Warm Up 1/24

Evaluate the following.

1. $\tan \frac{4\pi}{3}$

2. $\cot \pi$

3. $\sec \frac{11\pi}{6}$

4. $\csc \frac{2\pi}{3}$

Lesson 5-4

More Trigonometric Graphs

Objective

Students will…

- Be able to identify Tangent, Cotangent, Secant, and Cosecant graphs.
- Be able to find the period of Tangent, Cotangent, Secant, and Cosecant functions.

Standard Equation of tan and cot Curves

Just like sine and cosine functions, there exists a standard equation of tangent and cotangent functions.

Tangent Curves: Any equation of a tangent curve is written in the form:

$y = a \tan kx$, where a and k are real numbers with $k > 0$

$y = a \tan k(x - h) + m$

Cotangent Curves: Any equation of a cotangent curve is written in the form:

$y = a \cot kx$, where a and k are real numbers with $k > 0$

$y = a \cot k(x - h) + m$.

Asymptotes of Tangent and Cotangent Functions

Graphing tangent and cotangent functions by hand is even less efficient than graphing sine or cosine functions. However, there are some things to keep in mind when dealing with them. Consider the following…

$\tan\frac{\pi}{2} = \frac{1}{0} = \text{und} = \tan\frac{3\pi}{2}$ $\quad$ $\cot\pi = \frac{-1}{0} = \text{und} = \cot 0$

This happens throughout the unit circle, which tells us that the standard tangent and cotangent functions are undefined at various points. This calls for drawing **vertical asymptotes** at these undefined points.

Finding the Period of tan, cot, csc, and sec

Finding the period of tangent, cotangent, cosecant, and secant functions is as easy as it was for sine and cosine functions.

Recall that standard tangent and cotangent functions have period of π.

So, the period of any tangent or cotangent function is of the form: $\boldsymbol{\frac{\pi}{k}}$

Recall that standard cosecant and secant functions have period of 2π.

So, the period of any cosecant or secant function is of the form: $\boldsymbol{\frac{2\pi}{k}}$

