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# NCERT Solutions for 11th Class Maths: Chapter 3- Trigonometric Functions



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## NCERT Solutions for 11th Class Maths: Chapter 3-Trigonometric Functions

Class 11: Maths Chapter 3 solutions. Complete Class 11 Maths Chapter 3 Notes.

### NCERT Solutions for 11th Class Maths: Chapter 3-Trigonometric Functions

NCERT 11th Maths Chapter 3, class 11 Maths Chapter 3 solutions

#### Exercise 3.1

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

**Question 1:**

Find the radian measures corresponding to the following degree measures:

(i)  $25^\circ$  (ii)  $-47^\circ 30'$  (iii)  $240^\circ$  (iv)  $520^\circ$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

(i)  $25^\circ$

We know that  $180^\circ = \pi$  radian

$$\therefore 25^\circ = \frac{\pi}{180} \times 25 \text{ radian} = \frac{5\pi}{36} \text{ radian}$$

(ii)  $-47^\circ 30'$

$$-47^\circ 30' = -47\frac{1}{2} \text{ degree } [1^\circ = 60']$$

$$= \frac{-95}{2} \text{ degree}$$

Since  $180^\circ = \pi$  radian

$$\frac{-95}{2} \text{ degree} = \frac{\pi}{180} \times \left(\frac{-95}{2}\right) \text{ radian} = \left(\frac{-19}{36 \times 2}\right) \pi \text{ radian} = \frac{-19}{72} \pi \text{ radian}$$

$$\therefore -47^\circ 30' = \frac{-19}{72} \pi \text{ radian}$$

(iii)  $240^\circ$

We know that  $180^\circ = \pi$  radian

$$\therefore 240^\circ = \frac{\pi}{180} \times 240 \text{ radian} = \frac{4}{3} \pi \text{ radian}$$

(iv)  $520^\circ$

We know that  $180^\circ = \pi$  radian

$$\therefore 520^\circ = \frac{\pi}{180} \times 520 \text{ radian} = \frac{26\pi}{9} \text{ radian}$$

## Question 2:

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Find the degree measures corresponding to the following radian measures

$$\left( \text{Use } \pi = \frac{22}{7} \right)$$

$$(i) \frac{11}{16} \quad (ii) -4 \quad (iii) \frac{5\pi}{3} \quad (iv) \frac{7\pi}{6}$$

**Ans:**

$$(i) \frac{11}{16}$$

We know that  $\pi$  radian =  $180^\circ$

$$\begin{aligned} \therefore \frac{11}{16} \text{ radian} &= \frac{180}{\pi} \times \frac{11}{16} \text{ degree} = \frac{45 \times 11}{\pi \times 4} \text{ degree} \\ &= \frac{45 \times 11 \times 7}{22 \times 4} \text{ degree} = \frac{315}{8} \text{ degree} \\ &= 39\frac{3}{8} \text{ degree} \\ &= 39^\circ + \frac{3 \times 60}{8} \text{ minutes} \quad [1^\circ = 60'] \\ &= 39^\circ + 22' + \frac{1}{2} \text{ minutes} \\ &= 39^\circ 22' 30'' \quad [1' = 60''] \end{aligned}$$

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(ii)  $-4$

We know that  $\pi$  radian  $= 180^\circ$

$$\begin{aligned} -4 \text{ radian} &= \frac{180}{\pi} \times (-4) \text{ deg ree} = \frac{180 \times 7(-4)}{22} \text{ deg ree} \\ &= \frac{-2520}{11} \text{ deg ree} = -229 \frac{1}{11} \text{ deg ree} \\ &= -229^\circ + \frac{1 \times 60}{11} \text{ min utes} \quad [1^\circ = 60'] \\ &= -229^\circ + 5' + \frac{5}{11} \text{ min utes} \\ &= -229^\circ 5' 27'' \quad [1' = 60''] \end{aligned}$$

(iii)  $\frac{5\pi}{3}$

We know that  $\pi$  radian  $= 180^\circ$

$$\therefore \frac{5\pi}{3} \text{ radian} = \frac{180}{\pi} \times \frac{5\pi}{3} \text{ deg ree} = 300^\circ$$

(iv)  $\frac{7\pi}{6}$

We know that  $\pi$  radian  $= 180^\circ$

$$\therefore \frac{7\pi}{6} \text{ radian} = \frac{180}{\pi} \times \frac{7\pi}{6} = 210^\circ$$

### Question 3:

A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second?

**Ans:**

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Number of revolutions made by the wheel in 1 minute = 360

$$\therefore \text{Number of revolutions made by the wheel in 1 second} = \frac{360}{60} = 6$$

In one complete revolution, the wheel turns an angle of  $2\pi$  radian.

Hence, in 6 complete revolutions, it will turn an angle of  $6 \times 2\pi$  radian, i.e.,

$12\pi$  radian

Thus, in one second, the wheel turns an angle of  $12\pi$  radian.

#### Question 4:

In a circle of diameter 40 cm, the length of a chord is 20 cm. Find the length of minor arc of the chord.

