

6-6 Notes: Function Operations

Lesson Objective: To add, subtract, multiply, and divide two or more functions. Also, to find the composite of two functions.

Function Notation:

1) If $f(x) = 3x + 4$ find $f(2)$

$$f(2) = 3(2) + 4$$

$$f(2) = 6 + 4$$

$$f(2) = 10$$

2) If $g(x) = \frac{2x^2 + 4}{6}$ find $g(-6.5)$. Round to nearest hundredth.

$$g(-6.5) = \frac{2(-6.5)^2 + 4}{6}$$

$$g(-6.5) = \frac{2(42.25) + 4}{6}$$

$$g(-6.5) = \frac{84.5 + 4}{6}$$

$$g(-6.5) = \frac{88.5}{6}$$

$$g(-6.5) = 14.75$$

FUNCTION OPERATIONS

Addition

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

Multiplication

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

Subtraction

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

Division

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{f}{g} \quad ; \quad g(x) \neq 0$$

Example: Let $f(x) = 3x + 8$ and $g(x) = 2x - 12$

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

$$= 3x + 8 + 2x - 12$$

$$= 5x - 4$$

Domain

 \mathbb{R}

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

$$= 3x + 8 - (2x - 12)$$

$$= 3x + 8 - 2x + 12$$

$$= x + 20$$

Domain

 \mathbb{R}

$$f - g = x + 20$$

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

$$= (3x + 8)(2x - 12)$$

$$= 6x^2 - 36x + 16x - 96$$

$$= 6x^2 - 20x - 96$$

Domain

 \mathbb{R}

find $\frac{g}{f} = \frac{g(x)}{f(x)} = \frac{2x - 12}{3x + 8}$

Domain

$$3x + 8 = 0$$

$$3x = -8$$

$$x = -\frac{8}{3}$$

$$\left(-\infty, \frac{8}{3}\right) \cup \left(-\frac{8}{3}, \infty\right)$$

 \mathbb{R} except $x \neq -\frac{8}{3}$

Example: Let $f(x) = 6x^2 - 5$ and $g(x) = 2x - 1$

$$f + g$$

Domain

$$f - g$$

Domain

$$f \cdot g$$

Domain

$$\frac{f}{g}$$

Domain

Example: If: $f(x) = 2x - 5$ *and* $g(x) = x^2 - 4$

Find the following:

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

$$-2g(x) + f(x)$$

$$-3f(x) \cdot g(x)$$

$$\frac{2f(x)}{g(x)}$$

COMPOSITE FUNCTIONS

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

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

Steps 1.

2.

Example: Let $f(x) = x - 2$ and

$$g(x) = x^2$$

find the following:

$$(g \circ f)(-5)$$

$$(f \circ g)(-5)$$

$$g(f(a))$$

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

Example: Let $f(x) = x^3 - 4$ and $g(x) = x^2 + 5x$
find the following:

$$(g \circ f)(-3)$$

$$(g \circ f)(-a)$$

Homework

Let $f(x) = 2x^2 + x - 3$ and $g(x) = x - 1$. Perform each function operation and then find the domain.

13. $f(x) + g(x)$

14. $g(x) - f(x)$

16. $f(x) \cdot g(x)$

17. $\frac{f(x)}{g(x)}$

Let $f(x) = 3x + 5$ and $g(x) = x^2$. Perform each function operation, and state the domain

1. $f(x) + g(x)$

2. $g(x) - f(x)$

4. $f(x) \cdot g(x)$

5. $\frac{f(x)}{g(x)}$

Let $f(x) = x^2$ and $g(x) = x - 3$. Find each value or expression.

31. $(g \circ f)(-2)$

32. $(f \circ g)(-2)$

33. $(g \circ f)(0)$

34. $f(g(x))$

35. $g(f(x))$

Let $f(x) = x^2$ and $g(x) = x - 3$. Find each value or expression.

40. $(g \circ f)(c)$

41. $(f \circ g)(-a)$

42. $(g \circ f)(-a)$