Math 55 Discussion problems 7 Feb

1. 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) $f(S \cap T) \subseteq f(S) \cap f(T)$
2. Let f be a function from A to B. Let S and T be subsets of B. Show that
   (a) $f^{-1}(S \cup T) = f^{-1}(S) \cup f^{-1}(T)$
   (b) $f^{-1}(S \cap T) = f^{-1}(S) \cap f^{-1}(T)$
3. Show that a subset of a countable set is also countable.
4. Show that the set $\mathbb{Z}^+ \times \mathbb{Z}^+$ is countable.
5. Show that the set of real numbers that are solutions of quadratic equations $ax^2 + bx + c = 0$, where a, b, and c are integers, is countable.