Trigonometric Formulas and Identities

Basis Trig Definitions

$$\sin A = \frac{y}{r}$$

$$\cos A = \frac{x}{r}$$

$$\tan A = \frac{y}{x}$$

Reciprocal Identities

$$\cos ecA = \frac{r}{y} = \frac{1}{\sin A}$$

$$\sec A = \frac{r}{x} = \frac{1}{\cos A}$$

$$\cot anA = \frac{x}{y} = \frac{1}{\tan A}$$

Quotient Identities

$$\tan A = \frac{\sin A}{\cos A}$$

$$\cot A = \frac{\cos A}{\sin A}$$

Related Angles

$\sin(-A) = -\sin A$	$\sin(2\pi - A) = -\sin A$	$\sin(\pi - A) = \sin A$	$\sin(\pi + A) = -\sin A$
$\cos(-A) = \cos A$	$\cos(2\pi - A) = \cos A$	$\cos(\pi - A) = -\cos A$	$\cos(\pi + A) = -\cos A$
$\tan(-A) = -\tan A$	$\tan(2\pi - A) = -\tan A$	$\tan(\pi - A) = -\tan A$	$\tan(\pi + A) = \tan A$

Co-Related Angles

$\sin(\frac{\pi}{2} - A) = \cos A$	$\sin(\frac{\pi}{2} + A) = \cos A$	$\sin(\frac{3\pi}{2} - A) = -\cos A$	$\sin(\frac{3\pi}{2} + A) = -\cos A$
$\cos(\frac{\pi}{2} - A) = \sin A$	$\cos(\frac{\pi}{2} + A) = -\sin A$	$\cos(\frac{3\pi}{2} - A) = -\sin A$	$\cos(\frac{3\pi}{2} + A) = \sin A$
$\tan(\frac{\pi}{2} - A) = \cot A$	$\tan(\frac{\pi}{2} + A) = -\cot A$	$\tan(\frac{3\pi}{2} - A) = \cot A$	$\tan(\frac{3\pi}{2} + A) = -\cot A$

Pythagorean Identities

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\csc^2 A = 1 + \cot^2 A$$

Addition and Subtraction Formulas

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Double Angle Formulas

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$\cos 2x = 2\cos^2 A - 1$$

$$\cos 2A = 1 - 2\sin^2 A$$

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

Special Derivatives

$$\frac{d}{dx}\sin x = \cos x \qquad \frac{d}{dx}\sec x = \sec x \tan x \qquad \frac{d}{dx}e^x = e^x$$

$$\frac{d}{dx}\cos x = -\sin x \qquad \frac{d}{dx}\cot x = -csc^2 x \qquad \frac{d}{dx}(\ln x) = \frac{1}{x}$$

$$\frac{d}{dx}\tan x = sec^2 x \qquad \frac{d}{dx}\log_b x = \frac{1}{x \ln b} \qquad \frac{d}{dx}b^x = b^x \ln b$$

$$\frac{d}{dx}\csc x = -\csc x \cot x$$

$\frac{d}{dx}\sin^{-1}x = \frac{1}{\sqrt{1-x^2}}$ $\frac{d}{dx}\cos^{-1}x = -\frac{1}{\sqrt{1-x^2}}$

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

Table of Indefinite Integrals (Antiderivatives)

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C \quad (n \neq 1) \qquad \int \frac{1}{x} dx = \ln|x| + C$$

$$\int \sin x \, dx = -\cos x + C \qquad \int \cos x \, dx = \sin x + C$$

$$\int \sec^2 x \, dx = \tan x + C \qquad \int \csc^2 x \, dx = -\cot x + C$$

$$\int \sec x \tan x \, dx = \sec x + C \qquad \int \csc x \cot x \, dx = -\csc x + C$$

$$\int e^x \, dx = e^x + C \qquad \int a^x dx = \frac{a^x}{\ln a} + C \quad (a \neq 1)$$

$$\int \frac{1}{x^2+1} dx = \tan^{-1} x + C \qquad \int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x + C$$

Substitution Rule: If $u = g(x)$ then $\int f\big(g(x)\big)g'(x)dx = \int f(u)du$

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