



Chapter 5 Trigonometric Functions Ex 5.3 Q 2.i

$$\begin{aligned}
 \text{LHS} &= \tan 225^\circ \cot 405^\circ + \tan 765^\circ \cot 675^\circ \\
 &= \tan \left(\pi + \frac{\pi}{4} \right) \cot \left(2\pi + \frac{\pi}{4} \right) + \tan \left(4\pi + \frac{\pi}{4} \right) \cot \left(4\pi - \frac{\pi}{4} \right) \\
 &= \tan \frac{\pi}{4} \cdot \cot \frac{\pi}{4} + \tan \frac{\pi}{4} \times \left(-\cot \frac{\pi}{4} \right) \quad \left(\because \cot \left(4\pi - \frac{\pi}{4} \right) = -\cot \frac{\pi}{4} \right) \\
 &= 1 \cdot 1 + 1 \cdot (-1) \\
 &= 0 \\
 &= \text{RHS} \\
 &\quad \text{Proved}
 \end{aligned}$$

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$$\begin{aligned}
 \text{LHS} &= \sin \frac{8\pi}{3} \cos \frac{23\pi}{6} + \cos \frac{13\pi}{3} \sin \frac{35\pi}{6} \\
 &= \sin \left(3\pi - \frac{\pi}{3} \right) \cos \left(4\pi - \frac{\pi}{6} \right) + \cos \left(4\pi + \frac{\pi}{3} \right) \sin \left(6\pi - \frac{\pi}{6} \right) \\
 &= \sin \frac{\pi}{3} \cos \frac{\pi}{6} + \cos \frac{\pi}{3} \left(-\sin \frac{\pi}{6} \right) \quad \left(\because \sin(6\pi - \theta) = -\sin \theta \right) \\
 &= \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} + \frac{1}{2} \times \left(-\frac{1}{2} \right) \\
 &= \frac{3}{4} - \frac{1}{4} \\
 &= \frac{2}{4} \\
 &= \frac{1}{2} \\
 &= \text{RHS} \\
 &\quad \text{Proved}
 \end{aligned}$$

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$$\begin{aligned}
 \text{LHS} &= \cos 24^\circ + \cos 55^\circ + \cos 125^\circ + \cos 204^\circ + \cos 300^\circ \\
 &= \cos 24^\circ + \cos 204^\circ + \cos 55^\circ + \cos 125^\circ + \cos 300^\circ \\
 &= \cos 24^\circ + \cos (\pi + 24^\circ) + \cos 55^\circ + \cos \left(\pi - 55^\circ \right) + \cos \left(2\pi - \frac{\pi}{3} \right) \\
 &= \cos 24^\circ - \cos 24^\circ + \cos 55^\circ - \cos 55^\circ + \cos \frac{\pi}{3} \\
 &= \cos \frac{\pi}{3} \\
 &= \frac{1}{2} \\
 &= \text{RHS} \\
 &\quad \text{Proved}
 \end{aligned}$$

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$$\begin{aligned}
 \text{LHS} &= \tan \{-225^\circ\} \cot \{-405^\circ\} - \tan \{-765^\circ\} \cot \{675^\circ\} \\
 &= -\tan 225^\circ \{-\cot 405^\circ\} + \tan 765^\circ \cot 765^\circ \quad \left(\begin{array}{l} \because \tan(-\theta) = -\tan \theta \\ \& \cot(-\theta) = -\cot \theta \end{array} \right) \\
 &= \tan \left(\pi + \frac{\pi}{4} \right) \cot \left(2\pi + \frac{\pi}{4} \right) + \tan \left(4\pi + \frac{\pi}{4} \right) \cot \left(4\pi - \frac{\pi}{4} \right) \\
 &= \tan \frac{\pi}{4} \cot \frac{\pi}{4} + \tan \frac{\pi}{4} \times \left(-\cot \frac{\pi}{4} \right) \quad \left(\because \cot(4\pi - \theta) = -\cot \theta \right) \\
 &= 1 \cdot 1 + 1 \cdot (-1) \\
 &= 1 - 1 \\
 &= 0 \\
 &= \text{RHS} \\
 &\quad \text{Proved}
 \end{aligned}$$

