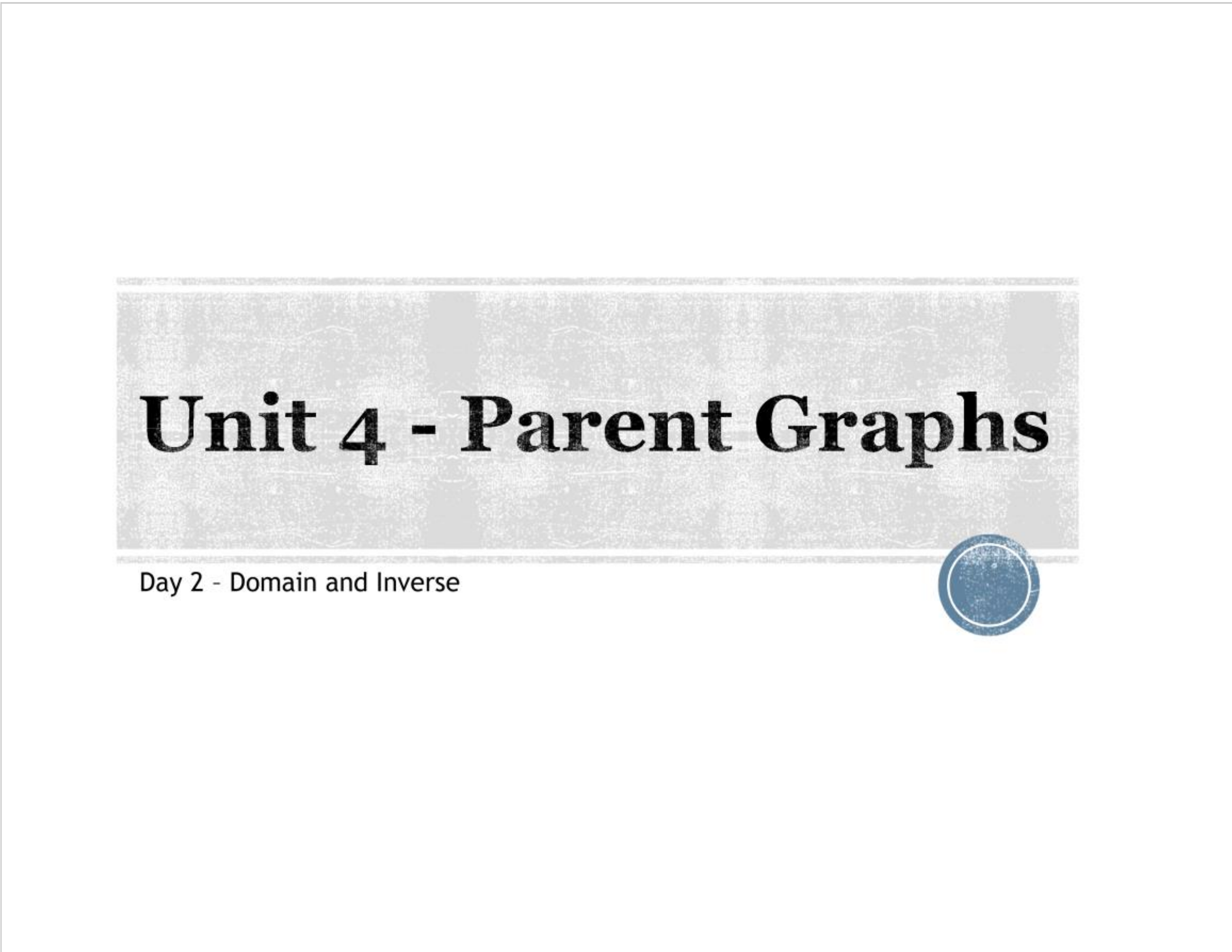
B3 Notes

Wednesday, March 13, 2019 7:59 AM

Day 2 - Domain and Inverse



Agenda

Objective:
I can find the domain and range of a function from a graph or equation.
I can find the inverse of a function and then state its domain and range.

