

FOUNDATIONS OF ADVANCED MATH 2:00PM MWF SPRING 2009 SH 309

- Instructor: Jonathan White
- E-Mail: JWhite@Coe.Edu
- Web Page: <http://public.coe.edu/~jwhite/>
- Office: Stuart 316
- Office Hours: 11:00-11:25 MWF, 3:00-3:25 MW, and by appointment
- Office Phone: 399-8280
- Home Phone: 841-5111 (between 7am and 10pm)
- Text: *Sets, Functions, and Logic: An Introduction to Abstract Mathematics*, 3rd ed., Devlin
- Problem Sets: There will be several problem sets during the semester. Together these will be worth 200 points (20% of the final grade)
- Participation: Day-to-day class participation, presentations, and snap quizzes will be a prominent aspect of this class, and together will be worth 200 points (20% of the final grade)
- Math Culture Points: Math Culture Points will constitute 200 points (20% of the final grade). These will be earned through participation in various activities outside of class, as detailed on page 3 of this syllabus.
- Examlets: There will be four small in-class examlets administered during class time. The dates of these are indicated in the schedule on the back side of this sheet. These examlets will be worth 50 points (5% of the final grade) each.
- The final exam will be held during finals week at the date and time indicated on the back side of this sheet. The final will be worth 200 points (20% of the final grade).
- Grading: Grading will approximately follow a 90% A, 80% B, 70% C, 60% D scale.
- Makeups: For the sake of fairness to those who follow the schedule, makeups for examlets will be allowed only under extenuating circumstances, with documentation and advance notice when humanly possible. Late problem sets will generally not be accepted, and if accepted due to extenuating circumstances will generally be subject to a penalty of 20% of the possible points for each day past due.

This class is intended to achieve several goals, but primary among them is to give some accurate idea of what mathematics actually is. The specific content of the course is secondary, but my hope is to give a good exposure to many topics which are helpful or necessary to further study in mathematics and related fields. These include, but are not limited to, the basics of number theory, set theory, functions, logic, and combinatorics.

This course will be profoundly different, both in subject matter and in daily conduct, than what most of you are accustomed to in a math class. Please understand that it's different on purpose, with very clear reasons in mind. You will probably have to find different ways to learn things in this class than in any math class you've taken before. Don't let that be overwhelming, and remember that I'm around to help.

"Doubt everything at least once, even the proposition that two times two equals four."

– Georg Christoph Lichtenberg (1742-1799)

Tentative Schedule

	Wednesday, January 14 th §1.1 - §1.5	Friday, January 16 th §2.1 The Language of Math
Monday, January 19 th No Class – MLK Day	Wednesday, January 21 st §2.2 Truth and Implication	Friday, January 23 rd §2.3 Quantification
Monday, January 26 th §2.4 More on Quantification	Wednesday, January 28 th §2.5 Proof Techniques	Friday, January 30 th §2.5 Proof Techniques
Monday, February 2 nd §2.6 The Integers	Wednesday, February 4 th §2.7 Mathematical Truth	Friday, February 6 th Examlet 1
Monday, February 9 th §3.1 Sets	Wednesday, February 11 th §3.2 Operations on Sets	Friday, February 13 th §3.3 Real Intervals
Monday, February 16 th §3.4 Absolute Values	Wednesday, February 18 th §3.5 Inequalities	Friday, February 20 th §3.6 Arbitrary \cup and \cap
Monday, February 23 rd §3.7 Cartesian Products	Wednesday, February 25 th §3.8 History of Set Theory	Friday, February 27 th Examlet 2
Monday, March 2 nd §4.1 Introduction to Functions	Wednesday, March 4 th §4.2 Examples of Functions	Friday, March 5 th §4.3 History of Functions
Spring Break		
Monday, March 16 th §4.4 Injectivity and Surjectivity	Wednesday, March 18 th §4.5 Composition and Inverses	Friday, March 20 th §4.6 Countability
Monday, March 23 rd §4.7 Uncountability	Wednesday, March 25 th The Continuum Hypothesis	Friday, March 27 th Examlet 3
Monday, March 30 th §5.1 Binary Relations	Wednesday, April 1 st §5.2 Properties of Relations	Friday, March 3 rd §5.3 Relations as Sets
Monday, April 6 th §5.4 Relations as Graphs	Wednesday, April 8 th Student Research Symposium	Friday, April 10 th §5.5 Equivalence Relations
Monday, April 13 th §5.6 Functions as Relations	Wednesday, April 15 th §5.7 \mathbb{R}	Friday, April 17 th Examlet 4
Monday, April 20 th Combinatorics	Wednesday, April 22 nd Probability	Friday, April 24 th The Peano Axioms
Monday, April 27 th The Peano Axioms	Wednesday, April 29 th The Peano Axioms	
Final Exam – 8am on Friday, May 1 st		

Any students with disabilities which might affect their performance in this class should contact me as soon as possible to arrange accommodations.

Coe's faculty has adopted an academic integrity policy. It is your responsibility to understand and follow it.

Diversity, in all its forms, is valuable.

FOUNDATIONS OF ADVANCED MATH 2:00PM MWF SPRING 2009 SH 309

One of the profound puzzles inherent in teaching mathematics is the question of how to teach students to actually do math. That doesn't mean just carrying out algorithms – the routine procedures that solve routine problems are readily taught by demonstration and practice. But doing math means far more than performing those routine rituals, and unfortunately involves tasks that are not so readily learned by demonstration. For instance, mathematicians are able to read math books – something notoriously difficult for math students, and something with which observation provides little help. Mathematicians are also able to do problems of types they have never seen before – a task for which drill work provides only very limited help.

“The true function of the teacher is to create the most favorable conditions for selflearning. True teaching is not that which gives knowledge, but that which stimulates pupils to gain it. One might say that he teaches best who teaches least.”

– John Milton Gregory, 1884

Math Culture Points

A significant portion of the grade for this course will take the form of Math Culture Points. These will be earned through activities outside of class including, but not necessarily limited to, those listed below:

Activity	Points	Max #
Colloquium Attendance	10	–
Colloquium Presentation	10-30	2
Meeting Attendance Midwest Undergraduate Mathematics Symposium (April 3 rd - 4 th) Nebraska Conference for Undergraduate Women in Mathematics (Jan. 30 th - Feb. 1 st)	30	2
Mathematics Competition Participation Iowa Collegiate Mathematics Competition (Feb. 28 th) Mathematical Contest in Modeling (Feb. 5 th - 9 th)	20	2
Math Culture Reading Some weeks specific readings will be posted on the course web page With approval, any column on MAA.org With approval, an article from <i>Math Horizons</i> , <i>CMJ</i> , etc.	10	– 5 5
Math Club Activities (when appropriate) Winter Break Book, Movies, Pi Day celebration, Speakers, etc.	10	5
Volunteer Math Outreach Working with students at Polk Elementary, etc.	10	3
Other Appropriate Coe Activities Attending a Quantitative Research Symposium Presentation Poverty Simulation Psychology Experiment Participation Contemporary Issues Forum	10	–

Generally Math Culture Points can be earned for at most two activities in any given week, so you should plan to spread your participation throughout the semester. In each case above, credit assumes both full participation and posting a brief summary/response on Moodle. These reflections should generally be between 100 and 300 words,

and include both a brief summary and your personal thoughts on the event, and must be submitted within one week of the event.