Graduate Texts in Mathematics

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Differential and Riemannian Manifolds

Springer

Contents

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.

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