Contribution of rene descartes to mathematics philosophy essay

Rene Descartes was born on March 31, 1596, in the magnificent city of the south of France (Touraine, France). Joachim Descartes – his father was a councilor of Congress and intelligence, and ensured that Descartes was provided an excellent environment for learning. In 1606, when Descartes reached an age of 8 years, was admitted to Jesuit College of Henry IV, where he studied literature, grammar, science and mathematics for eight years. He was usually and critically unhealthy and was allowed to stay in bed late each morning. However, he studied the classics, logic and philosophy. In all Descartes just found mathematics is satisfactory to the truth of natural science. In 1614, he left the university to study civil and canon law at Poitiers. In 1616, he received his baccalaureate and licentiate titles. The degrees outside it, Descartes also spent time studying philosophy, theology and health. Descartes spent several years studying mathematics in Paris with friends, as Messene. Over time, a man for this type of education or enlist in the army or the church. Descartes decides to enlist in the army of a nobleman in 1617.

During the service, with some geometric issues Descartes, a problem that had become a challenge for everyone to solve. Descartes solved it in only a few hours. Later, he met a man named Isaac Holland Beckman a scientist that became a friend of Descartes. Shortly after he took power in mathematics, the tasks is in the army would be unacceptable to him. However, he was still in the army under the influence of family and tradition.

In 1621, Descartes give up the army and traveled extensively for doing researches in pure mathematics. Then he settled in Paris in 1626, he found the construction of the optical (eye) Instruments. Finally, in 1628, became the researcher for truth about the natural sciences.

During this period, he moved to the Netherlands. He continued to live in there for over twenty years. During this period, Descartes published his " first meditations philosophy. None other than his own work, he discovered his famous phrase" I think then I exist. It could be used to cause the complex ideas of the universe in the simple idea that's true. So Descartes continued his work in mathematics.

In 1638, the geometric aspect of Descartes became famous in the history of mathematics, as he did the invention of analytic geometry. Although this work has been done before by other mathematicians and the history of mathematics, introduces the theory Descartes Identify a point in a plane of pairs of real numbers (ordered pairs). This is called Cartesian delta.

In 1649, Queen Descartes invited to Sweden to work in mathematics. It is said that the Queen wants to work in mathematics in the early morning hours. So Descartes must wake up early to go to the palace. Due to the cold climate, they developed pneumonia after only a few months and died on February 11, 1650.

Contribution to Mathematics:

Descartes has made many notable and famous contributions to mathematics. In 1618, when Descartes travelled to Holland to finally settle there, he met a thirty year-old student of medicine, Isaac Beeckman, after next few weeks. This new friend of Descartes was astonished at capability of

Descartes at maths. Over the next few weeks Descartes showed Beeckman the following facts:

How to apply algebra and mathematics to many problems.

Mathematics could be applied to a more precise spacing and tuning of lute stings,

Proposed algebraic formula to determine the raise in water level when a heavy object was placed in water.

Drew a geometric graph that showed how to predict the accelerating speed of a pencil falling in a vacuum at any time during a two hour period.

How a spinning top stays upright and how this could be used to help man become airborne.

By the end of 1618, Descartes was already applying algebraic equations to solve geometric problems. It was then, not later as many sources say, that he invented analytical geometry.

Descartes attempted to provide a philosophical foundation for the new mechanistic physics that was developing from the work of Copernicus and Galileo. He divided all things into two categories-mind and matter-and developed a dualistic philosophical system in which, although mind is subject to the will and does not follow physical laws, all matter must obey the same mechanistic laws

The philosophical system that Descartes developed, known as Cartesian philosophy, was based on skepticism and asserted that all reliable knowledge must be built up by the use of reason through logical analysis. Cartesian philosophy was influential in the ultimate success of the Scientific Revolution and provides the foundation upon which most subsequent philosophical thought is grounded.

Descartes published various treatises about philosophy and mathematics. In 1637 Descartes published his masterwork, Discourse on the Method of reasoning well and Seeking Truth in the Sciences. In Discourse, Descartes sought to explain everything in terms of matter and motion. Discourse contained three appendices, one on optics, one on meteorology, and one titled La Géometrie (The Geometry). In La Géometrie, Descartes described what is now known as the system of Cartesian Coordinates, or coordinate geometry. In Descartes's system of coordinates, geometry and algebra were united for the first time to create what is known as analytic geometry.

Many of his contributions to mathematics are:

Cartesian coordinate system

Fibred category

Cartesian product

Defect (geometry)

Descartes' rule of signs

Descartes' theorem

Analytic geometry

Pullback Theorm

Cartesian Coordinate System:

History:

The idea of this system was developed in 1637 with two works by Descartes and independently by Pierre de Fermat, although Fermat used three-dimensional and unpublished findings. In the second part of his lecture method, Descartes introduces the new idea of determining the location of a point or object on the surface, using two intersecting axes as measuring guides. La Geometrie, he continued to explore the concept mentioned above.

