

Assignment I (ICSE Class 10 2018 Problem 3b)

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problem 3b

Simplyfying LHS

Prove $\sqrt{\sec^2 \theta + \csc^2 \theta} = (\tan \theta + \cot \theta)$

$$LHS \Rightarrow \sqrt{\sec^2 \theta + \csc^2 \theta} \quad (6)$$

$$\Rightarrow \sqrt{\frac{1}{\sin^2 \theta} + \frac{1}{\cos^2 \theta}} \quad (7)$$

$$\Rightarrow \sqrt{\frac{\sin^2 \theta + \cos^2 \theta}{\sin^2 \theta \times \cos^2 \theta}} \quad (8)$$

$$\Rightarrow \sqrt{\frac{1}{\sin^2 \theta \times \cos^2 \theta}} \quad (9)$$

$$\Rightarrow \sqrt{\sec^2 \theta \times \csc^2 \theta} \quad (10)$$

$$\Rightarrow \sec \theta \times \csc \theta \quad (11)$$

Solution

Let's divide the equation into 2 parts those are LHS and RHS and lets simplyfy both LHS and RHS and find their simplyfied value if both are same then statement is true if not then false

What we know before starting proof are

on simplyfying LHS we got

$$LHS = \sec \theta \times \csc \theta \quad (12)$$

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

$$\sec \theta = \frac{1}{\cos \theta} \quad (2)$$

$$\csc \theta = \frac{1}{\sin \theta} \quad (3)$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \quad (4)$$

$$\cot \theta = \frac{\cos \theta}{\sin \theta} \quad (5)$$

Simplyfying RHS

$$RHS \Rightarrow \tan \theta + \cot \theta \quad (13)$$

$$\Rightarrow \frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} \quad (14)$$

$$\Rightarrow \frac{\sin^2 \theta + \cos^2 \theta}{\sin \theta \times \cos \theta} \quad (15)$$

$$\Rightarrow \frac{1}{\sin \theta \times \cos \theta} \quad (16)$$

$$\Rightarrow \sec \theta \times \csc \theta \quad (17)$$

we may use these equations in simplyfying RHS ans LHS

on simplyfying RHS we got

$$RHS = \sec \theta \times \csc \theta \quad (18)$$

conclusion

based on eq12 and eq18 we will get down
equation $\{when \sec \theta \times \csc \theta > 0\}$

$$LHS = RHS = \sec \theta \times \csc \theta \quad (19)$$

$$\therefore \sqrt{\sec^2 \theta + \csc^2 \theta} = (\tan \theta + \cot \theta)$$

Hence Proved