MATH 434, Abstract Algebra
Spring 2014

Bryan Smith

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1 Introduction

Abstract Algebra 434 is a senior level course and is essential either for graduate school or a career in secondary education. In this course, you will investigate a bit more of group theory and learn the basics of a the algebraic structures called rings and fields (and perhaps modules). I recommend that you take the time to find and use additional references besides our textbook. In particular, there are an abundance of useful books in the library and mathematics reading room.

For an official description of this course, see `http://www.math.ups.edu/~matthews/Syllabi/MATH433_434_May2006.pdf` [4].

By the time we finish this course, you should have refined the skills outlined in the information sheet for first semester abstract algebra as well as enhancing your abilities to research, understand, summarize, and verbally present an application of the concepts you have learned in this course.

2 Course Information

2.1 Textbook

The textbook is *Abstract Algebra*, Theory and Applications, 2013 Edition, Thomas Judson, ©1997, GNU Free Documentation License

We will address the information in Chapters 16-23 but will not necessarily follow the textbook.

2.2 Basic Information

You can find information pertinent to all of my classes at the link below and, once there, information specific to this class by clicking on the Math 434 link.

`http://math.ups.edu/~bryans/` [1]

Location Th 383, 9:00-9:50am M,F, 8:30-8:20am T,Th

2.3 Office Hours

Professor Bryan Smith	879-3562	bryans[at]pugetsound.edu	Thompson Hall 390D
Office Hours		Tue, Thu	8:00-8:25 am
			12:00-12:25 pm
			1:30-1:55 pm
		Wed	2:00-3:20 pm
		Other	By Appointment

2.4 Day to Day Structure

The class weeks will be structured in essentially the same way as last semester. One difference is that an appropriate number of days at the end of the semester will be reserved for each of you to present your research project to the rest of the class.

3 Examinations

There will be no examinations during the semester but there might be a final consisting of problems from the student presentations.

Final Examination Time: Monday May 12 at 8:00 A.M.

4 Homework

4.1 Writing Projects

Many homework problems will be assigned throughout the semester. They represent a selection of the available problems that highlight important concepts, techniques, or computational skills. Most of these problems will not be collected so you are expected to work as many of them as you feel necessary to master the material.

However, 23 problems will be collected and marked. Of these, 20 will be marked for mathematical accuracy and graded as pass/fail. When you present these, you are to provide a clear, easy to read argument with the students in the analogous course at PLU as your audience. In particular, provide justifications for every step in your argument that is not clear to this audience. Credit is earned when you turn in a complete and accurate solution. If you turn in an incomplete or inaccurate solution, I will make a few comments and return it. You may then re-submit the problem. This process may be repeated. To provide some reinforcement for being timely and thoughtful, you may submit no more than 4 problems per week.

In addition, over the course of the semester, you are to designate 3 of the 23 problems as "writing" problems which I will mark for both mathematical accuracy and clarity of exposition (see below and my web page for some basic guidelines for writing mathematics). Do not turn in more than one of these writing problems in any week since their purpose is to provide feedback as you develop your mathematical writing style. I expect at least 2 of these problems to be turned in by midterm. **Writing problems may only be resubmitted one time.**

Feel free to use (or not) any technology that you like (e.g., Sage, Scientific Notebook, calculators, *Mathematica*, MATLAB, etc.) but do not use the internet to look up solutions. You may also work with others in solving these problems but there is to be no collaboration (other than consulting with me) in the **writing** of the solutions.

Moreover, you **must** cite each resource you use. Do this in a reference paragraph at the beginning of your paper affirming you have not used the internet to solve the problems and either affirming the work is completely yours or citing each resource you use: names of participants in discussions (other than the in-class discussions), technological tools, reference texts employed, and anything else other than your own thoughts. Failure to include references is intellectual theft! Please see the "Academic Honesty" section of the *Logger* to see how serious this issue is to the university community.

The "writing" problems are actually the mathematical equivalent of assigned papers in humanities courses. In particular, be sure to invest adequate time in analysis and research before you completely explain that analysis of the problem. You are also expected to follow standard mathematical style in your presentation. The easiest way to see examples of this standard style is to peruse any copy of *Mathematics Magazine* or the American Mathematical Association *Monthly*. You can find copies of these journals in the Mathematics Reading Room, my office or the library. Remember, your "writing" papers will be graded both for mathematical content and for written presentation using the grading rubric on the last page of this document.

