MATH 461 – Abstract Algebra I
Dr. Boersma
Fall 2022

Goals: This course is an introduction to abstract algebra – a mathematical look at "structure". We are all familiar with the structure of the real numbers (how to add, multiply, and solve equations) and some of us may be familiar with the structure of complex numbers, vectors spaces, and modular arithmetic. This course will provide an axiomatic approach to the study of additional algebraic structures and an investigation into their properties and symmetries. We will begin with the study of groups and group homomorphisms.

It is important to understand that this is a senior-level, abstract mathematics course. Unlike some of your previous mathematics classes, like calculus and differential equations, there is not much focus on computation and "getting the right answer". Instead we care more about the detailed study of certain examples and the ability to abstract those properties which appear fundamental to the overall structure into well-worded definitions. From these definitions we will be able to build up our knowledge base in the form of theorems. Reading, understanding, and creating proofs of theorems is essential to an understanding of abstract algebra. The ability to communicate mathematics and mathematical truths will be the most essential skill needed for success in this course. Pay attention to detail – when reading the textbook and when turning in your own work.

Office: Samuelson 221-A, phone: 963-1395, email Stuart.Boersma@cwu.edu. Drop-in office hours will be announced in class.

Required Text *Abstract Algebra: Theory and Applications*, by Thomas W. Judson. You may view this online or download a free pdf copy. Printed copies are available for purchase. See `http://abstract.pugetsound.edu/` for more information.

Your Grade: Your final grade in this course will depend on your willingness to come to class prepared to engage with the material, your ability to demonstrate understanding of the basic content of abstract algebra, and your mastery of mathematical communication through proof writing. Your progress will be measured by 1) Preparing for Class (PFC) assignments, 2) weekly homework sets, and 3) Perfect Proof assignments. For homework and perfect proof assignments, I will give you detailed feedback and, if necessary, give you the chance to resubmit your work. You are responsible for showing me that you have met or exceeded the standards for these assignments. See below for more details on each of these types of assignments and how your final grade will be calculated.

Preparing for Class

It will be your responsibility to read the textbook, think about the definitions, work through the examples, examine the theorems and proofs, and come to class prepared to discuss the material. Class time will be spent answering questions from the reading and working on problems from the textbook. Thus, most days will require that you complete a reading assignment **BEFORE** coming to class. As part of the reading assignment you will complete a short PFC assignment at least two hours before class begins. These will be marked as "Complete" or "Incomplete". In order to receive a "Complete" you should make an honest attempt at answering the questions and, if you are confused about any of the concepts, let me know what could be clarified in our next class meeting.

Collected Homework

About once a week I will collect written assignments to grade. When you hand in a homework assignment, I will be looking for neat, clear, and concise solutions containing complete and eloquent explanations. You should think of these turn-in homework sets as an opportunity for you to really show me your understanding of the material. All homework should be typed in TEX or LaTEX. All homework assignments will be marked as "Exceeds Standards (E)", "Meets Standards (M)", or "Not Yet (NY)", indicating that you have not yet demonstrated a clear understanding of the current material. There will be two opportunities to resubmit most homework assignments (to be explained more carefully in class).

Perfect Proofs

Occasionally, you will be given a "Perfect Proof" assignment where you will be asked to write a clear proof of a mathematical statement. As with homework assignments, these will be marked as "Exceeds Standards (E)", "Meets Standards (M)", or "Not Yet (NY)", if your proof requires substantial revisions. As with most writing, it may take several drafts to achieve (near) perfection. If you continue to turn in revised drafts by the designated due dates, I will continue to give you helpful feedback on how your proof can be improved. We will discuss elements of a good proof and explain the details of these assignments in class.

Attendance

This is a 400-level mathematics course. Thus, I expect every student to make an effort to be in class (on time!) every day. The work we do in class, the discussions we have, and the short problem presentations are all an integral part of this course. Please let me know if a health problem forces you to miss too many classes.

Final grades

Your final grade in the course is determined by the following table. Each grade has a requirement specified in its row in the table. **To earn a grade, you will need to meet** *all* **the requirements in the row for that**

grade. A grade of F will be given if **none** of the rows have been fully completed.

Grade	PFC	Homework	Perfect Proofs
A	85%	5 at E and 2 at M	4 at E
B	80%	3 at E and 3 at M	3 at E
C	75%	5 at M	2 at E and 1 at M
D	70%	4 at M	3 at M

Plus/minus grades will be assigned at my discretion based on how close you are to the next higher grade level.

Students who have special needs or disabilities that may affect their ability to access information or material presented in this course are encouraged to contact me or Disability Support Services, for additional disability-related educational accommodations.