MATH 462, Section 1
Abstract Algebra II
Spring 2009

Syllabus

First, to attend to basic, yet critical, information:

- **Who's your instructor?** Dr. Patrick Bahls (please feel free to call me Patrick).
- **When is class?** Monday, Wednesday, and Friday from 2:45 p.m. to 3:35 p.m.
- **Where is class?** Karpen Hall, Room 034: down in the basement.
- **What text are we using?** *First Course in Abstract Algebra* (3rd edition), by Joseph Rotman (ISBN: 0-13-186267-7). For those of you continuing on from Fall 2008, this is the *same* text.
- **What do I bring to class?** Yourself, mind intact. Definitely bring something to write with/on. I will let you know in advance if you will need to bring your textbooks (or other materials) to class.
- **What about office hours?** I will soon be scheduling office hours at times which prove convenient for the class as a whole. As many of you know, I'm in my office almost constantly throughout the day on most days, and if you catch me, I'm yours. Of course, I'm definitely willing to meet at other times by appointment.
- **How can I get a hold of you?** My office phone number is 232-5190, and my e-mail address is patrick.bahls@gmail.com. (E-mail's the best way to get me.) Or just stop on by my office; as I said above, if you catch me, I'm yours: Room 324, Robinson Hall.
- **Do you have a website?** Yes indeed: http://facstaff.unca.edu/pbahls. From there you can find easy links to the course websites, and resources like this syllabus. Chances are if you'll need anything course-related throughout the semester, it'll be on the website, so please look before asking.
- **What other resources will I have available to me?** As I'm sure many of you know, the Math Lab, located across the hall from my office in Robinson Hall, is an *excellent* place to meet and work together. Please consider gathering there to do your homework, to get tips from the dependable Math Lab staff, and to get help from me when you're stuck.

Next on the agenda...

What will we be studying? Our studies will continue from the point at which Abstract Algebra I left off. We will start by considering polynomial rings, irreducibility, ideals, quotient rings, and field extensions. Once we understand all of that jazz, it's off on an excursion into Galois theory and solvability. Finally, we will spend a bit of time examining the finer structure of finite and finitely generated abelian groups. Time permitting we might even look into other advanced algebraic topics...although you will have a chance to work through some of those topics for your presentation!

Very roughly, we will work with the second half of Chapter 3, parts of Chapter 4, and most of Chapters 5 and 6 of your text.

What do you expect me to get out of this course? Think of the following list as a set of skills I'd like for you to have five years after taking this course:

- Be able to explain and give examples of *polynomial rings*, *irreducible polynomials*, *ideals*, *Galois groups*, *free abelian groups*, and *Sylow subgroups*.

- Be able to explain a few applications of these objects elsewhere in mathematics.
- Be able to write clear and correct algebraic proofs.
- Be able to write clear and well-composed expository (explanatory) mathematics.
- Be able to assess the validity and quality of your colleagues' mathematical writing, and to provide them with helpful and respectful feedback.
- Demonstrate confidence in speaking about mathematics to your peers and to mathematical experts.

It might not hurt you to go back over this list every so often and ask yourself (and me!), "am I making progress in developing these skills?" If at any time you feel the answer is "no," please come and talk to me about it; one or both of us might be able to change our ways and adjust the course to help you better reach these goals.

What kind of work will I do in this course? Your grade will be based upon completion, peer-review, and discussion of homework problems; three take-home exams scattered throughout the semester; and an end-of-semester presentation on a relevant topic chosen from a textbook or undergraduate mathematics journal.

- *Homework.* Homework will be assigned roughly once per week, and will typically consist of several exercises taken from your textbook, or simply made up by me. Once submitted, all homework will be graded for correctness, completeness, and clarity, and graded work will be returned to you promptly.

  In addition to completing the homework, you will also be asked to take part in peer review and class discussions on selected homework problems. Most of you are familiar with this sort of peer review from earlier classes with me, but I'll go over it again to make sure we're all on the same page.

  From each homework set, one or two problems will be selected as the focus of peer-review. For each such exercise, I will form a committee of three of you to meet and discuss all students' solutions to the given problem. For your solutions to be considered by this committee, they will have to have been submitted by a certain date, well before the homework assignment's due date. (In order to receive full credit for the peer-review portion of your grade, you will be required to submit preliminary solutions to the respective homework committee for at least 50% of the committee problems assigned during the course of the semester.)

  The committee for a given problem will meet outside of class to discuss the solutions that have been submitted to them. They will then offer feedback to each solution's author, checking the solution for correctness, completeness, and clarity, and indicating strengths and weaknesses of the solution. It is the responsibility of each committee to verify a solution's quality. Although I will be available for consultation should the need arise, I feel very strongly that *you too must develop the authority to assess the quality of mathematical arguments.*

  The committee will write a brief (one- or two-paragraph) report on their overall impressions of the solutions submitted to them, and will provide me with a list of their peers they feel made a substantial effort in completing a first draft of a solution. Finally, the committee will lead a brief discussion on the assigned problem with the class, highlighting the strengths and weaknesses of the solutions submitted. (It is *not* the committee's job to provide a correct solution in their discussion!) After this discussion, the completed solutions will be returned to their authors, who will be given the opportunity to make corrections or adjustments as needed before returning a final draft of the solution to me.

Please note that I have made available on the course website a rubric I often use to assess the quality of mathematical writing. I encourage you to refer to this rubric both when composing your own writing and when evaluating the writing of others.

Thus a typical weekly schedule might look like this:

- **1st Friday:** Homework is first assigned.
- **Monday:** Submissions are due to the committee.
- **Wednesday:** Committee leads discussion.
- **2nd Friday:** Homework, with revisions, is due. The committee submits it written report at this time.

Homework completion will count for 35% of your grade, and active participation in the peer review (both as a submitter and as a reviewer) and class discussions will count for 10%.

- *Exams.* There will be three exams, each worth 15% of your final grade. They will be take-home exams, given roughly in the 5th week, the 9th week, and the 13th week of class. I will post precise dates on the course website as these dates approach. Make-up exams will be allowed rarely, and only in case of excused absences arranged well in advance. I reserve the right not to allow a make-up exam.

  Much like the homework, each exam will be completed in two phases. After you have submitted your exam, I will read through it, proffer a tentative grade, and provide you with feedback on your solutions. After I have done this, the exams will be returned to you, and you will be allowed to perform revisions of your solutions in order to improve your proofs before resubmitting the final version. Your grade on each exam will be computed by adding 1/3 of the points missed on each problem in your preliminary draft for successful improvements in the final draft. That is, if you miss 9 points on a particular problem in the preliminary version, but you nail the solution in revision, you'll receive an additional $9/3 = 3$ points above the score you got for that problem in the first draft.

- *End-of-semester presentations.* As important as learning how to communicate mathematics through writing is learning how to communicate mathematics through speech. Therefore, in addition to the homework discussions you will all take part in, in the final two weeks of class each of you, working alone or in pairs, will be asked to give a 15-minute presentation on an algebraic topic we have not covered during the preceding portion of the semester. Topics for these presentations will be selected and assigned by the 11th week of class so that you will have plenty of time to prepare your presentation. I will be happy to assist you in your preparation in any way (topic selection, dry runs, technical details, *etc.*). Your presentation will be worth 10% of your overall grade.

That's all that I have to say about our class for now. Please don't hesitate to let me know at any time if you have questions, or if concerns arise. Let's go ahead and dive right in!