

## Properties of Exponents Review

1. **Zero Exponent Property:** For every nonzero number  $a$ ,  $a^0 = 1$ .  
(Anything to the zero property is 1)

2. **Negative Exponent Property:** For every nonzero number  $a$  and integer  $n$ ,  $a^{-n} = \frac{1}{a^n}$   
(Always make a fraction when you have negative exponents, then flip the fraction or any negative exponent will be moved to the opposite side of the fraction and the exponent will become positive)

3. **Product of Powers Property:** To multiply powers having the same base, add the exponents.  
 $a^m \cdot a^n = a^{m+n}$   
(When you have the same base you add exponents)

4. **Power of a Power Property:** – To find a power of a power, multiply the exponents.  
 $(a^m)^n = a^{mn}$   
(When a base is raised to an exponent, raised to another exponent you multiply exponents- up in the sky, multiply!)

5. **Power of Product Property:** To find a power of a product, find the power of each factor and multiply.  
 $(a \cdot b)^m = a^m \cdot b^m$   
(When multiplying, you can distribute the exponents to all the factors inside)

6. **Quotient of Powers Property** – When dividing same bases, you subtract exponents

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

(When dividing like bases, you can subtract exponents)

7. **Power of a Quotient Property** – to find a power of a quotient, find the power of the numerator and the power of the denominator and divide.

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m} \quad b \neq 0$$

(When multiplying, you can distribute the exponents to all the factors inside)

Simplify each expression. Use only positive exponents.

1.  $x^8 \cdot \frac{1}{x^3}$

2.  $(2^3 x^2)^5$

3.  $(x^2 y^2)^{-1}$

4.  $\frac{x^5}{x^{-2}}$

5.  $\frac{x^5 y^2}{x^4 y^0}$

6.  $\frac{x^{11} y^{10}}{x^{-3} y^{-1}}$

7.  $(10x^3 y^5)^{-3}$

8.  $\frac{x^{-1} y}{xy^{-2}}$

9.  $(4x^2 y^5)^{-2}$

10.  $\frac{5x^3 y^9}{20x^2 y^{-2}}$

11.  $\frac{xy^9}{3y^{-2}} \cdot \frac{-7y}{21x^5}$

12.  $\frac{y^{10}}{2x^3} \cdot \frac{20x^{14}}{xy^6}$

13.  $\frac{12xy}{7x^4} \cdot \frac{7x^5y^2}{4y}$

14.  $(4x^3)^{-2}$

15.  $\frac{b^5}{b^3}$

16.  $\frac{x^8}{x^{10}}$

17.  $\frac{8x^3y^3}{2x^2y^4}$

18.  $\frac{6a^5b^3}{18a^5b^2}$

19.  $\frac{9w^0x^5y^{-4}}{3x^{-6}z^2}$

20.  $\frac{15c^{-1}d^{-5}e^4}{20d^{-7}e^2}$

21.  $\left(\frac{10x^2yz^{-2}}{4xy^{-3}}\right)^2$

22.  $\left(\frac{16a^{-3}b^2c^4}{4a^{-4}bc^5}\right)^3$

23.  $\left(\frac{8a^5bc^8}{4a^{-2}bc^{-5}}\right)^{-2}$

24.  $\left(\frac{7x^6b^{-2}c^{-7}}{21a^5b^{-3}c^5}\right)^{-4}$

$$25. \frac{4 \cdot 4^3}{4^6}$$

$$26. \left(\frac{2}{3}\right)^{-3}$$

$$27. \frac{(3x)^{-2}}{6x^{-5}}$$

$$28. (2a^3)^2(5a^4)^2$$

$$29. \frac{(6x^3)^0}{3xy^2}$$

$$30. \frac{(3r^{-2}s^3t^0)^{-3}}{3rs}$$

$$31. \left(\frac{r^{-1}s^2t^{-3}}{r^{-2}s^0t^1}\right)^{-1}$$

$$32. \frac{5a^{-4}c^4}{(c^2)^2}$$

$$33. \frac{4^2}{(4^3)^4}$$