Notes for R.6 Rational Exponents (pp. 55 – 62)

Name:
Date:
Instructor:

Topics: Negative and Rational Exponents and Their Properties

I. Negative Exponents and the Quotient Rule (pp.55 – 57)

Recall: The Product Rule for Exponents states that $a^m \bullet a^n =$ ________

Ex. $\frac{a^2}{a^5} = \frac{a \bullet a}{a \bullet a \bullet a \bullet a \bullet a} =$ ___________________________________

So the definition of a negative exponent is that we use the reciprocal of the ______________________________.

*Negative exponents are *instructions to rewrite as the reciprocal*, **not** anything left of zero on the number line.

When we use the Quotient Rule and divide with exponents, we ____________________ ____

Special cases:

$a^0 = 1$ and $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$

Ex. $\frac{24x^5y^3}{8x^7y} =$

Ex. $2x^{-2}(-3^{-1}x^{-4})^2 =$

II. Rational Exponents (pp. 58 –61)

Def. $\left(a^{\frac{1}{n}}\right)^n = a$, when n is an ***even*** positive integer, and when ***a* is positive**. Also,

$a^{\frac{m}{n}} = \left(a^m\right)^{\frac{1}{n}}$ $a^{\frac{1}{n}}$ is called the ________________ n^{th} root of a.

Def. $\left(a^{\frac{1}{n}}\right)^n = a$, when n is an ***odd*** positive integer, and when ***a* is any real number**. The answer is the positive or the negative real number whose n^{th} power is a.

Ex. $64^{\frac{1}{2}} =$

Ex. $-(144)^{\frac{1}{2}} =$

Ex. $16^{\frac{1}{4}} =$

Ex. $(-8)^{\frac{1}{3}} =$

Ex. $(-81)^{\frac{1}{4}} =$

vs. $-81^{\frac{1}{4}} =$

*Note the big difference that the ( ) make in the solutions to these two problems!

For rational exponents with a value other than 1 in the numerator of its exponent, then $a^{\frac{m}{n}} = \left(a^{\frac{1}{n}}\right)^m$ or $a^{\frac{m}{n}} = \left(a^m\right)^{\frac{1}{n}}$, whichever is more convenient.

Ex. $8^{\frac{2}{3}} = \left(8^{\frac{1}{3}}\right)^2 =$ or $8^{\frac{2}{3}} = \left(8^2\right)^{\frac{1}{3}} =$

Ex. $-49^{\frac{3}{2}} =$

Ex. $(-9)^{\frac{7}{2}} =$

Ex. $-32^{\frac{-2}{5}} =$

Summary of Exponential Definitions and Rules

Ex. $\left(2y^{\frac{3}{4}}z\right)\left(3y^{-2}z^{\frac{-1}{3}}\right) =$

Ex. $\left(\dfrac{2a^{\frac{1}{6}}}{b^{\frac{3}{4}}}\right)^2 \cdot \left(\dfrac{32a^5}{b^{-10}}\right)^{\frac{2}{5}} =$

Factoring Polynomials with Rational Exponents: Factor out the *smaller* exponent.

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

Ex. $4x^{-1} + 10x^{-3} =$

III. Omit More Complex Fractions (p.61) (Stop video at 18:24 – 19:45)

IV. Calculator Notes:

- When entering an exponent in the calculator, use the ^ key or the "to the" key.
  Ex. 2^3 is entered as "2 ^ 3" and read aloud as "Two to the third power".
- When entering an exponent that is a fraction, you must use ( ) around the fraction. Ex. $2^{\frac{3}{4}}$ is entered as "2 ^ (3 / 4)"

Assignments: Text: pp. 62 – 63, #1 – 27 odd, 37 – 59 odd, 65, 73, 75 "A Review of Algebra": p. 175 #1, 3, 5 – 51 every other odd