THE UNIVERSITY OF AKRON
Theoretical and Applied Mathematics

Flash Cards

Graphs of other Trigonometric Functions

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and
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WebTrig Flash Cards
AcroTEX eDucation Bundle

Graph the function

$$y(t) = \tan\left(\frac{\pi}{2}t\right).$$

Graph the function

$$y(t) = \tan(-2t + \pi).$$

Hint Soln
Next Home

Graph the function

$$y(t) = \cot(2t) - 2.$$

Graph the function

$$y(t) = \cot\left(\frac{\pi}{4}t + \frac{\pi}{4}\right).$$

Graph the function

$$y(t) = \sec\left(\frac{\pi}{3}t\right) + 1.$$

Graph the function

$$y(t) = \sec\left(\frac{1}{2}t - \frac{\pi}{2}\right).$$

Graph the function

$$y\left(t\right)=\csc\left(-3t\right)+2.$$

Graph the function

$$y(t) = \csc\left(-t + \frac{\pi}{4}\right).$$

What is the period of the function

$$y(t) = \tan(4t).$$

What is the period of the function

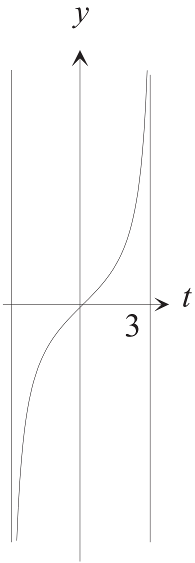
$$y(t) = \cot\left(-\pi t + \frac{\pi}{4}\right).$$

What is the period of the function

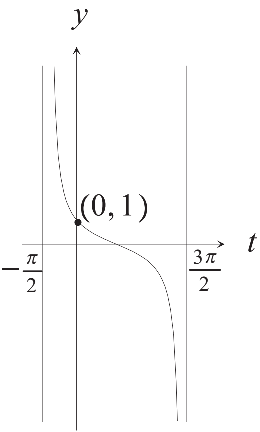
$$y(t) = \sec\left(\frac{-\pi}{3}t\right) - 1.$$

What is the period of the function

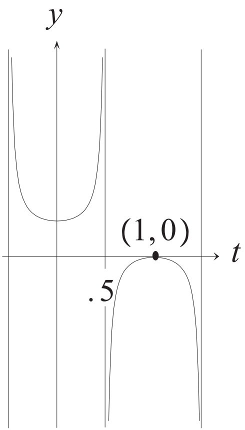
$$y(t) = \csc\left(3t - \frac{\pi}{3}\right) + 1.$$



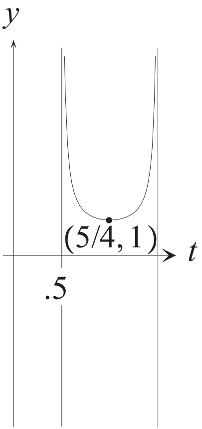
Find a tangent function whose graph looks like the figure.



Find a cotangent function whose graph looks like the one given in the figure.



Find a secant function whose graph looks like the figure.



Find a cosecant function with a negative period whose graph looks like the given figure..

Find a tangent function whose graph is identical to the graph of the function

$$y(t) = \cot\left[\pi(t+1)\right].$$

Find a cotangent function whose graph is identical to the graph of the function

$$y(t) = \tan\left[\frac{1}{2}(t+\pi)\right].$$

Find a secant function whose graph is identical to the graph of the function

$$y(t) = \csc\left[2\left(t + \frac{\pi}{2}\right)\right].$$

Find a cosecant function whose graph is identical to the graph of the function

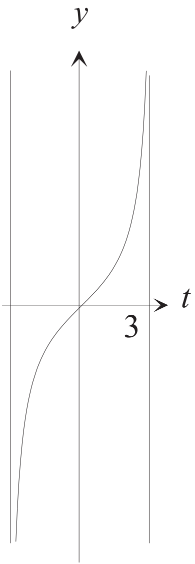
$$y(t) = \sec\left[\frac{\pi}{2}(t+2)\right] + 1.$$

HINT

In order to graph the function

$$y(t) = \tan\left(\frac{\pi}{2}t\right)$$

note that the $\frac{\pi}{2}$ causes a change in the graph's period.



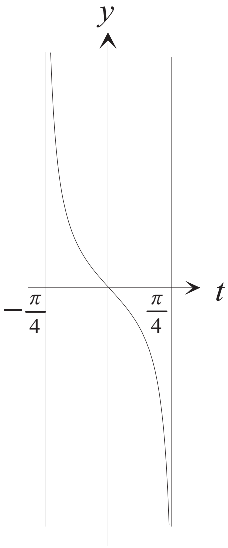
Solution: The graph of y has the same general appearance as the fundamental tangent function except that the period is $\dfrac{\pi}{\left|\frac{\pi}{2}\right|} = 2$.

