Synthesis of Math Concepts (Math 407), Fall 2011
Math East 141, MW 2:00-3:15

Professor: Bryden Cais **Office:** 615 Mathematics

Email: cais@math.arizona.edu **OH:** M: 3:15–4:15, Tu: 11–12, W: 1–2.

Course Goals: The aim of this course is to develop an advanced perspective on high school mathematics, with a view toward better preparing future teachers. We will pay particular attention to the evolution of fundamental mathematical ideas and principles, and will emphasize the myriad connections between different areas of mathematics as revealed by a deepened understanding of common underlying structures.

Course Topics: The course will consist of three main units: Algebra, Functions, and Geometry.

Text: We will follow the text *Mathematics for High School Teachers*, by Usiskin *et al.*

Webpage: A course webpage will be maintained here:

http://www.math.arizona.edu/~cais/407Page/index.html

Assignments and links to other resources will be posted there.

Method of Evaluation: Your grade for the course will be determined as follows: Team Homework: 25%, Midterm exam: 25%, Final project: 40%, Participation: 10%. A letter grade will be assigned in accordance with University standards: 90% or above for an A, 80% for a B, 70% for a C, 60% for a D. Any score below 60% will be given an E.

Team Homework: Students will submit bi-weekly written assignments in teams of three.

- Teams will be assigned on the first day of class. After the midterm, you will have the opportunity to change teams.
- Each of the three team members will perform one of the following roles on each assignment:
  - **Scribe:** Responsible for writing up the team's and solutions to the problems. This writeup which will be graded and will determine the team's grade for the assignment.
  - **Manager:** Responsible for organizing and running team meetings, and for submitting a team report for each assignment which includes a summary of how each meeting went, which team members were present at the meeting and what roles they fulfilled. When homework is returned, the manager is responsible for distributing photocopies to the team so that each member can review the comments and corrections.
  - **Clarifier:** Responsible for making sure that every member of the team understands the solutions to the problems. The clarifier must be prepared to present homework solutions to the class if called upon.

- The team roles listed above must be rotated each assignment, so that every team member performs each role once in each 6-week period.

- Assignments are due every other Wednesday, at the beginning of class (with the exception of the week of the midterm exam). Late work is not accepted for any reason.

An excellent guide for team homework is available here:

http://instruct.math.lsa.umich.edu/support/teamhomework/

See also:

http://www.math.lsa.umich.edu/courses/115/grhwk.html

Individual Homework: Throughout the semester, individual homework will be assigned weekly. While this will not be submitted for grading, it is critical to keep current with this work as it is the only way to ensure that you are understanding and digesting the course material.

Midterm Exam: There will be one in class, 1-hour midterm exam on **Monday, October 17**. Should you miss the midterm, I will be **very** reluctant to give a make-up exam, and will require a good excuse with appropriate documentation.

Final Project: There will be a final project with an in-class presentation (10 minutes). Select a standard topic in the high school mathematics curriculum that presents interesting mathematical or pedagogical difficulties. In 2–4 pages of text (not counting diagrams or mathematical formulae), discuss (1) why you chose this particular topic, (2) the underlying mathematical concepts, going deeper than what would be presented to students, and (3) how you would teach it, including a discussion of why students might find it difficult, possible student mistakes, and examples of relevant student activities and tasks. You will be graded on items (1)–(3) in your project essay (due the day of your presentation) and on your presentation.

Participation: Mathematics is not a spectator sport. To encourage you to be (over) active participants, 10% of your final grade will be determined by your participation in the course. This is comprised of two components, each worth 5%: in-class work and team homework. The former will be evaluated by me throughout the semester, while the latter will be evaluated based on the team homework reports.

Academic Integrity: All students are expected to abide by the University of Arizona Code of Academic Integrity, which will be strictly enforced:

http://deanofstudents.arizona.edu/codeofacademicintegrity

Tentative Schedule (Page and section numbers refer to Usiskin *et al.*)
Days in *** bold** indicate homework due dates (beginning of class).

Day	Date	Reading	Homework
Monday	8-22	pgs. 1–10	p. 14 #6
Wednesday	8-24	pgs. 10–13	p. 15 #10
Monday	8-29	4.1.1	p. 140 # 4
Wednesday	8-31	4.1.2	p. 145 #12
Monday	9-5	NO CLASS (Labor Day)	
*Wednesday	9-7	4.2.1–2	Team homework 1 due
Monday	9-12	4.2.3	p. 159 #1, 6
Wednesday	9-14	4.3.1	p. 163 # 5
Monday	9-19	4.3.2	p. 166 #1
*Wednesday	9-21	4.3.4	Team homework 2 due
Monday	9-26	3.1.2	p. 79 #1
Wednesday	9-28	3.1.1	p. 75 #5
Monday	10-3	3.1.3	p. 85–86, #6,10
*Wednesday	10-5	3.2.1	Team homework 3 due
Monday	10-10	GUEST LECTURE	
Wednesday	10-12	3.2.2	
Monday	10-17	MIDTERM (Through 3.1.3)	
Wednesday	10-19	3.2.3	Change teams
Monday	10-24	3.2.4	p. 100, #7, p. 112 #4
Wednesday	10-26	7.1.1–2	p. 282 #6
Monday	10-31	7.1.3–4	p. 294 # 8
*Wednesday	11-2	7.2.1–2	Team homework 4 due
Monday	11-7	7.2.3	p. 312 #4, p. 321 #12
Wednesday	11-9	7.2.4	p. 323 #6
Monday	11-14	7.2.5	p. 328 # 2
*Wednesday	11-16	10.1.1	Team homework 5 due
Monday	11-21	10.1.2	p. 491, #11, 13
Wednesday	11-23	10.1.3	p. 485 #10, p. 500 #14
Monday	11-28	10.1.4	p. 505 #5
*Wednesday	11-30	Presentations	Team homework 6 due
Monday	12-5	Presentations	
Wednesday	12-7	Presentations	