MATH 304-01: ABSTRACT ALGEBRA I (3 cr.)

SYLLABUS & COURSE POLICIES

DORDT UNIVERSITY

FALL 2024

Instructor:	Dr. Mike Janssen, Professor of Mathematics
Email:	`Mike.Janssen@dordt.edu`; I will endeavor to reply to every email within one school day.
Classroom:	SB 2736
Class time:	2:10–3:00 PM, MWF
Office:	SB 1612
Office Phone:	(712) 722-6398
Student Hours:	By appointment (see Canvas).
Textbook:	*Rings with Inquiry*, Fall 2024 edition, by Janssen and Lindsey. Available at `https://ringswithinquiry.org/eq`.
Prerequisite:	A grade of C– or higher in Math 212, or permission of the instructor
Required for:	General math, joint math/computer science, and secondary math education majors

Catalog course description: An introduction to algebraic structures focused on rings and fields. Connections between the ring of integers and the ring of polynomials over a field are developed and explored. Brief attention is given to groups.

COURSE OVERVIEW

Welcome to Abstract Algebra I! I am thrilled to be exploring this corner of God's mathematical creation with you this semester. My own undergraduate experiences with this subject solidified my calling to graduate work, and I hope by the end of the semester you will see both the beauty and utility of an abstract treatment of algebra.

As every high school algebra student can tell you, a great deal of importance is placed on the problem of factoring polynomials. But when do such factorizations exist? *Why* do they exist? Can we say what the factors look like? Are they unique in any sense?

Our focus this semester will be to explore these and related questions. Specifically, we will search for deep structural properties in systems of numbers and polynomials that are sufficient to guarantee that something like unique factorization into products of primes holds.

LEARNING OBJECTIVES

In this course, students will:

be *communicators* of mathematics by regularly presenting and writing sound mathematical proofs.

be *learners* of mathematics by demonstrating proficiency with the axiom-definition-theorem-proof mathematical liturgy.

be *explorers* by engaging with in-class activities and regular work outside the classroom. (CD)

COURSE LITURGIES

I firmly believe that every student is capable of engaging mathematics in an authentic, humanizing way. To that end, I aim to structure my courses so that you have the chance to explore open-ended mathematical questions in community with others–sharing ideas, working together to overcome obstacles, and rejoice in one another's successes.

There are two main types of regular mathematical engagement in this course: daily work, and written work.

ENGAGEMENT: DAILY WORK

Class time will be a mix of interactive lecture, time to work on daily exercises, and presentations of the daily exercises.

You will be assigned three problems to solve or theorems to prove from the textbook to work on before coming to class. You may **not** use any outside resources to help you solve these problems–*no books, no websites, no friends who have taken this course before*. Using these resources will constitute plagiarism and will be reported to the Student Life Committee. You *may* work with others currently enrolled in the course, but you will need to ensure that you can completely understand and explain the solutions and proofs you come up with.

One of the main goals of this course is to improve your mathematical communication. Thus, we will spend a significant amount of each class period discussing and presenting your work on these daily problems as a class. **The emphasis on giving quality presentations will be higher in this class than in previous proof-based courses you have taken.**

By 12:00pm before each class, you will claim on Canvas problems whose solutions you are willing to present. You will be allowed to present at most one problem per class meeting. You will earn 0.1 *daily work points* per problem you sign up to present, even if you are not ultimately the person to present it.

You will be notified by 1:00pm on Canvas of any problems you are assigned to present.

At the appointed time, you will:

1. write the problem and solution up on the board;

2. highlight the main points of the proof/solution;

3. and lead the class discussion.

As presenter, you will earn 1 daily work point for a clear, good-faith effort. Extreme unpreparedness will result in the loss of your daily work point; I expect this will be a rare occurrence.

Support

Of course, not everyone can be assigned the problems they sign up for. However, you may be assigned as *support* for a given problem, typically a problem you've indicated a willingness to present. Prior to the presentation, it is your job to work with the presenter to make sure that the presenter's written proof is correct and clear. During and following the presentation, it is your job to try to answer questions alongside the presenter. Satisfactorily engaging as a problem support person will earn you 0.5 points (assuming the presenter earns full credit; if the presenter earns no credit, the supporter will also earn no credit).

Scribes

Each presented problem will also have a *scribe* assigned on Canvas by 1:00pm. The first problems will be scribed (more or less) in alphabetical order by last name, and subsequent scribes will be assigned in ascending order from least daily work points to most.