The "writing" problems are to be written using LaTeX as will the written portion of your research project.

5 Talk/Paper

Due Dates:

- March 7: Last day to have your topic accepted. This will require that you convince me you have a reasonable topic.
- March 31: Last day to schedule a time for your oral presentation. Times are available first come, first served to those who have accepted topics. You will have 25 minutes to present your results and will be expected to use LaTeX and Beamer to generate your slides.
- April 18: submit your completed paper to me as a PDF. Include two "exercises" appropriate as problems on an in-class examination. I will make copies of your paper available to the other students so they can look it over before your talk.

The last 6 days of class will be devoted to talks given by the class members. You may investigate any topic that involves higher algebra. Those of you with interests in physics or chemistry will have no trouble finding

many possibilities. I will supply a list of possible options when I pass out the Research Project assignment sheet but you are not limited to those possibilities. Here are a few that come to mind while I am typing: more depth on the Sylow theorems, the classification of finite simple groups, combinatorial group theory, knot groups, knot polynomials, quadratic forms, algebraic graph theory, more depth on boolean algebras, 2 and 3 dimensional symmetry groups, non-associative algebras, lattice theory, and quantum computing.

You will receive grades on your proposal, the oral presentation of your investigations and the paper that you will write using LaTeX and submit to me electronically.

6 Course Information Updates

If you wish, I will post (and update) a grade report on your current standing in the class on my university web page.

7 Total Points

Homework + Final	60% +10%
Homework: Writing	10%
Talk/Paper: Proposal	4%
Talk/Paper: Oral	6%
Talk/Paper: Written	10%

8 Additional Information

Please review university emergency preparedness and response procedures posted at `http://www.pugetsound.edu/emergency/`. There is a link on the university home page. Familiarize yourself with hall exit doors and the designated gathering area for your class and laboratory buildings.

If building evacuation becomes necessary (e.g. earthquake), meet your instructor at the designated gathering area so she/he can account for your presence. Then wait for further instructions. Do not return to the building or classroom until advised by a university emergency response representative.

If confronted by an act of violence, be prepared to make quick decisions to protect your safety. Flee the area by running away from the source of danger if you can safely do so. If this is not possible, shelter in place by securing classroom or lab doors and windows, closing blinds, and turning off room lights. Stay low, away from doors and windows, and as close to the interior hallway walls as possible. Wait for further instructions.

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Peggy Perno, Director of the Office of Accessibility and Accommodations, 105 Howarth, 253.879.3395. She will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

References

[1] Bryan Smith's Homepage
`http://math.ups.edu/~bryans/`

[2] Math 434A Course Webpage
`http://math.ups.edu/~bryans/Current/Spring_2011/434Index_Spring2011.html`

[3] Department Calculator Policy
`http://www.math.ups.edu/info/calcpolicy.pdf`

[4] Department Syllabus for MATH 434
`http://www.math.ups.edu/~matthews/Syllabi/MA434Syllabus.pdf`

[5] Location of MikTeX package for using LaTeX `miktex.org`

[6] Development tools for composing LaTeX documents `miktex.org/Links.aspx`

[7] William Rapaport's "How to Study"
`http://www.cse.buffalo.edu/~rapaport/howtostudy.html`

[8] TI-86 Manual
`http://education.ti.com/us/product/tech/86/guide/86guideus.html`

8.1 "Writing" Problem Guidelines

It is best to think of these writing projects as officially assigned papers in which you completely explain and justify your analyses of the problems. You may work with others in solving these problems but there is to be **no collaboration on the written exposition of the solutions.** In addition I expect your papers to be

- Fully documented – specifically:

    1. You must include a reference paragraph at the beginning of your paper either affirming the work is completely yours or listing each resource you use: names of participants in discussions (other than the in-class discussions), technological tools, reference texts employed, and anything else other than your own thoughts.
    2. Any idea obtained during brainstorm sessions or in discussions is cited in-line.
    3. All textbook results (theorems, propositions, and lemmas) are cited in-line and include the name of the result.
    4. Any use of technology is cited in-line.

- Written up using using complete, accurately punctuated sentences and in LaTeX.
- Presented in active voice, the first person plural and with a clear, easy-to-follow expository style.
- Targeted at an audience consisting of students in the equivalent course at PLU.