TRIGNOMETRIC FORMULAE

1) $\sin(-\theta) = -\sin\theta, \quad \cos(-\theta) = \cos\theta, \quad \tan(-\theta) = -\tan\theta.$

2) $\sin\left(\frac{\pi}{2} - \theta\right) = \cos\theta, \quad \cos\left(\frac{\pi}{2} - \theta\right) = \sin\theta, \quad \tan\left(\frac{\pi}{2} - \theta\right) = \cot\theta$

$\sin\left(\frac{\pi}{2} + \theta\right) = \cos\theta, \quad \cos\left(\frac{\pi}{2} + \theta\right) = -\sin\theta, \quad \tan\left(\frac{\pi}{2} + \theta\right) = -\cot\theta,$

3) $\sin(\pi - \theta) = \sin\theta, \quad \cos(\pi - \theta) = -\cos\theta, \quad \tan(\pi - \theta) = -\tan\theta$

$\sin(\pi + \theta) = -\sin\theta, \quad \cos(\pi + \theta) = -\cos\theta, \quad \tan(\pi + \theta) = \tan\theta$

4) $\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$

$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

① $\sin^2\theta + \cos^2\theta = 1$

② $1 + \tan^2\theta = \sec^2\theta$

③ $1 + \cot^2\theta = \operatorname{cosec}^2\theta$

5) $\sin 2A = 2\sin A \cos A$

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

$= 2\cos^2 A - 1$

$= 1 - 2\sin^2 A$

$\therefore \quad 2\cos^2 A = 1 + \cos 2A \quad \because 1 + \cos A = 2\cos^2\left(\frac{A}{2}\right)$

& $\quad 2\sin^2 A = 1 - \cos 2A \quad \because 1 - \cos A = 2\sin^2\left(\frac{A}{2}\right)$

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

6) $\sin 2A = \frac{2t}{1 + t^2}, \quad \cos 2A = \frac{1 - t^2}{1 + t^2}$ where $t = \tan A$

7) $\sin 3A = 3\sin A - 4\sin^3 A$

$\cos 3A = 4\cos^3 A - 3\cos A$

$$\tan 3A = \frac{3\tan A - \tan^3 A}{1 - 3\tan^2 A}$$

8) $\sin A + \sin B = 2\sin\left(\frac{A + B}{2}\right)\cos\left(\frac{A - B}{2}\right)$

$\sin A - \sin B = 2\cos\left(\frac{A + B}{2}\right)\sin\left(\frac{A - B}{2}\right)$

$\cos A + \cos B = 2\cos\left(\frac{A + B}{2}\right)\cos\left(\frac{A - B}{2}\right)$

$\cos A - \cos B = -2\sin\left(\frac{A + B}{2}\right)\sin\left(\frac{A - B}{2}\right) = 2\sin\left(\frac{A+B}{2}\right)\sin\left(\frac{B-A}{2}\right)$

9) $2\sin A \cos B = \sin(A + B) + \sin(A - B)$

$2\cos A \sin B = \sin(A + B) - \sin(A - B)$

$2\cos A \cos B = \cos(A + B) + \cos(A - B)$

$2\sin A \sin B = \cos(A - B) - \cos(A + B)$

Integrals

$f(x)$	$\int f(x)dx$
x^n	$\frac{x^{n+1}}{n+1} + c,\ n \neq -1$
$(ax + b)^n$	$\frac{(ax+b)^{n+1}}{n+1} \cdot \frac{1}{a}$ when $n \neq -1$
$\frac{1}{x}$	$\log \lvert x \rvert$
e^x	e^x
a^x	$\frac{a^x}{\log a}$
$\sin x$	$-\cos x$
$\cos x$	$\sin x$
$\sec^2 x$	$\tan x$
$\operatorname{cosec}^2 x$	$-\cot x$
$\operatorname{cosec} x \cot x$	$-\operatorname{cosec} x$
$\sec x \tan x$	$\sec x$
$\frac{1}{\sqrt{1 - x^2}}$	$\sin^{-1} x$ or $-\cos^{-1} x$
$\frac{1}{1 + x^2}$	$\tan^{-1} x$ or $-\cot^{-1} x$
$\frac{1}{x\sqrt{x^2 - 1}}$	$\sec^{-1} x$ or $-\operatorname{cosec}^{-1} x$

