

Verify - Sum & Difference Identities

Verify the following.

1) $\cos\left(x - \frac{\pi}{6}\right) = \frac{\sqrt{3} \cos x - \sin x}{2}$

2) $\tan(60^\circ - x)(1 + \sqrt{3})$

3) $\sin(x + y) \sin(x - y)$

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Verify - Sum & Difference Identities

Verify the following.

4) $\tan(30^\circ + x) = \frac{1 + \sqrt{3} \tan x}{\sqrt{3} - \tan x}$

5) $\sin\left(x + \frac{\pi}{6}\right) - \sin\left(x - \frac{\pi}{6}\right)$

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

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Verify - Sum & Difference Identities

Verify the following.

$$1) \quad \cos\left(x - \frac{\pi}{6}\right) = \frac{\sqrt{3} \cos x - \sin x}{2}$$

$$\cos\left(x - \frac{\pi}{6}\right) = \cos x \cos \frac{\pi}{6} + \sin x \sin \frac{\pi}{6}$$

Using difference identity

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

Substitute the values for trig ratios

$$= \frac{\sqrt{3} \cos x - \sin x}{2}$$

Simplify

$$2) \quad \tan(60^\circ - x)(1 + \sqrt{3})$$

$$\tan(60^\circ - x)(1 + \sqrt{3})$$

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Using difference identity

Substitute the values for trig ratios

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Cancel the common factors

$$3) \quad \sin(x + y) \sin(x - y)$$

$$\sin(x + y) \sin(x - y) =$$

Using sum and difference identities

$$= \sin^2 x \cos^2 y + \sin x \cos y \cos x \sin y - \sin x \cos y \cos x \sin y - \cos^2 x \sin^2 y$$

Simplify

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

$$= (1 - \cos^2 x) \cos^2 y - \cos^2 x (1 - \cos^2 y)$$

Using Pythagorean identity

$$= \cos^2 y - \cos^2 x \cos^2 y - \cos^2 x + \cos^2 y \cos^2 x$$

Simplify

$$= \cos^2 y - \cos^2 x$$

Verify - Sum & Difference Identities

Verify the following.

$$4) \quad \tan(30^\circ + x) = \frac{1 + \sqrt{3} \tan x}{\sqrt{3} - \tan x}$$

$$\tan(30^\circ + x) = \frac{\tan 30^\circ + \tan x}{1 - \tan 30^\circ \tan x}$$

Using sum identity

$$= \frac{\frac{\sqrt{3}}{3} + \tan x}{1 - \frac{\sqrt{3}}{3} \tan x}$$

Substitute the values for trig ratios

$$= \frac{\sqrt{3} + 3 \tan x}{\sqrt{3} - \tan x}$$

$$= \frac{\sqrt{3} + 3 \tan x}{\sqrt{3} - \tan x}$$

Simplify

PREVIEW

Cancel the common factors

$$5) \quad \sin\left(x + \frac{\pi}{6}\right) - \sin\left(x - \frac{\pi}{6}\right)$$

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$$\sin\left(x + \frac{\pi}{6}\right) - \sin\left(x - \frac{\pi}{6}\right)$$

$$= \sin x \sin \frac{\pi}{3}$$

Using sum and difference identities

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Substitute the values for trig ratios

Simplify

$$6) \quad \frac{\cos(x + y) + \cos(x - y)}{\sin x \cos y}$$

$$\frac{\cos(x + y) + \cos(x - y)}{\sin x \cos y} = \frac{\cos x \cos y - \sin x \sin y + \cos x \cos y + \sin x \sin y}{\sin x \cos y}$$

Using sum and difference identities

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

Simplify

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

Cancel the common factors

$$= 2 \cot x$$

Using quotient identity