- **Warm UP**
- **HW Review**
- **Unit 4 - Parent Graphs Day 2 Notes**
- **Classwork**
- **Homework: Day 2 HW (in packet)**

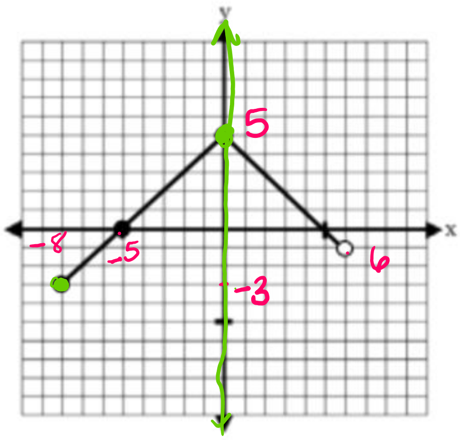
Warm Up

Let $f(x) = -3x+7$ and $g(x) = 2x^2-8$

1. Find $f(g(x))$
2. Find $(g \circ f)(x)$
3. Find $f(g(3))$

Warm Up (cont.)

List the domain and range of the graph



List of #'s

Domain: [-8, 6)

Range: [-3, 5]

VI. Finding the Domain From A Function:

Domain: the set of all real numbers for which the expression is defined

The Domain of a Function: Always All Real Numbers, EXCEPT for the following cases.

Fractions: **Denominator ≠ Zero**

Where is it undefined?
1. Set denominator = 0
2. Solve for x
3. The value of x is NOT in the domain.

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

① $x-3=0$
$x=3$

$-\infty \quad 2 \quad 3 \quad 4 \quad \infty$

$\frac{2}{2-3}$ $\frac{2}{-1}$ -2

$\frac{2}{4-3}$ $2/1$

$\boxed{D: (-\infty, 3) \cup (3, \infty)}$

Radicals: **Must ALWAYS be positive square root** $\sqrt{+}$

Where is it undefined?
1. Set inside = 0
2. Solve for x
3. Use graphing calc. to see where it is defined

Example: $f(x) = \sqrt{(64 - x^2)}$

$64-x^2=0$
$(8-x)(8+x)=0$
$x=-8 \quad x=8$

$-\infty \quad -9 \quad -8 \quad 1 \quad 8 \quad 10 \quad \infty$

$\boxed{D: [-8, 8]}$

Practice Together: Find the domain and write in interval notation.

1. $f(x)= x^2-25$

$\boxed{D:(-\infty,\infty)}$

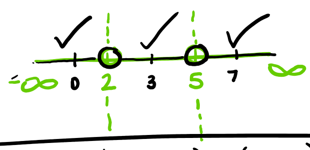
no restrictions!

2. $f(x)=\dfrac{2x}{x^2-7x+10}$

$x^2-7x+10=0$

$(x-5)(x-2)=0$

$x=5 \quad x=2$



$\boxed{D: (-\infty,2)\cup(2,5)\cup(5,\infty)}$

3. $f(x)=\dfrac{x+6}{x^2-64}$

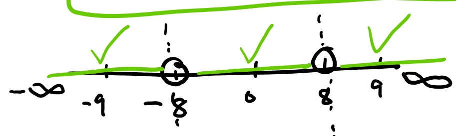
$x^2-64=0$

$(x-8)(x+8)=0$

$x=8 \quad x=-8$

where my denom is equal to zero!

$\boxed{D: (-\infty,-8)\cup(-8,8)\cup(8,\infty)}$

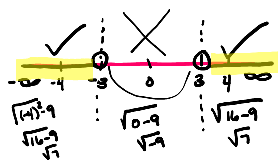


4. $f(x) =\dfrac{x-5}{\sqrt{x^2-9}}$

$x^2-9=0$

$(x+3)(x-3)=0$

$x=-3 \quad x=3$



$\boxed{D:(-\infty,-3)\cup(3,\infty)}$

Partner Practice (10mins)

Find the Domain of the following functions.

1. $f(x) = 2x + 4$
2. $f(x) = x^2 - 16$
3. $f(x) = \frac{x+4}{x-4}$
4. $f(x) = \frac{2x+4}{x^2-9}$
5. $j(x) = \frac{x^2+4x}{x^2-4x+3}$
6. $k(x) = \sqrt{x+4}$
7. $l(x) = \frac{x+3}{\sqrt{x+4}}$
8. $m(x) = 5 + \sqrt{2x-6}$
9. $n(x) = \sqrt{8-2x}$
10. $p(x) = \sqrt{x^2+4x-5}$

Warm Up

- Find the domain of the following function: $\frac{\sqrt{x-2}}{x^2-x-6}$

VII. Inverse Functions:

An inverse is a relation that performs the opposite operation on x (the domain). The domain of *f(x)* is the range of . $f^{-1}(x)$

Domain

Examples:

1. $f(x) = x - 3$

   $f^{-1}(x) = x+3$

notation inverse function

2. $g(x) = \sqrt{x}, x \geq 0$

   $g^{-1}(x) = x^2$

3. $h(x) = 2x$

   $h^{-1}(x) = \frac{x}{2}$

How do we know if an inverse function exists?

