

Functions

Methods: Logic, Part 3b

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Topics covered

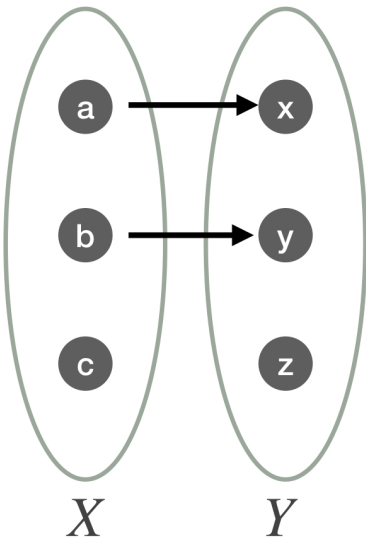
- functions
- properties of functions
 - injective
 - surjective
 - bijective

Functions

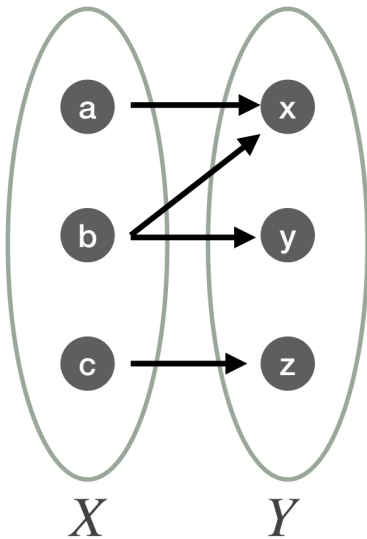
Definition

A function $f : X \rightarrow Y$ is a relation $f \subseteq X \times Y$ such that for every $x \in X$ there is a unique $y \in Y$ with $\langle x, y \rangle \in f$. We write $f(x)$ for the unique $y \in Y$ with $\langle x, y \rangle \in f$.

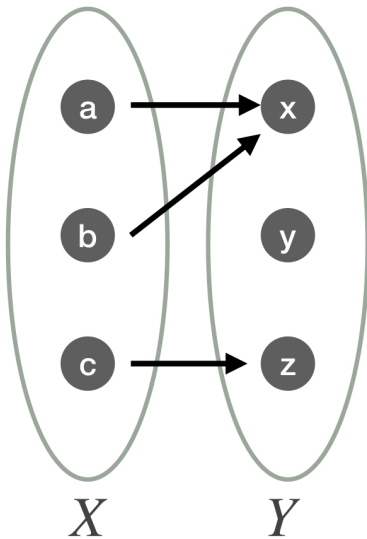
function -



function -



function ✓



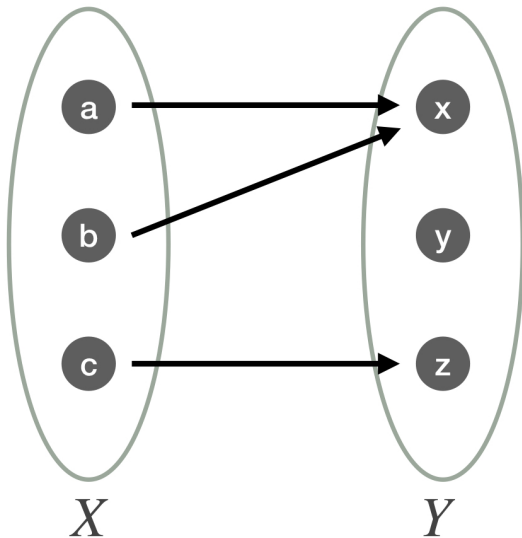
Injection, surjection, bijection

A function $f : X \rightarrow Y$ is

injective iff $f(x_1) = f(x_2)$ implies $x_1 = x_2$ [every x has its own unique y]

surjective iff for each $y \in Y$ there is an $x \in X$ with $f(x) = y$ [every y covered by an x]

bijective iff f is injective and a surjective



function



injection

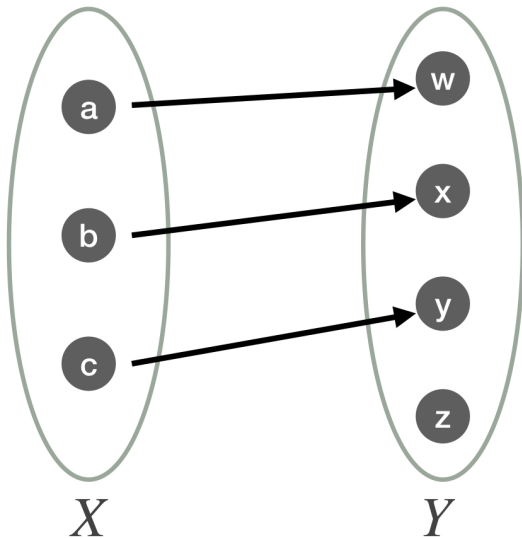
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surjection

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bijection

—

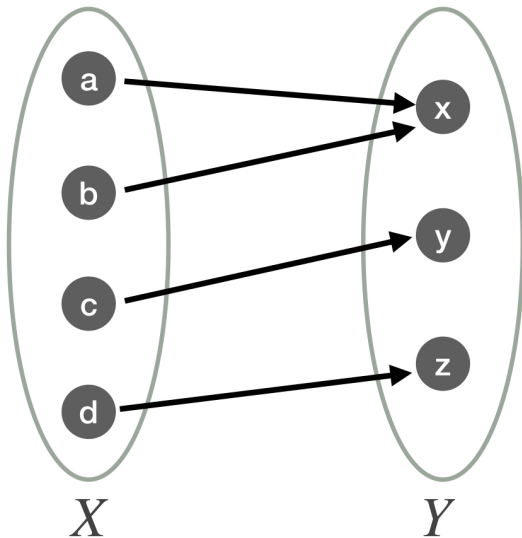


function ✓

injection ✓

surjection —

bijection —

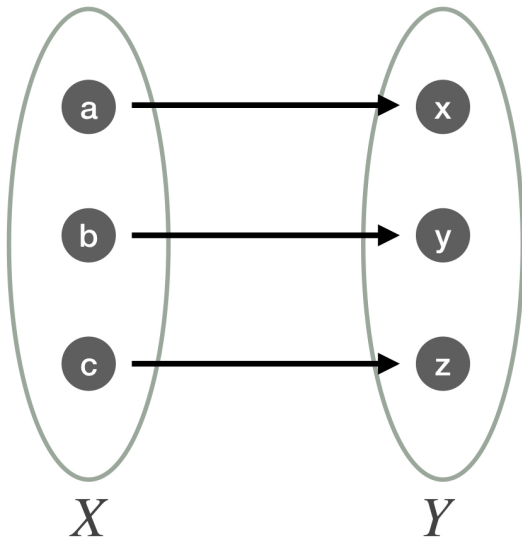


function ✓

injection —

surjection ✓

bijection —



function ✓

injection ✓

surjection ✓

bijection ✓