MATH 200 – SYLLABUS

PEYAM TABRIZIAN

Welcome to Math 200, an exciting adventure awaits you! This is the survival manual for this course, where you can find all the administrative info you need to know, such as office hours, grading, and other goodies. Feel free to e-mail me if you have any other questions.

- **Instructor:** Peyam (Pie-Am) Ryan Tabrizian
- **E-mail:** tabrizianpeyam@hotmail.com or prt2@williams.edu
- **Office:** 117 Bronfman
- **Class meeting times:** This course meets on MWF from 9 to 9:50 AM in 105 Bronfman, from Friday, February 3 up to and including Friday, May 12. I do not take attendance, so whether you show up to class is entirely up to you, although it is highly recommended, since there might be problems on the exams that are not in the book but that I covered in lecture.
- **Office Hours:** Wednesdays 2-3 and Thursdays 4-6 in 117 Bronfman. That said, my door is always open for you, even outside the above hours, so if you knock on my door and I'm in, I'd be glad to help. I'm usually around Mondays through Fridays from 2 pm to 7 pm.
- **TAs:** There are two TAs for this course:

  Name: Coly Elhai
  E-mail: cle4@williams.edu
  TA Session: Wednesdays 7:30 - 8:30 PM in 103 Bronfman

  Name: Yuxin Wu
  E-mail: yw2@williams.edu
  TA Session: Thursdays 8 - 9 PM in 103 Bronfman

Date: Friday, February 3, 2016.

- **TA Help Sessions:** There are two TA help sessions offered, on Wednesdays and Thursdays from 8 pm to 9 pm. TA Sessions usually consist of answering your questions about the homework. Note that the TA reserves the right to leave if no one shows up during the first 20 minutes of the TA session.

- **Important Dates:**
  - Friday, Feburary 10: Last day to add/drop classes
  - Friday, February 17: Winter Carnival (no classes)
  - **Friday, March 10: Midterm 1**
  - Saturday, March 18 to Sunday, April 2: Spring Break! (no classes)
  - Thursday, April 6: Last day to drop a fifth class
  - **Friday, April 21: Midterm 2**
  - Friday, April 28: Last day to change the grading option of eligible courses to P/F
  - Friday, April 28: Last day to withdraw from a course
  - Friday, May 5: Last day to claim exam hardship
  - Friday, May 12: Last day of class
  - **Saturday, May 13 to Sunday, May 21: Final exam−period**

- **Online resources you can use:**

  - sites.williams.edu/prt2: This is the most important resource that you'll need. It contains all homework assignments, as well as information about exams (once we'll get closer to them).
  - www.glow.williams.edu: Mainly use this to check your grades.

- **Textbooks:**

  Required: *Discrete Mathematics with Applications* (4th edition, 2010) by Susanna S. Epp, ISBN-13: 978-0495391326; ISBN-10: 0495391328

  IMPORTANT NOTE: Please make sure that you have the version that says "Printed in United States of America" (on the bottom left on the page before the dedication to Jayne and Ernest). If you have the version that says "Printed in Canada," you have the incorrect version. They are almost identical, but occasionally there are some mistakes, and it is your responsibility to do the correct problems. One way of checking if you have the correct version is that on number 24 on page 189, the statement should have $n \mod 5 = 1$, not $n \mod 3 = 6$.

Note: The student store sells it for the (outrageous) price of $ 396.50, but you can buy an used copy on amazon.com for $120.75, an online version for $107.99, or rent a copy for $49.99. Once the semester is over, you can trade it in for an (up to) $93.83 gift card. I also have a couple of copies of the textbook in my office, so it's totally fine with me just for you to drop by and take pictures of the homework problems if you want. That said, note that you're responsible for *everything* that's in the textbook, even for things that I didn't cover it in lecture or that wasn't on the homework (except when I explicitly say so). Finally, there's a copy on reserve in the Schow Science Library, which you can borrow for 4 hours at a time.

Recommended: *The Nuts and Bolts of Proofs: An Introduction to Mathematical Proofs* (4th edition, 2012) by Antonella Cupillari, ISBN-13: 978-0123822178; ISBN-10: 0123822173: It's a cute and very accessible introduction to mathematical proof-techniques, designed for beginning mathematicians like you who are transitioning into higher-level mathematics-courses. You can read it if you want to sharpen your proof-skills. Think of it as a more in-depth version of Chapter 4 of our textbook (Introduction to Proofs via Number Theory).

Not-so recommended: *Discrete Mathematics and its applications* (7th edition, 2011) by Kenneth H. Rosen, ISBN-13: 978-0073383095, ISBN-10: 0073383090. This is the book that I used when I learned discrete math, and I think it is awfully dense. That said, this book is a great source of challenging problems, so if you're bored and/or you're looking for more difficult problems, you could take a glance at this book. Also, it has a tremendous amount of applications to computer science, so it's especially suitable for Computer Science majors.

