

MIDTERM INFORMATION MATH 2231

Friday, Oct. 30, 2009 at 10:30

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The midterm will cover the following sections of the text book:

Sections 1.1 - 1.3 — Arithmetic in  $\mathbf{Z}$  (not 1.4)

Sections 2.1 - 2.3 — Congruence

Sections 3.1 - 3.3 — Rings

The mid-term will be 50 minutes. You will not be allowed to use a calculator. You will also not be allowed to bring in any notes. 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, multiplicative inverse, zero divisor, isomorphism, homomorphism, the image of a function.

**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 1.8, Theorem 1.11 (The Fundamental Theorem of Arithmetic), Theorem 2.2, Theorem 2.3, Theorem 2.6, Theorem 2.8, Theorem 3.1, Theorem 3.4, Theorem 3.5, Theorem 3.6, Theorem 3.9, Theorem 3.11, Theorem 3.12

I will also ask you to prove one of the following theorems:

Theorem 2.3, Theorem 2.8, Theorem 3.9, Theorem 3.11

**Exam Format.** The exam will be based on the material above. The questions will have the following form:

1. **[15 pts]** There will be five questions which will ask you to write a definition, give an example, or apply a theorem. Some of these questions will involve calculations, e.g. the Euclidean Algorithm.
2. **[15 pts]** There will be 6 proof questions, of which you will have to prove 3. Five of the questions will be new, unseen problems. One question will ask you to prove one of the theorems above [Theorem 2.3, 2.8, 3.9, or 3.11].