

Inverse Switch Lab

Reverse functions, reflect points, and check with composition.

HIGH SCHOOL • MA.912.F.3.7

MA.912.F.3.7 "Represent the inverse of a function algebraically, graphically or in a table. Use composition of functions to verify that one function is the inverse of the other."

NAME _____

DATE _____

REVERSE THE RULE

An inverse function reverses each input-output pair. To find an inverse algebraically, write y , switch x and y , and solve for y . Check inverse functions by composing them in both orders, and look for x each time.

WORKED EXAMPLE

Find the inverse of $f(x)=4x-7$. Verify it using composition.

1. Write $y=4x-7$.
2. Switch x and y : $x=4y-7$.
3. Solve for y : $y=(x+7)/4$, so $f^{-1}(x)=(x+7)/4$.
4. Check: $4((x+7)/4)-7=x$, and $(4x-7+7)/4=x$.

Answer: $f^{-1}(x)=(x+7)/4$

PRACTICE 6 problems

- 1** Find the inverse of $f(x)=3x+5$.

ANSWER _____

- 2** Find the inverse of $g(x)=(x-2)/6$.

ANSWER _____

- 3** Find the inverse of $h(x)=9-2x$.

ANSWER _____

- 4** A function has the table x : -3, 0, 5 and y : 8, 2, -1. Write the inverse table as ordered pairs.

ANSWER _____

- 5** Let $p(x)=5x+1$ and $q(x)=(x-1)/5$. Are p and q inverses? Verify with composition.

ANSWER _____

- 6** A graph of a function passes through (-2,3), (1,6), and (3,10). List the corresponding points on its inverse graph.

ANSWER _____

APPLY IT Show your work

- 1** A music-streaming app gives $y=5x+3$ reward points after x hours of listening. Write the inverse rule, verify it with composition, and find the hours of listening when a student has 28 points.

WORK SPACE

ANSWER _____

- 2** An online school store charges $y=3x+8$ dollars for x custom laptop stickers, including one shipping fee. Write the inverse rule and find x when the total cost is 26 dollars.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Let $f(x)=(2x+3)/(x-5)$. Find $f^{-1}(x)$, state the restrictions on f and f^{-1} , and use composition to verify the inverse relationship.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the inverse of $f(x)=3x+5$.	$f^{-1}(x)=(x-5)/3$
2	Find the inverse of $g(x)=(x-2)/6$.	$g^{-1}(x)=6x+2$
3	Find the inverse of $h(x)=9-2x$.	$h^{-1}(x)=(9-x)/2$
4	A function has the table x: -3, 0, 5 and y: 8, 2, -1. Write the inverse table as ordered pairs.	(8,-3), (2,0), (-1,5)
5	Let $p(x)=5x+1$ and $q(x)=(x-1)/5$. Are p and q inverses? Verify with composition.	Yes. $p(q(x))=x$ and $q(p(x))=x$.
6	A graph of a function passes through (-2,3), (1,6), and (3,10). List the corresponding points on its inverse graph.	(3,-2), (6,1), (10,3)

PART 2 · APPLY IT

- $f^{-1}(x)=(x-3)/5$. $f(f^{-1}(x))=x$ and $f^{-1}(f(x))=x$. At 28 points, x=5 hours. Reverse $y=5x+3$ to get $f^{-1}(x)=(x-3)/5$. Substitute 28 into the inverse rule to get $(28-3)/5=5$.
- $f^{-1}(x)=(x-8)/3$. When y=26, x=6 stickers. Reverse $y=3x+8$ to get $f^{-1}(x)=(x-8)/3$. Substitute 26 to get $(26-8)/3=6$.

CHALLENGE

$f^{-1}(x)=(5x+3)/(x-2)$. For f, $x \neq 5$. For f^{-1} , $x \neq 2$. $f(f^{-1}(x))=x$ for $x \neq 2$, and $f^{-1}(f(x))=x$ for $x \neq 5$. The restrictions prevent a denominator from being zero.

Accept equivalent algebraic forms, including $-(x-9)/2$ for problem 3. For inverse tables and graph points, accept answers in any order if every ordered pair is correct.