EXERCISE 3.2

1. Find the values of other five trigonometric functions in Exercises 1 to 5:
1. cos x = -1/2, x lies in third quadrant.

Solution:

Given, cos x = -1/ 2

It can be written as:

sec x = 1 / cos x = 1 / (-1/2) = -2.

Using the trigonometry identity

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

$1 - (-1/2)^2 = \sin^2 x$

$1 - (1/4) = \sin^2 x$

$\sin^2 x = 3/4$

sin x = ± √3/2

Since the value of cos x in the third quadrant is negative and x lies in the third quadrant.

sin x = -√3/2

cosec x = 1/ sin x

cosec x = 1 / -√3/2

cosec x = -2/√3

tan x = sin x/ cos x

tan x = (-√3/2)/(-1/2)

tan x = √3

cot x = 1/tan x

cot x = 1/√3

2. 2. sin x = 3/5, x lies in second quadrant

Solution:

Given, $\sin x = 3/5$

It can be written as

$\operatorname{cosec} x = 1 / \sin x = 1 / (3/5) = 5/3$.

Using the trigonometry identity $\sin^2 x + \cos^2 x = 1$

$1 - (3/5)^2 = \cos^2 x$

$1 - (9/25) = \cos^2 x$

$\cos^2 x = 16/25$

$\cos x = \pm 4/5$

Since x lies in the second quadrant, the value of cos x is negative.

So

$\cos x = -4/5$

$\sec x = 1/ \cos x$

$\sec x = 1 / -4/5$

$\sec x = -5/4$

$\tan x = \sin x/ \cos x$

$= (3/5)/(-4/5)$

$= -3/4$

$\cot x = 1/\tan x$

$= 1/(-3/4)$

$= -4/3$

3. 3. cot x = 3/4, x lies in third quadrant.

Solution:

Given, $\cot x = 3/ 4$

It can be written as

$\tan x = 1/\cot x = 1/(3/4) = 4/3$.

Using the trigonometry identity

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

It can be written using the values

$1 + (4/3)2 = \sec^2 x$

$1 + (16/9) = \sec^2 x$

$(9 + 16)/9 = \sec^2 x$

$\sec^2 x = 25/9$

$\sec x = \pm 5/3$

Since the value of sec x in the third quadrant is negative and x lies in the third quadrant.

$\sec x = -5/3$

$\cos x = 1/\sec x$

$\cos x = 1/(-5/3)$

$\cos x = -3/5$

$\tan x = \sin x/\cos x$

$\sin x = \tan x \cos x$

$= 4/3 \times (-3/5)$

$= -4/5$

$\mathrm{cosec}\, x = 1/\sin x$

$= 1/(-4/5)$

$= -5/4$

4. 4. sec x = 13/5, x lies in fourth quadrant

Solution:

Given $\sec x = 13/5$

It can be written as $\cos x = 1/\sec x = 1/(13/5) = 5/13$.

Using the trigonometry identity

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

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

$\sin^2 x = 1 - (5 / 13)^2$

$\sin^2 x = 1 - 25 / 169$

$\sin^2 x = (169 - 25) / 169 = 144 / 169$

$\sin x = \pm 12 / 13$

Since x lies in the fourth quadrant, the value of sin x is negative.

$\sin x = - 12 / 13$.

It can be written as

$\operatorname{cosec} x = 1/ \sin x$

$\operatorname{cosec} x = 1 / -(12/13)$

$\operatorname{cosec} x = -13/12$

$\tan x = \sin x/ \cos x$

$\tan x = (-12/13)/(5/13)$

$\tan x = -12/5$

$\cot x = 1/\tan x$

$\cot x = -5/12$

5. 5. tan x = -5/12, x lies in second quadrant

Solution:

Given that $\tan x = – 5/12$

It can be written as

$\cot x = 1/\tan x = - 1/(5/12) = -12/5$

Using the trigonometry identity

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

It can be written as

1 + $(-5/12)^2 = \sec^2 x$

Substituting the values

1 + 25/144 = $\sec^2 x$

$\sec^2 x$ = (144 + 25) /144 = 169 / 144

sec x = ± 13/12

Since x lies in the second quadrant, the value of sec x is negative.

sec x = –13/12

We have cos x = 1 / sec x = 1/(-13/12) = -12/13.

tan x = sin x/ cos x

sin x = tan x · cos x

sin x = (-5/12) × (-12/13)

sin x = 5/13

cosec x = 1/sin x

cosec x = 1/(5/13)

cosec x = 13/5

Find the values of the trigonometric functions in Exercises 6 to 10:
6. sin 765°

Solution:

sin 765° = sin (2 × 360° + 45°)

We know that the values of sin x repeat after an interval of 360° or 2 π.

⇒ sin 765° = sin 45°

⇒ sin 765° = 1 / √2 (Using trigonometric table)

7. cosec (– 1410°)

Solution:

cosec (– 1410°) = cosec (– 1410° + 4 × 360°)

We know that the values of cosec x (any trigonometric function) repeat after an interval of 360° or 2 π.

⇒ cosec (– 1410°) = cosec (30°)

⇒ cosec (– 1410°) = 2 (Using trigonometric table)

8. 8. tan 19 π / 3

Solution:

It can be written as

tan 19 π / 3 = tan [3 (2π) + π / 3]

We know that the values of tan x (any trigonometric function) repeat after an interval of 360° or 2π.

⇒ tan 19 π / 3 = tan π / 3

⇒ tan 19 π / 3 = tan 60 °

⇒ tan 19 π / 3 = √ 3 (Using trigonometric table)

9. sin -11 π / 3

Solution:

We know that the values of sin x repeat after an interval of 360° or 2 π.

It can be written as

sin - 11 π / 3 = sin [- 11 π /3 + 2 × 2 π] (to make the angle positive, we are adding the multiples of 2π)

⇒ sin - 11 π / 3 = sin [- 11 π /3 + 4 π]

⇒ sin - 11 π / 3 = sin [(- 11 π + 12 π)/ 3]

⇒ sin - 11 π / 3 = sin [π / 3]

⇒ sin - 11 π / 3 = √3/2 (Using trigonometric table)

10. cot (-15 π / 4)

Solution:

We know that the values of cot x repeat after an interval of 360° or 2 π.

It can be written as

cot - 15 π / 4 = cot [- 15π/ 4 + 2 × 2 π] (to make the angle positive, we are adding the multiples of 2π)

As we know that value of cot πis not defined.

⇒ cot - 15 π/ 4 = cot [- 15 π/ 4 + 4 π]

⇒ cot - 15 π / 4 = cot [(- 15π + 16 π) / 4]

⇒ cot - 15 π / 4 = cot [π/ 4]

⇒ cot - 15 π/ 4 = 1 (Using trigonometric table)