

<<微分方程的定性理论>>

图书基本信息

书名：<<微分方程的定性理论>>

13位ISBN编号：9787312024559

10位ISBN编号：7312024556

出版时间：2009-5

出版时间：刘和涛 中国科学技术大学出版社 (2009-05出版)

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页数：243

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前言

Differential equations are mainly used to describe the changes of quantities or behavior of certain systems in applications, such as those governed by Newton's laws in physics. When the differential equations under study are linear, the conventional methods, such as the Laplace transform method and the power series solutions, can be used to solve the differential equations analytically, that is, the solutions can be written out using formulas. When the differential equations under study are nonlinear, analytical solutions cannot, in general, be found; that is, solutions cannot be written out using formulas. In those cases, one approach is to use numerical approximations. In fact, the recent advances in computer technology make the numerical approximation classes very popular because powerful software allows students to quickly approximate solutions of nonlinear differential equations and visualize their properties. However, in most applications in biology, chemistry, and physics modeled by nonlinear differential equations where analytical solutions may be unavailable, people are interested in the questions related to the so-called qualitative properties, such as:

will the system have at least one solution ?

will the system have at most one solution ?

can certain behavior of the system be controlled or stabilized ?

or will the system exhibit some periodicity ?

If these questions can be answered without solving the differential equations, especially when analytical solutions are unavailable, we can still get a very good understanding of the system. Therefore, besides learning some numerical methods, it is also important and beneficial to learn how to analyze some qualitative properties.

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内容概要

书中主要讲解了微分方程理论的基本方法,对微分方程的存在性、连续依赖性、稳定性、周期解、自治微分系统、动力系统等基本问题进行详细分析,并注重理论间的联系。

《微分方程的定性理论》基础性强、应用广泛,是一本适合大学高年级选修课、研究生双语教学以及读者自学的英文教科书。

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作者简介

刘和涛，教授，留美执教数十年，曾在培生教育等国际著名、出版机构出版过多种教材，为美国多所院校采用。

本教材秉承了国外先进教学理念，并针对国内学生实际情况，尤其注、意了由浅入深的理论过渡，建立了完备的逻辑体系，语言地、道，是适合于双语教学的优秀教科书，亦适合学生自学。

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章节摘录

插图：The study of linear differential equations is very important for the following reasons. First, the study provides us with some basic knowledge for understanding general nonlinear differential equations. Second, many nonlinear differential equations can be written as summations of linear differential equations and some small nonlinear perturbations. Thus, under certain conditions, the qualitative properties of linear differential equations can be used to infer essentially the same qualitative properties for nonlinear differential equations.

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