

Heinrich Eduard Heine Biography

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Biography

Heinrich Eduard Heine was one of the most productive mathematical writers in 19th century Germany, having published approximately 50 papers on a wide range of topics. His most notable achievements in mathematics were the formulation of the concept of uniform continuity and the Heine-Borel **theorem**.

Born in Berlin, Heine was the eighth child in a family of nine. His father, Karl, was a banker. Henriette Märten, his mother, stayed home and tended to the children. Heine was privately schooled at home before enrolling in the Friedrichswerdersche Gymnasium, and in 1838 graduated from the Köllnische Gymnasium in Berlin. He attended Göttingen University and often sat in on the lectures of **Karl Gauss** and Moritz Stern. In 1842, Heine received his Ph.D. in mathematics from Berlin University, where he was a student of **Peter Dirichlet**. He taught at Bonn University as a *privatdozent*, or unpaid lecturer, and as professor before moving to Halle University, where he remained throughout his career. Heine held the office of rector for the university in 1864-1865.

The Heine-Borel Theorem

Heine is most noted for his work regarding the Heine-Borel Theorem, which is defined as the following by Carl Boyer in his *A History of Mathematics*: "If a closed set of points on a line can be covered by set intervals so that every point of the set is an interior point of at least one of the intervals, then there exists a finite number of intervals with this covering property." Heine formulated the notion of uniform **continuity** and proved its existence in continuous **functions**. What has been noted often is that Heine's was the essential discovery and **Émile Borel**'s reduction of uniform continuity to the covering property was secondary. Heine also studied Bessel functions, Lamé functions, and spherical functions, also known as Legendre **polynomials**, and in 1861 he published his most influential work, *Handbuch der Kugelfunctionen*, which was considered the authoritative text on spherical functions well into the turn of the 20th century.

In 1850, Heine married Sophie Wolff and had four children. He was an active member of the Prussian Academy of Sciences as well as a member of the Göttingen Gesellschaft der Wissenschaften. In 1875, Heine declined the offer to chair the mathematics department at Göttingen, but received the Gauss Medal in 1877. Heine died in 1881 in Halle.