

## Math 414, Mathematics Curriculum and Instruction

Spring 2011, 5:35–6:50 MW, C-8

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**Office hours:** 4:30–5:30 MTuW.

**Prerequisites:** Senior standing and 12 upper division units of mathematics. In particular, Math 521A is recommended. There is good reason for prerequisites. It is in your own best interest to take them seriously.

**Required text:** Usiskin, Pereskin, Marchisotto, Stanley: Mathematics for High School Teachers.

**Course objective:** This course is intended for students who intend to become high school mathematics teachers. Its goal is to establish connections between the math you have learned in your college classes and the math you will teach in high school. Therefore it is essential that you have taken a number of college-level math courses—this means upper division courses. In particular, algebra (Math 521A) will be useful. Math 414 should be one of the last courses you take for your degree.

This is not a pedagogy course, but a math course. While we will discuss some principles and procedures of teaching, our focus will be on the math. In particular, we will be interested in how to convey an in-depth understanding of math to high school students and how to develop strong problem-solving skills.

Obviously, you will be expected to be able to solve the types of math problems we cover. Certainly, you must be able to do high school math in order to pass this course. You will also be expected to view the math we do from the perspective of a teacher: what does it teach, how does it teach it, and how does it fit into the great framework of mathematical thinking. You need to be able to solve problems in multiple ways, judge the correctness of a solution, understand and explain the principles that underlie the mathematics taught in high school. You will have to be able to come up with examples and exercises that illustrate specific ideas in math.

**Website:** [www.rohan.sdsu.edu/~ituba/math414s11](http://www.rohan.sdsu.edu/~ituba/math414s11). I will also use Blackboard to post your grades periodically.

**Class attendance:** This is not distance education. You are expected to attend and participate in every class. If you skip class you will miss the chance to learn skills that will be tested on the exams. You may also miss a quiz and there are no make-ups. Finally, if you keep skipping class, I will think that you are not serious about your education and will remember that when I assign your grade at the end of the semester.

**On work outside of class:** Have you ever wondered why taking 12 units of classes qualifies you as a full time student? That's only 10 hours per week in class. The reason is that you are expected to do a lot of work on your own outside of class. In fact, the rule of thumb of college education is that for every hour you spend in class, you should expect to spend three hours studying outside of class. That is how 12 units makes full time: 10 hours in class and 30 hours studying outside of class each week. That means you'll need to spend about 7.5 hours a week studying outside of class for this course. That is if you are well-prepared for the course. If your math background is lacking, then you'll have to spend more time. I am not kidding.

**Homework and reading** will be posted on the class website regularly. You will be able to follow the progress of the course using the website. HW is an essential part of your learning. Take it very seriously. It is extremely important that you keep up with the HW. If you do not, you will quickly

find yourself lost in class and at a great disadvantage during exams. Treat the HW as a learning opportunity, rather than something you need to get out of the way. Reread, revise, and polish your solutions until they are correct, concise, efficient, and elegant. This will really deepen your understanding of the material. You won't do well in a math class without doing all of the HW. Attending class and reading your textbook are necessary but not sufficient conditions for passing the course. Expecting to learn math without doing exercises on your own is like expecting to learn to ride a bicycle without ever sitting on a bicycle.

Your performance on the homework will be tested on quizzes and exams. Every quiz and half of every exam will consist of exercises straight from the homework. You can turn in your homework to me any time for feedback. I will comment on it and turn it back to you as soon as I can. Clearly, if you don't turn in homework, I can't give you feedback on your work, no matter how much I want.

There is an obvious winning strategy. Do the HW, seek feedback on it, revise it, and keep your HW notes neat and organized. The familiarity you gain with the exercises by doing this will let you do the quizzes with ease. It will also let you complete half of each exam quickly and move onto the other half of the exam. The experience you gain by keeping up with your homework will be invaluable in doing that other half of the exam. On the other hand, if you do not keep up with your HW, you will face the challenge of solving many unfamiliar problems under time pressure on the quizzes and the exams. You will find this an impossibly daunting task and your grade will reflect this.

**Collaboration on assignments:** Limited collaboration with your fellow students in the class is OK. But see the section on Academic Integrity! The idea is to let you discuss and critique each other's ideas and not to let you split the workload. Keep collaboration constructive and reasonable. You should fully understand the solution and write it up on your own. Your understanding of the material will be tested on the exams.

