Math 751 Syllabus Summer 2019

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Linear and Abstract Algebra for Educators
9:00-11:00 and 12:00-2:00 MTuWTh; WEB 123
Section 1; Credits: 4

Office hours: I will be in my office after class each day (207B NH; office phone 715-425-4360) or email me to make an appointment for another time.

Text: you should have an Abstract Algebra and a Linear Algebra textbook to use as a reference. You can check out a copy of the books currently used in the undergraduate classes from the textbook library.

Announcements and assignments are posted on my web site: http://langfordmath.com/. I will be posting your scores on Canvas. Sometimes there are problems (both human and machine errors). **Please save your graded work until after you have checked your grades in Canvas to make sure I have scores recorded correctly.**

Assignments and assessments.: I try to assign practice problems on each math content topic or skill I think is important. I also assign some tasks that involve summarizing, explaining or unpacking important ideas. Finally, I'm going to recruit your skills to summarize the daily discussions in a format that we can share with the group as shared notes (I will ask two people each day to summarize the day's discussions in a form that can be shared on the class web site). I try to grade the homework I assign (if it was worth your time to do it, I should invest time to read/look at it).

I also want to value discussions about pedagogy, and I want your input (as experts on the content you teach). There will be two longer assignments that are involve the content you teach.

- A first essay introducing yourself and sharing some of your expertise in teaching algebra and/or trigonometry.
- A final essay on how abstract algebra relates to content in pre-calculus algebra and/or trigonometry.

There will be two exams on math content, the latter of which we will call a final exam, though it will not be particularly cumulative.

Grading: Your grade will be based primarily on your scores on assignments and assessments.

- Homework assignments will contribute 25%
- The two essays will contribute 25%
- The exams will contribute 25% each.

Your grade will be based primarily on the weighted average of your scores. Letter grades will be at least as high* as those determined by your weighted average and these percents:

A: 94-100%	A-: 90-93%	B+: 87-89%	B: 84-86%	B-: 80-83%
C+: 77-79%	C: 74-76%	C-: 70-73%	D+: 67-69%	D: 60-66%

*I will occasionally raise a grade for someone who shows a greater understanding of the content (eg. in class discussions and presentations) than is reflected in the test scores, but I never lower a grade below what is indicated by the weighted average).

Late work: Late work will be accepted at my convenience. Late work may earn partial or full credit, depending on when it is turned in. Of course, since this class squeezes so much content into such a short time, the biggest issue with late work is that it's difficult catching up if you get behind.

The UWRF promotes safe, inclusive and effective learning environments that protect the rights and support the interests of both students and faculty. For additional information regarding our inclusivity expectations, academic accommodations, academic conduct expectations and processes, and other syllabi information, please consult http://go.uwrf.edu/Syllabi

Academic Integrity

Language regarding the University of Wisconsin-River Falls Academic Misconduct code, including a discussion of the appropriate policies and procedures to be followed in any case of potential misconduct, is located here.

> "UWS Chapter 14 is the chapter of the University of Wisconsin System Administrative code that regulates academic misconduct" for all campuses in the UW System and outlines the process by which the code is adjudicated.

UWS 14.03 defines academic misconduct as follows:

Academic misconduct is an act in which a student:

- seeks to claim credit for the work or efforts of another without authorization or citation;
- uses unauthorized materials or fabricated data in any academic exercise;
- forges or falsifies academic documents or records;
- intentionally impedes or damages the academic work of others;
- engages in conduct aimed at making false representation of a student's academic performance;
- assists other students in any of these acts.

Examples include but are not limited to:

- Cutting and pasting text from the web without quotation marks or proper citation
- Paraphrasing from the web without crediting the source;
- Using notes or a programmable calculator in an exam when such use is not allowed;
- Using another person's ideas, words, or research and presenting it as one's own by not properly crediting the originator; stealing examinations or course materials;
- Changing or creating data in a lab experiment;
- Altering a transcript;
- Signing another person's name to an attendance sheet;
- Hiding a book knowing that another student needs it to prepare an assignment;
- Collaboration that is contrary to the stated rules of the course, or tampering with a lab experiment or computer program of another student.

If you are suspected of misconduct, you may have questions and concerns about the process. If so, you should feel free to call the Office of Student Conduct & Community Standards at 715-425-4844, send an email, and/or consult its website for additional information.

Inclusivity, Respect, and Ability/Disability Expectations

1. The University of Wisconsin-River Falls strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment. If you have concerns about such behavior, contact your instructor, the Office of Student Conduct and Community Standards at 715-425-4844, or the Office of Equity, Diversity, and Inclusion at 715-425-3833. For a list of prohibited behaviors and protected classes or to report something that is inappropriate using an online process, go to this page.

2. The University of Wisconsin-River Falls is committed to upholding standards that promote respect and human dignity in an environment that fosters academic excellence and professionalism. Sexual misconduct and relationship violence in any form are antithetical to the university's mission and core values, violate university policies, and may also violate federal and state law. Faculty members are considered "Responsible Employees" and are required to report incidents of sexual misconduct and relationship violence. If you or someone you know has been impacted by sexual assault, dating and domestic violence, stalking, or sexual exploitation, please visit Title IX to access information about university support and resources.

3. The University of Wisconsin-River Falls welcomes students with disabilities into its educational programs, activities, residential halls, and everything else it offers. Those who will need academic adjustments or accommodations for a disability should contact the Ability Services Office. Decisions to allow adjustments and accommodations are made by the Ability Services Office on the basis of clinical documentation that students provide to sufficiently indicate the nature of their situation.

Official Course Objectives

At the end of this course students will be able to:

- have a deeper conceptual understanding of algebra and its role in the secondary mathematics curriculum (essential understandings)
- have a greater appreciation for the connections within algebra
- develop a connection between algebraic thinking and geometry
- develop habits of mind to look for and make use of algebraic structure

Official Course Content

This course will discuss the following topics using the following structure: a) an overview of the topic (essential understandings); b) a discussion of how the topic relates to secondary level mathematics (pedagogical content knowledge); c) applications of the topic; d) group or individual presentations and assignments on the topic (rich mathematical tasks); e) use of technology, when appropriate, for inquiry-based learning and instruction.

1. Group Theory
   a. The structure of groups
   b. Integers mod n as groups
   c. Dihedral groups as symmetries of geometric objects

2. Rings and Fields
   a. The structure of fields
   b. The Rational, Real, and Complex numbers as a field
   c. The Fundamental Theorem of Algebra
   d. Polynomial Factorization
   e. Proving the non-existence of solutions to the angle trisection problem

3. Linear Algebra
   a. The structure of vector spaces
   b. Vector spaces in 2- and 3-dimensions
   c. Solutions of linear systems
   d. Linear transformations in 2-dimensions

Mode of Instruction: Mixed Face to Face
Prerequisites: Consent of Instructor.

Un-Official Course Objectives (additional)

At the end of this course students will be able to:

- Understand the role of abstraction in abstract algebra and in mathematical thinking at all levels
- Understand what abstract algebra is and what it was invented to do
- Think geometrically about algebra, especially on complex numbers
- Appreciate the role of concrete examples in communicating about algebra
- Appreciate the roles different representations have in understanding algebra
- Look for and explore interesting questions in algebra.