$f(x)$	$\int f(x)dx$
$\frac{1}{\sqrt{(a^2 - x^2)}}$	$\sin^{-1}(\frac{x}{a})$
$\frac{1}{a^2 + x^2}$	$\frac{1}{a}\tan^{-1}(\frac{x}{a})$
$\frac{1}{x\sqrt{x^2 - a^2}}$	$\frac{1}{a}\sec^{-1}(\frac{x}{a})$
$\frac{1}{\sqrt{(x^2 + a^2)}}$	$\log[x + \sqrt{(x^2 + a^2)}]$
$\frac{1}{\sqrt{(x^2 - a^2)}}$	$\log[x + \sqrt{(x^2 - a^2)}]$
uv	$u\int v\,dx - \int \frac{du}{dx}(\int v dx)dx$
$\tan x$	$\log(\sec x)$
$\cot x$	$\log(\sin x)$
$\operatorname{cosec} x$	$\log \tan(\frac{x}{2}) = \log(\operatorname{cosec} x - \cot x)$
$\sec x$	$\log[\tan(\frac{x}{2} + \frac{\pi}{4})] = \log(\sec x + \tan x)$

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$\frac{1}{x^2 - a^2}$	$\frac{1}{2a} \log\left[\frac{x - a}{x + a}\right]$
$\frac{1}{a^2 - x^2}$	$\frac{1}{2a} \log\left[\frac{a + x}{a - x}\right]$
$e^{ax} \cdot \sin(bx)$	$\frac{e^{ax}}{(a^2 + b^2)} [a \sin(bx) - b \cos(bx)]$
$e^{ax} \cdot \cos(bx)$	$\frac{e^{ax}}{(a^2 + b^2)} [a \cos(bx) + b \sin(bx)]$
$\sqrt{(a^2 - x^2)}$	$\frac{x}{2}\sqrt{(a^2 - x^2)} + \frac{a^2}{2} \sin^{-1}\left(\frac{x}{a}\right)$
$\sqrt{(x^2 \pm a^2)}$	$\frac{x}{2}\sqrt{(x^2 \pm a^2)} \pm \frac{a^2}{2} \log[x + \sqrt{(x^2 \pm a^2)}]$

DERIVATIVES:

y or $f(x)$	$\frac{dy}{dx}$ or $f'(x)$	y or $f(x)$	$\frac{dy}{dx}$ or $f'(x)$
c (const.)	0	sec x	sec x . tan x
x^n	$n \cdot x^{n-1}$	cot x	$-\text{cosec}^2 x$
$(ax+b)^n$	$n(ax + b)^{n-1} \cdot a$	$\sin^{-1} x$	$\frac{1}{\sqrt{(1 - x^2)}}$
$u \pm v$	$\frac{du}{dx} \pm \frac{dv}{dx}$	$\cos^{-1} x$	$\frac{-1}{\sqrt{(1 - x^2)}}$
u . v	$u \frac{dv}{dx} + v \frac{du}{dx}$	$\tan^{-1} x$	$\frac{1}{1 + x^2}$
cu	$c \frac{du}{dx}$	$\text{cosec}^{-1} x$	$\frac{-1}{\lvert x\sqrt{(x^2 - 1)}\rvert}$, $\lvert x\rvert > 1$
u . v . w	$vw\frac{du}{dx} + wu\frac{dv}{dx} + uv\frac{dw}{dx}$	$\sec^{-1} x$	$\frac{1}{\lvert x\sqrt{(x^2 - 1)}\rvert}$, $\lvert x\rvert > 1$
$\frac{u}{v}$	$\frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$	$\cot^{-1} x$	$\frac{-1}{1 + x^2}$
sin x	cos x	e^x	e^x
cos x	-sin x	a^x	$a^x \log a$
tan x	$\sec^2 x$	$\log_e x$	$\frac{1}{x}$
cosec x	-cosec x . cot x	$\log_a x$	$\frac{1}{x \log_e a}$

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