LESSON MAKER PRO

Undo the Rule

Find inverse functions and use them to work backward.

HIGH SCHOOL · MT.PLUS.ALG.FUN.2

MT.PLUS.ALG.FUN.2 "Understand the relationship between a function and its inverse."

NAME _____ DATE _____

THE BIG IDEA

An inverse function reverses a function's input and output. To find an inverse rule, write y = f(x), switch x and y, then solve for y. A function and its inverse undo each other.

WORKED EXAMPLE

Find the inverse of f(x) = 13x + 17.

1. Write y = 13x + 17.
2. Switch x and y: x = 13y + 17.
3. Subtract 17: x - 17 = 13y.
4. Divide by 13: y = (x - 17)/13.

Answer: $f^{-1}(x) = (x - 17)/13$

PRACTICE 6 problems

1 Find the inverse of f(x) = 3x + 8.

ANSWER _____

2 Find the inverse of f(x) = 5 - 2x.

ANSWER _____

3 Find the inverse of f(x) = x/4 + 6.

ANSWER _____

4 If f(x) = 9x - 4, find $f^{-1}(23)$.

ANSWER _____

5 Use the table to find $f^{-1}(2)$ and $f^{-1}(10)$.

VALUES OF F

x	f(x)
-2	10
0	6
2	2
4	-2

ANSWER _____

6 Are f(x) = 6x + 2 and g(x) = (x - 2)/6 inverses? Show one composition to justify your answer.

ANSWER _____

APPLY IT Show your work

1 A music app charges a one-time $6 setup fee plus $8 per month. Its total cost after x months is C(x) = 8x + 6. Write an inverse rule for valid total costs. How many months have passed when the total is $38?

WORK SPACE

ANSWER _____

2 An arcade card starts with 50 credits. Each game uses 4 credits, so R(x) = 50 - 4x gives the credits left after x games. Write an inverse rule for valid credit balances. How many games have been played when 18 credits remain?

WORK SPACE

ANSWER _____

CHALLENGE One step up

For $f(x) = x^2 - 4$ with $x >= 0$, find $f^{-1}(x)$ and its domain. Explain why the restriction $x >= 0$ is needed.

WORK SPACE AND ANSWER

Undo the Rule

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the inverse of f(x) = 3x + 8.	**$f^{-1}(x) = (x - 8)/3$**
2	Find the inverse of f(x) = 5 - 2x.	**$f^{-1}(x) = (5 - x)/2$**
3	Find the inverse of f(x) = x/4 + 6.	**$f^{-1}(x) = 4x - 24$**
4	If f(x) = 9x - 4, find $f^{-1}(23)$.	**3**
5	Use the table to find $f^{-1}(2)$ and $f^{-1}(10)$.	**$f^{-1}(2) = 2$; $f^{-1}(10) = -2$**
6	Are f(x) = 6x + 2 and g(x) = (x - 2)/6 inverses? Show one composition to justify your answer.	**Yes. f(g(x)) = 6((x - 2)/6) + 2 = x.**

PART 2 · APPLY IT

1. **$C^{-1}(x) = (x - 6)/8$; 4 months** Switch the input and output of C and solve to get $C^{-1}(x) = (x - 6)/8$. Then $C^{-1}(38) = 32/8 = 4$.
2. **$R^{-1}(x) = (50 - x)/4$; 8 games** Switch the input and output of R and solve to get $R^{-1}(x) = (50 - x)/4$. Then $R^{-1}(18) = 32/4 = 8$.

CHALLENGE

$f^{-1}(x) = \text{sqrt}(x + 4)$, with domain $x >= -4$. The restriction makes f one-to-one; without it, a positive input and its negative give the same output.

Accept equivalent algebraic forms of the inverse rules. For problem 6, a correct composition in either order is sufficient.