

Answers to Concept Quiz Sections 6.3-6.5

- 1. Functions on Finite Sets.** Let $\mathbb{Z}_4 := \{0, 1, 2, 3\}$. Set $f := \{(0, 1), (0, 2), (2, 2), (3, 1)\} \subset \mathbb{Z}_4 \times \mathbb{Z}_4$. Which of the following is true about f ? Only one answer, please.
 - ✗ f is a bijection $\mathbb{Z}_4 \rightarrow \mathbb{Z}_4$.
 - ✗ f is a function $\mathbb{Z}_4 \rightarrow \mathbb{Z}_4$, but it is not a surjection.
 - ✗ f is a function $\mathbb{Z}_4 \rightarrow \mathbb{Z}_4$, but it is not an injection.
 - ✓ f is not a function $\mathbb{Z}_4 \rightarrow \mathbb{Z}_4$.
- 2. More Functions on Finite Sets.** Let $\mathbb{Z}_4 := \{0, 1, 2, 3\}$. Set $f := \{(0, 1), (1, 2), (2, 0), (3, 0)\} \subset \mathbb{Z}_4 \times \mathbb{Z}_4$. Which of the following is true about f ? Only one answer, please.
 - ✗ f is a bijection $\mathbb{Z}_4 \rightarrow \mathbb{Z}_4$.
 - ✗ f is a function $\mathbb{Z}_4 \rightarrow \mathbb{Z}_4$ that is not a surjection.
 - ✗ f is a function $\mathbb{Z}_4 \rightarrow \mathbb{Z}_4$ that is not an injection.
 - ✓ f is a function $\mathbb{Z}_4 \rightarrow \mathbb{Z}_4$ that is neither injective nor surjective.
 - ✗ f is not a function $\mathbb{Z}_4 \rightarrow \mathbb{Z}_4$.
- 3. Functions: ISBN.** For each of the following functions, state whether it is only an injection, is only a surjection, is a bijection, or is neither. Only one answer is valid for each question.
 - I** $f: \mathbb{Z} \rightarrow \mathbb{Z}$, where $f(x) = 3x + 1$ for $x \in \mathbb{Z}$.
 - B** $f: \mathbb{Q} \rightarrow \mathbb{Q}$, where $f(x) = 3x + 1$ for $x \in \mathbb{Q}$.
 - I** $f: \mathbb{Q} \rightarrow \mathbb{Q}$, where $f(x) = x^3$ for $x \in \mathbb{Q}$.
 - B** $f: \mathbb{R} \rightarrow \mathbb{R}$, where $f(x) = x^3$ for $x \in \mathbb{R}$.
 - S** $f: \mathbb{C} \rightarrow \mathbb{C}$, where $f(x) = x^3$ for $x \in \mathbb{C}$.