

①

$$\sin^2 x \csc^2 x - \sin^2 x = \cos^2 x$$

$$\sin^2 x (\csc^2 x - 1) = \cos^2 x$$

$$\sin^2 x (\cot^2 x) = \cos^2 x$$

$$\cancel{\sin^2 x} \left( \frac{\cos^2 x}{\cancel{\sin^2 x}} \right) = \cos^2 x$$

$$\cos^2 x = \cos^2 x \quad \checkmark$$

$$\textcircled{2} \quad \cos^2 x + \cos^2 x \cot^2 x = \cot^2 x$$

$$\cos^2 x (1 + \cot^2 x) = \cot^2 x$$

$$\cos^2 x (\csc^2 x) = \cot^2 x$$

$$\cos^2 x \left( \frac{1}{\sin^2 x} \right) = \cot^2 x$$

$$\frac{\cos^2 x}{\sin^2 x} = \cot^2 x$$

$$\cot^2 x = \cot^2 x \quad \checkmark$$

③

$$\frac{\sin x \sec^2 x - \sin x}{\tan^2 x} = \sin x$$

$$\frac{\sin x (\sec^2 x - 1)}{\tan^2 x} = \sin x$$

$$\frac{\sin x (\cancel{\tan^2 x})}{\cancel{\tan^2 x}} = \sin x$$

$$\sin x = \sin x \quad \checkmark$$

$$\textcircled{4} \quad \frac{\tan x + \tan x \cot^2 x}{\csc^2 x} = \tan x$$

$$\frac{\tan x (1 + \cot^2 x)}{\csc^2 x} = \tan x$$

$$\frac{\tan x (\cancel{\csc^2 x})}{\cancel{\csc^2 x}} = \tan x$$

$$\tan x = \tan x$$

$$\textcircled{5} \quad \frac{\cancel{\tan x} - \cancel{\tan x} \cos^2 x}{\cos x} = \tan^2 x \sin x$$

$$\rightarrow \frac{\tan x (1 - \cos^2 x)}{\cos x} =$$

$$\rightarrow \frac{\tan x (\sin^2 x)}{\cos x} =$$

$$\begin{aligned} & \rightarrow \frac{\left(\frac{\sin x}{\cos x}\right) \cdot \sin^2 x}{\cos x} = \frac{\left(\frac{\sin^3 x}{\cos x}\right)}{\cos x} = \frac{\sin^3 x}{\cos^2 x} = \frac{\sin^2 x \sin x}{\cos^2 x} \\ & = \tan^2 x \sin x \end{aligned}$$

$$\frac{\left( \frac{\sin x}{\cos x} \cdot \sin^2 x \right)}{\cos x} = \frac{\left( \frac{\sin^3 x}{\rightarrow \cos x} \right)}{\rightarrow \cos x} = \frac{\sin^3 x}{\cos x} \cdot \frac{1}{\cos x}$$

$$= \frac{\sin^3 x}{\cos^2 x} = \frac{\sin^2 x \cdot \sin x}{\cos^2 x} = \underline{\underline{\tan^2 x \cdot \sin x}}$$

$$\textcircled{6} \quad \frac{\cos x \tan^2 x + \cos x}{\csc x} = \tan x$$

$$\frac{\cos x (\tan^2 x + 1)}{\csc x} =$$

$$\frac{\cos x (\sec^2 x)}{\csc x} =$$

$$\frac{\cancel{\cos x} \left( \frac{1}{\cancel{\cos x}} \right)}{\left( \frac{1}{\sin x} \right)} = \frac{\left( \frac{1}{\cos x} \right)}{\left( \frac{1}{\sin x} \right)} = \frac{1}{\cos x} \cdot \frac{\sin x}{1} = \frac{\sin x}{\cos x} = \tan x$$

$$\textcircled{7} \frac{\sin x + \sin x \cot^2 x}{\sec x} = \cot x$$

$$\frac{\sin x (1 + \cot^2 x)}{\sec x} = \cot x$$

$$\begin{aligned} \frac{\sin x (\csc^2 x)}{\sec x} &= \frac{\cancel{\sin x} \left( \frac{1}{\cancel{\sin^2 x}} \right)}{\left( \frac{1}{\cos x} \right)} : \frac{\frac{1}{\sin x}}{\frac{1}{\cos x}} \\ &= \frac{1}{\sin x} \cdot \frac{\cos x}{1} = \frac{\cos x}{\sin x} : \cot x \end{aligned}$$