

Limits

lim_{x \to a} f(x) = L

It’s read as x approaches a , $f(x)$ approaches L .

Basic formulas

lim_{x \to a} x = a lim_{x \to \infty} \frac{1}{x} = 0

lim_{x \to a} c = c \text{ where } c \text{ is a constant}

lim_{x \to a} (f(x) + g(x)) = lim_{x \to a} f(x) + lim_{x \to a} g(x)

lim_{x \to a} (f(x) \cdot g(x)) = lim_{x \to a} f(x) \cdot lim_{x \to a} g(x)

lim_{x \to a} \frac{f(x)}{g(x)} = \frac{lim_{x \to a} f(x)}{lim_{x \to a} g(x)} \text{ provided } lim_{x \to a} g(x) \neq 0

Advanced formulas

L'Hopital's Rule: lim_{x \to a} \frac{f(x)}{g(x)} = \frac{lim_{x \to a} f'(x)}{lim_{x \to a} g'(x)}

lim_{x \to a} \frac{f(x)}{g(x)} = +\infty \cdot \text{sign}(f(x)) \text{ if } g(x) \rightarrow 0^+

lim_{x \to a} \frac{f(x)}{g(x)} = -\infty \cdot \text{sign}(f(x)) \text{ if } g(x) \rightarrow 0^-

f'(x) = lim_{h \to 0} \left(\frac{f(x+h) - f(x)}{h} \right)

Derivatives

- Lagrange’s notation: $f'(x)$
- Leibniz’s notation: $\frac{d}{d(x)}f(x)$

Basic formulas

(e^x)' = e^x (e^{f(x)})' = e^{f(x)} f'(x)

x^{n'} = nx^{n-1} a^{x'} = a^x \ln(a) \text{ where } a > 0

\ln(x)' = \frac{1}{x} \log_a x' = \frac{1}{x \ln(a)} \ln(g(x))' = \frac{g'(x)}{g(x)}

(f(x) \cdot g(x))' = f'(x) \cdot g(x) + f(x) \cdot g'(x)

\left(\frac{f(x)}{g(x)} \right)' = \frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{g^2(x)}

(f(g(x)))' = f'(g(x)) \cdot g'(x)

\sin(x)' = \cos(x) \cos(x)' = -\sin(x)

Common derivatives:

- TBA

Integrals

- TBA

Common integrals:

- TBA

Miscellanies

- On writing sums, “sort” the terms by their degrees descending.

For example:

x^3 + 2x^2 + 3 \text{ instead of } 2x^2 + 3 + x^3

- On writing products, “sort” the terms alphabetically.

x^2yz^4 \text{ instead of } z^4x^2y

Fundamental Theorem of Calculus

- TBA

where

F(x)

is the antiderivative of

f(x)

.

Multivariable Calculus

Partial Derivatives

- TBA

Gradient

- TBA

Divergence

- TBA

Curl

- TBA

Green’s Theorem

- TBA

Stokes’ Theorem

- TBA

Linear Algebra

Vectors and Matrices

- **Vector:** TBA
- **Matrix:** TBA

Determinants

- TBA

Eigenvalues and Eigenvectors

- TBA

Inverse of a Matrix

- TBA

Ordinary Differential Equations

First-Order ODEs

Separable Equations

- TBA

Integrating Factor

- TBA
- TBA

Second-Order ODEs

Homogeneous Equations

- TBA

Characteristic Equation

- TBA

Systems of ODEs

- TBA

Laplace Transform

- TBA

Feel free to expand and customize this cheat sheet according to your needs.