The American Journal of Social Science and Education Innovations
(ISSN – 2689-100x)
VOLUME 04 ISSUE 11 Pages: 58-62
SJIF IMPACT FACTOR (2020: 5. 525) (2021: 5. 857) (2022: 6. 397)
OCLC – 1121105668 METADATA IF – 8.106
Publisher: The USA Journals

Journal Website: https://theamericanjournals.com/index.php/tajssei

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Research Article

THE HISTORY OF ANALYTIC GEOMETRY AND THE PHILOSOPHICAL VIEWS OF RENE DESCARTES

Submission Date: November 01, 2022, Accepted Date: November 15, 2022,
Published Date: November 22, 2022 |
Crossref doi: https://doi.org/10.37547/tajssei/Volume04Issue11-11

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ABSTRACT

This article discusses analytic geometry, a branch of geometry, and the scientists who contributed to its creation. The application of this science today, as well as the importance of the Cartesian coordinate system, are briefly described.

KEYWORDS

Geometry, analytical geometry, René Descartes, straight line, point, plane.

INTRODUCTION

The science of geometry has an ancient history, the first concepts of it were created in Egypt and Babylon 4000 years ago. The emergence of geometric knowledge is related to the practical activities of people. This is reflected in the names of many geometric figures. For example, the name trapezium is derived from the Greek word "trapezion", which means "table". The term "line" is derived from the Latin word "limem" - "flax thread" and they were mainly used to measure land.

Since ancient times, geometry has become a strictly logical science based on a system of axioms. He continuously developed and enriched himself with new theorems, ideas and methods. The reason for this was

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their need for geometry. First, geometry was studied as part of algebra.

The main results and findings

In the 3rd century BC, the Greek scientist Euclid wrote a work called "Fundamentals". Euclid summarized the geometrical knowledge up to that time and tried to give a complete axiomatic statement of this science. Scientists who lived after Euclid added some topics to his "Fundamentals" and made clarifications.

Euclid developed Plato's philosophical concept of the 4 elements, which are related to the 4 regular polygons:

- fire - tetrahedron;
- air - octahedron;
- ground - cube;
- water is an icosahedron.

From this point of view, the "Beginnings" can be understood as <<the original doctrine of the construction of the Platonic solids, i.e., the 5 regular polygons. The proof of the possibility of building such bodies is supplemented by the statement.

The geometry course we are currently studying is a part of Euclid's systematized and theoretically based work "Fundamentals" adapted for high school.

It's interesting to see how geometry connects to modern physics. New concepts that enrich mathematics often come from physics and other branches of chemistry and natural science. For example, vector is derived from mechanics. In the future development of geometry, as a result of the internal demand of mathematics and its logical development, new geometrical concepts appeared in it, which paved the way for the creation of a new modern physics. For example, Lobachevsky's geometry served as the basis for the discovery of the theory of relativity. Modern geometry has many directions. One of them combines geometry with number theory, the second with quantum physics, and the third with mathematical analysis. Today's math departments are such that it's hard to tell if it's more geometry, algebra, or analysis. In ancient times, geometry was not some branch of mathematics. Later, according to the research of scientists, geometry was separated from mathematics as a separate science.

Geometry consists of the following sections:

✓ Elementary geometry — includes planimetry and stereometry. Also explores points, straight lines, surfaces, and objects in space.

✓ Analytical geometry — in which simple geometric figures (points, straight lines, planes, curves and surfaces) are studied by algebraic means based on the method of coordinates.

✓ Differential geometry — studies lines and surfaces given by differential functions and their reflections.

✓ Topology is the science of continuity.

We will reflect on the history of the creation of analytic geometry. The history of the creation of analytical geometry corresponds to the territory of Europe. The term analytic geometry arose in France in the 17th century because of the need to answer problems that could not be solved separately by algebra and geometry, but the solution was to use both together. During the 17th century, two French mathematicians accidentally carried out research, and these researches were the creation of analytic geometry. These scientists were Pierre de Fermat and René Descartes.

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Rene Descartes is considered to be the creator of analytic geometry. This is because he published his book before Fermat. However, both Fermat and Descartes discovered that lines and geometric figures can be represented by equations, and equations can be represented by lines or geometric figures. According to their discoveries, both of them can be said to be the creators of analytic geometry.

In the 17th century, thanks to the work of the French mathematician and philosopher René Descartes, the method of coordinates was created, which revolutionized all mathematics, especially geometry. Algebraic equalities (inequalities) can be interpreted by means of geometric images (graphs) and, on the contrary, it has become possible to search for the solution of geometrical problems using analytical, formulas, systems of equations. A new branch of mathematics, analytic geometry, was born. The essence of analytical geometry is carried out by applying its algebraic (analytical) expression to geometric objects, studying their properties, and checking corresponding algebraic expressions.

