Lesson 6-7

Example 1

Find each value by referring to the graphs of the trigonometric functions.

a. $\tan \frac{11\pi}{4}$

Since $\frac{11\pi}{4} = 2\pi + \frac{3\pi}{4}$, $\tan \frac{11\pi}{4} = -1$.

b. $\cot \frac{5\pi}{2}$

Since $\frac{5\pi}{2} = 2\pi + \frac{\pi}{2}$, $\cot \frac{5\pi}{2} = 0$

Example 2

Find the values of θ for which each equation is true.

a. $\csc \theta = -1$

From the pattern of the cosecant function, $\csc \theta = -1$ if $\theta = \frac{3\pi}{2} + 2\pi n$, where n is an integer.

b. $\sec \theta = 1$

From the pattern of the secant function, $\sec \theta = 1$ if $\theta = \pi n$, where n is an even integer.

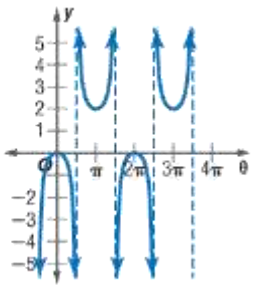
Example 3

Graph $y = \csc 1\theta - \frac{\pi}{2}2 + 1$.

The period is $\frac{2\pi}{1}$ or 2π.

The phase shift is $-\frac{\frac{-\pi}{2}}{1}$ or $\frac{\pi}{2}$.

The vertical shift is 1. Use this information to graph the function.



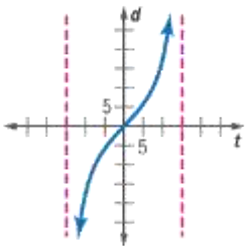
Example 4

SECURITY **A security camera scans a long, straight driveway that serves as an entrance to a house. Suppose a line is drawn down the center of the driveway. The camera is located 10 feet to the right of the midpoint of the line. Let *d* represent the distance along the line from its midpoint. If *t* is time in seconds and the camera points at the midpoint at *t* = 0, then *d* = 10 tan $1\frac{\pi}{30}t2$ models the point being scanned.**

a. Graph the equation for –15 ≤ *t* ≤ 15.

b. Find the location the camera is scanning at 12 seconds.

a. The period is $\frac{\pi}{\frac{\pi}{30}}$ or 30. There are no horizontal or vertical shifts. Draw the asymptotes at *t* = -15 and *t* = 15. Graph the equation.



b. To find the location the camera is scanning at 12 seconds, evaluate the equation at *t* = 12.

d = 10 tan $1\frac{\pi}{30}t2$

d = 10 tan $\square\frac{\pi}{30}(12)\square$ *t = 12*

d ≈ 30.77683537

The camera is scanning a point that is about 30.8 feet above the center of the driveway.

Example 5

Write an equation for a secant function with period π, phase shift $-\frac{\pi}{2}$, and vertical shift 3.

The form of the equation will by $y = \sec(k\theta + c) + h$. Find the values of k, c, and h.

k: $\frac{2\pi}{k} = \pi$

$k = 2$

***c*:** $-\frac{c}{k} = -\frac{\pi}{2}$

$-\frac{c}{2} = -\frac{\pi}{2}$

$c = \pi$

***h*:** $h = 3$

Substitute these values into the general equation. The equation is $y = \sec(2\theta + \pi) + 3$.