Algebra 2 6.2

Find the inverse of a function or relation* *Algebra 1

Determine whether two relations are inverses

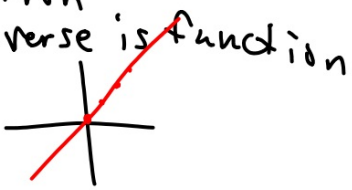
relation
function
inverse operations
inverse functions f^{-1}
vertical line test
horizontal line test
identity function y=x
whiteboards

$x \div + - ( )^2 \sqrt{\ }$

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

function

inverse is function



What do you notice?

KeyConcept Inverse Relations

Words

Example

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

$(-2, 7)$ $(0, -8)$ $(7, -2)$ $(-8, 0)$

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

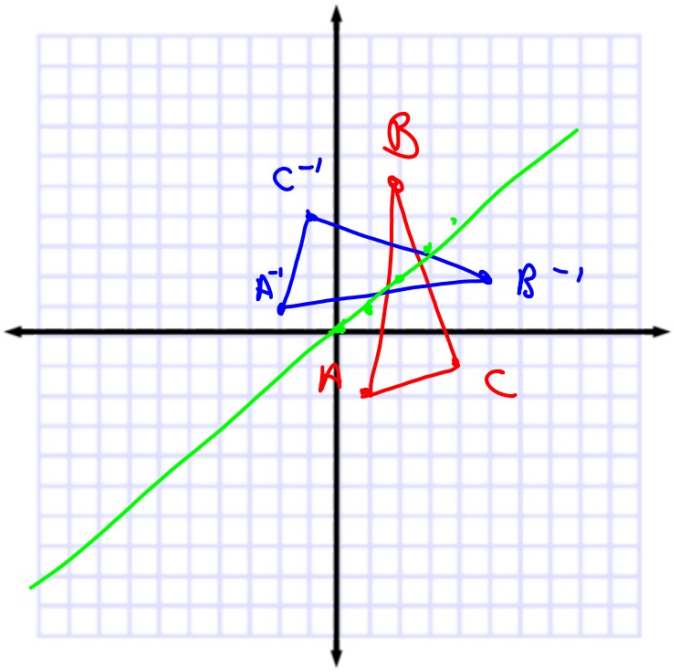
$(-2, 1)$

$(5, 2)$

$(-1, 4)$

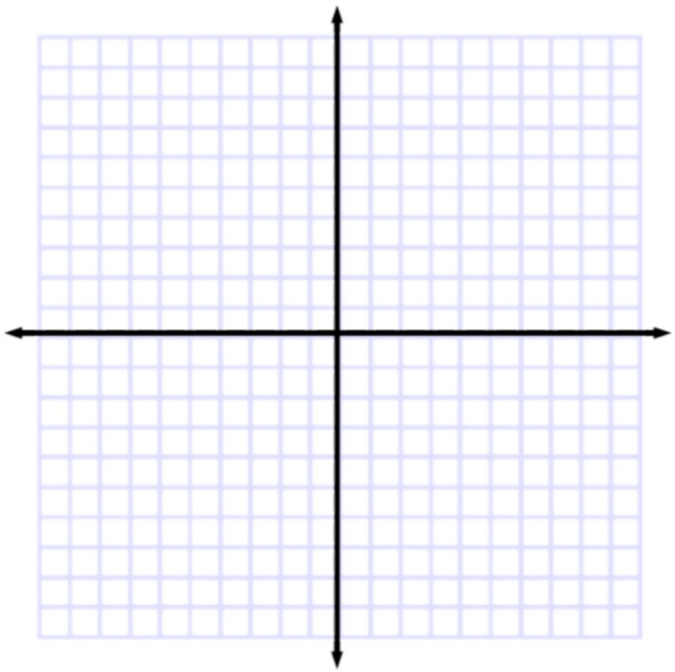
reflection over $y = x$

identity fn



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.



