LESSON MAKER PRO

Undo Function Check

Use composition to test inverse pairs.

HIGH SCHOOL · HSF-BF.B.4b

CCSS.Math.Content.HSF-BF.B.4b "(+) Verify by composition that one function is the inverse of another."

NAME _____ DATE _____

THE BIG IDEA

Two functions are inverses if each function undoes the other. Substitute g(x) into f(x), then substitute f(x) into g(x). If both compositions simplify to x on the stated domains, the functions are inverses.

WORKED EXAMPLE

Verify whether f(x) = 7x + 2 and g(x) = (x - 2)/7 are inverses.

1. f(g(x)) = 7((x - 2)/7) + 2
2. f(g(x)) = x - 2 + 2 = x
3. g(f(x)) = ((7x + 2) - 2)/7 = x

Answer: f(g(x)) = x and g(f(x)) = x, so f and g are inverses.

PRACTICE 6 problems

1 Verify whether f(x) = 4x + 1 and g(x) = (x - 1)/4 are inverses by finding both compositions.

ANSWER _____

2 Verify whether f(x) = (x + 6)/5 and g(x) = 5x - 6 are inverses by finding both compositions.

ANSWER _____

3 Verify whether f(x) = x^3 and g(x) = cuberoot(x) are inverses by finding both compositions.

ANSWER _____

4 Verify whether f(x) = 8 - x and g(x) = 8 - x are inverses by finding both compositions.

ANSWER _____

5 For x != 0, verify whether f(x) = 9/x and g(x) = 9/x are inverses by finding both compositions.

ANSWER _____

6 Verify whether f(x) = 6x - 4 and g(x) = (x + 5)/6 are inverses by finding both compositions.

ANSWER _____

APPLY IT Show your work

1 A music festival app gives a volunteer 12 points for each hour worked, plus 15 welcome points. It uses f(h) = 12h + 15 to convert hours h to points. The app uses g(p) = (p - 15)/12 to convert points p back to hours. Verify by composition that the rules are inverses.

WORK SPACE

ANSWER _____

2 An esports club uses f(m) = 8m - 11 to turn a match rating m into a displayed score. Its reverse rule is g(s) = (s + 11)/8. Verify by composition that the rules are inverses.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let a != 0. Function f is defined by f(x) = ax + 9, and function g is defined by g(x) = (x - 9)/a. Verify by composition that f and g are inverses. Explain why the condition a != 0 is needed.

WORK SPACE AND ANSWER

ANSWER KEY

Undo Function Check

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Verify whether f(x) = 4x + 1 and g(x) = (x - 1)/4 are inverses by finding both compositions.	**f(g(x)) = x and g(f(x)) = x, so f and g are inverses.**
2	Verify whether f(x) = (x + 6)/5 and g(x) = 5x - 6 are inverses by finding both compositions.	**f(g(x)) = x and g(f(x)) = x, so f and g are inverses.**
3	Verify whether f(x) = x^3 and g(x) = cuberoot(x) are inverses by finding both compositions.	**f(g(x)) = x and g(f(x)) = x, so f and g are inverses.**
4	Verify whether f(x) = 8 - x and g(x) = 8 - x are inverses by finding both compositions.	**f(g(x)) = x and g(f(x)) = x, so f and g are inverses.**
5	For x != 0, verify whether f(x) = 9/x and g(x) = 9/x are inverses by finding both compositions.	**f(g(x)) = x and g(f(x)) = x for x != 0, so f and g are inverses on this domain.**
6	Verify whether f(x) = 6x - 4 and g(x) = (x + 5)/6 are inverses by finding both compositions.	**f(g(x)) = x + 1 and g(f(x)) = x + 1/6, so f and g are not inverses.**

PART 2 · APPLY IT

1. **f(g(x)) = x and g(f(x)) = x, so the rules are inverses.** Substitute (x - 15)/12 into f to get 12((x - 15)/12) + 15 = x. Substitute 12x + 15 into g to get ((12x + 15) - 15)/12 = x.
2. **f(g(x)) = x and g(f(x)) = x, so the rules are inverses.** Substitute (x + 11)/8 into f to get 8((x + 11)/8) - 11 = x. Substitute 8x - 11 into g to get ((8x - 11) + 11)/8 = x.

CHALLENGE

f(g(x)) = a((x - 9)/a) + 9 = x, and g(f(x)) = ((ax + 9) - 9)/a = x. The condition a != 0 is needed because division by zero is undefined.

Accept equivalent algebraic forms of either composition, as long as both simplify to x for inverse pairs. For the rational pair, students should state or use the restriction x != 0.