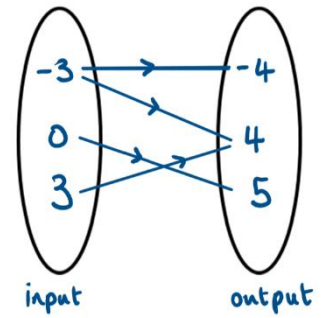# Functions – The Basics

A relation is a relationship between sets of values.
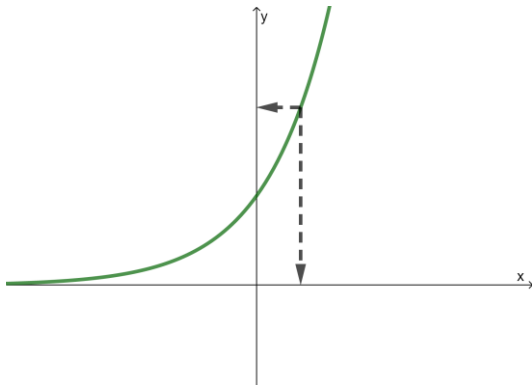
The set of **inputs** makes up the **domain**.

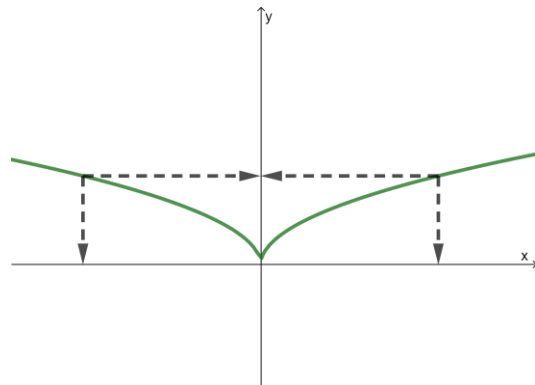The set of **outputs** makes up the **range**.
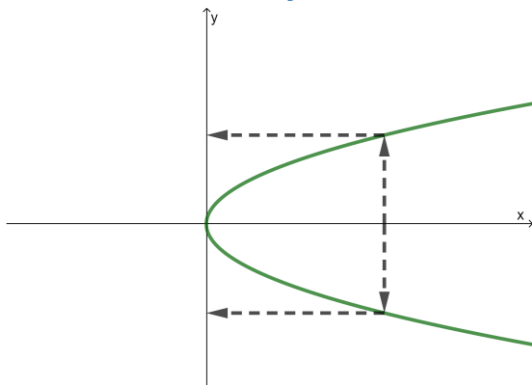

Different types of relation

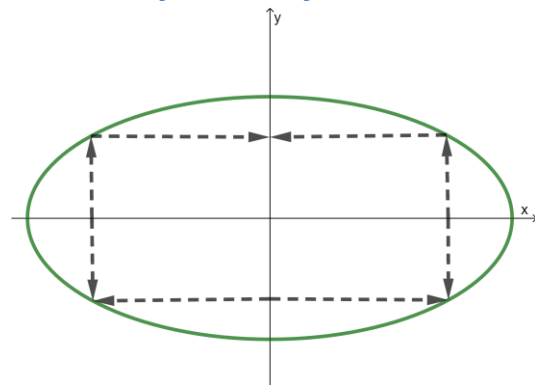### One-to-one function

…has an inverse

Many-to-one function

…does not have an inverse
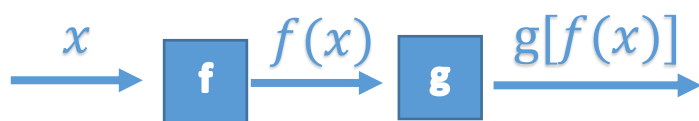
One-to-many relation

…is not a function

Many-to-many relation

…is not a function

Composite functions

$g[f(x)]$ represents the composition of 2 functions. In this case we 'do' f first then we 'do' g

$$x \longrightarrow \boxed{f} \xrightarrow{f(x)} \boxed{g} \xrightarrow{g[f(x)]}$$
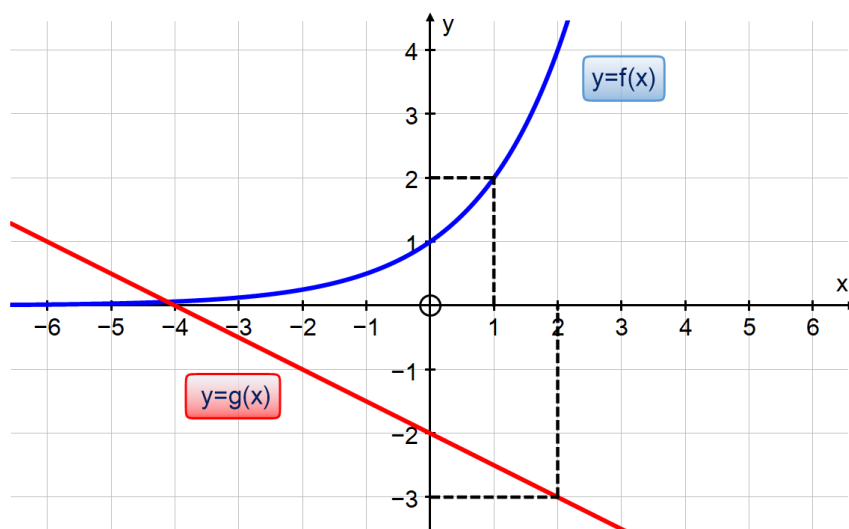
$g[f(x)]$ can be written $g \circ f(x)$ or $gf(x)$

The order in which we carry out the functions is important. Usually, $g[f(x)] \neq f[g(x)]$

Often, we are required to think about composite functions graphically.

In this graph, we can see that

$$g[f(1)] = -3$$

Often, we are required to think about inverse functions graphically.

Inverse functions

For the inverse of a function to exist, the function must be a one-to-one function.

Note that,

domain of f^{-1} = range of f

Often, we are required to think about inverse functions graphically.

In this graph, we can see that

$$f^{-1}(2) = 1$$

INTHINKING