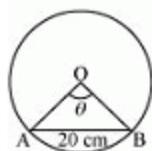
**Ans:**

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Diameter of the circle = 40 cm

$$\therefore \text{Radius } (r) \text{ of the circle} = \frac{40}{2} \text{ cm} = 20 \text{ cm}$$

Let AB be a chord (length = 20 cm) of the circle.



In  $\triangle OAB$ ,  $OA = OB = \text{Radius of circle} = 20 \text{ cm}$

Also,  $AB = 20 \text{ cm}$

Thus,  $\triangle OAB$  is an equilateral triangle.

$$\therefore \theta = 60^\circ = \frac{\pi}{3} \text{ radian}$$

We know that in a circle of radius  $r$  unit, if an arc of length  $l$  unit subtends an angle  $\theta$  radian at the centre, then  $\theta = \frac{l}{r}$ .

$$\frac{\pi}{3} = \frac{\widehat{AB}}{20} \Rightarrow \widehat{AB} = \frac{20\pi}{3} \text{ cm}$$

Thus, the length of the minor arc of the chord is  $\frac{20\pi}{3} \text{ cm}$ .

We know that in a circle of radius  $r$  unit, if an arc of length  $l$  unit subtends an angle  $\theta$  radian at the centre, then  $\theta = \frac{l}{r}$ .

$$\frac{\pi}{3} = \frac{\widehat{AB}}{20} \Rightarrow \widehat{AB} = \frac{20\pi}{3} \text{ cm}$$

Thus, the length of the minor arc of the chord is  $\frac{20\pi}{3} \text{ cm}$ .

## Question 5:

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If in two circles, arcs of the same length subtend angles  $60^\circ$  and  $75^\circ$  at the centre, find the ratio of their radii.

**Ans:**

Let the radii of the two circles be  $r_1$  and  $r_2$ . Let an arc of length  $l$  subtend an angle of  $60^\circ$  at the centre of the circle of radius  $r_1$ , while let an arc of length  $l$  subtend an angle of  $75^\circ$  at the centre of the circle of radius  $r_2$ .

Now,  $60^\circ = \frac{\pi}{3}$  radian and  $75^\circ = \frac{5\pi}{12}$  radian

We know that in a circle of radius  $r$  unit, if an arc of length  $l$  unit subtends an angle  $\theta$  radian at the centre, then  $\theta = \frac{l}{r}$  or  $l = r\theta$ .

$$\therefore l = \frac{r_1\pi}{3} \text{ and } l = \frac{r_2 5\pi}{12}$$

$$\Rightarrow \frac{r_1\pi}{3} = \frac{r_2 5\pi}{12}$$

$$\Rightarrow r_1 = \frac{r_2 5}{4}$$

$$\Rightarrow \frac{r_1}{r_2} = \frac{5}{4}$$

Thus, the ratio of the radii is 5:4.

## Exercise 3.2

### Question 1:

Find the values of other five trigonometric functions if  $\cos x = -\frac{1}{2}$ ,  $x$  lies in third quadrant.

**Ans:**

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

$$\therefore \sec x = \frac{1}{\cos x} = \frac{1}{\left(-\frac{1}{2}\right)} = -2$$

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

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

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

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

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

Since  $x$  lies in the 3<sup>rd</sup> quadrant, the value of  $\sin x$  will be negative.

$$\therefore \sin x = -\frac{\sqrt{3}}{2}$$

$$\therefore \sin x = -\frac{\sqrt{3}}{2} \quad \text{W}$$

$$\operatorname{cosec} x = \frac{1}{\sin x} = \frac{1}{\left(-\frac{\sqrt{3}}{2}\right)} = -\frac{2}{\sqrt{3}}$$

$$\tan x = \frac{\sin x}{\cos x} = \frac{\left(-\frac{\sqrt{3}}{2}\right)}{\left(-\frac{1}{2}\right)} = \sqrt{3}$$

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

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**Question 2:**

Find the values of other five trigonometric functions if  $\cot x = \frac{3}{4}$ ,  $x$  lies in third quadrant.

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

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

$$\tan x = \frac{1}{\cot x} = \frac{1}{\left(\frac{3}{4}\right)} = \frac{4}{3}$$

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

$$\Rightarrow 1 + \left(\frac{4}{3}\right)^2 = \sec^2 x$$

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

$$\Rightarrow \frac{25}{9} = \sec^2 x$$

$$\Rightarrow \sec x = \pm \frac{5}{3}$$

Since  $x$  lies in the 3<sup>rd</sup> quadrant, the value of  $\sec x$  will be negative.

$$\therefore \sec x = -\frac{5}{3}$$

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

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

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

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

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

### Question 3:

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

**Ans:**

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

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

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

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

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

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

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

Since  $x$  lies in the 4<sup>th</sup> quadrant, the value of  $\sin x$  will be negative.

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

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

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

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

#### Question 4:

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Find the values of other five trigonometric functions if  $\tan x = -\frac{5}{12}$ ,  $x$  lies in second quadrant.

**Ans:**

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

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

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

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

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

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

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

Since  $x$  lies in the 2<sup>nd</sup> quadrant, the value of  $\sec x$  will be negative.

