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A course in multivariable calculus and analysis. (English)

Undergraduate Texts in Mathematics. London: Springer. xii, 475 p. EUR 59.95/net; £ 53.99; SFR 93.50 (2010). ISBN 978-1-4419-1620-4/hbk; ISBN 978-1-4419-1621-1/ebook

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This text is a fairly thorough treatment of real multivariable calculus which aims to develop wherever possible notions and results analogous to those in one-variable calculus. The treatment is rigorous, giving complete proofs, mostly independent of the exercises, of all results stated except the change of variables formula. The objective of emphasizing analogy with results in one-variable calculus led the authors to make some choices different from usual ones in what to include. Not included are line integrals, surface integrals and the corresponding theorems of Green, Gauss and Stokes. Some topics included but less often found in books on multivariable calculus are monotonicity and bimonotonicity of functions of two variables and their relation to partial derivatives; functions of bounded variation and bounded bivariation; the rectangular Rolle's and mean value theorems; higher order directional derivatives; convexity and its relation to gradient and Hessian; an exact analogue of the Fundamental Theorem of Calculus for real valued functions on a rectangle; and more. In the first part of the first chapter, vectors, intervals and functions are discussed in the full n -variable fashion; thereafter the detailed treatment is pretty much limited to two variables.

The chapter headings are: 1. Vectors and Functions; 2. Sequences, Continuity and Limits; 3. Partial and Total Differentiation; 4. Applications of Partial Differentiation; 5. Multiple Integration; 6. Applications and Approximations of Multiple Integrals; 7. Double Series and Improper Double Integrals.

Each chapter concludes with a section of notes and comments, and an extensive set of exercises. The exercises are divided into two parts: Part A, consisting of relatively routine problems, and Part B, containing those that are of a more theoretical nature or are especially challenging. Note, however, that a great many of the Part A exercises call for proofs. Except for a basic acquaintance with 2×2 or 3×3 matrices and their determinants, a background in linear algebra is not required.

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Keywords : multivariable calculus; intermediate calculus; advanced calculus

Classification :

*26-01 Textbooks (real functions)