

**5.5 Inverse Trigonometric Functions**

Evaluate each expression without using a calculator, and write your answers in radians.

1.  $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{3}$

2.  $\cos^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{3}$

3.  $\cos^{-1}(-1) = \pi$

4.  $\cos^{-1}(0) = \pi/2$

5.  $\tan^{-1}(1) = \pi/4$

6.  $\tan^{-1}(0) = 0$

7.  $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right) = -3\pi/4$

8.  $\cos^{-1}(1) = 0$

9.  $\sin^{-1}\left(-\frac{1}{2}\right) = -\pi/6$

10.  $\sin^{-1}\left(\frac{\sqrt{2}}{2}\right) = \pi/4$

11.  $\tan^{-1}(\sqrt{3}) = \pi/3$

12.  $\tan^{-1}\left(\frac{\sqrt{3}}{3}\right) = \pi/6$

13.  $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) = -\pi/3$

14.  $\cos^{-1}\left(-\frac{1}{2}\right) = 2\pi/3$

15.  $\cos^{-1}\left(\frac{3}{2}\right)$  Does not exist.

Use a calculator to evaluate each expression to the nearest tenth of a degree.

16.  $\sin^{-1}(0.1702) = 9.8^\circ$

17.  $\arcsin(-0.1702) = -9.8^\circ$

18.  $\cos^{-1}(-0.8425) = 147.4^\circ$

19.  $\arccos(0.8425) = 32.6^\circ$

20.  $\tan^{-1}(0.3799) = 20.8^\circ$

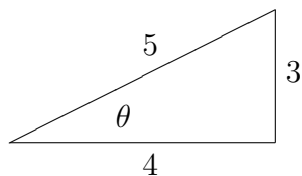
21.  $\arctan(-0.3799) = -20.8^\circ$

22.  $\arctan(-2.748) = -70.0^\circ$

Evaluate without using a calculator.

23.  $\cos\left(\tan^{-1}\frac{3}{4}\right)$

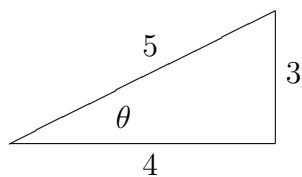
SOLUTION



$$\begin{aligned} \text{Let } \theta &= \tan^{-1}\frac{3}{4} \\ \tan \theta &= \frac{3}{4} = \frac{\text{opp}}{\text{adj}}, \quad \theta \in \text{QI} \\ \cos \theta &= \frac{\text{adj}}{\text{hyp}} = \frac{4}{5} \end{aligned}$$

24.  $\tan\left(\sin^{-1}\frac{3}{5}\right)$

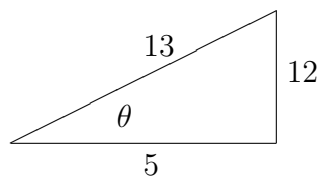
SOLUTION



$$\begin{aligned} \text{Let } \theta &= \sin^{-1}\frac{3}{5} \\ \sin \theta &= \frac{3}{5} = \frac{\text{opp}}{\text{hyp}}, \quad \theta \in \text{QI} \\ \tan \theta &= \frac{\text{opp}}{\text{adj}} = \frac{3}{4} \end{aligned}$$

25.  $\sin\left(\cos^{-1}\frac{5}{13}\right)$

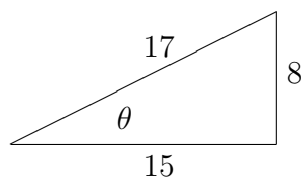
SOLUTION



$$\begin{aligned}\text{Let } \theta &= \cos^{-1}\frac{5}{13} \\ \cos \theta &= \frac{5}{13} = \frac{\text{adj}}{\text{hyp}}, \quad \theta \in \text{QI} \\ \sin \theta &= \frac{\text{opp}}{\text{hyp}} = \frac{12}{13}\end{aligned}$$

26.  $\cos\left(\tan^{-1}\frac{8}{15}\right)$

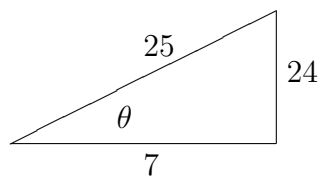
SOLUTION



$$\begin{aligned}\text{Let } \theta &= \tan^{-1}\frac{8}{15} \\ \tan \theta &= \frac{8}{15} = \frac{\text{opp}}{\text{adj}}, \quad \theta \in \text{QI} \\ \cos \theta &= \frac{\text{adj}}{\text{hyp}} = \frac{15}{17}\end{aligned}$$

