UDAAN

2025

Trigonometry

Mathematics | Lecture - 05

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Topics

to be covered

1. Homework Discussion
2. Trigonometric Identities
   (Part -2)


WORK HARD
DREAM BIG
NEVER GIVE UP !!

Reciprocal Relation.

$\sin\theta \longleftrightarrow \operatorname{cosec}\theta$

$\cos\theta \longleftrightarrow \sec\theta$

$\tan\theta \longleftrightarrow \cot\theta$

Quotient Relation.

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

$\cot\theta = \frac{\cos\theta}{\sin\theta}$

1 or Square vali identity.

★ $\sin^2\theta + \cos^2\theta = 1$

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

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

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

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

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

★ $\sec^2\theta = 1 + \tan^2\theta$

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

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

#Sochna Seekhna

H.W

1. $\sec\theta \rightarrow \sin\theta$
2. $\tan\theta \rightarrow \cos\operatorname{ec}\theta$
3. $\cot\theta \rightarrow \sec\theta$
4. $\operatorname{cosec}\theta \rightarrow \cos\theta$

DPP abhi nahi banegi...

Wait Karo.....

Aage aane wali classes ki...

① $\sec\theta \rightarrow \sin\theta$

$\sec\theta \rightarrow \cos\theta \rightarrow \sin\theta$

$\sec\theta \rightarrow \tan\theta \rightarrow \sin\theta$

$\sec\theta = \frac{1}{\cos\theta}$

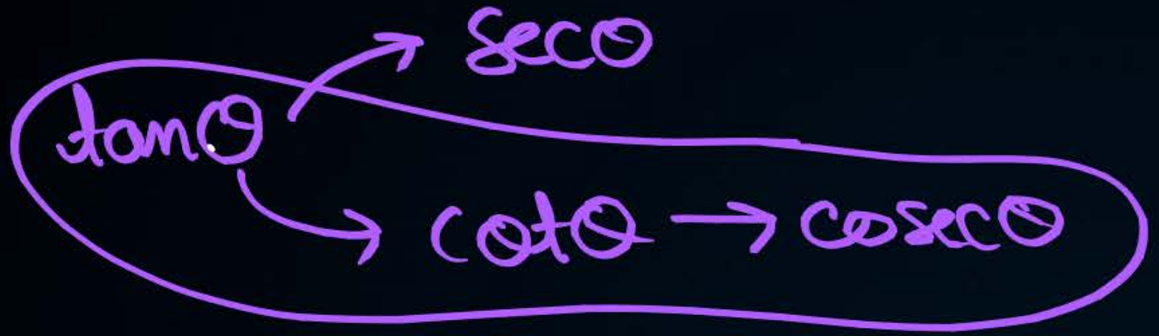
$$\sec\theta = \frac{1}{\sqrt{1-\sin^2\theta}}$$

