

## MA196X Problem Set 2

**Instructions:** Please first read the rules on the presentation of assignments in the course. Then complete as many of these as you can by Thursday, April 2nd. After that, I will still accept problems until the sample solutions have been distributed.

**Note:** Always identify each problem by its problem number before stating the problem.

For each of the following five problems, first state the problem precisely and then give a proper proof of the statement using English sentences.

7. For all sets  $A$ ,  $B$  and  $C$ , if  $A \subseteq B$  and  $A \subseteq C$ , then  $A \subseteq B \cap C$ .
  8. For all sets  $A$ ,  $B$  and  $C$ ,  $C - (A \cup B) = (C - A) \cap (C - B)$ .
  9. For all sets  $A$ ,  $B$  and  $C$ , if  $(A \cap B) \cup C \subseteq A \cap (B \cup C)$ , then  $C \subseteq A$ .
  10. For all sets  $A$ ,  $B$  and  $C$ ,  $(A - B) - C = A - (B - C)$  if and only if  $A \cap C = \emptyset$ .
  11. For all sets  $A$ ,  $B$ ,  $C$  and  $D$ , if  $A \subseteq C$  and  $B \subseteq C \cup D$ , then  $A \cup B \subseteq C \cup D$ .
12. Each of the following statements is false. For each, first write the statement, then write the negation of the statement in English and then provide a counterexample, with a brief explanation.
- (a) For all sets  $A$  and  $B$ ,  $A \cup B = (A - B) \cup (B - A)$ .
  - (b) For all sets  $A$  and  $B$ ,  $A \cap B \neq A - B$ .
  - (c) For all sets  $A$  and  $B$ , if  $A \cup B = A$ , then  $B = \emptyset$ .
  - (d) For all sets  $A$ ,  $B$  and  $C$ ,  $A \cap (B \cup C) = (A \cap B) \cup C$ .