



Trigonometric Identities Ex 6.1 Q43

**Answer :**

We need to prove  $\frac{\operatorname{cosec} A}{\operatorname{cosec} A - 1} + \frac{\operatorname{cosec} A}{\operatorname{cosec} A + 1} = 2 \sec^2 A$

Using the identity  $a^2 - b^2 = (a + b)(a - b)$ , we get

$$\begin{aligned} \frac{\operatorname{cosec} A}{\operatorname{cosec} A - 1} + \frac{\operatorname{cosec} A}{\operatorname{cosec} A + 1} &= \frac{\operatorname{cosec} A(\operatorname{cosec} A + 1) + \operatorname{cosec} A(\operatorname{cosec} A - 1)}{\operatorname{cosec}^2 A - 1} \\ &= \frac{\operatorname{cosec} A(\operatorname{cosec} A + 1 + \operatorname{cosec} A - 1)}{\operatorname{cosec}^2 A - 1} \end{aligned}$$

Further, using the property  $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$ , we get

So,

$$\begin{aligned} \frac{\operatorname{cosec} A(\operatorname{cosec} A + 1 + \operatorname{cosec} A - 1)}{\operatorname{cosec}^2 A - 1} &= \frac{\operatorname{cosec} A(2 \operatorname{cosec} A)}{\cot^2 A} \\ &= \frac{2 \operatorname{cosec}^2 A}{\cot^2 A} \\ &= \frac{(2) \left( \frac{1}{\sin^2 A} \right)}{\left( \frac{\cos^2 A}{\sin^2 A} \right)} \\ &= 2 \left( \frac{1}{\sin^2 A} \right) \left( \frac{\sin^2 A}{\cos^2 A} \right) \\ &= 2 \left( \frac{1}{\cos^2 A} \right) \\ &= 2 \sec^2 A \end{aligned}$$

Hence proved.

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**Answer :**

We need to prove  $(1 + \tan^2 A) + \left(1 + \frac{1}{\tan^2 A}\right) = \frac{1}{\sin^2 A - \sin^4 A}$ .

Using the property  $1 + \tan^2 \theta = \sec^2 \theta$ , we get

$$\begin{aligned}(1 + \tan^2 A) + \left(1 + \frac{1}{\tan^2 A}\right) &= \sec^2 A + \left(\frac{\tan^2 A + 1}{\tan^2 A}\right) \\ &= \sec^2 A + \left(\frac{\sec^2 A}{\tan^2 A}\right)\end{aligned}$$

Now, using  $\sec \theta = \frac{1}{\cos \theta}$  and  $\tan \theta = \frac{\sin \theta}{\cos \theta}$ , we get

$$\begin{aligned}\sec^2 A + \left(\frac{\sec^2 A}{\tan^2 A}\right) &= \frac{1}{\cos^2 A} + \left(\frac{\frac{1}{\cos^2 A}}{\frac{\sin^2 A}{\cos^2 A}}\right) \\ &= \frac{1}{\cos^2 A} + \left(\frac{1}{\cos^2 A} \times \frac{\cos^2 A}{\sin^2 A}\right) \\ &= \frac{1}{\cos^2 A} + \frac{1}{\sin^2 A} \\ &= \frac{\sin^2 A + \cos^2 A}{\cos^2 A(\sin^2 A)}\end{aligned}$$

Further, using the property,  $\sin^2 \theta + \cos^2 \theta = 1$ , we get

$$\begin{aligned}\frac{\sin^2 A + \cos^2 A}{\cos^2 A(\sin^2 A)} &= \frac{1}{\cos^2 A(\sin^2 A)} \\ &= \frac{1}{(1 - \sin^2 A)(\sin^2 A)} \quad (\text{using } \cos^2 \theta = 1 - \sin^2 \theta) \\ &= \frac{1}{\sin^2 A - \sin^4 A}\end{aligned}$$

Hence proved.

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