

4.5

Multiplicative Law of Exponents and Negative Exponents

• Example 1

Simplify each expression.

$$(a) (x^4)^5 = x^{4 \cdot 5} = x^{20}$$

$$(b) (2^3)^4 = 2^{3 \cdot 4} = 2^{12}$$

$$\begin{aligned} (c) (2x^4)^{-3} &= \frac{1}{(2x^4)^3} \\ &= \frac{1}{2^3(x^4)^3} \\ &= \frac{1}{8x^{12}} \end{aligned}$$

• • • CHECK YOURSELF 1

Simplify each expression.

$$\text{a. } \frac{x^5}{x^{-3}}$$

$$\text{b. } \frac{m^3 n^{-5}}{m^{-2} n^3}$$

$$\text{c. } (3a^3)^{-4}$$

$$\text{d. } \frac{(r^3)^{-2}}{(r^{-4})^2}$$

• • • CHECK YOURSELF ANSWER

$$1. \text{ (a) } x^8; \text{ (b) } \frac{m^5}{n^8}; \text{ (c) } \frac{1}{81a^{12}}; \text{ (d) } r^2.$$

4.5 Exercises

Name _____

Section _____

Date _____

A N S W E R S

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Use the Multiplicative Law of Exponents to simplify each of the following expressions.

1. $(x^2)^3$

2. $(a^5)^3$

3. $(m^4)^4$

4. $(p^7)^2$

5. $(2^4)^2$

6. $(3^3)^2$

7. $(5^3)^5$

8. $(7^2)^4$

9. $(2a^{-3})^4$

10. $(3x^2)^{-3}$