

Math 99r Tutorial topics
(2011-2012)

Fall Tutorial 2011

Category Theory

Description: Category theory has found ubiquitous uses in modern mathematics. Most of the subjects which have been profoundly influenced are however rather technical and typically lie outside the standard undergraduate curriculum. On the other hand, insights derived from a categorical point of view could be very useful when learning mathematics at any level.

The first part of this course will introduce the subject by building on many familiar examples from basic algebra and topology. We will explain the meaning of categories, functors, natural transformations, limits, colimits, Yoneda's lemma, representability, and adjunctions. In order to make our exposition more meaningful and enjoyable, each definition will be followed by an explicit example in a category the students are acquainted with.

Once the basis of the subject has been thoroughly covered, we will venture into a more advanced topic. The aim in this second part will be to bring together all ideas developed earlier in one or more lengthier and more realistic examples. Potential topics include, but are not limited to:

- the correspondence between $(1+1)$ -dimensional topological quantum field theories and Frobenius algebras,
- the concept of classifying/moduli spaces in topology and algebraic geometry,
- abelian categories and a little homological algebra,
- higher categories.

Students background and interests will be the main parameters taken into consideration when choosing topics

Prerequisites: Math 122 will be essential

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Spring 2011 Tutorial

Grupoids in Topology

Prerequisites: Math 122 and some familiarity with the fundamental group (e.g. Math 131) is desirable but not required.

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The Figure Eight Knot: An Introduction to Hyperbolic Geometry

Prerequisites: Math 122 and Math 131 fundamental group (e.g. Math 131) is desirable but not required.

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