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 :

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

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

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

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

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

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

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

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

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

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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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Hence proved