

Function Mashups

Build new rules by combining function rules.

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, replace each function name with its rule, then add, subtract, multiply, or divide as directed. Simplify like terms, and for a quotient exclude every x -value that makes the original divisor equal zero.

WORKED EXAMPLE

Let $f(x)=19x+23$ and $g(x)=x^2-53$.
Find $(f+g)(x)$.

1. $(f+g)(x)=f(x)+g(x)$
2. $= (19x+23)+(x^2-53)$
3. $= x^2+19x-30$

Answer: $(f+g)(x)=x^2+19x-30$; domain: all real x

PRACTICE 6 problems

- 1** Let $f(x)=2x+7$ and $g(x)=x^2-9$. Find $(f+g)(x)$ and its domain.

ANSWER _____

- 2** Let $f(x)=x^2+1$ and $g(x)=7x-1$. Find $(f-g)(x)$ and its domain.

ANSWER _____

- 3** Let $f(x)=3x-2$ and $g(x)=x+5$. Find $(fg)(x)$ and its domain.

ANSWER _____

- 4** Let $f(x)=x^2-1$ and $g(x)=x-1$. Find $(f/g)(x)$. Include the domain restriction.

ANSWER _____

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

ANSWER _____

- 6** Let $p(x)=x^3-2x$ and $q(x)=x^2+3$. Find $(p+q)(x)$ and its domain.

ANSWER _____

APPLY IT Show your work

- 1** A gaming club sells tournament entries. Its income is $I(x)=14x$ dollars for x entries, and its costs are $C(x)=48+2x$ dollars. Write a profit function $P(x)=I(x)-C(x)$. State the practical domain.

WORK SPACE

ANSWER _____

- 2** A student uploads two short videos on the same day. After t days, the first video has $L(t)=4t+6$ views, and the second has $S(t)=3 \cdot 2^t$ views. Write a function $T(t)$ for the total views. State the practical domain.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Let $a(x)=x^3-27$, $b(x)=x-3$, and $c(x)=2x+1$. Find $H(x)=a(x)/b(x)-c(x)$. Include the domain restriction and explain why it remains after simplifying.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let $f(x)=2x+7$ and $g(x)=x^2-9$. Find $(f+g)(x)$ and its domain.	$(f+g)(x)=x^2+2x-2$; domain: all real x
2	Let $f(x)=x^2+1$ and $g(x)=7x-1$. Find $(f-g)(x)$ and its domain.	$(f-g)(x)=x^2-7x+2$; domain: all real x
3	Let $f(x)=3x-2$ and $g(x)=x+5$. Find $(fg)(x)$ and its domain.	$(fg)(x)=3x^2+13x-10$; domain: all real x
4	Let $f(x)=x^2-1$ and $g(x)=x-1$. Find $(f/g)(x)$. Include the domain restriction.	$(f/g)(x)=x+1, x \neq 1$
5	Let $f(x)=2^x$ and $g(x)=x^2$. Find $(f+g)(x)$ and its domain.	$(f+g)(x)=2^x+x^2$; domain: all real x
6	Let $p(x)=x^3-2x$ and $q(x)=x^2+3$. Find $(p+q)(x)$ and its domain.	$(p+q)(x)=x^3+x^2-2x+3$; domain: all real x

PART 2 · APPLY IT

- $P(x)=12x-48$; domain: x is a nonnegative integer** Subtract the cost rule from the income rule: $14x-(48+2x)$.
- $T(t)=3 \cdot 2^t+4t+6$; domain: t is a nonnegative integer** Add the two view models and restrict t to whole days starting at zero.

CHALLENGE

$H(x)=x^2+x+8, x \neq 3$. The value $x=3$ remains excluded because $b(3)=0$ in the original quotient.

Accept equivalent simplified forms and equivalent statements of the domains. For quotient functions, require restrictions from the original denominator even when a factor cancels.