — see *representation theory*
- **Noncommutative topology**
- **Nonlinear analysis**
- **Nonlinear functional analysis**
- **Number theory** — a branch of pure mathematics primarily devoted to the study of the integers. Originally it was known as *arithmetic* or *higher arithmetic*.
- **Numerical analysis**
- **Numerical geometry**
- **Numerical linear algebra**

15 O

- **Operad theory** — a type of abstract algebra concerned with prototypical algebras.
- **Operator geometry**
- **Operator K-theory**
- **Operator theory** — part of functional analysis studying operators.
- **Operator trigonometry**

- **Optimal control theory** — a generalization of the calculus of variations.
- **Orbifold theory**
- **Order theory** — a branch that investigates the intuitive notion of order using binary relations.
- **Ordered geometry** — a form of geometry omitting the notion of measurement but featuring the concept of intermediacy. It is a fundamental geometry forming a common framework for affine geometry, Euclidean geometry, absolute geometry and hyperbolic geometry.
- **Oriented elliptic geometry**
- **Oriented spherical geometry**

16 P

- **p-adic analysis** — a branch of number theory that deals with the analysis of functions of p-adic numbers.
- **p-adic dynamics** — an application of p-adic analysis looking at p-adic differential equations.
- **p-adic Hodge theory**
- **Parabolic geometry**
- **Paraconsistent mathematics** — sometimes called *inconsistent mathematics*, it is an attempt to develop the classical infrastructure of mathematics based on a foundation of paraconsistent logic instead of classical logic.
- **Partition theory**
- **Perturbation theory**
- **Picard–Vessiot theory**
- **Plane geometry**
- **Point-set topology** — see *general topology*
- **Pointless topology**
- **Poisson geometry**
- **Polyhedral combinatorics** — a branch within combinatorics and discrete geometry that studies the problems of describing convex polytopes.
- **Polyhedral geometry**
- **Possibility theory**
- **Potential theory**
- **Precalculus**
- **Predicative mathematics**
- **Probability theory**
- **Probabilistic combinatorics**
- **Probabilistic graph theory**
- **Probabilistic number theory**
- **Projective geometry** — a form of geometry that studies geometric properties that are invariant under a projective transformation.
- **Projective differential geometry**
- **Proof theory**
- **Pseudo-Riemannian geometry** — generalizes Riemannian geometry to the study of pseudo-Riemannian manifolds.
- **Pure mathematics** — the part of mathematics that studies entirely abstract concepts.

17 Q

- **Quantum calculus** — a form of calculus without the notion of limits. There are 2 forms known as q-calculus and h-calculus
- **Quantum geometry** — the generalization of concepts of geometry used to describe the physical phenomena of quantum physics
- **Quaternionic analysis**

18 R

- **Ramsey theory** — the study of the conditions in which order must appear. It is named after Frank P. Ramsey.
- **Rational geometry**
- **Rational trigonometry** — a reformulation of trigonometry in terms of spread and quadrance instead of angle and length.
- **Real algebra** — the study of the part of algebra relevant to real algebraic geometry.
- **Real algebraic geometry** — the part of algebraic geometry that studies real points of the algebraic varieties.
- **Real analysis** — a branch of mathematical analysis; in particular *hard analysis*, that is the study of real numbers and functions of Real values. It provides a rigorous formulation of the calculus of real numbers in terms of continuity and smoothness, whilst the theory is extended to the complex numbers in complex analysis.

- **Real analytic geometry**
- **Real K-theory**
- **Recreational mathematics** — the area dedicated to mathematical puzzles and mathematical games.
- **Recursion theory** — see *computability theory*
- **Representation theory** — a subfield of abstract algebra; it studies algebraic structures by representing their elements as linear transformations of vector spaces. It also studies modules over these algebraic structures, providing a way of reducing problems in abstract algebra to problems in linear algebra.
- **Representation theory of algebraic groups**
- **Representation theory of algebras**
- **Representation theory of diffeomorphism groups**
- **Representation theory of finite groups**
- **Representation theory of groups**
- **Representation theory of Hopf algebras**
- **Representation theory of Lie algebras**
- **Representation theory of Lie groups**
- **Representation theory of the Galilean group**
- **Representation theory of the Lorentz group**
- **Representation theory of the Poincaré group**
- **Representation theory of the symmetric group**
- **Ribbon theory** — a branch of topology studying ribbons.
- **Riemannian geometry** — a branch of differential geometry that is more specifically, the study of Riemannian manifolds. It is named after Bernhard Riemann and it features many generalizations of concepts from Euclidean geometry, analysis and calculus.
- **Rough set theory — the a form of set theory based on rough sets.**

