Warm Up.

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SWBAT find the inverse of functions

Agenda:
Warm up
Desmos activity
Notes
practice (homework)

Unit 3: Inverse Functions

What is an inverse?

What is an inverse operation?

What is an inverse function?

What is an inverse? something that is the opposite or reverse of something?

What is an inverse operation? operations that undo each other for example: addition and subtraction

What is an inverse function? a **function** that "reverses" another **function**: f the **function** f applied to an input x gives a result of y, then applying its **inverse function** g to y gives the result x, and vice versa. i.e., f(x) = y if and only if g(y) = x.

The inverse of f(x) is written as $f^{-1}(x)$

$f(f^{-1}(x))$

x

The domain of a function's inverse is the range of the function

$3\left(\frac{1}{3}x\right)$ x $(\sqrt{x})^2$

x

The rangeof a function's inverse is the domain of the function

Function		Inverse	
Input	Output	Input	Output
–3	–17	–17	–3
–1	–11	–11	–1
1	–6	–6	1
3	–3	–3	3

To algebraically find the inverse of a function with *x* as the independent variable and *y* as the dependent variable, switch *x* and *y*, then solve for *y* by using **inverse operations**, or operations that reverse the effect of other operations.

For example: find the inverse of y = 5x + 3

$x = 5y + 3$

$-3 \quad -3$

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

$\frac{1}{5}x - \frac{3}{5} = y$

Steps for finding inverses:

1. Determine if the function is one-to-one.
2. Rewrite the function f(x) in the for "y="
3. Switch x and y in the original equation
4. Solve the new equation for y by using inverse operations.
5. Replace y with $f^{-1}(x)$ to show the inverse notation

Example 2: $y = x^2 + 5$

Find the inverse:

$x = y^2 + 5$

$-5 \quad -5$

$\sqrt{x-5} = \sqrt{y^2}$

$\pm\sqrt{x-5} = y$

Example 2: $y = x^2 + 5$

Find the inverse:

Practice.

1. $y = 2x + 5$

2. $f(x) = 3 - 4x$

Practice.

1. $y = 2x + 5$

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

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

2. $f(x) = 3 - 4x$

$f^{-1}(x) = -\frac{1}{4}x + \frac{3}{4}$

$f^{-1}(x) = \frac{x-3}{-4}$

$y = x^2 + 5$

$y = \sqrt{2x - 6}$

$y = x^2 + 5$

$x = y^2 + 5$

$f^{-1}(x) = \pm\sqrt{x-5}$

$y = \sqrt{2x-6}$

$f^{-1}(x) = \frac{x^2+6}{2}$

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

$f(g(x))$ $g(f(x))$

$f \circ g$ $g \circ f$

Now you try:

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

2. $f(x) = (x + 3)^2$ $f^{-1}(x) = \pm\sqrt{x} - 3$

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

1. $y = 3x - 5$ $y = 3\left(\frac{x+5}{3}\right) - 5$

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

$y = x$

$y = \frac{x+5}{3} \rightarrow \frac{(3x-5)+5}{3}$

$\frac{3x-5+5}{3}$

$\frac{3x}{3} = x$

Now you try:

1. $y = 3x - 5$

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

3. $y = \sqrt{x} + 5$