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

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

$$\cos\theta = \sqrt{1-\sin^2\theta}$$

② $\tan\theta \rightarrow \operatorname{cosec}\theta$



$$\tan\theta = \frac{1}{\cot\theta}$$

$$\tan\theta = \frac{1}{\sqrt{\operatorname{cosec}^2\theta - 1}}$$

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

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

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

③ $\cot\theta \rightarrow \sec\theta$

$\cot\theta \rightarrow \tan\theta \rightarrow \sec\theta$

$\cot\theta \rightarrow \operatorname{cosec}\theta$

$\cot\theta = \frac{1}{\tan\theta}$

$$\boxed{\cot\theta = \frac{1}{\sqrt{\sec^2\theta - 1}}}$$

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

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

$$\boxed{\sqrt{\sec^2\theta - 1} = \tan\theta}$$

Topic : Trigonometric Identities

#Q. Prove the following identity: $(1-\sin^2\theta)\sec^2\theta = 1$

L.H.S

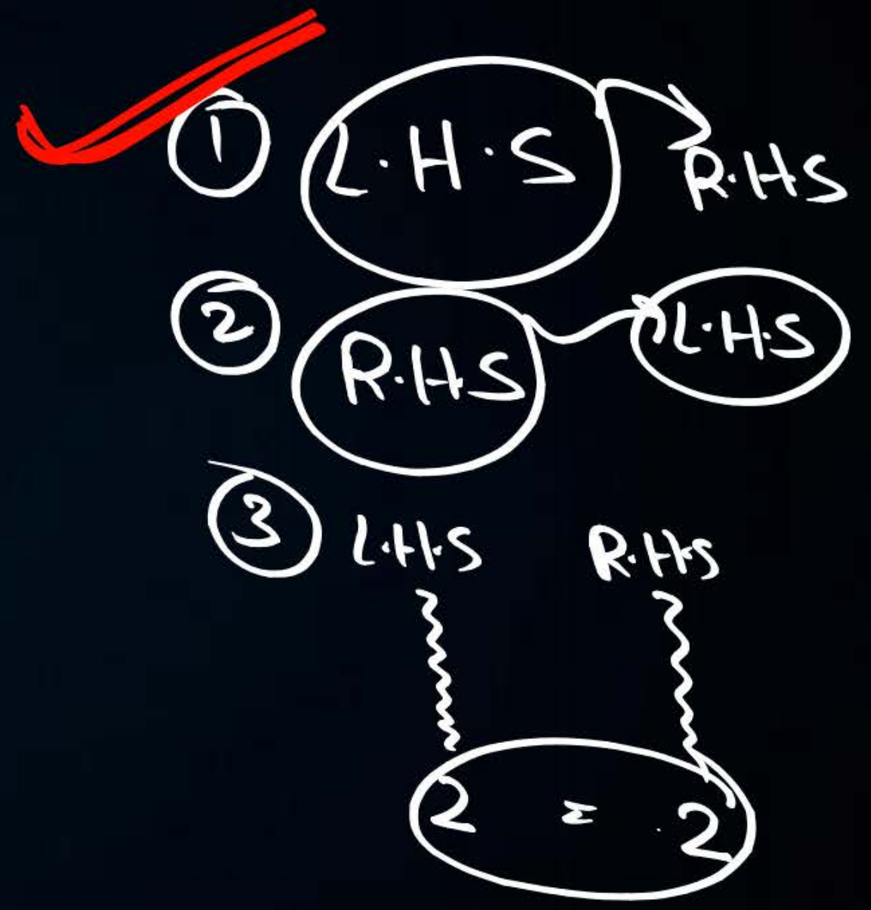
$(1-\sin^2\theta)\sec^2\theta$

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

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

$\cos^2\theta \times \sec^2\theta$

$\frac{1}{\sec\theta} \times \sec\theta = 1 =$ R.H.S H.P



Topic : Trigonometric Identities

#Q. Prove the following identity : $\cos^2\theta(1 + \tan^2\theta) = 1$

$\tan\theta \rightarrow \cos\theta$

$\tan\theta \rightarrow \sec\theta \rightarrow \cos\theta$

$\tan\theta \rightarrow \cot\theta$

L.H.S

$= \cos^2\theta(\sec^2\theta)$

$= \cos\theta \times \frac{1}{\cos\theta}$

$= 1$

$=$ R.H.S

HP

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

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\cos^2\theta + \frac{1}{1+\cot^2\theta} = 1$$

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

L.H.S

$= \cos^2\theta + \frac{1}{\operatorname{cosec}^2\theta}$

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

$= 1$

$=$ R.H.S HP

Topic : Trigonometric Identities

#ImpQ. Prove the following identity : **[NCERT Exemplar]**

$$\cot^2\theta - \frac{1}{\sin^2\theta} = -1$$

L.H.S

$\cot^2\theta - \frac{1}{\sin^2\theta}$

$\cot^2\theta - \operatorname{cosec}^2\theta$

$\cot^2\theta - (1 + \cot^2\theta)$

$\cot^2\theta - 1 - \cot^2\theta$

$-1 =$ R.H.S

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

Topic : Trigonometric Identities

#ImpQ. Prove the following identity : **[NCERT Exemplar]**

$$\tan^2\theta - \frac{1}{\cos^2\theta} = -1$$

L.H.S

$\tan^2\theta - \frac{1}{\cos^2\theta}$

$\tan^2\theta - \sec^2\theta$

$\sec^2\theta - 1 - \sec^2\theta$

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

Topic : Trigonometric Identities

#ImpQ. Prove the following identity : $(1+\tan^2\theta)(1+\sin\theta)(1-\sin\theta) = 1$

[NCERT Exemplar]

L.H.S

$(1+\tan^2\theta)(1^2-\sin^2\theta)$

$(1+\tan^2\theta)(\cos^2\theta)$

$\sec^2\theta \times \cos^2\theta$

$\frac{1}{\cos^2\theta} \times \cos^2\theta = 1$

$(1+\sin\theta)(1-\sin\theta)$

$(a+b)\ (a-b) = a^2-b^2$

Topic : Trigonometric Identities

#ImpQ. Prove the following identity: $(1 + \cot^2\theta)(1 + \cos\theta)(1 - \cos\theta) = 1$

