

Exponent Rules Notes

Name _____ Class Period _____

Product of Powers:

- When you multiply like bases, you add the exponents

Ex:

- $(a^n)(a^m) = a^{n+m}$
- $(3^5)(3^2) = 3^{5+2} = 3^7$

Power to a Power:

- When you raise a power to a power, you multiply the exponents

Ex:

- $(a^n)^m = a^{nm}$
- $(3^2)^6 = 3^{2 \cdot 6} = 3^{12}$

Quotient of Powers:

- When you divide like bases, you subtract the exponents

Ex:

- $\frac{(a^n)}{(a^m)} = a^{n-m}$
- $\frac{(3^5)}{(3^2)} = 3^{5-2} = 3^3$

Power of One:

- Any number raised to a power of one is itself

Ex:

- $a^1 = a$
- $7589^1 = 7589$

Power of Zero:

- Any number raised to a power of zero is one

Ex:

- $a^0 = 1$
- $789065432^0 = 1$

Negative Exponents:

- Move variable or number containing negative exponent to the opposite side of the fraction and change the exponent to a positive number

- $\frac{a^{-n}}{1} = \frac{1}{a^n}$ Or $\frac{1}{a^{-n}} = \frac{a^n}{1}$

- $6^{-2} = \frac{1}{6^2} = \frac{1}{36}$

- $\frac{1}{b^{-3}} = b^3$

Power of a Product:

- When you have a power of a **product**, give exponent to everything

Ex:

- $(ab)^n = a^n b^n$

- $(3x)^2 = 3^2 x^2 = 9x^2$

Power of a quotient:

- When you have a power of a **quotient**, give exponent to everything

Ex:

- $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

- $\left(\frac{5}{x}\right)^2 = \frac{5^2}{x^2} = \frac{25}{x^2}$

Examples:

1. $(4x^2)(3x^3)$

$$12x^5$$

2. $(a^3b^4)^3$

$$(a^3)^3 (b^4)^3$$
$$\boxed{a^9 b^{12}}$$

3. $\frac{m^5}{m^{12}} m^{5-12} = m^{-7}$

$$\boxed{\frac{1}{m^7}}$$

4. $\frac{x^5 y^7}{2x^3 y^9}$

$$\frac{x^{5-3} y^{7-9}}{2}$$

$$\boxed{\frac{1x^2}{2y^2}}$$

5. $(3x^4)^2 (-2xy^3)^3$

$$3^2 (x^4)^2 (-2)^3 x^3 y^9$$
$$(9x^8)(-8x^3 y^9)$$

$$\boxed{-72x^{11} y^9}$$

6. $\frac{(-2xy^2)^3}{4x(3y)^2}$

$$\frac{(-2)^3 x^{3-1} y^{6-2}}{4x \cdot 3^2 y^2} = \frac{-8x^3 y^6}{36xy^2}$$

$$\frac{-8x^2 y^4}{36} = \boxed{\frac{-2x^2 y^4}{9}}$$