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$$\begin{aligned}
\text{LHS} &= \cos 570^\circ \sin 510^\circ + \sin(-330^\circ) \cos(-390^\circ) \\
&= \cos\left(3\pi + \frac{\pi}{6}\right) \sin\left(3\pi - \frac{\pi}{6}\right) - \sin 330^\circ \cos 390^\circ & \left(\begin{array}{l} \because \sin(-\theta) = -\sin \theta \text{ and} \\ \cos(-\theta) = \cos \theta \end{array} \right) \\
&= -\cos \frac{\pi}{6} \sin \frac{\pi}{6} - \sin\left(2\pi - \frac{\pi}{6}\right) \cos\left(2\pi + \frac{\pi}{6}\right) \\
&= -\sin \frac{\pi}{6} \cos \frac{\pi}{6} + \sin \frac{\pi}{6} \cdot \cos \frac{\pi}{6} & (\because \sin(2\pi - \theta) = -\sin \theta) \\
&= 0 \\
&= \text{RHS} \\
&\text{Proved}
\end{aligned}$$

Chapter 5 Trigonometric Functions Ex 5.3 Q 2.vi

$$\begin{aligned}
\text{LHS} &= \tan \frac{11\pi}{3} - 2 \sin \frac{4\pi}{6} - \frac{3}{4} \cos^2 \frac{\pi}{4} + 4 \cos^2 \frac{17\pi}{6} \\
&= \tan\left(4\pi - \frac{\pi}{3}\right) - 2 \sin \frac{2\pi}{3} - \frac{3}{4} \times (\sqrt{2})^2 + 4 \cos^2\left(3\pi - \frac{\pi}{6}\right) \\
&= -\tan \frac{\pi}{3} - 2 \sin\left(\pi - \frac{\pi}{3}\right) - \frac{3}{4} \times 2 + 4 \cos^2 \frac{\pi}{6} \\
&\quad \left(\because \tan\left(4\pi - \frac{\pi}{3}\right) = -\tan \frac{\pi}{3}, \cos\left(3\pi - \frac{\pi}{6}\right) = -\cos \frac{\pi}{6} \right) \\
&= -\sqrt{3} - 2 \sin \frac{\pi}{3} - \frac{3}{2} + 4 \times \left(\frac{\sqrt{3}}{2}\right)^2 \\
&= -\sqrt{3} - 2 \times \frac{\sqrt{3}}{2} - \frac{3}{2} + 4 \times \frac{3}{4} \\
&= -\sqrt{3} - \sqrt{3} - \frac{3}{2} + 3 \\
&= -2\sqrt{3} - \frac{3+6}{2} \\
&= -2\sqrt{3} + \frac{3}{2} \\
&= \frac{3-4\sqrt{3}}{2} \\
&= \text{RHS} \\
&\text{Proved}
\end{aligned}$$

Chapter 5 Trigonometric Functions Ex 5.3 Q 2.vii

$$\begin{aligned}
\text{LHS} &= 3 \sin \frac{\pi}{6} \sec \frac{\pi}{3} - 4 \sin \frac{5\pi}{6} \cot \frac{\pi}{4} \\
&= 3 \times \frac{1}{2} \times 2 - 4 \sin\left(\pi - \frac{\pi}{6}\right) \times 1 \\
&= 3 - 4 \sin \frac{\pi}{6} & (\because \sin(\pi - \theta) = \sin \theta) \\
&= 3 - 4 \times \frac{1}{2} \\
&= 3 - 2 \\
&= 1 \\
&= \text{RHS} \\
&\text{Proved}
\end{aligned}$$

***** END *****