Differential and Riemannian Manifolds (Graduate Texts in Mathematics)

By Serge Lang

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This is the third version of a book on differential manifolds. The first version appeared in 1962, and was written at the very beginning of a period of great expansion of the subject. At the time, I found no satisfactory book for the foundations of the subject, for multiple reasons. I expanded the book in 1971, and I expand it still further today. Specifically, I have added three chapters on Riemannian and pseudo Riemannian geometry, that is, covariant derivatives, curvature, and some applications up to the Hopf-Rinow and Hadamard-Cartan theorems, as well as some calculus of variations and applications to volume forms. I have rewritten the sections on sprays, and I have given more examples of the use of Stokes' theorem. I have also given many more references to the literature, all of this to broaden the perspective of the book, which I hope can be used among things for a general course leading into many directions. The present book still meets the old needs, but fulfills new ones. At the most basic level, the book gives an introduction to the basic concepts which are used in differential topology, differential geometry, and differential equations. In differential topology, one studies for instance homotopy classes of maps and the possibility of finding suitable differentiable maps in them (immersions, embeddings, isomorphisms, etc.).

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Differential and Riemannian Manifolds (Graduate Texts in Mathematics) By Serge Lang Bibliography

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Editorial Review

From the Back Cover

This text provides an introduction to basic concepts in differential topology, differential geometry, and differential equations, and some of the main basic theorems in all three areas: for instance, the existence, uniqueness, and smoothness theorems for differential equations and the flow of a vector field; the basic theory of vector bundles including the existence of tubular neighborhoods for a submanifold; the calculus of differential forms; basic notions of symplectic manifolds, including the canonical 2-form; sprays and covariant derivatives for Riemannian and pseudo-Riemannian manifolds; applications to the exponential map, including the Cartan-Hadamard theorem, and the first basic theorem of calculus of variations. These are all covered for infinite-dimensional manifolds, modeled on Banach and Hilbert spaces, at no cost in complications, and some gain in the elegance of the proofs. In the finite-dimensional case, differential forms of top degree are discussed, leading to Stokes' theorem (even for manifolds with singular boundary), and several of its applications to the differential or Riemannian case.

Review

S. Lang

Differential and Riemannian Manifolds

"An introduction to differential geometry, starting from recalling differential calculus and going through all the basic topics such as manifolds, vector bundles, vector fields, the theorem of Frobenius, Riemannian metrics and curvature. Useful to the researcher wishing to learn about infinite-dimensional geometry."

?MATHEMATICAL REVIEWS

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