MATH 155R - COMBINATORICS
INFORMATION ON THE MIDTERM

When? The midterm will take place on Thursday, October 17, 2019, from 10h30am to 11h45am in room SC-222 (the usual class time and place). If you cannot take the exam at that time (for example because of a religious holiday or a university event), please let me know as soon as possible (`sebv@math.harvard.edu`).

What is covered? The midterm will cover everything discussed in class until Tuesday, October 8, as well as the material introduced in assignments 1-6 (your answers may use the material seen later, but it will not be tested in the exam). For your convenience, the following lists the topics discussed in class (up to and including the October 8 class), with corresponding chapters and sections in Matoušek-Nešetřil.

- Orderings: Chapter 2.
- Basic counting: Section 3.1, 3.3, estimates for the factorial and binomial coefficients: 3.5, 3.6 (3.6.2, 3.6.3 were not discussed), the inclusion-exclusion principle: 3.7, 3.8 (but 3.8.2 was not discussed).
- Graphs: 4.1 (did not talk about number of nonisomorphic graphs), 4.2 (did not talk about adjacency matrix), graph scores: 4.3 (did not prove the score theorem in class), Eulerian graphs: 4.4, 4.5, 2-connectivity: 4.6, extremal graph theory: 4.7, 7.3.
- Trees: 5.1, 5.3, 5.4, 5.5., 8.1, 8.2
- Graph drawing: 6.1, 6.2, 6.3.1.

What can I use during the exam? You may only use your brain, an eraser, and a pen. Scratch paper will be provided if needed. You may *not* use any other documents: textbooks or personal notes are *not* allowed. You also may *not* use a calculator (you will not need one anyway).

What will the exam look like? The exam will have four problems and one extra credit question. The first problem will ask you to state (without proofs) results or definitions seen in class. The second problem will ask you whether several statements are true or false (you will also have to give a brief justification). The third problem will ask you to give the proof of a result seen in class. Finally, the fourth and extra credit problems will ask you for proofs (or disproofs) of statements

Date: October 10, 2019.

that you have (probably) not seen before. These could for example be statements about counting, graphs or orderings. I will try to make the problems slightly easier than in your homework, but your answer will be expected to have the same level of details as in the homework.

What can I do to prepare for the exam? Make sure you understand all of the homework and the course material. A sample exam is available on the course website. Try to solve it! You can also try to do the problems at the end of each section in the textbook (the first few problems are usually easier). You can find solution and/or hints to some of those at the end of the book.