# Class 11

## Important Formulas

## Trigonometric Functions

1. Following are some of the fundamental trigonometric identities:

(i) $\sin x = \frac{1}{\operatorname{cosec} x}$ or, $\operatorname{cosec} x = \frac{1}{\sin x}$

(ii) $\cos x = \frac{1}{\sec x}$ or, $\sec x = \frac{1}{\cos x}$ (iii) $\cot x = \frac{1}{\tan x}$ or, $\tan x = \frac{1}{\cot x}$

(iv) $\tan x = \frac{\sin x}{\cos x}$ or, $\cot x = \frac{\cos x}{\sin x}$ (v) $\sin^2 x + \cos^2 x = 1$

(vi) $1 + \tan^2 x = \sec^2 x$ or, $\sec x - \tan x = \frac{1}{\sec x + \tan x}$

(vii) $1 + \cot^2 x = \operatorname{cosec}^2 x$ or, $\operatorname{cosec} x - \cot x = \frac{1}{\operatorname{cosec} x + \cot x}$

2. (i) $\sin(-x) = -\sin x$ or, $\operatorname{cosec}(-x) = -\operatorname{cosec} x$

(ii) $\cos(-x) = \cos x$ or, $\sec(-x) = \sec x$

(iii) $\tan(-x) = -\tan x$ or, $\cot(-x) = -\cot x$

(iv) $\sin\left(\frac{\pi}{2} - x\right) = \cos x$, $\cos\left(\frac{\pi}{2} - x\right) = \sin x$, $\tan\left(\frac{\pi}{2} - x\right) = \cot x$, $\sec\left(\frac{\pi}{2} - x\right) = \operatorname{cosec} x$

$\operatorname{cosec}\left(\frac{\pi}{2} - x\right) = \sec x$, $\cot\left(\frac{\pi}{2} - x\right) = \tan x$

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

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

(vi) $\sin(\pi - x) = \sin x$, $\cos(\pi - x) = -\cos x$, $\tan(\pi - x) = -\tan x$, $\cot(\pi - x) = -\cot x$

$\sec(\pi - x) = -\sec x$, $\operatorname{cosec}(\pi - x) = \operatorname{cosec} x$

(vii) $\sin\left(\frac{3\pi}{2}-x\right)=-\cos x$, $\cos\left(\frac{3\pi}{2}-x\right)=-\sin x$, $\tan\left(\frac{3\pi}{2}-x\right)=\cot x$, $\cot\left(\frac{3\pi}{2}-x\right)=\tan x$

$\operatorname{cosec}\left(\frac{3\pi}{2}-x\right)=-\sec x$, $\sec\left(\frac{3\pi}{2}-x\right)=-\operatorname{cosec} x$

(viii) $\sin\left(\frac{3\pi}{2}+x\right)=-\cos x$, $\cos\left(\frac{3\pi}{2}+x\right)=\sin x$, $\tan\left(\frac{3\pi}{2}+x\right)=-\cot x$, $\cot\left(\frac{3\pi}{2}+x\right)=-\tan x$

$\operatorname{cosec}\left(\frac{3\pi}{2}+x\right)=-\sec x$, $\sec\left(\frac{3\pi}{2}+x\right)=\operatorname{cosec} x$

(ix) $\sin(2\pi-x)=-\sin x$, $\cos(2\pi-x)=\cos x$, $\tan(2\pi-x)=-\tan x$, $\operatorname{cosec}(2\pi-x)=-\operatorname{cosec} x$

$\sec(2\pi-x)=\sec x$, $\cot(2\pi-x)=-\cot x$

(x) Sine and Cosine functions and their reciprocals i.e. Cosecant and Secant functions are periodic functions with period $2\pi$. Tangent and Cotangent functions are periodic with period $\pi$.

(xi) Cosine and secant functions are even functions and all other trigonometric functions are odd functions.