

Mathematical Formulae

A Book of High School and Engineering Common Core Mathematical
Formulae

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Part I

Algebra

Chapter 1

Logarithm

1.1 Basic Formulae

For $a^x = b$:

$$\log_a x, \forall x \leq 0 \text{ is undefined} \quad (1.1)$$

$$\log_a b = x, \text{ if } a^x = b, a \neq 1 \quad (1.2)$$

$$\log_b a^m = m \log_b a, \text{ for } a^m = b \quad (1.3)$$

$$a^{\log_a x} = x \quad (1.4)$$

$$a^{\log_b c} = c^{\log_b a} \quad (1.5)$$

$$\frac{1}{\log_a b} = \log_b a \quad (1.6)$$

$$\log_c(ab) = \log_c a + \log_c b \quad (1.7)$$

$$\log_c \left(\frac{a}{b} \right) = \log_c a - \log_c b \quad (1.8)$$

$$|\log_a x| = \begin{cases} -\log_a x, & \text{if } 0 < x < 1 \\ \log_a x, & \text{if } 1 \leq x < \infty \end{cases} \quad (1.9)$$

1.2 Series

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots \infty = \lim_{n \rightarrow \infty} \sum_{i=0}^n \frac{x^i}{i!} \quad (1.10)$$

$$\log(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots \infty = \lim_{n \rightarrow \infty} \sum_{i=1}^n (-1)^{(i-1)} \frac{x^i}{i} \quad (1.11)$$