Graph of Tangent Function

Let's now graph the standard tangent function: $y = \tan x$

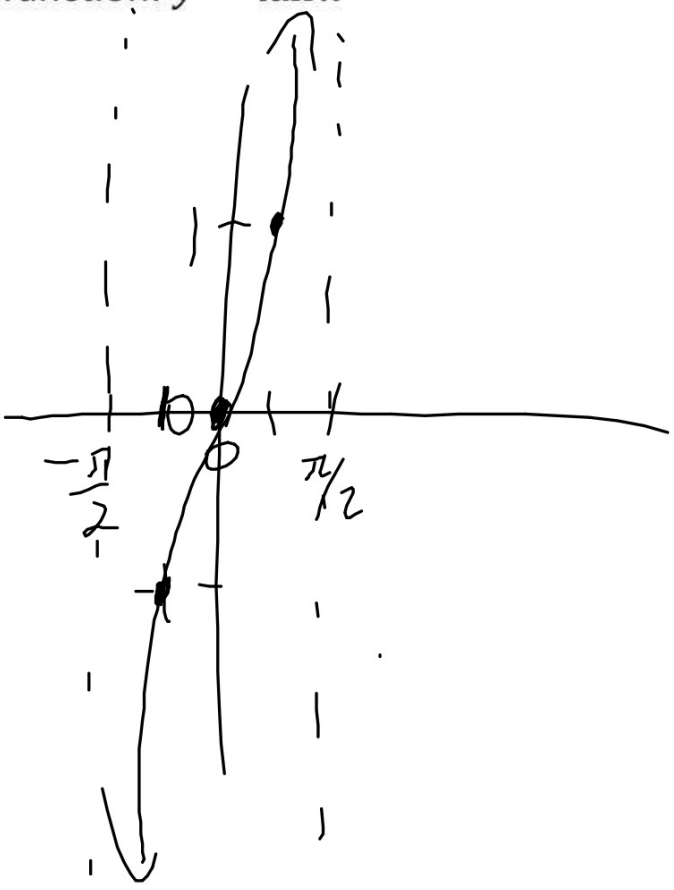
amp: 1

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

Start/End

X-axis: $-\frac{\pi}{2} \to \frac{\pi}{2}$

y-axis: $-1, 0, 1$



Graph of Cotangent Function

And now the standard cotangent function: $y = \cot x$

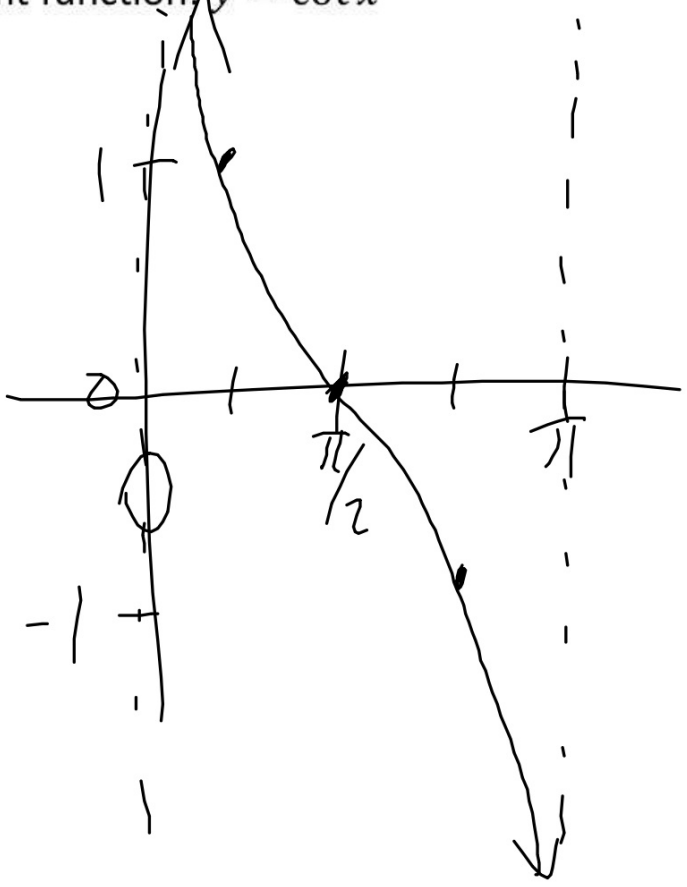
amp: 1

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

Start/End

x-axis: $0 \rightarrow \pi$

y-axis: $-1, 0, 1$



Standard Equation of csc and sec Curves

The standard equations of cosecant and secant functions are as follows:

1/sin

Cosecant Curves: Any equation of a cosecant curve is written in the form:

