

Topic: Verify and Graph Inverses Functions

Name: _____

What am I learning today?

Warm-Up:

Warm-up: Use the 4 step process to find the inverse of the following:

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

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

1) $f(x) = -5x + 3$

$$y = -5x + 3$$

$$x = -5y + 3$$

$$x - 3 = -5y$$

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

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

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

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

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

$$+1 \sqrt{2x} = y - 1$$

$$y = \sqrt{2x} + 1$$

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

3) $f(x) = \sqrt{x-4}$

$$y = \sqrt{x-4}$$

$$(y)^2 = (\sqrt{x-4})^2$$

$$x^2 = y - 4$$

$$y = x^2 + 4$$

$$f^{-1}(x) = x^2 + 4$$

Steps to Verify

To prove $f(x)$ and $g(x)$ are inverses, you must show that $f(g(x)) = g(f(x)) = x$

You must show only ONE mathematical step at a time to actually PROVE the concept!!

Examples

Verify if the functions are inverses

$$\sqrt{\frac{1}{a}} = \frac{1}{\sqrt{a}}$$

$$\sqrt{\frac{1}{3}} = \frac{1}{\sqrt{3}}$$

yes, $f(x)$ & $g(x)$ are inverses!

Verify $f(x)$ and $g(x)$ are inverses.

No, $f(x)$ & $g(x)$ are NOT inverses.

1) $f(x) = \frac{1}{3}x^2$ and $g(x) = 3\sqrt{x}$

① $f(g(x))$

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

$$= \frac{1}{3}(9x)$$

$$= 3x$$

② $g(f(x))$

$$= 3\sqrt{\frac{1}{3}x^2}$$

$$= 3 \cdot \frac{1}{\sqrt{3}}x$$

$$= \sqrt{3}x$$

Yes, $f(x)$ & $g(x)$ are inverses

2) $f(x) = 2x + 14$, $g(x) = \frac{1}{2}x - 7$

① $f(g(x))$

$$= 2(\frac{1}{2}x - 7) + 14$$

$$= x - 14 + 14$$

$$= x$$

② $g(f(x))$

$$= \frac{1}{2}(2x + 14) - 7$$

$$= x + 7 - 7$$

$$= x$$

3) $f(x) = \frac{2x+7}{5}$, $g(x) = \frac{5x-7}{2}$

$f(g(x))$

$$= \frac{2(\frac{5x-7}{2}) + 7}{5}$$

$$= \frac{5x - 7 + 7}{5}$$

$$= \frac{5x}{5} = x$$

$g(f(x))$

$$= \frac{5(\frac{2x+7}{5}) - 7}{2}$$

$$= \frac{2x + 7 - 7}{2}$$

$$= \frac{2x}{2} = x$$

4) $f(x) = \sqrt[3]{2x}$, $g(x) = \frac{1}{2}x^3$

$f(g(x))$

$$= \sqrt[3]{2(\frac{1}{2}x^3)}$$

$$= \sqrt[3]{x^3}$$

$$= x$$

$g(f(x))$

$$= \frac{1}{2}(\sqrt[3]{2x})^3$$

$$= \frac{1}{2}(2x)$$

$$= x$$

yes, $f(x)$ & $g(x)$ are inverses!

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Inverse Graphs

Horizontal Line Test

The _____ of an inverse relation is the reflection of the points or graph of the original relation over the line $y = x$.

Note: given a table of values, switching the x and _____ values yields the inverse graph.

If a function has an _____ that is also a function, then a _____ line through the graph of the original function will pass through _____ point.

Steps
Graphing Inverses

In **INVERSES**, the **outputs** become the **inputs**, so...**X's** become **Y's** and **Domain** becomes **Range**

Original Relation

Inverse Relation

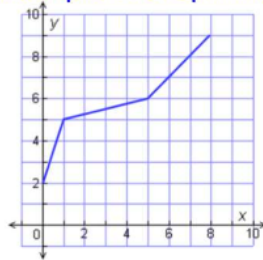
x	y
-2	4
-1	2
0	0
1	-2
2	-4

Domain: _____
Range: _____
Domain: _____
Range: _____

x	y

Examples
Graphing the Inverse

Example 1: Graph the inverse of the function.



x	0	1	5	8
y	2	5	6	9
x				
y				

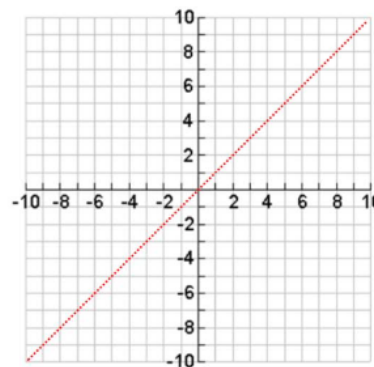
Example 2

Original: $y = 2x - 4$

Inverse:

x	y
2	
1	
0	
-1	
-2	

x	y



Summary
Summarize the lesson in your own words