



Transformation Formulae Ex 8.2 Q 7(i)

We have,

$$\begin{aligned}
 \text{LHS} &= \frac{\sin A + \sin 3A}{\cos A - \cos 3A} \\
 &= \frac{2 \sin \left(\frac{A+3A}{2} \right) \cos \left(\frac{A-3A}{2} \right)}{-2 \sin \left(\frac{A+3A}{2} \right) \sin \left(\frac{A-3A}{2} \right)} \\
 &= \frac{-\sin 2A \times \cos(-A)}{\sin 2A \sin(-A)} \\
 &= \frac{-\cos(-A)}{\sin(-A)} \\
 &= \frac{-\cos A}{-\sin A} & [\because \cos(-\theta) = \cos \theta \text{ and } \sin(-\theta) = -\sin \theta] \\
 &= \frac{\cos A}{\sin A} \\
 &= \cot A \\
 &= \text{RHS}
 \end{aligned}$$

$$\therefore \frac{\sin A + \sin 3A}{\cos A - \cos 3A} = \cot A. \quad \text{Hence proved.}$$

Transformation Formulae Ex 8.2 Q 7(ii)

We have,

$$\begin{aligned}
 \text{LHS} &= \frac{\sin 9A - \sin 7A}{\cos 7A - \cos 9A} \\
 &= \frac{2 \sin \left(\frac{9A-7A}{2} \right) \cos \left(\frac{9A+7A}{2} \right)}{-2 \sin \left(\frac{7A+9A}{2} \right) \sin \left(\frac{7A-9A}{2} \right)} \\
 &= \frac{-\sin A \cos 8A}{\sin 8A \sin(-A)} \\
 &= \frac{-\sin A \cos 8A}{-\sin A \times \sin 8A} & [\because \sin(-\theta) = -\sin \theta] \\
 &= \frac{\cos 8A}{\sin 8A} \\
 &= \cot 8A \\
 &= \text{RHS}
 \end{aligned}$$

$$\therefore \frac{\sin 9A - \sin 7A}{\cos 7A - \cos 9A} = \cot 8A. \quad \text{Hence proved.}$$

Transformation Formulae Ex 8.2 Q 7(iii)

We have,

$$\begin{aligned}
 \text{LHS} &= \frac{\sin A - \sin B}{\cos A + \cos B} \\
 &= \frac{2 \cos \left(\frac{A+B}{2} \right) \sin \left(\frac{A-B}{2} \right)}{2 \cos \left(\frac{A+B}{2} \right) \cos \left(\frac{A-B}{2} \right)} \\
 &= \frac{\sin \left(\frac{A-B}{2} \right)}{\cos \left(\frac{A-B}{2} \right)} \\
 &= \tan \left(\frac{A-B}{2} \right) \\
 &= \text{RHS}
 \end{aligned}$$

$$\therefore \frac{\sin A - \sin B}{\cos A + \cos B} = \tan \left(\frac{A-B}{2} \right). \quad \text{Hence proved.}$$

Transformation Formulae Ex 8.2 Q7(iv)

We have,

$$\begin{aligned}
 \text{LHS} &= \frac{\sin A + \sin B}{\sin A - \sin B} \\
 &= \frac{2 \sin \left(\frac{A+B}{2} \right) \cos \left(\frac{A-B}{2} \right)}{2 \sin \left(\frac{A-B}{2} \right) \cos \left(\frac{A+B}{2} \right)} \\
 &= \frac{\sin \left(\frac{A+B}{2} \right) \cos \left(\frac{A-B}{2} \right)}{\cos \left(\frac{A+B}{2} \right) \sin \left(\frac{A-B}{2} \right)} \\
 &= \tan \left(\frac{A+B}{2} \right) \cot \left(\frac{A-B}{2} \right) \\
 &= \text{RHS}
 \end{aligned}$$

$$\therefore \frac{\sin A + \sin B}{\sin A - \sin B} = \tan \left(\frac{A+B}{2} \right) \cot \left(\frac{A-B}{2} \right). \quad \text{Hence proved.}$$

Transformation Formulae Ex 8.2 Q 7(v)

We have,

$$\begin{aligned}
 \text{LHS} &= \frac{\cos A + \cos B}{\cos B - \cos A} \\
 &= \frac{2 \cos \left(\frac{A+B}{2} \right) \cos \left(\frac{A-B}{2} \right)}{-2 \sin \left(\frac{B+A}{2} \right) \sin \left(\frac{B-A}{2} \right)} \\
 &= \frac{-\cos \left(\frac{A+B}{2} \right) \cos \left(\frac{A-B}{2} \right)}{\sin \left(\frac{A+B}{2} \right) \sin \left(\frac{B-A}{2} \right)} \quad [\because \sin(-\theta) = -\sin \theta] \\
 &= \frac{-\cos \left(\frac{A+B}{2} \right) \cos \left(\frac{A-B}{2} \right)}{-\sin \left(\frac{A+B}{2} \right) \sin \left(\frac{A-B}{2} \right)} \\
 &= \cot \left(\frac{A+B}{2} \right) \cot \left(\frac{A-B}{2} \right) \\
 &= \text{RHS}
 \end{aligned}$$

$$\therefore \frac{\cos A + \cos B}{\cos B - \cos A} = \cot \left(\frac{A+B}{2} \right) \cot \left(\frac{A-B}{2} \right). \quad \text{Hence proved.}$$

***** END *****

