Domain and Range of Functions

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What is Function Notation?

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- The $f(x)$ notation can also be used to define a function.
- If f is a function, the symbol $f(x)$ is used to denote the value of the function f at a given value of x.
- $f(x)$ denotes the y-value that the function f associates with x-value.

Example 1

Using the function notation, how do you write the rule of function f such that $y = -2x + 1$?

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$$f(x) = -2x + 1$$

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Using the function notation, how do you write the rule of function g such that $y = 5x - 2$?

$$g(x) = 5x - 2$$

What is the Domain of a Function?

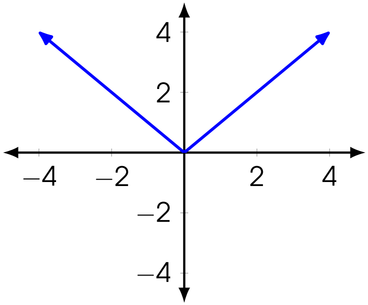
Domain: the set of all permissible values of x that give real values for y

What is the Range of a Function?

Range: the set of permissible values for y or $f(x)$ that give the values of x real numbers

Example 1

Determine the domain and the range of the function described in this graph.



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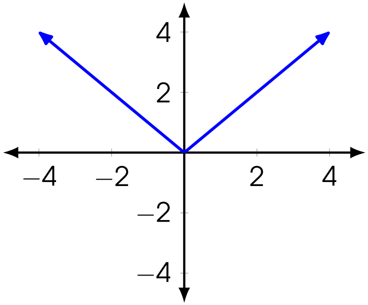

$$D = \{x | x \in \mathbb{R}\}$$

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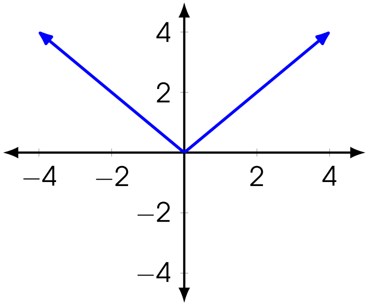

$$D = \{x | x \in \mathbb{R}\}\ ,\ R = \{y | y \in \mathbb{R}, y \geq 0\}$$

Example 2

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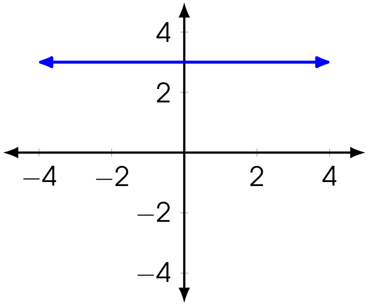

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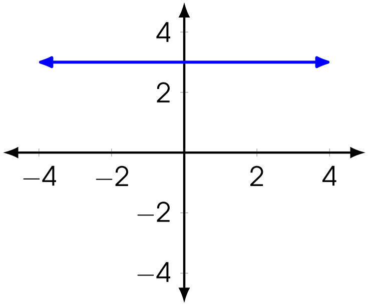

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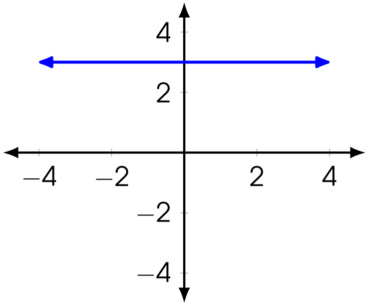
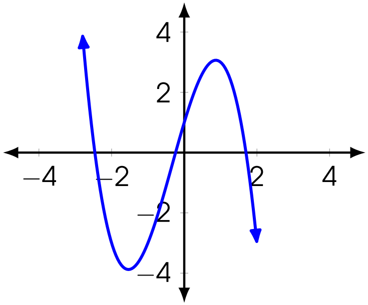


$$D = \{x | x \in \mathbb{R}\}\ ,\ R = \{y | y = 3\}$$

Example 3

Determine the domain and the range of the function described in this graph.



