
Warm -Up

$$f(x) = 3x - 7$$

$$h(x) = x^2 + 3x - 40$$

$$g(x) = x - 5$$

1. $(f-h)(x)$

3. $\left(\frac{h}{g}\right)(x)$

2. $(f \cdot h)(x)$

4. $h(-3)$

5. $(f \circ g)(x)$

Objective

Today we will:

- Determine the Inverse of a function algebraically
- Graph the inverse of a function

Agenda

- Inverse Notes/Examples
- Practice!

Inverse of a Function

It's a function that "reverses" another function

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

Steps:

1. Change $f(x)$ to y
2. Switch x and y
3. Solve for y

$f(x)$: function

$f^{-1}(x)$: Inverse function

Find the Inverse Function

Ex.1 $f(x) = 2x + 4$

$$y = 2x + 4$$

$$x = 2y + 4$$

$$\frac{x-4}{2} = \frac{2y}{2}$$

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

You Try

Ex. 2 $f(x) = -2x - 7$

$$y = -2x - 7$$

$$x = -2y - 7$$

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

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

Ex. 3

$$y = \frac{4}{7}x - 5$$

$$\frac{7}{4}(x + 5) = \frac{4}{7}y - 5$$

$$\frac{7}{4}x + \frac{35}{4} = y \quad f^{-1}(x) = \frac{7}{4}x + \frac{35}{4}$$

You Try

Ex. 4 $f(x) = 7 + \frac{3}{4}x$

$$y = 7 + \frac{3}{4}x$$

$$x = 7 + \frac{3}{4}y$$

$$\frac{4}{3}(x-7) = \cancel{\frac{3}{4}}y \left(\cancel{\frac{4}{3}} \right)$$

$$f^{-1}(x) = \frac{4}{3}x - \frac{28}{3}$$

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

$$\begin{array}{r} y = -x^5 - 3 \\ X = -y^5 - 3 \\ \hline +3 \qquad \qquad +3 \end{array}$$

$\frac{X+3}{-1} = \frac{-y^5}{-1}$

$\sqrt[5]{-X-3} = \sqrt[5]{y^5}$

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

Ex.6 $g(x) = -\sqrt[3]{x} - 3$

$$y = -\sqrt[3]{x} - 3$$

$$X = -\sqrt[3]{y} - 3$$

$$+3 \qquad \qquad +3$$

$$X+3 = -\sqrt[3]{y}$$

$(-X-3)^3 = \sqrt[3]{y}^3$

$g^{-1}(x) = (-x-3)^3$

Ex. 7
$$g(x) = \sqrt[5]{x} - 3$$

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

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

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

$$g^{-1}(x) = (x+3)^5$$

Ex. 8
$$f(x) = -2(x+1)^5$$

$$y = -2(x+1)^5$$

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

$$\sqrt[5]{\frac{x}{-2}} = \sqrt[5]{(y+1)^5}$$

$$\sqrt[5]{\frac{x}{-2}} = y+1$$

$$\sqrt[5]{\frac{x}{-2}} - 1 = y$$

Reminder:

We can tell if a graph is a function by applying the: Vertical line test

Graphing the Inverse

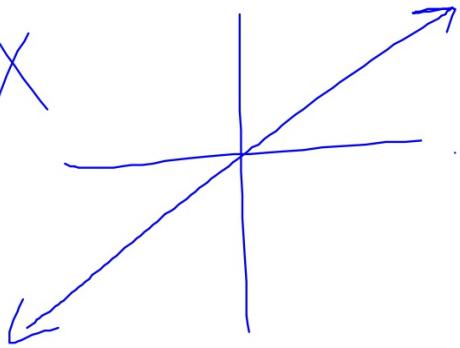
- Switch the x and y values of the original function

