Proving trigonometric identities: Problem type 2

Prove the identity.

$$\sec x - \sin x \tan x = \cos x$$

$\frac{1}{\cos x} - \sin x \tan x$ reciprocal

$\frac{1}{\cos x} - \frac{\sin x \sin x}{\cos x}$ quotient

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

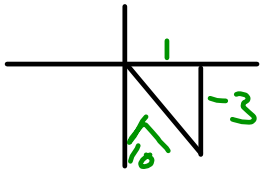
$\frac{\cos^2 x}{\cos x}$ Pyth

$\cos x$ Alg

Double-angle identities: Problem type 1

Find $\sin 2x$, $\cos 2x$, and $\tan 2x$ if $\tan x = -3$ and x terminates in quadrant IV.

toa=opp/adj



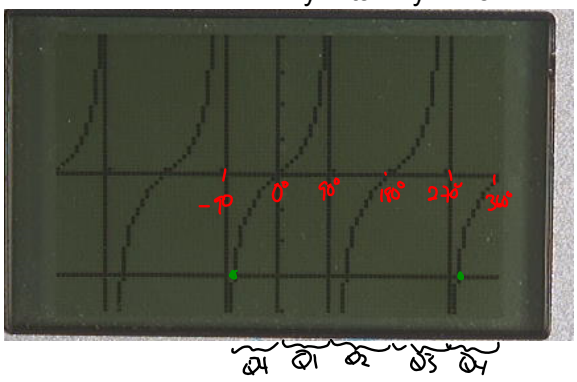
$\sin x = \frac{opp}{hyp} = \frac{-3}{\sqrt{10}}$

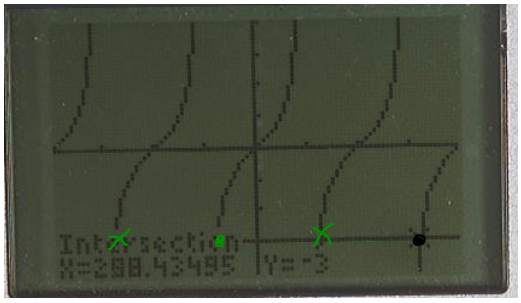
$\cos x = \frac{1}{\sqrt{10}}$

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

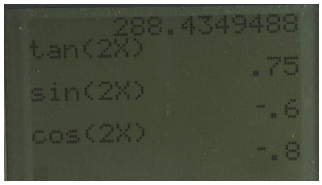
$= 2\left(\frac{-3}{\sqrt{10}}\right)\left(\frac{1}{\sqrt{10}}\right) = \frac{-6}{10} = -.3$

y1=tanx y2= -3





in degrees



Proving trigonometric identities using double-angle properties

Prove the identity.

$$\frac{1}{\tan x(1+\cos 2x)} = \csc 2x$$

$$\frac{1}{\frac{\sin x}{\cos x}(1+\cos 2x)} \quad \text{Quo}$$

$$\frac{\cos x}{\sin x(1+\cos 2x)} \quad \text{Alg}$$

$$\frac{\cos x}{\sin x(1+2\cos^2 x-1)} \quad \text{DH \&}$$

$$\frac{\cos x}{2\sin x\cdot\cos^2 x} \quad \text{Alg}$$

$$\frac{1}{2\sin x\cos x} \quad \text{Alg}$$

$$\csc(2x)$$

$$\frac{1}{\sin(2x)} \quad \text{Recip}$$

$$\frac{1}{2\sin x\cos x} \quad \text{DH \&}$$

Proving trigonometric identities using double-angle properties

Prove the identity.

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

Quot.

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

Recipr

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

Algebra ($\times \frac{\sin^2 x}{\sin^2 x}$)

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

Pythag. Id.

$$2\cos^2 x - 1$$

Dbl $\measuredangle$

$$\cos(2x)$$

Double-angle identities: Problem type 2

Simplify the expression by using a double-angle formula.

$$2\cos^2\frac{2\pi}{11} - 1 = \cos\left(\frac{4\pi}{11}\right)$$

The following identities are the double-angle formulas.

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

$\cos\left(\frac{4\pi}{11}\right)$

$2\cos^2\frac{2\pi}{11} - 1$

$x = \frac{2\pi}{11}$