Instructor:	Nathan Pflueger (pronounced "flleeger")	**office hours**:	Tuesday 1:45-3:15
email:	npflueger@amherst.edu	(tentative)	Wednesday 1:45-3:15
office:	SMUD 401		Friday 1:00-2:00
			(or by appointment)

Math Fellow:	Jonah Botvinick-Greenhouse	**office hours:**	TBA

Times and locations:	MWF	9:00-9:50	SMUD 205
	Tuesday	9:00-9:50	SMUD 205

What are office hours for? You can come to scheduled office hours for any reason whatsoever. You can bring any questions you have, including vague questions about the big picture. You can also come with no questions; there is a desk in my office and several just outside where you are welcome to work, meet your classmates, or listen to other conversations. Office hours are the best way I have to learn about you and how you're doing in the course and the college, so please visit!

Course webpage: `http://npflueger.people.amherst.edu/220/`

Textbook: *A Discrete Transition to Advanced Mathematics*, by Richmond and Richmond. We will most likely cover chapters 1 through 6 and 8.

Goals and topics: Math 220 provides a transition from more computational math courses, such as calculus, to more advanced courses. This course aims to develop two skills essential to all higher mathematics.

- **Mathematical writing.** Clear, engaging, and precise communication is essential to advanced mathematics. Especially important is the craft of writing **proofs.** A great proof is both precise and elegant – proofs can be as piercingly beautiful as a poem or piece of music. Writing (and reading) proofs is a skill that requires considerable practice, feedback, trial, and error. This course aims to provide the support and challenges necessary to practice and develop the craft of proof-writing.
- **Problem solving.** Mathematics is a versatile and useful college major largely because it trains you to problem-solve in novel situations. Higher mathematics challenges you to constantly adapt tools and ideas you've learned before to novel situations in creative ways. Much of the challenge, and satisfaction, of doing mathematics is learning to rely on your own ideas, and placing faith in the soundness of your own reasoning, when solving problems unlike those you've seen before. Problem-solving is a skill that can only be developed by consistent and deliberate practice. This course provides the opportunity to practice and gain confidence problem-solving.

Alongside the development of these skills, Math 220 introduces several core concepts and topics that arise frequently in higher mathematics. A **tentative** schedule of these topics is as follows.

- 1/27 - 2/21: Sets, logic, and proof techniques (§1-2)
- 2/24 - 3/13: Topics in number theory and combinatorics (§3-4)
- 3/23 - 4/10: Functions, relations, and cardinality (§5-6)
- 4/13 - 5/1: Sequences, limits, and special topics (§8 and supplementary notes)

Expectations: You are expected to attend class every day, arrive on time, and be respectful. You are expected to know about any announcement I make in class. You should expect to spend at least eight hours studying and working on problem sets outside of class each week. Of that time, I recommend that you spend at least two hours reviewing your notes, the textbook, and previous assignments. Distributing your practice and review throughout the semester will be much more effective than concentrating your review and studying right before exams or due dates.

Prerequisites: This course has no official prerequisites. Prior math courses will be helpful, since you have already practices mathematical reasoning. The most important requisite for the course is enthusiasm and interest to develop writing and reasoning skills in math!

Structure of the course: There will be weekly homework assignments (due Wednesday nights), two midterm exams, a cumulative final exam, and a group final project. The dates of all exams, and their share of your final grade, are listed below.

Participation	5%	
Homework	20%	(all assignments weighted equally)
Proof portfolio	10%	
Midterm 1	15%	Monday 3/9 in class
Midterm 2	15%	Monday 4/27 in class
Final exam	25%	Date/time TBA
Your best exam	10%	(midterm or final; added to its original weight)

Exam dates: The midterm dates are listed above. The final exam date is set by the registrar, and should be available on the registrar's website partway through the term. The final exam will be sometime in the week of May 11-15. **Do not schedule travel before the end of exam week unless the final exam date has been determined by the registrar**. All students are expected to be present for the final exam.

Homework: Homework will be **due at 10pm**, typically on Wednesdays, via an online system called Gradescope. To allow for technical difficulties or other last-minute issues, Gradescope will allow you submit homework after the deadline, however your score will be reduced by 2% per hour after the deadline (scaled continuously, e.g. being fifteen minutes late results in a 0.5% deduction). Please try to turn in your work by 10pm (I don't want to be responsible for lost sleep!), but don't worry about short delays.

