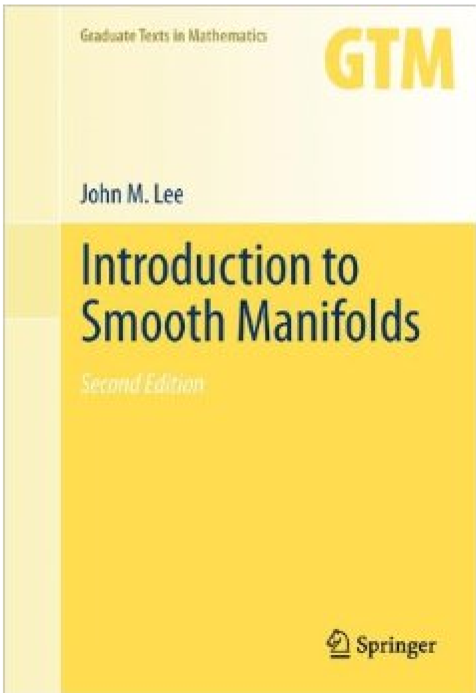
Introduction To Smooth Manifolds (Graduate Texts In Mathematics, Vol. 218)



Synopsis

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.This second edition has been extensively revised and clarified, and the topics have been substantially rearranged. The book now introduces the two most important analytic tools, the rank theorem and the fundamental theorem on flows, much earlier so that they can be used throughout the book. A few new topics have been added, notably Sardâ ™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.Prerequisites include a solid acquaintance with general topology, the fundamental group, and covering spaces, as well as basic undergraduate linear algebra and real analysis.

Book Information

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Customer Reviews

Much of what I have to say has already been said by reviewers of the first edition. But it’s worth hearing again. This book is virtually flawless. The material is quite standard (manifold theory, vector bundles, Lie groups, distributions, etc.), but the level of organization and its close attention to detail sets this book apart. In particular, the proofs are quite thorough, with every step accounted for. All the background material that is needed (mainly topology and calculus) is listed in a fairly extensive appendix.I imagine someone with experience in differential geometry might find Lee’s style tedious. However, as Lee himself points out in the introduction, students encountering differential geometry for the first time usually need this level of detail. I wholeheartedly agree with him. Differential geometry is a difficult subject to get into, with lots and lots of notation and a tendency to handwave technical details. I personally found Lee’s book far superior to the relatively sparse class notes provided by my instructor. A careful reading of Lee’s book is slow going, but there’s no question that you will understand the material after you’re done. (I wish the same could be said for all math books...)A nice feature is the very frequent exercises interspersed in the text. These delegate the easier or more repetitive proofs to the reader--and they’re designed to be easy. This gives the reader a chance to get comfortable with the mechanics of the subject before being expected to tackle the more difficult problem sets at the end of each chapter. Too often math courses skip this phase of the learning process.

This book was written with the beginning graduate student very much in mind; that is, someone who hasn’t been previously exposed to differential geometry outside of Euclidean space in a serious/rigorous way, but someone with (at least) a good background in multivariable calculus, (real) analysis, linear algebra, along with a smattering of basic abstract algebra and point set topology. Even a well-prepared undergraduate student can gain a lot of mileage from this book.A few remarks about the many details provided in the text: I think they only add pedagogical value, most, if not all, of which can be glossed over by more experienced readers. Some of these details are significant (even by way of the embedded "exercises", not so much the end-of-chapter "problems" -- the author makes the distinction between the two), and don’t disrupt the flow of the text in a detrimental way. And though some of these exercises are routine, they’re great for checking understanding, and give the reader some confidence. And sometimes it’s just nice to see some things spelled out for you when you’re working through the details (of a technical proof) yourself. In other words, I don’t feel that the author gets bogged down too much with the finer points so as to lose sight of what’s really important. Though this makes for a bulky text, I’m actually quite fond of bulky math books myself! To the student, especially a beginner, these can be instructive.Despite all this, I still think text is quite an enjoyable read -- even pleasantly chatty in places -- and serves as a solid introduction to smooth manifolds in particular, and differential geometry in general.

This is a really great book. I loved Jack Lee’s intro topology book and was expecting this text to be just as great. I really like his expositions and problems, both of which keep me interested in continuing reading the book.If you haven’t read his other book on topology, I suggest doing so first. This book definitely feels like the "next" book, or a sequel to his topology book, if you will.

A very well written text in a world of poorly texts on this subject. So many authors seem to confound this elegant subject with a profusion of notation that is either poorly defined or garrulously described creating a mess for the student to unravel. Lee has done a superior job. He hasreasonably organized the material and gives proper definitions with a good amount of description. Although a few of the lemmas and theoremscould have a little better motivation and proof, the text is overall one of the best.

This book is exceptionally clear which was all I really wanted after gaining "insight" from Spivak. However it offered much more with good writing, motivation, examples, and problems. This has made the book my go to on the subject. As an added bonus, the notation Lee uses is the most intuitive that I’ve seen.

Brilliantly written book. I don’t like math books which are a bareknuckled definition -> theorem -> proof sequence. Sigh, maybe I am just not smart enough to fill in the gaps on the fly. Prof. Lee takes the time to discuss and motivate, which I really appreciate as a student new to the field. And he lays out topics in a way you can sort of see how they are parts of a whole (again pet hate math tomes where you are hanging on for dear life but it’s not clear where the heck the author is headed with it all).

This book is the best text on manifolds that I have encountered, and it’s one of the best in the GTM series. Every mathematics graduate student should read this book at some point. The proofs are very thorough, the examples are illuminating, and the exercises are thought-provoking. I have read both editions of the book, and I think that the second edition is a huge improvement over the (already excellent) first edition.

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