

## 6-6 Function Operations

## Algebra 2

## THOMPSON

1. Let  $f(x) = 5x + 7$  and  $g(x) = 3x^2$ . Perform the function operation and then find the domain of the result.

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

Add the functions:  $3x^2 + 5x + 7$

Domain is all reals

2. Let  $f(x) = x + 1$  and  $g(x) = 4x^2$ . Perform the function operation and then find the domain of the result.

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

Subtract  $f$  from  $g$  so  $g$  will be negative:  $-4x^2 + x + 1$

Domain is all reals

- 3) Let  $f(x) = 8 - x$  and  $g(x) = \frac{1}{x}$ . Perform the function operation and then find the domain of the result.

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

Subtract  $f$  from  $f$  so change all signs in  $f$ :

$$(g - f)(x) = \frac{1}{x} + x - 8 \text{ (Simplify your answer.)}$$

What is the domain of  $(g - f)(x)$ ?

cannot have 0 on bottom of the fraction

- A. The domain of  $g - f$  is the set of all  $x \geq 0$ .
- B. The domain of  $g - f$  is the set of all real numbers.
- C. The domain of  $g - f$  is the set of all real numbers **except  $x = 0$ .**
- D. The domain of  $g - f$  is the set of all  $x \leq 0$ .

- 4) Let  $f(x) = 7 - x$  and  $g(x) = \frac{1}{x}$ . Perform the function operation and then find the domain of the result.

$$\frac{f}{g}(x) \quad \frac{7-x}{\frac{1}{x}} \text{ flip bottom and multiply} \quad x(7-x)$$

$$\frac{f}{g}(x) = 7x - x^2 \text{ (Simplify your answer.)}$$

What is the domain of  $\frac{f}{g}(x)$ ?

cannot have 0 on bottom of the fraction, have to look at original

- A. The domain of  $\frac{f}{g}$  is the set of all real numbers **except  $x = 0$ .**

- 5) Let  $f(x) = 2x^2 + 3x - 5$  and  $g(x) = x - 1$ . Perform the function operation and then find the domain.

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

has no fractions so no exclusions for domain

$$(f + g)(x) = 2x^2 + 4x - 6 \text{ (Simplify your answer.)}$$

What is the domain of  $(f + g)(x)$ ?

- A. The domain of  $f + g$  is the set of all  $x \leq 0$ .
- B. The domain of  $f + g$  is the set of all real numbers.

- 6) Let  $f(x) = 2x^2 - 11x + 12$  and  $g(x) = x - 4$ . Perform the function operation and then find the domain of the result.

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

$$(f \cdot g)(x) = 2x^3 - 19x^2 + 56x - 48 \quad (\text{Simplify your answer.})$$

$$(x-4)(2x^2 - 11x + 12) \quad \text{multiply out}$$

What is the domain of  $(f \cdot g)(x)$ ?

$$x^3 - \underline{11x^2} + \underline{12x} - \underline{8x^2} + \underline{44x} - 48 \quad \text{combine like terms}$$

- A. The domain of  $f \cdot g$  is the set of all  $x \geq 0$ .
- B. The domain of  $f \cdot g$  is the set of all real numbers except  $x = 0$ .
- C. The domain of  $f \cdot g$  is the set of all real numbers.

$$x^3 - 19x^2 + 56x - 48$$

- 7) Let  $f(x) = 2x^2 - 21x + 40$  and  $g(x) = x - 8$ . Perform the function operation and then find the domain of the result.

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

factor  $2x^2 - 21x + 40$  by slide and divide

$$\frac{x^2 - 21x + 80}{(x-16)(x-5)}$$

$$\frac{(x-16)(x-5)}{2 \quad 2}$$

$$\frac{(x-8)(2x-5)}{x-8} = 2x-5$$

Domain is where bottom is zero  $x \neq 8$

- 8) Let  $f(x) = 2x - 1$  and  $g(x) = x^2 + 3$ .

