1. Prove that if $m$ is an integer, then $\lfloor x \rfloor + \lfloor m-x \rfloor = m - 1$ if $x$ is not an integer, and $\lfloor x \rfloor + \lfloor m-x \rfloor = m$, if $x$ is an integer.

2. Let $A$, $B$, and $C$ be sets. Show that $(A - B) - C = (A - C) - (B - C)$.

3. Determine whether each of these functions from $\mathbb{Z}$ to $\mathbb{Z}$ is one-to-one, or onto.
   a) $f(n) = n - 1$;
   b) $f(n) = n^2 + 1$;
   c) $f(n) = n^3$;
   d) $f(n) = \lfloor \frac{n}{2} \rfloor$.

4. Find $f \circ g$ and $g \circ f$, where $f(x) = x^2 + 1$ and $g(x) = x + 2$ are functions from $\mathbb{R}$ to $\mathbb{R}$.

5. Let $f$ be a function from the set $A$ to the set $B$. Let $S$ and $T$ be subsets of $A$. Show that
   a) $f(S \cup T) = f(S) \cup f(T)$;
   b) $f(S \cap T) \subseteq f(S) \cap f(T)$.

6. Suppose $A$ and $B$ are two sets such that their power sets are equal, $P(A) = P(B)$. Does it follow that $A = B$?