1-1: Functions

CP Precalculus

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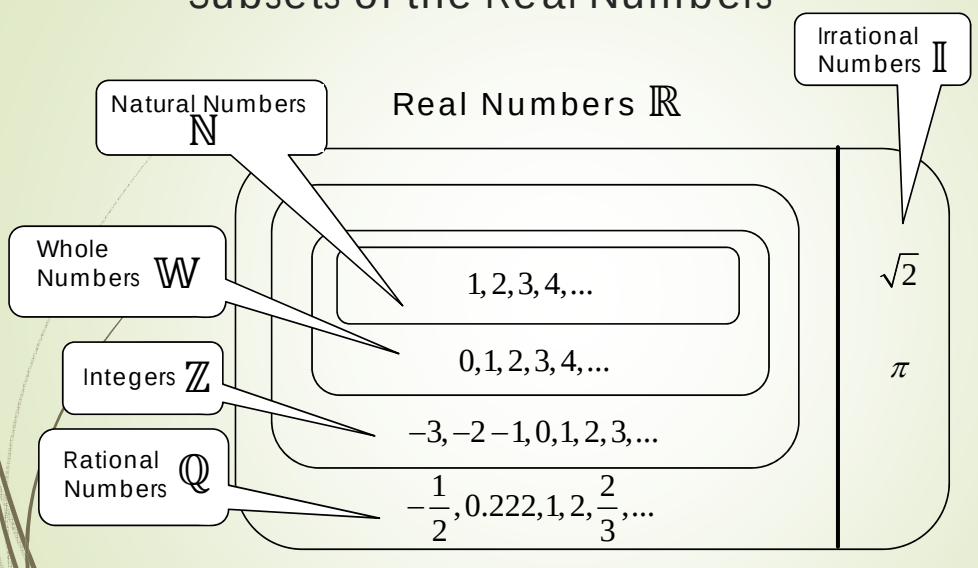
Subsets of the Real Numbers



Describing Subsets of Real Numbers

- Set-builder Notation
  - Use Properties to describe

$$\{x \mid -3 \le x \le 16, x \in \mathbb{R}\}$$

The set of numbers x such that ...

x has the given properties ...

And x is an element of the given set of numbers

- Interval Notation
  - Uses inequalities
  - [or]-endpoint included
  - (or)-endpoint not included

Subset of Real Numbers

$$a \le x < b$$

Interval Notation

$$[a, b)$$

Write the set of numbers using interval notation.

a. $-4 \le x < 4$

$[-4, 4)$

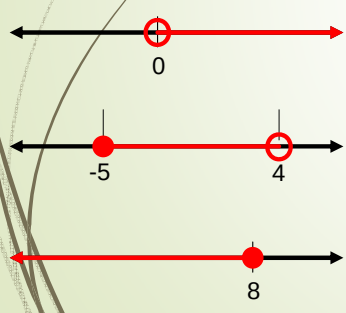
b. $x \ge 3$

$[3, \infty)$

c. $x > 9$ or $x < -2$

$(-\infty, -2) \cup (9, \infty)$

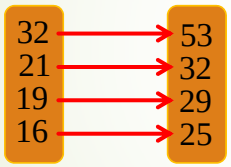
Write the set of numbers using set builder notation and interval notation.



	Set Builder	Interval
0	$\{x \mid x > 0, x \in \mathbb{R}\}$	$(0, \infty)$
-5, 4	$\{x \mid -5 \le x < 4, x \in \mathbb{R}\}$	$[-5, 4)$
8	$\{x \mid x \le 8, x \in \mathbb{R}\}$	$(-\infty, 8]$

Identifying Functions

- What is a **Function**?
  - A relation in which each element of the *domain* corresponds with *one and only one* element in the *range*.



FUNCTION

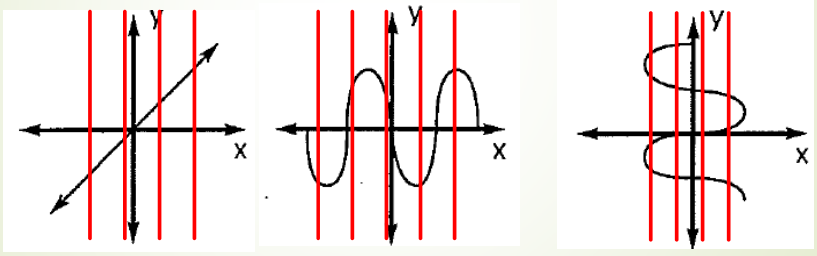
$(1,9),(4,-2),(1,-11),(9,10)$

Look for duplicates in the **Domain**

NOT A FUNCTION

The Vertical Line Test

- Used with graphs
  - If the vertical line touches the graph in **more than** one point, the graph is not a function.



