

11-1 Real Exponents

Exponential Definitions

For any real number b , and a positive integer exponent n ,

(a) If $n=1$, $b^n = b$

(b) If $n > 1$, $b^n = b \cdot b \cdot b \cdot b \cdots n \text{ factors}$

(c) If $b \neq 0$, $b^0 = 1$

(d) If $b \neq 0$, $b^{-n} = \frac{1}{b^n}$

Exponential Properties

Given that m & n are positive integers and a & b are real numbers, then the following properties are true.

Product $a^m \cdot a^n = a^{m+n}$

Power of a Power $(a^m)^n = a^{mn}$

Power of a Quotient $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ where $b \neq 0$

Power of a Product $(ab)^m = a^m b^m$

Quotient $\frac{a^m}{a^n} = a^{m-n}$ where $a \neq 0$

Definition of $b^{\frac{1}{n}}$ - For any real number $b \geq 0$ and any integer $n > 1$, $b^{\frac{1}{n}} = \sqrt[n]{b}$

This also is true when $b < 0$ and n is odd.

$$b^{\frac{m}{n}} = \left(b^{\frac{1}{n}}\right)^m \quad \text{and} \quad b^{\frac{m}{n}} = \left(b^m\right)^{\frac{1}{n}}$$

$$\sqrt[n]{b^m}$$

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