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Book review. A. Kufner, O. John, S. Fučík: *Function Spaces*

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A. Kufner, O. John, S. Fučík. FUNCTION SPACES. Noordhoff International Publishing, Leyden and Academia, Praha, 1977, XVI + 456 pages, 13 figs., \$ 50,—, Kčs 175,—.

The theory of function spaces is a flourishing field of research. On the other hand, it is a well-known fact that function spaces are helpful (and sometimes indispensable) in other parts of mathematics, such as ordinary and partial differential equations, approximation theory, harmonic analysis etc. A few years ago the situation was the following: The number of results in the theory of function spaces and its applications (mainly in partial differential equations and approximation theory) was growing rapidly but there was no up-to-date book covering this material. This situation was disturbing, in particular for mathematicians who wanted to use function spaces as a tool in their own research work without being a specialist in function spaces. In the last few years several books have appeared (by Adams, Nikol'skij, Besov-Il'in-Nikol'skij, Semadeni, Stein, Stein-Weiss, Peetre, and the reviewer) dealing with special aspects of the theory of function spaces. Nevertheless, all these books are monographs, i.e. they are written by specialists for specialists. The gap remained: An up-to-date textbook covering a wide part of the theory of function spaces and directed (in style, level, representation and selection of the material) also to non-specialists was not available. The book under review fills this gap in an excellent way: It is a handbook on function spaces which is very useful both for specialists and non-specialists. It is required that the reader have a basic knowledge of calculus, linear algebra and functional analysis. (For the convenience of the reader the needed tools are described briefly.) Graduate students should be able to understand the main bulk of the book.

The book is divided into Chapter 0 (Preliminaries from functional analysis) and three parts (I. Smooth functions, II. Integrable functions, III. Differentiable functions). These three parts are divided into 8 chapters: 1. (Continuous, Hölder continuous and continuously differentiable functions.) The chapter deals with basic facts of the mentioned spaces. 2. (Lebesgue spaces.) This is an extensive description of the theory of the L_p spaces. 3. (Orlicz spaces.) A systematic study of the Orlicz spaces is given. 4. (Campanato and Morrey spaces.) This is the first time that the theory of Campanato and Morrey spaces has been studied systematically in a book (as far as the reviewer knows). 5. (Classical Sobolev spaces.) This chapter contains the theory of the spaces $W^{k,p}(\Omega)$, $H^{k,p}(\Omega)$ and related spaces. 6. (Traces of functions in $W^{k,p}(\Omega)$.) This chapter is the continuation of the preceding chapter and deals mainly with the imbeddings on the boundary, including inverse theorems. 7. (Sobolev-Orlicz spaces.) A brief description of the present situation in the theory of Sobolev-Orlicz spaces is given. 8. (Some generalizations.) This chapter gives a survey of further types of function spaces, which are mainly of interest for research workers (Besov spaces, Bessel-potential spaces, anisotropic spaces, weighted Sobolev spaces etc.). The book contains a lot of references.

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