

CBSE Class-11 Mathematics
NCERT Solutions
Chapter - 3 Trigonometric Functions
Exercise 3.2

Find the values of other trigonometric functions in exercises 1 to 5.

1. $\cos x = -\frac{1}{2}$, x lies in third quadrant.

Ans. Given: $\cos x = -\frac{1}{2}$

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

$$\Rightarrow \sin^2 x + \left(-\frac{1}{2}\right)^2 = 1$$

$$\Rightarrow \sin^2 x = 1 - \frac{1}{4}$$

$$\Rightarrow \sin^2 x = \frac{3}{4}$$

$$\Rightarrow \sin x = \pm \frac{\sqrt{3}}{2}$$

$$\Rightarrow \sin x = -\frac{\sqrt{3}}{2} \text{ [} x \text{ lies in third quadrant]}$$

$$\text{Now, } \operatorname{cosec} x = \frac{1}{\sin x} = -\frac{2}{\sqrt{3}}$$

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

$$\tan x = \frac{\sin x}{\cos x} = \frac{-\sqrt{3}/2}{-1/2} = \sqrt{3}$$

$$\cot x = \frac{\cos x}{\sin x} = \frac{-1/2}{-\sqrt{3}/2} = \frac{1}{\sqrt{3}}$$

2. $\sin x = \frac{3}{5}$, x lies in second quadrant.

Ans. Given: $\sin x = \frac{3}{5}$

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

$$\Rightarrow \left(\frac{3}{5}\right)^2 + \cos^2 x = 1$$

$$\Rightarrow \cos^2 x = 1 - \frac{9}{25}$$

$$\Rightarrow \cos^2 x = \frac{16}{25}$$

$$\Rightarrow \cos x = \pm \frac{4}{5}$$

$$\Rightarrow \cos x = -\frac{4}{5} \text{ [} x \text{ lies in second quadrant]}$$

$$\text{Now, } \operatorname{cosec} x = \frac{1}{\sin x} = \frac{5}{3}$$

$$\sec x = \frac{1}{\cos x} = -\frac{5}{4}$$

$$\tan x = \frac{\sin x}{\cos x} = \frac{3/5}{-4/5} = -\frac{3}{4}$$

$$\cot x = \frac{\cos x}{\sin x} = \frac{-4/5}{3/5} = -\frac{4}{3}$$

3. $\cot x = \frac{3}{4}$, x lies in third quadrant.

Ans. Given: $\cot x = \frac{3}{4}$

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

$$\Rightarrow \operatorname{cosec}^2 x - \left(\frac{3}{4}\right)^2 = 1$$

$$\Rightarrow \operatorname{cosec}^2 x = 1 + \frac{9}{16}$$

$$\Rightarrow \operatorname{cosec}^2 x = \frac{25}{16}$$

$$\Rightarrow \operatorname{cosec} x = \pm \frac{5}{4}$$

$$\Rightarrow \operatorname{cosec} x = -\frac{5}{4} \text{ [} x \text{ lies in third quadrant]}$$

$$\text{Now, } \sin x = \frac{1}{\operatorname{cosec} x} = \frac{-4}{5}$$

$$\cos x = \sqrt{1 - \sin^2 x} = \sqrt{1 - \frac{16}{25}} = -\frac{3}{5}$$

$$\tan x = \frac{1}{\cot x} = \frac{4}{3}$$

$$\sec x = \frac{1}{\cos x} = \frac{-5}{3}$$

4. $\sec x = \frac{13}{5}$, x lies in fourth quadrant.

Ans. Given: $\sec x = \frac{13}{5}$

$$\therefore \sec^2 \theta - \tan^2 \theta = 1$$

$$\Rightarrow \left(\frac{13}{5}\right)^2 - \tan^2 x = 1$$

$$\Rightarrow \tan^2 x = \left(\frac{13}{5}\right)^2 - 1$$

$$\Rightarrow \tan^2 x = \frac{169}{25} - 1$$

$$\Rightarrow \tan^2 x = \frac{144}{25}$$

$$\Rightarrow \tan x = \pm \frac{12}{5}$$

$$\Rightarrow \tan x = \frac{-12}{5} \text{ [} x \text{ lies in fourth quadrant]}$$

$$\text{Now } \cot x = \frac{1}{\tan x} = \frac{-5}{12}$$

$$\cos x = \frac{1}{\sec x} = \frac{5}{13}$$

$$\sin x = -\sqrt{1 - \cos^2 \theta} = -\sqrt{1 - \frac{144}{169}} = -\frac{12}{13}$$

$$\operatorname{cosec} x = \frac{1}{\sin x} = \frac{-13}{12}$$

5. $\tan x = \frac{-5}{12}$, x lies in second quadrant.

Ans. Given: $\tan x = \frac{-5}{12}$

$$\therefore \cot x = \frac{1}{\tan x} = \frac{-12}{5}$$

$$\because \sec^2 \theta - \tan^2 \theta = 1$$

$$\Rightarrow \sec^2 x - \left(\frac{-5}{12}\right)^2 = 1$$

$$\Rightarrow \sec^2 x = 1 + \frac{25}{144}$$

$$\Rightarrow \sec^2 x = \frac{169}{144}$$

$$\Rightarrow \sec x = \pm \frac{13}{12}$$

$$\Rightarrow \sec x = \frac{-13}{12} \text{ [} x \text{ lies in second quadrant]}$$

Now, $\cos x = \frac{1}{\sec x} = \frac{-12}{13}$

$$\sin x = \sqrt{1 - \cos^2 x} = \sqrt{1 - \frac{144}{169}} = \frac{5}{13}$$

$$\operatorname{cosec} x = \frac{1}{\sin x} = \frac{13}{5}$$

Find the values of the trigonometric functions in exercises 6 to 10.

6. $\sin 765^\circ$

Ans. Here $\sin 765^\circ = \sin(2 \times 360^\circ + 45^\circ) = \sin 45^\circ = \frac{1}{\sqrt{2}}$

7. $\operatorname{cosec}(-1410)^\circ$

Ans. Here $\operatorname{cosec}(-1410)^\circ = \operatorname{cosec}(-4 \times 360^\circ + 30^\circ) = \operatorname{cosec} 30^\circ = 2$

8. $\tan \frac{19\pi}{3}$

Ans. Here $\tan \frac{19\pi}{3} = \tan \frac{19}{3} \times 180^\circ = \tan 1140^\circ = \tan(3 \times 360^\circ + 60^\circ) = \tan 60^\circ = \sqrt{3}$

9. $\sin\left(\frac{-11\pi}{3}\right)$

Ans. Here

$$\sin\left(\frac{-11\pi}{3}\right) = \sin\left(\frac{-11 \times 180^\circ}{3}\right) = \sin(-660^\circ) = \sin(-2 \times 360^\circ + 60^\circ) = \sin 60^\circ = \frac{\sqrt{3}}{2}$$

10. $\cot\left(\frac{-15\pi}{4}\right)$

Ans. Here

$$\cot\left(\frac{-15\pi}{4}\right) = \cot\left(\frac{-15 \times 180^\circ}{4}\right) = \cot(-675^\circ) = \cot(-2 \times 360^\circ + 45^\circ) = \cot 45^\circ = 1$$