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Lesson 1.03 Domain and Range

Students will be able to:

- <u>Content Objective:</u> Determine the domain and range of functions using interval, inequality, and set builder notation.

- <u>Language Objective:</u> Write an explanation of how to find the range given the domain.

Warm Up

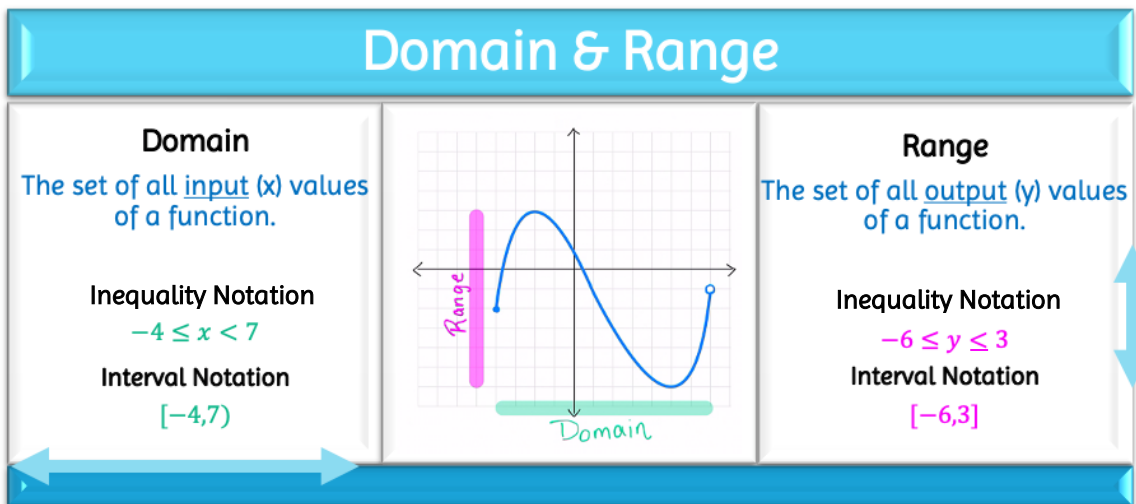Given the function $f(x) = \frac{x^2 + 2x - 1}{5}$, determine the value of $f(1) \cdot f(-5)$.

Vocabulary Review

Matching: Match the word to its correct definition/example.

___1. Domain   a. $x \geq 1$

___2. Range   b. $\{x|, x \in \mathbb{R}, -3 \leq x < 4\}$

___3. Set Builder Notation   c.   Set of all x-values (input) that result in an output

___4. Inequality Notation   d.   Set of all y-values (outputs)

___5. Interval Notation   e. $[3, \infty)$

Graphic Organizer

Domain & Range

Domain

The set of all <u>input</u> (x) values of a function.

Inequality Notation

$-4 \leq x < 7$

Interval Notation

$[-4, 7)$

Range

The set of all <u>output</u> (y) values of a function.

Inequality Notation

$-6 \leq y \leq 3$

Interval Notation

$[-6, 3]$

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Skill 1: Using the 3 Notations

a. Indicate all values from 3 up to 8, including 3 and 8 and every decimal in between.

Interval Notation:

Inequality Notation:

Set-Builder Notation:

b. Indicate all values from -4 up to 5, not including -4 and 5 but including the decimals in between.

Interval Notation:

Inequality Notation:

Set-Builder Notation:

Exercise 1: Using the 3 Notations

a. Indicate all values from 2 up to 10, not including 2 but including 10 and every decimal in between.

Interval Notation:

Inequality Notation:

Set-Builder Notation:

b. Indicate all values that are less than or equal to -6.

Interval Notation:

Inequality Notation:

Set-Builder Notation:

Note: Some functions by their nature have values that are not allowed in the domain. Here is a summary of ones we will learn about today.
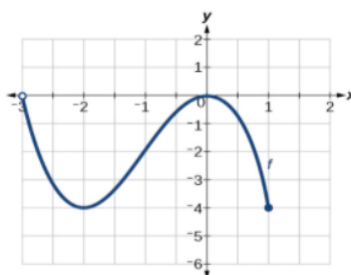
- You cannot divide by zero, therefore zero can never be the value of a fraction's denominator.

