

Exam 1 Review Sheet

This exam will cover Chapter 3 and Sections 4.1, 4.2, and the part of Section 4.3 up to Corollary 4.9.

- (1) The following list consists of terms that you may be asked to define, and theorems you may be asked to state.
 - A ring (page 42).
 - A commutative ring (page 42).
 - A ring with identity (page 43).
 - An integral domain (page 46).
 - A field (page 47).
 - A subring or a subfield (page 49).
 - A unit (page 60).
 - A zero divisor (page 62).
 - One-to-one or injective map (page 511).
 - Onto or surjective map (page 512).
 - A bijection (page 513).
 - An isomorphism (page 69).
 - A homomorphism (page 71).
 - Cartesian product (page 507).
 - Leading coefficient (page 84).
 - Degree (page 84).
 - Constant polynomials (page 84).
 - The Division Algorithm in $F[x]$ (where F is a field).
 - Divides (for polynomials) (page 90).
 - Monic (page 91).
 - Relatively prime (page 93).
 - Greatest common divisor (for polynomials) (page 91).
- (2) You should know the statements of the lemmas, theorems and corollaries found in these sections. You will be asked to provide a proof of at least one of the following (the statements will be given): Each of the 5 parts of Theorem 3.12, and Theorem 4.8.
- (3) **Guarantees.** Your exam will have from 4 to 6 problems, some consisting of several parts.
 - (30-40%) You will be asked to state some of the definitions and theorems listed in (1) above and to prove at least one of those listed in (2).
 - You will be asked to prove statements, answer questions and provide examples involving the material on the lists above. The proofs will be in the style of the homework problems, involving the material listed in (1) and (2) above. In particular:
 - You **will** be asked to prove a given subset of a ring is a subring.
 - You **may** be asked to give examples of rings, rings with or without identity, rings that are or are not commutative, integral domains, or fields.
 - You **will** be asked to prove a given function is an isomorphism or a homomorphism, or to create an isomorphism between two given sets.
 - At least one question will deal with a polynomial ring.
 - On a problem in which you are asked to write a proof, you will receive substantial partial credit for correctly setting up the problem and for completely explaining what you want to prove and what your assumptions are, even if you are not able to complete the problem. On the other hand, you must state the definitions that you are asked to recall in a mathematically accurate way; please pay attention to the details! Little partial credit will be given for an incorrect definition.