THE UNIVERSITY OF TEXAS-PAN AMERICAN
Department of Mathematics

Math 3328.01: Intro Math. Proof Spring 2013   MAGC 2.416 MWF 08:45-09:35

Contact information

Instructor: Dr. Eleftherios Gkioulekas, Department of Mathematics
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Office hours: MW 14:45-17:00 F 09:45-10:45
Office location: MAGC 3.214

Course information

Prerequisites: MATH 1460 with a grade of C or better.
Corequisites: None.
Course Description: This course is intended to prepare the student for advanced mathematics courses that require the writing of proofs. It reviews the elementary proof methods and the logical structure underlying them. It examines the formal definitions and basic properties of the mathematical structures that one encounters when constructing proofs, and it recounts famous theorems concerning these structures that every mathematician needs to know. Students are expected to construct, independently, non-routine mathematical proofs and to present their work in written form. Substantial written work is required.

References

(1) E. Gkioulekas (2009): "Lecture Notes on Introduction to Mathematics Proof", 165 pp. [required; available online]
(2) G. Chartrand, A.D. Polimeni, and P. Zhang (2007): "Mathematical Proofs: A Transition to Advanced Mathematics", 2nd edition, Addison Wesley. [optional]

Outline of Topics

- **Sets and Logic**
  Sets – Definitions
  Statements – Definitions.
  Proving set properties
  Predicates and quantified statements
  Application to set relations
  Fundamental,properties of sets
  Indexed set collections
- **Integers**
  Definitions – odd and even integers
  Well-ordering principle
  Divisability
  More on well-ordering principle
  Method of induction

  Strong induction
- **Relations and Functions**
  Cartesian product
  Relations
  Equivalence relations
  Equivalence classes
- **Mappings and Functions**
  Basic definitions
  One to-one mappings/functions
  Function Monotonicity
  Algebra and Properties of Functions
  Mapping composition
  Mapping inverse

Grading Policies

- **Grading:** There will be 4 major exams, and a comprehensive final exam. The time and location of exams will be announced in class. Exams count for 75% (with lowest exam score dropped) and final exam for 25%. Attendence will be taken. For each absense I will deduct 1% from your total grade, starting from a 5% attendence credit. Combined, you get a numerical grade on a scale 0-20. Each exam question is graded on a 0-4 scale with $4 = A$, $3 = B$, $2 = C$, $1 = D$, $0 = F$. Combining all exams, as explained above, gives a weighted average score on a 0-20 scale. This score is then mapped to a letter grade as follows: A: 16-20; B: 12-16; C:10-12; D; 7-10; F: 0-7. If there is a downcurve, I will announce it in class and on the course website.
- **Lectures:** Students are expected to attend each lecture. You're expected to know everything I cover in lecture, regardless of whether or not it is covered properly in your textbook. If you miss any meeting, it is your responsibility to get class notes from another student.
- **Homework:** Homework will be assigned, but will not be collected or graded. Nevertheless, it is crucial to do the homework as part of your preparation for the exams. To keep up, I recommend that **after every lecture you should solve the homework problems corresponding to the material covered on that day's lecture. Thus you need to work on a continuous basis!**
- **Make-ups:** There are no make-up exams. In the case of **excused** absences the final exam will be used as a make-up exam. **Each student MUST take the final exam at the scheduled date and time.** There will be no make-ups for the final exam, after the official final exam date!
- **Regrading policy:** If you believe that a mistake in grading has been made you may request that your paper be regraded. Such request must be submitted **in writing** within one week from the day the graded test has been returned in class, and must be accompanied by the original (unaltered) paper. If you make any changes to the paper your request will be denied. Please note that if you request regrading, all problems are subject to review. Thus, your overall grade may be increased or decreased.

Other Policies

- **Course web page:** A course web page will be used to distribute the syllabus, assigned homework, solutions to exams, a copy of my lecture notes, and any other relevant material. A link to that page will be available from my main page at `http://faculty.utpa.edu/gkioulekase/index.html`
- **Extra Help:** You can get additional help during my office hours or from the following locations:
  (1) The *LSAMP Math Lab* is located in room MAGC 3.510 of the Math building. Tutoring hours are Monday - Friday: 8:00 am - 5:00pm All undergraduate math courses are tutored.
  (2) *Math Lab II* is located in room MAGC 3.530 of the Math building. Tutoring hours are Monday - Thursday: 8:00 am - 7:00pm and Friday: 8:00 am - 5:00 pm. All undergraduate math courses are tutored by Math professors and Graduate Assistants (GTAs).
  (3) *The Math Learning Center* is located in the LEAC building (the old Math building), room 114. Tutoring hours are: Monday-Thursday 8:30 am - 6:00 pm and Friday 8:30 am - 4:00 pm. Courses tutored are: MATH 1300; MATH 1334; MATH 1340; MATH 1341; MATH 1342; MATH 1450; MATH 1460; MATH 1470.
- **Calculator Policy:** Calculators are not allowed in this class.
- **Classroom Conduct:** Common courtesy requires that students arrive in class on time, and stay the entire class period. Turn your cellphones and pagers off. You are required to treat your classmate and instructor with respect and courtesy. Use of any electronic devices, except for

calculators, is not allowed in class, and I reserve the option to remove you from the classroom without warning for any behaviour that I deem as disrespectful or disruptive. You agree to indemnify and hold harmless the professor with respect to all actions undertaken by the professor to enforce classroom conduct or to properly proctor exams. For example, I may have to close your laptop, turn off your cell phone, temporarily seize a calculator that violates policy during exams, or move a notebook or text away from your desk during a closed notes closed book exam. Taking my course implies your consent to this policy.

