Exam 1 Review

Math 335

The first exam for Math 335 will take place on **Wednesday, February 24**. You will be able to choose any 90-minute time window during that day (from 12:01am to 11:59pm) to complete the test. The questions will be posted on iLearn, and you'll submit your solutions by either hand-writing and scanning them or by writing them on a tablet and saving to a PDF. It will cover everything we learned up through the previous Friday's class, meaning:

1. Introductory topics (modular arithmetic and symmetries of a square)
   (a) The definition of $a \equiv b \mod n$, and adding/multiplying/reducing modulo n
   (b) The list of symmetries of a square and how to compose them
2. Definition and basic properties of groups
   (a) The definition of a group, and proving that a certain set is or isn't a group
   (b) Examples and non-examples of groups
   (c) The cancellation property: $b * a = c * a \Rightarrow b = c$
   (d) The definition of abelian
   (e) Uniqueness of identity and inverses in a group
3. The symmetric group
   (a) The definitions of injective, surjective, and bijection
   (b) The definition of the symmetric group S_n
   (c) Moving between cycle notation and function notation
   (d) Calculating compositions and inverses in cycle notation
   (e) Disjoint cycles commute
4. Orders of elements in groups
   (a) The definition of order of an element
   (b) Calculating orders of specific elements in specific groups
   (c) $g^k = e$ if and only if $\text{ord}(g) \big| k$
   (d) The formula for the order of an element in S_n
5. Subgroups
   (a) The definition of a subgroup (including the definitions of proper and nontrivial)
   (b) Examples and non-examples of subgroups

You will be able to use your notes or books, but you will not be allowed to get help from any other person. Stylistically, you can expect a mixture of

- example problems ("give an example of ...."),

- short computations (e.g. "compute the composition of these two elements of S_3"), and
- short proofs (e.g. "prove that the following is a group").

The proofs will not be as involved as the sorts of things you do on your homework; think more along the lines of what you do on your in-class worksheets. For a sample of the sort of things I've asked in the past, see the "Sample Midterm," which is the actual midterm from my Fall 2019 Math 335 class.

One very good way to prepare for the exam is to review all of the definitions from our class videos (specifically, those that were highlighted as Definition: ...), ideally with flashcards or some other self-testing mechanism. When doing so, test yourself both on the precise definition and on whether you can give both an example and a non-example of the concept. The in-class worksheets are a good source of these examples, and reviewing them is another good way to prepare.

I also encourage you to use each other as a resource! Please let me know if you're organizing a study session over Zoom or some other platform, and (with your permission) I'll advertise it to the class.