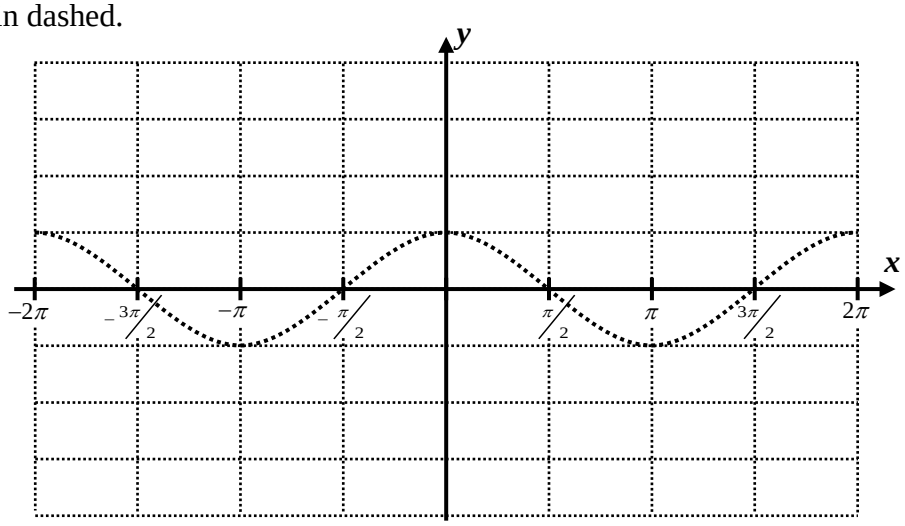
Name: _____ Date: _____

GRAPHS OF THE TRIGONOMETRIC RATIO FUNCTIONS
ALGEBRA 2 WITH TRIGONOMETRY

The four additional trigonometric functions we saw in the last lesson are sometimes known as the **trigonometric ratio functions** because they involve ratios of the sine and cosine functions. Their graphs are complex and interesting. Their behavior will only be explored in this lesson. Higher-level discussion and exploration should be treated in a pre-calculus course.

***Exercise* #1:** Consider the function $y = \sec(x)$. From our last lesson we know that $\sec(x) = \dfrac{1}{\cos(x)}$. The graph below shows the basic cosine curve in dashed.



(a) At what values of x on the interval $-2\pi \le x \le 2\pi$ is $\cos(x) = 0$. Circle these locations on the graph.

(b) What will be true of $\sec(x)$ at these values of x? Draw a dashed vertical line at each of these x-values.

(c) Using your calculator, sketch a graph of $y = \sec(x)$ on the grid. As a suggestion, have your calculator graph both $\sec(x)$ and $\cos(x)$.

(d) Algebraically explain why the secant function fails to have any x-intercepts.

***Exercise* #2:** Which of the following represents the period of $y = \sec(x)$?

(1) π (3) $\dfrac{\pi}{2}$

(2) 2π (4) 4π

_____

***Exercise* #3:** Which of the following could *not* be a value of $\sec(x)$?

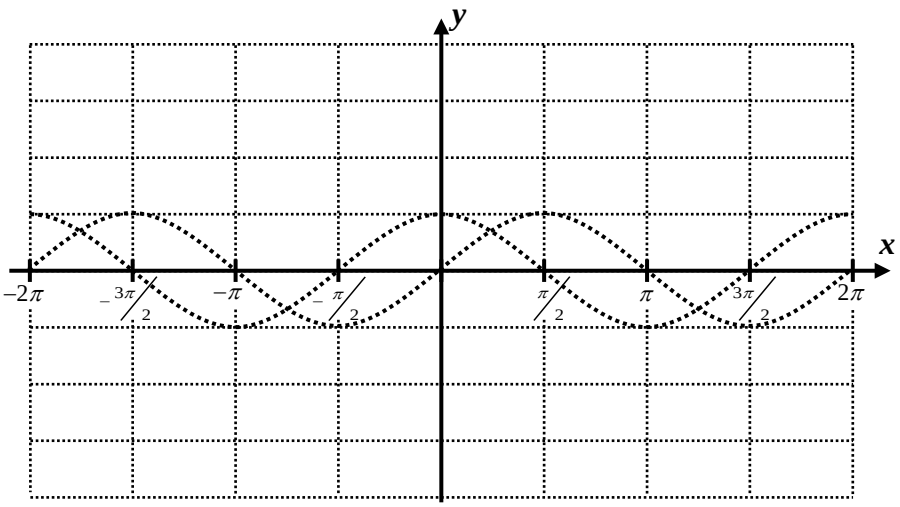
(1) 1 (3) $3/2$

(2) $1/2$ (4) $-5/4$

_____

***Exercise* #4:** Consider the function $y = \tan(x) = \dfrac{\sin(x)}{\cos(x)}$. On the graph below are shown both the basic sine and cosine curves, both dashed.

(a) At what values of x on the interval $-2\pi \le x \le 2\pi$ will tangent be undefined? Explain and then draw vertical lines on your graph at these locations.



(b) At what values of x on the interval $-2\pi \le x \le 2\pi$ will the tangent have x-intercepts. Explain why and then place points at these intercepts.

(c) Use your calculator to sketch $y = \tan(x)$ on the grid provided.

