5.1 Rules of Exponents Math 9

We know that $10^3 = 10 \cdot 10 \cdot 10$

$3y^4 =$

$(-4)^2 =$

$-4^2 =$

$x^3 \cdot x^2 =$

Rule 1: When multiplying terms of the same base, add the exponents.

$a^m \cdot a^k = a$——

$5^2 \cdot 5 \cdot 5^3 =$

When dealing with fractions….

$$\frac{5^7}{5^3} = \frac{5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5}{5 \cdot 5 \cdot 5} =$$

Rule 2: When dividing exponential expressions with the same base, subtract the exponents.

$$\frac{a^m}{a^k} = a^{m-k}$$

BE CAREFUL HERE!!! Always note where the majority of the factors is…

$$\frac{5^8}{5^2} = 5^{8-2} = 5^6 \qquad \text{but} \qquad \frac{4^3}{4^5} = \frac{4 \cdot 4 \cdot 4}{4 \cdot 4 \cdot 4 \cdot 4 \cdot 4} = \text{———}$$

Now you can simplify expressions like these:

1. $\dfrac{x^4 y^7}{xy^3} =$

2. $\dfrac{(R-2)^7 \cdot m^5}{(R-2)^5 \cdot m} =$

3. $\dfrac{(-3x)^{12}}{(-3x)^7} =$

When we raise an exponent to a power….as in…. $(x^6)^3$ it means…

$(x^6)^3 = x— \cdot x— \cdot x— = x—$ perhaps you notice a shortcut?

$(x^6)^3 = x——— = x—$

Rule 3: For real numbers a, m, k:

$$(a^m)^k = a^{m \cdot k} \text{ and } (xy^2)^k = x^k y^{2k}$$

It works nearly the same way with fractions:

$$\left(\frac{a}{b}\right)^k = \frac{a^k}{b^k} \text{ and } \left(\frac{a^m}{b^x}\right)^k = \frac{a^{mk}}{b^{xk}}$$

BE VERY CAREFUL with NEGATIVE SIGNS!!!

4. $\left(-3y^2z^4\right)^5 = \left(-1\right)^5 \cdot 3^5 \cdot \left(y^2\right)^5 \cdot \left(z^4\right)^5 =$

5. $\dfrac{\left(-4^2\right)^3}{-4} =$

6. $\dfrac{\left[\left(-4\right)^2\right]^3}{-4} =$

Now some for you to try: simplify as much as possible

7. $\left(\dfrac{x^4}{y^2}\right)^6 =$

8. $\dfrac{\left(-7x\right)^{10}}{\left(-7x\right)^8} =$

9. $\left(-6a^3b^2\right)^3 =$

10. $\dfrac{\left(-8^2xy^3\right)^3\left(-8\right)}{\left(-8\right)^2} =$