

Power Rules

Power of a Product Rule

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

i.e. When a group of factors is raised to a power, raise each of the **factors** in the group to this power.

WARNING: $(xy)^5 = x^5 y^5$ and $(2ab)^4 = 2^4 a^4 b^4$ but $(2+3)^3 \neq 2^3 + 3^3$ because 2 and 3 are terms, NOT factors!

$$(2+3)^3 = (2+3)(2+3)(2+3) \text{ or in general } (a+b)^3 = (a+b)(a+b)(a+b)$$

$$(-2x)^2 = (-2)^2(x)^2 = 4x^2$$

$$\text{This is different than } -2^2 x^2 = -4x^2$$

TRY: $(3y)^3$

$$(-3y)^3$$

$$-(3y)^3$$

Power of a Power Rule

If m and n are any integers and $a \neq 0$, then $(a^m)^n = a^{m \cdot n}$

i.e. A power to a power is found by multiplying the exponents.

$$(2^3)^2 = 2^{3 \cdot 2} = 2^6 = 64$$

$$(2x^2)^4 = 2^{1 \cdot 4} x^{2 \cdot 4} = 2^4 x^8 = 16x^8$$

$$\frac{(3a^2)^3}{(6a^3)^2} = \frac{3^3 a^6}{6^2 a^6} = \frac{3^3}{6^2} = \frac{27}{36} = \frac{3}{4}$$

CAREFUL – do not reduce until after the power rule is applied!!

TRY: $(a^2 b^2)^2$

$$(2x^4 y^2)^3$$

$$(2x^4)^3 (y^2)^4$$