MATH 385-01 Secondary Mathematics from an Advanced Perspective

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Prerequisites
Abstract Algebra (MATH 340 or equivalent). This course is intended for Professional Education minors and M.Ed. students pursuing secondary licensure in mathematics. Other students may enroll only with permission of the instructor and the student’s advisor.

Required text

Objective
*The Mathematical Education of Teachers*, a 2001 report of the Conference Board of the Mathematical Sciences, recommended that prospective teachers of high school mathematics take a capstone course in which “conceptual difficulties, fundamental ideas, and techniques of high school mathematics are examined from an advanced perspective” (p. 39). This course is intended to fulfill such a role for Xavier students pursuing secondary licensure. The primary learning mechanisms will be reading, problem solving, and communicating and justifying one’s mathematical thinking to others, both verbally and in written form. Although the mathematical content of this course is rooted in high school mathematics, we will approach it from a sophisticated undergraduate level that emphasizes the many interconnections among high school mathematics topics and includes analyses that reveal important insights and understandings not always considered in other undergraduate mathematics courses.

Course description
There are two primary mathematical strands in this course: analysis and algebra, although a bit of geometry will appear also. Analysis content will include the system of real numbers, convergence of sequences in $\mathbb{R}$ and $\mathbb{R}^n$, functions, countability and the concept of infinity, trigonometry, and complex numbers. From algebra, we will consider similarities between integers and polynomials, the Fundamental Theorem of Algebra and its consequences, and solving equations. We will use our text (Chapters 1-4, with parts of chapters 5 & 6) as our starting point, but it will be supplemented with additional resources and readings.

Using the above content, we will analyze alternative definitions and approaches to mathematical ideas, extend and connect high school level problems to advanced mathematical ideas, analyze individual mathematical concepts as they appear across the span of elementary through advanced mathematics, and connect ideas often taught separately in the undergraduate curriculum. We may also read some mathematics education literature that considers the challenges and difficulties of teaching and learning the content we’re studying.
Mathematics is not a spectator sport
A first principle of any theory of learning is that learning only happens if the learner is engaged. Students should be prepared to work individually and in groups (both in and out of class), and regularly take part in mathematical discussions (and, if we’re lucky, debates). Be prepared also to present your own ideas, however tentative, for discussion, as well as comment on and supportively critique the ideas of others. I intend to hold the class to high professional standards, and in doing so, encourage an atmosphere in which it is safe not to know everything already!

Course requirements
Successful completion of this course requires the following of student participants:

1. A commitment to reading reflectively and engaging with the assigned readings
2. A commitment to taking active and regular part in classroom conversations and problem-solving activities
3. Regular engagement with (and completion of) assigned mathematics problems and other homework assignments
4. The successful completion of two papers, investigating high school mathematical ideas from an advanced perspective
5. Successful performance on one mid-semester exam and a final exam

Homework assignments
Homework in the form of readings, mathematics problems, and brief writing assignments will be assigned regularly. Written homework will generally be due once a week (usually on Monday), but it will be considered “fair” to ask you to complete shorter assignments between Monday and Wednesday, also. Most submitted assignments will be graded. Assignments must be neat, legible, preferably written in pencil or word-processed, and stapled. Loose pages or sloppily prepared work that looks like scratch-paper will not, I repeat Not, I repeat NOT be accepted. Failure to submit a homework assignment on time will result in a score of zero for that assignment, however your lowest homework score will be dropped at the end of the semester.

Paper assignments
Two written papers will be due during the course of the semester. The first will be due on Wednesday, February 19th, and the second on Wednesday, April 16th. Details concerning these assignments are forthcoming.

Exams
An in-class mid-term exam is tentatively scheduled for Wednesday, February 26. The in-class final exam is scheduled for Monday, May 5. Each exam will deal with material discussed during the prior half-semester of the course. The mid-term exam may be taken at an alternate time only for very good reasons (by my definition), and, except in case of emergency, only if arrangements are made in advance. By university regulations, the final exam must take place during final exam week, and it may be taken at an alternate time only by permission of the dean. More specific details will be provided as the exam times approach.
Attendance
Mandatory. If you are going to arrive late, leave early, or be absent for a legitimate reason, please inform me by phone, voice mail, or email before class begins.

Grading
Your final grade will be based on the following point-distribution:

- Homework 25%
- Participation and group work 10%
- Two papers 30%
- Two exams 35%

Letter grades will be assigned according to the following scale: A/A- (90-100%), B/B± (80-89.9%), C/C± (70-79.9%), D (60-69.9%), F (< 60%). I reserve the right to make it easier—but not more difficult—to earn a particular grade. Plus-minus grades reflect the top 2% or bottom 2% of each of the above grade ranges. I do not intend to use the grade of D+.

Course Canvas site
A course schedule, homework assignments, handouts, readings, and other bits of information relevant to the course will be available on the course Canvas site. Please check it regularly. Additionally, announcements to the entire class may be sent to your Xavier email accounts. Your own failure to check your Xavier email is not an acceptable reason for not being aware of such announcements.

Academic Honesty
In accordance with the University Catalog:

“All work submitted for academic evaluation must be the student’s own. Certainly, the activities of other scholars will influence all students. However, the direct and unattributed use of another’s efforts is prohibited as is the use of any work untruthfully submitted as one’s own. Penalties for violations of this policy may include one or more of the following: a zero for that assignment or test, an ‘F’ in the course, and expulsion from the University.” (See the current University Catalog for a more complete statement at http://catalog.xavier.acalog.com/.)

You are encouraged to work and study with other students in class and to learn from one another as opportunities provide. However, turning in the work of another, collaborating on assignments when prohibited, or providing your work to someone else will be considered academically dishonest. It is my practice to handle such cases with the severest penalties possible.

Professional Education Students
This course contributes to the satisfaction of NCTM standards 1, 2, 3, 4, 5, 7, 9, 10, 12.

Acknowledgments
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