



Exercise 7A

Question 7

$$\begin{aligned}
 \text{LHS} &= \frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} \\
 &= \frac{\sin \theta(1 - \cos \theta)}{(1 + \cos \theta)(1 - \cos \theta)} + \frac{1 + \cos \theta}{\sin \theta} \\
 &= \frac{\sin \theta(1 - \cos \theta)}{1 - \cos^2 \theta} + \frac{1 + \cos \theta}{\sin \theta} \\
 &= \frac{\sin \theta(1 - \cos \theta)}{\sin^2 \theta} + \frac{1 + \cos \theta}{\sin \theta} = \frac{(1 - \cos \theta)}{\sin \theta} + \frac{1 + \cos \theta}{\sin \theta} \\
 &= \frac{1 - \cos \theta + 1 + \cos \theta}{\sin \theta} = \frac{2}{\sin \theta} = 2 \operatorname{cosec} \theta = \text{RHS}
 \end{aligned}$$

$$\therefore \text{LHS} = \text{RHS}$$

Question 8

$$\begin{aligned}
 \text{LHS} &= \frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} \\
 &= \frac{\frac{\sin \theta}{\cos \theta}}{1 - \frac{\cos \theta}{\sin \theta}} + \frac{\frac{\cos \theta}{\sin \theta}}{1 - \frac{\sin \theta}{\cos \theta}} \\
 &\quad \left[\because \tan \theta = \frac{\sin \theta}{\cos \theta}, \cot \theta = \frac{\cos \theta}{\sin \theta} \right] \\
 &= \frac{\frac{\sin^2 \theta}{\cos \theta}}{\frac{\sin \theta - \cos \theta}{\sin \theta}} + \frac{\frac{\cos^2 \theta}{\sin \theta}}{\frac{\cos \theta - \sin \theta}{\cos \theta}} \\
 &= \frac{\sin^2 \theta}{\cos \theta(\sin \theta - \cos \theta)} - \frac{\cos^2 \theta}{\sin \theta(\sin \theta - \cos \theta)} \\
 &= \frac{\sin^3 \theta - \cos^3 \theta}{\sin \theta \cos \theta(\sin \theta - \cos \theta)} \\
 &= \frac{(\sin \theta - \cos \theta)(\sin^2 \theta + \sin \theta \cos \theta + \cos^2 \theta)}{(\sin \theta - \cos \theta) \sin \theta \cos \theta} \\
 &\quad \left[\because a^3 - b^3 = (a - b)(a^2 + ab + b^2) \right] \\
 &= \frac{1 + \sin \theta \cos \theta}{\sin \theta \cos \theta} \\
 &= \frac{1}{\sin \theta \cos \theta} + 1 = 1 + \sec \theta \operatorname{cosec} \theta = \text{RHS}
 \end{aligned}$$

$$\therefore \text{LHS} = \text{RHS}$$

***** END *****