Ex: $f(x)$

If a function has points of $(3, -7)$ and $(-5, 9)$,

then the inverse has points of $(-7, 3)$ $(9, -5)$

Inverses on a graph
are a reflection about
the line $y=x$



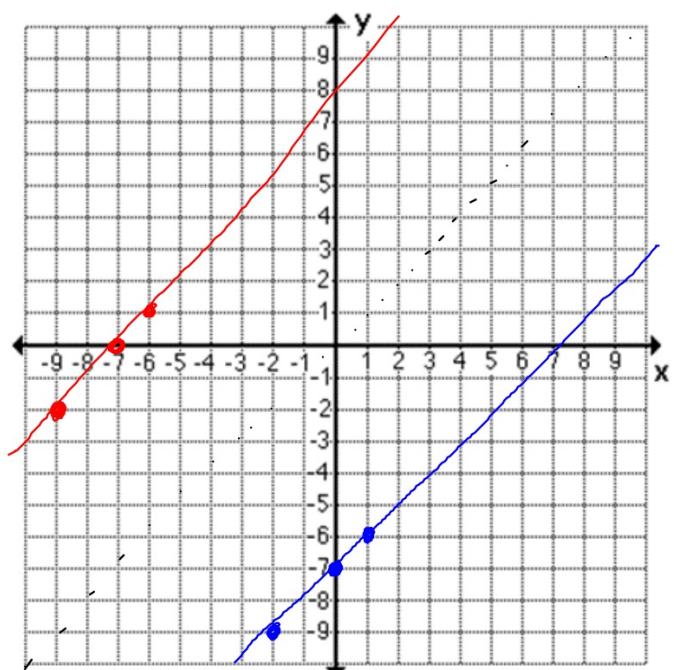
Function: $y = x - 7$

x	0	1	-2
y	-7	-6	-9

Inverse:

x	-7	-6	-9
y	0	1	-2

Is the inverse a
function? YES



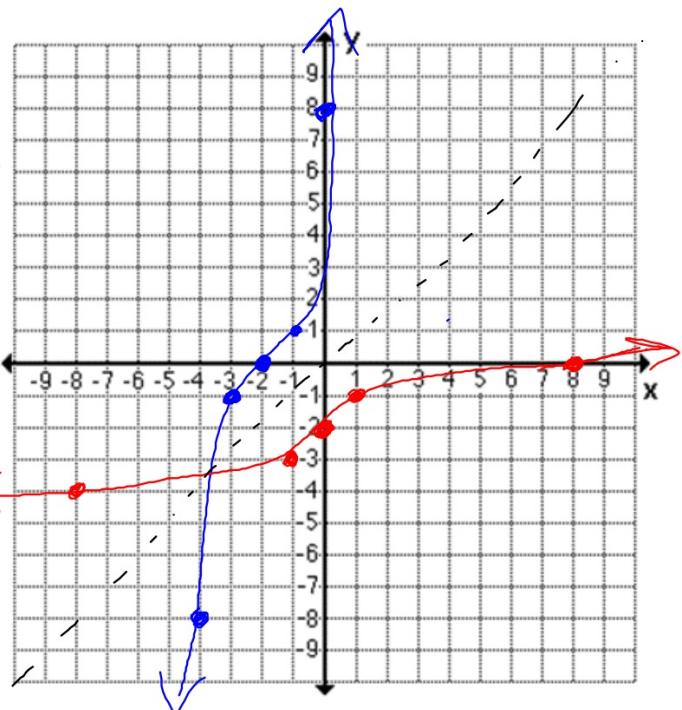
Function: $y = (x + 2)^3$

x	0	-2	-3	-4	-1
y	8	(0)	-1	-8	1

Inverse: Inflection Point

x	8	(0)	-1	-8	1
y	0	-2	-3	-4	-1

Is the inverse a function? YES



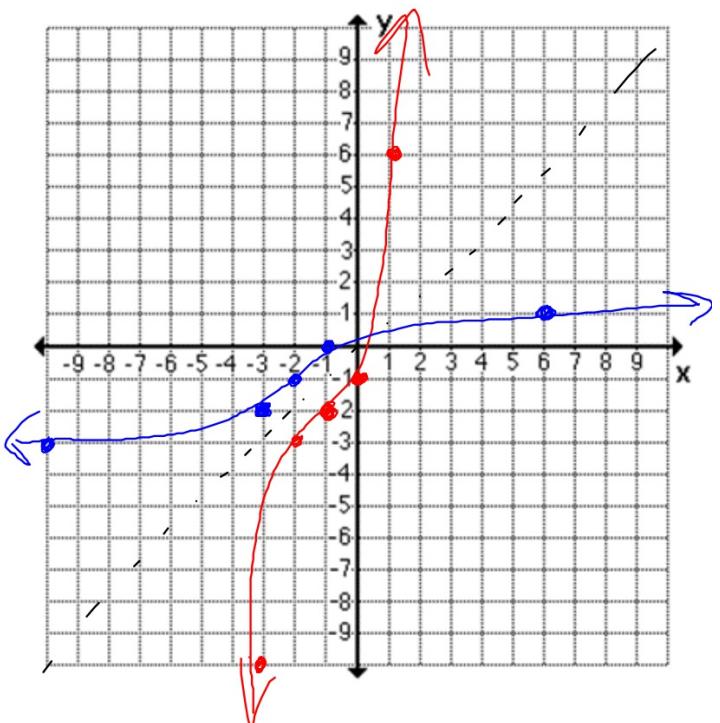
Function: $f(x) = \sqrt[3]{x+2} - 1$

$$\begin{array}{r|rrrrr} x & -2 & -1 & -3 & -10 & 6 \\ \hline y & -1 & 0 & -2 & -3 & 1 \end{array}$$

Inverse:

$$\begin{array}{r|rrrrr} y & -1 & 0 & -2 & -3 & 1 \\ \hline x & -2 & -1 & -3 & -10 & 6 \end{array}$$

Is the inverse a function? YES



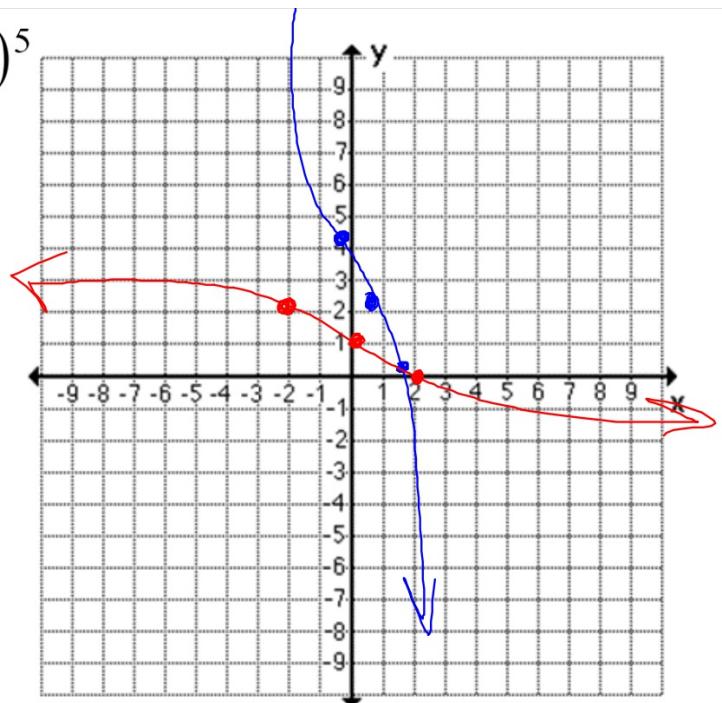
Function: $f(x) = -2(x - 1)^5$

x	0	1	2
y	2	0	-2

Inverse:

