

## Math 3GR3 Midterm 2 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 Thursday, November 16, 2017 at 1:30PM. The midterm will take place in

### University Hall 213

and will be 50 minutes long. There are two parts to the midterm. The first part consists of computational type problems and definition type problems. In the second part, five questions are given, of which you must do three.

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 6, 9, 10, and 11. 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 6.1.** Know what a (left and right) coset is. Know Lemma 6.3 which allows you to determine if two cosets are the same. Know Theorem 6.4. Know what is meant by the index of a subgroup in a group, and how to compute it.

**Section 6.2.** Know Lagrange's Theorem (Theorem 6.10), and its corollaries: Corollary 6.11, 6.12, and 6.13. Know that the converse of Lagrange's theorem is false (i.e., Proposition 6.15).

**Section 6.3.** Know what the  $\phi$  function is. Know Euler's Theorem and Fermat's Little Theorem.

**Section 9.1.** Know what it means for two groups to be isomorphic, and be able to prove two groups are isomorphic. Know the properties of isomorphisms (e.g., see Theorem 9.6). Know Theorems 9.7 and 9.8, which classifies all cyclic groups. Know Cayley's Theorem.

**Section 9.2.** Know how to make the external direct product of two groups. Know how to compute the order of elements in an external direct product (e.g. Theorem 9.17). Know Theorem 9.21. Know what we mean by an internal direct product, and know Theorem 9.27.

**Section 10.1.** Know what it means for a subgroup to be normal. Know how to test whether or not a subgroup is normal (Theorem 10.3). Know what we mean by a factor group, how to construct such a group, and know its group operation.

**Section 10.2.** You should know what a simple group is (plus examples). As well, you should know Theorem 10.11, although you do not need to know the proof.

**Section 11.1.** Know what is meant by a group homomorphism. Know the properties of group homomorphisms (Proposition 11.4). Know Theorem 11.5.

**Section 11.2.** Know what is meant by the natural homomorphism. Know the First, Second, and Third Isomorphism Theorems. Know Theorem 11.13.

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