



2009, XII, 150 p.

Gedrucktes Buch

Softcover

54,99 € | £49.99 | \$69.99

[1] 58,84 € (D) | 60,49 € (A) | CHF 65,00

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Serge Alinhac

Hyperbolic Partial Differential Equations

Reihe: Universitext

- Contains over 100 exercises
- “Do it yourself” instructions included for theorems
- An elementary approach to partial differential equations presented, with minimal prerequisites
- Self-contained chapters, split into two main parts

The aim of this book is to present hyperbolic partial differential equations at an elementary level. In fact, the required mathematical background is only a third year university course on differential calculus for functions of several variables. No functional analysis knowledge is needed, nor any distribution theory (with the exception of shock waves mentioned below). All solutions appearing in the text are piecewise classical C^k solutions. Beyond the simplifications it allows, there are several reasons for this choice: First, we believe that all main features of hyperbolic partial differential equations (PDE) (well-posedness of the Cauchy problem, finite speed of propagation, domains of determination, energy inequalities, etc.) can be displayed in this context. We hope that this book itself will prove our belief. Second, all properties, solution formulas, and inequalities established here in the context of smooth functions can be readily extended to more general situations (solutions in Sobolev spaces or temperate distributions, etc.) by simple standard procedures of functional analysis or distribution theory, which are “external” to the theory of hyperbolic equations: The deep mathematical content of the theorems is already to be found in the statements and proofs of this book. The last reason is this: We do hope that many readers of this book will eventually do research in the field that seems to us the natural continuation of the subject: nonlinear hyperbolic systems (compressible fluids, general relativity theory, etc.).

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