

Fun with Trig

Have fun with basic trig fundamentals, identities, and expressions!

Basic Trigonometric Functions and Definitions

Review some of the fundamentals of trigonometry. The ClassPad is a great way to review and explore trig.

Basic Trig Functions

In any right Δ

$$\sin(x) = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos(x) = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan(x) = \frac{\text{opposite}}{\text{adjacent}}$$

Remember SOH CAH TOA!

Trig Definitions

$$1. \tan(x) = \frac{\sin(x)}{\cos(x)}$$

Compare Graphs

Rad Real

The right window shows a graph of the trigonometric functions $y_1 = \sin(x)$, $y_2 = \cos(x)$, and $y_3 = \tan(x)$ plotted against x . The sine and cosine functions are periodic waves, while the tangent function has vertical asymptotes.

Deriving Trigonometric Identities

Learn how to derive many trig identities from one basic identity.

Trig Identities

Please note that we are using textbook notation to evaluate, for example $\sin^2 x$, input $(\sin(x))^{\wedge}2$.

Starting with:

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

we can derive other basic identities...

1. Dividing by $\sin^2 x$

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

yields:

$$1 + \cot^2 x = \csc^2 x$$

2. Dividing by $\cos^2 x$

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

yields:

$$\tan^2 x + 1 = \sec^2 x$$

This gives us:

$$\tan^2 x = \sec^2 x - 1$$

and:

$$\sec^2 x - \tan^2 x = 1$$

In summary, starting with this basic identity, $\sin^2 x + \cos^2 x = 1$, we can easily find:

$$1 + \cot^2 x = \csc^2 x$$

Verifying Trigonometric Identities

By making equivalent substitutions to one side of the equation, can you show it is identical to the other side?

Verify Trigonometric Identities

Using pencil and paper, verify the following identities. Use identities from these eActivities: **Derive Trig Identities** and **Basic Trig Identities**

1. Show that:

$$\frac{\sin^2 x + \cos^2 x}{\cos^2 x} = \sec^2 x$$

2. Show that:

$$\tan(x) + \sec(x) = \frac{\cos(x)}{1 - \sin(x)}$$

3. Show that:

$$\sec^2 x + \csc^2 x = \sec^2 x \csc x$$

4. Show that:

$$\frac{\tan^3 x + \cot^3 x}{\tan(x) + \cot(x)} = \tan^2 x + \cot^2 x$$

Rewriting Trigonometric Expressions

Rewrite a trig expression and show that your result is equivalent to the original by graphing each.

Finding Equivalent Trig Forms

Please do the **csc/sec/cot activity** before trying this one to define $\csc(x)$, $\sec(x)$ and $\cot(x)$ on your CP.

A. Transform each of the following to an expression containing only $\sin(x)$ and $\cos(x)$.

B. Verify your answer by showing their graphs are the same.

Example

Edit Zoom Analysis

Sheet1 | Sheet2 | Sheet3

y1 = $(\csc(x))^2 + (\cos(x))^2$

y2 = $\frac{1 + (\cos(x))^2}{(\sin(x))^2}$

y3:

y4:

y5:

y6:

How Many Triangles-1

When given the measure of an angle and two sides, how many triangles can you create? Determine the answer using Geometry and the Law of Sines.

How many triangles are possible?

An example

In Geometry, draw a Δ then advance the toolbar (tap \rightarrow) and constrain:

$m\angle A = 50^\circ$, side $a = 5$ and side $b = 6$

Select vertex B only, release pen, then drag point B. Measure $\angle B$. Move point B again. You will find two different values for $m\angle B$.

Drag vertex B \rightarrow

Please Complete

Using the Law of Sines,

File Edit View Draw

$m\angle A = 50^\circ$, side $a = 5$ and side $b = 6$

Select vertex B only, release pen, then drag point B. Measure $\angle B$. Move point B again. You will find two different values for $m\angle B$.

Drag vertex B \rightarrow

How Many Triangles-2

More practice with determining the number of possible triangles given the measure of an angle and two sides, how many triangles can you create.

How many triangles are possible?

*Please do HowManyDelta's_1 before beginning this activity.

How many Δ 's (acute, right or obtuse) can you make with the given constraints? Use the Law of Sines to determine the answer and then verify each answer using the Geometry application.

1. $m\angle A = 50^\circ$, side $a = 6$ and side $b = 7$

File Edit Insert Action

a. How many Δ 's?
b. Verify

#3 Verify Here \rightarrow

4. $m\angle A = 110^\circ$, side $a = 8$ and side $b = 5$

a. How many Δ 's?
b. Verify

#4 Verify Here \rightarrow

Bonus:

Under what conditions will you always have two types of Δ 's possible?