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

$$\cos x = \frac{1}{\sec x} = \frac{1}{\left(-\frac{13}{12}\right)} = -\frac{12}{13}$$

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

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

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

$$\operatorname{cosec} x = \frac{1}{\sin x} = \frac{1}{\left(\frac{5}{13}\right)} = \frac{13}{5}$$

**Question 5:**

Find the value of the trigonometric function  $\sin 765^\circ$

**Ans:**

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

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

**Question 6:**

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

**Ans:**

It is known that the values of  $\tan x$  repeat after an interval of  $\pi$  or  $180^\circ$ .

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

**Question 7:**

Find the value of the trigonometric function  $\sin \left( -\frac{11\pi}{3} \right)$

**Ans:**

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

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

### Question 8:

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

**Ans:**

It is known that the values of  $\cot x$  repeat after an interval of  $\pi$  or  $180^\circ$ .

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

### Exercise 3.3

#### Question 1:

Prove

$$\sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{3} - \tan^2 \frac{\pi}{4} = -\frac{1}{2}$$

**Ans:**

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$$\text{L.H.S.} = \sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{3} - \tan^2 \frac{\pi}{4}$$

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

$$= \frac{1}{4} + \frac{1}{4} - 1 = -\frac{1}{2}$$

$$= \text{R.H.S.}$$

### Question 2:

Prove that  $2 \sin^2 \frac{\pi}{6} + \operatorname{cosec}^2 \frac{7\pi}{6} \cos^2 \frac{\pi}{3} = \frac{3}{2}$

**Ans:**

$$\text{L.H.S.} = 2 \sin^2 \frac{\pi}{6} + \operatorname{cosec}^2 \frac{7\pi}{6} \cos^2 \frac{\pi}{3}$$

$$= 2 \left(\frac{1}{2}\right)^2 + \operatorname{cosec}^2 \left(\pi + \frac{\pi}{6}\right) \left(\frac{1}{2}\right)^2$$

$$= 2 \times \frac{1}{4} + \left(-\operatorname{cosec} \frac{\pi}{6}\right)^2 \left(\frac{1}{4}\right)$$

$$= \frac{1}{2} + (-2)^2 \left(\frac{1}{4}\right)$$

$$= \frac{1}{2} + \frac{4}{4} = \frac{1}{2} + 1 = \frac{3}{2}$$

$$= \text{R.H.S.}$$

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**Question 3:**

Prove that  $\cot^2 \frac{\pi}{6} + \operatorname{cosec} \frac{5\pi}{6} + 3 \tan^2 \frac{\pi}{6} = 6$

**Ans:**

$$\begin{aligned}\text{L.H.S.} &= \cot^2 \frac{\pi}{6} + \operatorname{cosec} \frac{5\pi}{6} + 3 \tan^2 \frac{\pi}{6} \\ &= (\sqrt{3})^2 + \operatorname{cosec} \left( \pi - \frac{\pi}{6} \right) + 3 \left( \frac{1}{\sqrt{3}} \right)^2 \\ &= 3 + \operatorname{cosec} \frac{\pi}{6} + 3 \times \frac{1}{3} \\ &= 3 + 2 + 1 = 6 \\ &= \text{R.H.S.}\end{aligned}$$

**Question 4:**

Find the value of:

(i)  $\sin 75^\circ$

(ii)  $\tan 15^\circ$

**Ans:**

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$$(i) \sin 75^\circ = \sin (45^\circ + 30^\circ)$$

$$= \sin 45^\circ \cos 30^\circ + \cos 45^\circ \sin 30^\circ$$

$$[\sin (x+y) = \sin x \cos y + \cos x \sin y]$$

$$\begin{aligned} &= \left(\frac{1}{\sqrt{2}}\right)\left(\frac{\sqrt{3}}{2}\right) + \left(\frac{1}{\sqrt{2}}\right)\left(\frac{1}{2}\right) \\ &= \frac{\sqrt{3}}{2\sqrt{2}} + \frac{1}{2\sqrt{2}} = \frac{\sqrt{3}+1}{2\sqrt{2}} \end{aligned}$$

$$(ii) \tan 15^\circ = \tan (45^\circ - 30^\circ)$$

$$\begin{aligned} &= \frac{\tan 45^\circ - \tan 30^\circ}{1 + \tan 45^\circ \tan 30^\circ} \quad \left[ \tan (x-y) = \frac{\tan x - \tan y}{1 + \tan x \tan y} \right] \\ &= \frac{1 - \frac{1}{\sqrt{3}}}{1 + 1\left(\frac{1}{\sqrt{3}}\right)} = \frac{\frac{\sqrt{3}-1}{\sqrt{3}}}{\frac{\sqrt{3}+1}{\sqrt{3}}} \\ &= \frac{\sqrt{3}-1}{\sqrt{3}+1} = \frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)(\sqrt{3}-1)} = \frac{3+1-2\sqrt{3}}{(\sqrt{3})^2 - (1)^2} \\ &= \frac{4-2\sqrt{3}}{3-1} = 2-\sqrt{3} \end{aligned}$$

