

Mathematics 220: Mathematical Proof

September -December, 2020

Syllabus

The main aim of Mathematics 220 is to teach you how to think mathematically, prove or disprove mathematical statements, and write clear, coherent, “good” proofs.

This means that, to many of you, this will be quite a different course from the other math courses you have taken. In this course, we will mainly focus on the question “why is X?” instead of “what is X?”. This means that we are going to more focus on justifying results rather than calculating expressions.

In the process, we will require the homework solutions to be typeset. This means that you are not going to handwrite your homeworks, but use a software to write them. There are various typesetting platforms you can use, but we strongly recommend using basic LaTeX (a typesetting language that makes the mathematical expressions look their best) to write homework solutions, since we are also going to provide some basic guidelines for using LaTeX (and also that LaTeX is really good).

There are 3 main reasons we want to utilize typesetting your homeworks, especially LaTeX. First reason is that LaTeX is simply the best scientific typesetting platform available and it would be quite an advantage to you all to learn how to use it. Second, it encourages you to go over your proof while you are typing it and thus makes you find errors before you submit your homework. Finally, it generates a pdf file of your homework which can be easily uploaded to Canvas.

Structure of the course

In this course we are going to have a common Canvas site, named “MATH 220 ALL 2020W” in addition to the section specific Canvas sites. All the homework sets, announcements, mini quizzes, pre-lecture videos, etc. are going to be posted on the common Canvas site. The individual Canvas sites are going to be used mainly for the section specific posts such as your instructor’s office hours, your section’s synchronous lectures, etc.

The common Canvas site is going to be organized in weekly modules. In each module, there is going to be two pre-recorded short introduction videos which are going to be followed by mini (quite easy, very short) quizzes to make sure that you are on track with the materials. The lectures are going to be on your scheduled times and your instructor is going to post the information on how you can log into them on your section’s Canvas site. The lecture hours are going to focus more on explaining nuances, doing examples, and group work instead of going over the definitions given in the pre-recorded videos. This means that you are required to watch the pre-recorded videos (and finishing the quizzes) before coming to your lectures. At the end of the modules, there will be the information about the weekly homework sets (see below).

Textbook

Book of Proof (3rd edition), by Richard Hammack You can download the text for free from

<https://www.people.vcu.edu/~rhammack/BookOfProof/Main.pdf>

Following the textbook we will cover, in the order given below,

- Sets and basic definitions: 1.1
- Logic: 2.1, 2.2, 2.3
- Proofs: 4.1, 4.2, 4.3, 4.4, 4.5
- Logic: 2.4, 2.5, 2.6
- Contrapositive Proof: 5.1, 5.2, 5.3
- Logic: 2.7, 2.8, 2.10
- Proving non-conditional statements: 7.1, 7.2, 7.3, 7.4
- Disproof: 9.1, 9.2, 9.3
- Mathematical Induction: 10.1 and 10.3
- Sets: 1.3, 1.4, 1.5, 1.6, 1.7
- Proofs involving sets: 8.1, 8.2, 8.3
- Sets: 1.2
- Relations: 11.1, 11.2, 11.3, 11.4, 11.5
- Functions: Chapter 12
- Proof by contradiction: Chapter 6
- Cardinality: Chapter 14

Prerequisites

- a score of 64% or higher in one of MATH 101, MATH 103, MATH 105, SCIE 001, or
- one of MATH 121, MATH 200, MATH 217, MATH 253, MATH 263.

Sections and Instructors

❖ 2020W:220:101	-	MWF 12:00N-1:00PM	Rechnitzer, Andrew
❖ 2020W:220:102	-	MWF 12:00N-1:00PM	Chen, Jingyi
❖ 2020W:220:103	-	MWF 10:00AM-11:00AM	Rechnitzer, Andrew
❖ 2020W:220:104	-	MWF 3:00PM-4:00PM	Chen, Jingyi
❖ 2020W:220:105	-	MWF 2:00PM-3:00PM	Rechnitzer, Andrew
❖ 2020W:220:106	-	MWF 9:00PM-10:00PM	Tung, Shen-Ning
❖ 2020W:220:107	-	TTh 9:30AM-11:00AM	Demirbas, Seckin
❖ 2020W:220:108	-	TTh 12:30PM-2:00PM	Demirbas, Seckin
❖ 2020W:220:109	-	MWF 5:00PM-6:00PM	Senizergues, Delphin
❖ 2020W:220:110	-	MWF 3:00PM-4:00PM	Boyle, Keegan

Breakdown of marks

- 15% Homework
- 15% ComPAIR
- 10% Mini quizzes (twice a week, on the MATH 220 ALL 2020W Canvas site)
- 25% Midterm exam
- 35% Final exam

Homeworks

- There will be one assignment posted weekly (unless otherwise specified). Each assignment is due in the following week to be submitted on Canvas and/or ComPAIR (clear instructions are going to be given every homework).
- ComPAIR is a peer grading software where you will be able to vote between two different proofs in terms of the criteria we post. This will give you the opportunity to see proofs other than your own and your instructors' so that you can develop a more critical eye that would benefit you in this course (and beyond).
- Late homework will not be accepted.
- Homework will be typeset (preferably LaTeX) and must be cleanly written and uploaded in pdf format. If you don't know how to use LaTeX, we will provide the basic guidelines for it so that you will be able to write and compile your homework easily. Please remember that it may feel a little confusing at first, but once you understand the basics, the rest will become quite straightforward; and if you stick with it you will have a powerful tool on your belt.
- Please remember that copying solutions from another student, from the web or from any other source, and turning them in as your own is a violation of the Academic Code.
- We all may have some problems this semester, so we will drop the lowest homework grade.

Midterm Exam

- The midterm exam will be held online.
- It will be 50 minutes and closed-book.
- It will be held on **October 21 at 6 pm Vancouver time**.

Final Exam

The date, time and location will be announced close to the middle of the term. Make your travel plans after you know your exam dates.

Missed homework or midterm

- If a student misses a homework assignment or the midterm, that student shall provide a documented excuse otherwise a mark of zero will be entered for that piece of assessment.

- **If you have any type of conflict (especially with the homework) should be mentioned to your instructor at the earliest possible chance.**
- Examples of valid excuses are an illness which has been documented by a physician and/or Student Health Services, or an absence to play a varsity sport (your coach will provide you with a letter).
- A physician's note or student self-declaration form must specifically state that the student was medically unfit to write the missed assessment on the date of the exam. Absence of this exact information will result in a mark of 0.
- Your instructor should be notified within 48 hours of such an absence and appropriate documentation should be produced within 7 days. Failure to comply with these time limits will result in a mark of zero.
- There will be no make-up midterms or homework if you miss an assignment or the midterm; the weight of the missed assessment will be transferred to the final examination.

Missed final exam

- You will need to present your situation to your faculty's Advising Office to be considered for a deferred exam.
- See the Calendar for detailed regulations.
- Your performance in a course up to the exam is taken into consideration in granting a deferred exam status (for instance, failing badly normally means you will not be granted a deferred exam).

University Policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on <https://senate.ubc.ca/policies-resources-support-student-success>.