NCERT Solutions for Class-XI Maths

Chapter-2 Exercise-3.2

NCERT Math Class 11

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

1. Given, $\cos x = \frac{-1}{2}$, x lies in 3rd quadrant

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

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

$\sin^2 x = 1 - \frac{1}{4} = \frac{3}{4}$

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

$\sin x = -\frac{\sqrt{3}}{2}$ ($\because$ x lies in 3rd quadrant)

Now,

$\tan x = \frac{\sin x}{\cos x} = \sqrt{3}$

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

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

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

2. Find the values of other five trigonometric functions if $\sin x = \frac{3}{5}$, x lies in second quadrant.

2. $\sin x = \frac{3}{5}$

$\operatorname{cosec} x = \frac{1}{\sin x} = \frac{1}{\left(\frac{3}{5}\right)} = \frac{5}{3}$

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

$\Rightarrow \cos^2 x = 1 - \sin^2 x$

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

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

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

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

Since x lies in the 2^{nd} quadrant, the value of $\cos x$ will be negative

$\therefore \cos x = -\frac{4}{5}$

$\sec x = \frac{1}{\cos x} = \frac{1}{\left(-\frac{4}{5}\right)} = -\frac{5}{4}$

$\tan x = \frac{\sin x}{\cos x} = \frac{\left(\frac{3}{5}\right)}{\left(-\frac{4}{5}\right)} = -\frac{3}{4}$

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

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

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

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

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

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

$\operatorname{cosec} x = \frac{-5}{4}$ ($\because$ x lies in 3rd quadrant)

Now,

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

$\therefore \sin^2 x + \cos^2 x = 1$

$\frac{16}{25} + \cos^2 x = 1$

$$\cos^2 x = 1 - \frac{16}{25}$$

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

$$\cos x = \frac{3}{5}$$

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

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

4. Find the values of other five trigonometric functions if $\sec x = \frac{13}{5}, x$ lies in fourth quadrant.

4.

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

$$\cos x = \frac{1}{\sec x} = \frac{1}{\left(\frac{13}{5}\right)} = \frac{5}{13}$$

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

$$\Rightarrow \sin^2 x = 1 - \cos^2 x$$

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

$$\Rightarrow \sin^2 x = 1 - \frac{25}{169} = \frac{144}{169}$$

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

Since x lies in the 4^{th} quadrant, the value of $\sin x$ will be negative.

$$\therefore \sin x = -\frac{12}{13}$$

$$\operatorname{cosec} x = \frac{1}{\sin x} = \frac{1}{\left(-\frac{12}{13}\right)} = -\frac{13}{12}$$

$$\tan x = \frac{\sin x}{\cos x} = \frac{\left(-\frac{12}{13}\right)}{\left(\frac{5}{13}\right)} = -\frac{12}{5}$$

$$\cot x = \frac{1}{\tan x} = \frac{1}{\left(-\frac{12}{5}\right)} = -\frac{5}{12}$$

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

5. Given, $\tan x = \frac{-5}{12}$, x lies in 2nd quadrant

$\sec^2 x - \tan^2 x = 1$

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

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

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

$\sec x = \frac{-13}{12}$ (∵ x lies in 2nd quadrant)

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

∴ $\sin^2 x + \cos^2 x = 1$

$\sin^2 x + \frac{144}{169} = 1$

$\sin^2 x = 1 - \frac{144}{169} = \frac{25}{169}$

$\sin x = \frac{5}{13}$

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

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

6. Find the value of the trigonometric function $\sin 765^o$

6. It is known that the values of $\sin x$ repeat after an interval of 2π or 360^o.

$\therefore \sin 765^o = \sin\left(2 \times 360^o + 45^o\right) = \sin 45^o = \frac{1}{\sqrt{2}}$

7. cosec (– 1410°)

7. We know that,

Value of cosecx repeat after an interval of 2π or 360^0.

$\operatorname{cosec}(-1410^0) = \operatorname{cosec}(90^0 \times 15 + 60^0)$

$= -(-)\sec 60^0$ [∵ $\operatorname{cosec}(90^0 + \theta) = \sec\theta$]

$= 2$

8. Find the value of the trigonometric function $\tan\frac{19\pi}{3}$

8. It is known that the values of $\tan x$ repeat after an interval of π or 180^{o}.

$\therefore \tan\frac{19\pi}{3} = \tan 6\frac{1}{3}\pi = \tan\left(6\pi + \frac{\pi}{3}\right) = \tan\frac{\pi}{3} = \tan 60^{o} = \sqrt{3}$

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

9. We know that,

Value of sinx repeat after an interval of 2π or 360^{0}.

$\sin\left(\frac{-11\pi}{3}\right) = \sin\left(\frac{-11\pi}{3} + 2\times 2\pi\right)$

$= \sin\left(\frac{\pi}{3}\right)$

$= \frac{\sqrt{3}}{2}$

10. Find the value of the trigonometric function $\cot\left(-\frac{15\pi}{4}\right)$

10. It is known that the values of $\cot x$ repeat after an interval of π or 180^{o}.

$\therefore \cot\left(-\frac{15\pi}{4}\right) = \cot\left(-\frac{15\pi}{4} + 4\pi\right) = \cot\frac{\pi}{4} = 1$