

TRIGONOMETRY

Trigonometric Ratios of standard angles

θ	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞

Identities

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

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

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

Compound Angle Formulae

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

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

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

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

Multiple Angle Formulae

$$\sin 2A = 2 \sin A \cos A = \frac{2 \tan A}{1 + \tan^2 A}$$

$$\begin{aligned} \cos 2A &= \cos^2 A - \sin^2 A \\ &= 2 \cos^2 A - 1 \Rightarrow 2 \cos^2 A = 1 + \cos 2A \\ &= 1 - 2 \sin^2 A \Rightarrow 2 \sin^2 A = 1 - \cos 2A \\ &= \frac{1 - \tan^2 A}{1 + \tan^2 A} \end{aligned}$$

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

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

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

Transformation Formulae

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

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

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

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

$$\sin C + \sin D = 2 \sin\left(\frac{C+D}{2}\right) \cos\left(\frac{C-D}{2}\right)$$

$$\sin C - \sin D = 2 \cos\left(\frac{C+D}{2}\right) \sin\left(\frac{C-D}{2}\right)$$

$$\cos C + \cos D = 2 \cos\left(\frac{C+D}{2}\right) \cos\left(\frac{C-D}{2}\right)$$

$$\cos C - \cos D = -2 \sin\left(\frac{C+D}{2}\right) \sin\left(\frac{C-D}{2}\right)$$

1. $\frac{d}{dx}(k) = 0$
2. $\frac{d}{dx}(x^n) = n x^{n-1}$
3. $\frac{d}{dx}\left(\frac{1}{x}\right) = \frac{-1}{x^2}$
4. $\frac{d}{dx}(\sqrt{x}) = \frac{1}{2\sqrt{x}}$
5. $\frac{d}{dx}(\sin x) = \cos x$
6. $\frac{d}{dx}(\cos x) = -\sin x$
7. $\frac{d}{dx}(\tan x) = \sec^2 x$
8. $\frac{d}{dx}(\sec x) = \sec x \tan x$

9. $\frac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x.$
10. $\frac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$
11. $\frac{d}{dx}(e^x) = e^x$
12. $\frac{d}{dx}(\log x) = \frac{1}{x}$
13. $\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}$
14. $\frac{d}{dx}(\cos^{-1} x) = \frac{-1}{\sqrt{1-x^2}}$
15. $\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$
16. $\frac{d}{dx}(a^x) = a^x \log_e a$

INTEGRALS

(Add constant of integration)

1. $\int x^n dx = \frac{x^{n+1}}{n+1}$
2. $\int \frac{1}{x^2} dx = -\frac{1}{x}$
3. $\int \frac{1}{\sqrt{x}} dx = 2\sqrt{x}$
4. $\int \frac{1}{x} dx = \log x$
5. $\int e^x dx = e^x$
6. $\int a^x dx = \frac{a^x}{\log a}$
7. $\int \sin x dx = -\cos x$
8. $\int \cos x dx = \sin x$

9. $\int \tan x dx = \log(\sec x)$
10. $\int \cot x dx = \log(\sin x)$
11. $\int \sec^2 x dx = \tan x$
12. $\int \operatorname{cosec}^2 x dx = -\cot x$
13. $\int \sec x \tan x dx = \sec x$
14. $\int \operatorname{cosec} x \cot x dx = -\operatorname{cosec} x$
15. $\int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x$
16. $\int \frac{1}{1+x^2} dx = \tan^{-1} x$