Algebraic Topology (M24)
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Algebraic topology assigns algebraic invariants (groups and homomorphisms) to topological spaces and continuous maps between them. The most important example of such an invariant is ordinary homology theory, which is part of the basic language of geometry today. This course will cover homology and cohomology, together with applications to the topology of manifolds and vector bundles. The emphasis will be on learning to compute and use these invariants in a variety of examples. A tentative syllabus is as follows:

• **Homology.** Singular homology and cohomology. Eilenberg-Steenrod axioms and cellular homology. Universal coefficient theorem. Künneth theorem and cup products.
• **Vector Bundles.** Vector bundles and principal bundles. The Thom isomorphism and the Euler class. Long exact sequence on homotopy groups.
• **Topology of Manifolds.** Handle decompositions and Morse theory. Poincaré duality. The Lefshetz fixed point theorem.

Pre-requisites
The only required background is basic point-set topology, but prior experience with the fundamental group would be helpful. The material in the Michaelmas term Differential Geometry course will be useful as well.

Literature

Additional support

Four examples sheets will be provided and four associated examples classes will be given. There will be a revision class in the Easter Term.