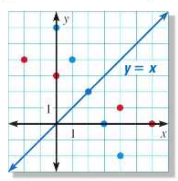
6.4 Inverses - an inverse relation interchanges the input and the output values of the original function.

Original relation

x	0	1	2	3	4
y	6	4	2	0	−2

Inverse relation

x	6	4	2	0	−2
y	0	1	2	3	4



The graph of an inverse relation is a *reflection* of the graph of the original relation. The line of reflection is $y = x$. To find the inverse of a relation given by an equation in x and y, switch the roles of x and y and solve for y.

The inverse is a reflection across the line $y=x$

Jan 28-8:08 PM

How to find an inverse-steps in book

1.) $y = 3x - 5$

Steps
① Switch x & y
② Solve for y

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

Work your way up: P E M D A S

Symbol for inverse $f^{-1}(x)$

Jan 28-8:11 PM

Find the inverse of the following function:

② $f(x) = 2x^3 + 1$

$y = 2x^3 + 1$
$x = 2y^3 + 1$
$x - 1 = 2y^3$
$\sqrt[3]{\frac{x-1}{2}} = \sqrt[3]{y^3}$
$\boxed{y = \sqrt[3]{\frac{x-1}{2}}}$ $f^{-1}(x)$

option 2
$\left(\frac{x-1}{2}\right)^{\frac{1}{3}} = \left(y^3\right)^{\frac{1}{3}}$
$\boxed{y = \left(\frac{x-1}{2}\right)^{\frac{1}{3}}}$

P E M D A S

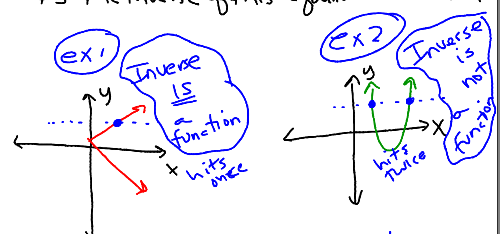
③ $f(x) = 2(x-1)^{\frac{3}{2}} + 4$
$y = 2(x-1)^{\frac{3}{2}} + 4$
$x = 2(y-1)^{\frac{3}{2}} + 4$
$x - 4 = 2(y-1)^{\frac{3}{2}}$
$\left(\frac{x-4}{2}\right)^{\frac{2}{3}} = \left((y-1)^{\frac{3}{2}}\right)^{\frac{2}{3}}$
$\left(\frac{x-4}{2}\right)^{\frac{2}{3}} = y - 1$
$\boxed{\left(\frac{x-4}{2}\right)^{\frac{2}{3}} + 1 = y}$ $f^{-1}(x)$

Jan 28-8:13 PM

Horizontal Line Test

The inverse of a function 'f' is also a function IFF no horizontal line intersects the graph 'f' more than once.

Is the inverse of this equation a function



Draw a horizontal line to see intersects

Feb 8-2:25 PM

Names

$f(x)$ original function

$f^{-1}(x)$ inverse of that function

Jan 15-12:17 PM

How to verify if two functions are inverses...Compositions :)

EXAMPLE 2 **Verify that functions are inverses**

Verify that $f(x) = 3x - 5$ and $f^{-1}(x) = \frac{1}{3}x + \frac{5}{3}$ are inverse functions.

Solution

STEP 1 Show that $f(f^{-1}(x)) = x$.

$f(f^{-1}(x)) = f\left(\frac{1}{3}x + \frac{5}{3}\right)$
$= 3\left(\frac{1}{3}x + \frac{5}{3}\right) - 5$
$= x + 5 - 5$
$= x$ ✓

STEP 2 Show that $f^{-1}(f(x)) = x$.

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

Jan 28-8:11 PM

HW #16 Verify Inverses

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

1st BOTH 2nd

$f(g(x))=$

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

$\cancel{2}\left(\frac{x-3}{\cancel{2}}\right)+3$ now simplify

$x\cancel{-3}+\cancel{3}$

$\boxed{x}$

after simplifying if you are left w/ $\boxed{x}$ YAY! its an inverse!

$g(f(x))=$

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

$\frac{2x+\cancel{3}-\cancel{3}}{2}$

$\frac{\cancel{2}x}{\cancel{2}}$

$\boxed{x}$

Jan 15-12:19 PM

Word Problems: The book is sketchy on what it calls an inverse...

DONT SWITCH VARIABLES- they have meaning they have value they have context...
Just solve for the other variable

Gosh if its all in bold...it must be important!

Find Inverse
Solve for r
don't switch

$A=\pi r^2$

$\frac{A}{\pi}=\frac{\pi r^2}{\pi}$

$\sqrt{\frac{A}{\pi}}=\sqrt{r^2}$

$r=\sqrt{\frac{A}{\pi}}$

Jan 17-12:54 PM

Jan 16-7:57 AM