PRACTICE & PROBLEM SOLVING

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Practice Tutorial

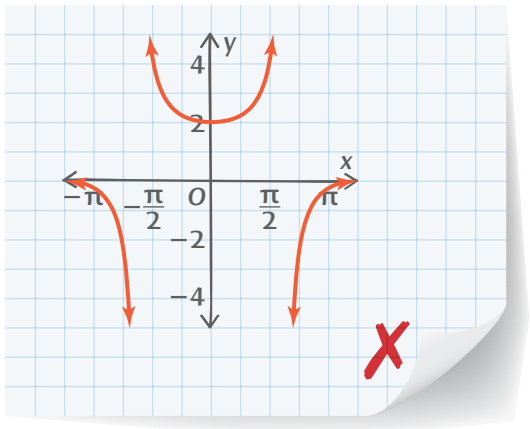
Additional Exercises Available Online

UNDERSTAND

6. **Look for Relationships** Describe the relationship between the ranges of the sine and cosine graphs and the ranges of the secant and cosecant graphs. What values do all their ranges share?

7. **Use Structure** Write at least 2 different tangent functions that have a period of 2π.

8. **Error Analysis** Describe and correct the error a student made in graphing the function $y = \sec x$.



9. **Construct Arguments** Explain why the cosecant function is undefined at multiples of π radians or 180°.

10. **Generalize** For what values of x is the function $y = \tan x$ undefined? Explain.

11. **Look for Relationships** Explain how the periods of the tangent and cotangent functions differ from the periods of the other four trigonometric functions.

12. **Generalize** Identify all the asymptotes of the graph of $y = \sec x$.

13. **Use Structure** Write a tangent function that has a period of $\frac{\pi}{3}$. Graph the function.

14. **Higher Order Thinking** A function f is considered even if $f(-x) = f(x)$ for all x in the domain of f; a function is odd if $f(-x) = -f(x)$ for all x in the domain of f. Which of the six trigonometric functions are even, and which are odd?

PRACTICE

15. Sketch the graph of $y = \tan x$ over the domain $-\pi$ to π. SEE EXAMPLE 1

16. Describe the domain, range, period, zeros, and asymptotes of the function $y = \tan x$. SEE EXAMPLE 2

Sketch the graphs of the functions. Then describe how the graph of each function compares to the graph of the parent function. SEE EXAMPLE 3

17. $y = \frac{1}{2}\tan 3x$

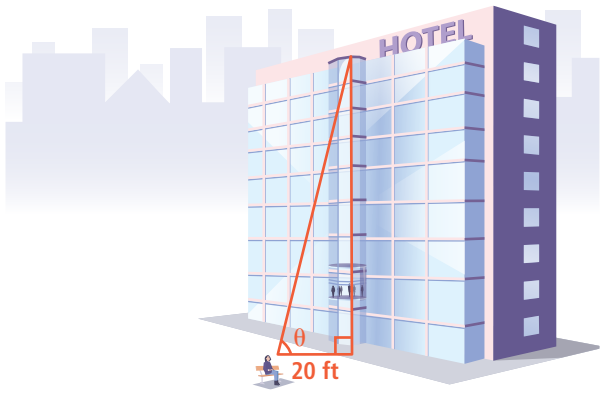
18. $y = 2\cot\frac{1}{2}x$

19. Stacy is observing a glass elevator from a bench 20 ft away from the elevator's entrance. SEE EXAMPLE 4

    a. Write a function to model the height h of the elevator as a function of the angle of inclination θ from Stacy's position to the elevator.

    b. Identify an appropriate domain, and use the function to graph and describe the motion of the elevator.

    c. About how high is the elevator when the angle of inclination is $\frac{\pi}{4}$?



20. Graph the function $y = \csc x$. Describe how the graph of $y = \csc x$ is related to the graph of $y = \sin x$. SEE EXAMPLE 5

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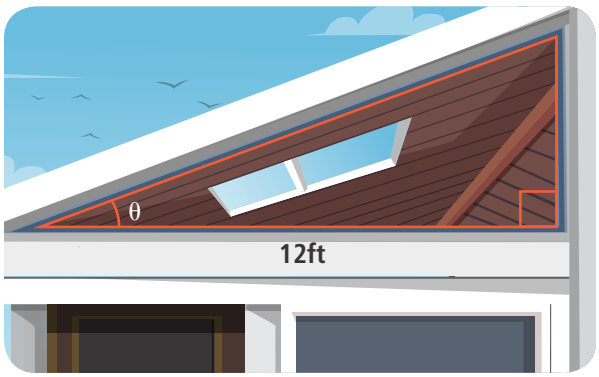
Mixed Review Available Online

APPLY

21. Make Sense and Persevere An architect is designing a sloped rooftop that is triangular from the side view.



a. Write a function that models the height of the triangle where θ is the angle indicated.

b. Graph the function over the domain $\left[0, \frac{\pi}{4}\right]$.

c. What is the height of the triangle if θ is $\frac{\pi}{10}$? Round to the nearest tenth of a foot.

22. Make Sense and Persevere A carpenter is constructing a hexagonal floor for a treehouse. The floor will be made of six isosceles triangles placed together as shown.

a. Write a function that models the height of one of the triangles where θ is the measure of one of the base angles and the base of the triangle is 16 ft in length.

b. Graph the function over the domain (0, 60°).

ASSESSMENT PRACTICE

23. Fill in the blanks to complete each statement regarding the properties of the tangent function.

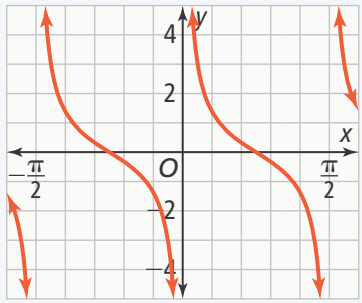
a. The domain is the set of all real numbers, except odd multiples of _____.

b. The range is the set of _____.

c. The x-intercepts are {..., -2π, _____, 0, π, 2π, _____}; the y-intercept is 0.

d. Vertical asymptotes occur at x = ..., _____, $-\frac{\pi}{2}$, _____ $\frac{3\pi}{2}$, ...

24. SAT/ACT Which equation is represented by the graph?



Ⓐ $y = 2 \cot x$
Ⓑ $y = \cot 2x$
Ⓒ $y = 2 \tan x$
Ⓓ $y = \tan 2x$

25. Performance Task A homeowner wants to move a flat screen television around the corner of two hallways that meet at a right angle as shown. One hallway is 6 ft wide, and the other hallway is only 4 ft wide. The length L of the diagonal through which the television must pass, as a function of θ, is $L(\theta) = \frac{4}{\sin \theta} + \frac{6}{\cos \theta}$.

Part A Write the function in terms of csc θ and sec θ.

Part B Use your graphing calculator to graph the function for $0 < \theta < 90°$ in order to determine the greatest length the television could have to the nearest foot.