

## Introduction to smooth manifolds

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Deskripsi Lengkap: <https://lib.ui.ac.id/detail?id=20419418&lokasi=lokal>

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### Abstrak

This book is an introductory graduate-level textbook on the theory of smooth manifolds. Its goal is to familiarize students with the tools they will need in order to use manifolds in mathematical or scientific research, smooth structures, tangent vectors and covectors, vector bundles, immersed and embedded submanifolds, tensors, differential forms, de Rham cohomology, vector fields, flows, foliations, Lie derivatives, Lie groups, Lie algebras, and more. The approach is as concrete as possible, with pictures and intuitive discussions of how one should think geometrically about the abstract concepts, while making full use of the powerful tools that modern mathematics has to offer.

The book now introduces the two most important analytic tools, the rank theorem and the fundamental theorem on flows. A few new topics have been added, notably Sard's theorem and transversality, a proof that infinitesimal Lie group actions generate global group actions, a more thorough study of first-order partial differential equations, a brief treatment of degree theory for smooth maps between compact manifolds, and an introduction to contact structures.