$y = a \csc kx$, where a and k are real numbers with $k > 0$

$y = a \csc k(x - h) + m$

1/cos

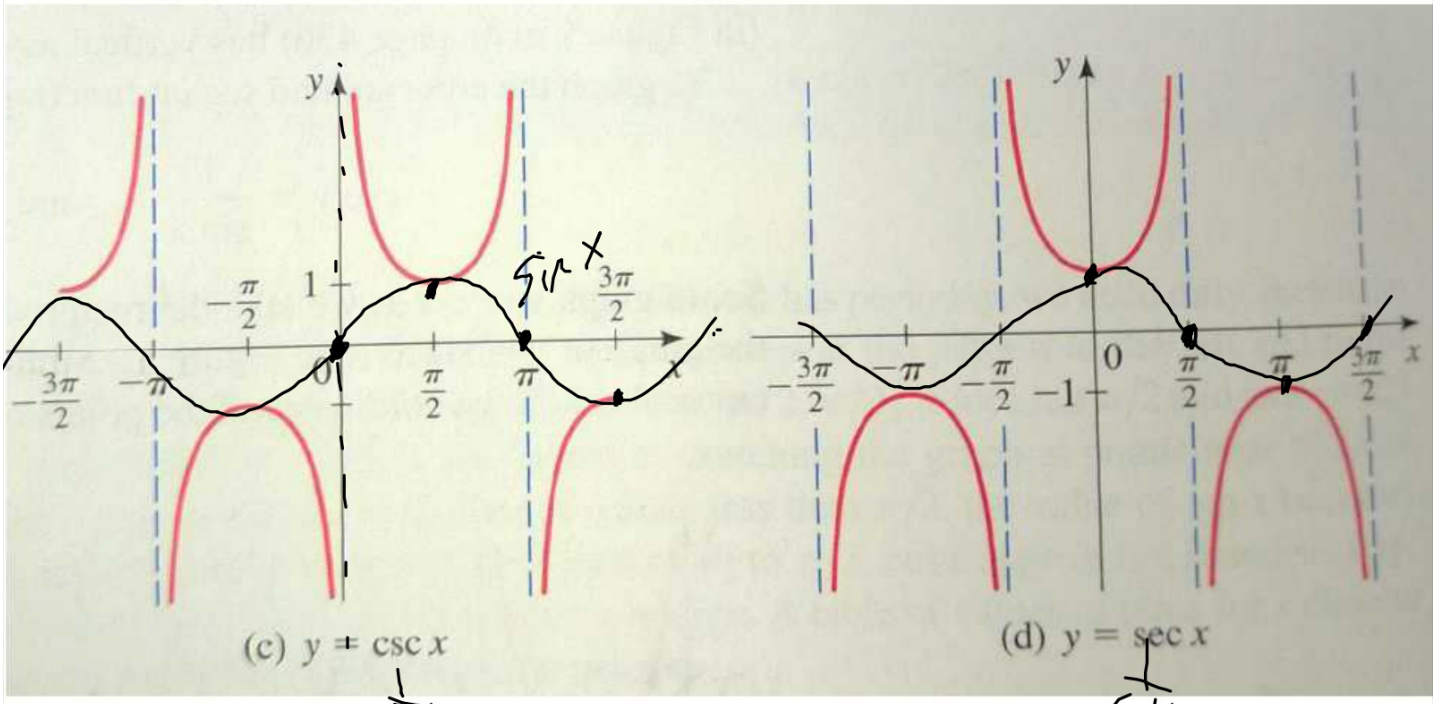
Secant Curves: Any equation of a secant curve is written in the form:

$y = a \sec kx$, where a and k are real numbers with $k > 0$

$y = a \sec k(x - h) + m$

Graphs of Cosecant and Secant

Graphs of cosecant and secant can be understood as "branching out" from sine and cosine functions, respectively. We will simply observe these graphs, visually. (Well, lucky you!). They both have a period of 2π.



(c) $y = \csc x$

(d) $y = \sec x$

Examples

Graph the following.