- There are no real number values which are square roots of negatives. Therefore, radicands must always be greater than or equal to zero in a square root.

Skill 2: Domain & Range

Determine the domain and range for each of the following in interval notation.

a. $f(x) = \sqrt{x-3}$

b.

$a(x) = 5\sqrt{-x+2}$

Domain: _____

Range: _____

Domain: _____

Range: _____

Domain: _____

Range: _____

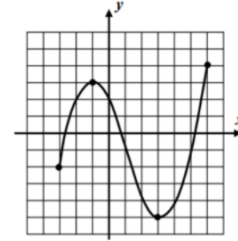**DigitLit** math instruction

Exercise 2: Domain and Range

Determine the domain and range for each of the following in interval notation.

d. $f(x) = \sqrt{x + 5}$

e. $c(x) = \sqrt{3x + 8}$

f.

Domain: _____

Range: _____

Domain: _____

Range: _____

Domain: _____

Range: _____

Skill 3: Excluded Values

Determine the values that are excluded from the domain of the following rational functions.

a. $h(x) = \dfrac{1}{x}$

b. $p(x) = \dfrac{x+3}{x+2}$

c. $t(x) = \dfrac{x+4}{x^2}$

Exercise 3: Excluded Values

Determine the values that are excluded from the domain of the following rational functions.

a. $l(x) = \dfrac{5}{x}$

b. $r(x) = \dfrac{1}{x-9}$

c. $w(x) = \dfrac{6x+1}{x^2-16}$

Check Point

Multiple Choice

The function $a(x) = 2x^2 + 1$ maps the domain given by the set $\{-5, -4, -3, -2\}$. Which of the following sets represents the range of $a(x)$?

a. $\{33, 19, 9, 3\}$

b. $\{51, 33, 19, 9\}$

c. $\{51, 33, 9\}$

d. $\{1, 3, 9, 19\}$

Write It Out

Explain in words, how you determined your answer to the check point.

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1.03- Problem Set

Name:_____

1. Given the function $f(x) = x^2 + 4x + 4$, determine the range in interval notation.

   a. $(0, \infty)$

   b. $[0, \infty]$

   c. $[0, \infty)$

   d. $(\infty, 0]$

2. Which of the following would represent the domain of the function $y = \sqrt{6 - 3x}$

   a. $x > 2$

   b. $x \geq 2$

   c. $x \leq 2$

   d. $x < 2$

3. Determine any values of x that do not lie in the domain of the functions below. Justify your response.

   a. $t(x) = \frac{x-11}{2x-3}$

   b. $w(x) = \frac{2x-7}{4x+5}$

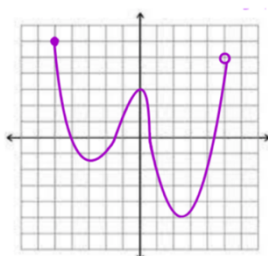4. State the domain and range of the graphs below in **set builder notation.**

   a.

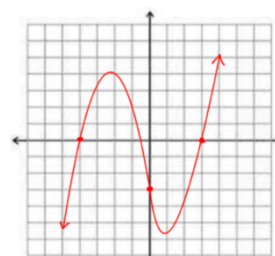   b.

   c.
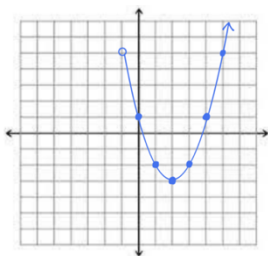
Domain: _____

Range: _____

Domain: _____

Range: _____

Domain: _____

Range: _____

5. If the range of $a(x) = 2x - 5$ is $y = \{1,3\}$, what is the domain? Show your work.