Rene Descartes was born on March 31, 1596, in the small town of Lae in the Touraine region of France. The history of creation of analytic geometry by René Descartes was as follows. Mathematical studies carried out in Saint-Germain and in Brede helped Descartes to become a mature mathematician of sufficient level for his time. It was during these years that he carried out important scientific research and made extensive discoveries that closely connected analytic geometry and algebra. Descartes' diary contains the following note: "On November 10, 1619, I began to understand the foundations of a wonderful discovery." Indeed, Descartes was on the verge of a remarkable discovery - the discovery of the foundations of analytic geometry. The essence of analytic geometry is that it expresses the principles of applying algebra to geometry problems and vice versa. That is, any curve can be represented by equations in two variables, and conversely, any equation in two variables can be represented as a curve! This discovery opened a new era in the history of science, and it was important not only for mathematics and geometry, but in general for all natural sciences that work on the basis of exact quantities in terms of numbers and measurements.

In July 1637, Descartes separated out the sections of his Universe that were subject to church censorship and published them as separate books, entitled "On Light" (Dioptrica) and "On Meteors". He also republished Geometry as Commentary on Style. "Reflections on Style" has become one of the perfect scholarly sources for emerging modern science. It contained the first buds of the achievements of modern science. Descartes specifically noted in his diaries that he deliberately complicated "Geometry" and made deep scientific considerations even more complicated. This is the fact that other mathematicians do not doubt Descartes' scientific works, or rather, they adopt them, despite the fact that they were first introduced to such (that is, Descartes's) reasoning and proofs in Descartes' works, "we already know that It was done on purpose so that they could not say "we were". That is, René Descartes wants to protect his scientific work and potential with a complex narrative style unique to him. In Descartes' "Geometry" analysis and proofs were carried out on extremely complex and difficult problems, bypassing the creation of forms. Descartes personally showed how to make shapes when necessary.

The main elements of analytic geometry are as follows:

✓ Cartesian coordinate system This system is named after René Descartes. He neither named it nor created Cartesian coordinates, but he spoke of coordinates

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with positive numbers that would allow future scientists to fill them in. This system consists of a rectangular coordinate system and a polar coordinate system.

✓ Rectangular coordinate systems Rectangular coordinate systems are called planes formed by the contours of two number lines perpendicular to each other, where the point of intersection corresponds to the common zero. Then this system would consist of horizontal and vertical lines.

✓ Polar coordinate system This system is responsible for checking the relative position of a point with respect to a fixed line and a fixed point on a line.

✓ Cartesian equation of a line This equation is obtained when two points passing through the line are known.

✓ A straight line It does not deviate, so it does not have curves and angles. Analytic geometry is a branch of geometry in which geometric lines, simple geometric figures: points, straight lines, planes, second-order curves and surfaces are studied. Analytical geometry is studied by applying the basic methods of algebra and mathematical analysis in a given coordinate system. It is a branch of mathematics that analyzes geometric figures in detail with all their data, i.e. size, angles, area, intersection points, their distances and other measurements. The main characteristic of analytic geometry is that it allows geometric figures to be represented by formulas. For example, circles are represented by polynomial equations of the second degree, and lines are represented by polynomial equations of the first degree.

Analytical geometry arose in the 17th century due to the need to answer problems that had no solution until then. Today, many authors consider it a revolutionary work in the history of mathematics, as it marks the beginning of modern mathematics. Pierre de Fermat was a French mathematician born in 1601 and died in 1665. During his lifetime he studied the geometry of Euclid, Apollonius, and Pappus to solve the measurement problems that existed at the time. These studies later led to the creation of geometry. They are expressed in his book An Introduction to Flat and Solid Places (Ad Locos Planos et Solidos Isagoge), published in 1679, 14 years after his death. In 1623, Pierre de Fermat applied analytic geometry to Apollonius' theorems on geometric spaces. Also known as Descartes, he was a mathematician, physicist, and philosopher who applied analytical geometry to three-dimensional space.

The above two scientists also made a great contribution to analytic geometry. In general, René Descartes is considered the father of analytic geometry.

CONCLUSION

In short, the history of analytic geometry has developed with the great achievements of the above scientists. René Descartes' publication of "Geometry" is the reason why we consider him the father of analytical geometry. Today, analytic geometry is introduced from elementary school. By explaining the coordinate system to children of junior school age, their understanding of the elements of analytical geometry is formed. In today's age of technology, they can find the location points by learning the coordinate system. This will serve as a foundation for them to learn higher grade geometry. As we have seen above, this innovation of René Descartes is the most valuable and rich scientific heritage even today. It is considered necessary for us to teach them to the students in a simple manner year after year.

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