MATH 411: HONORS ALGEBRA I

EMILY RIEHL

> What is algebra? Is it a branch of mathematics, a method or a frame of mind?
> - Igor Schafarevich, *Basic Notions of Algebra*, §1

Instructor:

- Emily Riehl, eriehl@math.jhu.edu, Krieger 312 (office hours: Tuesdays 1-3pm)

TA:.

- Sarah Yu, syu43@math.jhu.edu, Krieger 201 (office hours: Fridays 2-3pm)

Lectures: MW 12-1:15, Bloomberg 176

Section: F 12-12:50, Bloomberg 176

Textbook: *Algebra: Chapter 0*, Paolo Aluffi

Course website:

- Grades etc will be posted on the Blackboard website for AS.110.411.FA17 Honors Algebra I.
- Problem sets and supplemental materials can be found at www.math.jhu.edu/~eriehl/411

Problem Sets. A problem set will be due each week in class on Wednesday, with the exception of the first Wednesday meeting and the Wednesday after the midterm. At the end of the semester, the lowest problem set grade will be dropped. Late homework will be accepted only with an exceptionally good excuse.

Collaboration on homework is allowed and encouraged. However, each student must write up their solutions to the problems individually and in their own words, and must acknowledge their collaborators by name on their written assignments. Copying from another student or any other source is prohibited.[1]

Class participation requirement. To satisfy the class participation requirement, each student must ask one question or make one comment in class at least once before the midterm and at least once after the midterm. An acceptable question might be: "would you remind us what X means?" or "could you explain why you are using this notation?" I will do everything I can to help everyone satisfy the class participation requirement.

Exams. There will be one midterm exam in class on Monday, October 23.

The final will take the form of an oral exam to be scheduled at a mutually agreed-upon time after the final class meeting and before December 23. During the oral final, which will take place in my office, I will ask each student to answer questions drawn from a list that I will post in advance. No notes can be used during the exam. While the particular questions I ask may vary from student to student, there will be no surprises in the sense that the possible exam topics will be known in advance with enough time to prepare solutions.

Date: Fall 2017.

[1]The policies of the Johns Hopkins Ethics Guide will apply to this course.

Support.

> At key times, it is more useful to take stock of what one knows than blindly march forward hoping for the best. A difficulty at this time signals the need to reread the previous material carefully. *If the mystery persists, that's what office hours are there for.* But typically you should be able to find your way out on your own, based on the information we have given you, and you will most likely learn more this way. You should give it your best try before seeking professional help. -Paolo Aluffi, *Algebra: Chapter 0*, §I.3

My office hours will be held on Tuesdays from 1-3pm in Krieger 312. Sarah's office hours will be held on Fridays from 2-3pm in Krieger 201.

What you can call me. You are welcome to address me as "Professor Riehl," "Dr. Riehl," or "Emily." I use she/her pronouns.

Grades. A numerical grade will be assigned based on the following formula:

- 1/10 class participation (full credit received if the class participation requirement is satisfied)
- 2/5 problem sets

totaling 50% of your final grade, plus

- 1/6 midterm + 1/3 final exam OR
- 1/2 final exam, whichever is higher.[2]

Schedule. The following schedule is aspirational and subject to change.

- August 31: naive set theory (§I.1)
- September 6: functions (§I.2.1-5)
- September 11: more functions (§I.2.6-9)
- September 13: categories (§I.3)
- September 18: morphisms as arrows (§I.4)
- September 20: definition of group (§II.1.1-4)
- September 25: commutativity and order (§II.1.5-6)
- September 27: examples of groups (§II.2)
- October 2: group homomorphisms (§II.3-4)
- October 4: universal properties (§I.5)
- October 9: free groups (§II.5)
- October 11: subgroups, kernel, and image (§II.6)
- October 16: quotient groups (§II.7)
- October 18: canonical decomposition & Lagrange's theorem (§II.8)
- October 23: MIDTERM (in class)
- October 25: group actions (§II.9)
- October 30: conjugation action, center, class formula (§IV.1)
- November 2: symmetric groups (§IV.4)
- November 6: Sylow Theorem I (§IV.2.1-2)
- November 8: Sylow Theorems II & III (§IV.2.3-5)
- November 13: rings (§III.1)
- November 15: the category of rings (§III.2)
- November 27: ideals and quotient rings (§III.3)
- November 29: prime and maximal ideals (§III.4)
- December 4: modules over a ring (§III.5)
- December 6: classification of finite abelian groups (§IV.6)

[2]The final exam will be comprehensive, covering the entirety of the course. If your final exam grade beats your midterm grade, then this policy replaces your midterm grade with your improved final exam grade.