Topology - 1701.354
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Required texts: 1. Topological Spaces, by G. Buskes and A. van Rooij, Springer-Verlag, 1997. 2. Theory and Problems of General Topology by Seymour Lipschutz Schaum's Outline Series – McGraw Hill

Prerequisites: Introduction to Real Analysis

OBJECTIVES:

This course introduces the student to one of the main branches of modern mathematics and shows them how topological concepts are important in many other areas of mathematics, such as real analysis, functional analysis, and dynamical systems. The student will learn how to recognize the usefulness of topological concepts by studying them and researching applications using mathematics journals, books, and other resources.

COURSE CONTENT:

The tentative course content will include topics selected from those discussed in Chapters 1 - 9, 11, 12, 13 of the first text, together with study of applications to analysis, fractals, and chaos theory.

TENTATIVE GRADING: Grades in this course will be assigned based on:

1. Student submission of worked problems, most of which will be assigned from the texts. 20%
2. Midterm Exam 30%
3. Final exam 35%
4. Research Paper 15%

HOMEWORK:

1. I encourage you to work together to figure out the homework. But of course I expect you to hand in YOUR VERSION of the solutions. Don't write things you do not understand.

2. Please adhere to the following guidelines for homework submission:
   a. Write the problems in the assignment on the first page.
   b. Write the problem statement at the beginning of your solution.
   c. If the problem is a proof label it "Proposition"
   d. Be neat and organized.
   e. Staple your pages.
   f. Consider using Mathtype or LaTeX, or some equation editor at least some of the time.

HOMEWORK ASSIGNMENTS – FIRST PART

Here are some of the exercises I am asking you to do. These are from Buskes/van Rooij.

Assignment 1:→ Read Chapter 1, What Topology is About.
(→ In addition read this article about the history of topology :http://www.gap-system.org/~history/HistTopics/Topology_in_mathematics.html)
→ Exercises A, B, C, D, E

Assignment 2:→ Read Chapter 2 to review the axioms for the real number system, . Chances are some axioms are not the same as you learned in Real Analysis – they are stated with a view to generalizing to other topological spaces.
➔ Exercises B, C, D, G, H, J, K

Assignment 3: → Read Chapter 3. Topology has roots in the study of convergence and continuity. Here we examine the concept in familiar situations, the case of the real line and the plane.
→ Exercises A – D, F, G (implies that on any longitude there will always be 2 antipodal points having the same temperature.), H

Assignment 4: → Read Chapter 4 in which a three famous topological theorems are discussed (and two of them proved.) They are Peano's space filling curve theorem, the Brouwer fixed point theorem, and the Jordan curve theorem.
→ Exercises A, B, C, E

Assignment 5: → Read Chapter 5, where we are introduced to metric spaces. It is important to study the various examples of mathematical situations in which a metric space is present.
→ Exercises A – E, G, J

Assignment 6: Read Chapter 6.Open and closed sets. The situation with sets is rather different than with doors – a set can be both open and closed or neither open nor closed!
The word "boundary" can be vey misleading and so we must look at many examples.
→ Exercises B, D, E, H, I, J

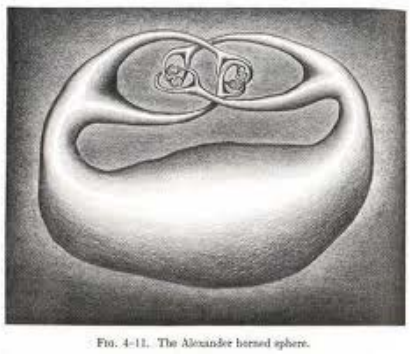
FIG. 4-11. The Alexander horned sphere.

Alexander Horned Sphere