### Question 5:

Prove that:  $\cos\left(\frac{\pi}{4}-x\right)\cos\left(\frac{\pi}{4}-y\right)-\sin\left(\frac{\pi}{4}-x\right)\sin\left(\frac{\pi}{4}-y\right)=\sin(x+y)$

### Question 6:

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Prove that: 
$$\frac{\tan\left(\frac{\pi}{4} + x\right)}{\tan\left(\frac{\pi}{4} - x\right)} = \left(\frac{1 + \tan x}{1 - \tan x}\right)^2$$

**Ans:**

It is known that  $\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$  and  $\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$

$\therefore$  L.H.S. =

$$\frac{\tan\left(\frac{\pi}{4} + x\right)}{\tan\left(\frac{\pi}{4} - x\right)} = \frac{\left(\frac{\tan \frac{\pi}{4} + \tan x}{1 - \tan \frac{\pi}{4} \tan x}\right)}{\left(\frac{\tan \frac{\pi}{4} - \tan x}{1 + \tan \frac{\pi}{4} \tan x}\right)} = \frac{\left(\frac{1 + \tan x}{1 - \tan x}\right)}{\left(\frac{1 - \tan x}{1 + \tan x}\right)} = \left(\frac{1 + \tan x}{1 - \tan x}\right)^2 = \text{R.H.S.}$$

**Question 7:**

Prove that 
$$\frac{\cos(\pi + x) \cos(-x)}{\sin(\pi - x) \cos\left(\frac{\pi}{2} + x\right)} = \cot^2 x$$

**Ans:**

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$$\begin{aligned}\text{L.H.S.} &= \frac{\cos(\pi + x) \cos(-x)}{\sin(\pi - x) \cos\left(\frac{\pi}{2} + x\right)} \\ &= \frac{[-\cos x][\cos x]}{(\sin x)(-\sin x)} \\ &= \frac{-\cos^2 x}{-\sin^2 x} \\ &= \cot^2 x \\ &= \text{R.H.S.}\end{aligned}$$

### Question 8:

$$\cos\left(\frac{3\pi}{2} + x\right) \cos(2\pi + x) \left[ \cot\left(\frac{3\pi}{2} - x\right) + \cot(2\pi + x) \right] = 1$$

**Ans:**

$$\begin{aligned}\text{L.H.S.} &= \cos\left(\frac{3\pi}{2} + x\right) \cos(2\pi + x) \left[ \cot\left(\frac{3\pi}{2} - x\right) + \cot(2\pi + x) \right] \\ &= \sin x \cos x [\tan x + \cot x] \\ &= \sin x \cos x \left( \frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} \right) \\ &= (\sin x \cos x) \left[ \frac{\sin^2 x + \cos^2 x}{\sin x \cos x} \right] \\ &= 1 = \text{R.H.S.}\end{aligned}$$

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**Question 9:**

Prove that  $\sin (n+1)x \sin (n+2)x + \cos (n+1)x \cos (n+2)x = \cos x$

**Ans:**

$$\begin{aligned}\text{L.H.S.} &= \sin (n+1)x \sin (n+2)x + \cos (n+1)x \cos (n+2)x \\&= \frac{1}{2} [2 \sin (n+1)x \sin (n+2)x + 2 \cos (n+1)x \cos (n+2)x] \\&= \frac{1}{2} \left[ \cos \{(n+1)x - (n+2)x\} - \cos \{(n+1)x + (n+2)x\} \right. \\&\quad \left. + \cos \{(n+1)x + (n+2)x\} + \cos \{(n+1)x - (n+2)x\} \right] \\&\quad \left[ \begin{array}{l} \because -2 \sin A \sin B = \cos (A+B) - \cos (A-B) \\ 2 \cos A \cos B = \cos (A+B) + \cos (A-B) \end{array} \right] \\&= \frac{1}{2} \times 2 \cos \{(n+1)x - (n+2)x\} \\&= \cos (-x) = \cos x = \text{R.H.S.}\end{aligned}$$

**Question 10:**

Prove that  $\cos \left( \frac{3\pi}{4} + x \right) - \cos \left( \frac{3\pi}{4} - x \right) = -\sqrt{2} \sin x$

**Ans:**

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It is known that  $\cos A - \cos B = -2 \sin\left(\frac{A+B}{2}\right) \cdot \sin\left(\frac{A-B}{2}\right)$ .