[NCERT Exemplar]

$(1+\cot^2\theta)(1^2-\cos^2\theta)$

$\operatorname{cosec}^2\theta \times \sin^2\theta$

$\frac{1}{\sin^2\theta} \times \sin^2\theta$

1

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\frac{1}{1+\sin\theta}+\frac{1}{1-\sin\theta}=2\sec^2\theta$$

$$\frac{1(1-\sin\theta)+1(1+\sin\theta)}{(1+\sin\theta)(1+\sin\theta)}$$

$$\frac{1-\sin\theta+1+\sin\theta}{1^2-\sin^2\theta}$$

$$\frac{2}{\cos^2\theta}$$

$$2\times\frac{1}{\cos^2\theta}$$

$$\boxed{2\sec^2\theta}$$

$\sin\theta \rightarrow \sec\theta$

$\sin\theta \rightarrow \cos\theta \rightarrow \sec\theta$

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\frac{\cos\theta}{1-\sin\theta}+\frac{\cos\theta}{1+\sin\theta}=2\sec\theta$$

$$\frac{\cos\theta(1+\sin\theta)+\cos\theta(1+\sin\theta)}{(1-\sin\theta)(1+\sin\theta)}$$

$$\frac{\cos\theta+\cancel{\cos\theta\sin\theta}+\cos\theta-\cancel{\cos\theta\sin\theta}}{1^2-\sin^2\theta}$$

$$\frac{2\cos\theta}{\cos^2\theta}$$

$$\frac{2\cancel{\cos\theta}}{\cos\theta\times\cancel{\cos\theta}}$$

$$\frac{2}{\cos\theta}$$

$$2\times\frac{1}{\cos\theta}$$

$$2\sec\theta$$

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$$

$$= \sqrt{\frac{1-\sin\theta}{1+\sin\theta} \times \frac{1-\sin\theta}{1-\sin\theta}}$$

$$= \sqrt{\frac{(1-\sin\theta)^2}{1^2-\sin^2\theta}}$$

$$= \frac{\sqrt{(1-\sin\theta)^2}}{\sqrt{\cos^2\theta}}$$

$$\frac{1-\sin\theta}{\cos\theta}$$

$$\frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}$$

$$\sec\theta - \tan\theta$$

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

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$$

$$\sqrt{\frac{1+\cos\theta}{1-\cos\theta} \times \frac{1+\cos\theta}{1+\cos\theta}}$$

$$\sqrt{\frac{(1+\cos\theta)^2}{1^2-\cos^2\theta}}$$

$$\frac{\sqrt{(1+\cos\theta)^2}}{\sqrt{\sin^2\theta}}$$

$$\frac{1+\cos\theta}{\sin\theta}$$

$$\frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}$$

$$\boxed{\operatorname{cosec}\theta + \cot\theta}$$

$2 \times 2 = 2^2$

$3 \times 3 = 3^2$

$a \times a = a^2$

$x \times x = x^2$

$\sin\theta \times \sin\theta = (\sin\theta)^2$

$(1+\sin\theta)(1+\sin\theta)$

$= (1+\sin\theta)^2$

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\frac{1-\sin\theta}{1+\sin\theta} = (\sec\theta - \tan\theta)^2$$

$$\frac{1-\sin\theta}{1+\sin\theta} \times \frac{1-\sin\theta}{1-\sin\theta}$$

$$\frac{(1-\sin\theta)^2}{1^2-\sin^2\theta}$$

$$\frac{(1-\sin\theta)^2}{\cos^2\theta}$$

$$\left(\frac{1-\sin\theta}{\cos\theta}\right)^2$$

$$\left(\frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}\right)^2$$

$$\boxed{(\sec\theta - \tan\theta)^2}$$

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\frac{1-\cos\theta}{1+\cos\theta} = (\operatorname{cosec}\theta - \cot\theta)^2$$

