

§11-1 REAL EXPONENTS

OBJ: USE PROPERTIES OF EXPONENTS

EVALUATE & SIMPLIFY

SOLVE EQN'S WITH RATIONAL EXPONENTS

REVIEW SCIENTIFIC NOTATION

$a \times 10^n$ $1 \leq a < 10$ AND n is an INTEGER.

PROPERTIES

$$b^1 = b$$

$$b^0 = 1$$

$$b^n = b \cdot b \cdot b \cdots b \quad n \text{ factors of } b$$

$$b^{-n} = \frac{1}{b^n}$$

Product $a^m a^n = a^{m+n}$

Power of Power $(a^m)^n = a^{m \cdot n}$

Power of Quotient $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}; b \neq 0$

Power of Product $(ab)^m = a^m b^m$

Quotient $\frac{a^m}{a^n} = a^{m-n}; a \neq 0$

EXAMPLES

EVALUATE

1) $\frac{3^4 \cdot 3^7}{3^6} =$

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

Simplify

1) $(s^4 t^7)^3 =$

2) $\frac{x^2 y^5}{(x^2)^4} =$

$b^{\frac{1}{n}}$ FOR ANY REAL # $b \geq 0$ AND ANY INTEGER $n \geq 1$
 $b^{\frac{1}{n}} = \sqrt[n]{b}$

* THIS ALSO HOLDS TRUE WITH $b < 0$ AND n IS ODD.

Ex. EVALUATE

1) $625^{\frac{1}{4}}$

2) $3^{\frac{11}{2}}, 21^{\frac{11}{2}} = 3^{\frac{1}{2}} \cdot 3^{\frac{1}{2}} \cdot 7^{\frac{1}{2}} \quad 3^{\frac{1}{2} + \frac{1}{2}} \cdot 7^{\frac{1}{2}} = 3\sqrt{7}$

Simplify

1) $(27x^6)^{\frac{1}{3}}$

2) $\sqrt[6]{8x^{12}} \quad (8x^{12})^{\frac{1}{6}} = 8^{\frac{1}{6}} x^{12 \cdot \frac{1}{6}} \quad (2^3)^{\frac{1}{6}} \cdot x^2$
 $2^{\frac{1}{2} \cdot x^2} = \sqrt{2} \cdot x^2$

RATIONAL EXPONENTS

FOR ANY NONZERO # b , AND ANY INTEGERS m and n with $n > 1$ and m and n have no common factors

~~$b^{\frac{m}{n}} = \sqrt[n]{b^m} = (\sqrt[n]{b})^m$~~

Ex. EVALUATE

1) $243^{\frac{4}{5}}$

2) $\frac{27^{\frac{5}{3}}}{27^{\frac{2}{3}}}$

Simplify

1) $\sqrt[4]{16s^4t^6}$

2) $5x^{\frac{3}{4}}y^{\frac{11}{2}}$

Simplify Radicals

USE PRODUCT PROPERTY TO FACTOR OUT THE NTH ROOT
USE THE SMALLEST INDEX POSSIBLE
USE CAUTION TO AVOID NEGATIVE VALUES

Ex. Simplify $\sqrt[4]{r^7 s^5 t^{24}} = |r|^3 s^2 t^6 \sqrt{rs}$

SOLVE $616 = x^{\frac{4}{5}} - 9$
 $625 = x^{\frac{4}{5}}$

$$(625)^{\frac{1}{\frac{4}{5}}} = x$$

$$(\sqrt[4]{625})^5 = x$$

$$\boxed{x = 3125}$$

IRRATIONAL EXPONENTS

IF X IS AN IRRATIONAL # AND $b > 0$, THEN b^x IS THE REAL # BETWEEN b^{x_1} AND b^{x_2} FOR ALL POSSIBLE CHOICES OF RATIONAL #'S x_1 AND x_2 SUCH THAT

$$x_1 < x < x_2$$

$$2^{\sqrt{3}} \quad \text{SINCE} \quad 1.7 < \sqrt{3} < 1.8$$

$$2^{1.7} < 2^{\sqrt{3}} < 2^{1.8}$$

$$2^{\sqrt{3}} = 3.321997085$$

Assign P. 700-701

21-67 ODD