- **Prerequisites:** None! The official prerequisites are MATH 140, or MATH 130 with CSCI 134 or 135 (or one year of high school calculus with permission of instructor), but we won't really use any calculus in this course. The awesome thing about this course is that we're starting from scratch, so you can give your love (or hate) for math a fresh new start! The only thing you'll really need is mathematical maturity equivalent to someone who took those classes, because we'll be dealing with new ways of thinking that you may not be used to.

  ON THE OTHER HAND, if you **EVER** feel that this course is too easy for you, please skip ahead to a more advanced course. There is a wonderful world of upper-level mathematics that awaits you, and it would be a bummer to miss out on it. In particular, please skip this course if you got

an A in Math 151.

- **What people make you believe this course is about:** The official description includes "mathematical logic, elementary number theory, mathematical induction, set theory, functions, relations, elementary combinatorics and probability, graphs and trees" More precisely, we will cover the following topics from the textbook in the following order (the topics in bold are the ones I'll spend a bit more time on):

  1. Introduction: Variables, Sets, Functions (Chapter 1)
  2. Mathematical Logic (Chapter 2, 3)
  3. **Number Theory and Introduction to Proofs** (Chapter 4)
  4. **Induction** (Chapter 5)
  5. Set Theory and Cardinality (Chapters 6, 7)
  6. Relations (Chapter 8)
  7. **Combinatorics and Probability** (Chapter 9)
  8. Graphs and Trees (Chapter 10)

  Warning: As you can see, we have lots of grounds to cover in the coming 12 weeks, and this course will move at a *very* fast pace (I'm planning on covering roughly one chapter a week). It is your responsibility to be up-to-date with the material, so don't fall behind.

  A special note for Computer Science-majors: If you're planning on pursuing a computer science major, please pay particular attention to the following topics:
  - ▶ Induction on the natural numbers (Chapter 5)
  - ▶ Basic Combinatorics (Chapter 9)
  - ▶ Basic discrete Probability (Chapter 9)
  - ▶ Functions (Chapter 7), Relations (Chapter 8), and Various Proof Techniques (Chapter 4).

- **What this course is *really* about:** I highly doubt that you'll forget the techniques you'll learn in this course because they are essential to human surival. That said, as Steve Krantz puts it in his book *"How to teach Mathematics,"* there is another goal of teaching this course. Namely, *real* purpose of this course is to teach you about *mathematical discourse* and critical thought. Just like in rhetoric, philosophy or politics, mathematics has its own language and way of thinking. How do mathematicians deal with an unknown problem? What methods do they use? What do they do when a given method doesn't work? Getting acquainted with all

those different types of discourses is what your college education is really about.

My second goal for you is to offer you a glimpse of the beauty of mathematics through this course. Math 200 is a gorgeous and exciting course, with lots of wonders and suprises, and I will try my best to share its beauty with you.

- **Grading:** All the exams will be in-class exams.
  - ▶ 15 % Homework, due on Fridays at 9:50 AM in 105 Bronfman Hall.
  - ▶ 20 % Midterm 1, Friday, March 10 (during class time)
  - ▶ 20 % Midterm 2, Friday, April 21 (during class time)
  - ▶ 45 % Final Exam, Saturday, May 13 - Sunday, May 21 (**self-scheduled**)

  IMPORTANT NOTE: You will be graded on a curve, which means that it only matters how you do *relative* to others. It may happen that you get homework and exam scores that are lower than what you're used to in other classes, but that doesn't mean that you will end up getting a low grade in the class. For instance, if you have a 70 on the midterm and the average is a 50, then that qualifies as an A. Also, I'm guaranteeing the average grade in the course will be a B+, and scoring in the third quartile of the class (75 % and above) will guarantee you an A (but you can get an A even if you score lower than that)

  Last semester, I assigned the following grades (there were 58 students in the class): 1 A+, 17 A, 7 A-, 10 B+, 7 B, 7 B-, 4 C+, 4 C, 1 C-, 0 D, 0 E. Depending on how well people are doing and on how close the cutoffs are, I'm planning on following roughly the same distribution this semester. **Again, just because your raw score is low it doesn't mean that you'll necessarily get a bad grade in the class.**

- **Homeworks:** Homeworks are due on **Fridays** at 9:50 AM in 105 Bronfman and will be graded by your TAs. You can find the homework assignments on my website. **Your lowest homework will be dropped.** No late homework will be accepted **unless** you have an accommodation letter from the Center of Accessible Education, and unless it's a very minor incident that can be solved within an hour (like you forgetting your homework in your dorm). No electronic copies are accepted, so you are not allowed to scan your homework to the TA. If you can't make it to class, have a friend bring the homework to class. Also, if you forget to put your name on your assignment, you get one excuse, but after that, you

lose 10 % of your assignment grade each after each incident.

