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Warm Up 9/3

<u>Lesson 2-1b: Functions and their Domain</u>

Objective

Students will…

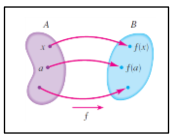
- Be able to solve word problems using functional relationship.
- Be able to find the domains of functions.
- Be able to represent functions in multiple ways.

Definition of a Function

So now we are ready to define what a function is.

A _______________, say f, is a rule that assigns to each element (item) x in a certain set A ___________________ element, called $f(x)$, in a set B.

Ex.



Another way to define function is for every **input**, there is exactly **<u>one</u> output**. The set A is also known as the ______________, and set B is known as the ______________.

Word Problems Using Functions

If an astronaut weighs 130 pounds on the surface of the earth, then her weight when she is h miles above the earth is given by the function: $w(h) = 130\left(\frac{3960}{3960+h}\right)^2$

a. What is her weight when she is 100 mi above the earth?

b. Construct a table of values of the function w that gives her weight at heights from 0 to 500 mi. What do you conclude from the table?

If the speed limit on a 100-mile stretch of road is 75 miles per hour, then the amount of time it takes a car going x miles per hour over the limit to travel the stretch is given by $f(x) = \frac{100}{75+x}$

a. How long does it take the car to travel the stretch if the car is going 10 miles per hour over the limit?

b. How long does it take the car to travel the stretch if the car is not speeding at all?

Domain of a Function

Recall that the **<u>domain</u>** of a function is the set of all **inputs**. Domain may be written **<u>explicitly</u>**. For example, for the function $f(x) = x^2$, $0 \le x \le 5$, the domain is specifically set as all inputs between and including 0 and 5. Hence its domain is simply $[0,\ 5]$.

Whenever we have a function without the domain stated explicitly, we need to figure it out by algebraic reasoning.

Ex. $\mathrm{f(x)} = x^2 + 1$ $g(x) = \frac{1}{x-4}$ $h(x) = \sqrt{x}$

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Examples of Functions

Find the domain of each function.

a. $f(x) = \frac{1}{x^2 - x}$ b. $g(x) = \sqrt{9 - x^2}$ c. $h(t) = \frac{t}{\sqrt{t+1}}$

Four Ways of Representing a Function

To help us understand what a function is, we have used machine and arrow diagrams. We can represent a functional relationship in following ways:

1. _______________ (by a description in words)
2. ___________________ (by an explicit formula)
3. ______________ (by a graph)
4. _________________ (by a table of values)

Four Ways to Represent a Function

Four Ways to Represent a Function

Verbal

Using words:

$P(t)$ is "the population of the world at time t"

Relation of population P and time t

Algebraic

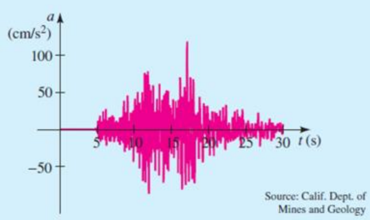
Using a formula:

$$A(r) = \pi r^2$$

Area of a circle

Visual

Using a graph:



Vertical acceleration during an earthquake

Numerical

Using a table of values:

w (ounces)	$C(w)$ (dollars)
$0 < w \le 1$	0.37
$1 < w \le 2$	0.60
$2 < w \le 3$	0.83
$3 < w \le 4$	1.06
$4 < w \le 5$	1.29
⋮	⋮

Cost of mailing a first-class letter

Homework 9/4

TB pg. 156 #34, 38, 42, 44, 50, 58, 59, 66