HINT

In order to graph the function

$$y(t) = \tan(-2t + \pi)$$

note that there are three changes in the appearance of the fundamental tangent function.



Solution: The graph of y has the same general appearance as the fundamental tangent function except that the period is $\frac{\pi}{|-2|} = \frac{\pi}{2}$, there is a phase shift of $\frac{\pi}{2}$ units to the right and the graph is reflected over the t-axis since

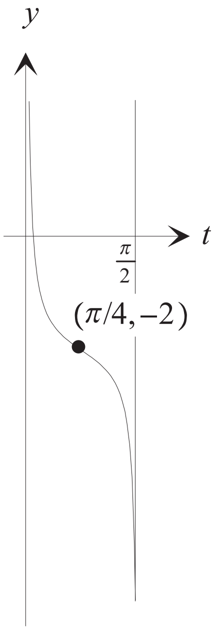
$$\begin{aligned}\tan(-2t+\pi) &= \tan\left[-2\left(t-\frac{\pi}{2}\right)\right] \\ &= -\tan\left[2\left(t-\frac{\pi}{2}\right)\right].\end{aligned}$$

HINT

In order to graph the function

$$y(t) = \cot(2t) - 2$$

note that there is a change in the period, vertical shift, and reflection of the fundamental cotangent function.



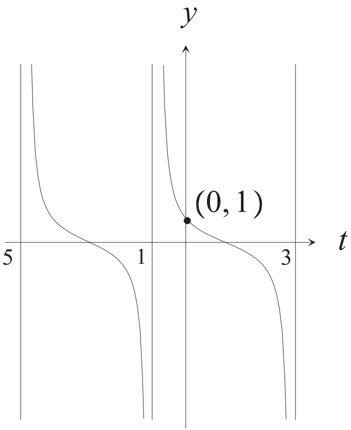
Solution: The graph of y has the same general appearance as the fundamental cotangent function except that the period is $\frac{\pi}{|-2|} = \frac{\pi}{2}$ and there is a shift of 2 units down.

HINT

In order to graph the function

$$y(t) = \cot\left(\frac{\pi}{4}t + \frac{\pi}{4}\right)$$

note that there are two changes in the period and phase shift of the fundamental cotangent function.



Solution: The graph of y has the same general appearance as the fundamental cotangent function except that the period is $\dfrac{\pi}{\left|\frac{\pi}{4}\right|} = 4$ and there is a phase shift of 1 unit to the left (since $\cot\left(\frac{\pi}{4}t + \frac{\pi}{4}\right) = \cot\left[\frac{\pi}{4}(t+1)\right]$).

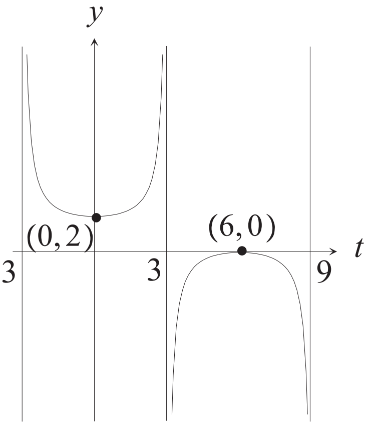
HINT

In order to graph the function

$$y(t) = \sec\left(\frac{\pi}{3}t\right) + 1$$

recall the fundamental secant function given in the following figure [figure].

Hint Soln
Next Home



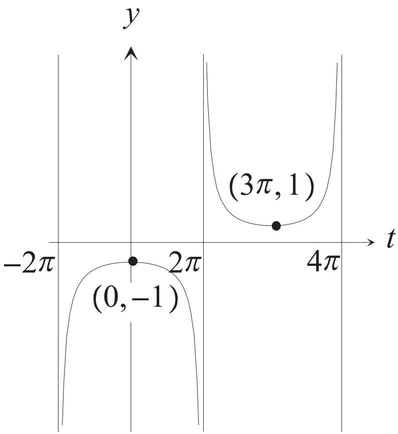
Solution: The graph of y has the same general appearance as the fundamental secant function except that the period is $\dfrac{2\pi}{\left|\frac{\pi}{3}\right|} = 6$ and there is a vertical shift of 1 unit up.

