

LIST OF FORMULAE

❖ TRIGONOMETRIC FORMULAE :-

1.  $\operatorname{cosec} \theta = \frac{1}{\sin \theta}$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

2.  $\sin\left(\frac{\pi}{2} - \theta\right) = \cos \theta$

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

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

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

$$\sec\left(\frac{\pi}{2} - \theta\right) = \operatorname{cosec} \theta$$

$$\operatorname{cosec}\left(\frac{\pi}{2} - \theta\right) = \sec \theta$$

3.  $\sin\left(\frac{\pi}{2} + \theta\right) = \cos \theta$

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

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

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

$$\sec\left(\frac{\pi}{2} + \theta\right) = -\operatorname{cosec} \theta$$

$$\operatorname{cosec}\left(\frac{\pi}{2} + \theta\right) = \sec \theta$$

|                                     |                                     |                                     |
|-------------------------------------|-------------------------------------|-------------------------------------|
| $\sin^2 \theta + \cos^2 \theta = 1$ | $1 - \sin^2 \theta = \cos^2 \theta$ | $1 - \cos^2 \theta = \sin^2 \theta$ |
| $\sec^2 \theta - \tan^2 \theta = 1$ | $1 + \tan^2 \theta = \sec^2 \theta$ | $\sec^2 \theta - 1 = \tan^2 \theta$ |
| $\csc^2 \theta - \cot^2 \theta = 1$ | $1 + \cot^2 \theta = \csc^2 \theta$ | $\csc^2 \theta - 1 = \cot^2 \theta$ |

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

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

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

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7.

| Double Angle   | Half Angle  |
|--|---|
| $\sin 2\theta = 2 \sin \theta \cos \theta$ $= \frac{2 \tan \theta}{1 + \tan^2 \theta}$   | $\sin \theta = 2 \sin \frac{\theta}{2} \cos \frac{\theta}{2}$ $= \frac{2 \tan \frac{\theta}{2}}{1 + \tan^2 \frac{\theta}{2}}$   |
| $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$ $= 1 - 2 \sin^2 \theta$ $= 2 \cos^2 \theta - 1$ $= \frac{1 - \tan^2 \theta}{1 + \tan^2 \theta}$ | $\cos \theta = \cos^2 \frac{\theta}{2} - \sin^2 \frac{\theta}{2}$ $= 1 - 2 \sin^2 \frac{\theta}{2}$ $= 2 \cos^2 \frac{\theta}{2} - 1$ $= \frac{1 - \tan^2 \frac{\theta}{2}}{1 + \tan^2 \frac{\theta}{2}}$ |
| $\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$   | $\tan \theta = \frac{2 \tan \frac{\theta}{2}}{1 - \tan^2 \frac{\theta}{2}}$   |
| $\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$   | $\sin \frac{3\theta}{2} = 3 \sin \frac{\theta}{2} - 4 \sin^3 \frac{\theta}{2}$  |
| $\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$   | $\cos \frac{3\theta}{2} = 4 \cos^3 \frac{\theta}{2} - 3 \cos \frac{\theta}{2}$  |
| $\tan 3\theta = \frac{3 \tan \theta - \tan^3 \theta}{1 - 3 \tan^2 \theta}$   | $\tan \frac{3\theta}{2} = \frac{3 \tan \frac{\theta}{2} - \tan^3 \frac{\theta}{2}}{1 - 3 \tan^2 \frac{\theta}{2}}$  |
| $1 + \cos 2\theta = 2 \cos^2 \theta$   | $1 + \cos \theta = 2 \cos^2 \frac{\theta}{2}$   |
| $1 - \cos 2\theta = 2 \sin^2 \theta$   | $1 - \cos \theta = 2 \sin^2 \frac{\theta}{2}$   |
| $1 + \sin 2\theta = (\sin \theta + \cos \theta)^2$   | $1 + \sin \theta = \left( \sin \frac{\theta}{2} + \cos \frac{\theta}{2} \right)^2$  |
| $1 - \sin 2\theta = (\sin \theta - \cos \theta)^2$   | $1 - \sin \theta = \left( \sin \frac{\theta}{2} - \cos \frac{\theta}{2} \right)^2$  |

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8.  $\sin C + \sin D = 2 \sin \frac{C+D}{2} \cos \frac{C-D}{2}$
9.  $\sin C - \sin D = 2 \cos \frac{C+D}{2} \sin \frac{C-D}{2}$
10.  $\cos C + \cos D = 2 \cos \frac{C+D}{2} \cos \frac{C-D}{2}$
11.  $\cos C - \cos D = -2 \sin \frac{C+D}{2} \sin \frac{C-D}{2}$
12.  $2 \sin A \cos B = \sin(A + B) + \sin(A - B)$
13.  $2 \cos A \sin B = \sin(A + B) - \sin(A - B)$
14.  $2 \cos A \cos B = \cos(A + B) + \cos(A - B)$
15.  $2 \sin A \sin B = \cos(A - B) - \cos(A + B)$
16. *If  $A + B + C = \pi$  then,*

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



❖ INVERSE TRIGONOMETRIC FUNCTION :-

$$1. \quad \sin^{-1} \frac{1}{x} = \operatorname{cosec}^{-1} x$$

$$2. \quad \cos^{-1} \frac{1}{x} = \sec^{-1} x$$

$$3. \quad \tan^{-1} \frac{1}{x} = \cot^{-1} x$$

$$4. \quad \sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$$

$$5. \quad \tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}$$

$$6. \quad \sec^{-1} x + \operatorname{cosec}^{-1} x = \frac{\pi}{2}$$

$$7. \quad \tan^{-1} \left( \frac{x-y}{1+xy} \right) = \tan^{-1} x - \tan^{-1} y, \text{ for } xy > 1$$

$$8. \quad \tan^{-1} \left( \frac{x+y}{1-xy} \right) = \tan^{-1} x + \tan^{-1} y, \text{ for } xy < 1$$

$$9. \quad \sin^{-1} \left( \frac{2x}{1+x^2} \right) = 2\tan^{-1} x$$

$$10. \quad \cos^{-1} \frac{1-x^2}{1+x^2} = 2\tan^{-1} x$$

$$11. \quad \tan^{-1} \left( \frac{2x}{1-x^2} \right) = 2\tan^{-1} x$$

❖ LOGARITHMS :-

1. Logarithmic form :  $x = \log_a m$

Exponential form:  $m = a^x$

2.  $\log_a 1 = 0$

$$\log_a a = 1$$

$$\log_a a^x = x$$

$$\log_e e = 1$$

$$a^{\log_a m} = m$$

3.  $\log_a mn = \log_a m + \log_a n$

4.  $\log_a \frac{m}{n} = \log_a m - \log_a n$

5.  $\log_a m^n = n \log_a m$

6.  $\log_a m = \frac{\log_b m}{\log_b a}$

7. If  $\log_a m = \log_a n$  then  $m = n$