Algebraic Topology: A First Course

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We introduce algebraic topology with a quick treatment of standard material about the fundamental groups of spaces, embedded in a geometrical proof of the Brouwer fixed point theorem and the fundamental theorem of algebra. What is algebraic topology? A topological space $X$ is a set in which there is a notion of nearness of points. Precisely, there is given a collection of open subsets of $X$ which is closed under finite intersections and arbitrary unions. This book introduces the important ideas of algebraic topology emphasizing the relation of these ideas with other areas of mathematics. Rather than choosing one point of view of modern topology (homotopy theory, axiomatic homology, or differential topology, say) the author concentrates on concrete problems in spaces with a few dimensions, introducing only as much algebraic machinery as necessary for the problems encountered. The first part of the book emphasizes relations with calculus and uses these ideas to prove the Jordan curve theorem. The study of fundamental groups and covering spaces emphasizes group actions. A final section gives a taste of the generalization to higher dimensions. This self-contained introduction to algebraic topology is suitable for a number of topology courses. It consists of... The book has emerged from courses given at the University of Newcastle-upon-Tyne to senior undergraduates and beginning postgraduates. It has been written at a level which will enable the reader to use it for self-study as well as a course book. The approach is leisurely and a geometric flavour is evident throughout. The many illustrations and over 350 exercises will prove invaluable as a teaching aid. This account will be welcomed by advanced students of pure mathematics at colleges and universities. Sets and groups.