University of Washington
Math 544
Fall 2016
General Information

Instructor:

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Office hours: By appointment, or just drop in.

Text: J.M. Lee, *Introduction to Topological Manifolds*, second edition, available at the University bookstore. I have also put the book *Topology*, 2nd edition, by J. R. Munkres on reserve in the Math Library.

About the course and prerequisites: The main goal in Math 544–6 is to introduce you to the study of smooth manifolds — a smooth manifold being an arbitrary-dimensional generalization of a curve (one-dimensional) or surface (two-dimensional) on which derivatives of functions make sense. Since a manifold is a topological space, we will spend most of this quarter on elementary topology and homotopy theory. A topological space is a generalization of a metric space — its salient feature is that it's an object on which one can define the notion of a continuous function. Just as one might hope to classify manifolds, one might, more generally, hope to classify topological spaces. This is impossible; however, we will assign to each topological space a group — called the fundamental group — with the property that if two topological spaces are (homotopy) equivalent, then their fundamental groups are isomorphic. (This is the beginning of algebraic topology, a subject that studies topological spaces by assigning algebraic invariants to them.) We will end the course by studying covering spaces, a tool which can be used for, among other things, computing fundamental groups.

To succeed in this course, you will need the following prerequisites:

From Set Theory: Basic facts of "naive set theory" such as functions, equivalence relations, countability, order relations, the well-ordering theorem. Reference: *Naive Set Theory* by P. R. Halmos.

From Algebra: Elementary group theory such as homomorphisms, isomorphisms, subgroups, normal subgroups, cosets, quotient groups.

From Analysis: Properties of the real numbers and $\mathbb{R}^n$, open and closed sets, continuous maps, convergence, metric spaces, compact and connected sets. Reference: *Principles of Mathematical Analysis* by W. Rudin.

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If you aren't familiar with one or two of these topics, you should fill in the gaps by independent reading. If, however, you find a lot of items on the list unfamiliar, you should consider taking a lower-level course that covers some of these prerequisites. In particular, if you are not comfortable with metric spaces, you should probably switch to Math 441.

Homework: Homework will be assigned more or less weekly and will consist of 5 or so problems to be written up and handed in for grading. This homework is expected to be demanding and will count for much of your grade. Although you are encouraged to share ideas on homework problems with your classmates, I expect you to actually write your homework on your own. You are also not allowed to use discussion boards on the internet, and any unattributed use of material from the internet constitutes plagarism. In principle, late homework will not be accepted.

In addition, there are many exercises integrated into the text. Although these will generally not be assigned as homework problems, I expect that you read each exercise carefully and make sure that you know exactly how to solve it.

Final Exam: The Final Exam is scheduled for Monday, December 12 from 2:30-4:20; I also anticipate giving a short take home final to be due later that week. These arrangements may change.

Grading: Your grade will be based 50% on the required homework problems, 30% on the in-class final, and 20% on the take home final. (If these arrangements change, the computation of your grade will change accordingly.) A grade at or below 3.0 means you are not performing at the level expected of a graduate student.