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

plug 0 in for x into the g function first  $\rightarrow = 0^2 + 3 = 3$

then plug that answer into f  $\rightarrow 2(3) - 1 = 5$

- 9) Let  $g(x) = -4x$  and  $h(x) = x^2 + 2$ . Find  $(g \circ h)(0)$ .

plug 0 in for x into the h function first  $\rightarrow = 0^2 + 2 = 2$

then plug that answer into f  $\rightarrow -4(2) = -8$

- 10) Let  $f(x) = x^2$  and  $g(x) = x - 1$ . Find  $(f \circ g)(-2)$ .

plug -2 in for x into the g function first  $\rightarrow = (-2) - 1 = -3$

then plug that answer into f  $\rightarrow (-3)^2 = 9$

- 11) Suppose the function  $f(x) = 11.11x$  represents the number of Chinese yuan equivalent to  $x$  British pounds and the function  $g(y) = 2.13y$  represents the number of Mexican pesos equivalent to  $y$  Chinese yuan.

- a. Write a composite function that represents the number of Mexican pesos equivalent to  $x$  British pounds.  
 b. Find the value in Mexican pesos of an item that costs 30 British pounds.

a. The composite function is  $(g \circ f)(x) = 23.66x$ . Always g first  $2.13 \cdot 11.11 = 23.66x$   
 (Simplify your answer. Round to two decimal places as needed.)

b. The value of the item is 709.8 Mexican pesos.  $23.66(30) = 709.8$   
 (Round to two decimal places as needed.)

12) Let  $f(x) = 5x + 3$  and  $g(x) = x^2 - x + 2$ . Perform the function operation and then find the domain.

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

$$\text{Add the functions: } 5x^3 - 5x^2 + 10x + 3x^2 - 3x + 6 = 5x^3 - 2x^2 + 7x + 6$$

Domain is all reals

13) Let  $f(x) = 4x + 5$  and  $g(x) = x^2 - x + 2$ . Perform the function operation and then find the domain.

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

$$\text{Subtract } g \text{ from } f \text{ so } f \text{ will be negative: } x^2 - x + 2 - (4x + 5)$$

$$x^2 - x + 2 - 4x - 5 = x^2 - 5x - 3$$

Domain is all reals

14) Let  $f(x) = 5x + 3$  and  $g(x) = x^2 - 7x + 12$ . Perform the function operation and then find the domain.

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

$$(5x + 3)(x^2 - 7x + 12) \quad \text{multiply out}$$

$$5x^3 - 35x^2 + 60x + 3x^2 - 21x + 36 \quad \text{combine like terms}$$

$$5x^3 - 32x^2 + 39x + 36$$

Domain is all reals

15) Let  $f(x) = 2x + 5$  and  $g(x) = x^2 - 5x + 6$ . Perform the function operation and then find the domain.

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

$$\frac{2x + 5}{x^2 - 5x + 6}$$

What is the domain of  $\frac{f(x)}{g(x)}$ ?

FACTOR BOTTOM FOR DOMAIN

A. The domain of  $\frac{f(x)}{g(x)}$  is the set of all real numbers.

$$(x - 3)(x - 2) \quad x = 3, 2$$

B. The domain of  $\frac{f(x)}{g(x)}$  is the set of all real numbers except  $x = 2$  and  $x = 3$ .

16) Let  $f(x) = 3x - 6$ . Find  $(f \circ f)(5)$ .

$$f(5) = 3(5) - 6 = 9$$

$$\text{then } f(9) = 3(9) - 6 = 21$$

17) Let  $f(x) = 5x - 1$ ,  $h(x) = \frac{x - 3}{3}$ . Find  $(f \circ h)(1)$ .

$$h(1) = \frac{1 - 3}{3} = -\frac{2}{3}$$

$$\text{then } f\left(-\frac{2}{3}\right) = 5\left(-\frac{2}{3}\right) - 1 = -\frac{13}{3}$$

**18)** Let  $f(x) = 3x - 3$  and  $g(x) = x + 7$ . Find  $f(g(x))$  and  $g(f(x))$ .

$$f(g(x)) \text{ plug } g \text{ into } f \quad 3(x+7) - 3 = 3x + 21 - 3 = 3x + 18$$

$$g(f(x)) \text{ plug } f \text{ into } g \quad (3x-3) + 7 = 3x - 3 + 7 = 3x + 4$$