Algebra 2 6.2

Find the inverse of a function or relation*

Determine whether two relations are inverses

*Algebra 1

opposite thing

relationship

function VLT

inverse operations

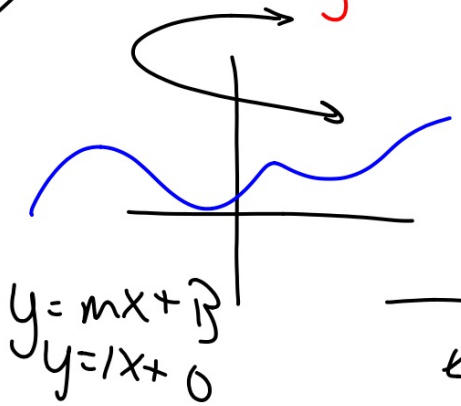
inverse functions f^{-1}

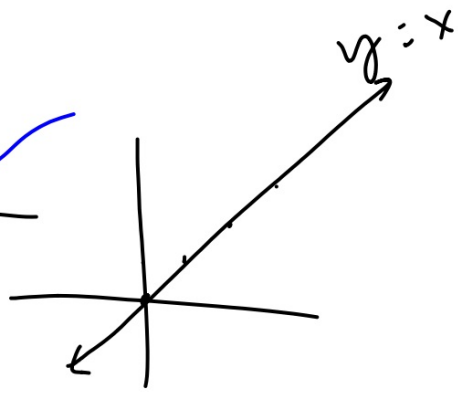
vertical line test

horizontal line test

identity function y=x

whiteboards





y = mx + b

y = 1x + 0

hide a key

What do you notice?

KeyConcept Inverse Relations

Words

Example

Relation

$A = \{(1, 5), (2, 6), (3, 7)\}$

Inverse

$B = \{(5, 1), (6, 2), (7, 3)\}$

$f =$

$f^{-1} =$

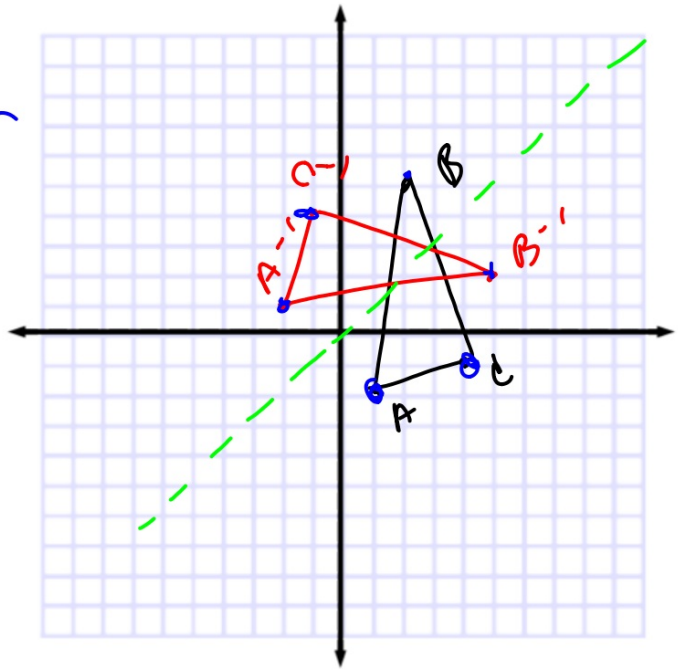
y=x is a line of symmetry

Example 1 Find an Inverse Relation

GEOMETRY The vertices of $\triangle ABC$ can be represented by the relation $\{(1, -2), (2, 5), (4, -1)\}$. Find the inverse of this relation. Describe the graph of the inverse.

