Common Limits Cheat Sheet

Complete common limits cheat sheet with standard limits, indeterminate forms, L'Hôpital's rule, and limits at infinity. Free PDF download for calculus students.

Important Standard Limits

Sine Limit

$$\lim_{x \to 0} \frac{\sin(x)}{x} = 1$$

Fundamental trig limit

Cosine Limit

$$\lim_{x \to 0} \frac{1 - \cos(x)}{x} = 0$$

Cosine Limit 2

$$\lim_{x \to 0} \frac{1 - \cos(x)}{x^2} = \frac{1}{2}$$

Euler's Number

$$\lim_{x \to \infty} \left(1 + \frac{1}{x}\right)^x = e$$

Euler's Number 2

$$\lim_{x \to 0} (1 + x)^{1/x} = e$$

Natural Log

$$\lim_{x \to 0} \frac{\ln(1 + x)}{x} = 1$$

Exponential

$$\lim_{x \to 0} \frac{e^x - 1}{x} = 1$$

Limits at Infinity

Polynomial Growth

$$\lim_{x \to \infty} \frac{1}{x^n} = 0 \quad (n > 0)$$

Exponential Dominates

$$\lim_{x \to \infty} \frac{x^n}{e^x} = 0$$

e^x grows faster than any polynomial

Polynomial Dominates Log

$$\lim_{x \to \infty} \frac{\ln(x)}{x^n} = 0 \quad (n > 0)$$

Ratio of Polynomials

$$\lim_{x \to \infty} \frac{a_n x^n + \dots}{b_m x^m + \dots} = \begin{cases} \frac{a_n}{b_m} & n = m \\ 0 & n < m \\ \pm\infty & n > m \end{cases}$$

Compare leading terms

Indeterminate Forms

Zero over Zero

$$\frac{0}{0}$$

Try factoring, rationalization, or L'Hôpital's rule

Infinity over Infinity

$$\frac{\infty}{\infty}$$

Use L'Hôpital's rule

Zero times Infinity

$$0 \cdot \infty$$

Rewrite as fraction, then use L'Hôpital

Infinity minus Infinity

$$\infty - \infty$$

Combine fractions or factor

Zero to Zero

$$0^0$$

Take ln, use L'Hôpital, then exponentiate

One to Infinity

$$1^\infty$$

Use ln or write as e^{...}

Infinity to Zero

$$\infty^0$$

Take ln, use L'Hôpital

L'Hôpital's Rule

L'Hôpital's Rule

$$\lim_{x \to a} \frac{f(x)}{g(x)} = \lim_{x \to a} \frac{f'(x)}{g'(x)}$$

Only valid for 0/0 or ∞/∞ forms

One-Sided Limits

Right Limit

$$\lim_{x \to a^+} f(x)$$

Approaching from the right

Left Limit

$$\lim_{x \to a^-} f(x)$$

Approaching from the left

Limit Exists

$$\lim_{x \to a} f(x) \text{ exists iff } \lim_{x \to a^+} f(x) = \lim_{x \to a^-} f(x)$$