

Name: _____

Inverse Function Notes

Complete the missing representations below for the function and its inverse below.

Equations:

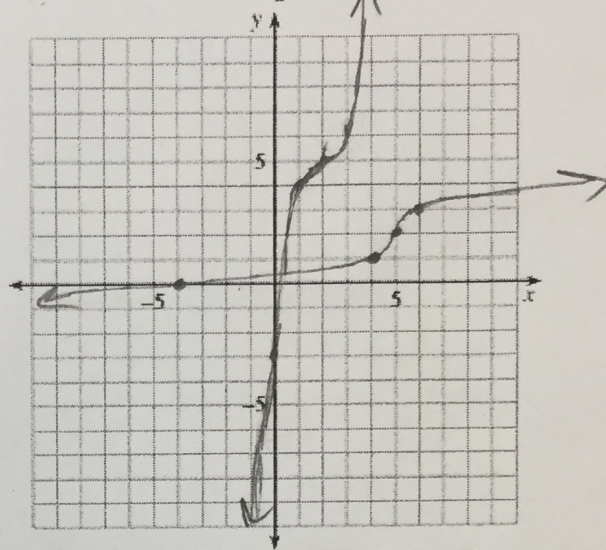
$f(x) = (x-2)^3 + 5$ inverse: $f^{-1}(x) = \sqrt[3]{x-5} + 2$

Tables:

x	y
-4	-211
-3	-120
-2	-59
-1	-22
0	-3
1	4
2	5
3	6
4	13

x	y
-211	-4
-120	-3
-59	-2
-22	-1
-3	0
4	1
5	2
6	3
13	4

Graphs:



Do $(-)$ $()^3$ $+5$
 Undo -5 $\sqrt[3]{ }$ $+$

or $y = (x-2)^3 + 5$
 $\sqrt[3]{x-5} = (y-2)^3$
 $\sqrt[3]{x-5} = y-2 \rightarrow \sqrt[3]{x-5} + 2 = y$

Describe the relationship between a function and its inverse for each of the representations.

Table

In the table the x-values and y-values swap

Equation

In the equation the inverse uses the opposite operations in the reverse order. They undo each other

Graph

The graphs are reflections over the line $y=x$

If the inverse of a function f is also a function, then f is **invertible** and its inverse is denoted by f^{-1} . (Note: $f^{-1}(x)$ does not mean $\frac{1}{f(x)}$) Is f invertible? If yes, explain why and write the inverse function using correct notation. If not, explain why not.

$f(x)$ is invertible because $f^{-1}(x)$ is also a function meaning each input has one and only one output.

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Inverse Function Notes

If you want to verify two functions f and g are inverses, you need to show that f and g undo one another. That is, you need to show that $f(g(x)) = x$ and $g(f(x)) = x$. Use composition to decide if each of the following pairs of functions are inverses.

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

$g(x) = x\sqrt{3} + 4$

$g(f(x)) = (3x^2 - 4)\sqrt{3} + 4$

$g(f(x)) = 3\sqrt{3}x^2 - 4\sqrt{3} + 4$

$3\sqrt{3}x^2 - 4\sqrt{3} + 4 \neq x$

These are not inverses

b. $f(x) = \sqrt{x} + 2$

$g(x) = x^2 - 4x + 4$

$f(g(x)) = \sqrt{x^2 - 4x + 4} + 2$

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

$f(g(x)) = x - 2 + 2$

$f(g(x)) = x$

yes these are inverses

Write the equation of the inverse of each function below. Use correct notation in your answer.

a. $f(x) = 3x^3 - 5$

Do $()^3 \cdot 3 - 5$
Undo $+5 \div 3 \sqrt{\quad}$

$f^{-1}(x) = \sqrt[3]{\frac{x+5}{3}}$

$y = 3x^3 - 5$

$x = \sqrt[3]{\frac{y+5}{3}}$

$x+5 = 3y^3$

$\sqrt[3]{\frac{x+5}{3}} = y$

$\sqrt[3]{\frac{x+5}{3}} = y$

$f^{-1}(x) = \sqrt[3]{\frac{x+5}{3}}$

b. $h(x) = \frac{x+3}{2x-8}$

Do undo will not work

*must use algebra

$y = \frac{x+3}{2x-8}$

$(2y-8)x = y+3 \cdot (2y-8)$

$2xy - 8x = y+3$

$2xy = y+3+8x$

$2xy - y = 3+8x$

$y(2x-1) = 3+8x$

$y = \frac{3+8x}{2x-1}$

$f^{-1}(x) = \frac{8x+3}{2x-1}$

$x \neq \frac{1}{2}$

$f^{-1}(x) = \frac{-8x-3}{-2x+1}$