Components of Functions

Independent Variable	Dependent Variable
Solution depends on it.	Depends on the **first** variable for a value.
Input	Output
Usually the ***first*** *variable in a table*	*Usually the* ***second*** *variable in a table*

Domain and Range

Domain

- Set of **inputs**
- *x* coordinates of ordered pair

Range

- Set of **outputs**
- *y* coordinates of ordered pair

State the domain of each function using interval and set builder notation.

a. $g(x)=\sqrt{4x-1}$

$[\frac{1}{4},\infty)$

$\left\{x \mid x \geq \frac{1}{4}, x \in \mathbb{R}\right\}$

b. $h(t)=\frac{3t^2}{t^2-1}$

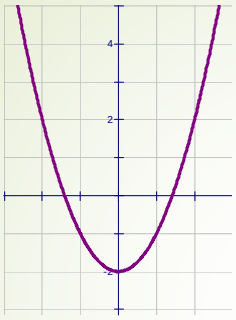
$(-\infty,-1)\cup(-1,1)\cup(1,\infty)$

$\{t \mid t \neq \pm 1, t \in \mathbb{R}\}$

c. $f(x)=\frac{x-5}{\sqrt{2x-3}}$

$\left(\frac{3}{2},\infty\right)$

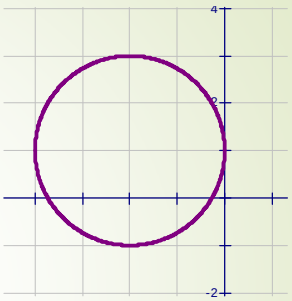
$\left\{x \mid x > \frac{3}{2}, x \in \mathbb{R}\right\}$



Domain: $(-\infty, \infty)$

Range: $[-2, \infty)$

Function: Yes



Domain: $[-4, 0]$

Range: $[-1, 3]$

Function: No

Homework: p.9 #1-8, 15, 18, 22, 25, 27, 39-47 odd, 54, 55

Euhler's Notation: $y = f(x)$

- Notations are used as a short hand
- Used mainly with sentences (equations)
- Letter denotes the name of the function

$$y = 3x - 10$$ Equation

$$f(x) = 3x - 10$$ Function Rule

- **Value of the function**
- Dependent variable
- Output

- **Argument of the function**
- Independent variable
- Input

Pizza costs $14 each and there is a flat delivery fee is $1.50.

a) Is cost a function of pizzas or is pizzas a function of cost?

b) Independent variable is Number of pizzas (P).

c) Dependent variable is Cost (C).

d) Domain: $\{P \mid P \geq 0, P \in \mathbb{R}\}$ or $[0, \infty)$.

e) Range: $\{C \mid C \geq 0, C \in \mathbb{R}\}$ or $[0, \infty)$.

Evaluate $f(x) = x^2 - 2x - 8$ for each given value:

a. $f(1)$

$f(1) = 1^2 - 2(1) - 8$

$f(1) = -9$

b. $f(2)$

$f(2) = 2^2 - 2(2) - 8$

$f(2) = -8$

c. $f(3)$

$f(3) = 3^2 - 2(3) - 8$

$f(3) = -5$

Does $f(1) + f(2) = f(3)$? No, $-17 \neq -5$

$f(1) + f(2) = (-9) + (-8) = -17$

$f(3) = -5$

$-17 \neq -5$

Piecewise Functions

- A function defined by **two or more equation** for different intervals of the domain.

$$f(x) = \begin{cases} x & \text{if } x < 0 \\ x - 3 & \text{if } 0 \leq x < 10 \\ 2x + 5 & \text{if } x \geq 10 \end{cases}$$

a. $f(2)$

Use $f(x) = x - 3$

$f(2) = 2 - 3$

$f(2) = -1$

b. $f(-2)$

Use $f(x) = x$

$f(-2) = -2$

c. $f(11)$

Use $f(x) = 2x + 5$

$f(11) = 2(11) + 5$

$f(11) = 27$

Homework: p.9 #33, 35, 48-52, 63, 65, 71