



Transformation Formulae Ex 8.1 Q1

$$\begin{aligned}
 \text{(i)} \quad & 2 \sin 3\theta \cos \theta \\
 &= \sin(3\theta + \theta) + \sin(3\theta - \theta) \quad [\because 2 \sin A \cos B = \sin(A + B) + \sin(A - B)] \\
 &= \sin 4\theta + \sin 2\theta
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad & 2 \cos 3\theta \sin 2\theta \\
 \because \quad & 2 \cos A \sin B = \sin(A + B) - \sin(A - B) \\
 \Rightarrow \quad & 2 \cos 3\theta \sin 2\theta = \sin(3\theta + 2\theta) - \sin(3\theta - 2\theta) \\
 = \quad & \sin 5\theta - \sin \theta
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad & 2 \sin 4\theta \sin 3\theta \\
 \because \quad & 2 \sin A \sin B = \cos(A - B) - \cos(A + B) \\
 \Rightarrow \quad & 2 \sin 4\theta \sin 3\theta = \cos(4\theta - 3\theta) - \cos(4\theta + 3\theta) \\
 = \quad & \cos \theta - \cos 7\theta
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv)} \quad & 2 \cos 7\theta \cos 3\theta \\
 \because \quad & 2 \cos A \cos B = \cos(A + B) + \cos(A - B) \\
 \Rightarrow \quad & 2 \cos 7\theta \cos 3\theta = \cos(7\theta + 3\theta) + \cos(7\theta - 3\theta) \\
 = \quad & \cos 10\theta + \cos 4\theta
 \end{aligned}$$

Transformation Formulae Ex 8.1 Q2

$$\begin{aligned}
 \text{(i)} \quad & 2 \sin \frac{5\pi}{12} \sin \frac{\pi}{12} \\
 \because \quad & 2 \sin A \sin B = \cos(A - B) - \cos(A + B) \\
 \Rightarrow \quad & 2 \sin \frac{5\pi}{12} \sin \frac{\pi}{12} = \cos\left(\frac{5\pi}{12} - \frac{\pi}{12}\right) - \cos\left(\frac{5\pi}{12} + \frac{\pi}{12}\right) \\
 &= \cos\left(\frac{4\pi}{12}\right) - \cos\left(\frac{6\pi}{12}\right) \\
 &= \cos\left(\frac{\pi}{3}\right) - \cos\left(\frac{\pi}{2}\right) \\
 &= \frac{1}{2} - 0 = \frac{1}{2} = \text{RHS}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad & 2 \cos \frac{5\pi}{12} \cos \frac{\pi}{12} = \frac{1}{2} \\
 \because \quad & 2 \cos A \cos B = \cos(A + B) + \cos(A - B) \\
 &= \cos\left(\frac{5\pi}{12} + \frac{\pi}{12}\right) + \cos\left(\frac{5\pi}{12} - \frac{\pi}{12}\right) \\
 &= \cos\left(\frac{\pi}{2}\right) + \cos\left(\frac{\pi}{3}\right) \\
 &= 0 + \frac{1}{2} = \frac{1}{2} = \text{RHS}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad & 2 \sin \frac{5\pi}{12} \cos \frac{\pi}{12} \\
 \because \quad & 2 \sin A \cos B = \sin(A + B) + \sin(A - B) \\
 &= \sin\left(\frac{5\pi}{12} + \frac{\pi}{12}\right) + \sin\left(\frac{5\pi}{12} - \frac{\pi}{12}\right) \\
 &= \sin \frac{\pi}{2} + \sin \frac{\pi}{3} \\
 &= 1 + \frac{\sqrt{3}}{2} = \frac{2 + \sqrt{3}}{2} = \text{RHS (Taking LCM)}
 \end{aligned}$$

