LESSON MAKER PRO

Function Mix Lab

Combine functions and keep track of where they are defined.

HIGH SCHOOL · A2.F.2.1

A2.F.2.1 "Add, subtract, multiply, and divide functions using function notation and recognize domain restrictions."

NAME _____ DATE _____

COMBINE, THEN CHECK

To add, subtract, multiply, or divide functions, use the same operation on their outputs. For a quotient, exclude any input that makes the original denominator zero, even if a factor cancels.

WORKED EXAMPLE

Let $f(x) = x^2 - 49$ and $g(x) = x - 7$. Find $(f/g)(x)$ and its domain.

1. $(f/g)(x) = (x^2 - 49)/(x - 7)$.
2. Factor the numerator: $(x - 7)(x + 7)/(x - 7)$.
3. Cancel the common factor, but keep the restriction $x - 7 \neq 0$.

Answer: $(f/g)(x) = x + 7$; domain: all real x except 7.

PRACTICE 6 problems

1 Let $f(x) = 2x + 4$ and $g(x) = x - 6$. Find $(f + g)(x)$ and its domain.

ANSWER _____

2 Let $f(x) = x^2 - 4$ and $g(x) = 3x + 8$. Find $(f - g)(x)$ and its domain.

ANSWER _____

3 Let $f(x) = x - 4$ and $g(x) = x + 6$. Find $(fg)(x)$ and its domain.

ANSWER _____

4 Let $f(x) = x^2 - 9$ and $g(x) = x - 3$. Find $(f/g)(x)$ and its domain.

ANSWER _____

5 Let $f(x) = 6x - 12$ and $g(x) = x^2 - 16$. Find $(f/g)(x)$ and its domain.

ANSWER _____

6 Let $f(x) = x^2 + x$ and $g(x) = 2x - 8$. Find $(f + g)(-2)$.

ANSWER _____

APPLY IT Show your work

1 For x concert tickets, $f(x) = 9x + 6$ dollars is the ticket cost and $g(x) = 2x + 3$ dollars is the service fee. Find $(f + g)(x)$, state its domain in this situation, and find the total cost for 2 tickets.

WORK SPACE

ANSWER _____

2 A gaming club books a private tournament room for x players. The total cost is $f(x) = 5x + 20$ dollars, and $g(x) = x$ players share the cost equally. Find $(f/g)(x)$, state its domain in this situation, and find the cost per player for 4 players.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let $f(x) = x^2 - 25$, $g(x) = x - 5$, and $h(x) = x + 5$. Simplify $((f/g)/h)(x)$. Explain why its domain is not all real numbers.

WORK SPACE AND ANSWER

ANSWER KEY

Function Mix Lab

HIGH SCHOOL · A2.F.2.1

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let f(x) = 2x + 4 and g(x) = x - 6. Find (f + g)(x) and its domain.	**(f + g)(x) = 3x - 2; domain: all real x.**
2	Let f(x) = x^2 - 4 and g(x) = 3x + 8. Find (f - g)(x) and its domain.	**(f - g)(x) = x^2 - 3x - 12; domain: all real x.**
3	Let f(x) = x - 4 and g(x) = x + 6. Find (fg)(x) and its domain.	**(fg)(x) = x^2 + 2x - 24; domain: all real x.**
4	Let f(x) = x^2 - 9 and g(x) = x - 3. Find (f/g)(x) and its domain.	**(f/g)(x) = x + 3; domain: all real x except 3.**
5	Let f(x) = 6x - 12 and g(x) = x^2 - 16. Find (f/g)(x) and its domain.	**(f/g)(x) = (6x - 12)/(x^2 - 16); domain: all real x except -4 and 4.**
6	Let f(x) = x^2 + x and g(x) = 2x - 8. Find (f + g)(-2).	**-10**

PART 2 · APPLY IT

1. **(f + g)(x) = 11x + 9; domain: positive whole numbers; 2 tickets cost $31.** Add the cost and fee functions to get 11x + 9. Substitute x = 2 to get 31; a ticket order must contain a positive whole number of tickets.
2. **(f/g)(x) = 5 + 20/x; domain: positive whole numbers; 4 players pay $10 each.** Divide the total cost by the number of players: (5x + 20)/x = 5 + 20/x. Substitute x = 4 to get 10; the number of players must be a positive whole number.

CHALLENGE

((f/g)/h)(x) = 1 for all real x except -5 and 5. The original quotient f/g is undefined at x = 5, and dividing by h is undefined at x = -5. Canceling factors does not restore either input.

Accept equivalent unsimplified expressions when they are correct and the stated domain matches the original operations. For the real-world problems, accept positive integers as another name for positive whole numbers.