<<微分方程与数学物理问题>>

图书基本信息

书名：<<微分方程与数学物理问题>>

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作者：伊布拉基莫夫

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前言

Modern mathematics has over 300 years of history. From the very beginning,it was focused on differential equations as a major tool for mathematical mod-elling. Most of mathematical models in physics, engineering sciences, biomath-ematics, etc. lead to nonlinear differential equations.Today's engineering and science students and researchers routinely confrontproblems in mathematical modelling involving solution techniques for differen-tial equations. Sometimes these solutions can be obtained analytically by nu-merous traditional ad hoc methods appropriate for integrating particular typesof equations. More often, however, the solutions cannot be obtained by thesemethods, in spite of the fact that, e.g. over 400 types of integrable second-orderordinary differential equations were accumulated due to ad hoc approaches andsummarized in voluminous catalogues.On the other hand, the fundamental natural laws and technological prob-lems formulated in terms of differential equations can be successfully treatedand solved by Lie group methods. For example, Lie group analysis reducesthe classical 400 types of equations to 4 types only！

Development of groupanalysis furnished ample evidence that the theory provides a universal tool fortackling considerable numbers of differential equations even when other meansof integration fail. In fact, group analysis is the only universal and effectivemethod for solving nonlinear differential equations analytically. The old inte-gration methods rely essentially on linearity as well as on constant coefficients.Group analysis deals equally easily with linear and nonlinear equations, as wellas with constant and variable coefficients. For example, from the traditionalpoint of view, the linear equation

内容概要

A Practical Course in Differential Equations and Mathematical Modelling is a unique blend of the traditional methods of ordinary and partial differential equations with Lie group analysis enriched by the author's own theoretical developments. The book -- which aims to present new mathematical curricula based on symmetry and invariance principles -- is tailored to develop analytic skills and "working knowledge" in both classical and Lie's methods for solving linear and nonlinear equations. This approach helps to make courses n differential equations, mathematical modelling, distributions and fundamental solution, etc. easy to follow and interesting for students. The book is based on the author's extensive teaching experience at Novosibirsk and Moscow universities in Russia, College de France, Georgia Tech and Stanford University in the United States, universities in South Africa, Cyprus, Turkey, and Blekinge Institute of Technology (BTH) in Sweden. The new curriculum prepares students for solving modern nonlinear problems and will essentially be more appealing to students compared to the traditional way of teaching mathematics. The book can be used as a main textbook by undergraduate and graduate students and university lecturers in applied mathematics, physics and engineering.

作者简介

作者：(瑞典)伊布拉基莫夫(Ibragimov.N.H)

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章节摘录

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