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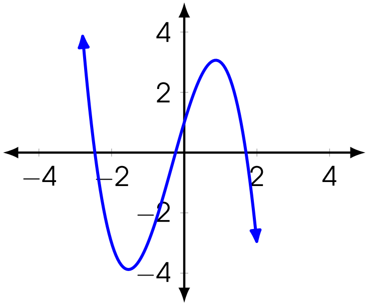

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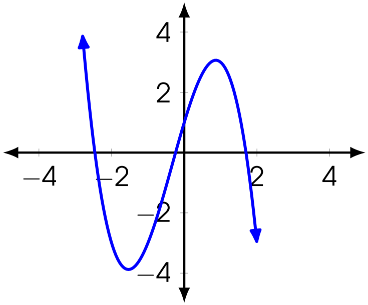

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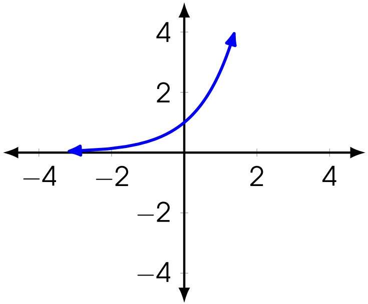

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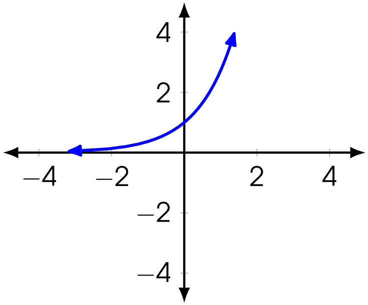

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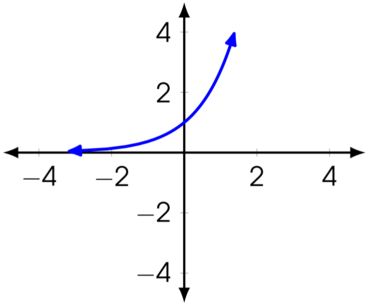

$$D = \{x|x \in \mathbb{R}\}\ , R = \{y|y \in \mathbb{R}, y > 0\}$$

What is an Asymptote?

Asymptote: a line that the graph of a function approaches, but never intersects

Example 5

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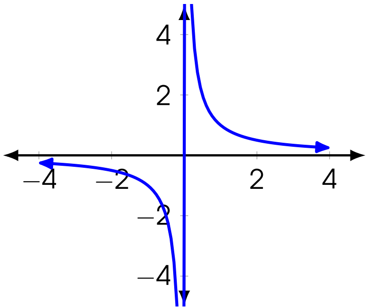

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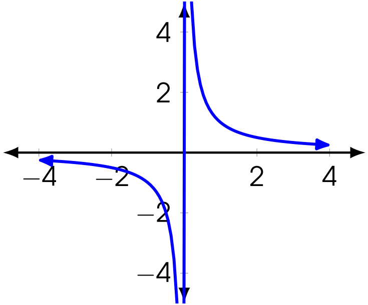

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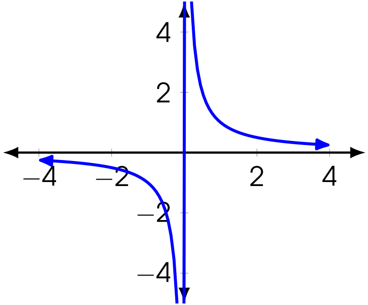

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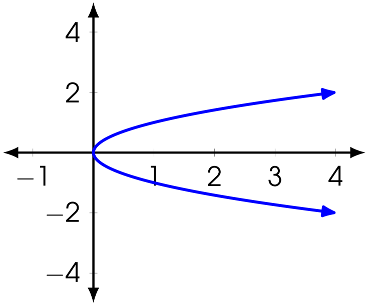

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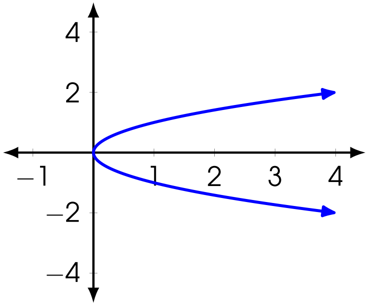

$$D = \{x | x \in \mathbb{R}, x \geq 0\}$$

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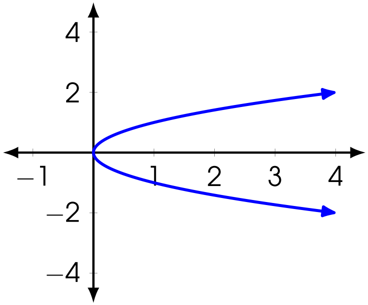

