

Rules of Exponents

Product Rule

If m and n are positive integers and a is a real number, then $a^m \cdot a^n = a^{m+n}$.

$$x^2 \cdot x^5 = x^{2+5} = x^7$$

$$x^8 \cdot x \cdot x^3 = x^{8+1+3} = x^{12}$$

$$b^5 \cdot b^2 \cdot b^3 \cdot b = b^{5+2+3+1} = b^{11}$$

Power Rule

If m and n are positive integers and a is a real number, then $(a^m)^n = a^{mn}$.

$$(s^2)^3 = s^{2 \cdot 3} = s^6$$

$$(t^2)^4 = t^{2 \cdot 4} = t^8$$

$$(u^7)^4 = u^{7 \cdot 4} = u^{28}$$

Power of a Product

If n is a positive integer and a and b are real numbers, then $(ab)^n = a^n b^n$.

$$(2c)^3 = 2^3 c^3 = 8c^3$$

$$(3xy^2z^4)^3 = 3^3 x^3 y^6 z^{12} = 27x^3 y^6 z^{12}$$

Power of a Quotient

If n is a positive integer and a and c are real numbers,

then $\left(\frac{a}{c}\right)^n = \frac{a^n}{c^n}$ provided $c \neq 0$

$$\left(\frac{m}{n}\right)^7 = \frac{m^7}{n^7}$$

$$\left(\frac{x^3}{3y^5}\right)^4 = \frac{x^{12}}{3^4 y^{20}} = \frac{x^{12}}{81y^{20}}$$

$$\left(\frac{2abc^8}{3a^3bc^3}\right)^2 = \frac{2^2 a^2 b^2 c^{16}}{3^2 a^6 b^2 c^6} = \frac{4a^2 b^2 c^{16}}{9a^6 b^2 c^6}$$

Quotient Rule

If m and n are positive integers and a is a real number, then $\frac{a^m}{a^n} = a^{m-n}$.

$$\frac{x^5}{x^2} = x^{5-2} = x^3$$

$$\frac{2x^5y^2}{xy} = 2x^{5-1}y^{2-1} = 2x^4y$$

$$\frac{4x^5y^7}{2x^4y^3} = 2xy^4$$

Zero Exponents

$a^0 = 1$, as long as $a \neq 0$

$$3^0 = 1$$

$$(ab)^0 = 1$$

$$(-5)^0 = 1$$

$$-5^0 = -1$$