

5.2 TRIGONOMETRIC FUNCTIONS: UNIT CIRCLE APPROACH PART II

Using a calculator to approximate the value of a trig fxn

Check settings on calculator: Do you want to enter angles as degrees or radians? Calculators have three of the six trig functions marked: cos, sin, and tan. To find the values of the remaining three trig fxns (sec, csc, and cot), use the following relationships.

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

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

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

Example. Use a calculator to find the approximate value of

a. $\cos 48^\circ \approx .6691$

b. $\csc 21^\circ = \frac{1}{\sin 21^\circ} \approx 2.79$

c. $\tan \frac{\pi}{12} \approx .268$

Use a circle of radius r to evaluate the trig fxns

How can we find the values of trig fxns given a point on a circle that has a radius other than 1?

For an ^{angle} θ in standard position, let $P = (x, y)$ be the point on the terminal side of θ that is also on the circle $x^2 + y^2 = r^2$. Then....

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

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

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

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

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

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

Given a point on the circumference of a circle with radius r , find the hypotenuse/radius first, then determine the values of the trig fxns.

Example. Find the exact values of the six trig fxns of an angle θ if $(4, -3)$ is a point on its terminal side in standard position.

★ find radius first

$$\begin{cases} 4^2 + (-3)^2 = r^2 \\ 16 + 9 = r^2 \\ 25 = r^2 \\ \underline{r = 5} \end{cases}$$

$$\begin{aligned} \sin\theta &= \frac{y}{r} = \frac{-3}{5} \\ \cos\theta &= \frac{x}{r} = \frac{4}{5} \\ \tan\theta &= \frac{y}{x} = \frac{-3}{4} \end{aligned}$$

$$\begin{aligned} \csc\theta &= \frac{r}{y} = \frac{5}{-3} \\ \sec\theta &= \frac{r}{x} = \frac{5}{4} \\ \cot\theta &= \frac{x}{y} = \frac{4}{-3} \end{aligned}$$