Assignment 4: Relations, Functions and Introducction to SML

Ernesto Rodriguez
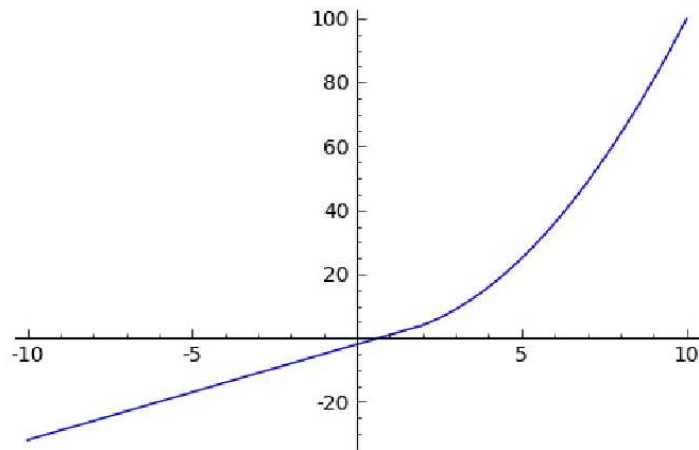
October 6, 2011

1 Problem 1

1.

$$f : \mathbb{R} \to \mathbb{R} : f(x) := \begin{cases} x^2 & \text{if x} \geq 2 \\ 3x - 2 & \text{if x} < 2 \end{cases}$$

Injective: The function is injective since there exists no two x values that return the same value. This is due to the fact that the function is always growing and has no minimum. The picture shows it:

Surjective: The function is surjective because we can write the inverse function namely:

$$f^{-1} : \mathbb{R} \to \mathbb{R} : f(x) := \begin{cases} \sqrt{x} & \text{if x} \geq 2 \\ \frac{x+2}{3} & \text{if x} < 2 \end{cases}$$
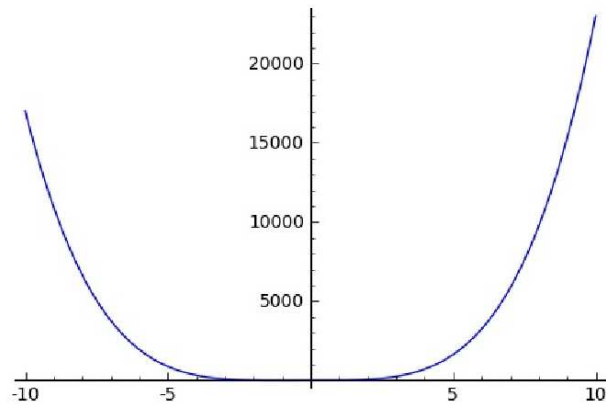
This functions returns values that also belong to $\mathbb{R}$. Though $\sqrt{x}$ can be positive or negative, we are only using the positive part.

Bijective: This function is surjective and injective therefore is bijective.

2.
$$g : \mathbb{R} \to \mathbb{R}, g(x) := 2x^4 + 3x^3 + 4$$

Injective: This function isn't injective. As we can see on the graph, multiple values for x map the same y value.

Surjective: This funciton isn't surjective since it dosen't have an image for all $\mathbb{R}$.

Bijective: This function isn't injective nor surjective so by definition it isn't bijective.