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

$\frac{1}{x} - \frac{3}{4} = \frac{x}{4}$ $\cdot 4x$ $\cdot 4x$

$4 - 3x = x^2$

$-4 \quad +3x \quad +3x-4$

$0 = x^2 + 3x - 4$

$0 = (x+4)(x-1)$

$x+4=0 \quad x-1=0$

$x=-4 \quad x=1$

May 13-8:18 AM

$\frac{1}{x} = \frac{x}{6} - \frac{5}{6}$

$6 = x^2 - 5x$

$-6 \qquad -6$

$0 = x^2 - 5x - 6$

$0 = (x-6)(x+1)$

$x-6=0 \quad x+1=0$

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$m \cdot \frac{m}{1} + \frac{12}{m} = 7 \cdot m$

$m^2 + 12 = 7m$

$-7m \qquad -7m$

$m^2 - 7m + 12 = 0$

$(m-3)(m-4)=0$

$m-3=0 \quad m-4=0$

$m=3 \quad m=4$

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Warm Up

Simplify each expression.

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

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

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

4. $\sqrt{75}$
$\sqrt{25 \cdot 3}$
$5\sqrt{3}$
$\sqrt{4 \cdot 35}$

5. $\frac{\sqrt{20} \cdot \sqrt{7}}{\sqrt{7} \cdot \sqrt{7}}$ $\frac{\sqrt{140}}{7}$
$\frac{2\sqrt{35}}{7}$

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.

$\sqrt{4} = 2$ $\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

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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.

$\sqrt[6]{64}$

B. cube roots of –216

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

$(-6)(-6)(-6) = -216$

C. fourth roots of 81

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

$3 \cdot 3 \cdot 3 \cdot 3 = 81$

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Example 2A: Simplifying Radical Expressions

How many groups of the index can you make?

Simplify each expression. Assume that all variables are positive.

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

$\sqrt[4]{81}$ $\sqrt[4]{x^{12}}$ $x^3 \cdot x^3 \cdot x^3 \cdot x^3$

3 x^3

$3x^3$

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

$\sqrt[3]{27 \cdot 6\, y^{15}}$

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

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

$\sqrt[3]{8 \cdot 3\, y^{21} \cdot y^2}$

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

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

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

$18y^{15}$

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Reduce first if possible!!

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

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

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

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

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

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Assignment:

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Problems 1-12, ~~30-40~~

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