

## Book reviews

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**Foundations of Mathematics.  
Questions of Analysis, Geometry and Algorithmics.**

(Translation from German: *Metamathematik der Elementarmathematik*, Springer 1983. Translated by Charles B. Thomas).

Springer-Verlag, Berlin – Heidelberg – New York 1993.

100 pages, 29 figures.

ISBN 3-540-56422-5 Berlin – Heidelberg – New York

ISBN 0-387-56422-5 New York – Berlin – Heidelberg.

Student reading standard textbooks of foundations of mathematics usually gets some information about the facts. This information can be better or worse but only exceptionally it contains also elementary comments explaining why exactly the presented facts were found important. Most of readers are satisfied with such presentation of compact and well shaped complete theories and do not ask for anything more.

The referred book address the remaining minority of students who are interested also in the backgrounds and motivations of the generally accepted results. Such students after becoming familiar with the standard subject matter, ask for more detailed answers on such questions like: Why exactly this approach was chosen? Why the used mathematical model of quantitative reality is considered for the best one? Which of the axiomatized properties are crucial for the adequacy between the mathematical theory and its heuristic motivation. There are not so many books reflecting and satisfying these demands. The referred one belongs to them.

Of course the set of subjects treated in the referred book cannot cover all interesting fields of metamathematics. Nevertheless it is representative and offers a good view on the roots of modern mathematical thinking. Its purpose is to display the logical and axiomatic construction of the most common parts of the mathematics traditionally presented in standard textbooks.

The book is divided into three main chapters. The first one of them, titled “The Continuum” deals with the concept of real numbers and related topics. Such subjects like the elementary theory of real numbers, non-standard analysis, continuum hypothesis, axiom of choice but also the discussion of natural and mathematical languages and their position in the logic represent the main sections of this chapter.

The second chapter is titled “Geometry”. Its content is focused to such topics like the mathematical representation of space, coordinates and their axiomatization, axiomatics of elementary geometry and formal properties of logical constructions. This choice of subjects, however narrow in the wide context of geometry, offers a representative view on the logical fundament of this important branch of mathematics.

The logic of mathematical algorithms forms the subject of the last chapter titled “Algorithmics”. Its sections are focused to the problems of the combinatory logic and combinatory algebras, to lambda calculus and also to the problems of computability of combinatorial algorithms. Of course, the discussion of the essence of the concepts of algorithm and algorithmization could not be omitted.

It was already mentioned above that the referred publication is not a textbook in the usual sense. Nevertheless it should be studied by advanced students and experienced specialists who really want to understand not only the standard matter but also the logical roots of the classical textbooks. To know and understand mathematics means to learn not only its statements but also something behind them. This “something” can be found also in this book.

*Milan Mareš*