

Derivative rules

Definition	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$
Power	$\frac{d}{dx} x^n = nx^{n-1}$
Product	$(uv)' = u'v + uv'$
Quotient	$\left(\frac{u}{v}\right)' = \frac{u'v - uv'}{v^2}$
Chain	$\frac{d}{dx} f(g(x)) = f'(g(x)) g'(x)$

Derivatives

Exponential	$(e^x)' = e^x, \quad (a^x)' = a^x \ln a$
Logarithm	$(\ln x)' = \frac{1}{x}, \quad (\log_a x)' = \frac{1}{x \ln a}$
Sine, cosine	$(\sin x)' = \cos x, \quad (\cos x)' = -\sin x$
Tangent, cotangent	$(\tan x)' = \sec^2 x, \quad (\cot x)' = -\csc^2 x$
Secant, cosecant	$(\sec x)' = \sec x \tan x, \quad (\csc x)' = -\csc x \cot x$
Inverse sine	$(\arcsin x)' = \frac{1}{\sqrt{1-x^2}}$
Inverse cosine	$(\arccos x)' = -\frac{1}{\sqrt{1-x^2}}$
Inverse tangent	$(\arctan x)' = \frac{1}{1+x^2}$
Hyperbolic	$(\sinh x)' = \cosh x, \quad (\cosh x)' = \sinh x$

Basic integrals

Power	$\int x^n dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$
Reciprocal	$\int \frac{1}{x} dx = \ln x + C$
Exponential	$\int e^x dx = e^x + C, \quad \int a^x dx = \frac{a^x}{\ln a} + C$
Sine, cosine	$\int \sin x dx = -\cos x + C, \quad \int \cos x dx = \sin x + C$
Secant squared	$\int \sec^2 x dx = \tan x + C$
Cosecant squared	$\int \csc^2 x dx = -\cot x + C$
Sec tan	$\int \sec x \tan x dx = \sec x + C$
Tangent	$\int \tan x dx = \ln \sec x + C$
Secant	$\int \sec x dx = \ln \sec x + \tan x + C$

Special integrals

$\int \frac{dx}{a^2 + x^2} = \frac{1}{a} \arctan \frac{x}{a} + C$
$\int \frac{dx}{\sqrt{a^2 - x^2}} = \arcsin \frac{x}{a} + C$
$\int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \ln \left \frac{x-a}{x+a} \right + C$
$\int \frac{dx}{\sqrt{x^2 \pm a^2}} = \ln x + \sqrt{x^2 \pm a^2} + C$
$\int \sqrt{a^2 - x^2} dx = \frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \arcsin \frac{x}{a} + C$
$\int \ln x dx = x \ln x - x + C$
$\int \sin^2 x dx = \frac{x}{2} - \frac{\sin 2x}{4} + C$

Techniques

Substitution	$\int f(g(x))g'(x) dx = \int f(u) du$
By parts	$\int u dv = uv - \int v du \quad (\text{LIATE})$
FTC	$\int_a^b f(x) dx = F(b) - F(a)$
Odd / even	$\int_{-a}^a f = 0 \text{ (odd)}, \quad 2 \int_0^a f \text{ (even)}$