

CALCULUS FORMULAS

LIMIT DEFINITION

Limit Definition: $\lim_{x \rightarrow a} f(x)$

Derivative Definition: $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

Power Rule: $\frac{d}{dx}(x^n) = n x^{n-1}$

Constant Rule: $\frac{d}{dx}(c) = 0$

Constant Multiple: $\frac{d}{dx}(cf) = c f'(x)$

Sum Rule: $\frac{d}{dx}(f+g) = f' + g'$

PRODUCT RULE

Product Rule: $(fg)' = f'g + fg'$

Quotient Rule: $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

Chain Rule: $\frac{d}{dx}f(g(x)) = f'(g(x))g'(x)$

e^x Derivative: $\frac{d}{dx}(e^x) = e^x$

a^x Derivative: $\frac{d}{dx}(a^x) = a^x \ln a$

$\ln x$ Derivative: $\frac{d}{dx}(\ln x) = \frac{1}{x}$

LOG_aX DERIVATIVE

$\log_a x$ Derivative: $\frac{d}{dx}(\log_a x) = \frac{1}{x \ln a}$

$\sin x$: $\frac{d}{dx}(\sin x) = \cos x$

$\cos x$: $\frac{d}{dx}(\cos x) = -\sin x$

$\tan x$: $\frac{d}{dx}(\tan x) = \sec^2 x$

Integral Definition: $\int f(x) dx$

Power Rule (Int): $\int x^n dx = \frac{x^{n+1}}{n+1} + C$

$\int 1/x dx$

$\int \frac{1}{x} dx$: \ln

$\int e^x dx$: $e^x + C$

$\int a^x dx$: $\frac{a^x}{\ln a} + C$

$\int \sin x dx$: $-\cos x + C$

$\int \cos x dx$: $\sin x + C$

$\int \sec^2 x dx$: $\tan x + C$

$\int \csc^2 x dx$

$\int \csc^2 x dx$: $-\cot x + C$

$\int \sec x \tan x dx$: $\sec x + C$

$\int \csc x \cot x dx$: $-\csc x + C$

Definite Integral: $\int_a^b f(x) dx = F(b) - F(a)$

Substitution: $\int f(g(x))g'(x) dx$

Integration by Parts: $\int u dv = uv - \int v du$

LIMIT IMPORTANT

Limit Important: $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$

Limit Important: $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x = e$

Slope Formula: $f'(x)$

Tangent Line: $y - y_1 = m(x - x_1)$

Area Between Curves: $\int_{(\text{top} - \text{bottom})} dx$

Volume (Disk): $\pi \int r^2 dx$

VOLUME (SHELL)

Volume (Shell): $2\pi \int x f(x) dx$