

Lesson 7 Calculating Circular Functions

Equation of the unit circle: $x^2 + y^2 = 1$

- Represents the circle with centre at the origin and radius 1 unit.

For any angle, θ in standard position, with terminal point $P(x, y)$ on a circle with radius, $r=1$

$$\sin \theta = y$$

$$\cos \theta = x$$

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

reciprocal trig fns

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

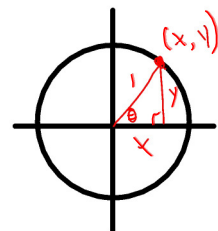
cosecant

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

secant

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

cotangent



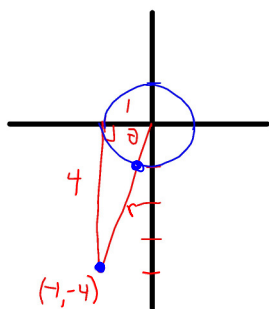
Ex. 1) Determine the value to the nearest thousandth.

a) $\sec 106^\circ = \frac{1}{\cos 106^\circ} = -3.628$

b) $\csc 64^\circ = \frac{1}{\sin 64^\circ} = 1.113$

c) $\cot(-88^\circ) = \frac{\tan(-88^\circ)}{\cos(-88^\circ)}$
 $\approx \frac{\sin(-88^\circ)}{\sin(-88^\circ)}$

Ex. 2) Given $P(-1, -4)$ is a terminal point of angle θ in standard position, determine the exact values of the six trigonometric ratios.



$$1^2 + 4^2 = r^2$$

$$17 = r^2$$

$$\sqrt{17} = r$$

$$\sin \theta = \frac{y}{r}$$

$$\sin \theta = \frac{-4}{\sqrt{17}}$$

$$\cos \theta = \frac{x}{r}$$

$$\cos \theta = \frac{-1}{\sqrt{17}}$$

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

$$\tan \theta = 4$$

$$\csc \theta = \frac{r}{y} \text{ (reciprocal of } \sin \theta)$$

$$= -\frac{\sqrt{17}}{4}$$

$$\sec \theta = \frac{r}{x} \text{ (reciprocal of } \cos \theta)$$

$$\sec \theta = -\sqrt{17}$$

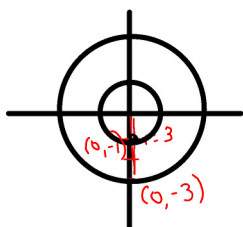
$$\cot \theta = \frac{x}{y} \text{ (reciprocal of } \tan \theta)$$

$$\cot \theta = \frac{1}{4}$$

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Ex. 3) Given $P(0, -3)$ is a terminal point of an angle in standard position, determine the exact values of the 6 trigonometric ratios.



$$(0, -1) \\ (\cos \theta, \sin \theta)$$

$$\sin \theta = -1$$

$$\csc \theta = -1$$

$$\cos \theta = 0$$

$$\sec \theta = \frac{1}{0}$$

$$\tan \theta = \frac{-1}{0} \\ \text{undefined}$$

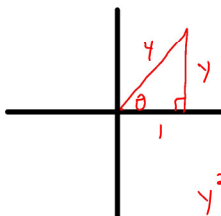
undefined

$$\cot \theta = \frac{0}{-1} \\ 0$$

$$(0, -3) \\ \sin \theta = \frac{y}{r} \\ \sin \theta = \frac{-3}{3} \\ = -1$$

Ex. 4) Given $\sec \theta = 4$, determine the exact values of the other trigonometric ratios for $0^\circ \leq \theta \leq 180^\circ$

QI and II
 $\sec \theta > 0$
 in QI



$$y^2 = 4^2 - 1^2 \\ y = \sqrt{15}$$

$$\sec \theta = 4$$

$$\cos \theta = \frac{1}{4} \quad \begin{matrix} \text{adj} \\ \text{hyp} \end{matrix}$$

$$\sin \theta = \frac{\sqrt{15}}{4}$$

$$\csc \theta = \frac{4}{\sqrt{15}}$$

$$\tan \theta = \sqrt{15}$$

$$\cot \theta = \frac{1}{\sqrt{15}}$$