Exercise 1
How many maps, injective maps, surjective maps and bijective maps $f$ from $A$ to $B$ exist for

(i) $A = \{1\}, B = \{1, 2\}$;
(ii) $A = \{1, 2\}, B = \{1\}$;
(iii) $A = \{1, 2\}, B = \{1, 2\}$;
(iv) $A = \{1, 2, 3\}, B = \{1, 2\}$.

Exercise 2
Find the inverse map $f^{-1}$ and specify its source and target for

(i) $f(x) = -2x$;
(ii) $f(x) = 3 - x$;
(iii) $f(x) = e^{2x} - 1$.

Exercise 3
Let $f: S \to T$ be a map and $A, B \subset S$ be two subsets.

(i) Show that $f(A \cup B) = f(A) \cup f(B)$;
(ii) Show that $f^{-1}(A \cup B) = f^{-1}(A) \cup f^{-1}(B)$;
(iii) Show that $f(A \setminus B) \supset f(A) \setminus f(B)$ and illustrate by example that “$\supset$” cannot be replaced by “$=$” in general.