

Assignment #1

Due on Wednesday January 25, 2012

Read Section 1.4 on *Set Theory* in DeGroot and Schervish.

Do the following problems

1. Let \mathcal{C} denote a sample space and A be a subset of \mathcal{C} . Establish the following set theoretic identities:

(a) $A \cap \emptyset = \emptyset$,

(b) $A \cup \emptyset = A$;

where \emptyset denotes the empty set. Justify your steps.

2. Let \mathcal{C} denote a sample space and A and B denote subsets of \mathcal{C} . Establish the following set theoretic identities:

(a) $(A^c)^c = A$,

(b) $(A \cup B)^c = A^c \cap B^c$;

where A^c denote the complement of A .

3. Let \mathcal{C} denote a sample space and A , B and C denote subsets of \mathcal{C} . Prove the following distributive properties:

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

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

4. Let A and B be subsets of the sample space \mathcal{C} . The *set difference* $A \setminus B$ is defined to be

$$A \setminus B = \{x \in A \mid x \notin B\};$$

thus, $A \setminus B$ is a subset of A that contains those elements in A which are not in B .

Prove that

(a) $A \setminus B = A \cap B^c$,

(b) $B \setminus (A \cap B) = A^c \cap B$

5. Suppose that $A \subseteq B$. Prove that $B^c \subseteq A^c$.