

3. Determine if the function $f : \mathbb{Z} \times \mathbb{Z} \rightarrow \mathbb{Z}$ is onto and/or 1-1 if

(a) $f(m, n) = m + n$

(b) $f(m, n) = m^2 + n^2$

(c) $f(m, n) = m$

4. Let $f : \mathcal{P}(X) \rightarrow \mathcal{P}(Y)$ be a function such that for all $S, S' \in \mathcal{P}(X)$, $S \subseteq S'$ if and only if $f(S) \subseteq f(S')$. Prove that f is 1-1.

5. Let $f : X \rightarrow Y$ and $g : Y \rightarrow Z$ be bijections. Show that $(g \circ f)^{-1} = g^{-1} \circ f^{-1}$.