8.6 Radical Expressions DAY ONE

Objectives

Rewrite radical expressions by using rational exponents.

Simplify and evaluate radical expressions and expressions containing rational exponents.

May 6-12:05 PM

Warm Up

Simplify each expression.

1. $7^3 \bullet 7^2 = 7^5$

2. $\frac{11^8}{11^6} = 11^2$

3. $(3^2)^3 \quad 3^6$

4. $\sqrt{75} \quad 5\sqrt{3}$

$25 \cdot 3$

5. $\frac{\sqrt{20}\cdot\sqrt{7}}{\sqrt{7}\cdot\sqrt{7}} = \frac{\sqrt{140}}{7}$

Apr 28-1:40 PM

The *n*th root of a real number *a* can be written as the radical expression $\sqrt[n]{a}$, where *n* is the **index** (plural: *indices*) of the radical and *a* is the radicand. When a number has more than one root, the radical sign indicates only the principal, or positive, root.

index $\sqrt[2]{\ }$

$\sqrt[2]{50}$

$\sqrt{25\cdot 2}$

$5 \cdot 5$

$5\sqrt{2}$

Apr 28-1:45 PM

You are probably familiar with finding the square root of a number. These two operations are inverses of each other. Similarly, there are roots that correspond to larger powers.

5 and –5 are square roots of 25 because $5^2 = 25$ and $(-5)^2 = 25$

2 is the cube root of 8 because $2^3 = 8$.

2 and –2 are fourth roots of 16 because $2^4 = 16$ and $(-2)^4 = 16$.

a is the *n*th root of *b* if $a^n = b$.

May 12-10:11 AM

Example 1: Finding Real Roots

Find all real roots.

A. sixth roots of 64

A positive number has two real sixth roots. Because $2^6 = 64$ and $(-2)^6 = 64$, the roots are 2 and −2.

$\sqrt[6]{64}$ $\boxed{2}$

8 8

4 2 4 2

2 2 2 2

B. cube roots of −216

$\sqrt[3]{-216}$ $\boxed{-6}$

6 36

6 6

2 3 2 3

2·3

6

C. fourth roots of 81

$\sqrt[4]{81}$ $\boxed{3}$

9 9

3 3 3 3

$3\sqrt[4]{3}$

Apr 28-1:47 PM

Example 2A: Simplifying Radical Expressions

$\sqrt[3]{x^6} \quad x^3$

How many groups of the index can you make?

Simplify each expression. Assume that all variables are positive.

1. $\sqrt[4]{81x^{12}}$

$\boxed{3x^3}$

$\sqrt{x^9} \quad \sqrt{x^8 x}$

$x^4\sqrt{x}$

2. $\sqrt[3]{162y^{15}}$

81 2

9 9

3 3 3 3

$3y^5\sqrt[3]{6}$

3. $\sqrt[3]{24y^{23}}$ $y^{21}y^2$

6 4

2 3 2 2

$2y^7\sqrt[3]{3y^2}$

4. $\sqrt[3]{27y^{18}}\cdot\sqrt[2]{36y^{18}}$

9 3

3 3

$3y^6 \cdot 6y^9$

$18y^{15}$

Apr 28-1:50 PM

Do you remember how to rationalize the denominator?

5. $\frac{3}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{3\sqrt{5}}{5}$

6. $\frac{2}{\sqrt[4]{3}} \cdot \frac{\sqrt[4]{3^3}}{\sqrt[4]{3^3}} = \boxed{\frac{2\sqrt[4]{27}}{3}}$

7. $\frac{x}{\sqrt[3]{5}} \cdot \frac{\sqrt[3]{5^2}}{\sqrt[3]{5^2}} = \boxed{\frac{x\sqrt[3]{25}}{5}}$

May 13-1:01 PM

Reduce first if possible!!

8. $\sqrt[4]{\frac{x^8}{3}}$

9.

$\frac{\sqrt[4]{x^8}}{\sqrt[4]{3}} = \frac{x^2}{\sqrt[4]{3}} \cdot \frac{\sqrt[4]{3^3}}{\sqrt[4]{3^3}} = \boxed{\frac{x^2\sqrt[4]{27}}{3}}$

10. $\sqrt[3]{\frac{4n^9}{5}}$

$\frac{\sqrt[3]{4n^9}}{\sqrt[3]{5}} = \frac{n^3\sqrt[3]{4} \cdot \sqrt[3]{5 \cdot 5}}{\sqrt[3]{5} \cdot \sqrt[3]{5^2}} = \boxed{\frac{n^3\sqrt[3]{100}}{5}}$

100
2 50
2 25
5 5

$\frac{\sqrt[3]{x^7}}{\sqrt[3]{27x^3}}$

$\sqrt[3]{\frac{x^7}{27x^3}} = \frac{\sqrt[3]{x^4}}{\sqrt[3]{27}} = \boxed{\frac{x\sqrt[3]{x}}{3}}$

27
9 3
3 3

Apr 28-1:54 PM

Assignment:

Page 614-615

Problems 1-12,30-40

Apr 28-2:01 PM

May 2-2:10 PM