Problem 1. Suppose that $f : A \to B$ and $g : B \to A$ are functions and for all $a \in A$ we know that $g(f(a)) = a$. Which of the following are guaranteed to be true?

A) f is injective

B) f is surjective

C) Both of the above (f is bijective)

D) None of the above

Solution. A) □

Problem 2. Suppose that $f : A \to B$ and $g : B \to A$ are functions and for all $b \in B$ we know that $f(g(b)) = b$. Which of the following are guaranteed to be true?

A) f is injective

B) f is surjective

C) Both of the above (f is bijective)

D) None of the above

Solution. B) □

Problem 3. Let $f : \mathbb{R} \to \mathbb{R}_{\geq 0}$ be the the function $f(x) = \sqrt{x^2}$. Let $g(x) = |x|$. Is $f = g$?
A) Yes B) No

Solution. A) □

Problem 4. Let A be a set and let $B = \{0, 1\}$. Prove that the number of functions $f : A \to B$ is the same as the number of subsets of A.