Algebra II

Section 3-1

PROPERTIES OF EXPONENTS

Operation	Coefficients	Exponent
Multiply	multiply	add
Raise to a power	raise to a power	multiply
Divide	divide or reduce	subtract

A) Examples using MULTIPLICATION.

1) $(-3x^2)(4x^5)$

$-12x^7$

2) $(a^3b^2)(9ab^5)(2b)$

$18a^4b^8$

3) $(-mn^8)(-5m^2np^6)$

$5m^3n^9p^6$

B) Examples using RAISE TO A POWER (squared, cubed, etc.).

1) $(y^3)^4$

y^{12}

2) $(-3r^2q^5)^3$

$-27r^6q^{15}$

3) $\left(\frac{2}{5}w^6\right)^2$

$\frac{4}{25}w^{12}$

C) Examples using DIVISION.

1) $\frac{44n^5}{11n^2}$

$4n^3$

2) $\frac{-28a^7b^2}{-7ab^4}$

$\frac{4a^6}{b^2}$

3) $\frac{-3xtz^{10}}{9x^3t^2z^{10}}$

$-\frac{1}{3x^2t}$

Leave the variable (top/bottom) where the larger exponent was

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D) Examples using more than one operation.

1) $(7d^3f)(-2df^3)^3$

$(7d^3f)(-8d^3f^9)$
$= -56d^6f^{10}$

2) $\frac{(3g^2j)^4}{9g^6j}$

$\frac{81g^8j^4}{9g^6j}$
$= 9g^2j^3$

$2^5 = 32$

$2^4 = 16$

$2^3 = 8$

$2^2 = 4$

$2^1 = 2$

$2^0 = 1$

$2^{-1} =$ move the 2 to the bottom & make the exponent positive

$= \frac{1}{2} or \frac{1}{2^1}$

$2^{-2} =$ move the 2^2 to the bottom & make the exponent positive, then actually square the 2

$= \frac{1}{4} or \frac{1}{2^2}$

NEGATIVE EXPONENTS

THE MOVE-IT-OR-LEAVE-IT THEORY

If you see something raised to a negative exponent on the top of a fraction, move it to the bottom & vice-versa. THE EXPONENT IS NO LONGER NEGATIVE!

If something is not raised to a negative exponent, leave it where it is.

The catch: you cannot move something out of a set of parenthesis!

EXAMPLE: $\frac{5x^2y^{-3}}{(2x)^{-1}y^4}$ = MOVE EVERYTHING RAISED TO A NEG. EXP. = $\frac{5x^2(2x)^1}{y^4y^3}$

= **NOW APPLY THE RULES FOR EXPONENTS** = $\frac{10x^3}{y^7}$

SIMPLE EXAMPLES:

1) $\frac{a^{-1}b}{a^{-4}b^{-5}}$

$\frac{a^4bb^5}{a^1} = \frac{a^4b^6}{a^1} = a^3b^6$

2) $n^4 \bullet n^{-9} \bullet n^3$

$\frac{n^4n^3}{n^9} = \frac{n^7}{n^9} = \frac{1}{n^2}$

3) $\frac{1}{(3y^2)^{-2}}$

( )move the entire thing!

$\frac{(3y^2)^2}{1} = (3y^2)^2 = 9y^4$

MODERATE EXAMPLES:

4) $\frac{(4m)^{-2}n}{3m^{-2}n^{-1}}$

$\frac{m^2nn}{3(4m)^2} = \frac{m^2n^2}{3 \bullet 16m^2} = \frac{n^2}{48}$

5) $(2x^{-2})^5$

apply exponent rule 1st

$32x^{-10} = \frac{32}{x^{10}}$

6) $\left(\frac{r^3}{7r^5}\right)^{-1}$

flip the entire fraction 1st

$\frac{7r^5}{r^3} = 7r^2$

NASTY EXAMPLES:

7) $(6x^{-1})^{-2}(3x^{-1})^2$

pay attention to which exponent is causing the movement, make only that one positive

$\frac{(3x^{-1})^2}{(6x^{-1})^2} = \frac{9x^{-2}}{36x^{-2}} = \frac{9x^2}{36x^2} = \frac{1}{4}$

8) $\left(\frac{4a^{-2}b}{ab^{-2}}\right)^{-3}$

flip the fraction leaving all inside exponents unchanged, then do, literally, what's inside the ( ). Cube it last!

$\left(\frac{ab^{-2}}{4a^{-2}b}\right)^3 = \left(\frac{aa^2}{4bb^2}\right)^3 = \left(\frac{a^3}{4b^3}\right)^3 = \frac{a^9}{64b^9}$