Math 21-127
Concepts of Mathematics
Syllabus, Spring 2015

Times and Places:
MWF 1:30-2:20 GHC 4401
MWF 3:30-4:20 PH 100

Instructor: Dr. Greggo M. Johnson
Office: Wean Hall 8122
Phone: 412-268-1504
E-mail: greggo@math.cmu.edu
Class webpage: http://www.cmu.edu/blackboard

Office Hours: MW 11am-12pm, or by appointment. Also remember there are a number of TAs with various office hours throughout the week. You can go to any of those. The information is up under the "Contacts" section of blackboard.

Required Text. *Everything You Always Wanted to Know about Mathematics (But Didn't Even Know to Ask)* by Brendan W. Sullivan. The pdf file of the book is available for free on blackboard.

This book will be used as a basic road map for the course, but occasionally material will be discussed in lecture that is not discussed in the text. If you miss a lecture, make sure to get the notes from a friend. Lecture notes will not be posted online.

Course Content. 21-127 is an introduction the upper level mathematics. We will not focus on any one field of math too deeply. Instead, our aim is to teach both how to read and understand proofs as well as how to write detailed, logical proofs. We will learn several different techniques of proof and how to employ each one. The primary goal is that by the end of the semester you can write concise and accurate proofs so that you will be ready to take higher level mathematics. We will cover sets, logic, induction, number theory, functions and cardinality, and combinatorics (with some probability). Depending on how much time remains we may discuss other topics from discrete math such as set theory, graph theory, or abstract algebra.

Absences. Make-up exams will not be given unless the student provides documentation of the illness or emergency. Notify the professor as soon as possible in this situation. Notification of a documented absence for an exam must be given to the professor within a reasonable period of time. (As soon as you're able to access your email you should notify the professor.) If you are unable to attend recitation, have a fellow student turn your homework in for you. If this is not possible and you have documentation of a university approved absence, contact your TA as soon as possible. Homework extensions for documented absences are granted on a case-by-case basis. If you do not have documentation of a university approved absence then you will not be granted an extension on your homework

(even if you have an exam on the same day that your homework is due). If solutions are already posted, homework extensions are not possible. If you provide documentation after solutions are posted and within a reasonable period of time based on your situation, you will be exempted from the assignment so that the grade neither hurts you nor helps you.

Recitation. There are many recitation sections, scheduled at various times and places, on Tuesdays and Thursdays. You are required to attend your assigned recitation. Please be prepared to ask questions and participate. On most days, you will be given a worksheet in recitation. Teaching assistants (TAs), will conduct these recitations and focus on going over the material from lecture in more detail, answering your questions, and going over problems from the worksheet. Solutions to worksheets will be provided to you by the TAs at the end of recitation. In addition, approximately once per week homework will be due. This will be turned in at the very beginning of recitation.

Homework. Homework for each week will be listed on blackboard. It is expected that you do all of these problems, but only the starred ones will be collected for grading. Along with the homework assignment, a due date will be listed. Homework will be turned in at the beginning of your recitation period on the due date. As outlined above, the only exceptions are for documented, university approved absences.

You are encouraged to discuss homework problems with your classmates, but the homework you turn in must be your own. Your homework should not be directly copied from your friends or the internet.

Important Note. Your work needs to be clear, organized and well thought out. Real mathematics often requires complete sentences. Your work is graded as a work of mathematical prose. It is important that it reads nicely and is not composed of regurgitated fragments of your mind scattered throughout the page. When you turn in your homework make sure it is neat (not ripped out of your notebook at the last minute), stapled, and well written. Points may be deducted for failing to meet any of these conditions. Sloppy, disjointed work is not acceptable.

EOS. If you require special accomodations for exams, you must give me a form from Larry Powell from EOS as soon as possible. EOS requires 1 week's notice to schedule proctoring of exams. If you get the note to me less than 1 week before an exam, we may not be able to accomodate you for that exam.