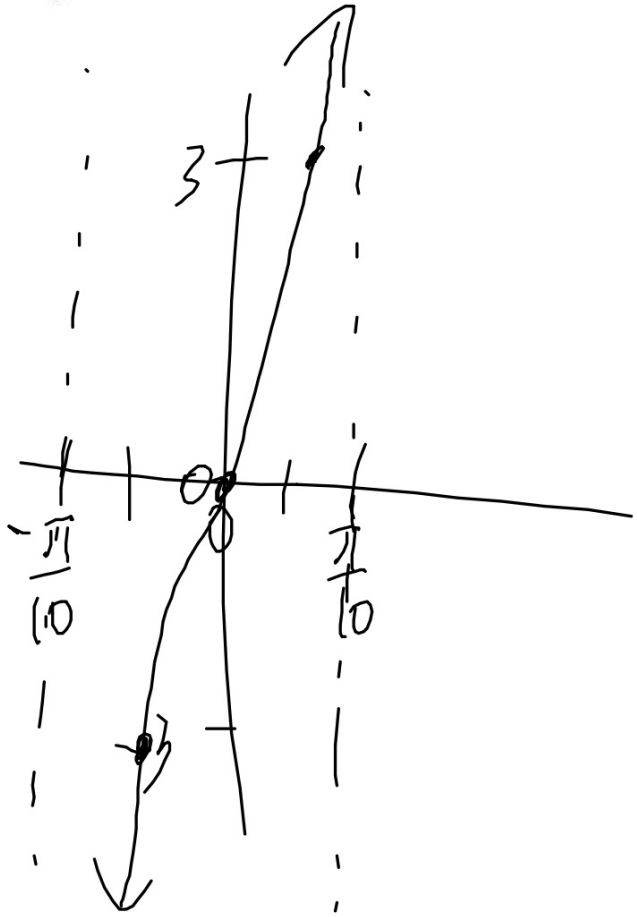
a) $3 \tan 5x$

amp: 3

Per: $\frac{\pi}{5}$

X-axis: $-\frac{\pi}{10} \rightarrow \frac{\pi}{10}$

y-axis: $-3, 0, 3$



Examples

Graph the following.

b) $\csc 2x$

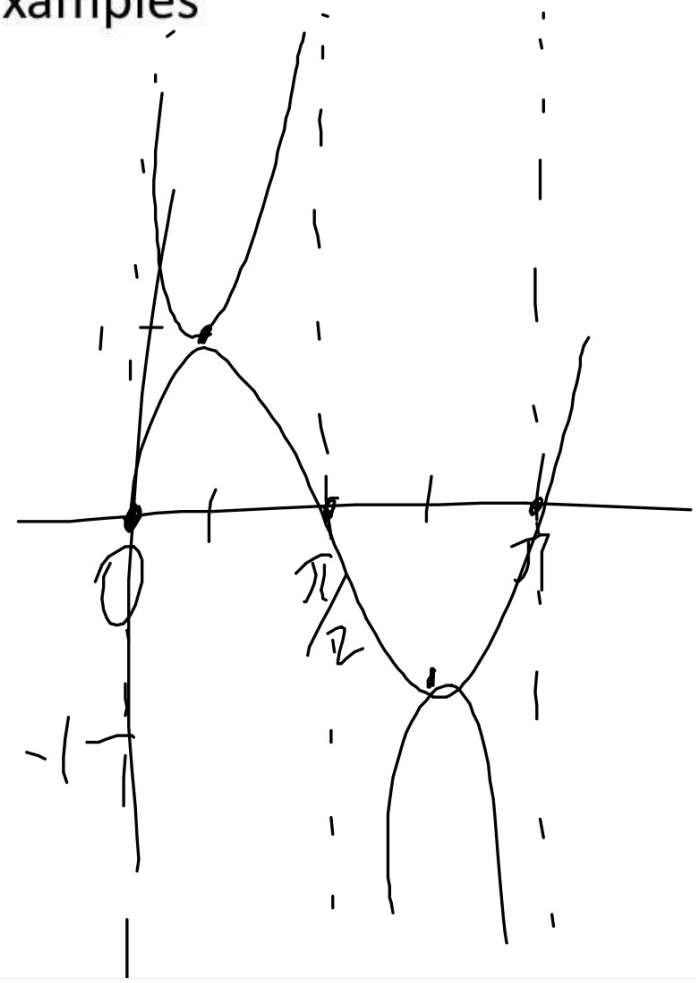
draw: $\sin 2x$

amp: 1

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

x-axis: $0 \to \pi$

y-axis: $-1 \to 0 \to 1$



Examples

Graph the following.