HINT

In order to graph the function

$$y(t) = \sec\left(\frac{1}{2}t - \frac{\pi}{2}\right)$$

note that there are two changes in the appearance of the fundamental secant function.



Solution: The graph of y has the same general appearance as the fundamental secant function except that the period is $\dfrac{2\pi}{\left|\frac{1}{2}\right|} = 4\pi$ and there is a phase shift of π units to the right since

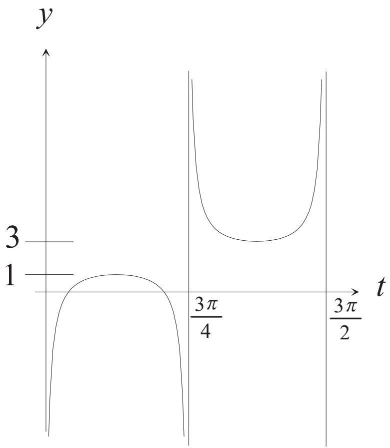
$$\sec\left(\frac{1}{2}t - \frac{\pi}{2}\right)$$
$$= \sec\left[\frac{1}{2}(t-\pi)\right].$$

HINT

In order to graph the function

$$y(t) = \csc(-3t) + 2$$

recall the fundamental cosecant function given in the following figure.



Solution: The graph of y has the same general appearance as the fundamental cosecant function except that the period is

$$\frac{2\pi}{|-3|} = \frac{2\pi}{3},$$

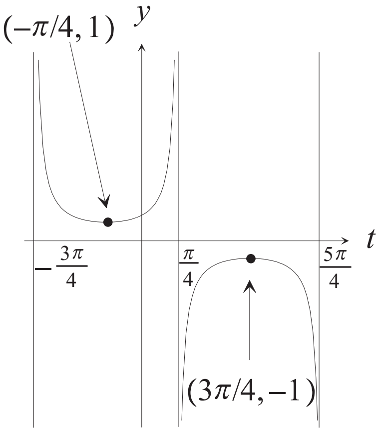
there is a shift of 2 units up, and the graph is reflected over the t-axis.

HINT

In order to graph the function

$$y(t) = \csc\left(-t + \frac{\pi}{4}\right)$$

remember that $\frac{\pi}{4}$ is a phase shift and the $-t$ causes a reflection in the fundamental cosecant function.



Solution: The graph of y has the same general appearance as the fundamental cosecant function except that there is a phase shift of $\frac{\pi}{4}$ units to the right (since $\csc\left(-t+\frac{\pi}{4}\right) = \csc\left[-\left(t-\frac{\pi}{4}\right)\right]$) and the graph is reflected over the t-axis.

HINT

To find the period of the function

$$y(t) = \tan(4t)$$

remember the fundamental tangent function has a period of π.

Answer: $\boxed{\dfrac{\pi}{4}}$

Solution: The equation $y(t) = \tan(4t)$ has the form $y(t) = \tan(at)$ where the period is $\dfrac{\pi}{|a|}$. So, the period of y is

$$\frac{\pi}{|4|} = \frac{\pi}{4}.$$

HINT

To find the period of the function

$$y(t) = \cot\left(-\pi t + \frac{\pi}{4}\right)$$

put the function in the form $y(t) = \cot(at + b)$ then the period is $\dfrac{\text{the period of } \cot t}{|a|}$.

Hint Soln
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Answer: $\boxed{1}$

Solution: The equation $y(t) = \cot\left(-\pi t + \frac{\pi}{4}\right)$ has the form $y(t) = \cot(at + b)$ where the period is $\dfrac{\pi}{|a|}$. So, the period of y is

$$\frac{\pi}{|-\pi|} = 1.$$

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HINT

To find the period of the function

$$y(t) = \sec\left(\frac{-\pi}{3}t\right) - 1$$

remember the fundamental secant function has a period of 2π.

Answer: $\boxed{6}$

Solution: The equation $y(t) = \sec\left(\frac{-\pi}{3}t\right) - 1$ has the form $y(t) = \sec(at + b) + c$ where the period is $\dfrac{2\pi}{|a|}$. So, the period of y is

$$\frac{2\pi}{\left|\frac{-\pi}{3}\right|} = 6.$$

◀

HINT

To find the period of the function

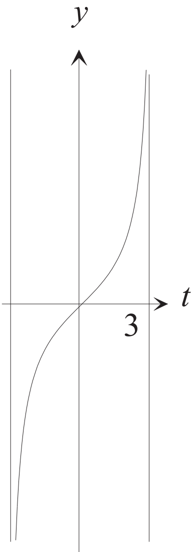
$$y(t) = \csc\left(3t - \frac{\pi}{3}\right) + 1$$

note in this case the 3 is a in the function form $y(t) = \csc(at + b) + c$.

