Name _____ Date _____ Class _____

LESSON 11-2

Review for Mastery

Graphs of Other Trigonometric Functions

Transformations of the tangent function change the period and/or asymptotes of the graph.

For $y = a\tan bx$:

Note: x is measured in radians.

- the period is $\frac{\pi}{|b|}$,
- the asymptotes are located at $x = \frac{\pi}{2|b|} + \frac{\pi n}{|b|}$, where n is an integer.

Use the graph of $f(x) = \tan x$ to sketch the graph of $g(x) = \tan\frac{1}{2}x$.

Step 1 Find b to identify the period.

$b = \frac{1}{2}$, and $\frac{\pi}{|b|} = \frac{\pi}{\left|\frac{1}{2}\right|} = 2\pi$, so the period is 2π.

There will be one full cycle between $-\pi$ and π.

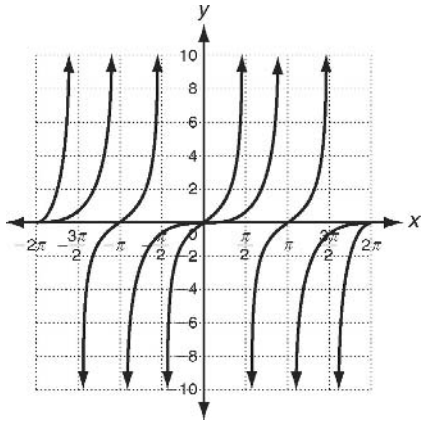
Step 2 Use the period to identify the x-intercepts.
The first x-intercepts of both $f(x)$ and $g(x)$ occur at 0.
Because the period is 2π, the intercepts occur at $2\pi n$.
For example, -2π, 0, and 2π are x-intercepts.

The intercepts shift 2π radians right and occur at integer multiples of 2π or the even multiples of π.

Step 3 Identify the asymptotes.

$b = \frac{1}{2}$, so the asymptotes occur at $x = \frac{\pi}{2\left|\frac{1}{2}\right|} + \frac{\pi n}{\left|\frac{1}{2}\right|} = \pi + 2\pi n$.

Step 4 Graph $f(x) = \tan x$ and $g(x) = \tan\frac{1}{2}x$ on the same plane.



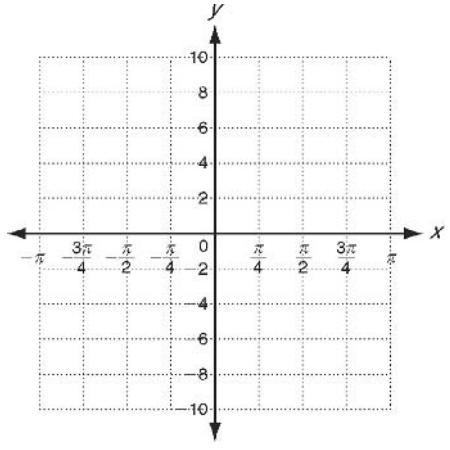
The x-intercepts of $g(x)$ are also x-intercepts of $f(x)$. The asymptotes are different. Because the period of $g(x)$ is 2π, there are fewer cycles of $g(x)$ in the same interval as $f(x)$.

Complete to graph $g(x) = \tan 2x$. Use the interval from $-\pi$ to π.

1. Find the period of $g(x)$. $\frac{\pi}{|b|} =$ _____
2. Find the x-intercepts of $g(x)$.

   _____
3. Find the asymptotes of $g(x)$.

   _____
4. Sketch the graph of $f(x) = \tan x$. Then graph $g(x) = \tan 2x$.



Name _____ Date _____ Class _____

LESSON 11-2

Review for Mastery

Graphs of Other Trigonometric Functions (continued)

Transformations of the cotangent function are similar to transformations of the tangent function.

For $y = \boldsymbol{a}\cot\boldsymbol{b}x$:

- the period is $\frac{\pi}{|b|}$,

This is the same as for tangent transformations.

- the asymptotes are located at $x = \frac{\pi n}{|b|}$, where n is an integer.

Use the graph of $f(x) = \cot x$ to sketch the graph of $g(x) = \cot 2x$.

Step 1 Find b to identify the period.

$b = 2$, and $\frac{\pi}{|b|} = \frac{\pi}{|2|} = \frac{\pi}{2}$, so the period is $\frac{\pi}{2}$.

There will be one full cycle between 0 and $\frac{\pi}{2}$.

Step 2 Use the period to identify the x-intercepts.

The first x-intercept of $f(x)$ is $\frac{\pi}{2}$.

The first x-intercept of $g(x)$ occurs at $\frac{\pi}{2} \cdot \frac{1}{2}$, or $\frac{\pi}{4}$.

The x-intercepts shift $\frac{\pi}{2}$ radians right.

From $-\pi$ to π the x-intercepts are $-\frac{3\pi}{4}, -\frac{\pi}{4}, \frac{\pi}{4}$, and $\frac{3\pi}{4}$.

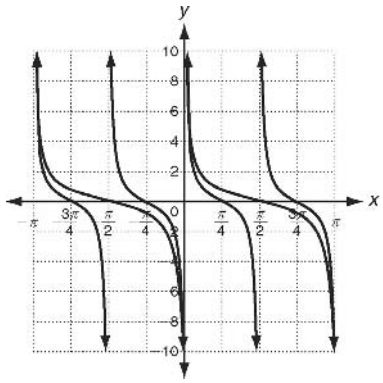
Step 3 Identify the asymptotes.

