

Verify the identity

$$\frac{\csc^2 \theta - \cot^2 \theta}{1 - \sin^2 \theta} = \sec^2 \theta$$

Simplify
Numerator

$$\frac{1}{\sin^2 \theta} - \frac{\cos^2 \theta}{\sin^2 \theta} = \frac{1 - \cos^2 \theta}{\sin^2 \theta}$$
$$= \frac{\sin^2 \theta}{\sin^2 \theta} = 1$$

Simplify
Denominator

$$1 - \sin^2 \theta = \cos^2 \theta$$

$$\frac{1}{\cos^2 \theta} = \sec^2 \theta$$

QED