Horizontal Line Test: a visual test to determine if the inverse relation will be a function.

If any horizontal line can intersect a graph more than once then the graph of the inverse is NOT a function

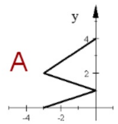
One-to-One Functions:

Each y value is produced from exactly one x value.

If horizontal lines can touch a graph at most one time.

Inverses ARE functions

A



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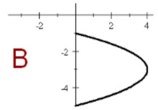


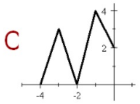
Many-to-One Functions:

Each y value may be produced from more than one x value.

If a horizontal line can touch a graph "many" times (more than once)

Inverses are NOT functions

C



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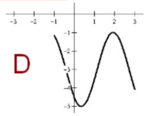


Original Relation		Inverse Relation
f(x)	Becomes	$f^{-1}(x)$
The point (a,b)	Becomes	The point (b,a)
Domain of f(x)	Becomes	Range of $f^{-1}(x)$
Range of f(x)	Becomes	Domain of $f^{-1}(x)$
Graph of f(x)	Reflect over y=x / Becomes	Graph of $f^{-1}(x)$

Find the equation of the Inverse Relation.

1. $f(x)=2x - 3$ $\qquad f^{-1}(x)=$

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

2. $f(x) = (x+5)^3 - 7$ $\qquad f^{-1}(x)=\sqrt[3]{x+7}\ -5$

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

Composites of Inverses

Find each of the following:

A. $f(f^{-1}(x)) = x$

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

$$x+3-3$$

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

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

2. $f(x) = (x+5)^3 - 7$ $f^{-1}(x) = \sqrt[3]{x+7} - 5$

A. $f(f^{-1}(x)) = x$

$$\left(\sqrt[3]{x+7}-5+5\right)^3 - 7$$

$$\left(\sqrt[3]{x+7}\right)^3 - 7$$

$$x+7-7$$

B. $f^{-1}(f(x)) = x$

$$\sqrt[3]{(x+5)^3-7+7} - 5$$

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

$$x+5-5=$$

If f(x) and $f^{-1}(x)$ are inverses, then

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

Find the equation of the inverse.

1. $\cancel{y}\, x = \frac{\sqrt[4]{2\cancel{x}y-9}}{2} + 8$

$$\frac{\left(2(x-8)\right)^4+9}{2} = y$$

Find the equation of the inverse.

2. $$y = \frac{(4x+7)^3 - 2}{3}$$

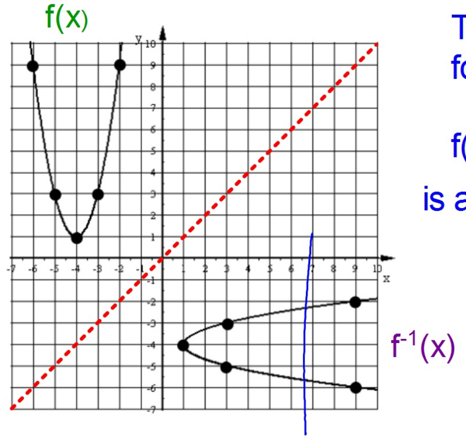
Find the equation of the inverse.

3. $$y = 2\left(\frac{\sqrt{6x+1}}{11}\right)^5 - 3$$

Find the equation of the inverse.

4. $$y = 9\sqrt[3]{\frac{x+7}{2} - 5} + 4$$

You can now finish Hwk #19.



The inverse relation for the Quadratic:

$f(x)=2(x+4)^2 + 1$

is a "sideways parabola"

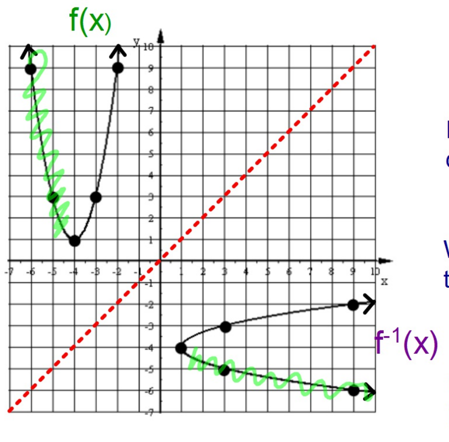
Is $f^{-1}(x)$ a function?

NO

Write the equation for the inverse relation.

$f(x)=2(x+4)^2 + 1$

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



To make $f^{-1}(x)$ a function we must "cut off" part of $f(x)$.

If we cut off the left side of $f(x)$ what does $f^{-1}(x)$ look like?

The top half of a sideways parabola

What is the domain and range of this new $f(x)$? $x \geq -4$ $y \geq 1$

What is the domain and range of this new $f^{-1}(x)$? $y \geq -4$ $x \geq 1$

Write the Inverse Relation of this:

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

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

What does the graph of the inverse look like?

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

a parabola that shifted left and up
and is wider

What does the graph of the original relation look like?

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

The top half of a "sideways" parabola

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

Why is the graph of the above only
"half a sideways parabola"?

- If it were both halves then it wouldn't be a function.
- Without a sign in front of the radical it means
  the Principal Square Root (positive root).

Describe the transformations to the parent
function the following equation represents.

$y = -4(x - 7)^2 + 11$

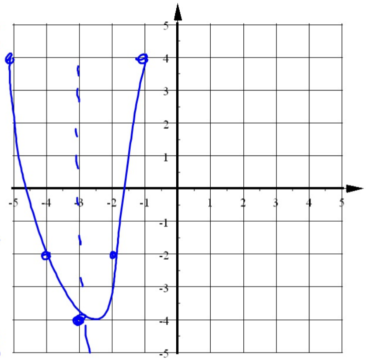
- x-axis reflection (upside down)
- Vertical Stretch Factor of 4
- Shift 7 units right
- Shift 11 units up

$y = -4(x - 7)^2 + 11$ State the Vertex of this
parabola.

(7, 11)

Graph this parabola:

$y = 2(x+3)^2 - 4$



1, 1 → 1, 2

2, 4 → 2, 8

x	y
-2	
-1	

Graph of the Parent Function:

$y = \sqrt{x}$

x	y
0	0
1	1
4	2