If you are approached by another student from the class who wants to copy your HW or your papers, think twice before generously sharing. You will feel bad if your crafty buddy outscores you in the class by exploiting your and everybody else's collective wisdom without doing work of his/her own.

**On independent work:** Problem solving skills are developed by practicing a lot, not by watching other people solve problems. Learning math is much like learning to ride a bicycle in that you learn by doing it and not by watching someone else do it. Attending class and reading the textbook won't be enough to do well on the exams. You should work through every example and argument in the book and in your class notes and expect to have to re-read everything several times. It's slow, but then your reading list for this class is short.

**Discussion sections:** I strongly encourage you to organize a weekly session to work with (not copy from!) your fellow students on problems in class and on the homework. This will help you keep up with your work and get ideas and feedback from others who are grappling with the same exercises as you. You will find that the sense of companionship motivates and encourages you to work.

**Quizzes:** We will have a quiz about every week and a half to two weeks. It will be straight from the homework. It is your responsibility to come to class, so if you miss a quiz because you are not there, you will not be allowed to make it up. Your lowest quiz score will be dropped.

**Exams:** There will be two in-class exams as well as a final exam. The in-class exams will be on Feb 21 and Mar 23. If you skip an exam, you will normally not be able to make it up, unless you have a compelling (e.g. medical) and documented excuse. Forgetting that there is an exam or being unprepared for it are not considered compelling excuses. Your in-class exam score will be computed as  $\frac{2}{3}(\text{higher score}) + \frac{1}{3}(\text{lower score})$ .

**Final exam:** Time and place TBA.

**Grading scheme:**

Grade	University policy	What this means in Math 414
A	outstanding achievement; available only for the highest accomplishment	You are thoroughly familiar with all definitions and examples covered, can precisely state and correctly prove all theorems from class. You have a firm understanding of the material and can do all of the homework exercises. You can use the concepts you learned in this course to solve unfamiliar problems comparable in complexity to those done in class and on the homework. You are thoroughly familiar with the reading and can present a sophisticated and polished discussion of the issues raised.
B	praiseworthy performance; definitely above average	You are thoroughly familiar with all definitions and examples covered, can precisely state and correctly prove almost all theorems from class. You have a solid understanding of the material and can do most of the homework exercises. You can use the concepts you learned in this course to solve most unfamiliar problems of comparable complexity. You are familiar with the reading and can present a compelling discussion of the issues raised.
C	average; awarded for satisfactory performance; the most common undergraduate grade	You are familiar with all definitions and most examples covered, can state and prove without major mistakes most theorems from class. You have a general understanding of the material and can do the majority of the homework exercises with perhaps small imperfections in your arguments. You can use the concepts you learned in this course to solve some unfamiliar problems of comparable complexity. You are familiar with the reading and can discuss in detail the issues raised.
D	minimally passing; less than the typical undergraduate achievement	You are familiar with the majority of definitions and many examples covered, can state and prove at least half of the theorems from class. You have some understanding of the material and can do the at least some of the homework exercises without major mistakes. You can use the concepts you learned in this course to solve at least a few unfamiliar problems of comparable complexity. You have done the reading and can discuss the issues raised.
F	failing	You have difficulty stating definitions and coming up with examples, do not remember statements of theorems and/or cannot prove them, can do few of the homework exercises, and lack the skills to attack unfamiliar problems of comparable complexity. Your familiarity with the reading is questionable or you lack a critical understanding of the issues raised.

Homework	10%
Quizzes	15%
Other assignments	10%
In-class exams	40%
Final exam	25%

A score of 80% or more will guarantee an A- or better, 60% a B- or better, 40% a C- or better, and 20% a D- or better. The curve may be adjusted somewhat lower than this.

**On academic integrity:** Using unauthorized aids—including help from another person—on exams and to complete assignments constitutes cheating. Representing someone else’s work as your own—even if you make minor changes to it, or reword it—is called plagiarism. Cheating and plagiarism are violations of academic integrity and university policy. The consequences are serious, ranging from receiving a failing grade on an assignment in question to expulsion from the university. Don’t do it, it’s not worth it.

**Quality of work:** It is important that you work neatly on the assignments. The quality of your work will affect your grades on the exams. Quality has to do with how easy it is for someone else to read your solution to a problem. It is not enough to do the math right, you must also communicate it well.

**Students with disabilities:** If you need special arrangements, let me know well in advance so we can plan to accommodate your needs.