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This textbook is an application-oriented introduction to the theory of distributions, a powerful tool used in mathematical analysis. The treatment emphasizes applications that relate distributions to linear partial differential equations and Fourier analysis problems found in mechanics, optics, quantum mechanics, quantum field theory, and signal analysis. Throughout the book, methods are developed to deal with formal calculations involving functions, series, and integrals that cannot be mathematically justified within the classical framework.

Key features:

¦ Many examples, exercises, hints, and solutions guide the reader throughout the text.
¦ Includes an introduction to distributions, differentiation, convergence, convolution, the Fourier transform, and spaces of distributions having special properties.
¦ Original proofs, which may be difficult to locate elsewhere, are given for many well-known results.
¦ The Fourier transform is transparently treated and applied to provide a new proof of the Kernel Theorem, which in turn is used to efficiently derive numerous important results.
¦ The systematic use of pullback and pushforward introduces concise notation.
¦ Emphasizes the role of symmetry in obtaining short arguments and investigates distributions that are invariant under the actions of various groups of transformations.

Distributions: Theory and Applications is aimed at advanced undergraduates and graduate students in mathematics, theoretical physics, and engineering, who will find this textbook a welcome introduction to the subject, requiring only a minimal mathematical background. The work may also serve as an excellent self-study guide for researchers who use distributions in various fields.