I do not grant extensions for any reason. However, to compensate for illness and other emergencies, your **lowest two homework scores will be dropped**. If you cannot make a due date due to an emergency, my advice is to skip the assignment, but study and understand the problems when you have time, and focus on keeping up with the new material in the course. You do not need to apologize or provide any reasons for skipping an assignment or turning it in unfinished; please choose what is best for your time, health, and well-being.

The Proof Portfolio The proof portfolio consists of four carefully written proofs, along with a two-page essay addressing what you have learned from the course and the role of proofs in mathematics. The proofs should be written with particular attention to good exposition and style; they should be carefully edited and **typed**. Drafts of two of the proofs will be due during the semester, so that

you can receive feedback on your writing. The full portfolio (four proofs and reflective essay) will be due by the day of the final exam.

LaTeX: I encourage you to learn how to type your mathematical work in LaTeX (the most commonly used system for mathematical typesetting). It is relatively easy to learn and is a convenient skill for any technical writing you do in the future. To incentivize learning it, **you will receive 2% extra credit** on any problem set you typeset. In addition, the **proof portfolio must be typed in LaTeX**. There are many great resources online to learn LaTeX, and our Math Fellow and Q Center staff will be able to provide support and advice as well.

Missed exams: There are no make-up exams. If you must miss an exam due to a medical or other emergency, your final exam score will be substituted for that exam score in your course grade. If you are ill or an emergency arises near an exam, notify me as soon as possible. Any medical emergencies must be confirmed by your class dean. If you have a time conflict with an exam, notify me as soon as possible, and **at least one week in advance** (exam dates are listed above).

Accommodations: I strive to make this course welcoming to all students. If you would like to discuss your learning needs with me, please schedule a meeting so that we can work together to support your academic success. Anyone who may require an accommodation based on the impact of a disability should contact me to make arrangements. I rely on Accessibility Services for assistance in verifying the need for accommodations and developing accommodation strategies, so you should contact them at `accessibility@amherst.edu` or 413-542-2337. If you require accommodations on exams, please arrange this with me at least one week in advance.

Intellectual responsibility:

- **Homework:** Mathematics is a collaborative subject; open and generous communication is one of its core values. Therefore you are strongly encouraged to work with other students, ask many questions, and learn from as many people as possible. However, you must write up the solution yourself. **All your submitted work must be your work, written in your own words**. Copying solutions from other students, solutions manuals, or online databases is plagiarism; such copying will result in a 0 on the assignment and will be reported to Community Standards. You are also expected to **list each person your worked with** on the front of your homework assignment.

- **Exams:** You will be allowed **one page of notes (front and back)** for each exam. No calculators or other aids are permitted. Cell phones should be stowed out of sight during exams. Use of cell phones or other devices during the exams will be grounds to receive a 0 on the exam. You are bound by the college's honor code, and all work must be entirely your own on exams.

For both homework and exams, I reserve the right to give no credit for any work that appears suspicious.

Tips:

- **Come to office hours!** I am happy to answer your questions and also talk about the course in general. Even if you don't have specific questions, you can come to review material, listen to other students' questions, or just to chat.

- **Review early and often.** You should constantly be looking over your notes and keeping the big picture in mind. Arrive each day in class with a sense for where we are.
- **Keep a positive attitude.** Learning is a long process, and you will struggle often. Remember that struggle and difficulty is how you grow. Don't be afraid to talk to me about whatever difficulty you're facing. I want all of my students to be successful and deepen their mathematical skill and appreciation.
- **Practice, practice, practice.** Start early on homework, and let hard problems simmer in your head. Try unassigned problems in addition to homework. Read the book, and **read actively**, always questioning, summarizing, and interpreting what's on the page.

Resources and additional help: Be sure to take advantage of office hours, and your peers, to answer questions and think through the material. The staff at the **Moss Quantitative Center** in the Science Center will host regular help hours, and are available for individual appointments. We also have a Math Fellow for the course, who will hold regular office hours, host exam review sessions, and be available to help with LaTeX. The schedule of these help hours will be posted on the course website once they are set. Finally, some students may benefit from a peer tutor, if they are already using the available help hours and require additional support. Peer tutoring is a limited resource, so please speak with me about it before requesting tutoring.

email policy: The best way to reach me with course questions (besides office hours) is by email. I generally reply to email within 24 hours. However, **I often do not reply to email on weekends**. I will also reply less quickly on Thursdays, which is the day I devote primarily to research.