

Function Mix-Up

Build new functions by combining rules.

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 THE RULES

To combine functions, replace each function name with its rule, then add, subtract, multiply, or divide. Simplify the expression after combining like terms. For a quotient, exclude any x-value that makes the original denominator 0.

WORKED EXAMPLE

Let $f(x)=7x+11$ and $g(x)=x^2-13$.
Find $(f-g)(x)$.

1. $(f-g)(x)=f(x)-g(x)$
2. $=(7x+11)-(x^2-13)$
3. $=7x+11-x^2+13$
4. $=-x^2+7x+24$

Answer: $(f-g)(x)=-x^2+7x+24$

PRACTICE 6 problems

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

ANSWER _____

2 Let $p(x)=x^2-4$ and $q(x)=3x+8$. Find $(p-q)(x)$.

ANSWER _____

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

ANSWER _____

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

ANSWER _____

5 Let $r(x)=5x-10$ and $s(x)=x^2-25$. Find $(r/s)(x)$ and state its domain.

ANSWER _____

6 Let $u(x)=3x^2-2x+4$ and $v(x)=2x^2+x-9$. Find $(u+v)(x)$.

ANSWER _____

APPLY IT Show your work

- 1** A student club's revenue from selling x event tickets is $R(x)=18x$ dollars. Its costs are $C(x)=x^2+6x+40$ dollars. Write the profit function $P(x)=R(x)-C(x)$, and state a domain that fits the context.

WORK SPACE

ANSWER _____

- 2** A gaming club models its total editing time for x highlight videos by $T(x)=x^2+4x$ hours. The average editing time per video is $A(x)=T(x)/x$. Write $A(x)$ and state a domain that fits the context.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Let $f(x)=x^2-16$ and $g(x)=x-4$. Simplify $(f/g)(x)$, state its domain, and explain in one sentence why the excluded value remains excluded after simplifying.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Let $f(x)=4x-1$ and $g(x)=x^2+6$. Find $(f+g)(x)$.	$(f+g)(x)=x^2+4x+5$
2	Let $p(x)=x^2-4$ and $q(x)=3x+8$. Find $(p-q)(x)$.	$(p-q)(x)=x^2-3x-12$
3	Let $a(x)=6x+4$ and $b(x)=x-8$. Find $(ab)(x)$.	$(ab)(x)=6x^2-44x-32$
4	Let $m(x)=x^2+1$ and $n(x)=x+1$. Find $(m/n)(x)$ and state its domain.	$(m/n)(x)=(x^2+1)/(x+1)$, where $x \neq -1$
5	Let $r(x)=5x-10$ and $s(x)=x^2-25$. Find $(r/s)(x)$ and state its domain.	$(r/s)(x)=5(x-2)/((x-5)(x+5))$, where $x \neq -5, 5$
6	Let $u(x)=3x^2-2x+4$ and $v(x)=2x^2+x-9$. Find $(u+v)(x)$.	$(u+v)(x)=5x^2-x-5$

PART 2 • APPLY IT

1. **$P(x)=-x^2+12x-40$, where x is a nonnegative whole number.** Subtract the entire cost function from the revenue function, then combine like terms. Because x counts tickets, its values are nonnegative whole numbers.
2. **$A(x)=x+4$, where x is a positive whole number.** Divide the total-time function by x and simplify. The value x cannot be 0 because an average per video requires at least one video.

CHALLENGE

$(f/g)(x)=x+4$, where $x \neq 4$. The original denominator is zero when $x=4$, so that input is not allowed.

Accept equivalent expanded or factored forms. For quotient answers, require restrictions from the original denominator, including $x \neq 4$ in the challenge after cancellation.