LESSON MAKER PRO

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

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.

WORK SPACE AND ANSWER

ANSWER KEY # Inverse Switch Lab

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

1. **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.
2. **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, $x\neq5$. For $f^{(-1)}$, $x\neq2$. $f(f^{(-1)}(x))=x$ for $x\neq2$, and $f^{(-1)}(f(x))=x$ for $x\neq5$. 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.