<<微分几何基础>>

图书基本信息

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前言

The present book aims to give a fairly comprehensive account of thefundamentals of differential manifolds and differential geometry. The sizeof the book influenced where to stop, and there would be enough materialfor a second volume (this is not a threat). At the most basic level, the book gives an introduction to the basicconcepts which are used in differential topology, differential geometry, anddifferential equations. In differential topology, one studies for instancehomotopy classes of maps and the possibility of finding suitable differen-tiable maps in them (immersions, embeddings, isomorphisms, etc.). Onemay also use differentiable structures on topological manifolds to deter-mine the topological structure of the manifold (for example, h ia Smale[Sin 67]). In differential geometry, one puts an additional structure on thedifferentiable manifold (a vector field, a spray, a 2-form, a Riemannianmetric, ad lib.) and studies properties connected especially with theseobjects. Formally, one may say that one studies properties invariant underthe group of differentiable automorphisms which preserve the additionalstructure. In differential equations, one studies vector fields and their in-tegral curves, singular points, stable and unstable manifolds, etc. A certainnumber of concepts are essential for all three, and are so basic and elementarythat it is worthwhile to collect them together so that more advanced expositionscan be given without having to start from the very beginnings. Those interested in a brief introduction could run through Chapters II, III, IV, V, VII, and most of Part III on volume forms, Stokes theorem, and integration. They may also assume all manifolds finite dimensional.

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内容概要

本书介绍了微分拓扑、微分几何以及微分方程的基本概念。
本书的基本思想源于作者早期的《微分和黎曼流形》，但重点却从流形的一般理论转移到微分几何，增加了不少新的章节。
这些新的知识为Banach和Hilbert空间上的无限维流形做准备，但一点都不觉得多余，而优美的证明也让读者受益不浅。
在有限维的例子中，讨论了高维微分形式，继而介绍了Stokes定理和一些在微分和黎曼情形下的应用。
给出了Laplacian基本公式，展示了其在浸入和浸没中的特征。
书中讲述了该领域的一些主要基本理论，如：微分方程的存在定理、唯一性、光滑定理和向量域流，包括子流形管状邻域的存在性的向量丛基本理论，微积分形式，包括经典2-形式的辛流形基本观点，黎曼和伪黎曼流形协变导数以及其在指数映射中的应用，Cartan-Hadamard定理和变分微积分第一基本定理。
目次：（第一部分）一般微分方程；微积分；流形；向量丛；向量域和微分方程；向量域和微分形式运算；Frobenius定理；（第二部分）矩阵、协变导数和黎曼几何：矩阵；协变导数和测地线；曲率；二重切线丛的张量分裂；曲率和变分公式；半负曲率例子；自同构和对称；浸入和浸没；（第三部分）体积形式和积分：体积形式；微分形式的积分；Stokes定理；Stokes定理的应用；谱理论。

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书籍目录

章节摘录

We shall recall briefly the notion of derivative and some of its usefulproperties. As mentioned in the foreword, Chapter VIII of Dieudonn6sbook or my books on analysis [La 83], [La 93] give a self-contained andcomplete treatment for Banach spaces. We summarize certain factsconcerning their properties as topological vector spaces, and then wesummarize differential calculus. The reader can actually skip this chapterand start immediately with Chapter II if the reader is accustomed tothinking about the derivative of a map as a linear transformation. （In thefinite dimensional case, when bases have been selected, the entries in thematrix of this transformation are the partial derivatives of the map.） Wehave repeated the proofs for the more important theorems, for the ease ofthe reader. It is convenient to use throughout the language of categories. Thenotion of category and morphism （whose definitions we recall in 1） isdesigned to abstract what is common to certain collections of objects andmaps between them. For instance, topological vector spaces and continuous linear maps, open subsets of Banach spaces and differentiablemaps, differentiable manifolds and differentiable maps, vector bundles andvector bundle maps, topological spaces and continuous maps, sets and justplain maps. In an arbitrary category, maps are called morphisms, and infact the category of differentiable manifolds is of such importance in thisbook that from Chapter II on, we use the word morphism synonymouslywith differentiable map （or p-times differentiable map, to be precise）. Allother morphisms in other categories will be qualified by a prefix to in-dicate the category to which they belong.

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