

MCR 3U

Exponent Laws

Day 1

Minds On!

Review of Exponent Laws:

$a^m a^n = a^{m+n}$ Ex. $2^3 \cdot 2^2 = 2^{3+2} = 2^5 = 32$
 $\frac{a^m}{a^n} = a^{m-n}$ $2^3 \div 2^2 = 2^1 = 2$
 $(a^m)^n = a^{mn}$ $(3^3)^3 = 3^9$
 $a^0 = 1$
 $a^{-m} = \frac{1}{a^m}$
 $\frac{x^7}{x^7} = x^0 = x^0 = 1$

Some things to consider when simplifying exponential expressions:

1. Do the flip! - change negatives
2. Make sure everything is reduced as much as possible (i.e., fractions)
3. Remember BEDMAS!
4. Work from the outside in when dealing with exponent laws.

Example 1:

Simplify, then evaluate:

a) $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

b) $(-2)^{-3} - 4^{-2}$
 $= \frac{1}{(-2)^3} - \frac{1}{4^2} = -\frac{1}{8} - \frac{1}{16} = -\frac{2}{16} - \frac{1}{16} = -\frac{3}{16}$

c) $\frac{(4^{-2})^{-3}}{4^8}$
 $= \frac{4^6}{4^8} = 4^{6-8} = 4^{-2} = \frac{1}{4^2} = \frac{1}{16}$

d) $(-2019)^0 = 1$
 $= -(-1) (-2019)^0 = 1$
 $= -1$

e) $(-\frac{3}{8})^{-2}$
 $= (\frac{-8}{3})^2 = \frac{64}{9}$

Example 2:

Simplify with positive exponents only:

a) $\frac{a^2 b^{-3}}{a^{-1} b^2}$

$$\begin{aligned} a) &= a^{2-(-1)} b^{-3-2} \\ &= a^3 b^{-5} \\ &= \frac{a^3}{b^5} \end{aligned}$$

b) $(2u^3 v^{-2})^{-3}$

$$\begin{aligned} b) &= 2^{-3} u^{-9} v^6 \\ &= \frac{2^3 u^9}{v^6} \end{aligned}$$

c) $\left(\frac{x^{-2}}{y^{-1}}\right)^{-2}$

$$= \frac{x^4}{y^2}$$

d) $\frac{(x^6 y^5)^{-2}}{(x^3 y)^{-2}}$

$$\begin{aligned} d) &= \frac{(x^6 y^{-10})^2}{(x^3 y)^{-2}} \\ &= \frac{x^{12} y^{-20}}{x^{-6} y^{-2}} \\ &= x^{18} y^{-18} \\ &= \frac{x^{18}}{y^{18}} \end{aligned}$$

Homework: Section 3.2, Page 166-167, #3-7