FINAL EXAM INFORMATION – MATH 2231
December 7, 2009, at 9:00 AM
RB1045

The final exam will cover the following sections of the text book:

Sections 1.1 - 1.3 — Arithmetic in **Z** (omit 1.4)

Sections 2.1 - 2.3 — Congruence

Sections 3.1 - 3.3 — Rings

Sections 4.1 - 4.6 — Arithmetic in $F[x]$

Sections 5.1 - 5.3 — Congruence in $F[x]$ and Congruence-Class Arithmetic

Sections 6.1 - 6.3 — Ideals and Quotient Rings

The final will be 3 hours. You will not be allowed to use a calculator. You will also not be allowed to bring in any notes.

The final will consist of two parts:

Part A [30 pts] Part A consists of questions about the definitions, and examples of the definitions (similar to the midterm). I will also ask you to answer some questions about specific examples, e.g., I may give you a ring and ask you questions about that ring. You will have to do all the questions in Part A.

Part B [30 pts] This part will consist of 10 questions of homework-like problems. You will have to do 6 of the 10 questions. There are more details on the these problems below.

Below are a list of the definitions and theorems you should know.

Definitions and terms. You will need to know the definitions of the following terms and know examples of each term:

b divides a, common divisor, greatest common divisor, least common multiple, relatively prime, prime, composite, a is congruent to b modulo n, the congruence class of a modulo n, a ring, a commutative ring, a ring with identity, an integral domain, a field, a subring, unit, zero divisor, isomorphism, homomorphism, the image of a function, polynomials, constant polynomials, degree, $f(x)$ divides $g(x)$, monic polynomial, the gcd of $f(x)$ and $g(x)$, relatively prime (for polynomials), associate, irreducible, reducible, polynomial function, root, $f(x)$ is congruent to $g(x)$ modulo $p(x)$, congruence class of $f(x)$ modulo $p(x)$, ideal, principal ideal generated by c, finitely generated ideal, a is congruent to b modulo I, coset, quotient ring, kernel, natural homomorphism, prime ideal, maximal ideal.

Theorems. You will need to know the statements of the following theorems, and how to apply them:

Theorem 1.1 (The Division Algorithm), Theorem 1.3, Theorem 1.6 (The Euclidean Algorithm), Theorem 1.11 (The Fundamental Theorem of Arithmetic), Theorem 2.2, Theorem 2.8, Theorem 3.4, Theorem 3.5, Theorem 3.6, Theorem 3.9, Theorem 3.11, Theorem 3.12, Theorem 4.2, Theorem 4.4 (The Division Algorithm in $F[x]$), Theorem 4.5, Theorem 4.7, Theorem 4.8, Theorem 4.11, Theorem 4.13, Theorem 4.14 (Remainder Theorem), Theorem 4.15 (Factor Theorem), Theorem 4.20 (Rational Root Test), Theorem 4.23 (Eisenstein's Criterion), Corollary 4.27, Theorem 4.29, Theorem 5.2, Corollary 5.5, Theorem 5.9, Theorem 5.10, Theorem 6.1, Theorem 6.2, Theorem 6.5, Theorem 6.10, Theorem 6.13 (First Isomorphism Theorem). Theorem 6.14, Theorem 6.15, Corollary 6.16

For Part B, some of the questions will involve giving a proof to one or more of the following theorems:

Theorem 4.2, Theorem 4.8, Theorem 5.2, Theorem 5.9, Theorem 6.5, Theorem 6.10