MA1971 Name: Solutions

Quiz 2 D Term, 2013

High: 19
Median: 13
Low: 9

Show all work needed to reach your answers.

1. (4 points) Suppose $S = (1,3) \cup [4,7]$. What is $S_{\mathbb{R}}^C$?

$S_{\mathbb{R}}^C = (-\infty, 1] \cup [3,4) \cup (7, +\infty)$

2. (4 points) If X and Y are disjoint sets, what is $X \cap Y$?

$X \cap Y = \emptyset$

3. (6 points) Please prove the following: If A and B are sets, then $A \subseteq B$ iff $\mathcal{P}(A) \subseteq \mathcal{P}(B)$

3 ($\Rightarrow$) Suppose $A \subseteq B$. Let $X \in \mathcal{P}(A)$ (i.e., let X be a subset of A). Then $X \subseteq A \subseteq B \Rightarrow X \subseteq B \Rightarrow X \in \mathcal{P}(B)$. Therefore $\mathcal{P}(A) \subseteq \mathcal{P}(B)$ ▲

3 ($\Leftarrow$) Now suppose $\mathcal{P}(A) \subseteq \mathcal{P}(B)$. Let $x \in A$. Then $\{x\} \subseteq \mathcal{P}(A) \subseteq \mathcal{P}(B)$ which implies that $\{x\} \subseteq \mathcal{P}(B) \Rightarrow x \in B$. Therefore $A \subseteq B$. ■

4. (6 points) Please prove the following: If A and B are sets contained in some universe U, then

$$A \cup B^C \subseteq (A^C \cap B)^C$$

($\subseteq$) Suppose $x \in A \cup B^C$. Then $x \in A$ <u>or</u> $x \in B^C$. So $x \notin A^c$ <u>or</u> $x \notin B$. Then $x \notin (A^c \cap B)$. Finally $x \in (A^c \cap B)^c$, which implies that $A \cup B^c \subseteq (A^c \cap B)^c$ <u>QED</u>