Warm Up #3

Perform the indicated operation. Assume all variables are positive.

1. $9x^{\frac{2}{3}} - 2x^{\frac{2}{3}}$

ANSWER $7x^{\frac{2}{3}}$

2. $\frac{28x}{4x^{1/5}}$

ANSWER $7x^{\frac{4}{5}}$

Let $f(x) = 3x + 5$ and $g(x) = 2x^2 - 7$. Find the following.

3. $f(-6)$

ANSWER -13

4. $g(-4)$

ANSWER 25

$2(-4)^2 - 7$

$2(16) - 7$

$32 - 7$

Ch.6 Section 3

Objective: Perform operations with functions.

KEY CONCEPT

Operations on Functions

Let f and g be any two functions. A new function h can be defined by performing any of the four basic operations on f and g.

Operation	Definition	Example: $f(x) = 5x$, $g(x) = x + 2$
Addition	$h(x) = f(x) + g(x)$	$h(x) = 5x + (x + 2) = 6x + 2$
Subtraction	$h(x) = f(x) - g(x)$	$h(x) = 5x - (x + 2) = 4x - 2$
Multiplication	$h(x) = f(x) \cdot g(x)$	$h(x) = 5x(x + 2) = 5x^2 + 10x$
Division	$h(x) = \frac{f(x)}{g(x)}$	$h(x) = \frac{5x}{x + 2}$

The domain of h consists of the x-values that are in the domains of both f and g. Additionally, the domain of the quotient does not include x-values for which $g(x) = 0$.

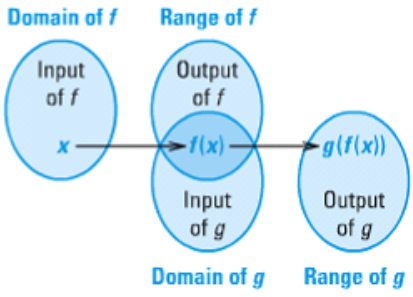
KEY CONCEPT

Composition of Functions

The **composition** of a function g with a function f is:

$$h(x) = g(f(x))$$

The domain of h is the set of all x-values such that x is in the domain of f and $f(x)$ is in the domain of g.



Let $f(x) = 4x^{1/2}$ and $g(x) = -9x^{1/2}$. Find the following and their domains.

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

$4x^{1/2} + -9x^{1/2} = -5x^{1/2}$

Domain: $x \geq 0$

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

$4x^{1/2} - (-9x^{1/2}) = 13x^{1/2}$

$x \geq 0$

Let $f(x) = -2x^{2/3} + 3x^{1/2}$ and $g(x) = 7x^{2/3} - 4x^{1/2}$. Find the following and their domains.

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

$5x^{2/3} - x^{1/2}$

$x \geq 0$

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

$-9x^{2/3} + 7x^{1/2}$

$x \geq 0$

Let $f(x) = 6x$ and $g(x) = x^{3/4}$. Find the following and their domains.

5. $f(x) \bullet g(x)$

$6x^{1}(x^{3/4}) = 6x^{7/4}$

D: $x \geq 0$

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

$= \frac{6x^{1}}{x^{3/4}}$

$= 6x^{1/4}$

$x \geq 0$

Let $f(x) = 3x^{2/3} + x$ and $g(x) = x^{1/5}$. Find the following and their domains.

7. $f(x) \bullet g(x)$

$x^{1/5}(3x^{2/3} + x)$

$= 3x^{13/15} + x^{6/5}$

$\mathbb{R}$

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

$\frac{3x^{2/3} + x}{x^{1/5}}$

$= 3x^{7/15} + x^{4/5}$

$\mathbb{R}, x \neq 0$

F(g(4))

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

9. f(g(5))

$g(5) = 2(5)^2 = 50$

$F(50) = 3(50) - 8 = 142$

10. g(f(5))

11. f(f(4))

12. g(g(4))

$g(4) = 2(4)^2 = 32$

$g(32) = 2(32)^2 = 2048$

Let $f(x) = 4x^{-1}$ and $g(x) = 5x - 2$. Find the following and their domains.

13. $f(g(x))$

$= 4(5x-2)^{-1} = \frac{4}{5x-2}$

$5x - 2 \neq 0$

$5x \neq 2$

$x \neq \frac{2}{5}$

D: $\mathbb{R}$ except $\frac{2}{5}$

14. $g(f(x))$

$5(4x^{-1}) - 2$

$= \frac{20}{x} - 2$

D: $\mathbb{R}, \neq 0$

15. $f(f(x))$

16. $g(g(x))$

Let $f(x) = 2x^{-1} - 1$ and $g(x) = 2x + 7$. Find the following and their domains.

17. $f(g(x))$

18. $g(f(x))$

19. $f(f(x))$

20. $g(g(x))$

Homework:

Section 6.3 (3-36 threes)