Question 20

(i)

$$\frac{\sec\theta - 1}{\sec\theta + 1} = \frac{\left(\dfrac{1}{\cos\theta} - 1\right)}{\left(\dfrac{1}{\cos\theta} + 1\right)} = \frac{1 - \cos\theta}{1 + \cos\theta}$$

$$= \frac{(1 - \cos\theta)}{(1 + \cos\theta)} \times \frac{(1 + \cos\theta)}{(1 + \cos\theta)} = \frac{1 - \cos^2\theta}{(1 + \cos\theta)^2}$$

$$= \frac{\sin^2\theta}{(1 + \cos\theta)^2}$$

∴ LHS = RHS

(ii)

$$\text{LHS} = \frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} = \frac{\left(\dfrac{1}{\cos\theta} - \dfrac{\sin\theta}{\cos\theta}\right)}{\left(\dfrac{1}{\cos\theta} + \dfrac{\sin\theta}{\cos\theta}\right)}$$

$$= \frac{(1 - \sin\theta)}{(1 + \sin\theta)}$$

$$= \frac{(1 - \sin\theta)}{(1 + \sin\theta)} \times \frac{(1 + \sin\theta)}{(1 + \sin\theta)} = \frac{1 - \sin^2\theta}{(1 + \sin\theta)^2}$$

$$= \frac{\cos^2\theta}{(1 + \sin\theta)^2} = \text{RHS}$$

∴ LHS = RHS

Question 21

$$\text{LHS} = \frac{\sin\theta}{\cot\theta + \cosec\theta} - \frac{\sin\theta}{\cot\theta - \cosec\theta}$$

$$= \frac{\sin\theta}{\cosec\theta + \cot\theta} + \frac{\sin\theta}{\cosec\theta - \cot\theta}$$

$$= \frac{\sin\theta(\cosec\theta - \cot\theta) + \sin\theta(\cosec\theta + \cot\theta)}{\cosec^2\theta - \cot^2\theta}$$

$$= \sin\theta(\cosec\theta - \cot\theta) + \sin\theta(\cosec\theta + \cot\theta)$$

$$\left[\because 1 + \cot^2\theta = \cosec^2\theta \text{ and } \cosec^2\theta - \cot^2\theta = 1\right]$$

$$= 2\sin\theta\cosec\theta = 2\sin\theta \times \frac{1}{\sin\theta} = 2 = \text{RHS}$$

∴ LHS = RHS

********** END **********