

The Other Trig Functions, Pt. 2

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Announcements

- ① Homework in M.O.M.
- ② Quiz on Friday.

Alternate Pythagorean Identity

Alternate Pythagorean Identities

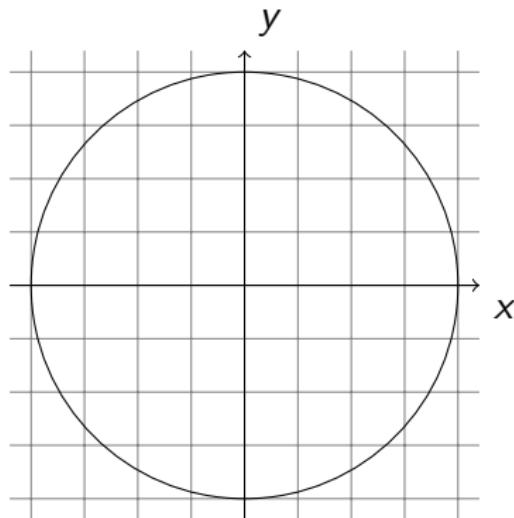
Alternate Pythagorean Identities

$$1 + (\tan \theta)^2 = (\sec \theta)^2$$

$$(\cot \theta)^2 + 1 = (\csc \theta)^2$$

Example

Period of the Trig Functions



Period of Trig Functions

The _____ of a “repeating” function $f(x)$ is the smallest positive number P such that

$$f(x + P) =$$

The period of $\sin(\theta)$, $\cos(\theta)$, $\sec(\theta)$ and $\csc(\theta)$ is _____.

The period of $\tan(\theta)$ and $\cot(\theta)$ is _____.

Example

Example

Simplify the following expressions using fundamental trig identities:

① $\tan(\theta) \cos(\theta)$

② $\frac{\csc(\theta)}{\sec(\theta)}$

③ $\sin(\theta) \csc(\theta) + \frac{1}{(\cos(\theta))^2}$

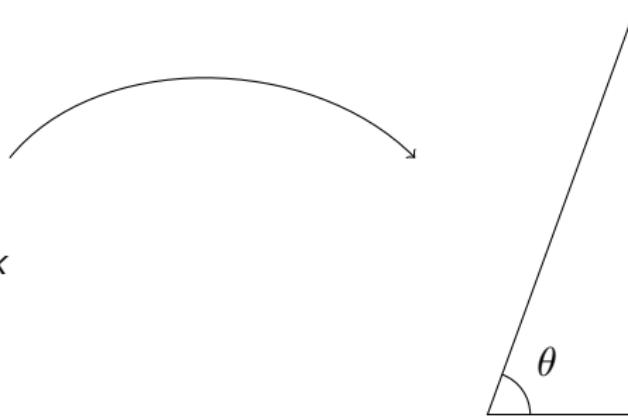
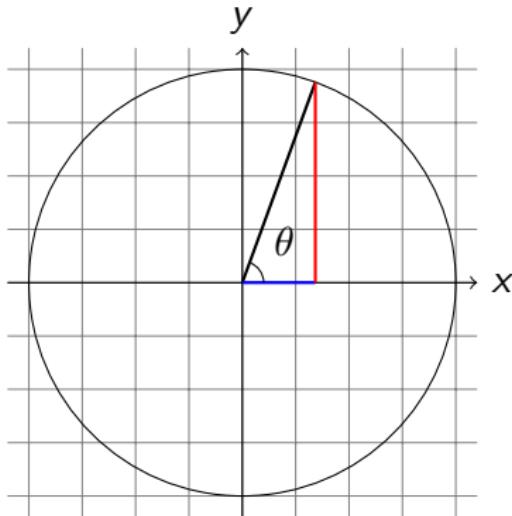
Example

Suppose $\tan(\alpha) = \frac{-3}{5}$ and $\frac{\pi}{2} \leq \alpha \leq \pi$. Find the other 5 trig functions at α . (Hint: Find $\sec(\alpha)$ first.)

Example

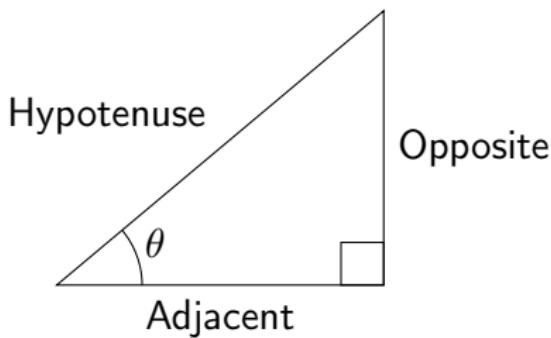
Right Triangle Trigonometry

Let's look one more time at the unit circle:



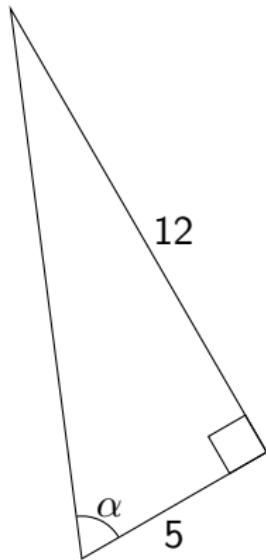
SOHCAHTOA

A convenient way to remember Sine/Cosine/Tangent with right triangles is the memory device _____.