$$\therefore \text{L.H.S.} = \cos\left(\frac{3\pi}{4} + x\right) - \cos\left(\frac{3\pi}{4} - x\right)$$

$$= -2 \sin\left\{\frac{\left(\frac{3\pi}{4} + x\right) + \left(\frac{3\pi}{4} - x\right)}{2}\right\} \cdot \sin\left\{\frac{\left(\frac{3\pi}{4} + x\right) - \left(\frac{3\pi}{4} - x\right)}{2}\right\}$$

$$= -2 \sin\left(\frac{3\pi}{4}\right) \sin x$$

$$= -2 \sin\left(\pi - \frac{\pi}{4}\right) \sin x$$

$$= -2 \sin \frac{\pi}{4} \sin x$$

$$= -2 \times \frac{1}{\sqrt{2}} \times \sin x$$

$$= -\sqrt{2} \sin x$$

$$= \text{R.H.S.}$$

### Question 11:

Prove that  $\sin^2 6x - \sin^2 4x = \sin 2x \sin 10x$

**Ans:**

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It is known that

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

$$\therefore \text{L.H.S.} = \sin^2 6x - \sin^2 4x$$

$$\begin{aligned} &= (\sin 6x + \sin 4x) (\sin 6x - \sin 4x) \\ &= \left[ 2 \sin\left(\frac{6x+4x}{2}\right) \cos\left(\frac{6x-4x}{2}\right) \right] \left[ 2 \cos\left(\frac{6x+4x}{2}\right) \sin\left(\frac{6x-4x}{2}\right) \right] \end{aligned}$$

$$= (2 \sin 5x \cos x) (2 \cos 5x \sin x)$$

$$= (2 \sin 5x \cos 5x) (2 \sin x \cos x)$$

$$= \sin 10x \sin 2x$$

$$= \text{R.H.S.}$$

### Question 12:

Prove that  $\cos^2 2x - \cos^2 6x = \sin 4x \sin 8x$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

It is known that

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

$$\therefore \text{L.H.S.} = \cos^2 2x - \cos^2 6x$$

$$= (\cos 2x + \cos 6x) (\cos 2x - \cos 6x)$$

$$= \left[ 2 \cos \left( \frac{2x+6x}{2} \right) \cos \left( \frac{2x-6x}{2} \right) \right] \left[ -2 \sin \left( \frac{2x+6x}{2} \right) \sin \left( \frac{2x-6x}{2} \right) \right]$$

$$= [2 \cos 4x \cos (-2x)] [-2 \sin 4x \sin (-2x)]$$

$$= [2 \cos 4x \cos 2x] [-2 \sin 4x (-\sin 2x)]$$

$$= (2 \sin 4x \cos 4x) (2 \sin 2x \cos 2x)$$

$$= \sin 8x \sin 4x$$

$$= \text{R.H.S.}$$

### Question 13:

Prove that  $\cot 4x (\sin 5x + \sin 3x) = \cot x (\sin 5x - \sin 3x)$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>



$$\text{L.H.S} = \cot 4x (\sin 5x + \sin 3x)$$

$$\begin{aligned} &= \frac{\cos 4x}{\sin 4x} \left[ 2 \sin \left( \frac{5x+3x}{2} \right) \cos \left( \frac{5x-3x}{2} \right) \right] \\ &\left[ \because \sin A + \sin B = 2 \sin \left( \frac{A+B}{2} \right) \cos \left( \frac{A-B}{2} \right) \right] \\ &= \left( \frac{\cos 4x}{\sin 4x} \right) [2 \sin 4x \cos x] \end{aligned}$$

$$= 2 \cos 4x \cos x$$

$$\text{R.H.S.} = \cot x (\sin 5x - \sin 3x)$$

$$\begin{aligned} &= \frac{\cos x}{\sin x} \left[ 2 \cos \left( \frac{5x+3x}{2} \right) \sin \left( \frac{5x-3x}{2} \right) \right] \\ &\left[ \because \sin A - \sin B = 2 \cos \left( \frac{A+B}{2} \right) \sin \left( \frac{A-B}{2} \right) \right] \\ &= \frac{\cos x}{\sin x} [2 \cos 4x \sin x] \end{aligned}$$

$$= 2 \cos 4x \cos x$$

$$\text{L.H.S.} = \text{R.H.S.}$$

### Question 14:

Prove that  $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

It is known that

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

$$\therefore \text{L.H.S.} = \frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x}$$

$$= \frac{2 \sin\left(\frac{5x+3x}{2}\right) \cdot \cos\left(\frac{5x-3x}{2}\right)}{2 \cos\left(\frac{5x+3x}{2}\right) \cdot \cos\left(\frac{5x-3x}{2}\right)}$$

$$= \frac{2 \sin 4x \cdot \cos x}{2 \cos 4x \cdot \cos x}$$

$$= \frac{\sin 4x}{\cos 4x}$$

$$= \tan 4x = \text{R.H.S.}$$

### Question 15:

Prove that  $\frac{\sin x - \sin y}{\cos x + \cos y} = \tan \frac{x-y}{2}$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

It is known that

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

$$\therefore \text{L.H.S.} = \frac{\sin x - \sin y}{\cos x + \cos y}$$

$$= \frac{2 \cos \left( \frac{x+y}{2} \right) \sin \left( \frac{x-y}{2} \right)}{2 \cos \left( \frac{x+y}{2} \right) \cos \left( \frac{x-y}{2} \right)}$$

$$= \frac{\sin \left( \frac{x-y}{2} \right)}{\cos \left( \frac{x-y}{2} \right)}$$

$$= \tan \left( \frac{x-y}{2} \right) = \text{R.H.S.}$$

### Question 16:

Prove that  $\frac{\sin x + \sin 3x}{\cos x + \cos 3x} = \tan 2x$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

