

Verify - Pythagorean Identities

Verify the following.

1) $\cos^4 x + 2 \cos^2 x \sin^2 x + \sin^4 x = 1$

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

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

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Verify - Pythagorean Identities

Verify the following.

4) $\frac{1 - \sin^2 x}{\csc^2 x - 1} = \sin^2 x$

5) $\cot^2 (90^\circ - x) -$

6) $-\frac{\sin x}{\cos x} + \frac{\sec}{\sin}$

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Verify - Pythagorean Identities

Verify the following.

1) $\cos^4 x + 2 \cos^2 x \sin^2 x + \sin^4 x = 1$

$$\cos^4 x + 2 \cos^2 x \sin^2 x + \sin^4 x = (\cos^2 x + \sin^2 x)^2 \quad \text{Using } (a + b)^2 = a^2 + 2ab + b^2$$

$$= 1^2 \quad \text{Using Pythagorean identity}$$

$$= 1$$

2) $(\csc x - \cot x)(\csc x + \cot x)$

$$(\csc x - \cot x)$$

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reciprocal & quotient
as

$$a^2 - b^2 = (a + b)(a - b)$$

Pythagorean identity

3) $\frac{\csc x (1 - \cos^2 x)}{\cos x \sin x}$

$$\frac{\csc x (1 - \cos^2 x)}{\cos x \sin x} = \frac{\csc x \sin^2 x}{\cos x \sin x} \quad \text{Using Pythagorean identity}$$

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

Using reciprocal identity

$$= \frac{1}{\cos x}$$

Simplify

$$= \sec x$$

Using reciprocal identity

Verify - Pythagorean Identities

Verify the following.

$$4) \frac{1 - \sin^2 x}{\csc^2 x - 1} = \sin^2 x$$

$$\frac{1 - \sin^2 x}{\csc^2 x - 1} = \frac{\cos^2 x}{\cot^2 x}$$

Using Pythagorean identities

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

Using quotient identity

$$= \cancel{\cos^2 x}$$

Cancel the common factors

$$= \sin^2 x$$

$$5) \cot^2(90^\circ - x) = \tan^2 x$$

$$\cot^2(90^\circ - x) = \tan^2 x$$

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Using function identity

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Using Pythagorean identity

$$6) -\frac{\sin x}{\cos x} + \frac{\sec x}{\sin x}$$

$$= -\frac{\sin x}{\cos x} + \frac{\sec x}{\sin x}$$

Using quotients

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

Using reciprocal identity & cancel the common factors

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

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

Using Pythagorean identity

$$= \cot x$$

Using quotient identity