3.2 Exponent Laws

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MULTIPLYING POWERS

To multiply powers with the same base, you ADD the exponents

ex. $2^3 \times 2^2 = 2^{3+2} = 2^5 = \boxed{32}$

* $2^3 \times 3^2$ different bases*

$= 8 \times 9 = 72$

DIVIDING POWERS

To divide powers with the same base, you SUBTRACT the exponents

ex $\frac{2^6}{2^2} = 2^6 - 2^2 = 2^{6-2} = 2^4 = \boxed{16}$

RAISEING POWERS, PRODUCT & QUOTIENTS

To raise a power to a power, multiply the exponents

ex $(2^3)^2 = 2^6 = \boxed{64}$

ex $\left(\frac{3^2}{4^1}\right)^3 = \frac{3^{2\times3}}{4^{1\times3}} = \frac{3^6}{4^3} = \frac{729}{64} = \boxed{11\ 4}$

Zero Exponent LAW

A power with any base (other than 0) that has a 0 exponent, is = 1

ex 2^0 ex $(-4)^0$ ex -2^0

$= 1$ $= 1$ $= -1$ ↓ base is 2

negative is not part of the base

NEGATIVE EXPONENT LAW

A power with a negative exponent becomes a fraction

ex $4^{-2} = \frac{1}{4^2} = \boxed{\frac{1}{16}}$

ex $\left(\frac{3}{-2}\right)^{-2} = \left(\frac{-2}{3}\right)^{2} = \frac{(-2)^2}{(3)^2} = \boxed{\frac{4}{9}}$

Writing Numbers using POWERS of 10

Write 3452 using powers of ten

thousands decimal place, hundreds, tens, ones

$= (3 \times 1000) + (4 \times 100) + (5 \times 10) + (2 \times 1)$

$= (3 \times 10^3) + (4 \times 10^2) + (5 \times 10^1) + (2 \times 10^0)$

Ex #1

(a) $[(-1)^3]^4$

$= (-1)^{3\times4}$

$= (-1)^{12} = \boxed{1}$

(b) $\frac{(-5)^6}{(-5)^4} = (-5)^{6-4} = (-5)^2$

$= \boxed{25}$

(c) $-(3^7)^2$

$= -3^{7\times2}$

$= \boxed{-3^{14}}$

(d) $3^5 \times 3^2 = 3^{5+2} = \boxed{3^7}$

(e) $(3\times4)^5$

(f) $[(-7)^2]^{-3} \times (-7)^2$

(e) $(3 \times 4)^5$

$= (12)^5$

(f) $\left[(-2)^2\right]^{-3} \times (-2)^2$

$= (-2)^{-6} \times (-2)^2$

$= (-2)^{-6+2} = (-2)^{-4}$

$= \frac{1}{(-2)^4} = \boxed{\frac{1}{16}}$

(g) $\left(\frac{1}{4}\right)^{-2} - \left(\frac{2^7 \times 2^{-5}}{2^3}\right)$

$= \left(\frac{4}{1}\right)^2 - \frac{2^{7+(-5)}}{2^3}$

$= 4^2 - \frac{2^2}{2^3} = 4^2 - 2^{2-3}$

$= 16 - 2^{-1}$

$= 16 - \frac{1}{2} = \boxed{15\frac{1}{2}}$

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