

Math 113 Review for final exam

Material covered

You are responsible for all of the material covered in class and on homework.

Here are the sections we covered from DF

- **Groups** Chapter 0, Sections 1.1-1.3, 1.6-7, Chapter 2, sections 3.1-3.3, sections 4.1-2, and some selections from the rest of ch. 4 including Sylow's Theorems.
- **Rings** 7.1, 7.2 not including the part on "group rings", 7.3 (we didn't talk about isomorphism theorems 2, 3 and 4), 7.4. Instead of 7.5, there is a reading about fields of fractions on the course website. 7.6, 8.1, and 8.2 but not including the part on "Dedekind-Hasse norms.", 8.3, 9.2-9.4 not including any parts on polynomial rings in multiple variables (e.g. $R[x, y]$).
- **Field Extensions** The parts of 13.1 and 13.3 that were covered in class.

Vocabulary

You should know all of the vocabulary from the previous review sheets. Additionally, be able to define and give an example of the following new terms:

Unique factorization domain, reducible, irreducible, root (of a polynomial), subfield, field extension, degree of a field extension.

Practice for the exam

1. *Homework.* Make sure you can do all the problems on the problem sets!
2. *Previous review sheets and exams.* Make sure you can do the problems from the review sheets for test 1, the midterm, and test 2. Make sure you can answer all the questions from the midterms and tests!
3. *Practice Exam.* A practice exam will be posted to the course website during the middle of review week.
4. *Some additional problems* from DF, covering material since test 2.
8.3 #1, 2.
9.2 # 6a-c, 9 9.3 # 3
9.4 # 5, 9.
Chapter 13: Give examples of field extensions of \mathbb{Q} of degree 2, 3, and 4. Give an example of a field extension of \mathbb{Q} of infinite degree, and explain why it is of infinite degree. Give an example of a field extension of \mathbb{R} .
More problems on fields: Show that the map $\phi(a + b\sqrt{2}) = a - b\sqrt{2}$ is a field isomorphism of $\mathbb{Q}(\sqrt{2})$. Does the same idea work for $\mathbb{Q}(\sqrt{D})$? Challenge: can you describe *all* the possible isomorphisms from $\mathbb{Q}(\sqrt{2})$ to $\mathbb{Q}(\sqrt{2})$?