

Homework

Page 241-242

Questions

3ac, 4ac, 5ac, 6ac

8 a c e g 9 a c e g

Example 1**Evaluating Powers with Negative Integer Exponents**

Evaluate each power.

a) $3^{-2} = \left(\frac{1}{3}\right)^2$ b) $\left(-\frac{3}{4}\right)^{-3} = \left(\frac{-3}{4}\right)^{-3} = \left(\frac{-4}{3}\right)^3$ c) 0.3^{-4}

SOLUTION

$$\begin{aligned} \text{a) } 3^{-2} &= \frac{1}{3^2} \\ &= \frac{1}{9} \end{aligned}$$

$$\begin{aligned} \text{b) } \left(-\frac{3}{4}\right)^{-3} &= \left(-\frac{4}{3}\right)^3 \\ &= -\frac{64}{27} \end{aligned}$$

(Solution continues.)

**Remember
Already did**

Example 2**Evaluating Powers with Negative Rational Exponents**

Evaluate each power without using a calculator.

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

b) $\left(\frac{9}{16}\right)^{-\frac{3}{2}}$

**Remember
Already did**

SOLUTION

a) $8^{-\frac{2}{3}} = \frac{1}{8^{\frac{2}{3}}}$

Write with a positive exponent.

$$= \frac{1}{(\sqrt[3]{8})^2}$$

Take the cube root.

$$= \frac{1}{2^2}$$

Square the result.

$$= \frac{1}{4}$$

(Solution continues.)

CHECK YOUR UNDERSTANDING

3. Simplify. Explain your reasoning.

$$\begin{aligned}
 \text{a) } & (25a^4b^2)^{\frac{3}{2}} \\
 & 25^{1 \times \frac{3}{2}} \quad a^{4 \times \frac{3}{2}} \quad b^{2 \times \frac{3}{2}} \\
 & = 25^{\frac{3}{2}} \quad a^{\frac{12}{2}} \quad b^{\frac{6}{2}} \\
 & = (\sqrt{25})^3 \quad a^6 \quad b^3 \\
 & = (5)^3 \quad a^6 \quad b^3 \\
 & = 125 \quad a^6 \quad b^3
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } & (x^3y^{-\frac{3}{2}})(x^{-1}y^{\frac{1}{2}}) \\
 & = x^3 \cdot y^{-\frac{3}{2}} \cdot x^{-1} \cdot y^{\frac{1}{2}} \\
 & = \underbrace{x^3 \cdot x^{-1}}_{\text{add exp}} \cdot y^{-\frac{3}{2}} \cdot y^{\frac{1}{2}} \\
 & = x^{3+(-1)} \cdot y^{-\frac{3}{2} + (\frac{1}{2})} \\
 & = x^2 \cdot y^{-\frac{2}{2}} \\
 & = x^2 y^{-1} \\
 & = \frac{x^2}{y}
 \end{aligned}$$

4.6 Applying the Exponent Laws

Answers: a) $125a^6b^3$ b) $\frac{x^2}{y}$

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

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

$$= 4 x^{(-5)-(\frac{1}{2})} y^{\frac{5}{2}-(-\frac{1}{2})}$$

common denom
add opp

$$= 4 x^{(-\frac{10}{2})-(\frac{1}{2})} y^{\frac{5}{2}+\frac{1}{2}}$$

$$= 4 x^{-\frac{11}{2}} y^{\frac{6}{2}}$$

$$= \frac{4 y^3}{x^{\frac{11}{2}}}$$

Answers: c) $\frac{4y^3}{x^{\frac{11}{2}}}$

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

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

$$= (25 x^{2-4} y^{4-7})^{\frac{1}{2}}$$

$$= (25 x^{-2} y^{-3})^{\frac{1}{2}}$$

$$= 25^{1 \times \frac{1}{2}} x^{-2 \times \frac{1}{2}} y^{-3 \times \frac{1}{2}}$$

$$= 25^{\frac{1}{2}} x^{-\frac{2}{2}} y^{-\frac{3}{2}}$$

$$\sqrt{25}$$

$$= 5 x^{-1} y^{-\frac{3}{2}}$$

$$= \frac{5}{x y^{\frac{3}{2}}}$$

d) $\frac{5}{xy^{\frac{3}{2}}}$

Laws of exponents Practice Worksheet

Simplify. Your answer should contain only positive exponents.

1) $\frac{2u^3v^3 \cdot (3u^2)^2}{2u^2}$

2) $\frac{(4xy^2)^3}{(4y^3)^4 \cdot 2y^3} = \frac{x^3}{8y^9}$

3) $\frac{(4uv^2)^2}{3u^2v^4 \cdot 3v^2} = \frac{16}{9v^2}$

4) $\left(\frac{4a^4b^3}{3a^4b^3 \cdot 4a^3b^4}\right)^3 = \frac{4^3}{4^3}$

5) $\left(\frac{3y^3 \cdot 3x^3y^4}{4x^4y^2}\right)^4$

6) $\left(\frac{3xy^4 \cdot 3x^3y^2}{yx^4}\right)^3 = 729y^{15}$

7) $\frac{2ba^2}{4a(2a^3b^4)^3} = \frac{1}{16a^8b^{11}}$

8) $\frac{(2x^2y^2)^4}{(2x^2 \cdot (yx^2)^3)^2}$

9) $\frac{(m^2n^2)^2}{3m^4n^2 \cdot 2m^3n^2}$

10) $\frac{x^2}{4x^4y^2 \cdot (3x^4y^2)^2}$

11) $\left(\frac{n}{m \cdot 2m^4n^4}\right)^4$

12) $\left(\frac{3x^2y^3 \cdot 4x^3y^2}{3xy^3}\right)^4 = 256x^{16}y^8$

13) $\left(\frac{3x^2y^4 \cdot x^3y^3}{(2x^2y^3)^4}\right)^2$

14) $\left(\frac{2u^4v^3 \cdot 2uv^3}{4u^3}\right)^4$

15) $\frac{3uv^2}{2u^3v^2 \cdot (2v^2)^2}$

16) $\frac{(4y)^3}{4y \cdot 3y^2}$

$$1) \frac{2u^3v^3(3u^2)^2}{2u^2} = \frac{2u^3v^3 \overset{\text{power to power}}{3^{1 \times 2} u^{2 \times 2}}}{2u^2}$$

$$= \frac{2u^3v^3 3^2 u^4}{2u^2}$$

$$= \frac{2u^3v^3 9u^4}{2u^2}$$

$$= \frac{2 \cdot 9 u^3 u^4 v^3}{2u^2}$$

$$= \frac{18 u^{3+4} v^3}{2u^2}$$

$$= \frac{18 u^7 v^3}{2u^2}$$

$$= \frac{18}{2} \frac{u^7}{u^2} v^3$$

$$= 9 u^{7-2} v^3$$

$$= \boxed{9u^5v^3}$$

$$2) \frac{(4xy^2)^3}{(4y^3)^4 \cdot 2y^3}$$

$$= \frac{4^3 x^3 y^6}{4^4 y^{12} 2y^3}$$

Same base

$$= \frac{4^{3-4} x^3 y^6}{2 y^{12+3}}$$

$$= \frac{4^{-1} x^3 y^6}{2 y^{15}}$$

$$= \frac{4^{-1} x^3 y^{6-15}}{2}$$

$$= \frac{4^{-1} x^3 y^{-9}}{2}$$

move *move*

$$= \frac{x^3}{4 \cdot 2 y^9}$$

$$= \frac{x^3}{8 y^9}$$