

**Examlet 2      Foundations of Advanced Math      2/24/06**

1. a) Find  $\{1, 2, 3, 4\} \cap \{3, 4, 5, 6\}$ .

b) Find  $(2, 5) \cup [4, 10]$ .

c) Find  $(2, 5) - [4, 10]$ .

d) Find  $\{3, 7\} \times \{-1, 0, 1\}$ , where “ $\times$ ” indicates the Cartesian product.

e) Solve the inequality  $|2x - 1| \leq 5$ , and write your answer as an interval or union of intervals.

2. State and prove the triangle inequality.

3. Let  $\{A_i / i \in I\}$  be an indexed family of sets, and let  $B$  be any set, all subsets of some universal set  $U$ . Show that  $B \cap \bigcup_{i \in I} A_i = \bigcup_{i \in I} (B \cap A_i)$ .

4. If  $A$  and  $B$  are bounded sets of real numbers,  $A \cup B$  is bounded as well.

5. Let  $A$ ,  $B$ ,  $C$ , and  $D$  be sets. If  $A \subseteq B$  and  $C \subseteq D$ , then  $A \cap C \subseteq B \cap D$ .

Extra Credit [2 points possible]: If  $A$  and  $B$  are  $n$ -dense sets, then  $A \cap B$  and  $A \cup B$  are also  $n$ -dense.