

MATH 420, Special Topics: Topology Spring 2009

Bryan Smith

January 14, 2009

Contents

1	Introduction	1
2	Course Information	1
2.1	Textbook	1
2.2	Basic Information	1
2.2.1	Logistics	1
2.3	Examinations	2
2.4	Final Examination	2
2.5	Homework	2
2.6	Reading	2
2.7	Course Information Updates	2
2.8	Total Points	3
2.9	Ungraded Homework Assignment	3

1 Introduction

We will be covering the basics of “Pointset Topology” in this course. Our material will focus on what type of structures need to be placed on a set in order to make it a “topological space” and what properties we can deduce from these structures. You have already experienced a similar situation in linear algebra where the structure of a “vector space” (addition, scalar multiplication and the definition with 10 properties) is placed on a set. Similar things are done in Math 433 and 434 in defining groups, rings, fields, modules, etc.

It is fair to say that pointset topology is a fundamental part of mathematics in that almost every other branch makes use of it at some level. The disciplines you are most familiar with are interested in what topology can tell them about “continuity” and related properties of functions, For example, Physics, Statistics and Analysis require the ideas associated with derivatives (which is more stringent than continuity), modern Geometry requires continuity (and differentiability) in its concepts of transformations, curvature, and metrics, and almost every type of optimization uses tools that rely on small changes in inputs not having catastrophic effects on outputs of functions (i.e., continuity). Hence, at an intuitive level, we will be studying what structures are needed to make functions between sets be “continuous” and what other properties follow from those structures.

2 Course Information

2.1 Textbook

The textbook is *Aspects of Topology*, 2nd Ed, Christenson and Voxman, ©1998, BCS Associates.

I expect that you already feel comfortable with the basic approaches to doing a mathematical proof. However, if you would like to have a resource at hand, you might consider one of the many books on “how to do proofs” such as *The Nuts and Bolts of Proofs*.

2.2 Basic Information

You can find information pertinent to all of my classes at the link below and, once there, information specific to this class by clicking on the Math 420 link.

<http://math.ups.edu/~bryans/> [1]

2.2.1 Logistics

Professor Bryan Smith	Thompson 390D	879-3562	bryans[at]ups.edu
Math 420A	Thompson 310 Thompson 395	Mon & Fri Tue & Thu	11:00 - 11:50 A.M. 11:00 - 11:50 A.M.
Office Hours		Tue.	3:00 - 3:50 P.M
		Wed.	3:00 - 4:30 P.M.
		Thu.	1:00 - 1:50 P.M.

If you have trouble meeting during office hours please make an appointment for a better time.

2.3 Examinations

Since the homework will be used to facilitate deep understanding, tests will be used more as a basic check of your knowledge. Hence, there will be three, “straightforward”, semester examinations that will include definitions as well as proofs.

Examination One Thursday February 12

Examination Two Thursday March 12

Examination Three Thursday April 16

Study Session If there is enough interest we can schedule an evening study session for the Wednesday before an examination.

2.4 Final Examination

12:00 - 2:00 P.M. Monday May 11

The final will also be “straightforward” and comprehensive. The final cannot be rescheduled so do not plan plane flights (or anything else) that will conflict with it.

2.5 Homework

Each of you will be assigned one or two homework problems from each section that we cover for an average of about 3 problems per week. You may submit a solution more than once but for each problem there will be a due date beyond which I will not accept submissions.

You are allowed (and encouraged) to work together and to use me as a resource while figuring out these problems but there is to be **no collaboration** when writing up your solutions. Also, always remember that failure to include references is intellectual theft! Please see the “Academic Honesty” section of the *Logger* [3] to see how serious this issue is to the university community.

You are to use the \LaTeX typesetting system to write up your solutions. For those of you who are unfamiliar with \LaTeX , I will be happy to give a brief workshop on how to install and use this package. \LaTeX is now the expected way to typeset papers in mathematics and science.

Since you will be using \LaTeX to submit your papers, it will be easy to compile a collection of our solutions. So, once you have a solution accepted (and if necessary, corrected), you will submit the \LaTeX code to me in electronic form. I will then collect the solutions into a single file that we can “publish” to the class at the end of the semester. The immediate benefit to you will be ongoing access to solutions of all homework solutions (not just the ones you have worked) to use as learning aids throughout the semester.

When working your problems, feel free to use (or not) any technology that you like (e.g., SAGE, Scientific Notebook, CABRI, Geometers Sketchpad, calculators, *Mathematica*, MATLAB, etc.).

2.6 Reading

You need to read math to learn math.

2.7 Course Information Updates

If you wish, I will post (and update) a grade report on your current standing in the class on my university web page. To have your information posted you need to print your name, the class (MATH 420), and a

code on a sheet of paper. Then sign the paper and physically hand it to me. The code is to be a sequence of up to 23 symbols I can type on a keyboard.

2.8 Total Points

Homework:	64%
Examinations:	27%
Final Examination:	9%

2.9 Ungraded Homework Assignment

Look over both my university web page <http://math.ups.edu/~bryans/> [1] and the course webpage for MATH 420 you'll find there. Then send an e-mail message to me at bryans [at] ups.edu that includes brief descriptions of both your background in mathematics and any aspects of your post-graduation plans.

References

- [1] Bryan Smith's Homepage
<http://math.ups.edu/~bryans/>
- [2] Math 420A Course Webpage
http://math.ups.edu/~bryans/Current/Spring_2009/420Index_Spring2009.html
- [3] University Academic Handbook (The Logger)
<http://www.ups.edu/x4716.xml>
- [4] Location of MikTeX package for using L^AT_EX
miktex.org
- [5] Development tools for composing L^AT_EX documents
[miktex.org/Links.aspx](http://www.esm.psu.edu/mac-tex/)
<http://www.esm.psu.edu/mac-tex/>
- [6] "The Nuts and Bolts of Proofs", Antonella Cupillari
<http://www.amazon.com/exec/obidos/tg/detail/-/0120885093/>