x	2	0	-2
y	0	1	2

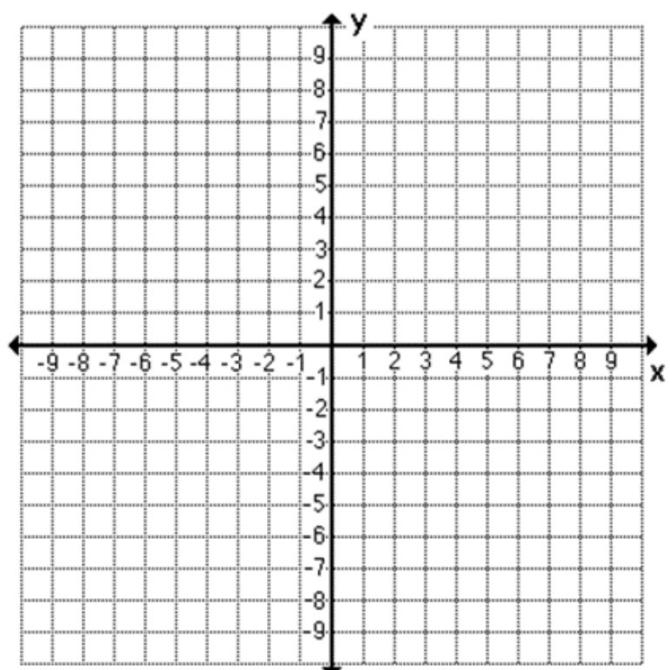
Is the inverse a
function? **YES**



Function: $f(x) = 2x + 4$

Inverse:

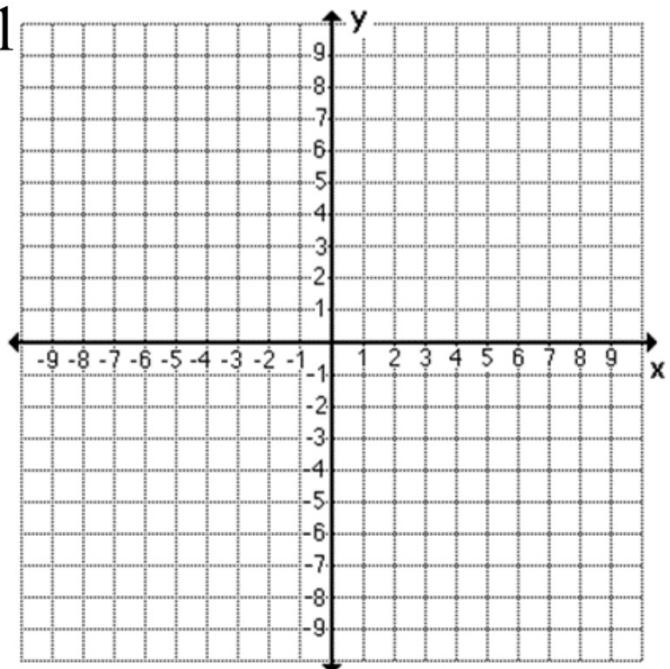
Is the inverse a function?



Function: $g(x) = -x^3 - 1$

Inverse:

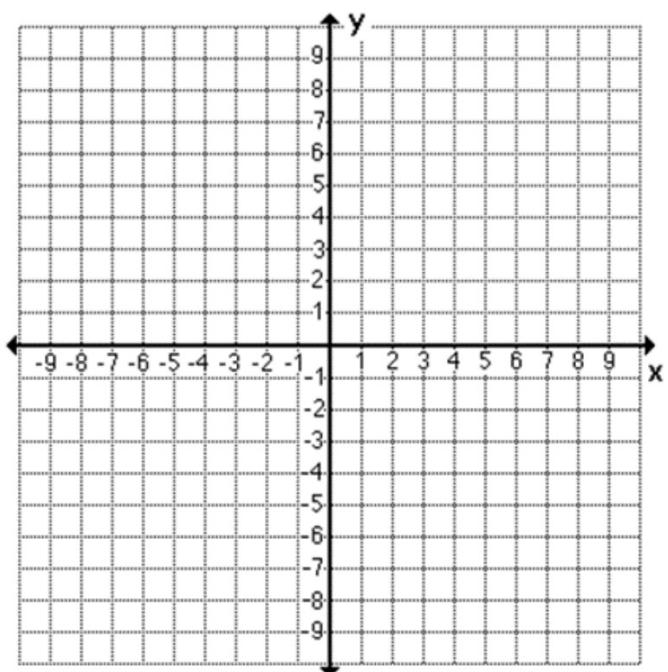
Is the inverse a function?



Function: $g(x) = \sqrt[5]{x} + 3$

Inverse:

Is the inverse a function?



Function: $f(x) = -\sqrt[3]{x} + 2$

Inverse:

Is the inverse a function?