$\frac{1-\cos\theta}{1+\cos\theta} \times \frac{1-\cos\theta}{1-\cos\theta}$

$\frac{(1-\cos\theta)^2}{1^2-\cos^2\theta}$

$\frac{(1-\cos\theta)^2}{\sin^2\theta}$

$\left(\frac{1-\cos\theta}{\sin\theta}\right)^2$

$\left(\frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}\right)^2$

$(\operatorname{cosec}\theta - \cot\theta)^2$

$\sin^2\theta = (\sin\theta)^2$

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\frac{\sin\theta}{1-\cos\theta} = \operatorname{cosec}\theta + \cot\theta$$

$$\frac{\sin\theta}{1-\cos\theta} \times \frac{(1+\cos\theta)}{(1+\cos\theta)}$$

$$\frac{\sin\theta(1+\cos\theta)}{1^2-\cos^2\theta}$$

$$\frac{\sin\theta(1+\cos\theta)}{\sin^2\theta}$$

$$\frac{1+\cos\theta}{\sin\theta}$$

$$\frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}$$

$$\operatorname{cosec}\theta + \cot\theta$$

Topic : Trigonometric Identities

#Q. Prove the following identity : **[NCERT CBSE 2000C]**

$$(\text{cosec}\theta - \cot\theta)^2 = \frac{1-\cos\theta}{1+\cos\theta}$$

$$\left(\frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}\right)^2$$

$$\left(\frac{1-\cos\theta}{\sin\theta}\right)^2$$

$$\frac{(1-\cos\theta)^2}{(\sin\theta)^2}$$

$$\frac{(1-\cos\theta)(1-\cos\theta)}{\sin^2\theta}$$

$$\frac{(1-\cos\theta)(1-\cos\theta)}{1-\cos^2\theta}$$

$a^2 - b^2 = (a+b)(a-b)$

$$\frac{(1-\cos\theta)(1-\cos\theta)}{(1-\cos\theta)(1+\cos\theta)}$$

$$\boxed{\frac{1-\cos\theta}{1+\cos\theta}}$$

Topic : Trigonometric Identities

#ImpQ. Prove the following identity: $\text{cosec}^2\theta + \sec^2\theta = \text{cosec}^2\theta \sec^2\theta$

[CBSE 2001]

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\cot\theta - \tan\theta = \frac{2\cos^2\theta - 1}{\sin\theta\cos\theta}$$

$$\frac{\cos\theta}{\sin\theta} - \frac{\sin\theta}{\cos\theta}$$

$$\frac{(\cos\theta)^2 - (\sin\theta)^2}{\sin\theta\cos\theta}$$

$$\frac{\cos^2\theta - \sin^2\theta}{\sin\theta\cos\theta}$$

$$\frac{\cos^2\theta - (1-\cos^2\theta)}{\sin\theta\cos\theta}$$

$$\frac{\cos^2\theta - 1 + \cos^2\theta}{\sin\theta\cos\theta}$$

$$\boxed{\frac{2\cos^2\theta - 1}{\sin\theta\cos\theta}}$$

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\frac{\tan\theta + \sin\theta}{\tan\theta - \sin\theta} = \frac{\sec\theta + 1}{\sec\theta - 1}$$

$$\frac{\frac{\sin\theta}{\cos\theta} + \frac{\sin\theta}{1}}{\frac{\sin\theta}{\cos\theta} - \frac{\sin\theta}{1}}$$

$$\frac{\cancel{\sin\theta}\left(\frac{1}{\cos\theta} + 1\right)}{\cancel{\sin\theta}\left(\frac{1}{\cos\theta} - 1\right)}$$

$$\boxed{\frac{\sec\theta + 1}{\sec\theta - 1}}$$

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\tan\theta - \cot\theta = \frac{2\sin^2\theta - 1}{\sin\theta\cos\theta}$$

Topic : Trigonometric Identities

#ImpQ. Prove the following identity : **[NCERT Exemplar]**

$$\frac{\sin\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}=2\operatorname{cosec}\theta$$

Topic : Trigonometric Identities

#ImpQ. Prove the following identity : **[NCERT]**

$$\frac{1+\sin\theta}{\cos\theta}+\frac{\cos\theta}{1+\sin\theta}=2\sec\theta$$

Topic : Trigonometric Identities

#ImpQ. Prove the following identity : **[CBSE 2000, 2000C]**

$$\frac{\sin A+\cos A}{\sin A-\cos A}+\frac{\sin A-\cos A}{\sin A+\cos A}=\frac{2}{\sin^2 A-\cos^2 A}=\frac{2}{2\sin^2 A-1}=\frac{2}{1-2\cos^2 A}$$

Topic : Trigonometric Identities

#Q. Prove the following identity :

$(\text{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta) = 1$

Topic : Trigonometric Identities

#Q. Prove the following identity :

$$\frac{\sin A - \sin B}{\cos A + \cos B} + \frac{\cos A - \cos B}{\sin A + \sin B} = 0$$

H/w

→ Have patience.

→ Practice more and more.... + practice sheet

THANK YOU