Proofs and Fundamentals (MATH 261) Spring 2015

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**Course URL:** [http://inside.bard.edu/~abarghi/math261s15](http://inside.bard.edu/~abarghi/math261s15)

**Scheduled Lectures:** M W 1:30 – 2:50, ALB 106

**Office Hours:** T 1:30 – 3:00, W 3:00 – 4:30, Th 1:30 – 2:30, and also by appointment


**Course Description:** This course introduces students to the methodology of the mathematical proof. The logic of compound and quantified statements; mathematical induction; and basic set theory, including functions and cardinality, are covered. Topics from foundational mathematics are developed to provide students with an opportunity to apply proof techniques.

**Prerequisites:** MATH 142 or permission of instructor.

**Expectations:** Students are expected to actively participate in their learning process. This requires them to:

1. Attend lectures and participate in classroom discussions. We will be using the textbook for discussions, so bring the textbook to each class. Electronic devices, including cellphones, tablets and laptops, may not be used during class.

2. Read the textbook. For classroom discussions, you are expected to have read the relevant sections of the textbook beforehand.

3. Complete the assignments in a timely manner. Generally late assignments will not be accepted. However, under unexpected circumstances such as a well-documented illness or a family emergency an extension might be granted. Please notify the instructor immediately if such circumstances arise.

**Assignments:** Every week a number of exercises will be assigned and their solutions will be collected the following week. You are strongly encourage to work on assignments with your classmates. However, you need to write up your work individually and in your own words, and explain your reasoning in every step of your solution. Copying solutions from outside sources (books, articles, websites, etc.) is absolutely unacceptable and constitutes plagiarism. You also need to acknowledge in writing with whomever you have worked. Failure to do so will also be construed as plagiarism. Finally, you are required to type your homework in \LaTeX. At the beginning of the semester, I will cover the fundamentals of \LaTeX in a session. A very good reference is Prof. Bloch’s \LaTeX for Bard Students.

**Exam Policies:** There will be a take-home mid-semester exam and a take-home final exam. Obtaining information from outside sources (classmates, friends, books, articles, websites, etc.) during an exam is strictly prohibited, with the exception of consulting the textbook or the instructor. Giving information to or discussing exam problems with your classmates while the exam is in progress is also strictly prohibited. Your solutions must be typed in \LaTeX, and no extensions will be given without medical or college-approved documentation.
Presentation: At the end of the semester, in groups of two, you have to present a topic of your choice. Each presentation should be approximately 15 minutes. A couple of places to look for possible topics are:

- *Proofs from THE BOOK* by M. Ainger and G. M. Ziegler
- *The Proof is in the Pudding: The Changing Nature of Mathematical Proof* by S. G. Krantz

Evaluation: At the end of the semester, I will use the following distribution to compute your total numeric grade (out of 100): Assignments: 40%; mid-semester exam (take-home): 25%; final (take-home): 25%; presentation and class participation: 10%. In order to assign letter grades, I will use the following rubric:

A: 93 - 100, A−: 90 - 92, B+: 87 - 89, B: 83 - 86, B−: 80 - 82,
C+: 77 - 79, C: 73 - 76, C−: 70 - 72, D: 60 - 69, F: below 60.

Note that no extra credit assignments will be given under any circumstances, especially after the final exam.

Communications: All the assignments and announcements will be posted on the course website. Also, urgent announcements may be sent out via campus email. Some of the course material, including updates to this document, will be posted on Moodle. It is your responsibility to regularly check the course website, your campus email, and Moodle for updates.

Accommodations: Students with documented physical, learning, psychological, and/or other disabilities are entitled to receive reasonable accommodations. If you need classroom or testing accommodations, please contact the Bard Learning Commons. Also, please privately discuss this matter with the instructor as close to the beginning of the semester as possible.

Religious Observances: Students who wish to observe religious holidays that conflict with the course schedule or requirements should meet with the instructor as close to the beginning of the semester as possible to discuss appropriate accommodations.

Important Academic Dates:

- The last day to elect the pass/fail grading option is Wednesday, February 11, the end of the add/drop period.
- Moderation papers are due on Friday, March 13.
- Spring Recess: Saturday, March 14 – Sunday, March 22
- No classes on Advising Days, Monday, April 27 and Tuesday, April 28.
- The last day to withdraw from a course is Tuesday, April 28.
- Senior project are due on Wednesday, April 29 at 5:00 pm.
- The last day of classes is Tuesday, May 19.

Academic Integrity: Consult Academic Dishonesty and Plagiarism or the Bard College Student Handbook regarding this matter.
Writing Proofs According to Prof. Bloch

Everyone makes honest mathematical mistakes, but there is no reason to get in your own way by writing your proofs with incomplete sentences and other grammatical mistakes, by using undefined symbols for variables, or by engaging in other forms of sloppy writing. Mathematics must be written carefully, and with proper grammar, no differently from any other writing.

This course will offer many opportunities to practice the careful writing of mathematical proofs. Properly written proofs require the writer to observe the following basic points.

- Justify each step in a proof, citing the appropriate results from the text as needed.
- Use definitions precisely as stated.
- Use correct grammar, including full sentences and proper punctuation.
- Be very careful with quantifiers.
- Strategize the outline of a proof before working out the details; the outline of a proof is always determined by what is being proved, not by what is known.
- Distinguish between scratch work and the actual proof; scratch work can be in any order, but the actual proof always starts with what is known and deduces the desired result.
- Proofs should stand on their own; check your proofs by reading them as if they were written by someone else.