

# Math 187 Assignment III

Dr. Holmes

June 14, 2004

This assignment is due Thursday, June 16.

1. Write down definitions completely in math notation for the following. In order to avoid mathematical English, you will need to use quantifiers and possibly other logical notation.

(a) The set of all natural numbers which are divisible by 7.

(b) The set of all natural numbers which are perfect cubes.

2. Let  $A = \{1, 3, 5, 7\}$ . Let  $B = \{1, 2, 3, 4\}$ . Let  $C = \{2, 5\}$ .

Compute the following sets.

(a)  $A \cup C$

(b)  $A - C$

(c)  $(A \cap B) \cup C$

(d)  $\mathcal{P}(A)$  (the power set of  $A$ ).

3. Use the method of Venn diagrams to provide an illustration of the proof of the equation

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C).$$

Make appropriate use of shadings (with keys) to indicate how you compute the sets and be sure to clearly outline the sets represented by the main expressions.

4. Use Venn diagrams to construct a counterexample to

$$A - (B - C) = (A - B) - C.$$

The sets in your counterexample should be finite sets of natural numbers presented in list form.

5. Prove the right distributive property

$$(a + b)c = ac + bc;$$

we did this in class, so what I expect is a detailed step by step proof using axioms 1-9 and clearly indicating what axiom is used at each step.

6. Give a complete, step-by-step proof of the identity

$$(a + b)(c + d) = (ac + ad) + (bc + bd),$$

using only axioms 1-9 and clearly justifying each step.