LESSON MAKER PRO

Function Fusion Lab

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

HIGH SCHOOL · MA.912.F.3.2

MA.912.F.3.2 "Given a mathematical or real-world context, combine two or more functions, limited to linear, quadratic, exponential and polynomial, using arithmetic operations. When appropriate, include domain restrictions for the new function."

NAME _____ DATE _____

COMBINE THE RULES

To combine functions, apply the named operation to their output expressions, then simplify. Keep parentheses when subtracting, and for a quotient exclude any x-value that makes the denominator equal to 0.

WORKED EXAMPLE

Let $f(x)=11x+13$ and $g(x)=x^2-20$. Find $(f+g)(x)$.

1. $(f+g)(x)=f(x)+g(x)$
2. $=(11x+13)+(x^2-20)$
3. $=x^2+11x-7$

Answer: $(f+g)(x)=x^2+11x-7$

PRACTICE 6 problems

1 Let $f(x)=3x-4$ and $g(x)=x^2+6$. Find $(f+g)(x)$.

ANSWER _____

2 Let $p(x)=5x+1$ and $q(x)=2x^2-8$. Find $(p-q)(x)$.

ANSWER _____

3 Let $a(x)=x+9$ and $b(x)=x^2-3$. Find $(ab)(x)$.

ANSWER _____

4 Let $m(x)=4x-1$ and $n(x)=x-2$. Find $(m/n)(x)$ and state its domain restriction.

ANSWER _____

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5 Let $r(x)=3^x$ and $s(x)=4x+5$. Find $(r+s)(x)$.

ANSWER _____

6 Let $u(x)=x^3-6x$ and $v(x)=2x^2+1$. Find $(u+v)(x)$.

ANSWER _____

APPLY IT Show your work

1 A student club sells custom phone cases. Its revenue is $R(x)=18x$ dollars, and its cost is $C(x)=x^2+4x+30$ dollars, where x is the number of cases. The club can make at most 14 cases. Write the profit function $P(x)=R(x)-C(x)$ and state its domain.

WORK SPACE

ANSWER _____

2 A gaming club tracks a player's net badge score after x daily quests. The bonus score is $B(x)=2^x$, and the deduction is $D(x)=3x+1$. For whole-number x from 0 through 5, write the net score function $N(x)=B(x)-D(x)$ and state its domain.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let $f(x)=x^2-4$ and $g(x)=x-2$. Define $h(x)=f(x)/g(x)$. Write a simplified rule for h(x), state its domain, and explain why the excluded value remains excluded after simplifying.

WORK SPACE AND ANSWER

ANSWER KEY # Function Fusion Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let $f(x)=3x-4$ and $g(x)=x^2+6$. Find $(f+g)(x)$.	**x^2+3x+2**
2	Let $p(x)=5x+1$ and $q(x)=2x^2-8$. Find $(p-q)(x)$.	**$-2x^2+5x+9$**
3	Let $a(x)=x+9$ and $b(x)=x^2-3$. Find $(ab)(x)$.	**$x^3+9x^2-3x-27$**
4	Let $m(x)=4x-1$ and $n(x)=x-2$. Find $(m/n)(x)$ and state its domain restriction.	**$(m/n)(x)=(4x-1)/(x-2)$, $x \neq 2$**
5	Let $r(x)=3^x$ and $s(x)=4x+5$. Find $(r+s)(x)$.	**3^x+4x+5**
6	Let $u(x)=x^3-6x$ and $v(x)=2x^2+1$. Find $(u+v)(x)$.	**x^3+2x^2-6x+1**

PART 2 · APPLY IT

1. **$P(x)=-x^2+14x-30$, where $x \in \{0, 1, 2, \ldots, 14\}$** Subtract the cost expression from the revenue expression and combine like terms. Since cases are counted and the club can make no more than 14, use whole-number inputs from 0 through 14.
2. **$N(x)=2^x-3x-1$, where $x \in \{0, 1, 2, 3, 4, 5\}$** Subtract the deduction function from the bonus function. Restrict x to the given whole-number quest counts.

CHALLENGE

$h(x)=x+2$, $x \neq 2$. The value $x=2$ is excluded because the original denominator, $x-2$, equals 0 at $x=2$.

Accept equivalent algebraic forms, including factored forms when they represent the same function. For quotient problems, require the restriction from the original denominator even if a factor cancels.