MIDTERM 2 TOPICS

Here is a list of topics covered by the second midterm. The exam will cover all of the material we will have covered beforehand. Most of the emphasis will be on the material covered since the first midterm (roughly the latter half of chapter 3 and all of chapter 4 in Dummit and Foote), although you will also be responsible for the earlier material upon which this builds.

Here is a partial list of topics:

- composition series, simple groups, the Jordan-Hölder theorem
- lattices of subgroups, the fourth isomorphism theorem
- basics of group actions: orbits, stabilizers, kernels, transitive actions, orbit-stabilizer theorem
- groups acting on themselves by left multiplication, Cayley's theorem
- groups acting on themselves by conjugation, conjugacy classes, the class equation, Burnside's lemma
- conjugacy classes and centralizers for symmetric groups and alternating groups, simplicity of alternating groups
- Sylow's theorems and applications (determining the size of a group's center, counting the number of Sylow p subgroups of a given group, etc).

Here are some examples of proofs you should understand well (don't be surprised if one or more of these appear on the midterm):

- Cauchy's theorem for abelian groups (without using Sylow's theorems)
- Cayley's theorem
- Sylow's theorems
- A_n is simple for $n \geq 5$
- Cauchy's theorem for all finite groups (using Sylow's first theorem)
- showing that a group of a given order cannot be simple (c.f. problem 2 on pset 7).