19 S

- **Scheme theory** — the study of schemes introduced by Alexander Grothendieck. It allows the use of sheaf theory to study algebraic varieties and is considered the central part of *modern algebraic geometry*.
- **Secondary calculus**
- **Semialgebraic geometry** — a part of algebraic geometry; more specifically a branch of real algebraic geometry that studies semialgebraic sets.
- **Set-theoretic topology**
- **Set theory**
- **Sheaf theory**
- **Sheaf cohomology**
- **Sieve theory**
- **Single operator theory** — deals with the properties and classifications of single operators.
- **Singularity theory** — a branch, notably of geometry; that studies the failure of manifold structure.
- **Smooth infinitesimal analysis** — a rigorous reformation of infinitesimal calculus employing methods of category theory. As a theory, it is a subset of synthetic differential geometry.
- **Solid geometry**
- **Spatial geometry**
- **Spectral geometry** — a field that concerns the relationships between geometric structures of manifolds and spectra of canonically defined differential operators.
- **Spectral graph theory** — the study of properties of a graph using methods from matrix theory.
- **Spectral theory** — part of *operator theory* extending the concepts of eigenvalues and eigenvectors from linear algebra and matrix theory.
- **Spectral theory of ordinary differential equations** — part of spectral theory concerned with the spectrum and eigenfunction expansion associated with linear ordinary differential equations.
- **Spectrum continuation analysis** — generalizes the concept of a Fourier series to non-periodic functions.
- **Spherical geometry** — a branch of non-Euclidean geometry, studying the 2-dimensional surface of a sphere.
- **Spherical trigonometry** — a branch of spherical geometry that studies polygons on the surface of a sphere. Usually the polygons are triangles.
- **Statistics** — although the term may refer to the more general study of statistics, the term is used in mathematics to refer to the mathematical study of statistics and related fields. This includes probability theory.
- **Stochastic calculus**

- **Stochastic calculus of variations**
- **Stochastic geometry** — the study of random patterns of points
- **Stratified Morse theory**
- **Super category theory**
- **Super linear algebra**
- **Surgery theory** — a part of geometric topology referring to methods used to produce one manifold from another (in a controlled way.)
- **Symbolic computation** — also known as *algebraic computation* and *computer algebra*. It refers to the techniques used to manipulate mathematical expressions and equations in symbolic form as opposed to manipulating them by the numerical quantities represented by them.
- **Symbolic dynamics**
- **Symmetric function theory**
- **Symplectic geometry** — a branch of differential geometry and topology whose main object of study is the symplectic manifold.
- **Symplectic topology**
- **Synthetic differential geometry** — a reformulation of differential geometry in the language of topos theory and in the context of an intuitionistic logic.
- **Synthetic geometry** — also known as *axiomatic geometry*, it is a branch of geometry that uses axioms and logical arguments to draw conclusions as opposed to analytic and algebraic methods.
- **Systolic geometry** — a branch of differential geometry studying systolic invariants of manifolds and polyhedra.
- **Systolic hyperbolic geometry** — the study of systoles in hyperbolic geometry.

20 T

- **Tensor analysis** — the study of tensors, which play a role in subjects such as differential geometry, mathematical physics, algebraic topology, multilinear algebra, homological algebra and representation theory.
- **Tensor calculus** — an older term for *tensor analysis*.
- **Tensor theory** — an alternative name for *tensor analysis*.
- **Theoretical physics** — a branch primarily of the science physics that uses mathematical models and abstraction of physics to rationalize and predict phenomena.
- **Time-scale calculus**
- **Topology**
- **Topological combinatorics** — the application of methods from algebraic topology to solve problems in combinatorics.
- **Topological degree theory**
- **Topological fixed point theory**
- **Topological graph theory**
- **Topological K-theory**
- **Topos theory**
- **Toric geometry**
- **Transcendental number theory** — a branch of number theory that revolves around the transcendental numbers.
- **Transfinite order theory**
- **Transformation geometry**
- **Trigonometry** — the study of triangles and the relationships between the length of their sides, and the angles between them. It is essential to many parts of applied mathematics.
- **Tropical analysis** — see *idempotent analysis*
- **Tropical geometry**
- **Twisted K-theory** — a variation on K-theory, spanning abstract algebra, algebraic topology and operator theory.
- **Type theory**

21 U

- **Umbral calculus** — the study of Sheffer sequences
- **Uncertainty theory**— a new branch of mathematics based on normality, monotonicity, self-duality, countable subadditivity, and product measure axioms.
- **Unitary representation theory**
- **Universal algebra** — a field studying the formalization of algebraic structures itself.
- **Universal hyperbolic trigonometry** — an approach to hyperbolic trigonometry based on rational geometry.

22 V

- **Valuation theory**
- **Variational analysis**
- **Vector algebra** — a part of linear algebra concerned with the operations of vector addition and scalar multiplication, although it may also refer to vector operations of vector calculus, including the dot and cross product. In this case it can be contrasted with geometric algebra which generalizes into higher dimensions.
- **Vector analysis** — also known as vector calculus, see *vector calculus*.
- **Vector calculus** — a branch of multivariable calculus concerned with differentiation and integration of vector fields. Primarily it is concerned with 3-dimensional Euclidean space.

23 W

- **Wavelet**
- **Windowed Fourier transform**
- **Window function**

24 X

25 Y

26 Z

27 See also

Glossary of engineering

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28.1 Text

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