

4.6 Applying the Exponent Laws

LESSON FOCUS

Apply the exponent laws to simplify expressions.

Make Connections

Recall the exponent laws for integer bases and whole number exponents.

Product of powers: $a^m \cdot a^n = a^{m+n}$

Quotient of powers: $a^m \div a^n = a^{m-n}$, $a \neq 0$

Power of a power: $(a^m)^n = a^{mn}$

Power of a product: $(ab)^m = a^m b^m$

Power of a quotient: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$, $b \neq 0$

What other types of numbers could be a base? An exponent?

How would you use the exponent laws to evaluate an expression with these numbers?

Example 2

Simplifying Algebraic Expressions with Integer Exponents

Simplify. Explain the reasoning.

a) $(x^3y^2)(x^2y^{-4})$

b) $\frac{10a^5b^3}{2a^2b^{-2}}$



SOLUTION

CHECK YOUR UNDERSTANDING

2. Simplify. Explain your reasoning.

a) $m^4n^{-2} \cdot m^2n^3$

b) $\frac{6x^4y^{-3}}{14xy^2}$

Example 3

Simplifying Algebraic Expressions with Rational Exponents

Simplify. Explain the reasoning.

a) $(8a^3b^6)^{\frac{1}{3}}$

b) $(x^{\frac{3}{2}}y^2)(x^{\frac{1}{2}}y^{-1})$

c) $\frac{4a^{-2}b^{\frac{2}{3}}}{2a^2b^{\frac{1}{3}}}$

d) $\left(\frac{100a}{25a^5b^{-\frac{1}{2}}}\right)^{\frac{1}{2}}$



SOLUTION

3. Simplify. Explain your reasoning.

a) $(25a^4b^2)^{\frac{3}{2}}$

b) $(x^3y^{-\frac{3}{2}})(x^{-1}y^{\frac{1}{2}})$

c) $\frac{12x^{-5}y^{\frac{5}{2}}}{3x^{\frac{1}{2}}y^{-\frac{1}{2}}}$

d) $\left(\frac{50x^2y^4}{2x^4y^7}\right)^{\frac{1}{2}}$



Example 4

Solving Problems Using the Exponent Laws

A sphere has volume 425 m^3 .

What is the radius of the sphere to the nearest tenth of a metre?



SOLUTION