

**Examlet 2      Foundations of Advanced Math      2/22/08**

1. a) State the definition of the union of two sets.

b) Find  $\{0,1,3,4\} \cap \{0,2,4\}$

c) Find  $(3,5) - (4, \infty)$

2. a) State the definition of the Cartesian product of two sets  $A$  and  $B$ .

b) Find  $\{a, b\} \times \{1, 2\}$ .

c) Find  $\{a, b\} \times \emptyset$ .

3. State and prove the triangle inequality.

4. Let  $\{A_i \mid i \in I\}$  be an indexed family of sets, and let  $B$  be a set. Show that

$$B \cap \bigcup_{i \in I} A_i = \bigcup_{i \in I} (B \cap A_i).$$

5. Suppose that  $a, b \in \mathbb{R}$ . Show that if  $a, b > 0$ , then  $a < b \Leftrightarrow a^2 < b^2$ .