Math 2513
Review for Third Exam
Nov. 16, 2012

The third exam will be over the material in sections 4.3, 5.1, 5.2 and 6.1 of the text, covered on Assignments 8, 9, 10, and 11. Below is a review of these sections in the text.

4.3. Primes and greatest common divisors. In class we covered the material in this section on pages 257, 258, 259, and pages 265 to 270. You should know the definition of a prime, the Fundamental Theorem of Arithmetic on page 258 (which says that every number can be written as a product of primes in a unique way — this is called the "prime factorization" of the number), Theorem 2 on page 258, and what the sieve of Eratosthenes is (this is easy). You should also know the definition of greatest common factor and least common multiple of two numbers, and the relation between them ($ab = \gcd(a, b) \cdot \mathrm{lcm}(a, b)$); and be able to use the Euclidean algorithm to (i) find the greatest common factor of two numbers and (ii) express the greatest common factor of two numbers as a linear combination of the two numbers (see Example 17 on page 270).

5.1. Mathematical induction. In this section, the author describes the principle of mathematical induction and gives a number of examples showing how various (mostly unrelated) statements can be proved by induction. We covered a few of these examples in class: namely, Examples 1, 5, 8, and 9 (or if not those exactly, then very similar ones). We also gave several other examples not in the text. In reviewing for the exam it would be a good idea to try reading some of the other examples in this section, and to try some of the problems at the end of the section that you haven't tried yet. Notice also the "template" on page 329 for writing up proofs by induction. I don't require you to use this or any other particular template, but it wouldn't hurt for you to develop a standard way of your own for writing up inductive proofs, so you don't have to think about how you will write things up on the exam.

5.2. Strong induction. Review the principle of strong induction, which is stated in the blue box on page 344, and the more general version stated in the blue lines headed "BASIS STEP" and "INDUCTIVE STEP" just before Example 4 on page 337. In class we did Example 4 (or one very like it), and also worked out problems 10 and 17 at the end of the section. You can also see the solution to problem 8 at the end of the section, as written up by one of the students in the class, on the course web page.

6.1. The basics of counting. The main ideas in this section are the "product rule" on page 386, the "sum rule" on page 389, the "subtraction rule" on page 393, the "division rule" on page 394, and tree diagrams on pages 394–395. Just reading those rules won't help much, however — to see what the rules mean, you really need to read some of the examples and do others on your own. Examples 1, 2, 3, 4, 5, 6, 10, 12, 13, 15, 16, 18, 19, 20, 21, and 22 are simple and instructive. However, there's nothing special about these examples — perhaps the best way to spend your study time would be to try odd-numbered problems from the end of the section, come up with an answer, and THEN check your answers against the ones in the back of the book — and if you got a different answer than the book's, make sure you figure out exactly what went wrong so you won't do it again. (A BAD way to spend your study time would be to look at a problem at the end of the section and read the answer in the back of the book to figure out how to do it.)