Introduction by other mathematicians and scientists. the concepts

Science

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Introduction

Sofia Kovalevskaya was one of the best mathematicians in the nineteenth century. She is known for the mathematical concepts and theorem that she developed. Her research and contributions were based on the studies that had been done earlier by other mathematicians and scientists.

The concepts and theories that she developed are still used today to solve various mathematical equations. This paper will highlight Kovalevskaya’s contributions in mathematics.

Cauchy Problem

The Cauchy problem is currently referred to as the “ Cauchy-Kovalevskaya theorem” (Morrow & Perl, 1998). She described the application of this theory in her dissertation which was titled, “ on the theory of partial differential equations” (Morrow & Perl, 1998). She developed this theory to help in

solving a system of general differential equations. The differential equations in this case were of the first order and could be used with any variable. Her study of deferential equations was informed by Weierstrass' concept on total equations. Her contribution in the study of differential equetions is found on the fact that she transformed Weierstrass' total equations into " partial differential equations" (Morrow & Perl, 1998).

Today, Kovalevskaya's concept is used to solve differential equations which have initial conditions (Cauchy problem). The theory is useful in solving hyperbolic equations. However, there is a lot of difficulty in using the theory to solve elliptic and parabolic equations.

Abelian Integrals

Kovalevskaya's study of the concept of Abelian integrals is found in her work titled, " on the reduction of a definite class of Abelian integrals of the third range" (Morrow & Perl, 1998). Building on Weierstrass' theory of Abelian integrals, she developed a series of skilled manipulations which explained the application of the theory. Thus her main contribution involved using her understanding to illustrate how the concept of Abelian integrals can be used to solve various mathematical equations.

Euler's Equations

Kovalevskaya's contributions to the development of Euler's equations are explained in a publication titled, " on the property of a system of equations" (Morrow & Perl, 1998).

Euler’s equations help in studying the motion of rigid bodies that are rotating towards a given direction. The equations are made up of six differential equations of the first order. This system of differential equations is associated with great symmetry.

Even though Euler’s equations had great symmetry, Euler did not succeed in finding their solutions. Drawing from the concept of theta equations, Kovalevskaya explained how Euler’s equations can be solved by using algebraic integrals and variable transformation. She completed the investigations of Lagrange and Euler by illustrating how the Euler’s equations can be used to solve equations that are associated with motion. She also developed the concept of “ Kovalevskaya’s top” (Morrow & Perl, 1998) by studying movable poles in order to understand the integration that is associated with a dynamical system. In this case, she helped scientist to realize the importance of complex analysis in solving mathematical equations.

Bruns’ Theorem

Kovalevskaya’s study of the Brun’s theorem is illustrated in her work that was titled, “ sur un theorem de M. Bruns” (Morrow & Perl, 1998). Her contribution in this case involved developing a simpler approach for proving Bruns’ theorem. She helped in proving that Brun’s theorem is “ a function of a homogeneous body” (Morrow & Perl, 1998).

Conclusion

Kovalevskaya made remarkable contributions in the development of various mathematical concepts and theories.

She is known for the development of the concept of differential equations (Morrow & Perl, 1998). She made significant contributions in the development of Brun’s theorem and Euler’s equations. Her study of the concept of Abelian integrals helped in explaining how the concept can be used to solve various mathematical equations.

Reference

Morrow, C., & Perl, T. (1998).

Notable women in mathematics. Westport: Greenwood Publishing.