What are some of the ways Functions are represented?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 4, Lesson 1

1. Warm-up
2. Functions
3. ICA
4. Homework

Functions

What are some of the ways Functions are represented?

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Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up

Warm-up: A shopkeeper recorded daily ice cream sales along with the temperature. The results are below.

Temp.	72	68	86	74	92	64	88
Sales	38	37	40	42	51	34	47

Using the regression line, estimate the number of sales when it is 80 degrees. $ax+b$

$a=0.487$

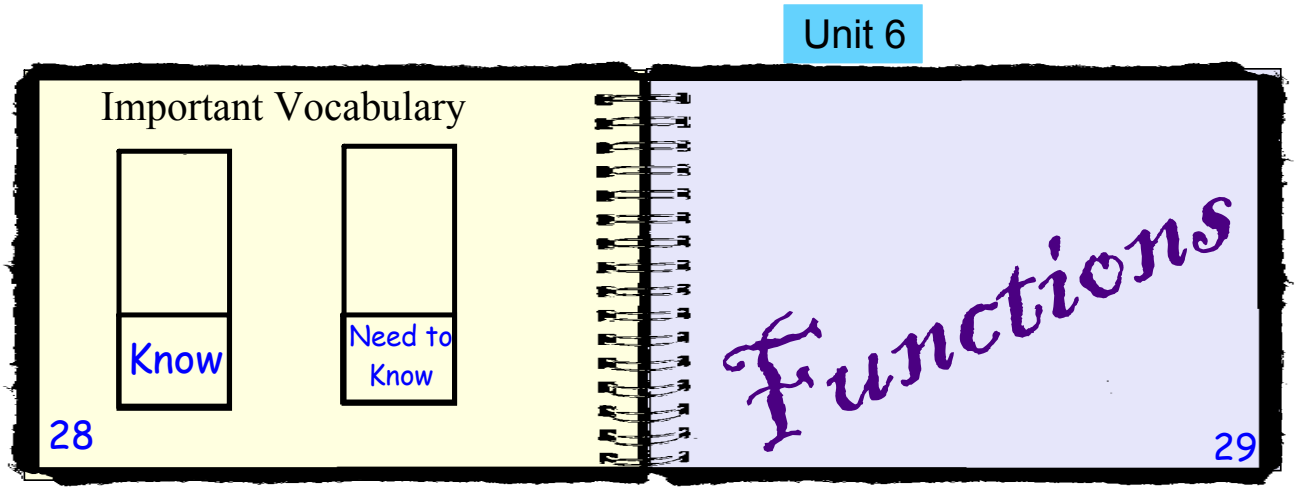
$b=3.43$

$0.487x + 3.43$

$0.487(80) + 3.43$

42.4

When it is 80 degrees he will sell about 42 ice creams.


Unit 6
Important Vocabulary
Know
Need to Know
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Functions
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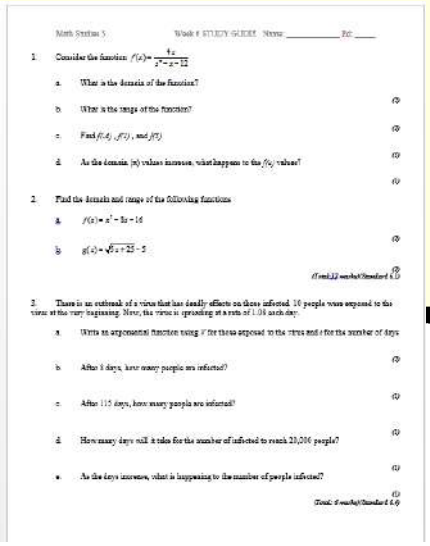
6 Week Study Guide



Math Studies 3 Week 6 STUDY GUIDE Name _____ Pd: ____

1. Consider the function $f(x)=\frac{4x}{x^2-x-12}$

a. What is the domain of the function?

(2)

b. What is the range of the function?

(2)

c. Find $f(4)$, $f(\pi)$, and $f(5)$

(3)

d. As the domain (x) values increase, what happen to the $f(x)$ values?

(1)

2. Find the domain and range of the following functions

a. $f(x)=x^2-8x-16$

(2)

b. $g(x)=\sqrt{x+25}-5$

(2)

[Total: 12 marks] Standard 6.10

3. There is an outbreak of a virus that has deadly effects on those infected. 10 people were exposed to the virus at the very beginning. Now, the virus is spreading at a rate of 1.08 each day.

a. Write an exponential function using V for those exposed to the virus and t for the number of days

(2)

b. After 5 days, how many people are infected?