- **Revisions:** This syllabus may be revised at any time. If it is revised, this will be announced in class, and logged on the course web site, where the revised syllabus will be made available. The syllabus posted on the professor's course web site is the only copy guaranteed to incorporate all revisions that may be made under this policy and will thus supersede any other versions posted on other university websites.

- **Email Policy:** Only email sent to my private email account is accessible to me via my Android device, due to the requirement that I permit UTPA systems to be able to remotely wipe my Android device in order to access UTPA email with it. Consequently, email sent to my UTPA email address requires a longer time for me to respond. **Email will not be used by the instructor for any essential announcements.** All necessary announcements will be made in class and via the course web page. Confidential information (e.g. grades) can be emailed only to your UTPA email account.

- **Disability Access Statement:** Students with disabilities are encouraged to contact the Disability Services Office for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Texas-Pan American to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Disability Services office (DS), University Center # UC 108 (on the first floor), 665-7005, disabilityservices@utpa.edu. The Director of Disabilities is Christine Stuart-Carruthers, 665-5375, carruthers@utpa.edu.

- **Academic integrity:** Student Code of Conduct: Each and every student registered for the section are expected and strictly required to comply at least with the following student conduct code and to observe standards of conduct appropriate for an academic institutions. The following practices are considered unacceptable conduct.

  (1) *Cheating:* Cheating involves: (1) copying from the test paper of another student, engaging in written, oral or any other means of communication with another during a test, or giving aid to or seeking aid from another student during a test; (2) possession and/or use during a test of materials which are not authorized by the person giving the test, such as class notes, books, or specially designed "crib notes"; (3) using, obtaining, or attempting to obtain by any means the whole or any part of an unadministered test, test key, homework solution, or computer program; (4) collaborating with or seeking aid from another student for an assignment without authority; (5) taking an examination for another person, or permitting another person to take an examination of one's self; and (6) falsifying research data, laboratory reports, and/or other academic work offered for credit.

  (2) *Plagiarism:* Any attempt by a student to represent the work of another as his or her own is cosidered as plagiarism. Of course, to prepare the course materials students are not only encouraged to discuss with the concerned instructor, they are allowed to discuss with fellow students, consult any books, journals, articles, internet or any other external resources; but work or answers presented by the students in the quiz, test or exam must be in their own

style and written in their own words of understanding. In the academic world, plagiarism by students is a very serious offence that can result in severe punishments such as failing grade on the particular assignment or for the course.

Plagiarism and Cheating of any kind on an examination, quiz, or assignment will result at least in an "F" for that assignment (and may, depending on the severity of the case, at the instructor's discretion, lead to an "F" for the entire course) and may be subject to appropriate referral to the University Administration.

Student Learning Outcomes

After completing this course students will:

(1) Understand the logical structure of mathematical proofs and associated constructs, such as logical statements, conditional statements, and quantified statements.
(2) Master the basic techniques and strategies used in mathematical proofs, such as direct proof of conditional and quantified statements, proof by contrapositive, proof by contraction, proof by exhaustion, uniqueness proofs, and mathematical induction.
(3) Master the basic techniques used to disprove false conjectures.
(4) Write mathematical arguments, such as proofs, in clear, precise, and correct English.
(5) Master rudimentary mathematical typesetting.
(6) Understand and use correctly mathematical structures and tools such as sets, relations, orders, functions, and cardinality, as well as often used formulas and inequalities.
(7) Develop an expanding vocabulary of mathematical terminology and the ability to use it fluently and correctly.
(8) Become acquainted with famous mathematical ideas, theorems, arguments, proofs, and formulas that every mathematician should know.

Mathematics Major Student Learning Outcomes

Students completing the B.S. program in Mathematics will:

(1) Demonstrate in-depth knowledge of Mathematics, its scope, application, history, problems, methods, and usefulness to mankind both as a science and as an intellectual discipline.
(2) Demonstrate a sound conceptual understanding of Mathematics through the construction of mathematically rigorous and logically correct proofs.
(3) Identify, formulate, and analyze real world problems with statistical or mathematical techniques.
(4) Utilize technology as an effective tool in investigating, understanding, and applying mathematics.
(5) Communicate mathematics effectively to mathematical and non-mathematical audiences in oral, written, and multi-media form.
(6) Demonstrate an appreciation of and enthusiasm for lifelong scientific inquiry, learning, and creativity.