Exams. There will be 3 midterm exams worth 100 points each and a final exam worth 200 points. The midterms are tentatively scheduled for February 11, March 23, and April 24. The final exam will be scheduled by the registrar for some day between May 4 and May 11, with the make-up exam on May 12. All students must take the final exam as scheduled, unless eligible for relief due to conflicts with other final exams as described in the student handbook. If you have a conflict, you will take the alternate exam on May 12. **Do not book a trip to leave town prior to the evening of May 12 until you know your final exam schedule.**

Grading Policy. Your final grade will be calculated from a combination of your midterm exam grades, your homework grades and your final exam grade.

Lowest Midterm Exam	50 points (score divided by 2)
Other 2 Midterm Exams	2 @ 100 points each
Homework Average (as a percentage)	100 points (1 lowest dropped)
Final Exam	200 points
Total	550 points

Your final grade will be the total number of points you earned divided by 550. A grade of 90-100 is an A, 80-89 is a B, 70-79 is a C, 60-69 is a D and anything less than a 60 is an R.

Mid-Semester Grade. Mid-semester grades will be calculated in the following way:

Exam 1	100 points	80%
Homework Average	100 points	20%

Mid-semester grades do not go on your record and are just a projection of your final standing in the class. There is no curve on mid-semester grades.

Grading Concerns. Any questions regarding grading on a homework or an exam must be addressed within a week of the material being passed back. If you have a question regarding the grading of a homework, contact your TA (who grades the homework). If you have a question on exam grading, the first thing you should do is contact the TA who graded the problem in question. This information will be posted on blackboard after each exam. If you still disagree with the grading and want a second opinion, talk to the professor.

Calculators A calculator will be of no help in this course. Calculators are not allowed at all.

Suggestions. There is a section on blackboard for you to anonymously post suggestions, ask questions, and give feedback. I will try to check this regularly and respond to your comments. Remember to *BE NICE* or the anonymity feature will have to be removed.

Academic Integrity Cheating, plagiarism and/or other forms of academic dishonesty will not be tolerated. If evidence of cheating is discovered, the material will be brought to the dean and it will most likely result in you failing the course for the semester.

As stated before, on homework it is reasonable to work with others, but the work you submit must be your own. It should not be copied from a friend, the internet, or any other sources of information you have at your disposal. Homework makes up a small percentage of your semester grade. Cheating on homework is not beneficial to you. Searching the internet for proofs of homework questions or asking a friend to show you their proof is certainly convenient, and you may understand the proof fully when shown it, but you will prevent yourself from developing the necessary intuition to be able to do mathematics on your own.

During exams, papers and notes may not be shared; each student is expected to focus only on his/her own paper. If you wish to leave the room during an exam to use the restroom, you must have permission from the Professor or TA. The professor or TA will hold on to your exam and your cell phone while you are in the restroom.

PROOFS | where to start?

1. definitions

a precise/accurate description of a concept
- don't require proofs
- should be ~~reversible~~ reversible

(sort of like a claim, a concept idea, I guess)

ex/

Defn

a sphere is a set of all points in $\mathbb{R}^3$ that are located at a distance r from a given point, for r a pos constant

2. axioms

a statement that we accept without proof / assume to be true

- typically axioms are dependent on the specified field in which we're working
- some axioms permeate nearly all fields: ~~ex~~

ex/ axioms of equality
~~axioms~~ axioms of arithmetic

3. propositions

a [mathematical] statement that is either true or false (but not both)

ex/ $1+1=2$ (true)
if n is non-neg int, n^2+n+41 is prime (false)

GEN TIPS / TRICKS

- be acquainted w/ stuff on this page (↑)
- how can a proposition be true if one of the assumptions is left out
- find a specific example of ~~sample~~ statement and check conditions
- try to find a counterexample. What are the obstacles?
- test the extremes (if 0-11, check 0 and 11)