

# 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 :**

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

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

$$(1 + \cot \theta - \csc \theta)(1 + \tan \theta + \sec \theta) = 1 + \cot \theta - \csc \theta + \tan \theta + 1 - \frac{\sin \theta}{\cos \theta} \times \frac{1}{\sin \theta} + \sec \theta + \frac{1}{\sec \theta} \times \frac{\cos \theta}{\sin \theta} \\ - \sec \theta \times \csc \theta$$

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

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

$$(1 + \cot \theta - \csc \theta)(1 + \tan \theta + \sec \theta) = 2 + \frac{\cos^2 \theta + \sin^2 \theta}{\sin \theta \times \cos \theta} - \sec \theta \times \csc \theta$$

$$(1 + \cot \theta - \csc \theta)(1 + \tan \theta + \sec \theta) = 2 + \frac{1}{\sin \theta \times \cos \theta} - \sec \theta \times \csc \theta \quad (\because \cos^2 \theta + \sin^2 \theta = 1)$$

$$(1 + \cot \theta - \csc \theta)(1 + \tan \theta + \sec \theta) = 2 + \cancel{\csc \theta \times \sec \theta} - \cancel{\sec \theta \times \csc \theta}$$

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

$$\text{L.H.S} = \text{R.H.S}$$

Hence proved.

**Output**

```
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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