It is known that

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

$$\therefore \text{L.H.S.} = \frac{\sin x + \sin 3x}{\cos x + \cos 3x}$$

$$= \frac{2 \sin\left(\frac{x+3x}{2}\right) \cos\left(\frac{x-3x}{2}\right)}{2 \cos\left(\frac{x+3x}{2}\right) \cos\left(\frac{x-3x}{2}\right)}$$

$$= \frac{\sin 2x}{\cos 2x}$$

$$= \tan 2x$$

$$= \text{R.H.S}$$

### Question 17:

Prove that  $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2 \sin x$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

It is known that

$$\sin A - \sin B = 2 \cos \left( \frac{A+B}{2} \right) \sin \left( \frac{A-B}{2} \right), \quad \cos^2 A - \sin^2 A = \cos 2A$$

$$\therefore \text{L.H.S.} = \frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x}$$

$$= \frac{2 \cos \left( \frac{x+3x}{2} \right) \sin \left( \frac{x-3x}{2} \right)}{-\cos 2x}$$

$$= \frac{2 \cos 2x \sin(-x)}{-\cos 2x}$$

$$= -2 \times (-\sin x)$$

$$= 2 \sin x = \text{R.H.S.}$$

### Question 18:

Prove that  $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

$$\begin{aligned}
 \text{L.H.S.} &= \frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} \\
 &= \frac{(\cos 4x + \cos 2x) + \cos 3x}{(\sin 4x + \sin 2x) + \sin 3x} \\
 &= \frac{2 \cos \left( \frac{4x+2x}{2} \right) \cos \left( \frac{4x-2x}{2} \right) + \cos 3x}{2 \sin \left( \frac{4x+2x}{2} \right) \cos \left( \frac{4x-2x}{2} \right) + \sin 3x} \\
 &\left[ \because \cos A + \cos B = 2 \cos \left( \frac{A+B}{2} \right) \cos \left( \frac{A-B}{2} \right), \sin A + \sin B = 2 \sin \left( \frac{A+B}{2} \right) \cos \left( \frac{A-B}{2} \right) \right] \\
 &= \frac{2 \cos 3x \cos x + \cos 3x}{2 \sin 3x \cos x + \sin 3x} \\
 &= \frac{\cos 3x (2 \cos x + 1)}{\sin 3x (2 \cos x + 1)} \\
 &= \cot 3x = \text{R.H.S.}
 \end{aligned}$$

### Question 19:

Prove that  $\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>



$$\text{L.H.S.} = \cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x$$

$$= \cot x \cot 2x - \cot 3x (\cot 2x + \cot x)$$

$$= \cot x \cot 2x - \cot (2x + x) (\cot 2x + \cot x)$$

$$= \cot x \cot 2x - \left[ \frac{\cot 2x \cot x - 1}{\cot x + \cot 2x} \right] (\cot 2x + \cot x)$$

$$\left[ \because \cot(A + B) = \frac{\cot A \cot B - 1}{\cot A + \cot B} \right]$$

$$= \cot x \cot 2x - (\cot 2x \cot x - 1)$$

$$= 1 = \text{R.H.S.}$$

### Question 20:

Prove that  $\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

It is known that  $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$ .

$$\therefore \text{L.H.S.} = \tan 4x = \tan 2(2x)$$

$$= \frac{2 \tan 2x}{1 - \tan^2 (2x)}$$

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

$$= \frac{\left( \frac{4 \tan x}{1 - \tan^2 x} \right)}{1 - \frac{4 \tan^2 x}{(1 - \tan^2 x)^2}}$$

$$= \frac{\left( \frac{4 \tan x}{1 - \tan^2 x} \right)}{\left[ \frac{(1 - \tan^2 x)^2 - 4 \tan^2 x}{(1 - \tan^2 x)^2} \right]}$$

$$= \frac{\left( \frac{4 \tan x}{1 - \tan^2 x} \right)}{\left[ \frac{(1 - \tan^2 x)^2 - 4 \tan^2 x}{(1 - \tan^2 x)^2} \right]}$$

$$= \frac{4 \tan x (1 - \tan^2 x)}{(1 - \tan^2 x)^2 - 4 \tan^2 x}$$

$$= \frac{4 \tan x (1 - \tan^2 x)}{1 + \tan^4 x - 2 \tan^2 x - 4 \tan^2 x}$$

$$= \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x} = \text{R.H.S.}$$

**Question 21:**

Prove that  $\cos 4x = 1 - 8\sin^2 x \cos^2 x$

**Ans:**

$$\begin{aligned}\text{L.H.S.} &= \cos 4x \\ &= \cos 2(2x) \\ &= 1 - 2 \sin^2 2x [\cos 2A = 1 - 2 \sin^2 A] \\ &= 1 - 2(2 \sin x \cos x)^2 [\sin 2A = 2 \sin A \cos A] \\ &= 1 - 8 \sin^2 x \cos^2 x \\ &= \text{R.H.S.}\end{aligned}$$

