

Trigonometry Worksheet: Verify Identities (2)

Verify the identities

$$1. \quad \frac{1}{1 - \cos x} + \frac{1}{1 + \cos x} = 2 \csc^2 x$$

add the fractions on the left

$$\frac{1 + \cancel{\cos(x)} + 1 - \cancel{\cos(x)}}{(1 - \cos x)(1 + \cos(x))} = \frac{2}{1 - \cos^2(x)}$$

$$= \frac{2}{\sin^2(x)} = \underline{\underline{2 \csc^2(x)}}$$

$$2. \quad (\cot^2 x + 1)(\sin^2 x - 1) = -\cot^2 x$$

Use the identity $\cot^2(x) + 1 = \csc^2(x)$ to rewrite the left side as follows:

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

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

$$= \frac{1}{\sin^2(x)}(-\cos^2(x)) = \underline{\underline{-\cot^2(x)}}$$