

Set Theory Problem Session 1

1. Show that $A \cap (B \cup C) \subseteq (A \cap B) \cup C$ by taking an arbitrary element from the left hand side and showing that it belongs to the right hand side.

Also show that $A \cap (B \cup C) = (A \cap B) \cup C$ does not always hold.

1. Show that if $A \subseteq B$, then $P(A) \subseteq P(B)$. Does the converse hold: if $P(A) \subseteq P(B)$, then $A \subseteq B$?
2. Prove $A \times (B - C) = (A \times B) - (A \times C)$.
3. Prove $(A \cap B) \times (C \cap D) = (A \times C) \cap (B \times D)$
4. Show that if $X = A \cup B = C \cup D$, then $X = (A \cap D) \cup C \cup B$.
5. If $f : x \rightarrow y$ and $v_i \subseteq y$ for $i \in I$, then

$$f^{-1}\left[\bigcap_{i \in I} v_i\right] = \bigcap_{i \in I} f^{-1}[v_i]$$