It might be interesting to note that some people have pointed out that the masters of the Renaissance used a grid, in the form of a mesh, as a tool to break the constituent parts of their subjects, they add color. Descartes may affect only speculate. (See opinion, radiation geometry.) Development of the Cartesian coordinate system enabled the development of the calculation of Isaac Newton and Gottfried Wilhelm Leibniz.

Nicole Oresme, a 14th century French philosopher, construction similar to using Cartesian coordinates before the time of Descartes.

Many other coordinate system is developed for Descartes, as the plane polar coordinates and the spherical and cylindrical coordinates three-dimensional space.

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Introduction:

A Cartesian coordinate system specifies each point uniquely in a plane by a pair of numerical coordinates, which are the signed distances from the point to two fixed perpendicular directed lines, measured in the same unit of length.

Each reference line is called a coordinate axis or just axis of the system, and the point where they meet is its origin. The coordinates can also be defined as the positions of the perpendicular projections of the point onto the two axes, expressed as a signed distances from the origin.

Illustration of a Cartesian coordinate plane.

Four points are marked and labeled with their coordinates: (2, 3) in green, (âˆ’3, 1) in red, (âˆ’1. 5, âˆ’2. 5) in blue, and the origin (0, 0) in purple.

One can use the same principle to specify the position of any point in three-dimensional space by three Cartesian coordinates, its signed distances to three mutually perpendicular planes (or, equivalently, by its perpendicular projection onto three mutually perpendicular lines). In general, one can specify a point in a space of any dimension n by use of n Cartesian coordinates, the signed distances from n mutually perpendicular hyper planes.

Cartesian coordinate system with a circle of radius 2 centered at the origin marked in red. The equation of a circle is x2 + y2 = r2.

The invention of Cartesian coordinates in the 17th century by René Descartes revolutionized mathematics by providing the first systematic link between Euclidean geometry and algebra. Using the Cartesian coordinate system, geometric shapes (such as curves) can be described by Cartesian equations: algebraic equations involving the coordinates of the points lying on the shape. For example, a circle of radius 2 may be described as the set of all points whose coordinates x and y satisfy the equation x2 + y2 = 22.

Cartesian coordinates are the foundation of analytic geometry, and provide enlightening geometric interpretations for many other branches of mathematics, such as linear algebra, complex analysis, differential geometry, multivariate calculus, group theory, and more. A familiar example is the concept of the graph of a function. Cartesian coordinates are also essential tools for most applied disciplines that deal with geometry, including astronomy, physics, engineering, and many more. They are the most common coordinate system used in computer graphics, computer-aided geometric design, and other geometry-related data processing.

Cartesian formulas for the plane:

Distance between two points

The Euclidean distance between two points of the plane with Cartesian coordinates (x1, y1) and (x2, y2) is

This is the Cartesian version of Pythagoras' theorem. In three-dimensional space, the distance between points (x1, y1, z1) and (x2, y2, z2) is

Which can be obtained by two consecutive applications of Pythagoras' theorem?

Fibred category:

Introduction:

Fibred categories are complex entities in mathematics is used to provide a general framework for the first theory. They are formalized in different situations and algebraic geometry, where the reverse image (or pull-backs) the objects as vector bundles can be determined. For example, for every topological space can be eliminated in the vector space, and for all continuous maps from a topological space X into a topological space Y is a combination of functional bundle bundle the pullback of Y type of system X . physique goals include normalization and contrast image functors. Same settings appear in various guises in mathematics, especially algebra, geometry, that is the context in which the body of the type originally appeared. Fibrations also plays an important role in the theory of category classification and theoretical computer science, especially in the theoretical model depends

Cartesian product:

Introduction:

In mathematics, a Cartesian product (or product set) is the direct product of two sets. The Cartesian product is named after René Descartes, whose formulation of analytic geometry gave rise to this concept.

Specifically, the Cartesian product of two sets X (for example the points on an x-axis) and Y (for example the points on a y-axis), denoted X Ã- Y, is the set of all possible ordered pairs whose first component is a member of X and whose second component is a member of Y (e. g., the whole of the x-y plane):

[2]

For example, the Cartesian product of the 13-element set of standard playing card ranks {Ace, King, Queen, Jack, 10, 9, 8, 7, 6, 5, 4, 3, 2} and the four-element set of card suits {â™ , â™¥, â™¦, â™£} is the 52-element set of all possible playing cards: ranks Ã- suits = {(Ace, â™), (King, â™), ..., (2, â™), (Ace, â™¥), ..., (3, â™£), (2, â™£)}. The corresponding Cartesian product has 52 = 13 Ã- 4 elements. The Cartesian product of the suits Ã- ranks would still be the 52 pairings, but in the opposite order {(â™ , Ace), (â™ , King), …}. Ordered pairs (a kind of tuple) have order, but sets are unordered. The order in which the elements of a set are listed is irrelevant; you can shuffle the deck and it's still the same set of cards.

A Cartesian product of two finite sets can be represented by a table, with one set as the rows and the other as the columns, and forming the ordered pairs, the cells of the table, by choosing the element of the set from the row and the column.

Basic properties

Let A, B, C, and D be sets.

In cases where the two input sets are not the same, the Cartesian product is not commutative because the ordered pairs are reversed.

