BE-1B | TUESDAY 10-3-06

① $\frac{x^{15}}{x^{8}}$

② $\frac{3y^{3}}{9y}$

③ $\frac{(2x)^{2}}{x}$

For 2 numbers, either one is less than the other, one is greater than the other, or they are equal.

The Division Rule for Exponents is: $\frac{a^m}{a^N} = a^{m-N}$

It has to work for all possible values of m and N.

If m is bigger, just subtract the top minus the bottom. ex) $\frac{x^9}{x^4} = x^5$

Lets look at the other 2 possibilities:

$m = N$

AND

$m < N$

What about $m = n$?

Ex) $\frac{x^5}{x^5}$

The division rule says: $x^{5-5} = x^0$

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but $\frac{x^5}{x^5}$ has to be 1. How do we fix that?

We define the Zero Exponent Rule as anything to the 0 power is ONE. (except $0^0 = 0$).

Ex) $x^0 = 1$

$(15x^3y^5)^0 = 1$

$\frac{9^4}{9^4} = 9^{4-4} = 9^0 = 1$

FINALLY, LETS LOOK AT $m < n$

EX) $\frac{x^3}{x^5} = \frac{(xxx)}{(xxx)xx} = \frac{1}{x^2} = x^{3-5} = x^{-2}$

THIS COULD BE A MESS EXCEPT WE DEFINE A NEGATIVE EXPONENT AS THE SAME A 1 OVER THE SAME EXPRESSION WITH A POSITIVE EXPONENT.

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

DON'T CONFUSE NEGATIVE EXPONENTS WITH NEGATIVE NUMBERS!

NER $\boxed{a^{-m} = \frac{1}{a^m}}$

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

Ex) 6^{-2}

Ex) $p^{-4}q^{-2}r^{5}$

$$\frac{1}{p^4}\cdot\frac{1}{q^2}\cdot r^5 = \boxed{\frac{r^5}{p^4q^2}}$$

NOT SIMPLIFIED UNTIL YOU GET RID OF NEGATIVE EXPONENTS

How would you simplify

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

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

Just like an x^{-2} means you have a positive x^2 in the denominator (bottom), a $\frac{1}{x^{-2}}$ means x^2 in the Numerator. (top)

LETS SUMMARIZE THE RULES BEFORE WE DO SOME EXAMPLES THAT MAY USE ANY OF the 6 RULES.

#20 - 34 on Pg 421

Summary - Exponent Rules

① MR $a^n \cdot a^N = a^{n+N}$

② DR $\frac{a^n}{a^N} = a^{n-N}$

③ P2P $(a^n)^N = a^{n \cdot N}$

④ G2P $(ab)^n = a^n b^n$

OR $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

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⑤ ZERO RULE $a^0 = 1$ EXCEPT $0^0 = 0$

⑥ NEGATIVE RULE $a^{-n} = \frac{1}{a^n}$