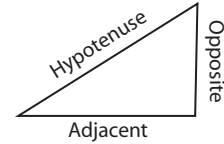


Basic Derivatives and Integrals

$\frac{d}{dx} [\cos x] = -\sin x$	$\int [\sin x] dx = -\cos x + C$
$\frac{d}{dx} [\sin x] = \cos x$	$\int [\cos x] dx = \sin x + C$
$\frac{d}{dx} [\tan x] = \sec^2 x$	$\int [\sec^2 x] dx = \tan x + C$
$\frac{d}{dx} [\cot x] = \csc^2 x$	$\int [\csc^2 x] dx = \cot x + C$
$\frac{d}{dx} [\sec x] = \sec x \tan x$	$\int [\sec x \tan x] dx = \sec x + C$
$\frac{d}{dx} [\csc x] = \csc x \cot x$	$\int [\csc x \cot x] dx = -\csc x + C$
$\frac{d}{dx} [e^x] = e^x$	$\int [e^x] dx = e^x + C$
$\frac{d}{dx} [\ln x] = \frac{1}{x}$	$\int [\frac{1}{x}] dx = \ln x + C$
$\frac{d}{dx} [\tan^{-1}x] = \frac{1}{1+x^2}$	$\int [\frac{1}{1+x^2}] dx = \tan^{-1}x + C$
$\frac{d}{dx} [\sin^{-1}x] = \frac{1}{\sqrt{1-x^2}}$	$\int [\frac{1}{\sqrt{1-x^2}}] dx = \sin^{-1}x + C$
$\frac{d}{dx} [\sec^{-1}x] = \frac{1}{x\sqrt{x^2-1}}$	$\int [\frac{1}{x\sqrt{x^2-1}}] dx = \sec^{-1}x + C$

Basic Trigonometry Review



SOH-CAH-TOA

$$\sin x = \frac{\text{Opposite}}{\text{Hypotenuse}} \quad \cos x = \frac{\text{Adjacent}}{\text{Hypotenuse}} \quad \tan x = \frac{\text{Opposite}}{\text{Adjacent}}$$

Basic Relationships

$$\tan x = \frac{\sin x}{\cos x} \quad \cot x = \frac{\cos x}{\sin x} \quad \sec x = \frac{1}{\cos x} \quad \csc x = \frac{1}{\sin x}$$

Trigonometric Identities

$\sin^2 x + \cos^2 x = 1$	$\sin 2x = 2 \sin x \cos x$	$\sin^2 x = \frac{1}{2}(1 - \cos 2x)$
$\tan^2 x + 1 = \sec^2 x$	$\cos 2x = \cos^2 x - \sin^2 x$	$\cos^2 x = \frac{1}{2}(1 + \cos 2x)$
$\cot^2 x + 1 = \csc^2 x$	$\cos 2x = 2 \cos^2 x - 1$	
	$\cos 2x = 1 - 2\sin^2 x$	

Addition Formulas

$$\begin{aligned} \sin(a+b) &= \sin a \cos b + \cos a \sin b \\ \sin(a-b) &= \sin a \cos b - \cos a \sin b \\ \cos(a+b) &= \cos a \cos b - \sin a \sin b \\ \cos(a-b) &= \cos a \cos b + \sin a \sin b \end{aligned}$$



Mathematical Reference

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Formulas and Constants

Product Rule

$$f(x)g(x) = f'(x)g(x) + f(x)g'(x)$$

Quotient Rule

$$\frac{f(x)}{g(x)} = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$$

Chain Rule

$$(f(x))^n = n(f(x))^{n-1}(f'(x))$$

Integration by Parts

$$uv - \int v du$$

Electron mass: 9.109×10^{-31} kg

Electron Charge: 1.6×10^{-19} C

Proton mass: 1.672×10^{-27} kg

Permittivity Constant: 8.85×10^{12} C²/Nm²

ElectronVolt: 1.6×10^{-19} J

Speed of Light: 3×10^8 m/s

Gas Constant: 8.314 J/(K-mole)⁻¹

Avogadro's Number: 6.022×10^{23}

Grav Constant: 6.66×10^{-11} Nm²/Kg²

Gravity: 9.8 m/s²

Speed of Sound: 344 m/s

SAP: 1.013×10^5 Pascals

More Integrals and Hyperbolics

$$\int [\sin^2 x] dx = \frac{1}{2}x - \frac{1}{4}\sin 2x + C$$

$$\int [\sin^3 x] dx = \frac{1}{3}\cos^3 x - \cos x + C$$

$$\int [\cos^2 x] dx = \frac{1}{2}x + \frac{1}{4}\sin 2x + C$$

$$\int [\cos^3 x] dx = \sin x - \frac{1}{3}\sin^3 x + C$$

$$\int [\tan x] dx = \ln |\sec x| + C$$

$$\int [\sec x] dx = \ln |\sec x + \tan x| + C$$

$$\int [\tan^2 x] dx = \tan x - x + C$$

$$\int [\sec^2 x] dx = \tan x + C$$

$$\int [\ln|x|] dx = x \ln|x| - x + C$$

$$\sinh x = \frac{e^x - e^{-x}}{2}$$

$$\cosh x = \frac{e^x + e^{-x}}{2}$$

$$\tanh x = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$