Assignment 1

Name : Harshit Pant
Roll Number : CS21BTECH11021

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

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

Solution :

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

$$= 1 + \cot\theta - \csc\theta + \tan\theta + \tan\theta\cot\theta - \tan\theta\csc\theta + \sec\theta + \sec\theta\cot\theta - \sec\theta\csc\theta \tag{2}$$

$$= 2 + \cot\theta - \csc\theta + \tan\theta - \frac{\cancel{\sin\theta}}{\cos\theta}\frac{1}{\cancel{\sin\theta}} + \sec\theta + \frac{1}{\cancel{\cos\theta}}\frac{\cancel{\cos\theta}}{\sin\theta} - \sec\theta\csc\theta \tag{3}$$

$$= 2 + \cot\theta - \cancel{\csc\theta} + \tan\theta - \cancel{\sec\theta} + \cancel{\sec\theta} + \cancel{\csc\theta} - \sec\theta \times \csc\theta \tag{4}$$

$$= 2 + \frac{\cos\theta}{\sin\theta} + \frac{\sin\theta}{\cos\theta} - \sec\theta \times \csc\theta \tag{5}$$

$$= 2 + \frac{\cos^2\theta + \sin^2\theta}{\sin\theta \times \cos\theta} - \sec\theta \times \csc\theta \tag{6}$$

$$= 2 + \frac{1}{\sin\theta \times \cos\theta} - \sec\theta \times \csc\theta \qquad (\because \cos^2\theta + \sin^2\theta = 1) \tag{7}$$

$$= 2 + \cancel{\csc\theta \times \sec\theta} - \cancel{\sec\theta \times \csc\theta} \tag{8}$$

$$= 2 \tag{9}$$

Output

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

```
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
```

Fig. 1: Value of trigonometric expression at some values of theta