Note: You can't do math, especially proof-writing, without practice, so expect the homework to be time-consuming and difficult. **The homework assignments will be heavy,** so do **NOT** start the assignment on Thursday night! Also, due to the nature of this class, the assignments will get harder and harder (especially when we start Chapter 5). On the bright side, your hard work will definitely not be in vain, strong math proof skills are essential to your survival in future courses.

- **Cheating: DON'T!** I *will* catch you, and you will be prosecuted by the full extent of the Williams College law! In particular, by taking this course, you agree to abide by the following honor code:

- **Honor Code:** As a member of the Williams College community, you will act with honesty, integrity, and respect for others. You promise not cheat on the homework and the exams. If you used any outside sources other than the textbook, or collaborated with someone on the homework, you will explicitly cite it, and, on the exams, you may not use any books, notes, and/or portable electronic devices. You are also not allowed to look at solutions to homework assignments from the previous semester.

- **Accommodations:** Students who may need disability-related accommodations are encouraged to talk to me and the deans as soon as possible. Moreover, according to Williams policy: "Any student who is unable, because of his or her religious beliefs, to attend classes or to participate in any examination, study, or work requirement on a particular day shall be excused from any such requirement, and shall be provided an opportunity to make up such requirement which s/he may have missed because of such absence now-provided, however, that such makeup examination or work shall not create an unreasonable burden upon the College. No adverse or prejudicial effects shall result to any student."

- **Finally:** Sit back, relax, and enjoy the show! Remember that this course is fun and enlightening! I'm really looking forward to an exciting semester together! :)

- **Note:** On the next page, you can find a tentative schedule of the lectures.

#		Date	Section	Lecture Title	
1	F	Feb 3	1.1, 1.2, 1.3	Introduction	
2	M	Feb 6	2.1	Mathematical Logic	
3	W	Feb 8	2.2, 2.3	Conditional Statements	
4	F	Feb 10	3.1, 3.2	Quantifiers	HW 1 due!
5	M	Feb 13	3.3, 3.4	Multiple Quantifiers	
6	W	Feb 15	4.1	Introduction to Proofs	
	F	Feb 17		No class (Winter Carnival)	
7	M	Feb 20	4.2, 4.3	Number Theory (I)	HW 2 due!
8	W	Feb 22	4.4	Number Theory (II)	
9	F	Feb 24	4.5, 4.6	Indirect Proofs	HW 3 due!
10	M	Feb 27	4.7	Three Little Proofs	
11	W	Mar 1	8.4	Bye Bye, Number Theory!	
12	F	Mar 3	5.2, 5.3	Induction (I)	HW 4 due!
13	M	Mar 6	5.2, 5.3	Induction (II)	
14	W	Mar 8	5.4	Strong Induction	
15	**F**	**Mar 10**		**Midterm 1**	**Covers Lec 1 – 13**
16	M	Mar 13	5.6, 5.7	Recursive Sequences	HW 5 due!
17	W	Mar 15	5.8	Dif-fun-rence quations	
18	F	Mar 17	6.1	The Joy of Sets	HW 6 due!
				Spring Break	
19	M	Apr 3	6.2, 6.3	Ready... Set... Theory!	
20	W	Apr 5	6.4	Set Theory Paradoxes	
21	F	Apr 7	7.1, 7.2	Fun-ctions (I)	HW 7 due!
22	M	Apr 10	7.2, 7.3	Fun-ctions (II)	
23	W	Apr 12	7.4	Cardinality (I)	
24	F	Apr 14	7.4	Cardinality (II)	HW 8 due!
25	M	Apr 17	8.1, 8.2, 8.3	Relations	
26	W	Apr 19	9.1, 9.2	Counting (I)	
27	**F**	**Apr 21**		**Midterm 2**	**Covers Lec 12 – 25**
28	M	Apr 24	9.2, 9.3	Counting (II)	HW 9 due!
29	W	Apr 26	9.4	The Pigeonhole Principle	
30	F	Apr 28	9.5	Combinations (I)	HW 10 due!
31	M	May 1	9.6	Combinations (II)	
32	W	May 3	9.7, 9.8	Applications of $\binom{n}{r}$	
33	F	May 5	9.8, 9.9	Conditional Probability	HW 11 due!
34	M	May 8	9.1, 9.9	Probability Paradoxes	
35	W	May 10	10.1, 10.2	Graph Theory (I)	
36	F	May 12	10.2, 10.5, 10.6	Graph Theory (II)	HW 12 due!
		TBA		**Final Exam**	**Covers Lec 1 – 36**