Proving Trigonometric Identities

Recall:

A trigonometric identity is an __________________________ that involves ______________________ _____________________ and are true for ____________________________ in the domain of the expressions on both sides.

I can identify a trig identity on a graph when the left side function is ______________________ as the right side function.

Pythagorean Identity

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

Quotient Identity

$$\tan x = \frac{\sin x}{\cos x}$$

Reciprocal Identities

$$\csc x = \frac{1}{\sin x} \qquad \sec x = \frac{1}{\cos x} \qquad \cot x = \frac{1}{\tan x}$$

Compound Angle Formulas

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$
$$\cos(A-B) = \cos A \cos B + \sin A \sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$
$$\sin(A-B) = \sin A \cos B - \cos A \sin B$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Double Angle Formulas

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

$$\begin{aligned}\cos(2x) &= \cos^2 x - \sin^2 x \\ &= 2\cos^2 x - 1 \\ &= 1 - 2\sin^2 x\end{aligned}$$

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

1. Prove that $\sin x + \sin(2x) = \sin(3x)$ is **not** an identity.

2. Prove the co-function identity: $\cos\left(\frac{\pi}{2} - x\right) = \sin x$

3. Prove that $\frac{\sin 2x}{1+\cos 2x} = \tan x$

4. Prove that $\cos^4 x - \sin^4 x = \cos 2x$