Inverse functions only exist if the original function is one to one (which means there are no repeated y-values).

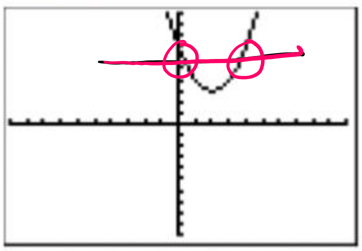
Horizontal Line Test: Used to test if the function is one to one.

-If the horizontal line intersects the graph more than once, then it is NOT one to one.

-Therefore there is not an inverse function and we call it an inverse relation.

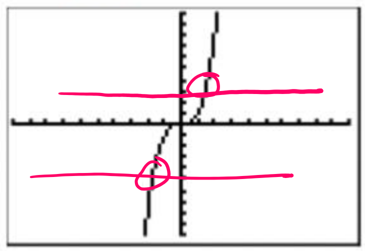
Examples: Look at the following graphs and determine if an inverse function is possible.

1. $f(x) = x^2 - 4x + 7$



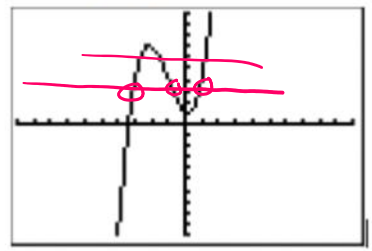
not one to one

2. $f(x) = x^3$



yes one to one

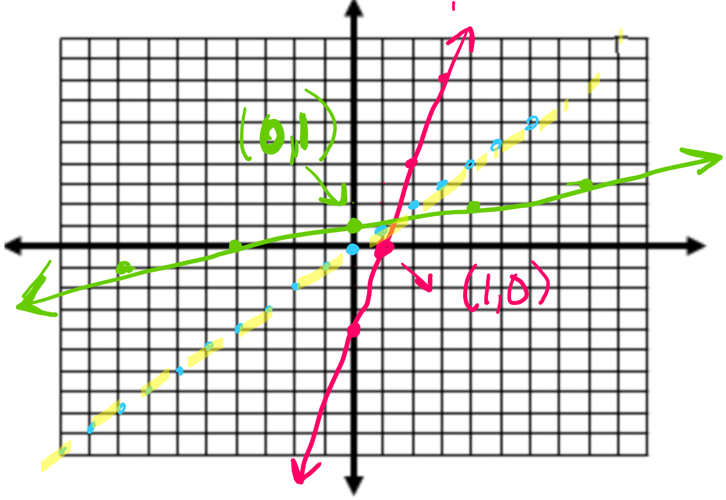
3. $f(x) = x^3 + 3x^2 - x - 1$



NO, not 1:1

Finding Inverse Functions Graphically:

Sketch the graph of $f(x) = 4x - 4$ and $f^{-1}(x) = \frac{1}{4}x + 1$.



We say *the function and its inverse are symmetric over the line* y=x.

Parent graph of a linear function!

Finding the Inverse Function Algebraically:

Steps

1. Use the horizontal line test to determine if f has an inverse function.
2. Write as y=
3. Switch x and y
4. Solve for y
5. Rewrite as y^{-1} or $f^{-1}(x)$

Examples:

1. $f(x) = -4x - 9$

$y = -4x - 9$ diff. y value!

$x = -4y - 9$

$+9 \qquad +9$

$\frac{x+9}{-4} = \frac{-4y}{-4}$

$\frac{x+9}{-4} = y$ give y a new name!

$\boxed{f^{-1}(x) = \frac{x+9}{-4}}$

2. $f(x) = \frac{5-3x}{2}$

$y = \frac{5}{2} - \frac{3}{2}x$

2. $x = \frac{5-3y}{\cancel{2}} \cdot \cancel{2}$

$2x = 5 - 3y$

$-5 \qquad -5$

$\frac{2x-5}{-3} = \frac{-3y}{-3}$

$f^{-1}(x)\ y = \frac{2x-5}{-3}$

3. $f(x) = \sqrt[3]{10+x}$

$y = \sqrt[3]{10+x}$

$(x)^3 = \left(\sqrt[3]{10+y}\right)^3$

$x^3 = 10 + y$

$-10 \qquad -10$

$x^3 - 10 = y$

$\boxed{f^{-1}(x) = x^3 - 10}$

Domain, Operations of Function, and Inverse Practice WKS