Abstract Algebra I  
MATH 340  
Syllabus  

Time: 11:30-12:20 MWF  
Classroom: Smith Hall 252  
Instructor: Dr. Dena Morton  
Office: Hinkle 108  
Phone: x3674 (Note: I do not check my voice mail very often.)  
Office Hours: By appointment and  
- Monday 10:30-11:20, Wednesday 10:30-11:20, 1:30-2:30, Friday 10:30-11:20, 1:30-2:30  
e-mail: morton@xavier.edu  
Note: this is the best way to reach me – I check my e-mail on a regular basis.  
Web Page: http://cerebro.xu.edu/~morton/aclasses.html  
Note: I update my webpage every day – all homework assignments and readings are always posted online. Also, check out the beautiful mathematical pictures!  

Prerequisites: MATH 240 (Linear Algebra).  

Purpose and Content: Abstract algebra (also known as modern algebra) is the branch of mathematics that studies the general algebraic structures of various sets (such as real numbers, complex numbers, matrices, and vector spaces) on which operations have been defined. This includes the rules and procedures for manipulating the individual elements of these algebraic systems. Algebraic systems include groups, rings, fields, modules, vector spaces, loops, and other algebras. We will develop all the important concepts of abstract algebra within the context of groups. Toward the end of the course, we will meet rings and, if time permits, fields and loops.  

Texts: Contemporary Abstract Algebra, seventh edition by Joseph A. Gallian  

Homework: Problem sets will be assigned weekly. Each student will be allowed to turn in one late homework set during the semester without penalty (to be turned in by the next class period unless given other instructions).  

Class Activities: Classes will consist of group activities, discussion, individual activities, and lectures.  

Quizzes: Weekly quizzes on algebraic definitions and examples will be given on Fridays. I will grade these on a 10-point scale. The lowest quiz score will be dropped, so makeup quizzes will not be given. Quizzes will not be given during exam weeks. Note: These quizzes are invaluable - if you don’t know the definitions, you cannot possibly expect to do the mathematics.  

Exams: There will be three exams given throughout the semester, each consuming an entire class period and also having a take-home component. There will also be a comprehensive final exam. If you must miss an exam for religious or academic reasons, or in cases of illness or emergency, you must submit a written excuse. A makeup may be scheduled -- this will be decided on a case-by-case basis.  

Grading:  
- Weekly quiz performance: 7%  
- Three exams: 13% each  
- Weekly graded problem sets: 27%  
- Research paper: 7%  
- Final exam (cumulative): 20%
Each exam will be curved separately and assigned a number grade between 0.0 (the lowest possible F) and 5.0 (the highest possible A). I will announce the cutoffs when returning the exam. If, for example, the cutoff for an A is 87 and the cutoff for a B is 71 and you get an 83, then the number grade corresponding to your 83 would be a 3.75 (B corresponds to 3.0 and you are 12/16=.75 of the way to the next cutoff). The homework and quizzes will be treated similarly. The total course grade may be curved further (that is, a 3.9 might result in an A or A- in the course), but the resulting curve will never lower your grade (that is, a 4.1 would always result in at least an A- in the course. I reserve the right to assign a grade of “F” to any student who earns less than 50% on the final exam.

The list of topics for the research papers (due Monday, Nov. 22) are included at the end of this syllabus.

**Important Dates (Exams are Tentatively Scheduled):**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Wednesday, Aug. 25</td>
<td>First day of class</td>
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<tr>
<td>Monday, Sept. 6</td>
<td>Labor Day Holiday (no classes)</td>
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<tr>
<td>Friday, Sept. 24</td>
<td>Exam I</td>
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<tr>
<td>Friday, Oct. 15</td>
<td>Fall Holiday (no classes)</td>
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<tr>
<td>Friday, Oct. 29</td>
<td>Exam II</td>
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<tr>
<td>Monday, Nov. 22</td>
<td>Last day to withdraw</td>
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<tr>
<td>Wednesday, Nov. 24-Friday, Nov. 26</td>
<td>AND research paper is due</td>
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<tr>
<td>Friday, Dec. 3</td>
<td>Thanksgiving Holiday (no classes)</td>
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<td>Friday, Dec. 10</td>
<td>Exam III</td>
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<tr>
<td>Monday, Dec. 13</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>1:00-2:50 Wednesday Dec.15</td>
<td>Study Day</td>
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<td></td>
<td>Final Exam</td>
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**Attendance:** Class attendance is crucial. Lectures include the introduction and explanation of new topics, explorations of proofs, and solutions of discrete mathematics problems. Class notes are to be used in conjunction with the text, in order to elicit a fuller understanding of discrete mathematics.

