

## Math 3GR3 Final Exam Info Sheet

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

**Final Information.** The exam will be on Monday, December 17, 2018 at 4:00PM. The exam will take place in

**L.R. Wilson Hall B1007**

and will be 2.5 hours long. There are two parts to the exam. The first part consists of computational type problems and definition type problems. In the second part, eight questions are given, of which you must do five (see below for more on this). The exam will be out of 50.

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 final exam is cumulative, although there is an emphasis on the material since the last exam. Below is a breakdown of what you will need to learn from Chapters 16 and 17. See the exam review sheets for the other chapters. 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 16.1.** Know what a ring is. Know what the identity is. Know the various types of rings, e.g., commutative ring, integral domain, division ring, field. Know what a unit and zero-divisor is. Know what a subring is, and know how to check if a subset is a subring (e.g., see Proposition 16.10).

**Section 16.2.** Know Proposition 16.15 and Theorem 16.16. Know what we mean by the characteristic of a ring. Know which rings  $\mathbb{Z}_n$  are domains and/or fields. Know Theorem 16.19.

**Section 16.3.** Know the definition of a ring homomorphism and ring isomorphism. Know what we mean by the kernel of a ring homomorphism. Know the properties of a ring homomorphism (e.g., Proposition 16.22). Know what an ideal is. Know what a principal ideal is. Know Theorem 16.25 and Proposition 16.27. Know how to construct the quotient ring. Know what we mean by the natural homomorphism. Know the First Isomorphism Theorem for rings. (You do not need to know the Second and Third Isomorphism Theorems for rings).

**Section 16.4.** Know what it means for an ideal to be maximal and for an ideal to be prime. Know Theorem 16.35 and Proposition 16.38. Also know Corollary 16.40.

**Section 17.1.** Know what a polynomial is, and what the polynomial ring is. Know the terms indeterminate, leading coefficient, and degree. Know Theorem 17.3 and Proposition 17.4.

**Section 17.2.** Know the Division Algorithm (Theorem 17.6) for polynomials. Know Corollary 17.8 and 17.9. You do not need to know about the greatest common divisors of two polynomials and you do not need to know about Proposition 17.10.

**Section 17.3.** Know what it means for a polynomial to be irreducible. As well, know Eisenstein's Criterion and how to apply it to test if a polynomial is irreducible. You do not need to know about the material in the section "Ideals in  $F[x]$ ". Note that although we discussed some material in Chapter 18, you do not need to know this material.

**Additional Information.** One question will be similar to Question 3 of Section 17.4 and one question will be similar to Question 8 of Section 17.4. As well, among the 8 problems in the second part of the test, I will ask you to write out a proof to one (or more) of the following results: Proposition 3.31, Proposition 11.4 Part 3, Proposition 16.27, and Corollary 17.8.

**Final Mark.** Your mark will be calculated in two different ways. I will take the higher of the two methods.

**Weight 1.**

- Homework/Quizzes =30%
- Two midterm tests  $2 \times 15\% = 30\%$
- Final Examination 40%

**Weight 2.**

- Homework/Quizzes =30%
- Maximum among {Midterm 1, Midterm 2} = 15%
- Final Examination 55%

If you have questions, please feel free to email me. You can also arrange to meet with me in my office (or simply drop by to see if I'm in). Good luck!