The scribe will have the responsibility of taking notes on the presented proof and asking questions when something is not clear. They then will write up a formal version of the proof **and** discussion and post it to our Overleaf document. The scribe will earn $1/4$ point when a correct proof is submitted.

Academic Integrity: This course structure effectively models the way professional mathematicians conduct and share their research. Thus, we will abide by the Policy Statement on Ethical Guidelines[1] adopted by the American Mathematical Society, in particular Section I on mathematical research and its presentation. As this statement describes, "[t]he knowing presentation of another person's mathematical discovery as one's own constitutes plagiarism and is a serious violation of professional ethics. Plagiarism may occur for any type of work, whether written or oral and whether published or not." When you present your work in this class, both orally and in writing, you must cite *any conversations* you have had about your problem with *anyone in the class*. Looking to ANY RESOURCE outside of the people in our class—including generative AI models like ChatGPT!—for information about the problems at hand constitutes plagiarism and will be reported to the Student Life Committee.

Daily work points will be monitored and factored into the final grade as described below.

EXTENSION: WRITTEN WORK

We'll extend, solidify, and apply the ideas we develop to complete additional examples and prove new theorems in the biweekly written homework. Each assignment will contain three problems and must be written in LaTeX. The assignments will be due **Sept. 11, 25, Oct. 9, 23, Nov. 13**, and **Dec. 4**.

Each problem will be graded on a four-level scale (each explained more fully on the proof rubric available on Canvas) as:

Exceeds expectations. Dr. Janssen would be happy to post this as the official class solution.

Meets expectations. The logic is generally correct and it is reasonably well written, but there is room for improvement.

Revision needed. Some major gaps in logic, misuse of notation, or unclear communication requires revision.

Not assessable. This is difficult to read, abuses notation, or contains significant mathematical flaws.

Writing proofs is as much art as science, and initially it can seem daunting and confusing. In order to aid your growth, you will have the opportunity to spend tokens to revise your work once after Dr. Janssen returns the graded version provided the work was (a) submitted on time (or extended using a token) and (b) received an initial assessment of R or higher.

In short, your submissions will go through the following workflow (with the number representing the number of days since the Wednesday submission):

Day 0: Initial submission due 5:00pm Wednesday

Day N: Initial assessment and feedback returned

Day $7 + N$, $1 \leq N \leq 7$: Revised problems submitted to Dr. Janssen (using tokens as described below), to be graded within a week.

Your written work *must* include an acknowledgments section or it will be returned ungraded. You may work on this homework with others in the course, but if you discuss **any** mathematical content of any problem with another person, you *must* include their name in the acknowledgments, and ensure that your final writeup is completely your own. Failure to meet these criteria will constitute academic dishonesty and will be reported to the Student Life Committee.

Work submitted more than 24 hours late or work initially assessed at an N requires a meeting with Dr. Janssen and short accompanying reflection on why the work was assessed at an N and how such assessments will be avoided in the future. If earning an N becomes a regular occurrence on written assignments due to perceived lack of effort, you may lose the grace afforded by the revision process and only be allowed a single submission.

EXPLORATION: PROJECT

You will complete a substantial research project as a part of this course. There will be two tracks: one geared toward those with a calling to teach mathematics, and a research-oriented track for students pursuing other callings. More details on the precise nature of the work, with rubrics for evaluation, will be available by October 2. However, you can anticipate the following deadlines:

Sept. 30: Project assigned

Oct. 11: Submit project survey on Canvas. The survey will ask you to rank the topics/standards that interest you most, and also indicate whether you'd prefer working in pairs or in a group. Every effort will be made to accommodate your first choices, but be aware that this may not be possible.

Oct. 16: Project topics/pairs assigned.

Nov. 4–8: Education track progress meetings with Dr. Janssen.

Nov. 11–15: Research track progress meetings with Dr. Janssen.

Dec. 6: Final rough draft due.

Friday, December 13, 3:30–5:30pm: project presentations, final draft due.

SUMMATION: EXAM

There will be one oral midterm exam, administered the week of October 28. It will be worth 50 points and factor into your final grade as described below.

REVISIONS

Each Written Work assignment submitted no more than 24 hours late may be revised *once*, assuming you have enough tokens. The cost to revise the assignment will be one token *per problem revised*. You'll begin the semester with ten (10) tokens; opportunities to earn more *may* be offered, but this is not guaranteed. Written Work assignments submitted more than 24 hours late will be assessed at one token/completed problem and no additional submissions will be allowed.

Note: you will not be able to revise all of your Written Work problems! Thus it is important to ensure that you are giving your best effort with your first submission. You are welcome to come to my office, work with others, etc., to ensure that your first submission is as good as possible.