(2)

c. After 115 days, how many people are infected?

(2)

d. How many days will it take for the number of infected to reach 20,000 people?

(2)

e. As the days increase, what is happening to the number of people infected?

(1)

[Total: 8 marks] Standard 6.10

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Show Your Work

31

Functions

Standard 6.1

Parent Functions

When dealing with functions, we can determine the general shape and direction by looking at the largest exponent.

A parent function is the basic function with no changes made to it.

$f(x) = x$ Linear

$f(x) = x^2$ quadratic

$f(x) = x^3$

$f(x) = x^4$

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

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

Example 1 - *Intersecting Functions*

Calculate the exact x-value where the following functions are equal

$f(x) = (x-2)^2 - 7$ $g(x) = -(x-2)^2 + 11$

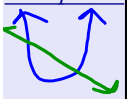
(-1,2) and (5,2) -1 and 5

Calculator

Graph → One function goes into Y1 → The other into Y2 → Draw

Shift → G-Solve: F5 → Intersection

Example 2 - *Intersections of Functions*



$f(x) = 2x^2 - 7x - 22$ $g(x) = -6x - 7$

Given the following 2 functions, what is the most number of intersections possible?

On your calculator, find the exact intersections of *f(x)* and *g(x)*

(-2.5,8) and (3,-25)

Function Notation

In certain examples, we do not only use *f(x)* and *g(x)*

Here are examples of different style notations

C(n)	*s(t)*	*a(t)*	*h(t)*
Cost according to number of items	*Position according to time*	*Acceleration according to time*	*Height according to time*

Example 3 - *Cost Analysis*

Company A can manufacture a product according to the function $A(n) = .5(n+4)^2 + 7$. Company B can manufacture the same product according to the function $B(n) = 15n + 67$. After creating how many products will the two companies cost the same?

(26 amount, 457 Cost)

When both companies produce 26 products they have the same cost of $457.

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At a horse race, Shadow's distance ran (meters) can be tracked according to the function S(t) = 22t. Another horse Ghost's distance ran (meters) can be tracked according to the function $G(t) = .5t^2$. How many seconds will it take Ghost to catch Shadow?

What is the difference between domain and range?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 4, Lesson 2

1. Warm-up
2. Domain and Range
3. ICA
4. Homework

Domain and Range

What is the difference between domain and range?

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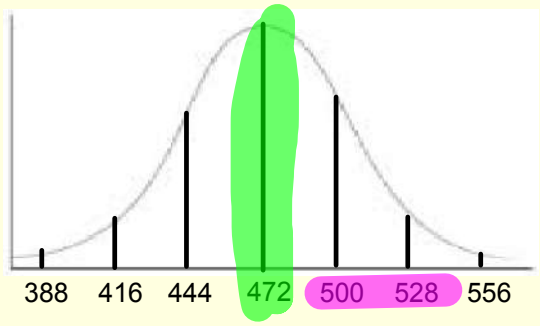
Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up

Warm-up: The data below is analyzing the monthly salary for a high school math teacher.



1. What percent of teachers make between $450 and $500 per month? NormCD(Lower, Higher, SD, Mean)

(450, 500, 28, 472)

0.6253 = 62.5%

2. If $480 is the required amount of money to pay bills each month, what percent of teachers cannot pay their bills?

NormCD(Lower, Higher, SD, Mean)

(0,479.99, 28,472)

0.6123

61.2%

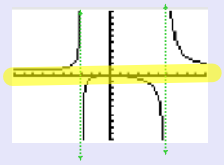
Domain and Range

Standard 6.1

Domain - The set of all possible input values (x values) that allow a function to work.

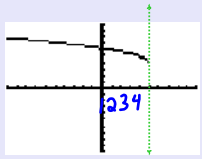
You can find domain on a graph by finding which x values have any corresponding y-value.

Example 1 - Find the domain from the following graph



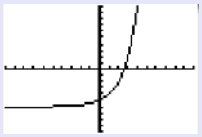
$x \mid x \neq -3, x \neq 6$

Example 2 - Find the domain from the following graph



$x \mid x < 5$

Example 3 - Find the domain from the following graph



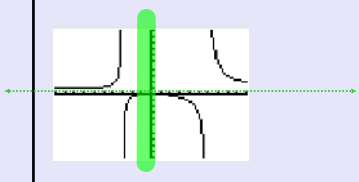
$x \mid x \in \mathbb{R}$

$-\infty < x < \infty$

Range- The set of all possible output values (y values) that are a *result* from the x values.

