6.3 Perform Function Operations

Example: $f(x) = 5x$, $g(x) = x + 2$

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

$h(x) = (5x) + (x+2)$

$h(x) = 6x + 2$

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

$h(x) = (5x) - (x+2)$

$= 5x - x - 2$

$h(x) = 4x - 2$

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

$h(x) = (5x)(x+2)$

$h(x) = 5x^2 + 10x$

$h(x) = \dfrac{f(x)}{g(x)}$

$h(x) = \dfrac{5x}{x+2} \neq 0$

$x + 2 \neq 0$

$x \neq -2$

EXAMPLE 1   **Add and subtract functions**

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

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

$$\left(4x^{\frac{1}{2}}\right) + \left(-9x^{\frac{1}{2}}\right)$$

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

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

$$\left(4x^{\frac{1}{2}}\right) - \left(-9x^{\frac{1}{2}}\right)$$

$$4x^{\frac{1}{2}} + 9x^{\frac{1}{2}}$$

$$\boxed{13x^{\frac{1}{2}}}$$

Dom: All positive reals

$$\boxed{x \geq 0}$$

c. the domains of $f + g$ and $f - g$

$$\boxed{x \geq 0}$$

EXAMPLE 2   **Multiply and divide functions**

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

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

$$\left(6x^1\right)\left(x^{3/4}\right)$$

$$6x^{1+\frac{3}{4}}$$

$$\boxed{6x^{\frac{7}{4}}}$$

$$\boxed{\text{Dom: } x \geq 0}$$

b. $\dfrac{f(x)}{g(x)}$

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

$$6x^{1-3/4}$$

$$\boxed{6x^{1/4}}$$

$$\boxed{\text{Dom: } x > 0}$$

c. the domains of $f \cdot g$ and $\dfrac{f}{g}$

ADD AND SUBTRACT FUNCTIONS Let $f(x) = -3x^{1/3} + 4x^{1/2}$ and $g(x) = 5x^{1/3} + 4x^{1/2}$. Perform the indicated operation and state the domain.

10. $g(x) - g(x)$

$$\left(5x^{1/3} + 4x^{1/2}\right) - \left(5x^{1/3} + 4x^{1/2}\right)$$

$$5x^{1/3} + 4x^{1/2} - 5x^{1/3} - 4x^{1/2}$$

$$\bigcirc$$

Dom: $x \geq 0$

MULTIPLY AND DIVIDE FUNCTIONS Let $f(x) = 4x^{2/3}$ and $g(x) = 5x^{1/2}$. Perform the indicated operation and state the domain.

17. $\dfrac{g(x)}{f(x)}$ $= \dfrac{x^{1/3} \cdot 5x^{1/2}}{x^{1/3} \cdot 4 x^{2/3}} = \dfrac{5}{4} x^{\frac{3}{3} \cdot \frac{1}{2} - \frac{2}{3} \cdot \frac{2}{2}}$

$= \dfrac{5}{4} x^{\frac{3}{6} - \frac{4}{6}}$

$= \dfrac{5}{4} x^{-\frac{1}{6}}$

$= \dfrac{5}{4x^{1/6}} \cdot \dfrac{x^{5/6}}{x^{5/6}}$

$= \boxed{\dfrac{5x^{5/6}}{4x}}$

Dom: $x > 0$