

Properties of Exponents Day #1

Review

Base → x^3 Exponent "power"

x^3 is the same as $x \cdot x \cdot x$

$x^0 = 1$

No Exponent?

If a number or variable does not have an exponent, it is 1.

$2 = 2^1$

$xy^2z = x^1 y^2 z^1$

NEGATIVE EXPONENTS:

$\frac{x^{-2}}{1} = \frac{1}{x^2}$

MAKE power positive then move from top → bottom

$\frac{y^{-5}}{x^{-3}} = \frac{x^3}{y^5}$ bottom → top

PRODUCT RULE:

$x^2 \cdot x^3 = x \cdot x \cdot x \cdot x \cdot x = x^5$

ADD EXPONENTS

$x^5 \cdot x^{30} = x^{5+30} = x^{35}$

$x^2y \cdot xy^4 = x^2 \cdot x \cdot y \cdot y^4 = x^3y^5$

QUOTIENT RULE:

$\frac{z^7}{z^4} = \frac{z \cdot z \cdot z \cdot z \cdot z \cdot z \cdot z}{z \cdot z \cdot z \cdot z} = z^3$

Subtract power in denominator from power in numerator

$\frac{x^4y^8}{xy^2} = x^{4-1}y^{8-2} = x^3y^6$

POWER TO A POWER RULE:

$(x^3)^2 = (x^3)(x^3) = x^6$

multiply the exponents

$(y^2)^5 = y^{2 \cdot 5} = y^{10}$

$(x^2y^4)^3 = x^{2 \cdot 3}y^{4 \cdot 3} = x^6y^{12}$

Let's try some together:

1. $c^{12} \cdot c^{-4} \cdot c^6$

$c^{12+(-4)+6} = c^{14}$

2. $\frac{b^8}{b^2} = b^{8-2} = b^6$

3. $(a^4)^5 = a^{4 \cdot 5} = a^{20}$

4. $\frac{x^{-2}y}{x^4y^{-1}}$

$\frac{x^{-2-4}y^{1-(-1)}}{x^4y^2} = \frac{x^{-6}y^2}{x^4y^2} = \frac{y \cdot y}{x^4 \cdot x^2} = \frac{y^2}{x^6}$

5. $\left(\frac{a^2b}{a^{-3}b^2}\right)^{-1} = \left(\frac{a^{2-(-3)}b^{1-2}}{a^{-5}b^{-1}}\right)^{-1} = \left(\frac{a^5b^{-1}}{a^{-5}b^{-1}}\right)^{-1} = \frac{b^1}{a^5}$

6. $\left(\frac{x^2y}{xy^3}\right)^2 = (xy^{1-3})^2 = (xy^{-2})^2 = \frac{x^2y^{-4}}{x^2/y^4} = \frac{y^4}{x^2}$

Properties of Exponents

What order should I simplify in?

1. Zero exponents $(2x^3)^5(4x^2)^0 = (2x^3)^5 \cdot 1 = 2^5 x^{15} = 32x^{15}$

2. Negative exponents $\frac{3x^2y^{-5}}{z^{-9}} = \frac{3x^2z^9}{y^5}$

3. Parenthesis $(4x^2y^3)^5 = 4^5 x^{2 \cdot 5} y^{3 \cdot 5} = 1024x^{10}y^{15}$

4. Numerator: multiplication with same base $\frac{9x^2y^5 \cdot x^3y^6}{4z} = \frac{9x^5y^{11}}{4z}$

5. Denominator: multiplication with same base $\frac{17z^4}{3x^2y \cdot 6y^3} = \frac{17z^4}{6 \cdot 3 x^2 y^4} = \frac{17z^4}{18x^2y^4}$
 $\hookrightarrow 3 \cdot 6 \cdot x^2 \cdot y \cdot y^3$

6. Division with same base $\frac{9x^3y^2}{4x^5y}$

7. Negative exponents

8. Reduce coefficients $\frac{2x^2y}{18z} = \frac{1x^2y}{9z} = \frac{x^2y}{9z}$