HAT
Rational Exponents

11/2/17

Getting Warmer...

Simplify:

a) $9^{\frac{1}{2}} \cdot 9^{\frac{1}{2}} = 9$

9^1

$\sqrt{9} \cdot \sqrt{9} = 9$

b) $\left(3^{\frac{1}{2}}\right)^2 = 3$

3^1

$(\sqrt{3})^2 = 3$

Rational Exponents

Conclusion: $b^{\frac{m}{n}} = \sqrt[n]{b^m} = \left(\sqrt[n]{b}\right)^m$

power

root

Ex#1: Evaluate each expression.

$27^{\frac{1}{3}} = \sqrt[3]{27} = 3$

$32^{\frac{2}{5}} = \left(\sqrt[5]{32}\right)^2 = (2)^2 = 4$

$49^{-\frac{1}{2}} = \left(\frac{1}{49}\right)^{1/2} = \frac{1}{7}$

$\left(\frac{125}{216}\right)^{\frac{2}{3}} = \left(\sqrt[3]{\frac{125}{216}}\right)^2 = \left(\frac{5}{6}\right)^2 = \frac{25}{36}$

Ex#2: Multiply $\left(x^{\frac{1}{2}} + y^{\frac{3}{2}}\right)\left(x^{\frac{1}{2}} - y^{\frac{3}{2}}\right)$

$x^{1/2} \cdot x^{1/2} - x^{1/2} \cdot y^{3/2} + x^{1/2} y^{3/2} - y^{3/2} \cdot y^{3/2}$

$x - y^3$

$(x^{1/2})^2 - (y^{3/2})^2$

An expression with rational exponents is "simplified" when all of these conditions are met.

- The expression has no negative exponents.
- The expression has no exponents that are not positive integers in the denominator.
- The expression is not a complex fraction.
- The index of any remaining radical is the least number possible.

Ex#3: Simplify

$$\frac{\sqrt[6]{16}}{\sqrt[3]{2}}$$

$$\frac{2^{4/6}}{2^{1/3}} = 2^{1/3}$$

$$\sqrt[3]{2}$$

$$x^{-\frac{3}{5}}$$

$$\frac{1}{x^{3/5}} \cdot \frac{x^{2/5}}{x^{2/5}}$$

$$\sqrt[5]{x^3} \cdot \sqrt[5]{x^2}$$

$$\frac{x^{2/5}}{x}$$

$$\frac{\sqrt[5]{x^2}}{x}$$

Ex#4: Simplify

$\sqrt[6]{27}$

$3^{3/6}$

$3^{1/2}$

$\sqrt{3}$

$\sqrt[8]{81}$

$3^{4/8}$

$3^{1/2}$

$\sqrt{3}$

* conjugate

Example #5: Simplify $\dfrac{y^{\frac{1}{2}}+1}{y^{\frac{1}{2}}-1}$

$\dfrac{\sqrt{y}+1}{\sqrt{y}-1}\cdot\dfrac{\sqrt{y}+1}{\sqrt{y}+1}$ $(\sqrt{y})^2-(1)^2$

$\dfrac{y+\sqrt{y}+\sqrt{y}+1}{y-1}$

$\dfrac{y+2\sqrt{y}+1}{y-1}$

Assignment: page 426 #32, 33, 35, 37, 39, 49, 51, 53, 57, 62, 63, 64, 66

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