A B C

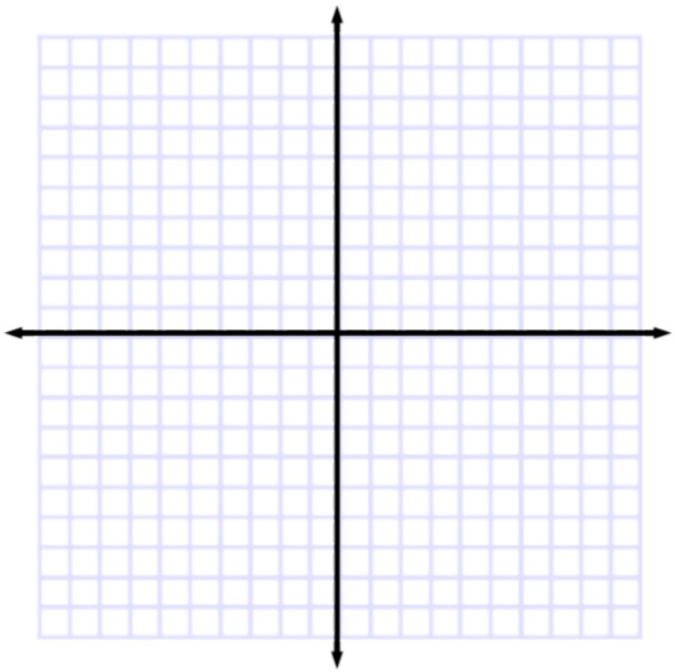
$y = x$ line of symm



GuidedPractice

1. **GEOMETRY** The ordered pairs of the relation $\{(-8, -3), (-8, -6), (-3, -6)\}$ are the coordinates of the vertices of a right triangle. Find the inverse of this relation. Describe the graph of the inverse.

$(-3, 8)$ $(-6, -8)$ $(-6, -3)$



Hide key...

orig. K → E → 2 → P - C

reverse C → P - 2 → E - K

What one does, the other one un-does...
ex: adding & subtracting

1. $f(y) \to y$
2. $x \leftrightarrow y$
3. $y =$
4. $f^{-1}(x)$

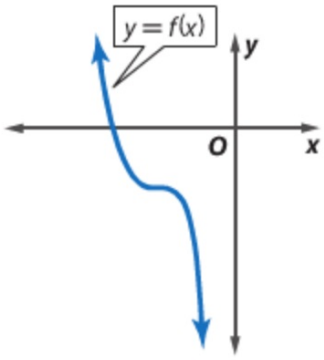
KeyConcept Property of Inverses

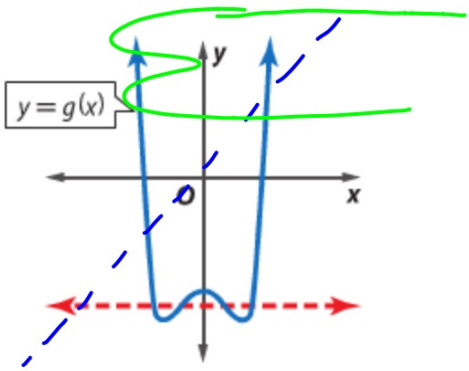
Words	If f and f^{-1} are inverses, then $f(a) = b$ if and only if $f^{-1}(b) = a$.
Example	Let $f(x) = x - 4$ and represent its inverse as $f^{-1}(x) = x + 4$.

$f(x) = x - 4 \longrightarrow y = x - 4$

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

$x = y - 4$
$+4 \quad +4$





VLT: Is it a function?
HLT: Will its inverse be a function?

x and y trade places: ordered pairs or equations

Example 2 Find and Graph an Inverse

Find the inverse of each function. Then graph the function and its inverse.

