

# MHF4U: Domain and Range of a Relation/Function

1. Define each term below.

a. Domain:

b. Range:

c. Relation:

d. Function:

2. Express each domain using interval notation.

a.  $\{x \in \mathbb{R} \mid x > 5\}$

b.  $\{x \in \mathbb{R} \mid x \leq 13\}$

c.  $\{x \in \mathbb{R}\}$

d.  $\{x \in \mathbb{R} \mid x \neq -8\}$

e.  $\{x \in \mathbb{R} \mid -4 \leq x \leq 7\}$

f.  $\{x \in \mathbb{R} \mid 2 < x \leq 10\}$

g.  $\{x \in \mathbb{R} \mid x < -6 \text{ or } x \geq 3\}$

h.  $\{x \in \mathbb{R} \mid x = 2 \text{ or } x \geq 10\}$

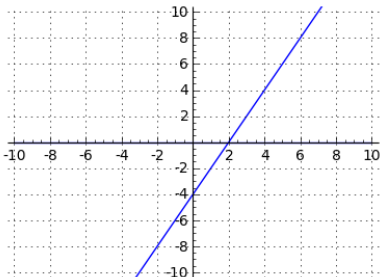
i.  $\{x \in \mathbb{R} \mid x \neq -4 \text{ and } x \neq 9\}$

j.  $\{x \in \mathbb{R} \mid -1 \leq x < 4 \text{ or } 7 < x \leq 11\}$

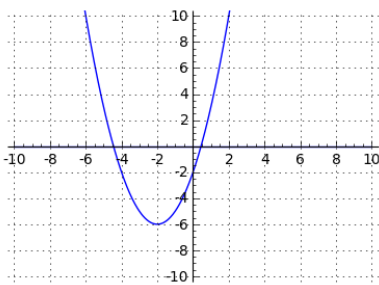
k.  $\{x \in \mathbb{R} \mid -3 < x < 0 \text{ or } 0 < x \leq 2 \text{ or } x \geq 4\}$

3. State the domain and range of each relation shown below, using both set-builder notation and interval notation. State whether each relation is also a function.

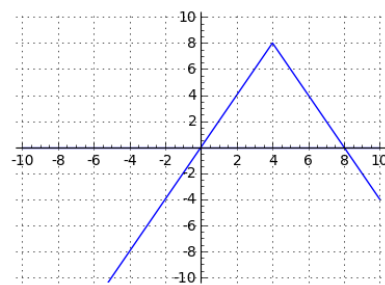
a.



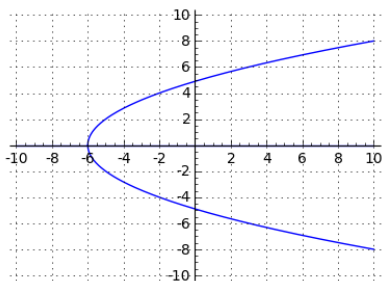
b.



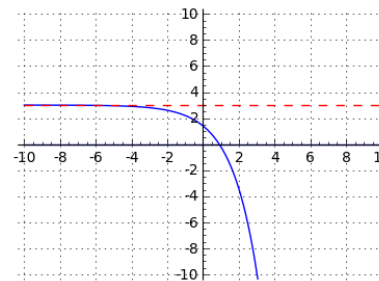
c.



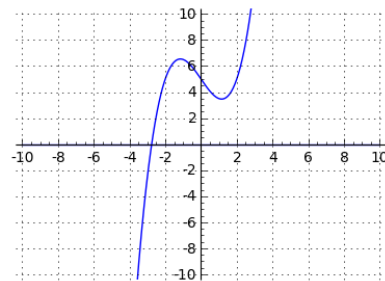
d.



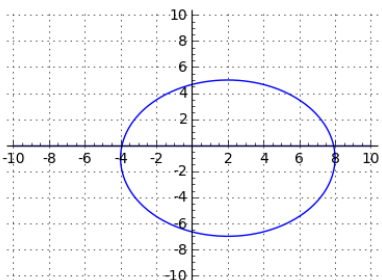
e.



