(9) $R.H.S = \sin^2\theta \dfrac{\cos^2\theta}{\sin^2\theta} + \dfrac{\sin^2\theta \cdot \sin^2\theta}{\sin^2\theta}$

$= \dfrac{\sin^2\theta (\cos^2\theta + \sin^2\theta)}{\sin^2\theta} = 1 = L.H.S$

(10) $L.H.S = \dfrac{\cos^2\theta}{\sin^2\theta} \cdot \sin^2\theta$

$= \cos^2\theta = 1 - \sin^2\theta = R.H.S$

(11) $L.H.S = \csc^2\theta = \dfrac{1}{\sin^2\theta}$

$R.H.S = \dfrac{1}{\tan^2\theta} \cdot \dfrac{1}{\cos^2\theta} = \dfrac{1}{\sin^2\theta}$ $\therefore LHS = RHS$

(12) $L.H.S = \left(\dfrac{1}{\cos\theta} - 1\right)\left(\dfrac{1}{\sin\theta} + \dfrac{1}{\tan\theta}\right)$

$= \dfrac{1}{\cos\theta\sin\theta} + \dfrac{1}{\cos\theta\tan\theta} - \dfrac{1}{\sin\theta} - \dfrac{1}{\tan\theta}$

$= \dfrac{\cos^2\theta + \sin^2\theta}{\cos\theta\sin\theta} + \dfrac{1}{\sin\theta} - \dfrac{1}{\sin\theta} - \dfrac{1}{\tan\theta}$

$= \dfrac{\cos^2\theta}{\cos\theta\sin\theta} + \dfrac{\sin^2\theta}{\cos\theta\sin\theta} - \dfrac{1}{\tan\theta}$

$= \dfrac{\cos\theta}{\sin\theta} + \dfrac{\sin\theta}{\cos\theta} - \dfrac{1}{\tan\theta}$

$= \dfrac{1}{\tan\theta} + \tan\theta - \dfrac{1}{\tan\theta} = \tan\theta = R.H.S$

(13) $L.H.S = (\tan^2\theta + 1)(\tan^2\theta - 1) = \sec^2\theta \cdot (\tan^2\theta - 1)$

$R.H.S = (\tan^2\theta - 1) \cdot \sec^2\theta = L.H.S$

(14)

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

$$= \frac{1}{\cos^2\theta} + \tan^2\theta + 2\tan\theta \cdot \frac{1}{\cos\theta}$$

$$= \sec^2\theta + \tan^2\theta + 2\tan\theta\sec\theta$$

$$= (\tan^2\theta+1) + \tan^2\theta + 2\tan\theta\sec\theta$$

$$= 2\tan^2\theta + 1 + 2\tan\theta\sec\theta = R.H.S$$

(15)

$$\frac{1+\sin\theta}{1-\sin\theta} = 2\tan^2\theta + 1 + 2\tan\theta\sec\theta \quad (\text{proved in Q.14})$$

$$= 2\tan^2\theta + (\sec^2\theta - \tan^2\theta) + 2\tan\theta\sec\theta$$

$$= \tan^2\theta + \sec^2\theta + 2\tan\theta\sec\theta$$

$$= (\tan\theta + \sec\theta)^2 = R.H.S.$$

(16)

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

$$R.H.S = 1 - \frac{2}{\sin^2\theta} - \frac{2\cos\theta}{\sin\theta} \cdot \frac{1}{\sin\theta}$$

$$= 1 - \frac{2}{\sin^2\theta} - \frac{2\cos\theta}{\sin^2\theta}$$

$$= \frac{\sin^2\theta - 2 - 2\cos\theta}{\sin^2\theta} = \frac{1-\cos^2\theta-2-2\cos\theta}{1-\cos^2\theta}$$

$$= \frac{-\cos^2\theta - 1 - 2\cos\theta}{1-\cos^2\theta} = \frac{\cos^2\theta + 1 + 2\cos\theta}{\cos^2\theta - 1} = L.H.S$$