a. $f(x) = 2x - 5$

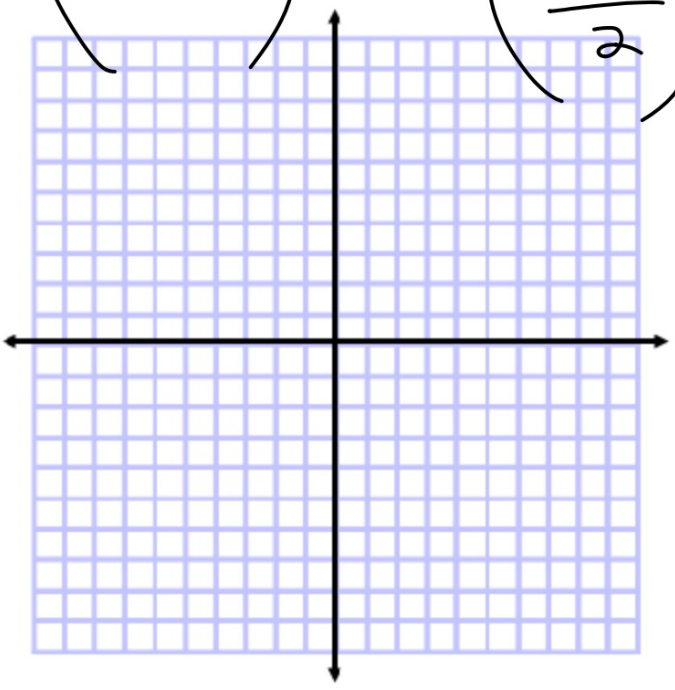
$y = 2x - 5$

$x = 2y - 5$

$+5 \quad +5$

$\frac{x+5}{2} = \frac{2y}{2}$

$f^{-1}(x) = \left(\frac{1}{2}x + \frac{5}{2}\right)$



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

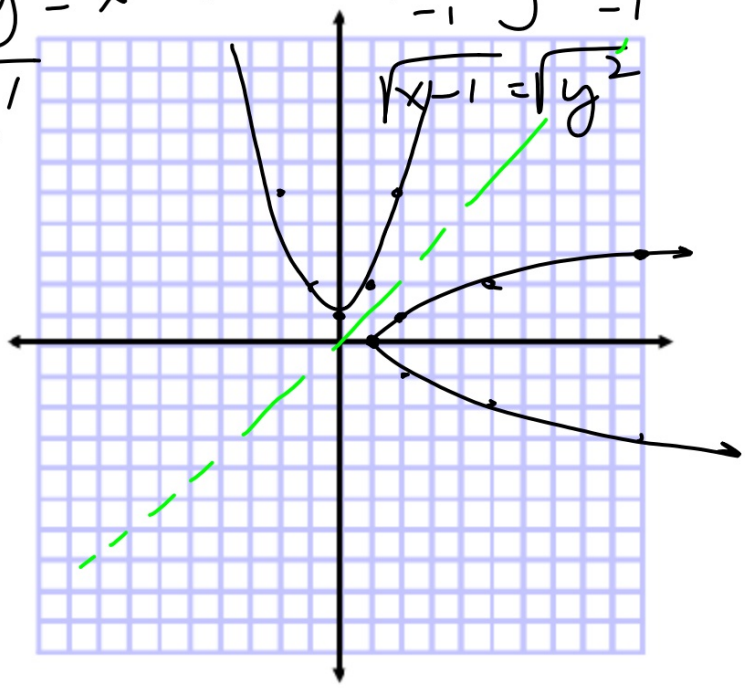
$y = x^2 + 1$

$x = y^2 + 1$

$x - 1 = y^2$

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

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



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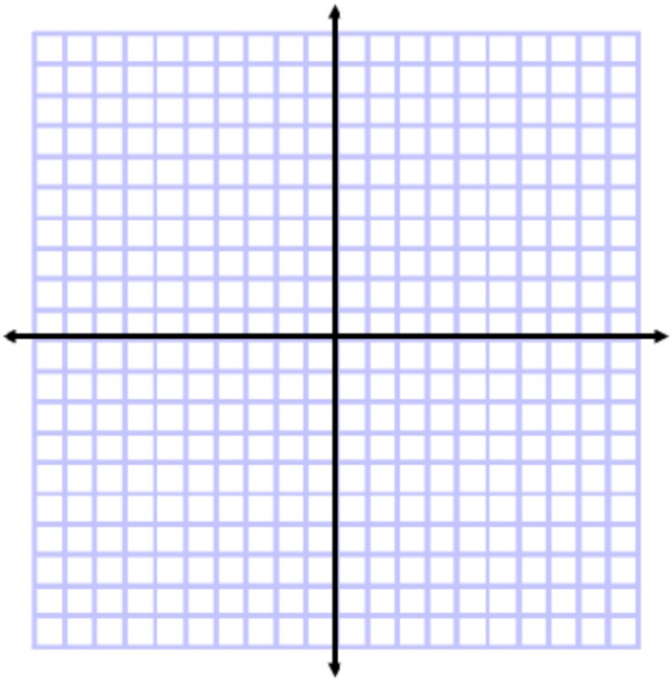
Find the inverse of each function. Then graph the function and its inverse.

2A. $f(x) = \frac{x-3}{5}$

2B. $f(x) = 3x^2$



KeyConcept Inverse Functions

Words	Two functions f and g are inverse functions if and only if both of their compositions are the identity function.
Symbols	$f(x)$ and $g(x)$ are inverses if and only if $[f \circ g](x) = x$ and $[g \circ f](x) = x$.

What operations are involved?
Are their compositions the identity function?
Analyze & predict, then do the math

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

$f(x) = 2x$ $g(x) = 0.5x$

$f(x) = 4x - 3$

$g(x) = 0.25x + 3$

b. $f(x) = 4x^2$ and $g(x) = 2\sqrt{x}$