Exponent Calculation Rules

Berlin

September 2023

1. **Multiplication Rule:** When multiplying numbers with the same base and different exponents, you add the exponents.
$$x^a \times x^b = x^{a+b}$$

2. **Division Rule:** When dividing numbers with the same base and different exponents, you subtract the exponents.
$$\frac{x^a}{x^b} = x^{a-b}$$

3. **Power of a Power Rule:** When an exponentiated number is raised to another power, you multiply the exponents.
$$(x^a)^b = x^{a \cdot b}$$

4. **Negative Exponent Rule:** A negative exponent indicates a reciprocal.
$$x^{-a} = \frac{1}{x^a}$$

5. **Zero Exponent Rule:** Any nonzero number raised to the power of 0 is 1.
$$x^0 = 1 \quad (\text{when } x \neq 0)$$

6. **Extended Multiplication Rule:** Different bases with the same exponent.
$$x^a \times y^a = (xy)^a$$

7. **Extended Division Rule:** Different bases with the same exponent.
$$\frac{x^a}{y^a} = \left(\frac{x}{y}\right)^a$$

8. **Root in Exponential Form:** An nth root can be expressed as a fractional exponent.
$$\sqrt[n]{x} = x^{\frac{1}{n}}$$
Specifically, for the square root:
$$\sqrt{x} = x^{\frac{1}{2}}$$