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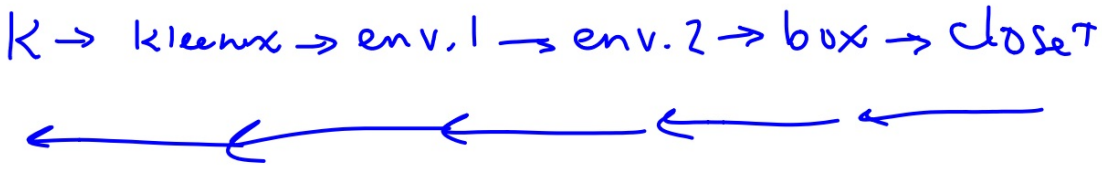
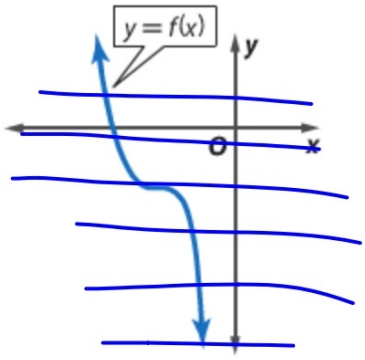
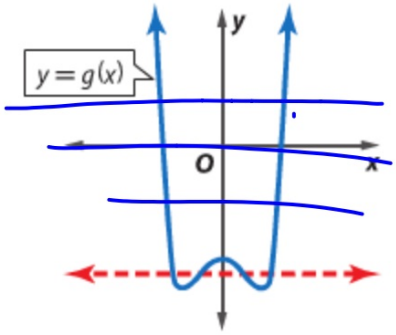


What one does, the other one un-does...
ex: adding & subtracting

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





fn → VLT: Is it a function?

