KEY

Foundations of Math & Pre-Calculus 10
Lesson 4.6 ~ Applying the Exponent Laws

Exponent Laws

- Product of powers: $a^m \cdot a^n = a^{m+n}$
- Quotient of powers: $a^m \div a^n = a^{m-n}, a \neq 0$
- Power of a power: $(a^m)^n = a^{mn}$
- Power of a product: $(ab)^m = a^m b^m$
- Power of a quotient: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$
- Negative exponents: $a^{-n} = \frac{1}{a^n}$

Examples: Simplify.

a) $0.8^2 \cdot 0.8^{-7}$ $\quad 2 + (-7) = -5$

$= 0.8^{-5}$

$= \boxed{\frac{1}{0.8^5}}$

b) $\frac{(1.5^{-3})^{-5}}{1.5^{-5}}$ $\quad (-3)(-5) = 15$ $\quad 15 - (-5) = 20$

$= \boxed{1.5^{20}}$

c) $\left[\left(-\frac{4}{5}\right)^2\right]^{-3} \div \left[\left(-\frac{4}{5}\right)^4\right]^{-5}$ $\quad (2)(-3) = -6$ $\quad 4(-5) = -20$

$-6 - (-20) = 14$

$= \left(-\frac{4}{5}\right)^{-6} \div \left(-\frac{4}{5}\right)^{-20}$

$= \boxed{\left(-\frac{4}{5}\right)^{14}}$

* remember: negative bases need brackets (and so do fractions)

d) $m^4n^{-2} \cdot m^2n^3$ $\quad 4+2=6$, $-2+3=1$

$= \boxed{m^6n}$

e) $\frac{6x^4y^{-3}}{14xy^2}$ $\quad 4-1=3$, $-3-2=-5$

$= \frac{3x^3y^{-5}}{7}$

$= \boxed{\frac{3x^3}{7y^5}}$

f) $\left(\frac{5a^4b^2}{ab^0c^2}\right)^{-3}$

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

$= \frac{5^{-3}a^{-9}b^{-6}}{c^{-6}}$

$= \boxed{\frac{c^6}{125a^9b^6}}$

or $= \left(\frac{ab^0c^2}{5a^4b^2}\right)^3$

$= \frac{a^3b^0c^6}{5^3a^{12}b^6}$

$= \boxed{\frac{c^6}{125a^9b^6}}$

g) $\left(x^3y^{\frac{-3}{2}}\right)\left(x^{-1}y^{\frac{1}{2}}\right)$ $\quad 3+(-1)=2$

$-\frac{3}{2}+\frac{1}{2}=\frac{-2}{2}=-1$

$= x^2y^{-1}$

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

*don't panic if you see fractions

↳ need a common denominator to add/subtract (but not to multiply)