Trigonometric Proofs
ID: 9777

<div align="right">

Time required
45 minutes

</div>

Activity Overview

Students will perform trigonometric proofs and use the graphing capabilities of the TI-Nspire handheld for verification.

Topic: Trigonometric Identities

- *Use fundamental trigonometric identities to prove more complex trigonometric identities.*

- *Verify trigonometric identities by graphing.*

Teacher Preparation and Notes

- *Students should already be familiar with the Pythagorean trigonometric identities as well the fact that tan(x) = sin(x)/cos(x).*

- *This activity is intended to be **teacher-led**. You may use the following pages to present the material to the class and encourage discussion. Students will follow along using their handhelds. The majority of the ideas and concepts are only presented in this document, so be sure to cover all the material necessary for students' total comprehension.*

- *Notes for using the TI-Nspire™ Navigator™ System are included throughout the activity. The use of the Navigator System is not necessary for completion of this activity.*

- ***To download the student .tns file and student worksheet, go to education.ti.com/exchange and enter "9777" in the keyword search box.***

Associated Materials

- *TrigonometricProofs_Student.doc*

- *TrigonometricProofs.tns*

- *TrigonometricProofs_Soln.tns*

Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

- *Proof of Identities (TI-Nspire technology) — 17196*

Problem 1 – Proof 1

In problem 1, students are asked to go through an example proof of $\sin(x) \cdot \csc(x) = 1$.

On page 1.3, students click through a step-by-step example with hints given to help them through each step.
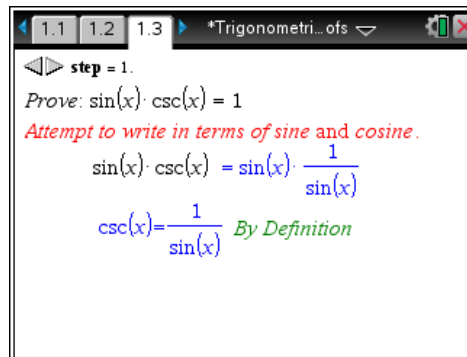
On page 1.5, students will have the left side of the expression graphed ($f1(x) = \sin(x) \cdot \csc(x)$).

They will input the right side of the expression ($f2(x) = 1$) and see that the graphs coincide.
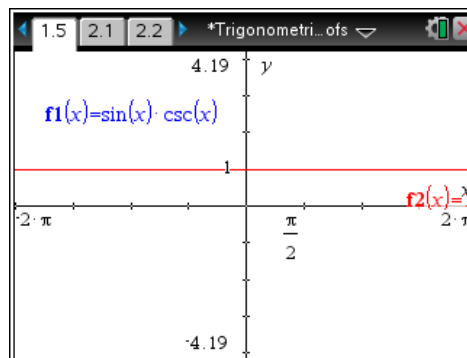
TI-Nspire™ Navigator™ Opportunity: *Class Capture*

See Note 1 at the end of this lesson.

Problem 2 – Proof 2

In problem 2, students are asked to click through the slider for hints and to complete the proof on the *Notes* page in the lower part of the screen.

The hints given are one of multiple ways to solve the proofs.
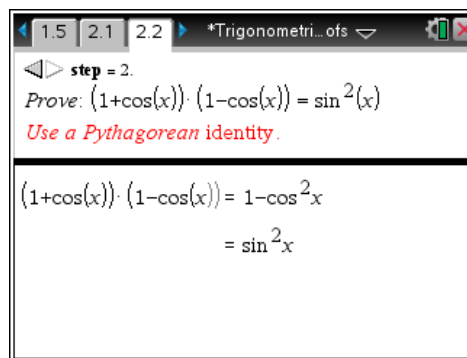
TI-Nspire™ Navigator™ Opportunity: *Class Capture*

See Note 2 at the end of this lesson.

Problem 3 – Proof 3

In problem 3, students are asked to click through the slider for hints and to complete the proof on the *Notes* page in the lower part of the screen.

The hints given are one of multiple ways to solve the proofs.

step = 2.
Prove: $\sin(x) \cdot \cot(x) \cdot \sec(x) = 1$
Multiply.

$$\sin(x) \cdot \cot(x) \cdot \sec(x) = \sin(x) \cdot \frac{\cos(x)}{\sin(x)} \cdot \frac{1}{\cos(x)}$$
$$= 1$$

Problem 4 – Proof 4

In problem 4, students are asked to click through the slider for hints and to complete the proof on the *Notes* page in the lower part of the screen.

The hints given are one of multiple ways to solve the proofs.

step = 3.
Prove: $\dfrac{\sec^2(x) - 1}{\sec^2(x)} = \sin^2(x)$
Use a Pythagorean identity.

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

Problem 5 – Proof 5

In problem 5, students are asked to click through the slider for hints and to complete the proof on the *Notes* page in the lower part of the screen.

The hints given are one of multiple ways to solve the proofs.

step = 4.
Prove: $\tan(x) + \cot(x) = \sec(x) \cdot \csc(x)$
Use Identities to get the right side.

$$= \frac{\sin^2 x + \cos^2 x}{\cos(x)\sin(x)}$$
$$= \frac{1}{\cos(x)} \cdot \frac{1}{\sin(x)}$$
$$= \sec(x) \cdot \csc(x)$$

Problem 6 – Proof 6

In problem 6, students are asked to click through the slider for hints and to complete the proof on the *Notes* page in the lower part of the screen.

The hints given are one of multiple ways to solve the proofs.

step = 2.
Prove: $\dfrac{\sin^2(x) - 49}{\sin^2(x) + 14 \cdot \sin(x) + 49} = \dfrac{\sin(x) - 7}{\sin(x) + 7}$
Divide out common terms.

$$\frac{\sin^2(x) - 49}{\sin^2(x) + 14 \cdot \sin(x) + 49} = \frac{(\sin(x) - 7)(\sin(x) + 7)}{(\sin(x) + 7)(\sin(x) + 7)}$$
$$= \frac{\sin(x) - 7}{\sin(x) + 7}$$

TI-Nspire™ Navigator™ Opportunities

Note 1
Problem 1, *Class Capture*
This would be a good place to use Class Capture to verify that students are entering the correct expression into the entry line for f2(x).

Note 2
Problem 2-6, *Class Capture*
You may want to use Class Capture to verify students are working out the proof on the *Notes* pages.