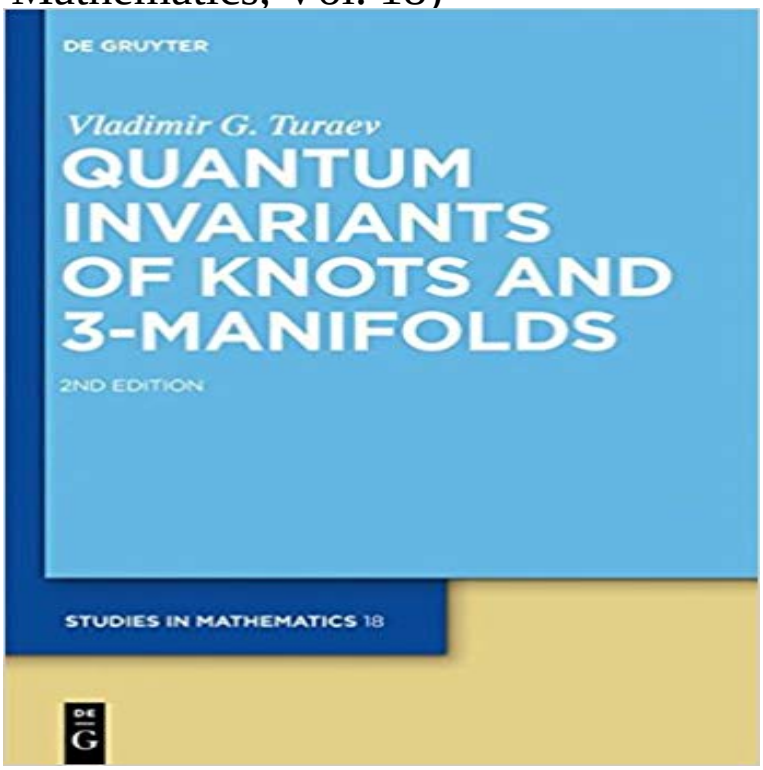
Quantum Invariants of Knots and 3-Manifolds (De Gruyter Studies in Mathematics, Vol. 18)



Due to the strong appeal and wide use of this monograph, it is now available in its second revised edition. The monograph gives a systematic treatment of 3-dimensional topological quantum field theories (TQFTs) based on the work of the author with N. Reshetikhin and O. Viro. This subject was inspired by the discovery of the Jones polynomial of knots and the Witten-Chern-Simons field theory. On the algebraic side, the study of 3-dimensional TQFTs has been influenced by the theory of braided categories and the theory of quantum groups. The book is divided into three parts. Part I presents a construction of 3-dimensional TQFTs and 2-dimensional modular functors from so-called modular categories. This gives a vast class of knot invariants and 3-manifold invariants as well as a class of linear representations of the mapping class groups of surfaces. In Part II the technique of 6j-symbols is used to define state sum invariants of 3-manifolds. Their relation to the TQFTs constructed in Part I is established via the theory of shadows. Part III provides constructions of modular categories, based on quantum groups and skein modules of tangles in the 3-space. This fundamental contribution to topological quantum field theory is accessible to graduate students in mathematics and physics with knowledge of basic algebra and topology. It is an indispensable source for everyone who wishes to enter the forefront of this fascinating area at the borderline of mathematics and physics. From the contents: Invariants of graphs in Euclidean 3-space and of closed 3-manifolds Foun

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