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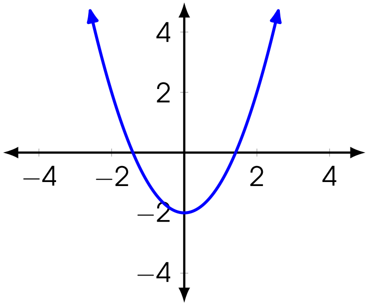

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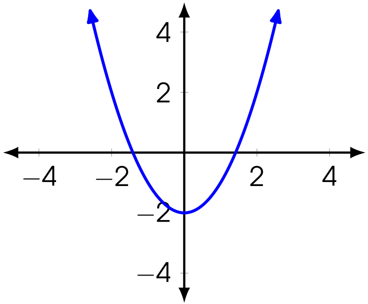

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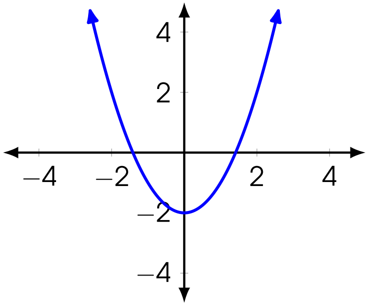

$$D = \{x | x \in \mathbb{R}\}\ ,\ R = \{y | y \in \mathbb{R}, y \geq -2\}$$

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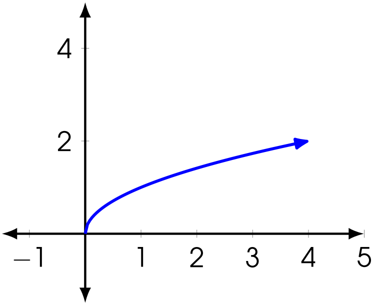
Determine the domain and the range of the function described in this graph.



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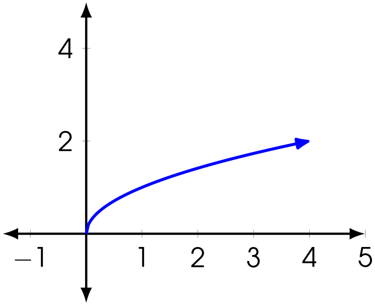

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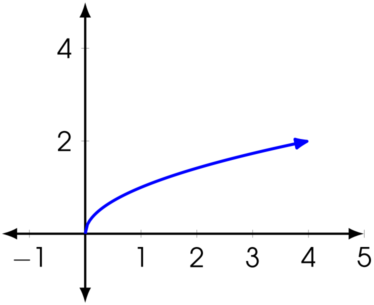

$$D = \{x | x \in \mathbb{R}, x \geq 0\}\ , R = \{y | y \in \mathbb{R}, y \geq 0\}$$

Example 9

Determine the domain and the range of the following function.

$$f(x) = 3x$$

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Take Note!

The value of the function will not be a real number if it is an imaginary number ($\sqrt{-1}$) or undefined (division by 0).

How to Determine the Domain of a Function with Square Root?

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- Write the radicand as an expression greater than or equal to zero.

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- Write the radicand as an expression greater than or equal to zero.
- Solve for x.

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Example 11

Determine the domain of the following function.

$$f(x) = \sqrt{x - 2}$$

Example 11

Step 1: Write the radicand as an expression greater than or equal to zero.

$$f(x) = \sqrt{x - 2}$$

Example 11

Step 2: Solve for x.

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Radicand $\qquad x - 2 \geq 0$

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Simplify	$x \geq 2$
Domain:	$D = \{x \mid x \in \mathbb{R}, x \geq 2\}$

Example 12

Determine the domain of the following function.

$$f(x) = \frac{x+1}{x-1}$$

Example 12

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Example 12

Step 2: Solve for x.

$$f(x) = \frac{x+1}{x-1}$$

Denominator $\qquad x - 1 \neq 0$

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Determine the domain of the following function.

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Step 2: Solve for x.

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Simplify	$x \geq -\frac{3}{2}$
Domain:	$D = \left\{ x \mid x \in \mathbb{R}, x \geq -\frac{3}{2} \right\}$

Example 14

Determine the domain of the following function.

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

Example 14

Step 1: Write the denominator as an expression not equal to zero.

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Example 14

Step 2: Solve for x.

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Domain:

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Simplify	$x \neq -\frac{2}{3}$
Domain:	$D = \left\{x \mid x \in \mathbb{R}, x \neq -\frac{2}{3}\right\}$

Thank you for watching.