

Assignment 1

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Q.6(c) [ICSE 2018] : Prove that,

$$(1 + \cot \theta - \csc \theta)(1 + \tan \theta + \sec \theta) = 2$$

Solution :

$$\text{L.H.S.} = (1 + \cot \theta - \csc \theta)(1 + \tan \theta + \sec \theta)$$

(1)

$$= 1 + \cot \theta - \csc \theta + \tan \theta + \tan \theta \cot \theta$$

$$- \tan \theta \csc \theta + \sec \theta + \sec \theta \cot \theta$$

$$- \sec \theta \csc \theta$$

(2)

$$= 2 + \cot \theta - \csc \theta + \tan \theta$$

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

(3)

$$- \sec \theta \csc \theta$$

$$= 2 + \cot \theta - \csc \theta + \tan \theta - \sec \theta$$

(4)

$$+ \sec \theta + \csc \theta - \sec \theta \times \csc \theta$$

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

(5)

$$= 2 + \frac{\cos^2 \theta + \sin^2 \theta}{\sin \theta \times \cos \theta} - \sec \theta \times \csc \theta$$

(6)

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

(7)

$$= 2 + \cancel{\csc \theta \times \sec \theta} - \cancel{\sec \theta \times \csc \theta}$$

(8)

$$= 2$$

(9)

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Value of trigonometric expression at
different values of theta
theta = 0.300000 , expression = 2.000000
theta = 0.600000 , expression = 2.000000
theta = 0.900000 , expression = 2.000000
theta = 1.200000 , expression = 2.000000
theta = 1.500000 , expression = 2.000000
theta = 1.800000 , expression = 2.000000
theta = 2.100000 , expression = 2.000000
theta = 2.400000 , expression = 2.000000
theta = 2.700000 , expression = 2.000000
theta = 3.000000 , expression = 2.000000
theta = 3.300000 , expression = 2.000000
theta = 3.600000 , expression = 2.000000
theta = 3.900000 , expression = 2.000000
theta = 4.200000 , expression = 2.000000
theta = 4.500000 , expression = 2.000000
theta = 4.800000 , expression = 2.000000
theta = 5.100000 , expression = 2.000000
theta = 5.400001 , expression = 2.000000
theta = 5.700001 , expression = 2.000000
theta = 6.000001 , expression = 2.000000
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Fig. 1: Value of trigonometric expression at some values of theta

Output

Below is the output of a C program to verify the trigonometric identity at some values of theta.