

**Verify - Double & Half-Angle Identities**

Verify the following.

1)  $\cos 4x = 1 - 8 \sin^2 x \cos^2 x$

2)  $\frac{2 \cos x}{\sin 2x} = \csc x$

3)  $\tan 3x = \frac{3 \tan x - \tan^3 x}{1 - 3 \tan^2 x}$

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## Verify - Double & Half-Angle Identities

Verify the following.

4)  $\sin 2x \tan x = 2 \sin^2 x$

5)  $\cos^2 \frac{x}{2} \sec x$

6)  $(\cos x + \sin x)$

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## Verify - Double & Half-Angle Identities

Verify the following.

1)  $\cos 4x = 1 - 8 \sin^2 x \cos^2 x$

$$\cos 4x = \cos 2(2x)$$

$$= 1 - 2 \sin^2 2x$$

Using double-angle identity

$$= 1 - 2 (\sin 2x)^2$$

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

Using double-angle identity

$$= 1 - 8 \sin^2 x \cos^2 x$$

2)  $\frac{2 \cos x}{\sin 2x} = \csc 2x$

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

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double-angle identity

the common factors

reciprocal identity

3)  $\tan 3x = \frac{3 \tan x}{1 - \tan^2 x}$

$$\tan 3x$$

$$= \frac{1 - \tan^2 x}{1 - \frac{2 \tan x}{1 - \tan^2 x} \tan x}$$

Using double-angle identity

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

Cancel the common factors

$$= \frac{3 \tan x - \tan^3 x}{1 - 3 \tan^2 x}$$

## Verify - Double & Half-Angle Identities

Verify the following.

4)  $\sin 2x \tan x = 2 \sin^2 x$

$$\sin 2x \tan x = 2 \sin x \cos x \tan x$$

Using double-angle identity

$$= 2 \sin x \cos x \left( \frac{\sin x}{\cos x} \right)$$

Using quotient identity & cancel the common factors

$$= 2 \sin^2 x$$

5)  $\cos^2 \frac{x}{2} \sec x$

$$\cos^2 \frac{x}{2} \sec x$$

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Half-angle identity

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Reciprocal identity & cancel the common factors

6)  $(\cos x + \sin x)^2$

$$(\cos x + \sin x)^2 = \cos^2 x + \sin^2 x + 2 \cos x \sin x$$

Using  $(a + b)^2 = a^2 + b^2 + 2ab$

$$= 1 + 2 \cos x \sin x$$

Using Pythagorean identity

$$= 1 + \sin 2x$$

Using double-angle identity