

Math 415 / 515 Spring 2008 Abrams
Exam 1 - Information

Exam happens Monday March 3

This exam will cover the material from Chapters 22, 23, 26, 27, 29, and 31

It will consist of some short answers / computations, and some proofs.

Specifically, you should know:

Factorization in $F[x]$

The division algorithm in $F[x]$ and consequences

Definition of irreducible polynomials

Factorization properties over \mathbf{Q} (especially Eisenstein's criterion, and that factorization over \mathbf{Q} implies factorization over \mathbf{Z} .)

$F[x]$ is a principal ideal domain

Evaluation homomorphisms

Definition of prime and maximal ideals

$I \leq R$ is maximal (resp. prime) if and only if R/I is a field (resp. integral domain)

Given a field F and an irreducible polynomial $p(x) \in F[x]$, construct a field E which contains (an isomorphic copy of) F and a zero for $p(x)$.

Definition and properties of $\text{Irr}(a, F)$.

Describe $F(\alpha)$ as a vector space over F , and give explicitly the form of each of its elements.

"Finite implies algebraic" theorem (Theorem 31.3) statement and proof.

"Dimensions multiply" theorem (Theorem 31.4) statement and proof

Consequences of the "Dimensions multiply" theorem

Definition of algebraic closure

Theorem 31.15 statement and proof (classifies algebraically closed fields).

Identify irreducible polynomials in $\mathbf{Z}_p[x]$

Additive and multiplicative properties of the field $\mathbf{Z}_p[x]/\langle p(x) \rangle$ where $g(x)$ is an irreducible polynomial in $\mathbf{Z}_p[x]$.

State Zorn's Lemma, and know how it is used in the proofs of Theorem 3.17 and Problem 38 section 31 (done in class).

Reminder: My usual office hours: (EAS 288) Monday and Wednesday 3:45 - 4:20; Tuesday and Thursday 11:45 - 12:15; **and by appointment. However, on the Exam Day (March 3), office will be 3:30 - 4:30 in with Dr. Seung in his office (EAS 282).**

Also: Turn in Homework Assignment 2 on Monday February 25 if you want feedback prior to Exam 1. I'll grade and return assignments which are submitted on Feb 25 by class time on Feb 27. You can also turn it in on Wednesday Feb 27. I will post solutions to homework 2 online on Thursday Feb 28.