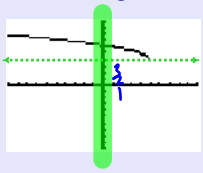
You can find domain on a graph by finding which y values the graph will eventually reach.

Example 4 - Find the range from the following graph



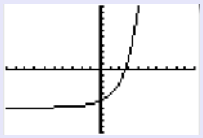
$y \mid y \neq 0$

Example 5 - Find the range from the following graph



$y \mid y > 4$

Example 6 - Find the range from the following graph



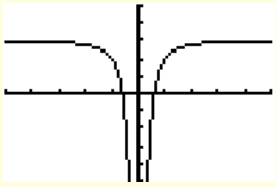
$y \in \mathbb{R}$

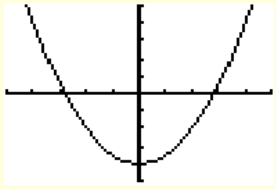
$-\infty < y < \infty$

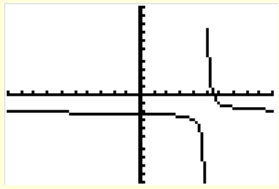
Match the functions to their correct domains, then to their correct ranges

$x \mid x \neq 5$ $\qquad$ $x \mid x \in \mathbb{R}$ $\qquad$ $x \mid -\infty < x < 0, 0 < x < \infty$

$y \mid y \geq -4$ $\qquad$ $y \mid y \neq -2$ $\qquad$ $y \mid y < 3$







What does the domain tell us?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 4, Lesson 3
1. Warm-up
2. Domain Rules
3. ICA
4. Homework

Domain Rules

What does the domain tell us?

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Warm-up: A researcher does a x^2 test of independence discovers that the p-value from her test is 5.5×10^{-6}. What should her conclusion say?

Fail to Reject p-value > Sig value

Reject p-value < Sig value

.000005.5 $\times 10^{-6}$

.000055

1% .01

5% .05

10% 0.1

Domain Rules

Standard 6.1

In your calculator, enter in the following problems:

1. $\sqrt{64-16\bullet 2}$ 5.66

2. $\sqrt{3\bullet 3^2-25}$

3. $\sqrt{25-5^2}$

4. $\sqrt{16\bullet 2-64}$ Error

5. $\sqrt{25-3\bullet 3^2}$ Error

6. $\sqrt{-1}$

1st Rule of Domain -

The only final total allowed inside of a square root is *zero or greater*

Example 1 - $\sqrt{x^2-4}$

$x^2-4=0$
$+4 \quad +4$
$\sqrt{x^2}=\sqrt{4}$
$x=\pm 2$

Which values for x *ARE* allowed under this square root?

$x \geq 2$
$x \leq -2$

Which values for x *ARE NOT* allowed under this square root?

$-2 < x < 2$

Example 2 - $\sqrt{-2x-20}$

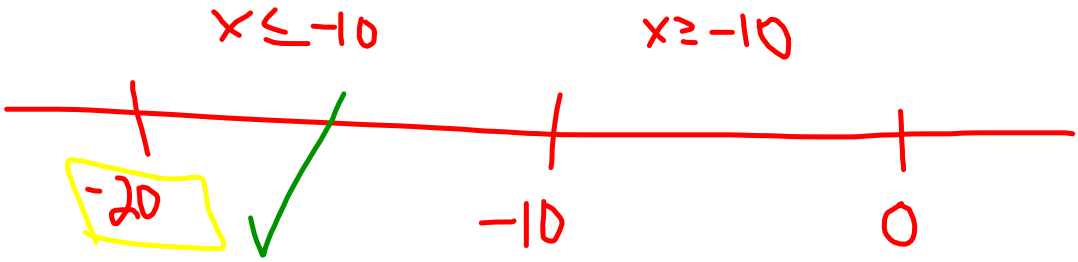
$-2x-20=0$
$+20 \quad +20$
$\frac{-2x}{-2}=\frac{20}{-2}$
$x=-10$

Which values for x *ARE* allowed under this square root?

$x \leq -10$

Which values for x *ARE NOT* allowed under this square root?

