TURBO

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LIMITS AND DERIVATIVES

Class 11 Mathematics • Complete Formula Sheet

Sr.	Concept	Formulas	Other Information
		LIMITS	
1	Definition	$LHL : \lim_{x \to a^-} f(x) = \lim_{h \to 0} f(a - h)$ $RHL : \lim_{x \to a^+} f(x) = \lim_{h \to 0} f(a + h)$	Limit exists if $LHL = RHL$.
2	Properties	$\lim(f \pm g) = \lim f \pm \lim g$ $\lim(f \cdot g) = \lim f \cdot \lim g$ $\lim(f/g) = \frac{\lim f}{\lim g}, g(x) \neq 0$	$\lim k f(x) = k \lim f(x).$
3	Standard Limits	$\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$ $\lim_{x \to 0} \frac{\sin x}{x} = 1, \quad \lim_{x \to 0} \frac{\tan x}{x} = 1$ $\lim_{x \to 0} \frac{e^x - 1}{x} = 1, \quad \lim_{x \to 0} \frac{a^x - 1}{x} = \ln a$	$\lim_{x \to 0} \frac{\log(1+x)}{x} = 1.$
		DERIVATIVES	
4	First Principle	$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$	Exists iff the limit is finite.
5	Basic Rules	$\frac{d}{dx}(f \pm g) = f' \pm g'$ $\frac{d}{dx}(f \cdot g) = f'g + fg'$ $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{f'g - fg'}{g^2}$	$\frac{d}{dx}(cf) = cf'(x).$
6	Standard Derivatives	$\frac{d}{dx}(x^n) = nx^{n-1}, \quad \frac{d}{dx}(e^x) = e^x$ $\frac{d}{dx}(\sin x) = \cos x, \quad \frac{d}{dx}(\cos x) = -\sin x$ $\frac{d}{dx}(\tan x) = \sec^2 x, \quad \frac{d}{dx}(\log x) = \frac{1}{x}$	$\frac{d}{dx}(a^x) = a^x \ln a.$ $\frac{d}{dx}(\sec x) = \sec x \tan x.$

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