

CSCI 2011 HW 5

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October 25, 2020

1 Chapter 5.3 Problem 28

Let $A = \{1, 2, 3\}$, $B = \{1, 2, 3, 4, 5\}$ and $C = \{1, 2, 3, 4\}$. Also let $f : A \rightarrow B$ and $g : B \rightarrow C$, where $f = \{(1, 4), (2, 5), (3, 1)\}$ and $g = \{(1, 3), (2, 3), (3, 2), (4, 4), (5, 1)\}$,

- (a) Determine $(g \circ f)(1)$, $(g \circ f)(2)$ and $(g \circ f)(3)$.
- (b) Determine $g \circ f$.

2 Chapter 5.4 Problem 24

Prove or disprove each of the following.

- (a) There exists functions $f : A \rightarrow B$ and $g : B \rightarrow C$ such that f is not one-to-one and $g \circ f : A \rightarrow C$ is one-to-one.
- (b) There exists functions $f : A \rightarrow B$ and $g : B \rightarrow C$ such that f is not onto and $g \circ f : A \rightarrow C$ is onto.

3 Chapter 5.5 Problem 12

Prove or disprove: The set $S = \{(a, b) : a, b \in \mathbb{R}\}$ of all points in the plane is uncountable.

4 Chapter 5 Problem 32

Prove that the function $f : \mathbb{R} - \{3\} \rightarrow \mathbb{R} - \{1\}$ defined by $f(x) = \frac{x}{x-3}$ is bijective.

5 Chapter 5 Problem 40

Determine, with explanation, whether the following is true or false. If A and B are disjoint sets such that A is countable and B is uncountable, then $A \cup B$ is uncountable.