

# MATH 240, Fall 2005

Discrete Mathematics

www.cburch.com/math/240/

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drop-ins, appointments always welcome

## Goal

If you have followed the traditional mathematics sequence — high school algebra, geometry, the differential and integral calculus — you have studied *continuous mathematics* almost exclusively. There is a whole other half of mathematics, which is just as large, just as important, and a lot more fun (in my opinion): *discrete mathematics*. It is this that we will study during this course.

But there is another purpose, too: This course is an important step toward learning how to use the logic that mathematicians and computer scientists use all the time. Much of your work in the course will involve proving statements; this is a big change from earlier courses. I expect that you will learn to construct convincing proofs during this course. Please keep in mind that a proof is an *argument* intended to *convince* the reader of some fact.

## Textbook (required)

Rosen, Kenneth H. *Discrete Mathematics and Its Applications*, 5th ed. McGraw-Hill, 2003.

## Evaluation

There are a total of 1,000 points over the semester.

Class attendance/participation	100 pts
Assignments (variable credit)	350 pts
Take-home tests (four, 50 pts each)	200 pts
In-class exams (two, 100 pts each)	200 pts
Final	150 pts
<b>Total</b>	<b>1,000 pts</b>

Letter grades will come from the following scale.

A	900 or more	D	600 to 699
B	800 to 899	F	less than 600
C	700 to 799		

I reserve the right to make adjustments in the entire grading scheme or in particular cases.

The A grade is meant for outstanding performance; a B is more typical and represents solid preparation for future mathematics and computer science courses, while a C represents marginally adequate preparation. I assign grades independent of any overall goal, but the average letter grade will likely be near 3.0. Bottom line: B isn't bad.

Note that I do not normally "curve" in determining letter grades at the course's end; instead, I monitor grades throughout the course and perform any "curves" as I grade tests. When I "curve" scores, I add a fixed amount to all scores; as a result, a high test score may end up being above 100%. Normally, scores in the non-test categories will be higher; the average class grade will likely be a B even though the average test grade is a C.

## Class attendance/participation

Several points are designated for "class participation." I will assign half of these points near the semester's middle, and the other half near the semester's end. I *may* use some points for in-class exercises, but most of the points will be based on attendance and participation.

I do monitor your class attendance. If your attendance is excellent (missing one or fewer classes each half-semester), you will receive at least 60% of these attendance/participation points. If you feel your absence should be excused, please warn me about the absence a day in advance. Whether I excuse your absence is my call.

The remaining 40% of these points are for participation, including both questions during class and responses to questions during class. I may give more than full credit in unusual circumstances. Take this as an invitation: I value your active participation in class, and I expect you to show evidence of being fully tuned in during class sessions.

## Assignments

You can expect assignments basically every class day, usually due the following class. The nature of the assignments and their point values will vary. Unless otherwise specified, your assignment solutions may be hand-written or typed.

You are welcome to work with other students in this class on assignments, as long as you note where you got help, from whom, etc. I reserve the right to place restrictions on your teamwork during the course.

Excepting what I deem as emergencies, I will not give credit for late work. I am happy to evaluate late work for your own learning, but it will not apply to your grade in the course.

## Take-home tests

The class has four scheduled take-home tests, which you will complete on your own. (I am the only person from whom you may receive help, and I am unlikely to be very helpful.) You may refer to your textbook and your class notes, but not to other resources.

The point of these take-home tests is primarily to give you practice with what I would call “real mathematics” — that is, inventing and writing proofs. This process is challenging, and doing it right takes time, more time than can normally be scheduled for a monitored test. Hence the take-home nature.

Rewrites on take-home tests are allowed. They are due the class day following when I distribute your initial grades. An argument on the rewrite must follow the skeleton of your original argument; you must submit the previously graded solution with your rewritten version. The grade you receive on the take-home test will be three points less than the grade given on the rewrite — or your original grade, if that is higher.

Again, I will not give credit for late work, excepting what I deem as emergencies.

## Exams and final

The two in-class exams and the final will be closed-book exams. While I strive for the time limit to not be an issue, I cannot guarantee this.

If you miss a test, you must receive advance permission from me to receive more than a 0. (Dire medical emergencies usually constitute an exception.) If you are excused from the test, I will either repeat your lowest exam score or administer a make-up, at my discretion. Let me know well in advance — 24 hours for exams and quizzes, and two weeks for the final. I would like to remind you that, when e-mail is impossible, telephones exist also. *Do not skip a test without my prior approval!*

Note that I may require you to document your reason for absence. Travel arrangements and work schedules are not adequate reasons to miss a test.

