Rationalizing a denominator: Quotient involving higher radicals and monomials

Rationalize the denominator and simplify.

\[ \frac{3\sqrt[3]{7x^5}}{2y} \]

Assume that all variables represent positive numbers.

\[ \frac{\sqrt[3]{7x^5}}{\sqrt[3]{4y^2}} \cdot \frac{\sqrt[3]{4y^2}}{\sqrt[3]{4y^2}} = \frac{\sqrt[3]{28x^5y^2}}{2y} \]

Simplifying a product and quotient involving square roots of negative numbers

Simplify the expressions below as much as possible.

Leave no negative numbers under radicals and no radicals in denominators.

\[ \frac{\sqrt{-54}}{\sqrt{-3}} = \frac{\sqrt{18}}{3} = \frac{\sqrt{2}}{\sqrt{3}} \]

\[ 54/3 = 18 \]

\[ \sqrt{-15} \cdot \sqrt{6} = \sqrt{-90} = \sqrt{90} = \frac{3\sqrt{10}}{\sqrt{3}} \]

\[ 3i \sqrt{10} \]
Dividing complex numbers

Divide.

\[
\frac{-i}{4 + 6i} \cdot \frac{4-6i}{4-6i} = \frac{-4i + 6i^2}{16 - 36i^2} = \frac{-4i - 6}{16 + 36} = \frac{-4i - 6}{52} = \frac{-4i}{52} - \frac{6}{52}
\]

Write your answer as a complex number in standard form.

conjugate of

4+6i is 4 - 6i

7.4 #9.
Rationalizing a denominator: Quotient involving a higher radical

Rationalize the denominator and simplify.

\[
\frac{4}{\sqrt[3]{27}} \cdot \frac{\sqrt[3]{3}}{\sqrt[3]{3}} = \frac{4\sqrt[3]{3}}{\sqrt[3]{81}} = \frac{4\sqrt[3]{3}}{3}
\]
10.
Rationalizing a denominator: Quotient involving higher radicals and monomials

Rationalize the denominator and simplify.
\[
\frac{2x^6}{\sqrt[3]{25y^{14}}} \cdot \frac{\sqrt[3]{5y}}{\sqrt[3]{5y}} = \frac{2x^6 \sqrt[3]{5y}}{5y^5}
\]
Assume that all variables represent positive numbers.

\[
\sqrt[3]{125y^{15}} = 5y^5
\]
week 11

November 11, 2015

Simplifying a sum or difference of higher radical expressions

Simplify,

\[ -4 \sqrt[3]{81x^{11}} + \frac{3}{24x^{11}} \]

Assume that the variable represents a positive real number.

\[ -4 \cdot 3 \]

\[ 9 \cdot 3 \]

\[ -12x^3 \sqrt[3]{3x^2} + 2x^3 \sqrt[3]{3x^2} \]

\[ -10x^3 \sqrt[3]{3x^2} \]

Simplifying a product of radical expressions: Multivariate

Simplify,

\[ \sqrt{2u^4 x^3 \sqrt{18u^7 x^9}} \]

Assume that all variables represent positive real numbers.

\[ \sqrt{2u^4 x^3 \sqrt{18u^7 x^9}} = \sqrt{2u^4 x^3 \cdot 18u^7 x^9} \]

Using the property \( \sqrt{A} \sqrt{B} = \sqrt{AB} \) for positive \( A \) and \( B \)

\[ = \sqrt{36u^{11} x^{12}} \]

Multiplying under the square root sign

\[ = \sqrt{36u^{10} x^{12} \cdot u} \]

Factoring out the perfect square \( 36u^{10} x^{12} \)

\[ = \sqrt{36u^{10} x^{12} \sqrt{u}} \]

Using the property \( \sqrt{AB} = \sqrt{A} \sqrt{B} \) for positive \( A \) and \( B \)

\[ = 6u^5 x^{6} \sqrt{u} \]

Here is the answer.

\[ 6u^5 x^{6} \sqrt{u} \]
Special products of radical expressions: Conjugates and squaring

Multiply and simplify.

\((\sqrt{x} - \sqrt{3})^2\) = \(X - 2\sqrt{3}X + 3\)

\((\sqrt{x} - \sqrt{3})(\sqrt{x} + \sqrt{3})\) = \(X + 27\)

FOIL

\((\sqrt{x} - \sqrt{3})(\sqrt{x} - \sqrt{3})\) = \(X - 2\sqrt{3}X + 3\)

\(\sqrt{x} + 3\sqrt{x} - 3\sqrt{3x} + 27\)

\(2\sqrt{3} \cdot 3\sqrt{3}\)

\(9 \cdot 3 = 27\)

Section 7.5 Radicals Equations - Question #1;
Introduction to solving a radical equation

Solve for \(w\), where \(w\) is a real number.