f^{-1} 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. $f(x) = 2x - 5$

$y = 2x - 5$

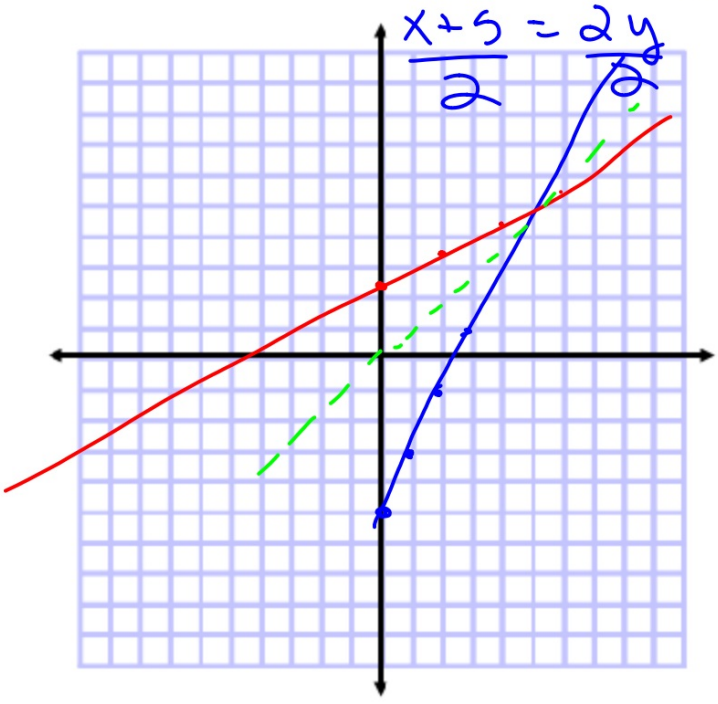
$x = 2y - 5$

$+5 \quad +5$

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

$y = \frac{1}{2}x + \frac{5}{2}$

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



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

- **b.** $f(x) = x^2 + 1$

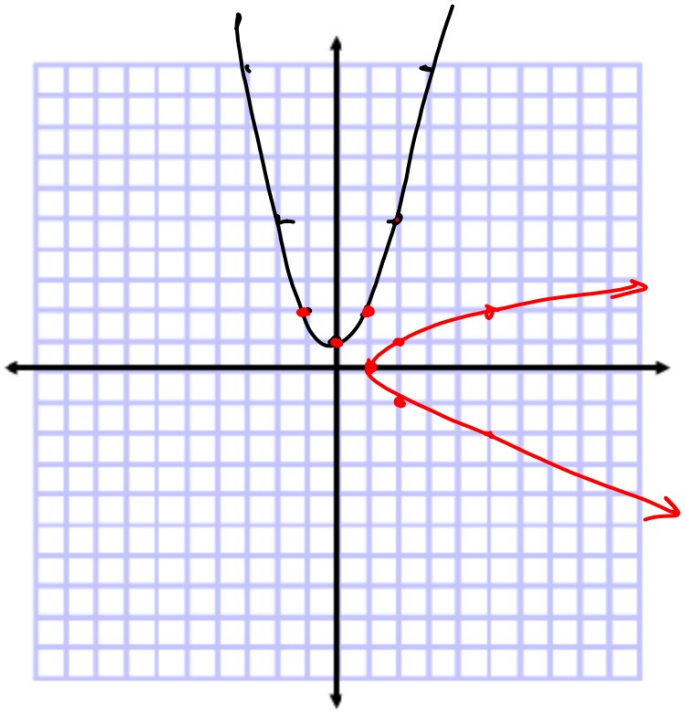
$y = x^2 + 1$

$x = y^2 + 1$

$-1 \quad -1$

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

$\pm\sqrt{x-1} = y$



GuidedPractice

$f^{-1}(x) = \pm\sqrt{\frac{1}{3}x}$

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

2A. $f(x) = \frac{x-3}{5}$ $f^{-1}(x) = 5x + 3$

$5 \cdot x = \frac{y-3}{5} \cdot 5$

$5x = y - 3$

$+3 \quad +3$

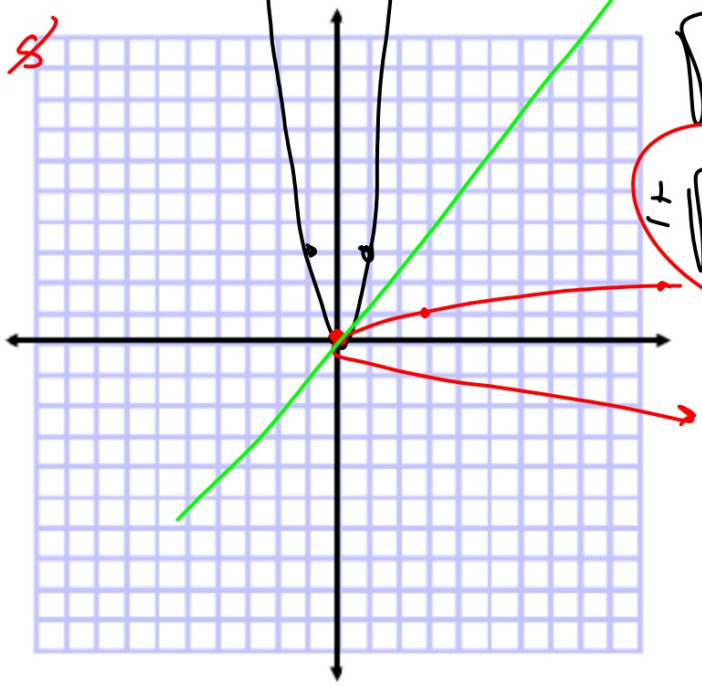
$5x + 3 = y$

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

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

$\sqrt{\frac{x}{3}} = \sqrt{y^2}$

$\pm\sqrt{\frac{1}{3}x} = y$

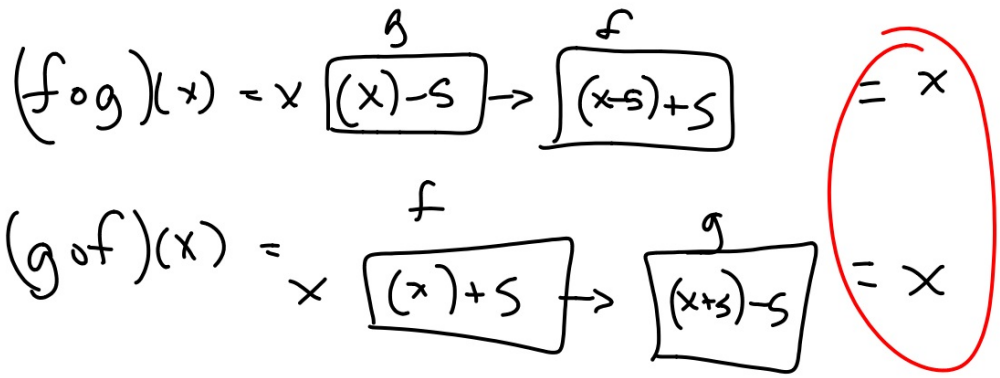


KeyConcept Inverse Functions

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

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

$\frac{1}{4}$

f(x) = 4x - 3

g(x) = 0.25x + 3

$f^{-1}(x)$

$y = 4x - 3$

$x = 4y - 3$

$+3 \quad +3$

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

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