*Please be courteous and come to class on time!*

University policies on attendance are stated in section 5 of the undergraduate handbook (available online).

**Missed Classes:** If you must miss a class due to illness or an emergency, you must first get a copy of the notes from one of your classmates. (If you do not know anyone in the class, I will help you contact someone to get notes.) Review the missed notes, and write detailed questions as you are reading them. I will be happy to answer all of your questions (as many as you would like to ask!), but I cannot re-lecture for you. As noted above, quizzes cannot be made up.

**Group Work:** Working in a group can be beneficial for everyone involved, provided that you do not abuse the privilege. Make sure that everyone in your group is making a contribution. **Do not copy answers from one another, as this will only backfire against you come test-time and is also cheating!** Instead, let concepts gel after group discussion, and then write up the solutions by yourself.

**Academic Honesty:** You are expected to conduct yourself with integrity in this course. Cheating will be dealt with as harshly as University regulations permit; measures will be taken during exams to prevent cheating. Students are directed to the undergraduate handbook for further information. Note: talking during an exam (to anyone other than me) is grounds for a failing grade.
on the exam. **Using (uncited) web-pages to write your research paper is cheating and plagiarizing!** The best critiques are written from your own experience.

**Calculators:** You will need some sort of calculator – a TI-83/84 is suggested. **Cell phone calculators are not allowed.** You may not have *any* programs on your calculator. If you have old programs, you must transfer them to a disc and reset all calculator memories at the beginning of exams.

**Cell phones:** **Please turn all cell phones off during class (no texting either, please).** Cell phones must be away during exams.

**How to Do Well in this Course:** Come to class! Come visit me during office hours! Read the textbook! Try the problems! Smile! Study hard! Read your class notes! Make sure you keep up with the material in class! Review your class notes! **Learn your definitions!** Don’t Panic! **Enjoy!**

Most important of all, if you feel that you are falling behind, or that you do not understand a certain topic, or if you would just like to discuss a mathematical idea (or anything else), come to visit me in my office. That’s why I am here!😊
MATH 340 – Paper topics.

Students are asked to choose a topic by Friday, Sept. 17. (One topic per person) Papers are due on Monday, November 22.

Papers should conform to the following guidelines, and will be evaluated against these criteria:

- The paper should present a comprehensively researched discussion of your topic; if your focus is biographical, then some significant mathematical accomplishments must be thoroughly discussed.
- It should be presented in a clear and coherent writing style, using correct spelling, proper punctuation, and good grammar.
- It should contain a bibliography listing at least three sources (no more than one of which can be web-based) and should include citations as either footnotes or endnotes. Any standard bibliographic style is acceptable.
- The body of the paper is to be 5+ pages long, typed or word-processed (in a 10 or 12 point font), double-spaced, with 1 inch margins. In addition, include a separate, unnumbered cover page, follow the body with a bibliography page.
- You should define all terms not known to the class. For example, there is no need to define “group” (which we define during the first two weeks of class) but you would have to define “nilpotent group”.
- You do not need to include proofs (unless you want to – but make sure that you completely understand what you are writing) but I want at least one non-trivial example in your paper.

Here is a list of topics from which you may choose. But do not view this as an exhaustive list; feel free to suggest topics of your own.

- Sylow’s First Theorem
- Sylow’s Second Theorem
- Sylow’s Third Theorem
- Second Isomorphism Theorem for groups
- Third Isomorphism Theorem for groups
- Solvable groups
- Finite simple groups
- Orbit-Stabilizer Theorem
- Quasigroups and loops
- Field of quotients
- Boolean Algebras
- Automorphism groups
- The ring of quaternions
- Euclidean domains
- Principal ideal domains
- Modules
- Distributive lattices
- Modular lattices
- Eisenstein’s irreducibility criterion
- Polynomial rings
- Tell the story of how Galois developed the notion of a Galois group.
- Trace the history of linear algebra in the nineteenth century.