\(\sqrt{w} = 11\)

If there is more than one solution, separate them with commas. If there is no solution, click on "No solution".

\((\sqrt{w} = 11)^2\)

\(W = 121\)

\((w^2) = w\)
Section 7.5 Radicals Equations - Question #7:  
Solving a radical equation that simplifies to a quadratic equation: One radical, advanced

Solve for \( W \), where \( W \) is a real number.

\[ W - 2 = \sqrt{-20 + 7W} \]

If there is more than one solution, separate them with commas. If there is no solution, click "No solution".

\[ (W-2)(W-2) = -20 + 7W \]

\[ W^2 - 4W + 4 = -20 + 7W \]

\[ W^2 - 4W + 4 = -20 + 7W \]

\[ -7W + 20 + 20 - 7W \]

\[ W^2 - 11W + 24 = 0 \]

\[ (W-8)(W-3) = 0 \]

\[ W = 8, 3 \]

CHECK!!!

BOTH WORK!

Section 7.5 Radicals Equations - Question #16: 
Solving an equation with exponent 1/n: Problem type 2

Solve for \( y \), where \( y \) is a real number.

\[ \left( \frac{1}{6} + 15 \right)^\frac{1}{4} + 7 = 4 \]

If there is more than one solution, separate them with commas. If there is no solution, click "No solution".

\[ y = \]

CHECK!!!

BOTH WORK!
Section 7.6: Exponential Equations – Question #16
Solving an equation with exponent 1/a: Problem type 2

Solve for \( y \), where \( y \) is a real number.

\[
(\phi + 1.5)^{\frac{1}{2}} + 7 = 4
\]

If there is more than one solution, separate them with commas. If there is no solution, click on "No solution".

We will use the following property:

If \( a = b \), then \( a^n = b^n \) for any exponent \( n \).

We solve as follows:

\[
(\phi + 1.5)^{\frac{1}{2}} + 7 = 4
\]

\[
(\phi + 1.5)^{\frac{1}{2}} = -3
\]

\[
(\phi + 1.5)^{\frac{1}{2}} = -3
\]

by the property above

\[
\phi + 1.5 = -91
\]

\[
\phi = -66
\]

\[
y = 11
\]

Raising both sides of an equation to a power might lead to a value that is not a solution. So we must check that \( y = 11 \) makes the original equation true.

Check: \( (\phi + 1.5)^{\frac{1}{2}} + 7 = 4 \)

\[
(\phi + 1.5)^{\frac{1}{2}} + 7 = 4 \quad \text{Letting } y = 11
\]

\[
11 = 7 + 4
\]

\[
11 = 4
\]

This is FALSE.

So, \( y = 11 \) is not a solution to the original equation.

There is no solution.

Here is the answer:

No solution

---

\[
\sqrt{3v+14} = \sqrt{7v-14}
\]

\[
3v+14 = 7v-14
\]

\[
3v+28 = 7v
\]

\[
\frac{28}{4} = 7
\]

\[
v = 7
\]
\( \sqrt[3]{3 + \sqrt{v}} = \sqrt{v + 27} \)

\[ (\sqrt[3]{v + 27})^2 = (\sqrt{v} + 3)^2 \]

\[ (27)^{\frac{2}{3}} = (18) \]

\[ (6)^2 (v) = (18)^2 \]

\[ 36v = 324 \]

\[ v = 324 \]

\[ \sqrt{v} = 9 \]
\[ m = \sqrt{\frac{k}{\beta}} \]
\[ m^2 = \left( \sqrt{\frac{k}{\beta}} \right)^2 \]
\[ m^2 = \frac{k}{\beta} \]
\[ \beta = 5m^2 \]

---

\[ 4u - 16 + 2 = 0 \]
\[ 4u - 16 = -2 \]
\[ 3\sqrt[3]{4u - 16} = 2 \]
\[ \left( \frac{3}{3} \sqrt[3]{4u - 16} \right)^3 = 2^3 \]
\[ 4u - 16 = 8 \]
\[ 4u = 8 + 16 \]
\[ 4u = 24 \]
\[ u = 6 \]
\[ \left( z + 5 \right)^{\frac{8}{3}} \cdot \frac{3}{3} \]

\[ \begin{align*}
\frac{z}{3} + \frac{5}{3} &= 4^{\frac{2}{3}} - 5 \\
\frac{z}{3} &= 4^{\frac{2}{3}} - 5 \\
\sqrt[3]{4^2} &= 4^{\frac{2}{3}} \\
\sqrt[3]{16} &= 4^{\frac{2}{3}} \\
2 + \frac{2}{3} &= 5
\end{align*} \]