$x > -10$ $\quad -10 < x$

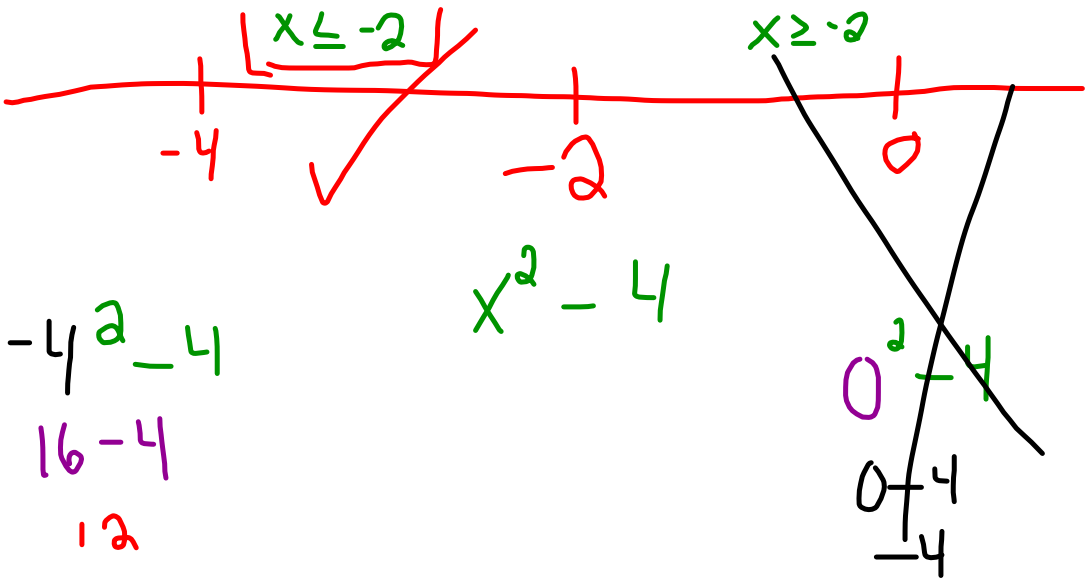


$-2x - 20$

$-2(-20) - 20$

$40 - 20$

$\sqrt{20}$


x ≤ -2
x ≥ -2
-4
-2
0
$x^2 - 4$
$-4^2 - 4$
16 - 4
12
$0^2 - 4$
0 - 4
-4

$$x^2 - 4 = 0$$
$$+4 \quad +4$$

$$\sqrt{x^2} = \sqrt{4}$$

$$x = \pm 2$$

Domain Rules

In your calculator, enter in the following problems:

18
109
.040

1. $\frac{(4^2)}{(3^3-16)}$

2. $\frac{(-5-9)}{(156\bullet -3)}$

0.0299

3. $\frac{(5\bullet 2-10)}{-(8-10)}$

0

1.45

4. $\frac{(4^2)}{(2^4-16)}$

error

5. $\frac{(-5-9)}{(25(-3)+75)}$

error

6. $\frac{5\bullet 2-10}{-(10-10)}$

error

2nd Rule of Domain -

The bottom of a fraction *CANNOT* equal zero

Example 3 - $\frac{x^2}{x+5}$

x+5 = 0
-5 -5
x = -5

Which values for x *ARE* allowed on the bottom of this fraction?

anything but -5

Which values for x *ARE NOT* allowed on the bottom of this fraction?

-5

Example 4 - $\frac{x^2}{x^3-8}$

$x^3-8=0$
$+8\ \ +8$
$\sqrt[3]{x^3}=\sqrt[3]{8}$
$x=2$

Which values for x *ARE* allowed on the bottom of this fraction?

anything but 2

Which values for x *ARE NOT* allowed on the bottom of this fraction?

2

Summary:

Match the expressions to the appropriate values of x.

1. $\sqrt{3x+18}$
2. $\sqrt{-4x+8}$
3. $\dfrac{x}{x^2-5x+4}$
4. $\dfrac{x^2}{x^3-5x}$

A. $x \mid x \neq \{1 \ , \ 4\}$

B. $x \mid x \geq -6$

C. $x \mid x \neq \{0 \ , \ \sqrt{5} \ , \ \sqrt{-5}\}$

D. $x \mid x \geq 2$

QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ QUIZ

Quiz Question

Find the domain of the following function:

$$f(x) = \frac{x}{\sqrt{3x+6}}$$

Why is domain not always "all real numbers"?

Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question Essential Question

Week 4, Lesson 4
1. Warm-up
2. Domain of Functions
3. ICA

Domain of Functions

Why is domain not always "all real numbers"?