**Question 22:**

Prove that:  $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

$$\text{L.H.S.} = \cos 6x$$

$$= \cos 3(2x)$$

$$= 4 \cos^3 2x - 3 \cos 2x [\cos 3A = 4 \cos^3 A - 3 \cos A]$$

$$= 4 [(2 \cos^2 x - 1)^3 - 3 (2 \cos^2 x - 1) [\cos 2x = 2 \cos^2 x - 1]]$$

$$= 4 [(2 \cos^2 x)^3 - (1)^3 - 3 (2 \cos^2 x)^2 + 3 (2 \cos^2 x)] - 6 \cos^2 x + 3$$

$$= 4 [8 \cos^6 x - 1 - 12 \cos^4 x + 6 \cos^2 x] - 6 \cos^2 x + 3$$

$$= 32 \cos^6 x - 4 - 48 \cos^4 x + 24 \cos^2 x - 6 \cos^2 x + 3$$

$$= 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$$

$$= \text{R.H.S.}$$

#### Exercise 3.4

#### Question 1:

Find the principal and general solutions of the equation  $\tan x = \sqrt{3}$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

$$\tan x = \sqrt{3}$$

It is known that  $\tan \frac{\pi}{3} = \sqrt{3}$  and  $\tan \left( \frac{4\pi}{3} \right) = \tan \left( \pi + \frac{\pi}{3} \right) = \tan \frac{\pi}{3} = \sqrt{3}$

Therefore, the principal solutions are  $x = \frac{\pi}{3}$  and  $\frac{4\pi}{3}$ .

$$\text{Now, } \tan x = \tan \frac{\pi}{3}$$

$$\Rightarrow x = n\pi + \frac{\pi}{3}, \text{ where } n \in \mathbb{Z}$$

Therefore, the general solution is  $x = n\pi + \frac{\pi}{3}$ , where  $n \in \mathbb{Z}$

## Question 2:

Find the principal and general solutions of the equation  $\sec x = 2$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

$$\sec x = 2$$

It is known that  $\sec \frac{\pi}{3} = 2$  and  $\sec \frac{5\pi}{3} = \sec \left( 2\pi - \frac{\pi}{3} \right) = \sec \frac{\pi}{3} = 2$

Therefore, the principal solutions are  $x = \frac{\pi}{3}$  and  $\frac{5\pi}{3}$ .

$$\text{Now, } \sec x = \sec \frac{\pi}{3}$$

$$\Rightarrow \cos x = \cos \frac{\pi}{3} \quad \left[ \sec x = \frac{1}{\cos x} \right]$$

$$\Rightarrow x = 2n\pi \pm \frac{\pi}{3}, \text{ where } n \in \mathbb{Z}$$

Therefore, the general solution is  $x = 2n\pi \pm \frac{\pi}{3}$ , where  $n \in \mathbb{Z}$

### Question 3:

Find the principal and general solutions of the equation  $\cot x = -\sqrt{3}$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

$$\cot x = -\sqrt{3}$$

It is known that  $\cot \frac{\pi}{6} = \sqrt{3}$

$$\therefore \cot\left(\pi - \frac{\pi}{6}\right) = -\cot \frac{\pi}{6} = -\sqrt{3} \text{ and } \cot\left(2\pi - \frac{\pi}{6}\right) = -\cot \frac{\pi}{6} = -\sqrt{3}$$

$$\text{i.e., } \cot \frac{5\pi}{6} = -\sqrt{3} \text{ and } \cot \frac{11\pi}{6} = -\sqrt{3}$$

Therefore, the principal solutions are  $x = \frac{5\pi}{6}$  and  $\frac{11\pi}{6}$ .

Now,  $\cot x = \cot \frac{5\pi}{6}$

$$\Rightarrow \tan x = \tan \frac{5\pi}{6} \quad \left[ \cot x = \frac{1}{\tan x} \right]$$

$$\Rightarrow x = n\pi + \frac{5\pi}{6}, \text{ where } n \in \mathbb{Z}$$

Therefore, the general solution is  $x = n\pi + \frac{5\pi}{6}$ , where  $n \in \mathbb{Z}$

#### Question 4:

Find the general solution of the equation  $\cos 4x = \cos 2x$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

$$\cos 4x = \cos 2x$$

$$\Rightarrow \cos 4x - \cos 2x = 0$$

$$\Rightarrow -2 \sin\left(\frac{4x+2x}{2}\right) \sin\left(\frac{4x-2x}{2}\right) = 0$$

$$\left[ \because \cos A - \cos B = -2 \sin\left(\frac{A+B}{2}\right) \sin\left(\frac{A-B}{2}\right) \right]$$

$$\Rightarrow \sin 3x \sin x = 0$$

$$\Rightarrow \sin 3x = 0 \quad \text{or} \quad \sin x = 0$$

$$\therefore 3x = n\pi \quad \text{or} \quad x = n\pi, \text{ where } n \in \mathbb{Z}$$

$$\Rightarrow x = \frac{n\pi}{3} \quad \text{or} \quad x = n\pi, \text{ where } n \in \mathbb{Z}$$

