

Day 74

7.6 Function Operations

Addition $(f+g)(x) = f(x) + g(x)$

Multiplication $(f \cdot g)(x) = f(x) \cdot g(x)$

Subtraction $(f-g)(x) = f(x) - g(x)$

Division $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$ where $g(x) \neq 0$

Examples: $f(x) = 5x^2 - 4x$ and $g(x) = 5x + 1$

① Find $f(x) + g(x)$. Find the domain.

$$(5x^2 - 4x) + (5x + 1)$$

$$\boxed{5x^2 + 1x + 1}$$

D: $(-\infty, \infty)$ or
all \mathbb{R} #'s

② $f(x) - g(x)$

$$(5x^2 - 4x) - (5x + 1)$$

$$5x^2 - 4x - 5x - 1$$

$$\boxed{5x^2 - 9x - 1}$$

distribute the
minus sign

D: $(-\infty, \infty)$

③ $(f \cdot g)(x) = (5x^2 - 4x)(5x + 1)$

$$25x^3 + 5x^2 - 20x^2 - 4x$$

$$\boxed{25x^3 - 15x^2 - 4x}$$

D: $(-\infty, \infty)$

④

$$\frac{f}{g} = \frac{5x^2 - 4x}{5x + 1}$$

Factor if possible

$$\frac{x(5x-4)}{5x+1}$$

Set denominator equal to zero and solve.

$$5x + 1 = 0$$

$$\frac{5x}{5} = \frac{-1}{5}$$

$$x = -\frac{1}{5}$$

D: all \mathbb{R} 's except $x = -\frac{1}{5}$

$$\frac{g}{f} = \frac{5x + 1}{x(5x - 4)}$$

$$x = 0 \quad 5x - 4 = 0$$

$$\frac{5x}{5} = \frac{4}{5}$$

$$x = \frac{4}{5}$$

D: all \mathbb{R} 's except $x = 0$ and $x = \frac{4}{5}$

Composition

ex

find.

$$(f \circ g)(x) = f(g(x))$$

Let: $f(x) = x - 2$ $g(x) = x^2$

substitution #1

2nd substitution

$$f(x^2) = x^2 - 2$$

↑ this means substitute in an x^2 in the $f(x)$ function wherever there is an x .

$$(f \circ g)(-5) = (-5)^2 - 2 = 25 - 2 = 23$$

$$f(x) = x^2 + 1 \quad g(x) = x^4 - 1$$

$$(f \circ g)(x) = f(g(x))$$

$$\begin{aligned} f(x^4 - 1) &= (x^4 - 1)^2 + 1 \\ &= (x^4 - 1)(x^4 - 1) + 1 \\ &= x^8 - 2x^4 + 1 + 1 \end{aligned}$$

$$\boxed{f(x^4 - 1) = x^8 - 2x^4 + 2}$$

HW: p. 400-401 (2-30 even, 45-56 all)