

Precalculus 5.2 One-to-One Functions; Inverse Functions
 Objective: able to determine one-to-one; determine inverse; obtain graph of inverse; find inverse from an equation

A function is **one-to-one** if any two different inputs from the domain correspond to two different outputs in the range. That is, if x_1 and x_2 are two different inputs of a function f , then f is **one-to-one** if $f(x_1) \neq f(x_2)$. (each x is paired with exactly one y , each y is paired with exactly one x)

Mappings of Functions. Which are 1-1?

State	Population	Team	City
IN	6.2	Cubs	Chicago
WA	6.1	White Sox	Chicago
SD	0.8	Cardinals	St. Louis
NC	8.3		
TN	5.8		

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Horizontal Line Test - If every horizontal line intersects the graph of a function f in at most one point, then f is one-to-one.

From the graph of each, determine if the function is one-to-one

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

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Let f be a one-to-one function. Since f is a function, each element x in the domain of f is paired with exactly one element y in the range of f . Since f is one-to-one, each element y in the range of f is paired with exactly one element x in the domain of f . This second correspondence from the range of f back to the domain of f is called the **inverse function of f** , denoted f^{-1} .

3. Find the inverse from a mapping.
 # of feet

# of feet	Animal
4	Dog
2	Cat
100	Duck
	Centipede
	Rabbit

4. Find the inverse from a set of ordered pairs: $\{(1, 2), (2, -3), (3, 4), (4, 7)\} = f(x)$
 $f^{-1}(x) = \{(2, 1), (-3, 2), (4, 3), (7, 4)\}$

Domain of $f =$ Range of f^{-1} Range of $f =$ Domain of f^{-1}

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The function $f(x) = 2x + 6$ is one-to-one. How do you find the inverse function?

5. Find f^{-1}

- Use Horiz line test to decide if an inverse exists.
- Interchange the variables x and y to obtain $x = f(y)$. This defines the inverse function implicitly.
- Solve for y in terms of x . This is the explicit form of f^{-1} . $y = f^{-1}(x)$
- Check: is the domain of $f =$ to the range of f^{-1} ; range of $f =$ to the domain of f^{-1} ; and $f^{-1}(f(x)) = f^{-1}(f(x)) = x$?

Handwritten work:
 ① $f(x) = 2x + 6$
 $y = 2x + 6$
 $x = 2y + 6$
 $x - 6 = 2y$
 $y = \frac{x-6}{2} = \frac{x}{2} - 3$
 $D = \mathbb{R}$
 $R = \mathbb{R}$

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\sin^{-1}

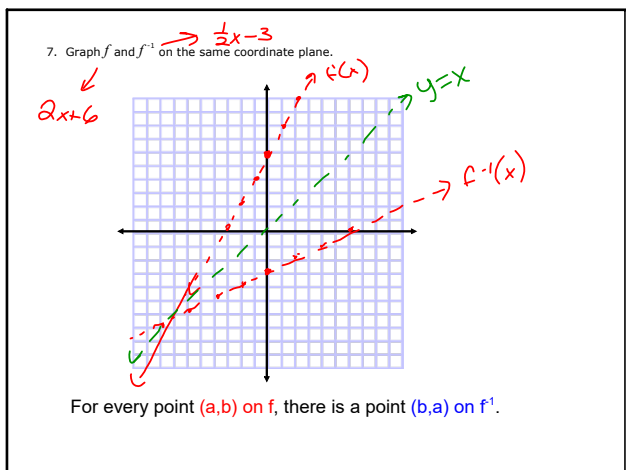
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Verifying Inverse Functions - Show that $f(f^{-1}(x)) = x$ and $f^{-1}(f(x)) = x$

6. Verify your result from (5)

Handwritten work:
 $f \circ f^{-1} = 2(\frac{1}{2}x - 3) + 6 = x - 6 + 6 = x$
 $f^{-1} \circ f = \frac{1}{2}(2x + 6) - 3 = x + 3 - 3 = x$

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Rate yourself on how well you understood this lesson.

I don't get it at all	I sort of get it	I understand most, but I need more practice.	I understand it pretty well	I got it!!
1	2	3	4	5

What I still need to work on....

Aug 24-10:50 AM