Tokens which are not used by the end of the semester are used by Dr. Janssen and disappear. This leads to a great increase in metaphysical understanding which has no practical relevance.

OTHER POLICIES AND ADVICE

I am generally fairly accepting of late work, with a built-in 24-hour grace period for any non-classroom activities. Additional time beyond the 24-hour grace period must be approved ahead of time.

Email Policy: I check my email twice per school day: once in the morning, where I'll deal with any emergencies, and once in the afternoon, when I'll respond to other emails (including any that have come in since the morning). If you require a more immediate response, you're welcome to come find me in my office.

Policy on Generative AI: Unless specifically permitted by Dr. Janssen in advance of student submission of work, any use of AI will be considered a breach of academic integrity. Suspected cases of misuse of AI tools will be treated as plagiarism and submitted to the Student Life Committee.

Student hours are your time to ask questions about all aspects of the class and college life. Please check online for an appointment. If you can't find one, send me an email! I will do my very best to accommodate your you.

Scan to book an appointment!

FINAL GRADES

In general, your final grade will be determined by the highest **fully completed row** in Table 1.

Final Grade	Daily Work	Written Work (M+)	Written Work (E)	Exams and Project
A	19	16	10	87%
A–	18.5	15	9	84%
B+	18	14	8	80%
B	17	13	6	77%
B–	16.5	12	4	74%
C+	16	11	2	70%
C	14	10	1	67%
C–	13	9	1	64%
D	11	8	—	50%

Table 1: Requirements for each letter grade.

TENTATIVE SCHEDULE

Because the course will be driven primarily by your interests and the pace you set, it is difficult to say precisely what we will do on any given day. However, I expect our schedule to be approximately:

Chapter 1:	The Structure of Fields and Rings	Aug. 28–Oct. 23
Chapter 2:	Factorization	Oct. 25–Nov. 25
Chapter 3:	Homomorphisms	Dec. 4–Dec. 10
Dessert:	Groups	Dec. 11

INSTITUTIONAL POLICIES AND INFORMATION

DORDT UNIVERSITY STUDENT'S RIGHT TO ACCOMODATIONS POLICY

Dordt University is committed to providing reasonable accommodations for students with documented qualifying disabilities in accordance with federal laws and university policy. Any student who needs access to accommodations based on the impact of a documented disability should contact the Coordinator for Service for Students with Disabilities, Academic Enrichment Center, 712-722-6490, Email: CSSD@dordt.edu.

DORDT UNIVERSITY ACADEMIC INTEGRITY POLICY

Dordt University is committed to developing a community of Christian scholars where all members accept the responsibility of practicing personal and academic integrity in obedience to biblical teaching. For students, this means not lying, cheating, or stealing others' work to gain academic advantage; it also means opposing academic dishonesty.

Students found to be academically dishonest will receive academic sanctions from their professor (from a failing grade on the particular academic task to a failing grade in the course) and will be reported to the Student Life Committee for possible institutional sanctions (from a warning to dismissal from the university). Appeals in such matters will be handled by the student disciplinary process. For more information, see the Student Handbook section concerning Academic Integrity.

DORDT UNIVERSITY ATTENDANCE POLICY

Class attendance policies and procedures as outlined in the Student Handbook are in place. To paraphrase the Student Handbook, Dordt University as an institution remains committed to in person instruction for face-to-face courses. As a result, you are expected to be present for every class period and laboratory period. Should you need to miss class for any reason, contact your instructor as soon as possible (either prior to the absence or immediately following). If the absence is the result of a documented disability, academic accommodations will be handled by the Coordinator for Service for Students with Disabilities. Absences for Dordt-sponsored curricular or co-curricular activities will be communicated by the activity sponsor and are considered excused. You are responsible to contact your instructor to make arrangements for missed work. Your instructor is not required to provide real time (synchronous) learning for you should you be absent for class for any reason (e.g., Zooming into your real time class). Your instructor is also not required to provide asynchronous virtual learning materials for you (e.g., recordings of missed classes, slide decks, other materials on Canvas). While some instructors might utilize some of the synchronous/asynchronous methods of making up work on occasion, you should not expect all instructors to provide these experiences automatically. Methods of making up missed work might include: contacting a fellow student to get notes from class, extensions on assignments or labs, or other methods as determined by your instructor. Making arrangements for missed class work is your responsibility! Please see your instructor's specific attendance policy.

> **I reserve the right to make changes to this document as the need arises.**