

Preface

This book is intended to give the reader an opportunity to master solving PDE problems. Our main goal was to have a concise text that would cover the classical tools of PDE theory that are used in today's science and engineering, such as characteristics, the wave propagation, the Fourier method, distributions, Sobolev spaces, fundamental solutions, and Green's functions. While introductory Fourier method – based PDE books do not give an adequate description of these areas, the more advanced PDE books are quite theoretical and require a high level of mathematical background from a reader. This book was written specifically to fill this gap, satisfying the demand of the wide range of end users who need the knowledge of how to solve the PDE problems and at the same time are not going to specialize in this area of mathematics. Arguably, this is the shortest PDE course, which stretches far beyond common, Fourier method – based PDE texts. For example, [Hab03], which is a common thorough textbook on partial differential equations, teaches a similar set of tools while being about five times longer.

The book is problem-oriented. The theoretical part is rigorous yet short. Sometimes we refer the reader to textbooks that give wider coverage of the theory. Yet, important theoretical details are presented with care, while the hints give the reader an opportunity to restore the arguments to the full rigor. Many examples from physics are intended to keep the book intuitive for the reader and to illustrate the applied nature of the subject.

The book will be useful for any higher-level undergraduate course and for self-study for both graduate and higher-level undergraduate students, and for any specialty in sciences. Its Russian version has been a standard problem-solving manual at Moscow State University since 1988, and is also used by students of St. Petersburg University and Novosibirsk Universities. Its Spanish version is used at Morelia University in Mexico, while the English draft has already been used in Vienna University and at Texas A&M University.

For further reading we recommend [Str92], [Eva98], and [EKS99].

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