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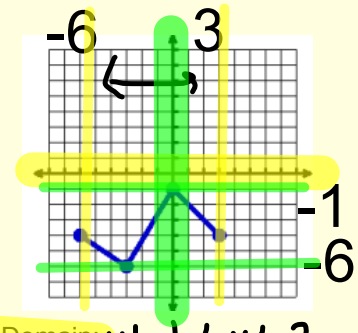
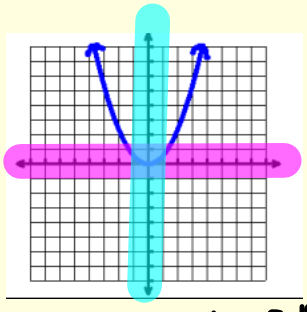
Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up Warm-up

Warm-up: What is the domain and range of the following functions?



Domain: $x \mid -6 \le x \le 3$

Range: $y \mid -6 \le y \le -1$



Domain: $x \mid x \in \mathbb{R}$

Range: $y \mid y \ge 0$

$$\sqrt{-5x-30}$$

Domain of a Function

Standard 6.1

Domain of a Function-

To find domain of a function, apply the rules we learned yesterday about square roots and fractions

The domain will be the x values that *ARE* allowed

Example 1 - Find the domain of *f(x)*

$$f(x)=\frac{x^3}{x^2-36}$$

$ax^2+bx+c=0$

$x^2 - 36 = 0$

1 0 -36

x_1 6

x_2 -6

Domain: $x \mid x \neq -6, x \neq 6$

Example 2 - Find the domain of *t(x)*

$$t(x)=\frac{5}{7x-42}$$

Domain: $x \mid x \neq 6$

Example 3 - Find the domain of *b(x)*

$$b(x)=\frac{4x^2-5x+10}{x^2-x-12}$$

$ax^2+bx+c=0$

$x^2 - x - 12 = 0$

1 -1 -12

x_1 4

x_2 -3

Domain: $x \mid x \neq -3, x \neq 4$

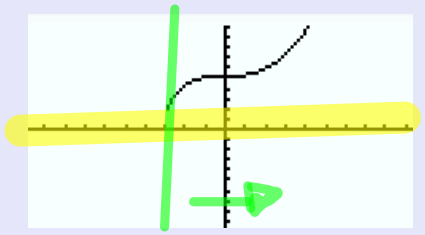
Domain of a Function

Domain of a Function-

Another option, you can plug the function into your calculator and look at the graph. *Only use this as a last resort*

Example 4 - Find the domain of r*(s)*

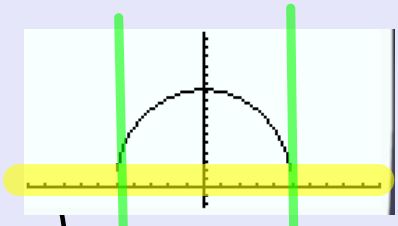
$$r(s) = \sqrt{s^3 + 27}$$



domain: $x \mid x \geq -3$

Example 5 - Find the domain of *w(p)*

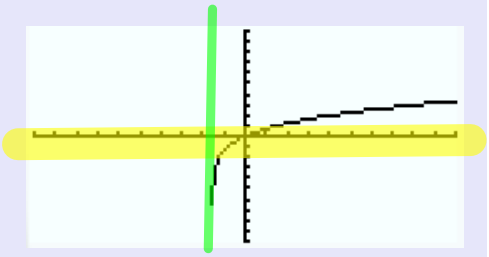
$$w(p) = \sqrt{-5p^2 + 125}$$



domain: $x \mid -5 \leq x \leq 5$

Example 6 - Find the domain of *f(x)*

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

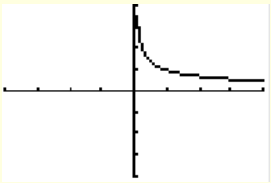


$x \mid x \geq -1.67$

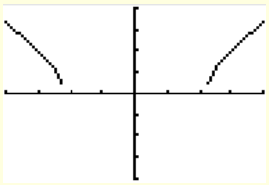
Summary:

Match the function to the proper domain, then to the graph.

$$f(x) = \frac{2x}{x^2 - 8x + 15} \qquad x \mid x > -1$$



$$g(x) = \sqrt{x^2 - 5} \qquad x \mid x \le \sqrt{5} \ , \ x \ge \sqrt{5}$$



$$h(x) = \frac{1}{\sqrt{x}} \qquad x \mid x \neq \{ 5 , 3 \}$$