c) $\cot 0.25x$

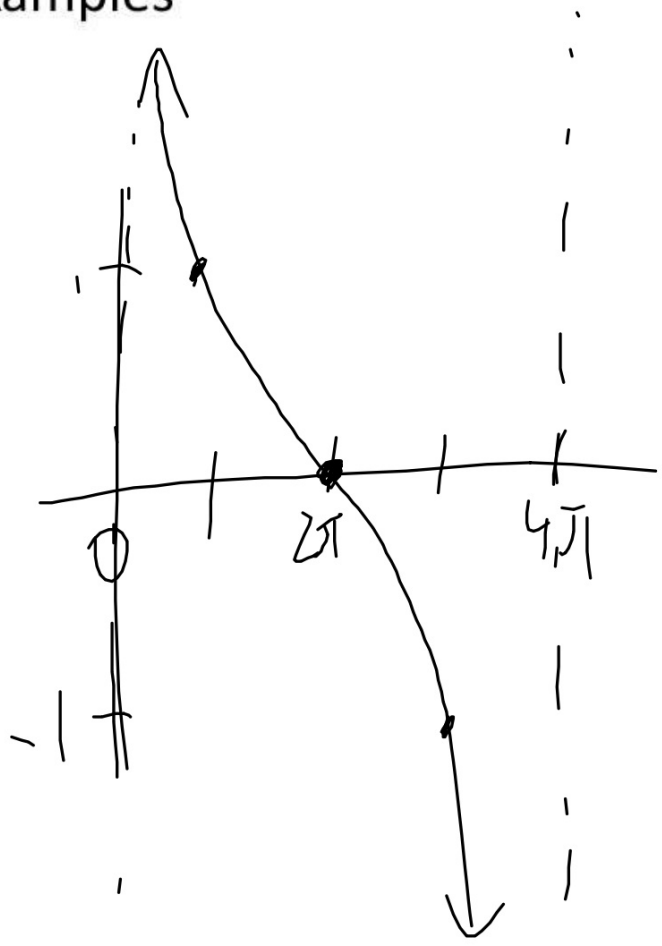
$\cot \frac{1}{4}x$

per: $\frac{\pi}{\frac{1}{4}} = 4\pi$

amp: 1

x-axis: $0 \to 4\pi$

y-axis: $-1, 0, 1$



Examples

Graph the following.

d) $\frac{1}{2}\tan(2x - \frac{\pi}{3})$

amp: $\frac{1}{2}$

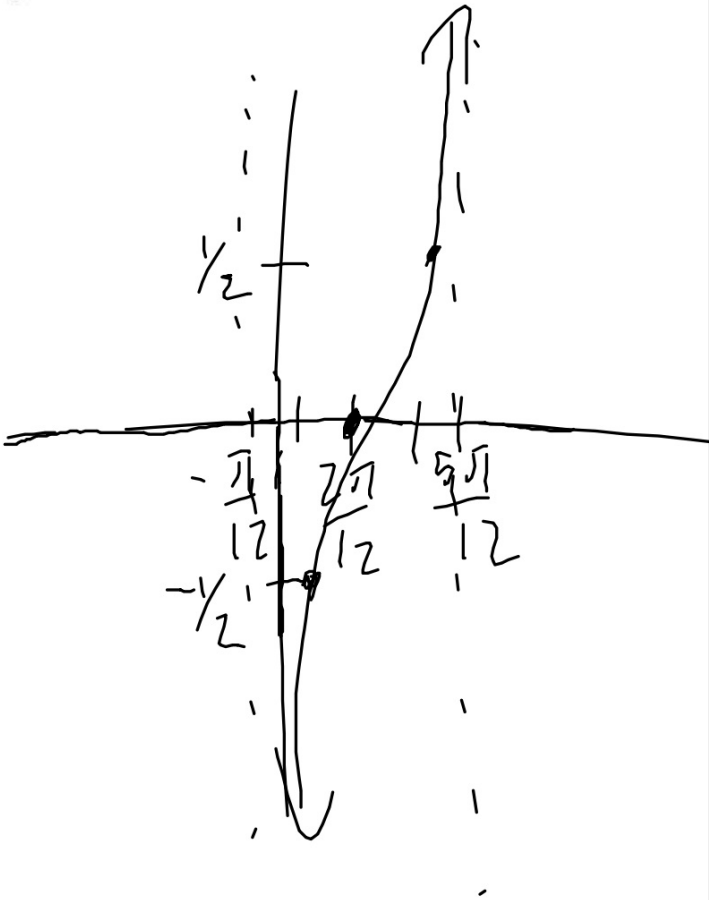
Per: $\pi/2$ $-\pi/4 \rightarrow \pi/4$

Shift: right $\pi/6$

Start/end

X-axis: $-\frac{\pi}{3} \rightarrow \frac{\pi}{3}$

y-axis: $-\frac{1}{2}, 0, \frac{1}{2}$



Homework 1/24

Graphing Tan, Sec, Csc WKSHT