

Domain and Range of Functions

Objectives

1 Find the domain of a function

2 Find the range of a function

Intro

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Domain

The **domain** of a function is the set of all possible legal input values (x) of the function.

Range

The **range** of a function is the set of all possible output values (y) from the domain.

Domain Restrictions

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- You are not allowed to divide by 0
- You can't take the square root (or any even root such as $\sqrt[4]{}$, $\sqrt[6]{}$, ...) of a negative number.

Both of the above issues will result in an error message from your calculator, and we would like to avoid those.

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Those domains are **all real numbers**, or \mathbb{R} .

Example 1

State the domain of each.

(a) $f(x) = -2x + 7$

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\mathbb{R}

Example 1

$$(c) \quad f(x) = \sqrt{x - 3}$$

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\mathbb{R}

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$$(e) \quad f(x) = \frac{3}{2x + 5}$$

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$$x \neq -\frac{5}{2}$$

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For now, we can look at the graphs of functions to assist us in finding the range.

Example 2

State the range of each.

(a) $f(x) = -2x + 7$

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(a) $f(x) = -2x + 7$

All real numbers, \mathbb{R}

Example 2

$$(b) \quad f(x) = (x + 4)^2$$

Example 2

$$(b) \quad f(x) = (x + 4)^2$$

$$y \geq 0$$

Example 2

$$(c) \quad f(x) = \sqrt{x - 3}$$

Example 2

$$(c) \quad f(x) = \sqrt{x - 3}$$

$$y \geq 0$$

Example 2

$$(d) \quad f(x) = -\sqrt{x-3}$$

Example 2

$$(d) \quad f(x) = -\sqrt{x-3}$$

$$y \leq 0$$

Example 2

$$(e) \quad f(x) = \sqrt{x-3} + 6$$

Example 2

$$(e) \quad f(x) = \sqrt{x-3} + 6$$

$$y \geq 6$$

Example 2

$$(f) \quad f(x) = \frac{3}{2x + 5}$$

Example 2

$$(f) \quad f(x) = \frac{3}{2x + 5}$$

$$y \neq 0$$