Math 184, Spring 2023, Midterm 1 study guide

At the end you will find the cover page for the midterm. Please read the instructions ahead of time so that there aren't any surprises. Particularly important:

- It will take place during lecture, Center 216, on April 25.
- This is a closed-book, closed-note exam. Just bring something to write with.
- Bring your ID.
- We will end at 10:45 (5 minutes early) to allow time for collecting exams.

1. Content

Midterm 1 covers the contents of Lectures 1–4, which is up to and including Section 3.1 in the course notes:

- Induction is *not specifically* on the exam. This was meant to be review.
- Methods to deal with bijections (sum principle, subtraction principle, product principle, and actually finding bijections)
- Falling factorials
- Permutations (and variations)
- Words and the problems they apply to
- Choice problems: subsets, multisets, Poker hands
- (Weak) compositions and the problems they apply to

Understanding how to do all of the problems (by yourself, without referencing notes) in Homeworks 1 and 2 is the best way to prepare. Almost all of the problems will be related to something in the homework.

I prefer to emphasize methods and techniques rather than formulas. Of course, remembering formulas is important, but you should think of it as secondary to understanding *how* to solve the homework problems.

You can review the podcasted lectures through the "media gallery" in Canvas. Unfortunately, the camera was not working for Lecture 3. For that lecture, you can reference the two videos from Winter 2022 posted there. The relevant portions are Jan6: 48:30-end and Jan11: 00:00-20:00

2. Study advice

Here are some miscellaneous tips:

- Start early. Generally speaking, spreading out your studying across many days is much more effective than cramming the night before.
- When studying problems, it is best to try to do them without looking at any notes and only look at them when you get stuck. This is the best way to develop intuition.
- Form study groups. I will create text/voice channels for exam studying. I will check the text channel and answer questions as they come up, but I'll stay out of the voice channel so feel free to use it for impromptu study sessions or to form your own.
- Try to think up your own problems and exchange with friends.
- The discussion session on April 24 will be reserved for midterm review, but to be most effective, you should bring questions.
- Take advantage of office hours to clear up any confusions, no matter how minor.

3. Fall 2019 practice exam

I've posted Midterm 1 from fall 2019 on the course site. Some differences:
- I did not cover falling factorials that time, so it's missing
- There are problems about set partitions but we haven't gotten that far yet, so ignore them.
- That was a 50 minute exam. You will have 75 minutes, and so the exam will be a little bit longer (but not 50% longer).

Still, it might be useful for you to try to take this exam in a 50 minute period without looking at your notes to see where you stand. I recommend doing this only after you have made a serious effort to study the material.

4. Extra practice from Bóna

If you want additional practice with the material, I have highlighted relevant exercises from **4th edition** of the textbook.

All of these have solutions in the book (problems are essentially the same in the third edition).
- Chapter 3: 1-3, 6-12, 14-15, 18-20, 23

The following do not have solutions in the book. I will not provide a solutions manual due to time constraints. However, I am happy to discuss these problems either in office hours or over Discord.
- Chapter 3: 27-37, 41-42, 44-47, 49-50, 52-55
- Chapter 5: 18, 21, 23-26, 36-37

If you're using the third edition, the numbering is a little different and some problems are missing, but there's still a lot here:
- Chapter 3: 25-33, 37-38, 40-43, 45-46, 48-51
- Chapter 5: 17, 20, 22-25, 35-36

Math 184, Midterm 1
Instructor: Steven Sam
April 25, 2023
9:30AM – 10:45AM

Your name:

(Try to use the exact name that is in Gradescope, since it will be automatically matched.)

Student ID:

- **No books, materials, notes, cell phones, calculators, etc.** Consulting other students or any other sources is considered an **academic integrity violation** and will be treated as such.

- Pages will be separated for scanning. **Write your name at the top of each page.** Also, make sure to write **legibly** and **dark enough** and **not too close to the edges of the paper**.

- By default, write your answers only in the space provided. The extra blank sheets can be used for your solution, but **clearly indicate** in the problem if you want the extra sheets to be graded.

- Cross out / erase irrelevant scratch work. If you write incorrect statements without crossing them out, you may lose points. **Make clear what your final answer is.**

- Answer should always have explanations. **You may lose points otherwise.**

- If you finish early, double-check your work and make sure you followed the above instructions. When you're ready, you may turn it in and leave.

- To turn in exam, show your ID and make sure your name is checked off the list.

Good luck!