



Trigonometric Identities Ex 6.1 Q28

**Answer :**

We have to prove  $\frac{1 + \tan^2 \theta}{1 + \cot^2 \theta} = \left( \frac{1 - \tan \theta}{1 - \cot \theta} \right)^2 = \tan^2 \theta$

Consider the expression

$$\begin{aligned} \frac{1 + \tan^2 \theta}{1 + \cot^2 \theta} &= \frac{1 + \tan^2 \theta}{1 + \frac{1}{\tan^2 \theta}} \\ &= \frac{1 + \tan^2 \theta}{\frac{\tan^2 \theta + 1}{\tan^2 \theta}} \\ &= \tan^2 \theta \frac{1 + \tan^2 \theta}{1 + \tan^2 \theta} \\ &= \tan^2 \theta \end{aligned}$$

Again, we have

$$\begin{aligned} \left( \frac{1 - \tan \theta}{1 - \cot \theta} \right)^2 &= \left( \frac{1 - \tan \theta}{1 - \frac{1}{\tan \theta}} \right)^2 \\ &= \left( \frac{1 - \tan \theta}{\frac{\tan \theta - 1}{\tan \theta}} \right)^2 \end{aligned}$$

$$\begin{aligned}
 &= \tan^2 \theta \left( \frac{1 - \tan \theta}{\tan \theta - 1} \right)^2 \\
 &= \tan^2 \theta \left( -\frac{1 - \tan \theta}{1 - \tan \theta} \right)^2 \\
 &= \tan^2 \theta (-1)^2 \\
 &= \tan^2 \theta
 \end{aligned}$$

Trigonometric Identities Ex 6.1 Q29

**Answer :**

We have to prove  $\frac{1 + \sec \theta}{\sec \theta} = \frac{\sin^2 \theta}{1 - \cos \theta}$

We know that,  $\sin^2 \theta + \cos^2 \theta = 1$

$$\begin{aligned}
 \frac{1 + \sec \theta}{\sec \theta} &= \frac{1 + \frac{1}{\cos \theta}}{\frac{1}{\cos \theta}} \\
 &= \frac{\cos \theta + 1}{\cos \theta} \\
 &= \frac{1 + \cos \theta}{1}
 \end{aligned}$$

Multiplying the numerator and denominator by  $(1 - \cos \theta)$ , we have

$$\begin{aligned}
 \frac{1 + \sec \theta}{\sec \theta} &= \frac{(1 + \cos \theta)(1 - \cos \theta)}{(1 - \cos \theta)} \\
 &= \frac{1 - \cos^2 \theta}{1 - \cos \theta} \\
 &= \frac{\sin^2 \theta}{1 - \cos \theta}
 \end{aligned}$$

\*\*\*\*\* END \*\*\*\*\*