Transformation Formulae Ex 8.1 Q3(i)

$$\sin 50^\circ \cos 85^\circ = \frac{1 - \sqrt{2} \sin 35^\circ}{2\sqrt{2}}$$

$$\text{LHS} = \sin 50^\circ \cos 85^\circ = \frac{2 \sin 50^\circ \cos 85^\circ}{2}$$

$$\therefore 2 \sin A \cos B = \sin(A + B) + \sin(A - B)$$

$$\begin{aligned} \Rightarrow \frac{2 \sin 50^\circ \cos 85^\circ}{2} &= \frac{1}{2} [\sin(50^\circ + 85^\circ) + \sin(50^\circ - 85^\circ)] \\ &= \frac{1}{2} [\sin 135^\circ + \sin(-35^\circ)] \\ &= \frac{1}{2} [\sin(90^\circ + 45^\circ) - \sin 35^\circ] && [\because \sin(-\theta) = -\sin \theta] \\ &= \frac{1}{2} [\cos 45^\circ - \sin 35^\circ] && [\because \sin(90^\circ + \theta) = \cos \theta] \end{aligned}$$

Now,

$$\begin{aligned} \cos 45^\circ &= \frac{1}{\sqrt{2}} \\ &= \frac{1}{2} \left[\frac{1}{\sqrt{2}} - \sin 35^\circ \right] \\ &= \frac{1 - \sqrt{2} \sin 35^\circ}{2\sqrt{2}} \end{aligned}$$

Transformation Formulae Ex 8.1 Q3(ii)

$$\begin{aligned} \text{LHS} &= \sin 25^\circ \cos 115^\circ \\ &= \frac{2 \sin 25^\circ \cos 115^\circ}{2} \end{aligned}$$

We Know that

$$\begin{aligned} 2 \sin A \cos B &= \sin(A + B) + \sin(A - B) \\ &= \frac{1}{2} [\sin(25^\circ + 115^\circ) + \sin(25^\circ - 115^\circ)] \\ &= \frac{1}{2} [\sin 140^\circ + \sin(-90^\circ)] \\ &\sin(-\theta) = -\sin \theta \end{aligned}$$

$$\text{And, } \sin(90^\circ + \theta) = \cos \theta$$

$$\begin{aligned} \Rightarrow \frac{1}{2} [\sin(90^\circ + 50^\circ) - \sin 90^\circ] \\ &= \frac{1}{2} [\cos 50^\circ - 1] \end{aligned}$$

Also,

$$\begin{aligned} \cos \theta &= \sin(90^\circ - \theta) \\ \cos 50^\circ &= \sin(90^\circ - 50^\circ) = \sin 40^\circ \\ &\frac{1}{2} [\sin 40^\circ - 1] \end{aligned}$$

Transformation Formulae Ex 8.1 Q4.

We have,

$$\begin{aligned}\text{LHS} &= 4 \cos \theta \cos \left(\frac{\pi}{3} + \theta \right) \cos \left(\frac{\pi}{3} - \theta \right) \\&= 2 \cos \theta \left[2 \cos \left(\frac{\pi}{3} + \theta \right) \cos \left(\frac{\pi}{3} - \theta \right) \right] \\&= 2 \cos \theta \left[2 \cos \left(\frac{\pi}{3} + \theta + \frac{\pi}{3} - \theta \right) + \cos \left(\frac{\pi}{3} + \theta - \frac{\pi}{3} + \theta \right) \right] \\&= 2 \cos \theta \left[\cos \frac{2\pi}{3} + \cos 2\theta \right] \\&= 2 \cos \theta \left[\cos \left(\frac{\pi}{2} + \frac{\pi}{6} \right) + \cos 2\theta \right] \\&= 2 \cos \theta \left[-\sin \frac{\pi}{6} + \cos 2\theta \right] \\&= 2 \cos \theta \left[-\frac{1}{2} + \cos 2\theta \right] \\&= -2 \cos \theta \times \frac{1}{2} + 2 \cos \theta \cos 2\theta \\&= -\cos \theta + [\cos (\theta + 2\theta) + \cos (2\theta - \theta)] \\&= -\cos \theta + \cos 3\theta + \cos \theta \\&= \cos 3\theta \\&= \text{RHS}\end{aligned}$$

\therefore LHS = RHS Hence proved.

***** END *****