Operations With Functions

Summary

1. Arithmetic operations with functions is very similar to arithmetic operations with numbers.

We can add, subtract, multiply, and divide functions just like we can with real numbers.

Sum	$(f+g)(x) = f(x) + g(x)$
Difference	$(f-g)(x) = f(x) - g(x)$
Product	$(fg)(x) = f(x) \cdot g(x)$
Quotient	$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, \quad g(x) \neq 0$

So if $f(x) = x + 2$ and $g(x) = x^2 - 4$, then

$$\begin{aligned}(f+g)(x) &= f(x) + g(x) \\ &= x + 2 + x^2 - 4 \\ &= x^2 + x - 2\end{aligned}$$

Example 1. Find each of the following if $f(x) = x^2 + 2x - 3$ and $g(x) = x - 1$

(a) $(f+g)(x)$ (b) $(f-g)(x)$ (c) $(g-f)(x)$

(d) $(fg)(x)$ (e) $\left(\frac{f}{g}\right)(x)$ (f) $\left(\frac{g}{f}\right)(x)$

Evaluating the Sum, Difference, Product, or Quotient of Two Functions

If $f(x) = x + 2$ and $g(x) = x^2 - 4$, then

$$\begin{aligned}(f+g)(3) &= f(3) + g(3)\\ &= (3+2) + (3^2 - 4)\\ &= 10\end{aligned}$$

Example 2. Evaluate each of the following if $f(x) = x^2 - 3$ and $g(x) = 4x + 5$

(a) $(f+g)(3)$ (b) $(f-g)(0)$ (c) $(fg)(2)$

(d) $(gg)(1)$ (e) $\left(\frac{f}{g}\right)(1)$ (f) $\left(\frac{g}{f}\right)(8)$

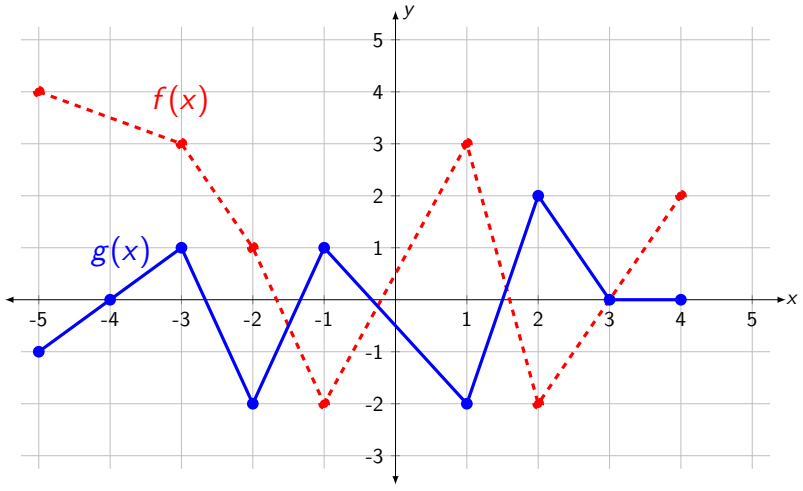
Tabular and Visual Methods

Example 3. Find each given the table below.

x	-3	-2	-1	0	1	2	3
$f(x)$	1	-2	-3	-1	3	2	0
$g(x)$	-2	2	-3	3	0	1	-1

(a) $(f+g)(-1)$ (b) $(f-g)(2)$ (c) $(fg)(0)$ (d) $\left(\frac{g}{f}\right)(-3)$

Example 4. Find each given the graph below.



(a) $(f+g)(-5)$ (b) $(g-f)(-2)$ (c) $(fg)(4)$ (d) $\left(\frac{f}{g}\right)(1)$