Function

Start

Function

Start

A function f

Start

A function f from X

Function

▸ Start

A function f from X to Y

Function

Start

A function f from X to Y is a subset

Function

Start

A function f from X to Y is a subset of the Cartesian product $X \times Y$

Function

Start

A function f from X to Y is a subset of the Cartesian product $X \times Y$ subject

Function

▸ Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:

Function

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element

Function

▸ Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X

Function

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component

Function

Start

A function f from X to Y is a subset of the Cartesian product $X \times Y$ subject to the following condition:
Every element of X is the first component of one and only one

Function

▸ Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair

Function

Start

A function f from X to Y is a subset of the Cartesian product $X \times Y$ subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.

Function

Start

A function f from X to Y is a subset of the Cartesian product $X \times Y$ subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words,

Function

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x

Function

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x in X

Function

▸ Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x in X there is

Function

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x in X there is exactly one element y

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x in X there is exactly one element y in Y

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x in X there is exactly one element y in Y such that

Function

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x in X there is exactly one element y in Y such that the ordered pair (x, y)

Function

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x in X there is exactly one element y in Y such that the ordered pair (x, y) is contained

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x in X there is exactly one element y in Y such that the ordered pair (x, y) is contained in the subset

Function

Start

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x in X there is exactly one element y in Y such that the ordered pair (x, y) is contained in the subset defining the function f.

home

A function f from X to Y is a subset of the Cartesian product X $\times$ Y subject to the following condition:
Every element of X is the first component of one and only one ordered pair in the subset.
In other words, for every x in X there is exactly one element y in Y such that the ordered pair (x, y) is contained in the subset defining the function f.

Function

Start

Function

Start

$X \times Y$

Function

Start

$$\mathrm{X} \times \mathrm{Y} =$$

Function

Start

$$X \times Y = \{$$

Function

Start

$$\mathrm{X} \times \mathrm{Y} = \{(x, y)$$

Function

Start

$$X \times Y = \{(x, y)|$$

Function

Start

$$X \times Y = \{(x, y) | x \in X,$$

Function

Start

$$X \times Y = \{(x, y) | x \in X, y \in Y\}$$

Function

Start

$$X \times Y = \{(x, y) | x \in X, y \in Y\}:$$

Function

▸ Start

$\mathrm{X} \times \mathrm{Y} = \{(x, y) | x \in \mathrm{X}, y \in \mathrm{Y}\}$: The Cartesian product

Function

Start

$\mathrm{X} \times \mathrm{Y} = \{(x, y) | x \in \mathrm{X}, y \in \mathrm{Y}\}$: The Cartesian product $\mathrm{X} \times \mathrm{Y}$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function

Function

▸ Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \\ \\ \end{cases}$$

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset \\ \\ \end{cases}$$

Function

Start

$\mathrm{X} \times \mathrm{Y} = \{(x,y) | x \in \mathrm{X}, y \in \mathrm{Y}\}$: The Cartesian product $\mathrm{X} \times \mathrm{Y}$

f is a function from X to Y.

$$\begin{cases} f \subset \mathrm{X} \times \mathrm{Y} \\ \\ \end{cases}$$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X \end{cases}$$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X, \end{cases}$$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \end{cases}$$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X, \ \exists ! y \in Y \text{ s.t.} \end{cases}$$

Function

▸ Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X, \ \exists ! y \in Y \text{ s.t. } (x, y) \in f \end{cases}$$

Function

Start

$\mathrm{X} \times \mathrm{Y} = \{(x, y) | x \in \mathrm{X}, y \in \mathrm{Y}\}$: The Cartesian product $\mathrm{X} \times \mathrm{Y}$

f is a function from X to Y.

$$\begin{cases} f \subset \mathrm{X} \times \mathrm{Y} \\ \forall x \in \mathrm{X},\ \exists! y \in \mathrm{Y} \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in \mathrm{X} \\ \end{cases} \end{cases}$$

Function

Start

$\mathrm{X} \times \mathrm{Y} = \{(x, y) | x \in \mathrm{X}, y \in \mathrm{Y}\}$: The Cartesian product $\mathrm{X} \times \mathrm{Y}$

f is a function from X to Y.

$$\begin{cases} f \subset \mathrm{X} \times \mathrm{Y} \\ \forall x \in \mathrm{X},\ \exists ! y \in \mathrm{Y} \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in \mathrm{X},\ \exists y \in \mathrm{Y} \\ \end{cases} \end{cases}$$

Function

Start

$X \times Y = \{(x,y)|x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ \end{cases}$$

Function

▸ Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x, y_1) \in f \end{cases} \end{cases}$$

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \end{cases} \end{cases}$$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow \end{cases}$$

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

f

▸ Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

f :

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X$$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \rightarrow$$

Function

Start

$\mathrm{X} \times \mathrm{Y} = \{(x, y) | x \in \mathrm{X}, y \in \mathrm{Y}\}$: The Cartesian product $\mathrm{X} \times \mathrm{Y}$

f is a function from X to Y.

$$\begin{cases} f \subset \mathrm{X} \times \mathrm{Y} \\ \forall x \in \mathrm{X},\ \exists ! y \in \mathrm{Y} \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in \mathrm{X},\ \exists y \in \mathrm{Y} \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : \mathrm{X} \to \mathrm{Y},$$

