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Sinopsis

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This self-contained treatment of Morse theory focuses on applications and is intended for a graduate course on differential or algebraic topology. The book is divided into three conceptually distinct parts. The first part contains the foundations of Morse theory. The second part consists of applications of Morse theory over the reals, while the last part describes the basics and some applications of complex Morse theory, a.k.a. Picard-Lefschetz theory.

This is the first textbook to include topics such as Morse-Smale flows, Floer homology, min-max theory, moment maps and equivariant cohomology, and complex Morse theory. The exposition is enhanced with examples, problems, and illustrations, and will be of interest to graduate students as well as researchers. The reader is expected to have some familiarity with cohomology theory and with the differential and integral calculus on smooth manifolds.

Some features of the second edition include added applications, such as Morse theory and the curvature of knots, the cohomology of the moduli space of planar polygons, and the Duistermaat-Heckman formula. The second edition also includes a new chapter on Morse-Smale flows and Whitney stratifications, many new exercises, and various corrections from the first edition.