

$$\frac{dy}{dx} = \frac{-\operatorname{cosec} x \cot x + \operatorname{cosec}^2 x}{\operatorname{cosec} x - \cot x} \quad \text{(iv)}$$

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

$$= \frac{-\cos x + 1}{\sin^2 x} \cdot \frac{1 - \cos x}{1 - \cos x} = \frac{(1 - \cos x)^2}{\sin^3 x}$$

$$= \frac{1 - 2\cos x + \cos^2 x}{\sin^3 x}$$