EXAMPLE 2 Multiply and divide functions

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

a. $f(x) \cdot g(x)$ **b.** $\frac{f(x)}{g(x)}$ **c.** the domains of $f \cdot g$ and $\frac{f}{g}$

Solution

a. $f(x) \cdot g(x) = (6x)(x^{3/4}) = 6x^{(1 + 3/4)} = 6x^{7/4}$

b. $\frac{f(x)}{g(x)} = \frac{6x}{x^{3/4}} = 6x^{(1 - 3/4)} = 6x^{1/4}$

c. The domain of f consists of all real numbers, and the domain of g consists of all nonnegative real numbers. So, the domain of $f \cdot g$ consists of all nonnegative real numbers. Because $g(0) = 0$, the domain of $\frac{f}{g}$ is restricted to all *positive* real numbers.

EXAMPLE 3 TAKS REASONING: Multi-Step Problem

RHINOS For a white rhino, heart rate r (in beats per minute) and life span s (in minutes) are related to body mass m (in kilograms) by these functions:

$$r(m) = 241m^{-0.25} \qquad s(m) = (6 \times 10^6)m^{0.2}$$

- Find $r(m) \cdot s(m)$.
- Explain what this product represents.

Solution

STEP 1 **Find** and simplify $r(m) \cdot s(m)$.

$$r(m) \cdot s(m) = 241m^{-0.25}\left[(6 \times 10^6)m^{0.2}\right] \quad \text{Write product of } r(m) \text{ and } s(m).$$

$$= 241(6 \times 10^6)m^{(-0.25 + 0.2)} \quad \text{Product of powers property}$$

$$= (1446 \times 10^6)m^{-0.05} \quad \text{Simplify.}$$

$$= (1.446 \times 10^9)m^{-0.05} \quad \text{Use scientific notation.}$$

STEP 2 **Interpret** $r(m) \cdot s(m)$.

Multiplying heart rate by life span gives the total number of heartbeats for a white rhino over its entire lifetime.

GUIDED PRACTICE for Examples 1, 2, and 3

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

1. $f(x) + g(x)$ **2.** $f(x) - g(x)$ **3.** the domains of $f + g$ and $f - g$

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

4. $f(x) \cdot g(x)$ **5.** $\frac{f(x)}{g(x)}$ **6.** the domains of $f \cdot g$ and $\frac{f}{g}$

7. RHINOS Use the result of Example 3 to find a white rhino's number of heartbeats over its lifetime if its body mass is 1.7×10^5 kilograms.