Continuity and Differentiability Class 12 Formula Sheet

CBSE Class 12 Maths · NCERT · for boards, NEET and JEE revision

ChapterNotes

Continuity

f(x) is continuous at x = a if: $\lim_{x \to a} f(x) = f(a)$
i.e., LHL = RHL = f(a)

Differentiation Rules

Chain Rule: $d/dx[f(g(x))] = f'(g(x)) \cdot g'(x)$
Product Rule: $d/dx[uv] = u'v + uv'$
Quotient Rule: $d/dx[u/v] = (u'v - uv')/v^2$
Standard Derivatives:
$d/dx(x^n) = nx^{n-1}$ | $d/dx(e^x) = e^x$ | $d/dx(a^x) = a^x \ln a$
$d/dx(\ln x) = 1/x$ | $d/dx(\sin x) = \cos x$ | $d/dx(\cos x) = -\sin x$
$d/dx(\tan x) = \sec^2 x$ | $d/dx(\sec x) = \sec x \tan x$
$d/dx(\sin^{-1} x) = 1/\sqrt{(1-x^2)}$ | $d/dx(\tan^{-1} x) = 1/(1+x^2)$
$d/dx(\cos^{-1} x) = -1/\sqrt{(1-x^2)}$

Special Differentiation Techniques

Implicit: Differentiate both sides w.r.t. x, collect dy/dx terms
Example: $x^2 + y^2 = 25 \rightarrow 2x + 2y(dy/dx) = 0 \rightarrow dy/dx = -x/y$
Parametric: If x = f(t), y = g(t), then $dy/dx = (dy/dt)/(dx/dt)$
Logarithmic: Take ln of both sides, then differentiate
Used for: x^x, x^(sin x), (sin x)^(cos x) type functions

Second Order Derivatives

$d^2y/dx^2 = d/dx(dy/dx)$ - differentiate the first derivative again

Rolle's Theorem

If f is continuous on [a,b], differentiable on (a,b), and f(a) = f(b), then there exists $c \in (a,b)$ such that **$f'(c) = 0$**

Mean Value Theorem (Lagrange's)

If f is continuous on [a,b] and differentiable on (a,b), then there exists $c \in (a,b)$ such that:
$f'(c) = [f(b) - f(a)]/(b - a)$

Quick revision

- Continuity: LHL = RHL = f(a)
- Every differentiable function is continuous, but not vice versa (|x| at x=0)
- Chain rule for composite; log differentiation for variable exponents
- Parametric: dy/dx = (dy/dt)/(dx/dt)
- Rolle's: f(a)=f(b) → f'(c)=0; MVT: f'(c) = [f(b)–f(a)]/(b–a)

Full chapter notes with solved examples and practice questions: https://chapternotes.in/cbse/class-12-maths/continuity-and-differentiability-class-12-notes/