

Functions

A **relation** pairs inputs with outputs. When a relation is given as ordered pairs, the x -coordinates are inputs and the y -coordinates are outputs. A relation that pairs each input with *exactly one* output is a **function**.

Example 1 Determine whether each relation is a function. Explain.

- a. $(-1, 3), (0, 3), (1, 3), (2, 1), (3, 1)$

Every input has exactly one output.

▶ So, the relation is a function.

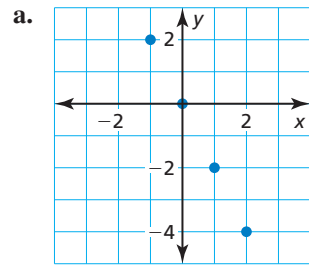
- b. $(5, 1), (9, 8), (7, 5), (5, 4), (6, 3)$

The input 5 has two outputs, 1 and 4.

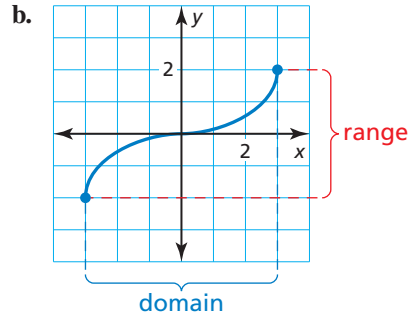
▶ So, the relation is *not* a function.

The **domain** of a function is the set of all possible input values. The **range** of a function is the set of all possible output values.

Example 2 Find the domain and range of the function represented by the graph.



▶ The domain is $-1, 0, 1,$ and 2 .
The range is $-4, -2, 0,$ and 2 .



▶ The domain is $-3 \leq x \leq 3$.
The range is $-2 \leq y \leq 2$.

Practice

Check your answers at BigIdeasMath.com.

Determine whether the relation is a function. Explain.

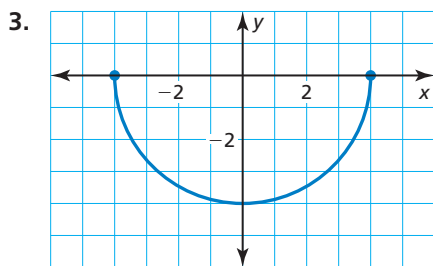
1. $(2, -5), (3, -1), (4, 2), (5, -5), (6, 7)$

yes; Every input has exactly one output.

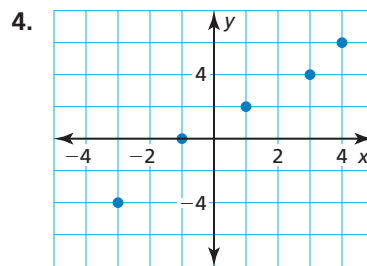
2. $(8, 5), (6, 0), (4, -7), (2, -4), (4, 7)$

no; The input 4 has two outputs, -7 and 7 .

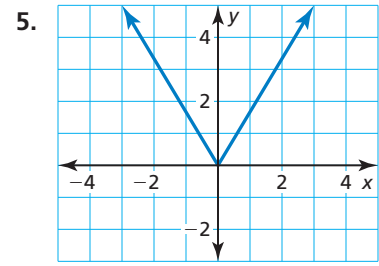
Find the domain and range of the function represented by the graph.



domain: $-4 \leq x \leq 4$
range: $-4 \leq y \leq 0$



domain: $-3, -1, 1, 3, 4$
range: $-4, 0, 2, 4, 6$



domain: all real numbers
range: $y \geq 0$