Answer: $\boxed{\dfrac{2\pi}{3}}$

Solution: The equation $y(t) = \csc\left(3t - \frac{\pi}{3}\right) + 1$ has the form $y(t) = \csc(at + b) + c$ where the period is $\dfrac{2\pi}{|a|}$. So, the period of y is

$$\frac{2\pi}{|3|} = \frac{2\pi}{3}.$$



HINT

To find a tangent function whose graph looks like the figure concentrate on one entire oscillation noting differences between the given graph and the fundamental tangent graph.

Answer: $\boxed{y(t) = \tan\left(\frac{\pi}{2}t\right)}$

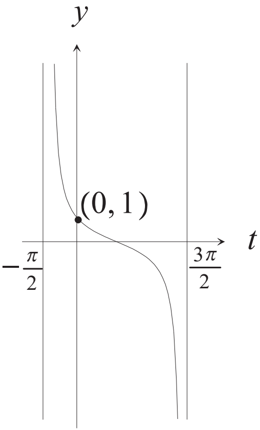
Solution: The function differs from the fundamental tangent wave in that the period is 2 units since the interval $[0, 2]$ contains exactly one oscillation of y. This means that $\frac{\pi}{|a|} = 2$ so that $a = \frac{\pi}{2}$.This indicates that

$$y(t) = \tan\left(\frac{\pi}{2}t\right).$$

There are many other acceptable answers for this question. Some include

$$y_a(t) = \tan\left[\frac{\pi}{2}(t+2)\right] \text{ and}$$
$$y_b(t) = \tan\left[\frac{\pi}{2}(t-2)\right].$$

HINT



To find a cotangent function whose graph looks like the figure concentrate on the period and phase shift of the curve.

Answer: $\boxed{y(t) = \cot\left[\frac{1}{2}t + \frac{\pi}{4}\right]}$

Solution: The function differs from the fundamental cotangent wave in that the period is 2π units since the interval $[-\pi/2, 3\pi/2]$ contains exactly one oscillation of y. This means that $\frac{\pi}{|a|} = 2\pi$ so that $a = \frac{1}{2}$. Also, the graph has been translated $\frac{\pi}{2}$ units to the left. This indicates that

$$\begin{aligned} y(t) &= \cot\left[\frac{1}{2}\left(t + \frac{\pi}{2}\right)\right] \\ &= \cot\left[\frac{1}{2}t + \frac{\pi}{4}\right]. \end{aligned}$$

There are many other acceptable answers for this question. One includes

$$y_a(t) = \cot\left[\frac{1}{2}\left(t - \frac{3\pi}{2}\right)\right].$$

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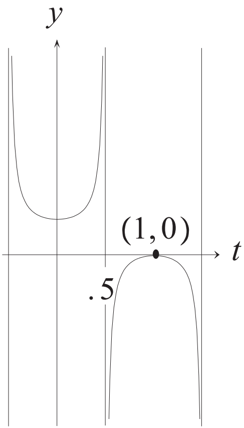
HINT



To find a secant function whose graph looks like the given figure consider the vertical asymptotes..

Answer: $\boxed{y(t) = \sec[\pi t - \pi] + 1}$

Solution: The function differs from the fundamental secant wave in that the period is 2 units since the interval $[0, 2]$ contains exactly one oscillation of y. This means that $\frac{2\pi}{|a|} = 2$ so that $a = \pi$. Also, the graph has been translated 1 unit to the right and 1 unit up. This indicates that

$$\begin{aligned} y(t) &= \sec[\pi(t-1)] + 1 \\ &= \sec[\pi t - \pi] + 1. \end{aligned}$$

There are many other acceptable answers for this question. Some include

$$\begin{aligned} y_a(t) &= -\sec(\pi t) + 1 \text{ and} \\ y_b(t) &= \sec[\pi(t-2)] + 1. \end{aligned}$$

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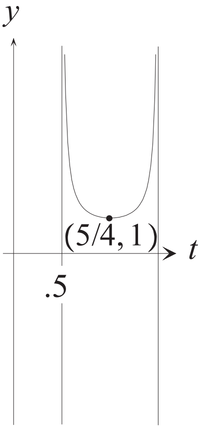

HINT

To find a cosecant function whose graph looks like the figure note that only half of an entire oscillation of a cosecant wave appears in the figure.

