1-1 Study Guide and Intervention

Functions

Describe Subsets of Real Numbers The set of real numbers $\mathbb{R}$ includes the rationals $\mathbb{Q}$, irrationals $\mathbb{I}$, integers $\mathbb{Z}$, wholes $\mathbb{W}$, and naturals $\mathbb{N}$.

- One way to describe a subset of the real numbers is to use **set-builder notation.**

$\{\text{variable} \mid \text{inequality}, \text{variable} \in \text{set}\}$

such that   is a part of

- Another way is to use **interval notation**. $\mathbb{R}$

[or (smallest value , biggest value) or]

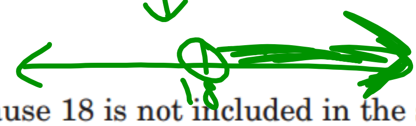
Example **Describe $x > 18$ using set-builder notation and interval notation.**

The set includes all numbers that are greater than 18 but are not equal to 18.

Set-builder notation: $\{x \mid x > 18, x \in \mathbb{R}\}$

The vertical line | means "such that." The symbol $\in$ means "is an element of." Read the expression as *the set of all x such that x is greater than 18 and x is an element of the set of real numbers.*

Interval notation: $(18, \infty)$



Use parentheses on the left because 18 is not included in the set. Use parentheses with infinity since it never ends.

$<$ or $>$ = parentheses

$\leq$ or $\geq$ = brackets

Exercises

Write each set of numbers in set-builder and interval notation, if possible.

1. $\{17, 18, 19, 20, \ldots\}$

$\{x \mid x \geq 17, x \in \mathbb{N}\}$

2. $x \leq -2$

$\{x \mid x \leq -2, x \in \mathbb{R}\}$

$(-\infty, -2]$

3. $x > -8.8$

4. $5 < x < 15$

Functions

A function relates a value from one set to **one** value of another set.

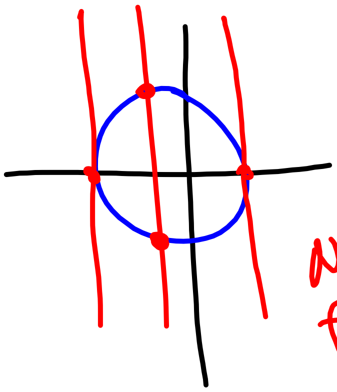
Example

- $1 \rightarrow 5$
- $2 \rightarrow 6$
- $3 \rightarrow 6$
- 7
- $4 \rightarrow 8$

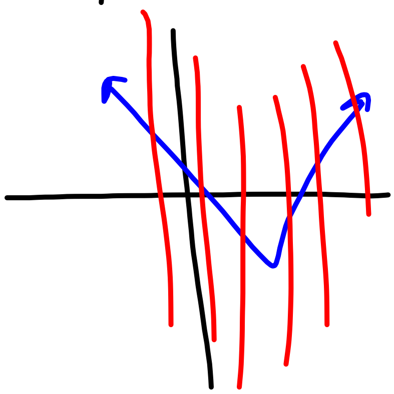
Non Example

- $1 \rightarrow 5$
- $2 \rightarrow 6$
- $3 \rightarrow 6$
- $3 \rightarrow 7$
- $4 \rightarrow 8$

Vertical line test: if a vertical line passes thru a graph in exactly one spot, then it's a function.



Not a function



function

Example 1 **Find each function value.**

a. If $f(x) = 4x^3 + 6x^2 + 3x$, find $f(-2)$. plug -2 in for x.

$$f(x) = 4x^3 + 6x^2 + 3x \qquad \text{Original function}$$

$$f(-2) = 4(-2)^3 + 6(-2)^2 + 3(-2) \qquad \text{Substitute } -2 \text{ for } x.$$

$$= -32 + 24 - 6 \text{ or } -14 \qquad \text{Simplify.}$$

b. If $g(x) = \begin{cases} \sqrt{x} + 1 \text{ if } x \le 4 \\ 3x \text{ if } 4 < x < 10 \\ 2x^2 - 15 \text{ if } x \ge 10 \end{cases}$, find $g(6)$ and $g(10)$.

Look at the "if" statements to see that 6 fits into the second rule, so $g(6) = 3(6)$ or 18.

The value 10 fits into the third rule, so $g(10) = 2(10)^2 - 15$ or 185.

Exercises

Find each function value.

1. If $f(x) = 5x^2 - 4x - 6$, find $f(3)$.

$f(3) = 5(3)^2 - 4(3) - 6$

$f(3) = 45 - 12 - 6$

$f(3) = 27$

4. If $f(x) = \begin{cases} \sqrt{2x} \text{ if } x < 3 \\ 2x + 10 \text{ if } 3 \le x < 8, \\ 42 \text{ if } x \ge 8 \end{cases}$ find $f(3)$ and $f(8.5)$.

$f(3) = 2x + 10$

$f(3) = 2(3) + 10$

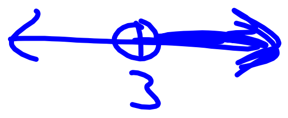
$f(3) = 16$

Example 2 **State the domain of** $f(x) = \dfrac{3 + x}{x^2 - 6x}$.

When the denominator of $\dfrac{3 + x}{x^2 - 6x}$ is zero, the expression is undefined. Solving $x^2 - 6x = 0$, the excluded values in the domain are $x = 0$ and $x = 6$. The domain is $\{x \mid x \neq 0, 6, x \in \mathbb{R}\}$.

Ex: Find the domain of $f(x) = \dfrac{1}{\sqrt{x-3}}$

$$x - 3 > 0$$
$$+3 \quad +3$$
$$x > 3$$



D: $(3, \infty)$

HW: p. 9

3, 7, 13, 17, 19, 27, 31, 37, 41, 45, 51, 53