Although the elements of each of the ordered pairs in the sets will be the same, the pairing will differ.

For example:

{1, 2} x {3, 4} = {(1, 3), (1, 4), (2, 3), (2, 4)}

{3, 4} x {1, 2} = {(3, 1), (3, 2), (4, 1), (4, 2)}

One exception is with the empty set, which acts as a “ zero”, and for equal sets.

and, supposing G, T are sets and G= T:

Strictly speaking, the Cartesian product is not associative.

The Cartesian Product acts nicely with respect to intersections.

Notice that in most cases the above statement is not true if we replace intersection with union.

However, for intersection and union it holds for:

and,

n-ary product

The Cartesian product can be generalized to the n-ary Cartesian product over n sets X1, ..., Xn:

It is a set of n-tuples. If tuples are defined as nested ordered pairs, it can be identified to (X1 Ã- ... Ã- Xn-1) Ã- Xn.

Defect (geometry):

Introduction:

In geometry, the defect (or deficit) means the failure of some angles to add up to the expected amount of 360° or 180°, when such angles in the plane would. The opposite notion is the excess.

Classically the defect arises in two ways:

the defect of a vertex of a polyhedron;

the defect of a hyperbolic triangle;

and the excess arises in one way:

the excess of a spherical triangle.

In the plane, angles about a point add up to 360°, while interior angles in a triangle add up to 180° (equivalently, exterior angles add up to 360°). However, on a convex polyhedron the angles at a vertex on average add up to less that 360°, on a spherical triangle the interior angles always add up to more than 180° (the exterior angles add up to less that 360°), and the angles in a hyperbolic triangle always add up to less than 180° (the exterior angles add up to more than 360°).

In modern terms, the defect at a vertex or over a triangle (with a minus) is precisely the curvature at that point or the total (integrated) over the triangle, as established by the Gauss-Bonnet theorem.

Descartes' rule of signs:

Introduction:

In mathematics, Descartes' rule of signs, first described by René Descartes in his work La Géométrie, is a technique for determining the number of positive or negative real roots of a polynomial.

The rule gives us an upper bound number of positive or negative roots of a polynomial. It is not a deterministic rule, i. e. it does not tell the exact number of positive or negative roots.

Positive Roots

The rule states that if the terms of a single-variable polynomial with real coefficients are ordered by descending variable exponent, then the number of positive roots of the polynomial is either equal to the number of sign differences between consecutive nonzero coefficients, or less than it by a multiple of 2. Multiple roots of the same value are counted separately.

Negative Roots

As a corollary of the rule, the number of negative roots is the number of sign changes after negating the coefficients of odd-power terms (otherwise seen as substituting the negation of the variable for the variable itself), or fewer than it by a multiple of 2.

Descartes' theorem:

Introduction:

In geometry, Descartes' theorem, named after René Descartes, establishes a relationship between four kissing, or mutually tangent, circles. The theorem can be used to construct a fourth circle tangent to three given, mutually tangent circles.

Descartes' theorem

If four mutually tangent circles have curvatures ki (for i = 1, …, 4), Descartes' theorem says:

(1)

When trying to find the radius of a fourth circle tangent to three given kissing circles, the equation is best rewritten as:

(2)

The ± sign reflects the fact that there are in general two solutions. Ignoring the degenerate case of a straight line, one solution is positive and the other is either positive or negative; if negative, it represents a circle that circumscribes the first three (as shown in the diagram above).

Other criteria may favor one solution over the other in any given problem.

Analytic Geometry:

Introduction

Analytic geometry has two different meanings in mathematics. Except for the section Modern analytic geometry, this article treats the classical and elementary meaning, which is a synonym of coordinate geometry. The modern and advanced meaning refers to the geometry of analytic varieties, whose object is sketched in Section Modern analytic geometry, below.

Cartesian coordinates.

Analytic geometry, also known as coordinate geometry, analytical geometry, or Cartesian geometry, is the study of geometry using a coordinate system and the principles of algebra and analysis. This contrasts with the general approach of Euclidean geometry, which holds a number of geometric concepts as primitives, and use deductive reasoning based on axioms and theorems get the facts. Analytical geometry is the foundation of most modern areas of geometry, including algebraic geometry, differential geometry and discrete geometry and calculations, and are widely used in physics and engineering.

Usually the Cartesian coordinate system is applied to manipulate the equations for planes, lines, and square, often two and sometimes three-dimensional measurement. Geometry, a study of the Euclidean plane (14:

00) and Euclidean space (15: 00). As taught in textbooks, geometry analysis can be explained more simply: it is concerned with defining a geometric shape and get some information from a representative of that. The digital outputs, however, might also be a vector or a shape. That the algebra of the real numbers can be employed to yield results about the linear continuum of geometry relies on the Cantor-Dedekind axiom.

Pullback (category theorem):

Introduction

In category theory, a branch of mathematics, a pullback (also called a fiber product, fibre product, fibered product or Cartesian square) is the limit of a diagram consisting of two morphisms f : X â†’ Z and g : Y â†’ Z with a common codomain; it is the limit of the cospan . The pullback is often written