

Trigonometric Identities Ex 6.1 Q62 Answer:

We have to prove $(\sec A - \csc A)(1 + \tan A + \cot A) = \tan A \sec A - \cot A \csc A$

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

$$(\sec A - \csc A)(1 + \tan A + \cot A) = \left(\frac{1}{\cos A} - \frac{1}{\sin A}\right)\left(1 + \frac{\sin A}{\cos A} + \frac{\cos A}{\sin A}\right)$$

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

$$= \left(\frac{\sin A - \cos A}{\sin A \cos A}\right)\left(\frac{\sin A \cos A + 1}{\sin A \cos A}\right)$$

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

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

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

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

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

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

$$= \frac{\sin^3 A - \cos^3 A}{\sin^2 A \cos^2 A}$$

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

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

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

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

$$= \frac{\sin A}{\cos A} - \cot A \cos A$$

Hence proved.

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Answer:

So,
$$\frac{\cos A \csc A - \sin A \sec A}{\cos A + \sin A} = \frac{\cos A \frac{1}{\sin A} - \sin A \frac{1}{\cos A}}{\cos A + \sin A}$$

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

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

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

$$= \frac{(\cos A - \sin A)(\cos A + \sin A)}{\sin A \cos A (\cos A + \sin A)}$$

$$= \frac{\cos A - \sin A}{\sin A \cos A}$$

$$= \frac{\cos A}{\sin A \cos A} - \frac{\sin A}{\sin A \cos A}$$

$$= \frac{1}{\sin A} - \frac{1}{\cos A}$$

$$= \csc A - \sec A$$

We have to prove $\frac{\cos A \csc A - \sin A \sec A}{\sin A \sec A} = \csc A - \sec A$

Hence proved.

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