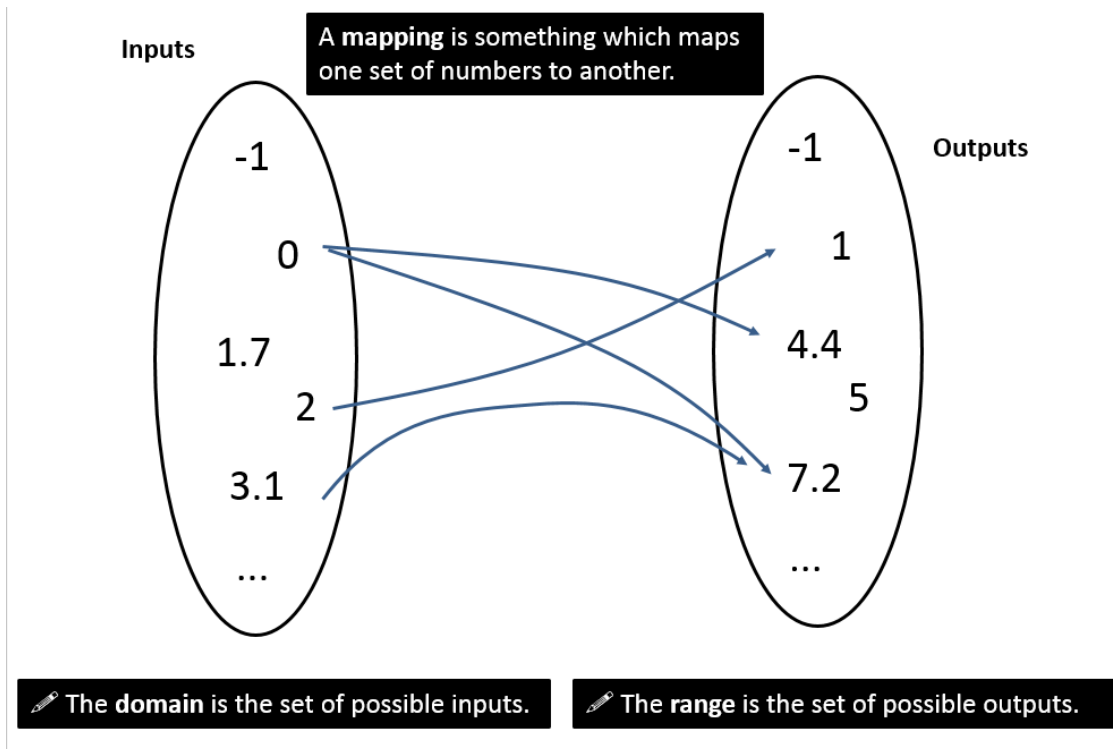
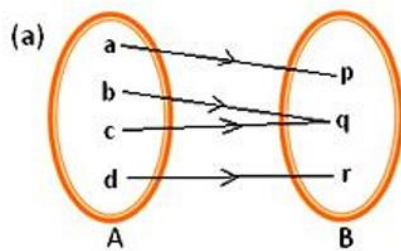


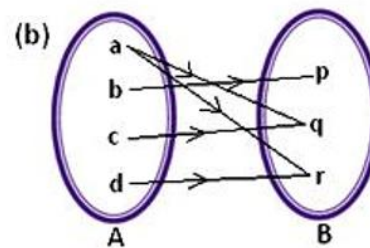
Mappings



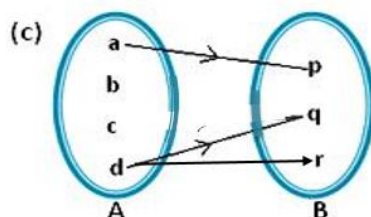
Types of Mappings



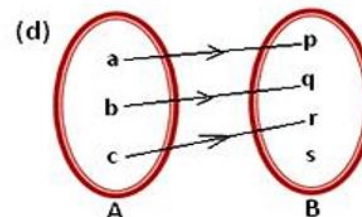
Many to one



Many to many



One to many



One to one

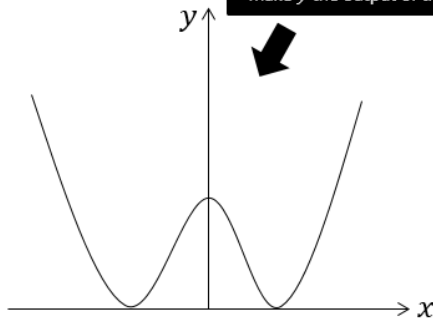
Functions

--

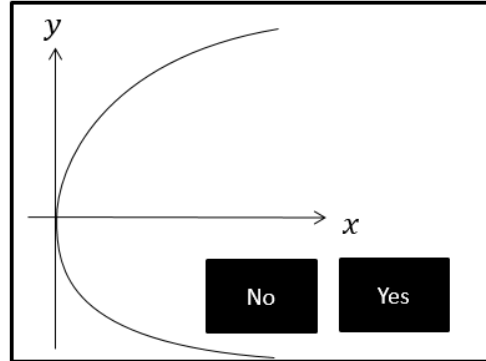
Type	Description	Example
Many-to-one Function		
One-to-one Function		

Which of these are functions?

Note: We can illustrate a mapping/function graphically, by plotting a point (x, y) if x maps to y . For this reason we write $y = f(x)$ to mean "make y the output of the function".



No Yes



No Yes

$$f(x) = \sqrt{x} \quad \text{Domain: } x \in \mathbb{R}$$

No Yes

$$f(x) = 2^x \quad \text{Domain: } x \in \mathbb{R} \text{ (i.e. all real values)}$$

No Yes

$$f(x) = \pm\sqrt{x} \quad \text{Domain: } x \geq 0$$

No Yes

Domain and Range

Remember:

The **domain** is

The **range** is

Using a sketch, try to identify the range of the following functions.

1. $f(x) = x^2, \quad x \in \mathbb{R}$

2. $f(x) = \frac{1}{x}, \quad x \in \mathbb{R}, x \neq 0$

3. $f(x) = \ln x, \quad x \in \mathbb{R}, x > 0$

4. $f(x) = e^x, \quad x \in \mathbb{R},$

5. $f(x) = x^2 + 2x + 9, \quad x \in \mathbb{R}$

6. $f(x) = x^2, \quad x \in \mathbb{R}, \quad -1 \leq x \leq 4$

Further Example

Find the range of each of the following functions.

a) $f(x) = 3x - 2, \text{ domain } \{1,2,3,4\}$

b) $g(x) = x^2, \text{ domain } \{x \in \mathbb{R}, -5 \leq x \leq 5\}$

c) $h(x) = \frac{1}{x}, \text{ domain } \{x \in \mathbb{R}, 0 < x \leq 3\}$

State if the functions are one-to-one or many-to-one.