Section 13-8: The Reciprocal Trig Functions

Cotangent: $\cot\theta = \frac{1}{\tan\theta} = \frac{x}{y} = \frac{\cos\theta}{\sin\theta}$

Secant: $\sec\theta = \frac{1}{\cos\theta} = \frac{1}{x}$

Cosecant: $\csc\theta = \frac{1}{\sin\theta} = \frac{1}{y}$

Use your calculator to find the value of each to the nearest hundredth.

$\cos(131°) = -0.66$

Make sure calculator is in degree mode

$\tan\frac{8\pi}{27} = 1.34$

Make sure calculator is in radian mode

$\csc(-75°) =$

$= \frac{1}{\sin(-75°)} = -1.04$

Make sure calculator is in degree mode

$\cot\frac{-4\pi}{13} =$

$= \frac{1}{\tan\left(\frac{-4\pi}{13}\right)} = -0.69$

Make sure calculator is in radian mode

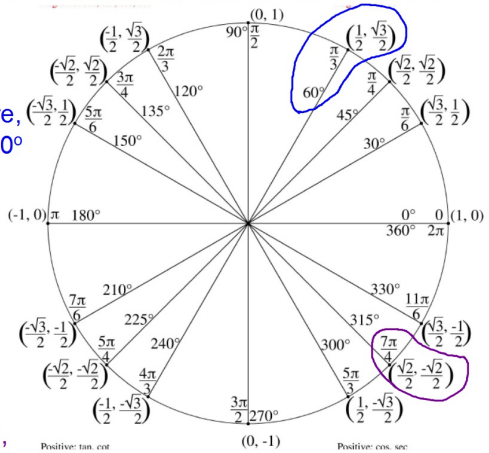
$\sec 14 = \frac{1}{\cos 14} = 7.31$

radians

since there is no degree symbol this must be a measure in radians.

Make sure calculator is in radian mode

Use the Unit Circle to find the EXACT value of each. Simplify & rationalize fractions.



1. $\sec 60°$

Sec is the reciprocal of Cos, therefore, find the reciprocal of the x-coord at 60°

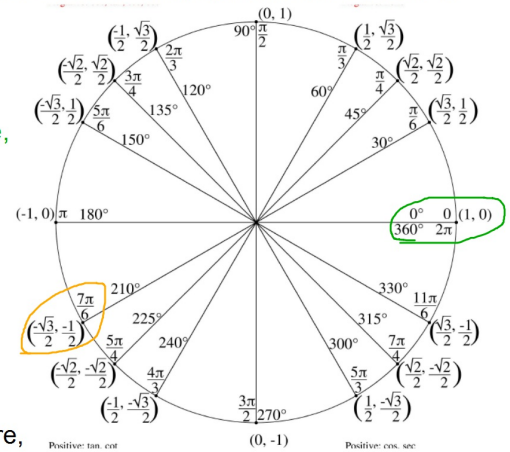
$\sec 60° = \frac{1}{\frac{1}{2}} = \frac{2}{1} = 2$

2. $\csc\frac{7\pi}{4}$

Csc is the reciprocal of Sin, therefore, find the reciprocal of the y-coord at 7π/4

$\csc\frac{7\pi}{4} = \frac{1}{\frac{-\sqrt{2}}{2}} = \frac{2}{-\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{-2} = -\sqrt{2}$

Use the Unit Circle to find the EXACT value of each. Simplify & rationalize fractions.



3. $\cot 16\pi$

16π is coterminal with 0 or 2π.
Cot is the reciprocal of Tan, therefore,
Cot is the x-coord/y-coord.

$\cot 16\pi = \frac{1}{0}$ = Undefined

4. $\sec\left(\frac{-17\pi}{6}\right)$

-17π/6 is coterminal with 7π/6.

Sec is the reciprocal of Cos, therefore,
Sec is the reciprocal of the x-coord at 7π/6.

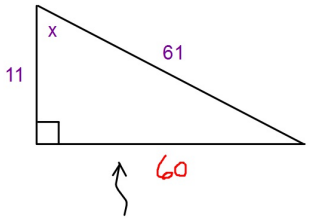
$\sec\frac{-17\pi}{6} = \frac{1}{\frac{-\sqrt{3}}{2}} = \frac{2}{-\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{-3}$

Given that Cosx = $\frac{11}{61}$ = $\frac{\text{Adj leg}}{\text{Hypot}}$

Evaluate the other five trig functions. Rationalize all denominators as needed and simplify fractions.

Secx = $\frac{61}{11}$ Since Sec is the reciprocal of the Cos you can find Secx right away by "flipping" the Cos ratio.

To find the remaining trig functions draw a right triangle, pick one of the acute angles to label as X, then place the 11 on the adjacent leg and the 61 on the hypotenuse.



Use this triangle to find the Tan and Sin ratios:

Tanx = $\frac{60}{11}$ Sinx = $\frac{60}{61}$

Use these to find their reciprocal functions:

Cotx = $\frac{11}{60}$ Cscx = $\frac{61}{60}$

Use the Pythagorean Theorem to find this missing side:

$61^2 = 11^2 + Leg^2$

$Leg = \sqrt{61^2 - 11^2}$

$= 60$

You can now finish Hwk #23 Sec 13-8

Page 766 Problems 2-4, 9-14
AND
Page 797 Problems 28, 30

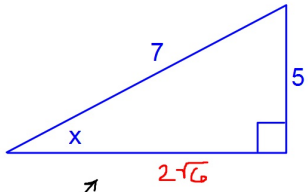
Given that Cscx = $\frac{7}{5}$

Evaluate the other five trig functions. Rationalize all denominators as needed and simplify fractions.

Turn Cscx into its reciprocal function, Sinx

Sinx = $\frac{5}{7}$ → Opp leg, → Hypot

Draw and label a right triangle using the Sin function:



Use Pythagorean Thm to find the missing leg:

$Leg = \sqrt{7^2 - 5^2}$

$= \sqrt{24} = 2\sqrt{6}$

Find Tanx and Cosx next:

Tanx = $\frac{5}{2\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}}$ = $\frac{5\sqrt{6}}{12}$

Cosx = $\frac{2\sqrt{6}}{7}$

Use these to find their reciprocal functions:

Cotx = $\frac{2\sqrt{6}}{5}$

Secx = $\frac{7}{2\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{7\sqrt{6}}{12}$