The second mapping does not satisfy this condition so we cannot call it a function.

Consider again what we can now call the function such that  $x \rightarrow x^2$ .

Using f for 'function' and the symbol: to mean 'such that', we can write  $f: x \rightarrow x^2$  to mean 'f is the function such that x maps to  $x^2$ '.

We use the notation f(x) to represent the output values of the function,

e-g-

for  $f: x \to x^2$  we have  $f(x) = x^2$ .

#### EXAMPLES 11A

1 Determine whether these mappings are functions,

**a** 
$$x \to \frac{1}{x}$$
 **b**  $x \to y$  where  $y^2 - x = 0$ 

**a** For any value of x, except x = 0,  $\frac{1}{x}$  has a single value,

therefore  $x \to \frac{1}{x}$  is a function provided that x = 0 is excluded.

Note that  $\frac{1}{0}$  is meaningless, so to make this mapping a function we have to exclude 0 as

an input value. The function can be described by  $f(x) = \frac{1}{x}, x \neq 0$ 

b If, as an example, we input x = 4, then the output is the value of y given by y²-4 = 0 i.e. y = 2 and y = -2.

Therefore an input gives more than one value for the output, so  $x \rightarrow y$  where  $y^2 - x = 0$  is not a function.

2 If  $f(x) = 2x^2 - 5$ , find f(3) and f(-1).

As f(x) is the output of the mapping, f(3) is the output when 3 is the input, i.e. f(3) is the value of  $2x^2 - 5$  when x = 3.

$$f(3) = 2(3)^2 - 5 = 13$$
  
 $f(-1) = 2(-1)^2 - 5 = -3$ 

#### EXERCISE 11A

 Determine which of these mappings are functions.

$$\mathbf{a} \quad x \longrightarrow 2x - 1$$

**b** 
$$x \to x^3 + 3$$

$$c \quad x \to \frac{1}{x-1}$$

d 
$$x \rightarrow t$$
 where  $t^2 = x$ 

$$e x \rightarrow \sqrt{x}$$

- f x → the length of the line from the origin to (0,x).
- g x → the greatest integer less than or equal to x.
- h x → the height of a triangle whose area is x.

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