Problem Set 1: Discrete Mathematics

1. For all set S, show that $\emptyset \subseteq S$.

2. Prove or give a counterexample: A ∩ P(A) = A.

3. Show that "For all sets A, B, and C, if $A \subseteq B$ and $B \subseteq C$, then $A \subseteq C$".

4. Prove that if $A \subseteq B$ then $\wp(A) \subseteq \wp(B)$.

5. Prove that $\wp(A) \cap \wp(B) = \wp(A \cap B)$.

6. Prove that $\wp(A) \cup \wp(B) \subseteq \wp(A \cup B)$.

7. Give a counterexample to disprove "For all sets A, B, and C, if $A \in B$ and $B \in C$, then $A \in C$".

8. Give a counterexample to disprove "For all sets A, B, and C, if $A \cup C = B \cup C$, then A = B".

9. Show that there exists a set A where $\wp(A) = \{A\}$.

10. Prove or give a counterexample: If $A \subset B$ and $A \subset C$, then $A \subset (B \cap C)$.