



Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q 6

LHS,

$$\begin{aligned}
 & \frac{\sin \theta + \sin 2\theta}{1 + \cos \theta + \cos 2\theta} \\
 &= \frac{\sin \theta + 2 \sin \theta \cdot \cos \theta}{\cos \theta + (1 + \cos 2\theta)} \\
 &= \frac{\sin \theta (1 + 2 \cos \theta)}{\cos \theta + 2 \cos^2 \theta} \\
 &= \frac{\sin \theta (1 + 2 \cos \theta)}{\cos \theta (1 + 2 \cos \theta)} \\
 &= \frac{\sin \theta}{\cos \theta} \\
 &= \tan \theta \\
 &= \text{RHS}
 \end{aligned}$$

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q 7

LHS,

$$\begin{aligned}
 & \frac{\cos 2\theta}{1 + \sin 2\theta} \\
 &= \frac{\cos^2 \theta - \sin^2 \theta}{\sin^2 \theta + \cos^2 \theta + 2 \sin \theta \cos \theta} \quad \left[\begin{array}{l} \because \cos 2\theta = \cos^2 \theta - \sin^2 \theta \\ \& \sin^2 \theta + \cos^2 \theta = 1 \end{array} \right] \\
 &= \frac{(\cos \theta - \sin \theta)(\cos \theta + \sin \theta)}{(\cos \theta + \sin \theta)^2} \quad \left[\because a^2 - b^2 = (a + b)(a - b) \right] \\
 &= \frac{\cos \theta - \sin \theta}{\cos \theta + \sin \theta}
 \end{aligned}$$

Dividing numerator and denominator by $\cos \theta$

$$\begin{aligned}
 &= \frac{1 - \tan \theta}{1 + \tan \theta} \\
 &= \tan \left(\frac{\pi}{4} - \theta \right) = \text{RHS}
 \end{aligned}$$

$$\begin{aligned}
 \text{Note: } \tan \left(\frac{\pi}{4} - \theta \right) &= \frac{\tan \frac{\pi}{4} - \tan \theta}{1 + \tan \frac{\pi}{4} \tan \theta} \\
 &= \frac{1 - \tan \theta}{1 + \tan \theta}
 \end{aligned}$$

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q 8

$$\begin{aligned}
& \frac{\cos \theta}{1 - \sin \theta} \\
&= \frac{\cos^2 \frac{\theta}{2} - \sin^2 \frac{\theta}{2}}{\sin^2 \frac{\theta}{2} + \cos^2 \frac{\theta}{2} - 2 \sin \frac{\theta}{2} \cos \frac{\theta}{2}} \quad \left[\because \cos 2A = \cos^2 A - \sin^2 A \text{ \& } \right. \\
&\quad \left. \sin^2 A + \cos^2 A = 1 \right] \\
&= \frac{(\cos \frac{\theta}{2} - \sin \frac{\theta}{2})(\cos \frac{\theta}{2} + \sin \frac{\theta}{2})}{(\cos \frac{\theta}{2} - \sin \frac{\theta}{2})^2} \\
&= \frac{\cos \frac{\theta}{2} + \sin \frac{\theta}{2}}{\cos \frac{\theta}{2} - \sin \frac{\theta}{2}}
\end{aligned}$$

Dividing numerator and denominator by $\cos \frac{\theta}{2}$

$$\begin{aligned}
&= \frac{1 + \tan \frac{\theta}{2}}{1 - \tan \frac{\theta}{2}} \\
&= \tan \left(\frac{\pi}{4} + \frac{\theta}{2} \right) = \text{RHS}
\end{aligned}$$

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q 9

LHS,

$$\begin{aligned}
& \cos^2 \frac{\pi}{8} + \cos^2 \frac{3\pi}{8} + \cos^2 \frac{5\pi}{8} + \cos^2 \frac{7\pi}{8} \\
&= \cos^2 \frac{\pi}{8} + \cos^2 \frac{3\pi}{8} + \cos^2 \left(\pi - \frac{3\pi}{8} \right) + \cos^2 \left(\pi - \frac{\pi}{8} \right) \\
&= \cos^2 \frac{\pi}{8} + \cos^2 \frac{3\pi}{8} + \cos^2 \frac{3\pi}{8} + \cos^2 \frac{\pi}{8} \\
&= 2 \left(\cos^2 \frac{\pi}{8} + \cos^2 \frac{3\pi}{8} \right) \\
&= 2 \left(\cos^2 \frac{\pi}{8} + \cos^2 \left(\frac{\pi}{2} - \frac{\pi}{8} \right) \right) \\
&= 2 \left(\cos^2 \frac{\pi}{8} + \sin^2 \frac{\pi}{8} \right) \\
&= 2 \\
&= \text{RHS}
\end{aligned}$$

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q 10

LHS,

$$\sin^2 \frac{\pi}{8} + \sin^2 \frac{3\pi}{8} + \sin^2 \frac{5\pi}{8} + \sin^2 \frac{7\pi}{8}$$

$$= \sin^2 \frac{\pi}{8} + \sin^2 \left(\frac{\pi}{2} - \frac{\pi}{8} \right) + \sin^2 \frac{5\pi}{8} + \sin^2 \left(\pi - \frac{\pi}{8} \right)$$

$$= \sin^2 \frac{\pi}{8} + \cos^2 \frac{\pi}{8} + \sin^2 \left(\pi - \frac{3\pi}{8} \right) + \sin^2 \frac{\pi}{8}$$

$$= 1 + \sin^2 \frac{3\pi}{8} + \sin^2 \frac{\pi}{8}$$

$$= 1 + \sin^2 \left(\frac{\pi}{2} - \frac{\pi}{8} \right) + \sin^2 \frac{\pi}{8}$$

$$= 1 + \cos^2 \frac{\pi}{8} + \sin^2 \frac{\pi}{8}$$

$$= 1 + 1$$

$$= 2$$

$$= \text{RHS}$$

***** END *****