## Cheating and groupwork

You must properly attribute any work or ideas you use in assignments for this course which are quoted or derived from others. Plagiarism includes not only copying the ideas and the written and spoken words of others, but also copying or otherwise appropriating their computer files as well. Interfering with the work of others is also a serious academic offense. I will abide by the catalog’s Academic Hon-

esty policy in referring cases to the college’s Committee on Academic Integrity.

Note that teamwork on assignments — when acknowledged on the assignment — is OK, subject to any limitations imposed during the course.

Discussing or viewing others’ solutions to take-home tests is out of bounds until you submit a rewritten version. Also, discussing or showing your own solution to others is grounds for charges of cheating, even if apparently inadvertent (leaving a copy at a printer, for example). A strong correlation between your solution and a classmate’s solution constitutes evidence of cheating.

## Office hours

If you aren’t stopping by your professors’ offices regularly to talk — whenever you can find an excuse —, you’re missing out on an important element of your college education. Don’t waste your time at Hendrix by staying away from your professors.

Feel free to stop by my office any time you want to talk about something related to the class. I do have some office hours listed above, but don’t take these seriously: These are simply times that I try to be in my office; they are *not* intended to limit you. I’m equally available at all times that my office door is open. I’m also happy to arrange appointments.

To help you, here are some useful starters in no particular order that you can use to break in.

- “We discussed  $X$  in class today, and I’m not sure I entirely understood. Could you explain it again?” Such a question is usually more appropriate during class; but if your classmates clearly understood, or if you discover later that you didn’t understand it as well as you thought you did at the time, then you might ask outside class.
- “We’ve been discussing  $X$ , and I thought maybe  $Y$  might be an alternative solution. Any thoughts?” I really like questions like this.
- “I’ve having a problem getting started on this problem. Could you help me out?”
- “Do you have any advice for how I can do better in this class?”

Of course, if you’re not in the building, you can telephone my office. And if I’m not in my office, you can send e-mail. But please don’t e-mail me unless I’m not around: It’s a lot less efficient.

## Tentative schedule

The schedule below is an outline of the initial semester plan, which will certainly be modified as the semester goes along. The section numbers key topics to the textbook.

Tue 23 Aug	First-order logic	§1.1, 1.2
Thu 25 Aug	Higher-order logic	§1.3, 1.4
Tue 30 Aug	Proof	§1.5, 3.1
Thu 1 Sep	Number theory	§2.4
	<b>Take-Home Test 1</b>	
Tue 6 Sep	Sets	§1.6, 1.7
Thu 8 Sep	Sequences, countability	§3.2
Tue 13 Sep	Induction	§3.3
Thu 15 Sep	<b>Exam 1</b>	
Tue 20 Sep	Structural induction	§3.4
Thu 22 Sep	Counting, pigeonholes	§4.1, 4.2
Tue 27 Sep	Permutations, combinations	§4.3
Thu 29 Sep	Binomial coefficients	§4.4
	<b>Take-Home Test 2</b>	
Tue 4 Oct	Permutations w/repetition	§4.5
Thu 6 Oct	Probability basics	§5.1
Tue 11 Oct	Probability theory	§5.2
Thu 13 Oct	<i>Fall break</i>	
Tue 18 Oct	Expected value	§5.3
Thu 20 Oct	<b>Exam 2</b>	
Tue 25 Oct	Relations	§7.1, 7.3
Thu 27 Oct	Equivalence & order relations	§7.5, 7.6
	<b>Take-Home Test 3</b>	
Tue 1 Nov	Graph basics	§8.1, 8.2
Thu 3 Nov	Graph connectedness, paths	§8.4, 8.5
Tue 8 Nov	Graph planarity	§8.7
Thu 10 Nov	Graph coloring	§8.8
	<b>Take-Home Test 4</b>	
Tue 15 Nov	Scheme basics	not in text
Thu 17 Nov	More Scheme	not in text
Tue 22 Nov	Recurrence relations	§6.1
Thu 24 Nov	<i>Thanksgiving</i>	
Tue 29 Nov	Solving recurrences	§6.2
Thu 1 Dec	Generating functions	§6.3
2:00p, 13 Dec	<b>Final</b>	

## Disabilities

It is the policy of Hendrix College to accommodate students with disabilities, pursuant to federal and state law. Any student with a disability who needs accommodation, for example in arrangements for seating, examinations, note taking, or access to information on the Web, should inform the instructor at the beginning of the course. In order to receive accommodations, students with disabilities are required to contact Counseling Services at 450-1448.