***Exercise* #5:** Which of the following represents the period of $y = \tan(x)$?

(1) π (3) $\dfrac{\pi}{2}$

(2) 2π (4) 4π

_____

***Exercise* #6:** Over the interval $-2\pi \le x \le 2\pi$ the equation $\tan(x) = 3$ would have how many solutions?

(1) 1 (3) 3

(2) 2 (4) 4

_____

***Exercise* #7:** At how many values of x on the interval $0 \le x \le \pi$ is $\tan(x) = \cos(x)$?

(1) 1 (3) 3

(2) 2 (4) 0

_____

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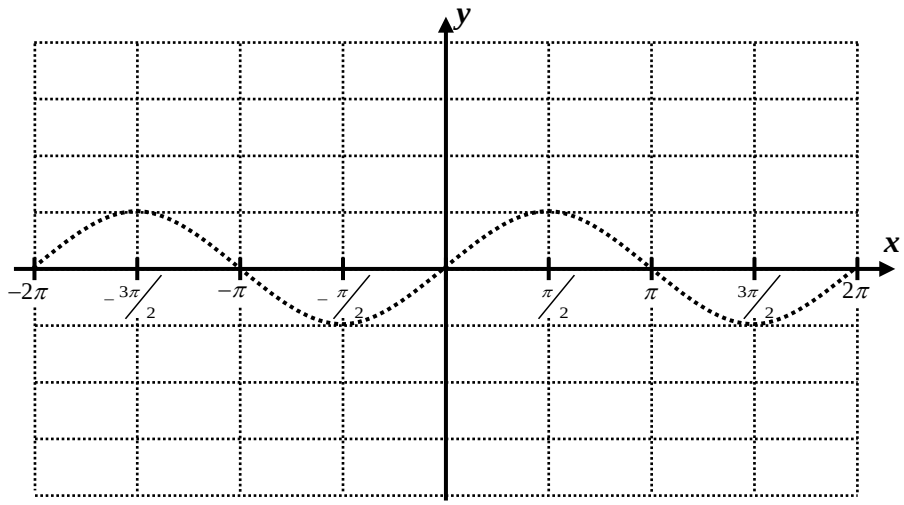
GRAPHS OF THE TRIGONOMETRIC RATIO FUNCTIONS
ALGEBRA 2 WITH TRIGONOMETRY - HOMEWORK

SKILLS

1. Consider the function $y = \csc(x) = \dfrac{1}{\sin(x)}$. On the graph below is shown the basic sine function.



(a) At what values of x on the interval $-2\pi \le x \le 2\pi$ is $\sin(x) = 0$? Circle these locations on the graph.

(b) What will be true of $\csc(x)$ at these values of x? Draw a dashed vertical line at each of these x-values.

(c) Using your calculator, sketch a graph of $y = \csc(x)$ on the grid. Have your calculator graph both $\csc(x)$ and $\sin(x)$.

2. Which of the following represents the period of $y = \csc(x)$?

(1) π (3) 2π

(2) $\pi/2$ (4) $3\pi/2$

_____

3. On the interval $-2\pi \le x \le 2\pi$, how many solutions are there of the equation $\csc(x) = 2$?

(1) 1 (3) 3

(2) 2 (4) 4

_____

4. If drawn on the same set of axes, the graph of $y = \csc(x)$ would not intersect the graph of

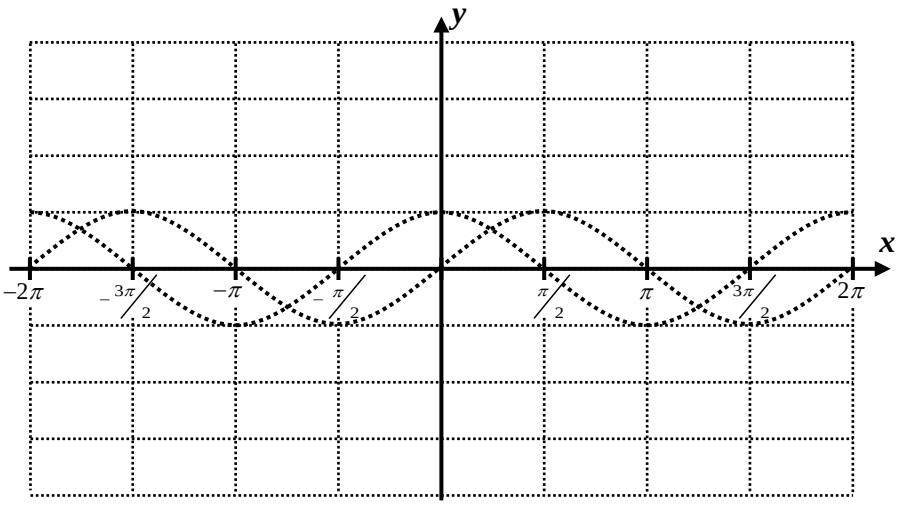
(1) $y = -3$ (3) $x = 1/2$

(2) $y = 1/2$ (4) $x = \pi/2$

_____

5. Consider the function $y = \cot(x) = \dfrac{\cos(x)}{\sin(x)}$. On the graph below are both the sine and cosine curves.

(a) At what values of x on the interval $-2\pi \le x \le 2\pi$ will the cotangent be undefined? Explain your choice and then draw vertical lines on your graph at these locations.



(b) At what values of x on the interval $-2\pi \le x \le 2\pi$ will the cotangent have x-intercepts? Explain why and then place points at these intercepts.

(c) Use your calculator to sketch $y = \cot(x)$ on the grid provided.

6. Which of the following represents the period of $y = \cot(x)$?

(1) 90° (3) 360°

(2) 60° (4) 180°

_____

7. On the interval $-\pi/2 \le x \le \pi/2$ the equation $\cot(x) = 2$ would have how many solutions?

(1) 1 (3) 3

(2) 2 (4) 4

_____

REASONING

8. Is anyone of the six trigonometric functions one-to-one? Explain graphically.