

Preliminaries

The midterm will be given without the use of aids of any kind. You will have one hour to complete the midterm. The midterm will cover Chapters 7-10. All of the problems will be proofs. For some problems, you will be asked to use a particular technique to prove a statement. For others, it will be your choice what method to use. In all cases, you are expected to write complete, formal, appropriately detailed proofs.

Definitions

For all of the terms below, you must be able to formally state and use the definition from your textbook.

1. odd, even, same parity, opposite parity
2. divides, multiple, divisor
3. prime
4. greatest common divisor, least common multiple
5. congruent modulo n
6. rational number, irrational number
7. subsets, set equality

All of the terms below should be familiar to you.

1. element of a set, cardinality of a set, set builder notation, natural numbers, integers, rational numbers, irrational numbers, real numbers, interval notation
2. ordered pair, Cartesian product, ordered n -tuple
3. subset, the power set of a set
4. union, intersection and difference of two sets, complement of a set
5. the mathematical meaning of *and*, *or* and *not*, conditional statement, biconditional, quantifiers, logically equivalent, contrapositive, negation

Proof Techniques

1. direct proof
2. using cases
3. by contrapositive
4. by contradiction
5. if-and-only-if proofs

6. existence statements
7. proofs involving sets (that is, statements including $A \subseteq B$ or $A = B$)
8. methods of disproving statements
9. proof by induction (both strong and weak)

Things to Keep in Mind

1. If a proof technique is not prescribed, you **MUST** state the method you are using.
2. You should put in the “boiler-plate” language even if you cannot figure out the whole proof.
3. You should expect to *use* all of the hypotheses.
4. I will *not* ask you to prove something that is false.