$b = 2$, so the asymptotes occur at $x = \frac{\pi n}{|2|} = \frac{\pi n}{2}$.

These are the multiples of $\frac{\pi}{2}$.

Step 4 Graph $g(x) = \cot 2x$.

- Sketch the asymptotes.
- Plot the intercepts.
- Then use $f(x) = \cot x$ as a guide to sketch the graph of $g(x) = \cot 2x$.



Complete to graph $g(x) = \cot\frac{1}{2}x$. Use the interval from -2π to 2π.

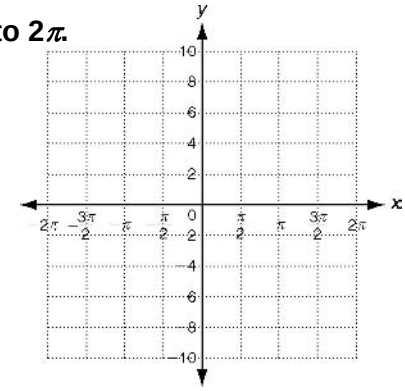
5. Find the period of $g(x)$. $\frac{\pi}{|b|} =$ _____

6. Find the x-intercepts of $g(x)$. _____

7. Where are the asymptotes of $g(x)$?

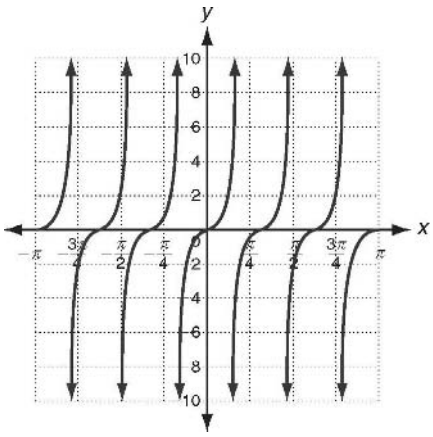
_____

8. Sketch the graph of $g(x) = \cot\frac{1}{2}x$.

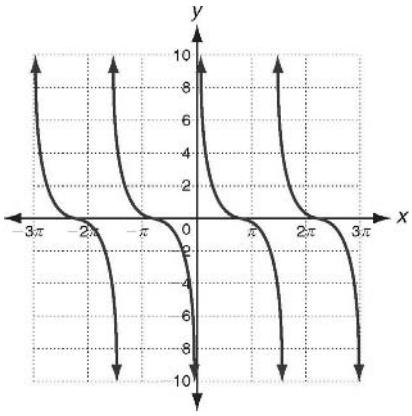


Practice C

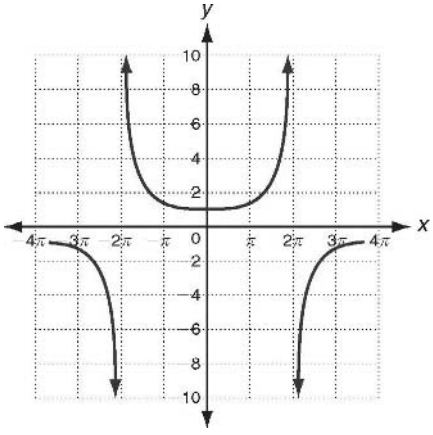
1. Period: 1; *x*-intercepts: *n*; asymptotes: $\frac{1}{2} + n$



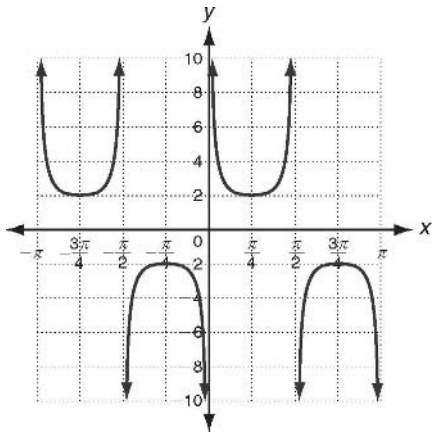
2. Period: $\frac{3\pi}{2}$; *x*-intercepts: $\frac{3\pi}{4} + \frac{3\pi n}{2}$; asymptotes: $\frac{3\pi n}{2}$



3. Period: 8π; asymptotes: $2\pi + 4\pi n$



4. Period: π; asymptotes: $\frac{\pi n}{2}$



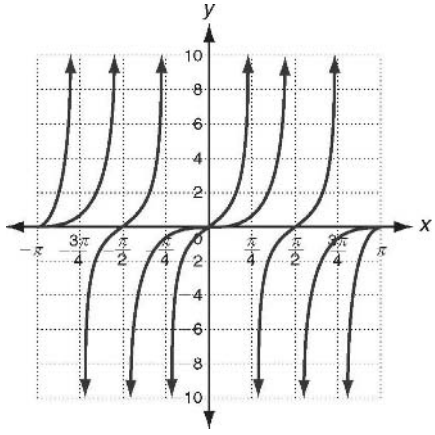
5. a. 6 b. 46.2 ft

Review for Mastery

1. $\frac{\pi}{2}$ 2. $-\pi, -\frac{\pi}{2}, 0, \frac{\pi}{2}, \pi$

3. $x = -\frac{3\pi}{4}, -\frac{\pi}{4}, \frac{\pi}{4}, \frac{3\pi}{4}$

4.



5. 2π 6. $-\pi$, π

7. $x = -2\pi, 0, 2\pi$

8.