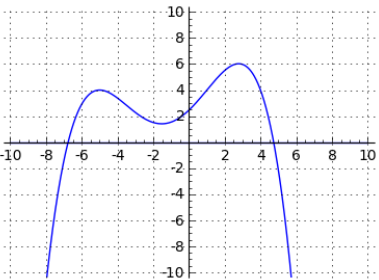
f.



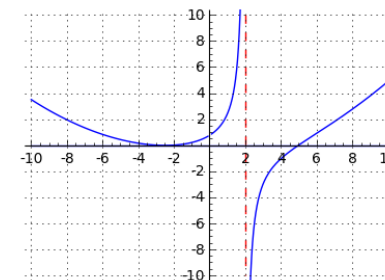
g.



h.



i.



4. Sketch a possible relation for each domain/range listed below.
- |   |   |
|---|---|
| a. $(-\infty, \infty), (-\infty, 3]$            | b. $(-\infty, \infty), [-4]$  |
| c. $[-2, 4], [-3, \infty)$                      | d. $(-\infty, -2) \cup (-2, \infty), (-\infty, 5) \cup (5, \infty)$ |
| e. $(-\infty, 4) \cup (4, \infty), (2, \infty)$ | f. $(-\infty, -5) \cup (-3, 1) \cup (4, \infty), (-\infty, -2)$     |
5. Is it possible for a function to have a domain and range that are both restricted? If so, sketch a possible function. If not, explain why not.
6. Is it possible for a relation that is *not* a function to have an infinite domain and infinite range? If so, sketch a possible relation. If not, explain why not.
7. Is it possible for a function to have a domain  $(-\infty, \infty)$  and range  $[a, b]$  where  $a, b \in \mathbb{R}$ ? If so, sketch a possible function. If not, explain why not.

## Solutions

- 2a.  $(5, \infty)$  b.  $(-\infty, 13]$  c.  $(-\infty, \infty)$  d.  $(-\infty, -8) \cup (-8, \infty)$  e.  $[-4, 7]$  f.  $(2, 10]$   
 g.  $(-\infty, -6) \cup [3, \infty)$  h.  $[2] \cup [10, \infty)$  i.  $(-\infty, -4) \cup (-4, 9) \cup (9, \infty)$  j.  $[-1, 4) \cup (7, 11]$   
 k.  $(-3, 0) \cup (0, 2] \cup [4, \infty)$

- 3a.  $\{x \in \mathbb{R}\}, \{f(x) \in \mathbb{R}\}; (-\infty, \infty), (-\infty, \infty);$  function  
 b.  $\{x \in \mathbb{R}\}, \{f(x) \in \mathbb{R} \mid f(x) \geq -6\}; (-\infty, \infty), [-6, \infty);$  function  
 c.  $\{x \in \mathbb{R}\}, \{f(x) \in \mathbb{R} \mid f(x) \leq 8\}; (-\infty, \infty), (-\infty, 8];$  function  
 d.  $\{x \in \mathbb{R} \mid x \geq -6\}, \{f(x) \in \mathbb{R}\}; [-6, \infty), (-\infty, \infty);$  not a function  
 e.  $\{x \in \mathbb{R}\}, \{f(x) \in \mathbb{R} \mid f(x) < 3\}; (-\infty, \infty), (-\infty, 3);$  function  
 f.  $\{x \in \mathbb{R}\}, \{f(x) \in \mathbb{R}\}; (-\infty, \infty), (-\infty, \infty);$  function  
 g.  $\{x \in \mathbb{R} \mid -4 \leq x \leq 8\}, \{f(x) \in \mathbb{R} \mid -7 \leq f(x) \leq 5\}; [-4, 8], [-7, 5];$  not a function  
 h.  $\{x \in \mathbb{R}\}, \{f(x) \in \mathbb{R} \mid f(x) \leq 6\}; (-\infty, \infty), (-\infty, 6];$  function  
 i.  $\{x \in \mathbb{R} \mid x \neq 2\}, \{f(x) \in \mathbb{R}\}; (-\infty, 2) \cup (2, \infty), (-\infty, \infty);$  function

4. Answers may vary

5. Possible

6. Possible

7. Possible