Example

Find $\sin(\alpha)$, $\cos(\alpha)$ and $\tan(\alpha)$ from the following triangle:



The other trig functions

We can also find $\sec(\theta)$, $\csc(\theta)$ and $\cot(\theta)$ using right triangles and the fact that

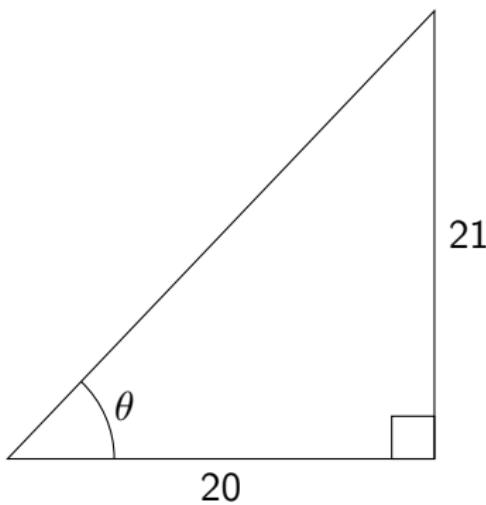
$$\sec(\theta) =$$

$$\csc(\theta) =$$

$$\cot(\theta) =$$

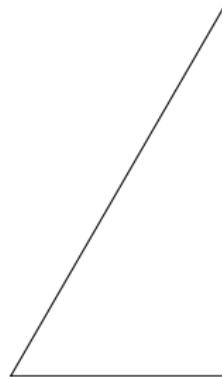
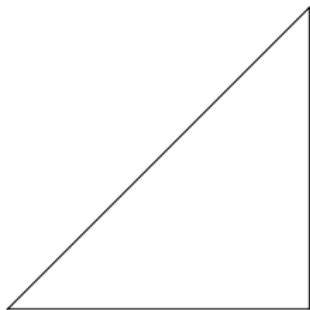
Example

For θ given below, find all 6 trig functions:



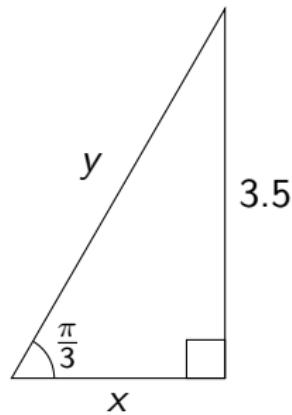
Example

Let's look at a few special triangles:



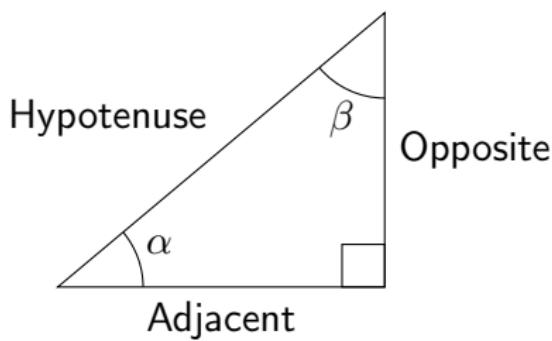
Example

Find the missing side lengths in the following right triangle:



A Special Relationship

Let's look at something very special that we can see now between Sine and Cosine



A Special Relationship

We've just shown two of the following

Cofunction Identities

If θ is an angle measured in radians, then

① $\sin\left(\frac{\pi}{2} - \theta\right) =$

② $\cos\left(\frac{\pi}{2} - \theta\right) =$

③ $\tan\left(\frac{\pi}{2} - \theta\right) =$

④ $\sec\left(\frac{\pi}{2} - \theta\right) =$

⑤ $\csc\left(\frac{\pi}{2} - \theta\right) =$

⑥ $\cot\left(\frac{\pi}{2} - \theta\right) =$

An applied problem!

We can use right triangle trig to answer a lot of real world problems! As an example: This tree is too close to my house! I'd like to know how tall it is to see if it is as close as it feels.

I stood 65.75 feet away from the tree and looked to the tippy top of it.

The angle of elevation when I did this was 35° . About how tall is the tree?



Example

Example

You are on a road trip and you see Mt. Hood (in Oregon). When you first see Mt. Hood, the angle of elevation made by your line of sight is 10° . You then continue driving straight towards Mt. Hood for 4.13 miles. Now the angle of elevation made by your line of sight is 15° . Using this information:

- ① How tall is Mt. Hood?
- ② How far are you from Mt. Hood when you look at it the second time?