

Math 3H03 Midterm 1 Info Sheet

The purpose of this handout is to help you study by listing the concepts, definitions, and results you will need to know for the midterm.

Midterm Information. The midterm will be on Wednesday, February 12, 2020 at 10:30AM. The midterm will take place in

- **HH 302** if your last name is between A-F.
- **T13 123** if your last name is between G-Z.

and will be 50 minutes long (during regular class time). The test contains 5 questions, each worth five points. You will need to do all five questions.

You will *not* be allowed to bring in any notes or use the text book, but you may use the standard McMaster calculator. Please bring your **Student Card**.

Material Covered. The midterm will cover the material we discussed in class about Chapters 1, Chapters 2, and Section 3.1 (this is the same material covered in homework assignments 1 through 4). Below is a breakdown of what you will need to know from each section. Note that when you are learning definitions, it is good to know an example of that definition, and an example of an object that does not satisfy the definition.

Section 1.1. Know the division algorithm and its corollaries. Know what it means for a number to divide another number, and know some of the basic properties of division (e.g. Exercise 1.3 and Theorem 1.3). Know what a common divisor and greatest common divisor are, and know how to use the Euclidean algorithm to find the gcd of two numbers.

Section 1.2. Know what is meant by Bezout's identity, and be able to calculate this identity. Know what it means for two numbers to be coprime and know some of the properties of coprime numbers (e.g., Corollary 1.11).

Section 1.3 Know what a (least) common multiple is. Know Theorem 1.12 (you can know either this proof, or the one I gave in class).

Section 1.4. Know what a linear Diophantine equation is. Know how to solve linear Diophantine equations of the form $ax + by = c$.

Section 2.1. Know the definitions of prime and composite numbers. Know Lemma 2.1 (and Corollary 2.2). Know the Fundamental Theorem of Arithmetic (Theorem 2.3), the identities on page 23 using the primary factorization, and Lemma 2.4. You don't need to know about irreducible or cyclotomic polynomials, and Corollary 2.5.

Section 2.2. Know Theorem 2.6, the definition of p_n , and Corollary 2.7. Know what $\pi(x)$ is, and how to estimate this value (i.e., the Prime Number Theorem). Know Dirichlet's Theorem (Theorem 2.10).

Section 2.3. Know what a Fermat number and prime are. Similarly, know what a Mersenne number and prime are. Know Lemma 2.11 and Theorem 2.13.

Section 2.4. Know Lemma 2.14, and some of the divisibility "tricks" discussed in class (see after the proof of Lemma 2.14). Know what we mean by the Sieve of Eratosthenes.

Section 3.1 Know what is meant by $a \equiv b \pmod{n}$. Know Lemmas 3.1, 3.2, and 3.3. Know what is meant by a complete set of residues \pmod{n} least non-negative residue \pmod{n} , and least absolute residues \pmod{n} . Know Theorem 3.4 and Lemma 3.5. Be able to do problems like Exercise 3.4.

If you have questions, please feel free to email me. Good luck!