Lesson 4 Presentation

Jacob Jashinsky as Scribe and Caleb Spear as Editor

Problem 2.3.2

Mark each statement as True or False. Justify each answer.

a. If $f : A \to B$ and C is nonempty subset of A, then $f(C)$ is a nonempty subset of B.

True. For f to be a function every element in A, which includes the subset C, will map to a $b \in B$. Therefore, $f(C)$ will also be a subset of B.

b. If $f : A \to B$ is surjective and $y \in B$, then $f^{-1}(y) \in A$.

True. Since the function is surjective $\text{rng} f = B$ and $f^{-1} : B \to A$.

c. If $f : A \to B$ and D is nonempty subset of B then $f^{-1}(D)$ is a nonempty subset of A.

False, D may include elements that are not in the range of f, and the inverse of f will not map elements outside of the range back to A.

d. The composition of two surjective functions is always surjective.

True, by Theorem 2.3.20 on page 72, we know that composition preserves properties of being injective and surjective.

e. If $f : A \to B$ is bijective, then $f^{-1} B \to A$ is bijective.

True. Since f is bijective each $a \in A$ maps to a unique $b \in B$. Therefore the inverse would also map every every $b \in B$ back to every element $a \in A$, which would make the inverse bijective.

f. The identity function maps $\mathbb{R}$ onto $\{ 1 \}$.

False. An identity function would map the set $\mathbb{R}$ back onto $\mathbb{R}$.