1. What is the Cardinality of these sets?
   
   (a) $\emptyset$
   
   (b) $\{\emptyset\}$
   
   (c) $\{\emptyset, \{\emptyset\}\}$
   
   (d) $\{\emptyset, \{\emptyset\}, \{\emptyset, \{\emptyset\}\}\}$

2. Can you conclude that $A = B$ if $A$ and $B$ are two sets that have the same power set?

3. Use a Venn diagram to illustrate the relationship $A \subseteq B$ and $B \subseteq C$.

4. Prove the following where $U$ is a universe of all elements and $A$ is a subset of $U$. The notation $A \cap B$ is the set of all elements in $A$ and in $B$. In other words, the set $\{x \mid x \in A \land x \in B\}$. The notation $A \cup B$ is the set of all elements in $A$ or in $B$. In other words, the set $\{x \mid x \in A \lor x \in B\}$.
   
   (a) $A \cup \emptyset = A$
   
   (b) $A \cap U = A$

5. (a) Find a formula for

   $$\sum_{i=1}^{n} \frac{1}{i \cdot (i + 1)} = \frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \ldots + \frac{1}{n(n + 1)}$$

   by examining the values of this expression for small values of $n$.

   (b) Prove the formula you conjectured in part (a). (Hint: use induction)