

Fall  
MATH 748, Spring 1996

S. Novikov: Topology from differential point of view.

**General Ideas.** Main Idea is to present elementary differential topology, avoiding big difficulties with foundations. For example, things like  $C^\infty$ -approximation of continuous maps and transversality should be accepted as axioms.

In some other specific cases nonrigorous pieces should be permitted also. Reason for doing that is following: beautiful topological intuition completely disappeared from the existing courses; topology students don't like to take these courses for qualifying exams; almost no nontrivial topological material, which can be used by people working in analysis and applications, is presented in them normally (or presented in the form, which is extremely difficult to understand for people working in other areas of mathematics).

This criticism is not specifically directed against the courses in our department: this tradition exists almost everywhere in math community. In my opinion, very high topological qualification existing here will be helpful in changing this tradition.

Our "nonrigorous" approach for learning topology successfully worked in Moscow, according to the authors opinion:

A lot of people, who learned topology in this way, became good topologists, who were able to work later in different fields of mathematics and its applications.

**Lecture 1.**

Introductory remarks, general description of future course and Literature, idea of transversality in 2 examples:

1. Real functions on the line

2. Families of operators (matrices) of different classes, including complex hermitian matrices. Topology of generic families of such matrices plays important role, for example in the so-called "Integral Quantum Hall Effect" - famous discovery of early 80-ies, awarded by Nobel Prize. Which topological objects do we need for this? The Answer is: vector bundles and Chern classes.