LESSON MAKER PRO

Function Mash-Up

Build new functions by adding, subtracting, multiplying, and dividing.

HIGH SCHOOL · MA.912.F.3.1

MA.912.F.3.1 "Given a mathematical or real-world context, combine two functions, limited to linear and quadratic, using arithmetic operations. When appropriate, include domain restrictions for the new function."

NAME _____ DATE _____

COMBINE FUNCTION OUTPUTS

To make a new function, apply the named operation to the outputs: $(f + g)(x) = f(x) + g(x)$, and similarly for subtraction, multiplication, or division. For a quotient, use only x-values that work for both functions and do not make the divisor $g(x)$ equal 0.

WORKED EXAMPLE

Let $a(x) = 7x - 11$ and $b(x) = 3x^2 + 4$. Find $(a + b)(x)$.

1. $(a + b)(x) = a(x) + b(x)$
2. $= (7x - 11) + (3x^2 + 4)$
3. $= 3x^2 + 7x - 7$

Answer: $(a + b)(x) = 3x^2 + 7x - 7$

PRACTICE 6 problems

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

ANSWER _____

2 Let $f(x) = x^2 + 8$ and $g(x) = 5x - 2$. Find $(f - g)(x)$.

ANSWER _____

3 Let $f(x) = 8x - 10$ and $g(x) = x + 2$. Find $(f \cdot g)(x)$ in standard form.

ANSWER _____

4 Let $f(x) = 6x + 2$ and $g(x) = x - 5$. Find $(f/g)(x)$. State the domain restriction.

ANSWER _____

5 Let $h(x) = x^2 - 10$ and $k(x) = 5x + 8$. Find $(h + k)(-2)$.

ANSWER _____

6 Let $f(x) = x^2 - 25$ and $g(x) = x + 5$. Find $(f/g)(x)$ in simplified form. State the domain restriction.

ANSWER _____

APPLY IT Show your work

1 A student music club sells x concert tickets, where x can be any whole number from 0 through 16. Revenue is $R(x) = 25x$ dollars. The club models its costs with $C(x) = x^2 + 8x + 50$ dollars. Write a profit function $P(x) = R(x) - C(x)$, and state its appropriate domain.

WORK SPACE

ANSWER _____

2 An esports club has x volunteers, where x can be any whole number from 1 through 15. Its gross donations are modeled by $D(x) = x^2 + 8x + 18$ dollars, and its event expenses are $E(x) = 2x + 6$ dollars. The club splits the net amount equally among the volunteers. Write the amount per volunteer, $A(x) = (D(x) - E(x))/x$, in simplified form and state its appropriate domain.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let $f(x) = x^2 - 36$ and $g(x) = x - 6$. Find $(f/g)(x)$ in simplified form. Then explain in one sentence why $x = 6$ is not in the domain.

WORK SPACE AND ANSWER

ANSWER KEY

Function Mash-Up

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let f(x) = 2x + 1 and g(x) = x^2 - 6. Find (f + g)(x).	**(f + g)(x) = x^2 + 2x - 5**
2	Let f(x) = x^2 + 8 and g(x) = 5x - 2. Find (f - g)(x).	**(f - g)(x) = x^2 - 5x + 10**
3	Let f(x) = 8x - 10 and g(x) = x + 2. Find (f · g)(x) in standard form.	**(f · g)(x) = 8x^2 + 6x - 20**
4	Let f(x) = 6x + 2 and g(x) = x - 5. Find (f/g)(x). State the domain restriction.	**(f/g)(x) = (6x + 2)/(x - 5), x ≠ 5**
5	Let h(x) = x^2 - 10 and k(x) = 5x + 8. Find (h + k)(-2).	**(h + k)(-2) = -8**
6	Let f(x) = x^2 - 25 and g(x) = x + 5. Find (f/g)(x) in simplified form. State the domain restriction.	**(f/g)(x) = x - 5, x ≠ -5**

PART 2 · APPLY IT

1. **P(x) = -x^2 + 17x - 50; x ∈ {0, 1, 2, …, 16}** Subtract the cost function from the revenue function and combine like terms. Because x counts tickets, use whole-number values from 0 through 16.
2. **A(x) = x + 6 + 12/x; x ∈ {1, 2, 3, …, 15}** First subtract expenses from donations to get x^2 + 6x + 12. Divide each term by x, and use positive whole-number volunteer counts from 1 through 15.

CHALLENGE

The simplified function is x + 6 with x ≠ 6 because at x = 6 the original denominator x - 6 is 0.

Accept equivalent expressions with terms in a different order. For quotient problems, require the restriction from the original denominator even when a factor cancels.