Answer: $\boxed{y(t) = \csc\left(\frac{2\pi}{3}t - \frac{\pi}{3}\right)}$

Solution: The function differs from the fundamental cosecant wave in that the period is 3 units since the interval $[0, 3]$ contains exactly one oscillation of y. This means that $\frac{2\pi}{|a|} = 3$ so we may choose $a = \frac{2\pi}{3}$. Also, the graph has been translated $\frac{1}{2}$ unit to the right. This indicates that

$$y(t) = \csc\left[\frac{2\pi}{3}\left(t - \frac{1}{2}\right)\right] = \csc\left[\frac{2\pi}{3}t - \frac{\pi}{3}\right].$$

There are many other acceptable answers for this question. Some include

$$y_a(t) = -\csc\left[\frac{2\pi}{3}\left(t + \frac{5}{2}\right)\right] \text{ and } y_b(t) = -\csc\left[\frac{2\pi}{3}\left(t - \frac{7}{2}\right)\right].$$

◀

HINT

To find a tangent function whose graph is identical to the graph of the function

$$y(t) = \cot[\pi(t+1)]$$

use an appropriate phase shift.

Answer: $\boxed{y_a(t) = -\tan\left[\pi\left(t + \frac{3}{2}\right)\right]}$

Solution: The fundamental tangent function is the same basic shape as the fundamental cotangent function with a phase shift of $\frac{\pi}{2}$ units (one half of the period) to the left and the graph is reflected over the t-axis. The period of the given function is $\frac{\pi}{\pi} = 1$ and one half of the period is $\frac{1}{2}$. So, similarly reflect and shift the given function to get the answer.

$$y_a(t) = -\tan\left[\pi\left(t + \frac{3}{2}\right)\right]$$

There are many other acceptable answers for this question including, for example,

$$y_b(t) = -\tan\left[\pi\left(t + \frac{1}{2}\right)\right].$$

◀

HINT

To find a cotangent function whose graph is identical to the graph of the function

$$y\left(t\right)=\tan\left[\frac{1}{2}\left(t+\pi\right)\right]$$

remember adding a negative sign in the appropriate place causes a reflection.

Answer: $\boxed{y_a(t) = -\cot\left(\frac{1}{2}t\right)}$

Solution: The fundamental cotangent function is the same basic shape as the fundamental tangent function with a phase shift of $\frac{\pi}{2}$ units (one half of the period) to the right and the graph is reflected over the t-axis. The period of the given function is $\frac{\pi}{\frac{1}{2}} = 2\pi$ and one half of the period is π. So, similarly reflect and shift the given function to get the answer.

$$y_a(t) = -\cot\left(\frac{1}{2}t\right)$$

There are many other acceptable answers for this question. One includes

$$y_b(t) = -\cot\left[\frac{1}{2}(t+\pi)\right].$$

◀

HINT

To find a secant function whose graph is identical to the graph of the function

$$y(t) = \csc\left[2\left(t + \frac{\pi}{2}\right)\right]$$

use an appropriate phase shift.

Answer: $\boxed{y_a(t) = \sec\left[2\left(t + \frac{3\pi}{4}\right)\right]}$

Solution: The fundamental cosecant function is the same basic shape as the fundamental secant function with a phase shift of $\frac{\pi}{2}$ units (one forth of the period) to the left. The period of the given function is $\dfrac{2\pi}{2} = \pi$ and one forth of the period is $\frac{\pi}{4}$. So, similarly shift the given function to get the answer.

$$y_a(t) = \sec\left[2\left(t + \frac{3\pi}{4}\right)\right]$$

There are many other acceptable answers for this question. One includes

$$y_b(t) = \sec\left[2\left(t - \frac{\pi}{4}\right)\right].$$

◀

HINT

To find a cosecant function whose graph is identical to the graph of the function

$$y\,(t) = \sec\left[\frac{\pi}{2}\,(t+2)\right] + 1$$

compare the fundamental secant graph with the fundamental cosecant graph.

Answer: $\boxed{y_a(t) = \csc\left[\frac{\pi}{2}(t-1)\right] + 1}$

Solution: The fundamental secant function is the same basic shape as the fundamental cosecant function with a phase shift of $\frac{\pi}{2}$ units (one forth of the period) to the right. The period of the given function is $\frac{2\pi}{\left|\frac{\pi}{2}\right|} = 4$ and one forth of the period is 1. So, similarly shift the given function to get the answer.

$$y_a(t) = \csc\left[\frac{\pi}{2}(t-1)\right] + 1$$

There are many other acceptable answers for this question. One includes

$$y_b(t) = -\csc\left[\frac{\pi}{2}(t+1)\right] + 1.$$