27.  $\sin\left(\tan^{-1}\frac{24}{7}\right)$

SOLUTION

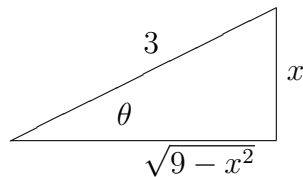


$$\begin{aligned}\text{Let } \theta &= \tan^{-1}\frac{24}{7} \\ \tan \theta &= \frac{24}{7} = \frac{\text{opp}}{\text{adj}}, \quad \theta \in \text{QI} \\ \sin \theta &= \frac{\text{opp}}{\text{hyp}} = \frac{24}{25}\end{aligned}$$

For each expression below, write an equivalent expression that involves  $x$  only. (Assume  $x$  is positive.)

28.  $\tan\left(\sin^{-1}\frac{x}{3}\right)$

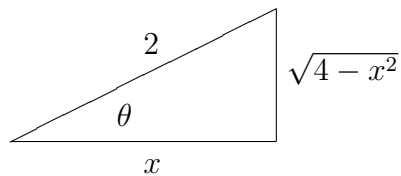
SOLUTION



$$\begin{aligned} \text{Let } \theta &= \sin^{-1}\frac{x}{3} \\ \sin \theta &= \frac{x}{3} = \frac{\text{opp}}{\text{hyp}}, \quad \theta \in \text{QI} \\ \tan \theta &= \frac{\text{opp}}{\text{adj}} = \frac{x}{\sqrt{9 - x^2}} \end{aligned}$$

29.  $\sin\left(\cos^{-1}\frac{x}{2}\right)$

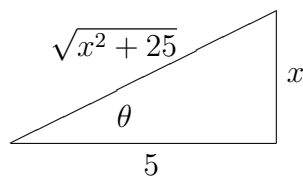
SOLUTION



$$\begin{aligned} \text{Let } \theta &= \cos^{-1}\frac{x}{2} \\ \cos \theta &= \frac{x}{2} = \frac{\text{adj}}{\text{hyp}}, \quad \theta \in \text{QI} \\ \sin \theta &= \frac{\text{opp}}{\text{hyp}} = \frac{\sqrt{4 - x^2}}{2} \end{aligned}$$

30.  $\sec\left(\tan^{-1}\frac{x}{5}\right)$

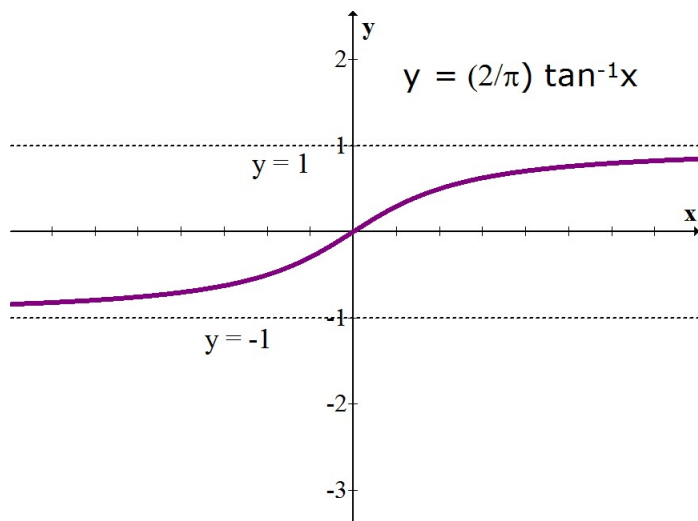
SOLUTION



$$\begin{aligned} \text{Let } \theta &= \tan^{-1}\frac{x}{5} \\ \tan \theta &= \frac{x}{5} = \frac{\text{opp}}{\text{adj}}, \quad \theta \in \text{QI} \\ \sec \theta &= \frac{\text{hyp}}{\text{adj}} = \frac{\sqrt{x^2 + 25}}{5} \end{aligned}$$

Sketch the graph. Label the horizontal asymptotes.

31.  $y = \frac{2}{\pi} \tan^{-1} x$



32.  $y = 1 + \frac{2}{\pi} \tan^{-1} x$

