

# 13-8: Reciprocal Trigonometric Functions

CP Algebra 1

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## Cosecant, Secant and Cotangent Functions

The cosecant (csc), secant (sec) and cotangent (cot) functions are defined using reciprocals. Their domains **do not** include the real numbers  $\theta$  that make the denominator zero.

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

Use the Unit Circle to evaluate the reciprocal trigonometric functions:

$$\csc \theta = \frac{1}{\sin \theta}$$

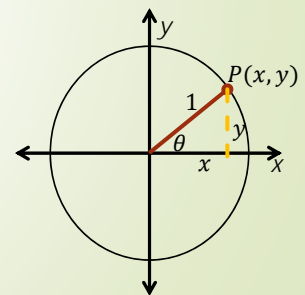
$$\sec \theta = \frac{1}{\cos \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

$$\csc \theta = \frac{1}{y}$$

$$\sec \theta = \frac{1}{x}$$

$$\cot \theta = \frac{x}{y}$$

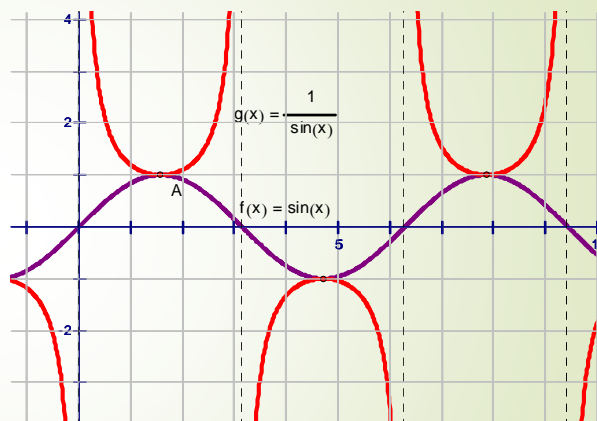


What are the exact values of each expression? Do not use a calculator.

$$\begin{aligned} \csc \frac{\pi}{3} &= \frac{1}{\sin \frac{\pi}{3}} \\ &= \frac{1}{\frac{\sqrt{3}}{2}} \\ &= \frac{2}{\sqrt{3}} \\ &= \frac{2\sqrt{3}}{3} \end{aligned} \quad \begin{aligned} \cot \left( -\frac{5\pi}{4} \right) &= \frac{1}{\tan \left( -\frac{5\pi}{4} \right)} \\ &= \frac{1}{-\frac{2}{\sqrt{2}}} \\ &= \frac{1}{-1} \\ &= -1 \end{aligned} \quad \begin{aligned} \sec 3\pi &= \frac{1}{\cos 3\pi} \\ &= \frac{1}{-1} \\ &= -1 \end{aligned} \quad \begin{aligned} \sec \left( -\frac{\pi}{6} \right) &= \frac{1}{\cos \left( -\frac{\pi}{6} \right)} \\ &= \frac{1}{\frac{\sqrt{3}}{2}} \\ &= \frac{2}{\sqrt{3}} \\ &= \frac{2\sqrt{3}}{3} \end{aligned}$$

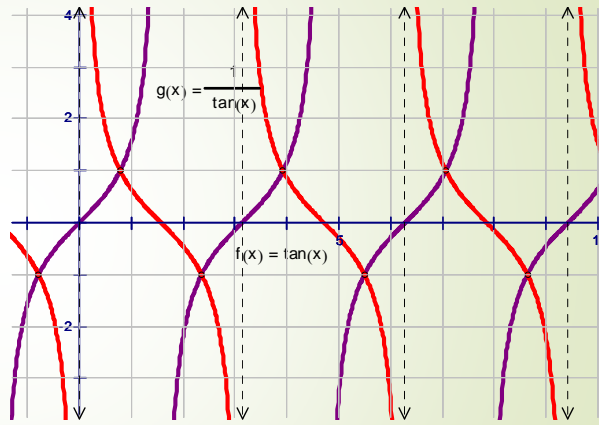
## Sketching Graphs of Reciprocal Functions

- ▀ Sine and Cosecant
  - ▀ Functions intersect at the Min/Max points.
  - ▀ Cosecant has asymptotes wherever  $\sin x = 0$ .
- ▀ Cosine and Secant
  - ▀ Functions intersect at the Min/Max points.
  - ▀ Secant has asymptotes wherever  $\cos x = 0$ .



## Sketching Graphs of Reciprocal Functions

- Tangent and Cotangent
  - Functions intersect at the  $a$  points.
  - Cotangent has asymptotes wherever  $\tan x = 0$ .



Homework: p.888 #9-11, 17-19, 25, 26, 28, 37, 40-42