### Question 5:

Find the general solution of the equation  $\cos 3x + \cos x - \cos 2x = 0$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>



$$\cos 3x + \cos x - \cos 2x = 0$$

$$\Rightarrow 2 \cos\left(\frac{3x+x}{2}\right) \cos\left(\frac{3x-x}{2}\right) - \cos 2x = 0 \quad \left[ \cos A + \cos B = 2 \cos\left(\frac{A+B}{2}\right) \cos\left(\frac{A-B}{2}\right) \right]$$

$$\Rightarrow 2 \cos 2x \cos x - \cos 2x = 0$$

$$\Rightarrow \cos 2x (2 \cos x - 1) = 0$$

$$\Rightarrow \cos 2x = 0 \quad \text{or} \quad 2 \cos x - 1 = 0$$

$$\Rightarrow \cos 2x = 0 \quad \text{or} \quad \cos x = \frac{1}{2}$$

$$\therefore 2x = (2n+1)\frac{\pi}{2} \quad \text{or} \quad \cos x = \cos \frac{\pi}{3}, \text{ where } n \in \mathbb{Z}$$

$$\Rightarrow x = (2n+1)\frac{\pi}{4} \quad \text{or} \quad x = 2n\pi \pm \frac{\pi}{3}, \text{ where } n \in \mathbb{Z}$$

### Question 6:

Find the general solution of the equation  $\sec^2 2x = 1 - \tan 2x$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

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

$$\Rightarrow 1 + \tan^2 2x = 1 - \tan 2x$$

$$\Rightarrow \tan^2 2x + \tan 2x = 0$$

$$\Rightarrow \tan 2x (\tan 2x + 1) = 0$$

$$\Rightarrow \tan 2x = 0 \quad \text{or} \quad \tan 2x + 1 = 0$$

$$\text{Now, } \tan 2x = 0$$

$$\Rightarrow \tan 2x = \tan 0$$

$$\Rightarrow 2x = n\pi + 0, \text{ where } n \in \mathbb{Z}$$

$$\Rightarrow x = \frac{n\pi}{2}, \text{ where } n \in \mathbb{Z}$$

$$\tan 2x + 1 = 0$$

$$\Rightarrow \tan 2x = -1 = -\tan \frac{\pi}{4} = \tan \left( \pi - \frac{\pi}{4} \right) = \tan \frac{3\pi}{4}$$

$$\Rightarrow 2x = n\pi + \frac{3\pi}{4}, \text{ where } n \in \mathbb{Z}$$

$$\Rightarrow x = \frac{n\pi}{2} + \frac{3\pi}{8}, \text{ where } n \in \mathbb{Z}$$

Therefore, the general solution is  $\frac{n\pi}{2}$  or  $\frac{n\pi}{2} + \frac{3\pi}{8}$ ,  $n \in \mathbb{Z}$ .

### Question 7:

Find the general solution of the equation  $\sin x + \sin 3x + \sin 5x = 0$

**Ans:**

<https://www.indcareer.com/schools/ncert-solutions-for-11th-class-maths-chapter-3-trigonometric-functions/>

$$\sin x + \sin 3x + \sin 5x = 0$$

$$\Rightarrow \sin 3x (2 \cos 2x + 1) = 0$$

$$\Rightarrow \sin 3x = 0 \quad \text{or} \quad 2 \cos 2x + 1 = 0$$

$$\text{Now, } \sin 3x = 0 \Rightarrow 3x = n\pi, \text{ where } n \in \mathbb{Z}$$

$$\text{i.e., } x = \frac{n\pi}{3}, \text{ where } n \in \mathbb{Z}$$

$$2 \cos 2x + 1 = 0$$

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

$$\Rightarrow \cos 2x = \cos \frac{2\pi}{3}$$

$$\Rightarrow 2x = 2n\pi \pm \frac{2\pi}{3}, \text{ where } n \in \mathbb{Z}$$

$$\Rightarrow x = n\pi \pm \frac{\pi}{3}, \text{ where } n \in \mathbb{Z}$$

$$(\sin x + \sin 5x) + \sin 3x = 0$$

$$\Rightarrow \left[ 2 \sin \left( \frac{x+5x}{2} \right) \cos \left( \frac{x-5x}{2} \right) \right] + \sin 3x = 0 \quad \left[ \sin A + \sin B = 2 \sin \left( \frac{A+B}{2} \right) \cos \left( \frac{A-B}{2} \right) \right]$$

$$\Rightarrow 2 \sin 3x \cos(-2x) + \sin 3x = 0$$

$$\Rightarrow 2 \sin 3x \cos 2x + \sin 3x = 0$$



# Chapterwise NCERT Solutions for Class 11 Maths :

- Chapter 1-Sets
- Chapter 2-Relations and Functions
- Chapter 3-Trigonometric Functions
- Chapter 4-Principle of Mathematical Induction
- Chapter 5-Complex Numbers and Quadratic Equations
- Chapter 6-Linear Inequalities
- Chapter 7-Permutation and Combinations
- Chapter 8-Binomial Theorem
- Chapter 9-Sequences and Series
- Chapter 10-Straight Lines
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- Chapter 12-Introduction to three Dimensional Geometry
- Chapter 13-Limits and Derivatives
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