Function

▸ Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y, X \xrightarrow{f}$$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X

Function

▸ Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

f

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

f :

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$f : x$

Function

Start

$\mathrm{X} \times \mathrm{Y} = \{(x, y) | x \in \mathrm{X}, y \in \mathrm{Y}\}$: The Cartesian product $\mathrm{X} \times \mathrm{Y}$

f is a function from X to Y.

$$\begin{cases} f \subset \mathrm{X} \times \mathrm{Y} \\ \forall x \in \mathrm{X},\ \exists! y \in \mathrm{Y} \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in \mathrm{X},\ \exists y \in \mathrm{Y} \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : \mathrm{X} \to \mathrm{Y},\ \mathrm{X} \xrightarrow{f} \mathrm{Y}$$

X Domain

Y Codomain

$$f : x \longrightarrow$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X, \ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X, \ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f}$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y,$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y$$

Start

$$X \times Y = \{(x, y) | x \in X, y \in Y\} : \text{The Cartesian product } X \times Y$$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y =$$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f$$

Function

▸ Start

$\mathrm{X} \times \mathrm{Y} = \{(x,y)|x \in \mathrm{X}, y \in \mathrm{Y}\}$: The Cartesian product $\mathrm{X} \times \mathrm{Y}$

f is a function from X to Y.

$$\begin{cases} f \subset \mathrm{X} \times \mathrm{Y} \\ \forall x \in \mathrm{X},\ \exists! y \in \mathrm{Y} \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in \mathrm{X},\ \exists y \in \mathrm{Y} \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : \mathrm{X} \to \mathrm{Y},\ \mathrm{X} \xrightarrow{f} \mathrm{Y}$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f($$

Function

▸ Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

Function

▸ Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

x

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

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$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

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$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$f(X)$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$f(X) =$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

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$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$f(X) = \{$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

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$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$f(X) = \{y$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$f(X) = \{y|$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

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$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$f(X) = \{y | \exists x$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$f(X) = \{y |\ \exists x \in$

Function

Start

$X \times Y = \{(x, y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

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$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x, y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x, y) \in f \\ (x, y_1) \in f \text{ and } (x, y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$f(X) = \{y | \exists x \in X$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$f(X) = \{y |\ \exists x \in X \text{ s.t.}$

Function

▸ Start

$X \times Y = \{(x,y)|x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$$f(X) = \{y|\ \exists x \in X \ \text{ s.t. } \ y = f(x)$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$$f(X) = \{y |\ \exists x \in X \text{ s.t. } y = f(x)\}$$

Function

Start

$X \times Y = \{(x,y)|x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$$f(X) = \{y|\ \exists x \in X \text{ s.t. } y = f(x)\} =$$

Function

▸ Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists ! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$f(X) = \{y |\ \exists x \in X \text{ s.t. } y = f(x)\} = \{$

Function

Start

$\mathrm{X} \times \mathrm{Y} = \{(x,y) | x \in \mathrm{X}, y \in \mathrm{Y}\}$: The Cartesian product $\mathrm{X} \times \mathrm{Y}$

f is a function from X to Y.

$$\begin{cases} f \subset \mathrm{X} \times \mathrm{Y} \\ \forall x \in \mathrm{X},\ \exists! y \in \mathrm{Y} \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in \mathrm{X},\ \exists y \in \mathrm{Y} \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : \mathrm{X} \to \mathrm{Y}, \mathrm{X} \xrightarrow{f} \mathrm{Y}$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$$f(\mathrm{X}) = \{y |\ \exists x \in \mathrm{X} \text{ s.t. } y = f(x)\} = \{f(x)\}$$

Function

▸ Start

$X \times Y = \{(x,y)|x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$$f(X) = \{y|\ \exists x \in X \text{ s.t. } y = f(x)\} = \{f(x)|$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

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$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$$f(X) = \{y | \exists x \in X \text{ s.t. } y = f(x)\} = \{f(x) | x$$

Function

Start

$X \times Y = \{(x,y)|x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists ! y \in Y \text{ s.t. } (x,y) \in f \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases} \end{cases}$$

$$f : X \to Y, X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y, x \xrightarrow{f} y, y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$$f(X) = \{y|\ \exists x \in X \text{ s.t. } y = f(x)\} = \{f(x)|x \in$$

Function

▸ Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

f is a function from X to Y.

$$\begin{cases} f \subset X \times Y \\ \forall x \in X,\ \exists! y \in Y \text{ s.t. } (x,y) \in f \end{cases} \begin{cases} \forall x \in X,\ \exists y \in Y \text{ s.t. } (x,y) \in f \\ (x,y_1) \in f \text{ and } (x,y_2) \in f \Rightarrow y_1 = y_2 \end{cases}$$

$$f : X \to Y,\ X \xrightarrow{f} Y$$

X Domain

Y Codomain

$$f : x \longrightarrow y,\ x \xrightarrow{f} y,\ y = f(x)$$

$f(x)$ The value of a function f at x

x The independent variable

y The dependent variable

$$f(X) = \{y |\ \exists x \in X \text{ s.t. } y = f(x)\} = \{f(x) | x \in X$$

Function

Start

$X \times Y = \{(x,y) | x \in X, y \in Y\}$: The Cartesian product $X \times Y$

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Image of f

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