



Chapter 5 Trigonometric Functions Ex 5.3 Q 3.i

$$\begin{aligned} \text{LHS} &= \frac{\cos(2\pi + \theta) \operatorname{cosec}(2\pi + \theta) \tan\left(\frac{\pi}{2} + \theta\right)}{\sec\left(\frac{\pi}{2} + \theta\right) \cos \theta \cot(\pi + \theta)} \\ &= \frac{\cos \theta \times \operatorname{cosec} \theta (-\cot \theta)}{-\operatorname{cosec} \theta \cdot \cos \theta \cot \theta} \quad \left( \begin{array}{l} \because \tan\left(\frac{\pi}{2} + \theta\right) = -\cot \theta \\ \& \sec\left(\frac{\pi}{2} + \theta\right) = -\operatorname{cosec} \theta \end{array} \right) \\ &= 1 \\ &= \text{RHS} \\ &\quad \text{Proved} \end{aligned}$$

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$$\begin{aligned} \text{LHS} &= \frac{\operatorname{cosec}(90^\circ + \theta) + \cot(450^\circ + \theta)}{\operatorname{cosec}(90^\circ - \theta) + \tan(180^\circ - \theta)} + \frac{\tan(180^\circ + \theta) + \sec(180^\circ - \theta)}{\tan(360^\circ + \theta) - \sec(-\theta)} \\ &= \frac{\sec \theta + \cot\left(2\pi + \frac{\pi}{2} + \theta\right)}{\sec \theta - \tan \theta} + \frac{\tan \theta - \sec \theta}{\tan \theta - \sec \theta} \\ &\quad \left( \because \operatorname{cosec}(90^\circ + \theta) = \sec \theta, \operatorname{cosec}(90^\circ - \theta) = \sec \theta, \tan(180^\circ - \theta) = -\tan \theta, \sec(-\theta) = \sec \theta \right) \\ &= \frac{\sec \theta + \cot\left(\frac{\pi}{2} + \theta\right)}{\sec \theta - \tan \theta} + 1 \quad \left( \because \cot(2\pi + \theta) = \cot \theta \right) \\ &= \frac{\sec \theta - \tan \theta}{\sec \theta - \tan \theta} + 1 \quad \left( \because \cot\left(\frac{\pi}{2} + \theta\right) = -\tan \theta \right) \\ &= 1 + 1 \\ &= 2 \\ &= \text{RHS} \\ &\quad \text{Proved} \end{aligned}$$

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$$\begin{aligned} \text{LHS} &= \frac{\sin(180^\circ + \theta) \cos(90^\circ + \theta) \tan(270^\circ - \theta) \cot(360^\circ - \theta)}{\sin(360^\circ - \theta) \cos(360^\circ + \theta) \operatorname{cosec}(-\theta) \sin(270^\circ + \theta)} \\ &= \frac{\sin \theta (-\sin \theta) \cot \theta (-\cot \theta)}{-\sin \theta \cos \theta (-\operatorname{cosec} \theta) (-\cos \theta)} \quad \left( \begin{array}{l} \because \tan(270^\circ - \theta) = \cot \theta \\ \& \sin(270^\circ + \theta) = -\cos \theta \end{array} \right) \\ &= \frac{-\sin \theta \times \sin \theta \times \cos \theta \times \cos \theta \times \sin \theta}{-\sin \theta \times \cos \theta \times \sin \theta \times \sin \theta \times \cos \theta} \quad \left( \begin{array}{l} \because \cot \theta = \frac{\cos \theta}{\sin \theta} \\ \& \operatorname{cosec} \theta = \frac{1}{\sin \theta} \end{array} \right) \\ &= 1 \\ &= \text{RHS} \\ &\quad \text{Proved} \end{aligned}$$

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$$\begin{aligned}
\text{LHS} &= \left\{ 1 + \cot \theta - \sec \left( \frac{\pi}{2} + \theta \right) \right\} \left\{ 1 + \cot \theta + \sec \left( \frac{\pi}{2} + \theta \right) \right\} \\
&= \left\{ 1 + \cot \theta - (-\operatorname{cosec} \theta) \right\} \left\{ 1 + \cot \theta - \operatorname{cosec} \theta \right\} \\
&\quad \left( \because \sec \left( \frac{\pi}{2} + \theta \right) = -\operatorname{cosec} \theta \right) \\
&= \{ (1 + \cot \theta) + \operatorname{cosec} \theta \} \{ (1 + \cot \theta) - \operatorname{cosec} \theta \} \\
&= (1 + \cot \theta)^2 - \operatorname{cosec}^2 \theta \\
&= 1 + \cot^2 \theta + 2 \cot \theta - \operatorname{cosec}^2 \theta \\
&= \operatorname{cosec}^2 \theta + 2 \cot \theta - \operatorname{cosec}^2 \theta \quad \left( \because 1 + \cot^2 \theta = \operatorname{cosec}^2 \theta \right) \\
&= 2 \cot \theta \\
&= \text{RHS} \\
&\quad \text{Proved}
\end{aligned}$$

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$$\begin{aligned}
\text{LHS} &= \frac{\tan (90^\circ - \theta) \sec (180^\circ - \theta) \sin (-\theta)}{\sin (180^\circ + \theta) \cot (360^\circ - \theta) \operatorname{cosec} (90^\circ - \theta)} \\
&= \frac{\cot \theta \times (-\sec \theta) \times (-\sin \theta)}{-\sin \theta \times (-\cot \theta) \times \sec \theta} \\
&= 1 \\
&= \text{RHS} \\
&\quad \text{Proved}
\end{aligned}$$

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