

CALCULUS BIBLE

TRIGONOMETRY

$$\begin{aligned}\tan \theta &= \frac{\sin \theta}{\cos \theta} \\ \cot \theta &= \frac{\cos \theta}{\sin \theta} = \frac{1}{\tan \theta} \\ \sec \theta &= \frac{1}{\cos \theta} \\ \csc \theta &= \frac{1}{\sin \theta}\end{aligned}$$

$$\begin{aligned}\sin(-\theta) &= -\sin \theta \\ \cos(-\theta) &= \cos \theta \\ \tan(-\theta) &= -\tan \theta \\ \sin^2 \theta + \cos^2 \theta &= 1 \\ \tan^2 \theta + 1 &= \sec^2 \theta \\ 1 + \cot^2 \theta &= \csc^2 \theta\end{aligned}$$

$$\begin{aligned}\sin(\theta + \phi) &= \sin \theta \cos \phi + \cos \theta \sin \phi \\ \sin(\theta - \phi) &= \sin \theta \cos \phi - \cos \theta \sin \phi \\ \cos(\theta + \phi) &= \cos \theta \cos \phi - \sin \theta \sin \phi \\ \cos(\theta - \phi) &= \cos \theta \cos \phi + \sin \theta \sin \phi \\ \tan(\theta + \phi) &= \frac{\tan \theta + \tan \phi}{1 - \tan \theta \tan \phi} \\ \tan(\theta - \phi) &= \frac{\tan \theta - \tan \phi}{1 + \tan \theta \tan \phi}\end{aligned}$$

$$\begin{aligned}\sin 2\theta &= 2 \sin \theta \cos \theta \\ \cos 2\theta &= \cos^2 \theta - \sin^2 \theta \\ \sin 45^\circ &= \frac{1}{\sqrt{2}}, \cos 45^\circ = \frac{1}{\sqrt{2}}, \tan 45^\circ = 1 \\ \sin 30^\circ &= \frac{1}{2}, \cos 30^\circ = \frac{\sqrt{3}}{2}, \tan 30^\circ = \frac{1}{\sqrt{3}} \\ \sin 60^\circ &= \frac{\sqrt{3}}{2}, \cos 60^\circ = \frac{1}{2}, \tan 60^\circ = \sqrt{3}\end{aligned}$$

DERIVATIVES

$$\text{Product Rule: } \frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$\text{Chain Rule: } \frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$\text{Quotient Rule: } \frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

$$\frac{d}{dx} u^n = nu^{n-1} \frac{du}{dx}$$

$$\frac{d}{dx} e^u = e^u \frac{du}{dx}$$

$$\frac{d}{dx} \ln u = \frac{1}{u} \frac{du}{dx}$$

$$\frac{d}{dx} \sin u = \cos u \frac{du}{dx}$$

$$\frac{d}{dx} \cos u = -\sin u \frac{du}{dx}$$

$$\frac{d}{dx} \tan u = \sec^2 u \frac{du}{dx}$$

$$\frac{d}{dx} \sec u = \sec u \tan u \frac{du}{dx}$$

$$\frac{d}{dx} \csc u = -\csc u \cot u \frac{du}{dx}$$

$$\frac{d}{dx} \cot u = -\csc^2 u \frac{du}{dx}$$

$$\frac{d}{dx} a^u = a^u \ln a \frac{du}{dx}$$

$$\frac{d}{dx} \log_a u = \frac{1}{u \ln a} \frac{du}{dx}$$

$$\frac{d}{dx} \sin^{-1} u = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx}$$

$$\frac{d}{dx} \cos^{-1} u = -\frac{1}{\sqrt{1-u^2}} \frac{du}{dx}$$

$$\frac{d}{dx} \tan^{-1} u = \frac{1}{1+u^2} \frac{du}{dx}$$

$$\frac{d}{dx} \sec^{-1} u = \frac{1}{|u|\sqrt{u^2-1}} \frac{du}{dx}$$

$$\frac{d}{dx} \csc^{-1} x = -\frac{1}{|u|\sqrt{u^2-1}} \frac{du}{dx}$$

$$\frac{d}{dx} \cot^{-1} u = -\frac{1}{1+u^2} \frac{du}{dx}$$

INTEGRALS

$$\int x^n dx = \frac{x^{n+1}}{n+1}, x \neq -1$$

$$\int \frac{dx}{x} = \ln x$$

$$\int e^x dx = e^x$$

$$\int \cos x dx = \sin x, \quad \int \sec x dx = \ln|\sec x + \tan x|$$

$$\int \sin x dx = -\cos x, \quad \int \csc x dx = -\ln|\csc x + \cot x|$$

$$\int \tan x dx = -\ln|\cos x|, \quad \int \cot x dx = \ln|\sin x|$$

$$\int \sec^2 x dx = \tan x$$

$$\int \csc^2 x dx = -\cot x$$

$$\int \sec x \tan x dx = \sec x$$

$$\int \csc x \cot x dx = -\csc x$$

$$\int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1} \frac{x}{a}, \quad \int -\frac{dx}{\sqrt{a^2-x^2}} = \cos^{-1} \frac{x}{a}$$

THE UNIT CIRCLE

