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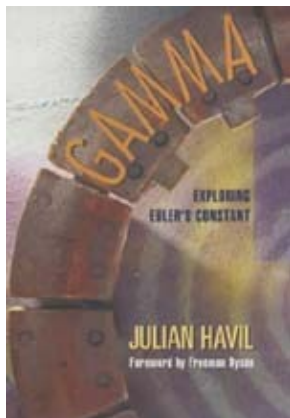
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November 2003

Reviews

'Gamma'

reviewed by Mohammad Akbar



Gamma: Exploring Euler's Constant

Of all the classical functions, the Gamma function still retains much of its mystery and intrigue, since Euler first spotted it as something "worthy of serious consideration". In *Gamma*, Julian Havil explores Gamma from its birth and in so doing simultaneously deals with many related functions, problems and issues that go beyond the conventional territory of functions alone.

Certainly the most remarkable aspect of the book is its departure from the conventional way of presenting "special functions". Havil shows that functions like Gamma and the Zeta function, for example, are not just useful inventions, but are products of continuous mathematical investigation over centuries. The book starts with logarithmic, harmonic and sub–harmonic series, and from there passes through much of the genealogy of Gamma, showing how the study of such series by mathematical giants like Euler gradually, and naturally, led to complex functions like Gamma.

The treatment of these topics is thorough, rather than simply concentrating on the prerequisites needed for subsequent chapters. The historical notes add life and convey the excitement of mathematical imagination. However, in taking such a historical approach the author does not water down the mathematical content. He takes the reader gradually to higher level of complexity within each chapter and within the book as a whole. This book is therefore not just about mathematical folklore, but about serious mathematics. The author warns

'Gamma'

that readers may need a pencil and paper in places.

For example, there is a lengthy discussion of why the infinite series of the sum of the reciprocals of the natural numbers, and, likewise, of the prime numbers, diverges, and why the related finite series never sum to an integer, mostly using the methods with which these results were first proved and needing no more than GCSE maths. As a result, this book is accessible to a wide range of readers, and should particularly appeal to those who feel a love for mathematics and are dissuaded by the dryness and formality of text-books, but are also not satisfied by the less rigorous approach of most popular books.

Mathematics is presented throughout as something connected to reality. (No wonder the author quotes Lobachevsky: "There is no branch of mathematics, however abstract, which may not some day be applied to phenomena of the real world.") This is partly achieved through the historical perspective and through many other examples the author painstakingly catalogued. Many readers will find in this book exactly what they have been missing.

The final two chapters discuss some unsolved problems to do with prime numbers, Riemann Zeta functions and the Riemann hypothesis, all of which are topics of much current research. In fact there is a million dollar prize by the Clay Mathematics Institute for proving the Riemann hypothesis. Although the reader should not expect to be able to solve the Riemann Hypothesis with the machinery presented in this book, it undoubtedly serves as an excellent and illuminating introduction to the subject.

Book details:

Gamma: Exploring Euler's Constant

Julian Havil

hardback – 376 pages (2003)

Princeton University Press

ISBN: 0691099839

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About the reviewer

Mohammad M. Akbar is a Research Associate in the Relativity and Gravitation group of the Department of Applied Mathematics and Theoretical Physics, University of Cambridge, where he obtained his Ph.D. His research interests include the physics of black holes and their thermodynamics, classical and quantum cosmology and boundary-value problems of the Einstein field equations and classical solutions of the latter in the presence of matter fields as in various supergravity theories.



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