

Function Fusion Lab

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

HIGH SCHOOL • MA.912.F.3.3

MA.912.F.3.3 "Solve mathematical and real-world problems involving functions that have been combined using arithmetic operations."

NAME _____

DATE _____

COMBINE FUNCTION RULES

You can combine functions by adding, subtracting, multiplying, or dividing their outputs. For example, $(f+g)(x)=f(x)+g(x)$ and $(f/g)(x)=f(x)/g(x)$. When dividing functions, the denominator function cannot equal 0.

WORKED EXAMPLE

Let $f(x)=12x+13$ and $g(x)=x-14$.
Find $(f-g)(5)$.

1. $(f-g)(5)=f(5)-g(5)$.
2. $f(5)=12(5)+13=73$.
3. $g(5)=5-14=-9$.
4. $(f-g)(5)=73-(-9)=82$.

Answer: 82

PRACTICE 6 problems

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

ANSWER _____

2 Let $p(x)=x^2+4$ and $q(x)=3x-2$. Find $(p-q)(x)$.

ANSWER _____

3 Let $m(x)=7x$ and $n(x)=x+1$. Find $(m \cdot n)(x)$, the product of the functions.

ANSWER _____

4 Let $a(x)=3x+8$ and $b(x)=x-2$. Find $(a/b)(6)$.

ANSWER _____

5 Let $r(x)=x^2+1$ and $s(x)=2x+3$. Find $(r+s)(-2)$.

ANSWER _____

6 Let $f(x)=4x+1$ and $g(x)=2x+8$. Solve $(f+g)(x)=27$.

ANSWER _____

APPLY IT Show your work

- 1** You run an online sticker shop. Your revenue is $R(x)=8x$ dollars, and your costs are $C(x)=2x+18$ dollars, where x is the number of sticker packs sold. Profit is $P(x)=R(x)-C(x)$. Find your profit when you sell 9 packs.

WORK SPACE

ANSWER _____

- 2** You sell custom phone cases. Your revenue is $R(x)=11x$ dollars, and your expenses are $E(x)=3x+20$ dollars. Profit is $P(x)=R(x)-E(x)$. How many cases must you sell to earn a profit of at least 44 dollars?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Let $f(x)=x^2-16$ and $g(x)=x-4$. The quotient function is $h(x)=f(x)/g(x)$. Simplify $h(x)$, then explain why $h(4)$ is still undefined.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Let $f(x)=2x+1$ and $g(x)=6-x$. Find $(f+g)(x)$.	$x+7$
2	Let $p(x)=x^2+4$ and $q(x)=3x-2$. Find $(p-q)(x)$.	x^2-3x+6
3	Let $m(x)=7x$ and $n(x)=x+1$. Find $(m \cdot n)(x)$, the product of the functions.	$7x^2+7x$
4	Let $a(x)=3x+8$ and $b(x)=x-2$. Find $(a/b)(6)$.	$13/2$
5	Let $r(x)=x^2+1$ and $s(x)=2x+3$. Find $(r+s)(-2)$.	4
6	Let $f(x)=4x+1$ and $g(x)=2x+8$. Solve $(f+g)(x)=27$.	$x=3$

PART 2 • APPLY IT

- 36 dollars** Compute $P(9)=R(9)-C(9)=8(9)-[2(9)+18]=72-36=36$.
- 8 cases** Set $11x-(3x+20)$ greater than or equal to 44. Solving $8x-20$ greater than or equal to 44 gives x greater than or equal to 8, so the minimum is 8 cases.

CHALLENGE

$h(x)=x+4$, where x is not 4. $h(4)$ is undefined because the original denominator, $g(4)=4-4$, equals 0.

Accept equivalent algebraic forms for the combined-function expressions. For the challenge, require both the simplified rule and the restriction x is not 4.