

Algebra 1

Lesson 8.2

Apply Exponent Properties Involving Quotients

Warm-Up

Simplify the expression

(a) $x^4 \cdot x^2$

$$x^6$$

(b) $z^2 \cdot z \cdot z^2$

$$z^5$$

(c) $(-3x^6)^2 \cdot x^2$

$$9x^{12} \cdot x^2 = 9x^{14}$$

(d) $4xy^3(-6x^2y)$

$$-24x^3y^4$$

Properties of Exponents

$$a^m \cdot a^n = a^{m+n}$$

$$(a^m)^n = a^{mn}$$

$$(ab)^m = a^m b^m$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$$

$$\frac{12x^5}{2x^2} = \frac{12 \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x}}{2 \cdot \cancel{x} \cdot \cancel{x}} = \frac{12x^3}{2} = 6x^3$$

$$\frac{m^4}{m^5} = \frac{\cancel{m} \cdot \cancel{m} \cdot \cancel{m} \cdot \cancel{m}}{\cancel{m} \cdot \cancel{m} \cdot \cancel{m} \cdot \cancel{m} \cdot m} = \frac{1}{m}$$

Example 1. Use the Quotient of Powers Property

Simplify the expression.

(a) $\frac{3^{12}}{3^5} = 3^{12-5}$

$$3^7$$

(b) $\frac{x^3 \cdot x^4}{x^2} = \frac{x^7}{x^2} = x^{7-2}$

$$x^5$$

(c) $\frac{1}{b^5} \cdot \frac{b^8}{1} = \frac{b^8}{b^5}$

$$b^3$$

Example 2. Use the Power of a Quotient Property

(a) $\left(\frac{3}{5}\right)^3$
 $\frac{27}{125}$

(b) $\left(\frac{x}{y}\right)^5$
 $\frac{x^5}{y^5}$

(c) $\left(\frac{-2}{y}\right)^4$
 $\frac{16}{y^4}$

Try It!
Simplify the expression.

(a) $\left(\frac{a}{b}\right)^2$
 $\frac{a^2}{b^2}$

(b) $\frac{x^{10}}{x^2}$
 x^8

(c) $\left(-\frac{3}{c}\right)^3$
 $-\frac{27}{c^3}$

Example 3. Use the Properties of Exponents

Simplify the expression using all of the properties of exponents.

(a) $\left(\frac{3a^4}{4b}\right)^3$
 $\frac{27a^{12}}{64b^3}$

(b) $\left(\frac{x^2}{4y}\right)^2$
 $\frac{x^4}{16y^2}$

(c) $\left(\frac{x^3}{y}\right)^4 \cdot \frac{1}{3x^6}$
 $\frac{x^{12}}{y^4} \cdot \frac{1}{3x^6}$
 $\frac{x^6}{3y^4}$

Try It!
Simplify the expression using all of the properties of exponents.

(a) $\frac{-24a^4}{8a^2}$
 $-3a^2$

(b) $\frac{8m^5n}{2m^4}$
 $4mn$

(c) $\left(\frac{2s}{3t}\right)^3 \cdot \left(\frac{t^5}{16}\right)$
 $\frac{8s^3}{27t^3} \cdot \frac{t^5}{16}$
 $\frac{s^3t^2}{54}$

Assignment

New: Pg. 498 #4 – 36 (evens)

Review:
Simplify.

1. $-(-x)^2(-x^3)(-x)^5$

2. $(2x^3y^6)(-4x^4y^2)$

3. $(-3a^5b^2c)^3$