

Name _____ Date _____ Period _____

Worksheet 5.6—The Other Trig FunctionsShow all work. A calculator **is permitted**. Report three decimals and units in all final answers.**Multiple Choice**1. The graph of $y = \cot x$ can be obtained by a horizontal shift of the graph of the graph of $y =$

- (A) $-\tan(x + \pi)$ (B) $-\cot\left(x - \frac{\pi}{2}\right)$ (C) $\sec x$ (D) $\tan\left(x - \frac{\pi}{2}\right)$ (E) None of these

2. The graph of $y = \sec x$ **never** intersects the graph of $y =$

- (A) x (B) x^2 (C) $\csc x$ (D) $\cos x$ (E) $\sin x$

3. If $k \neq 0$, what is the range of the function $y = k \csc x$?

- (A) $[-k, k]$ (B) $(-k, k)$ (C) $(-\infty, -k) \cup (k, \infty)$ (D) $(-\infty, -k] \cup [k, \infty)$ (E) $\left(-\infty, -\frac{1}{k}\right] \cup \left[\frac{1}{k}, \infty\right)$

4. The function $y = \csc x$ has the same domain as the function $y =$

- (A) $\sin x$ (B) $\tan x$ (C) $\cot x$ (D) $\sec x$ (E) $\csc 2x$

5. Consider the functions $f(x) = \tan \frac{\pi x}{4}$ and $g(x) = \frac{1}{2} \sec \frac{\pi x}{4}$ on the interval $(-1, 1)$

I. Approximate the largest interval where $f < g$.

- (A) $\left(-1, \frac{2}{3}\right)$ (B) $\left(-\frac{2}{3}, 1\right)$ (C) $\left(-1, \frac{4}{3}\right)$ (D) $\left(-\frac{4}{3}, 1\right)$ (E) $(-1, 1)$

II. Approximate the largest interval where $2f < 2g$

- (A) $\left(-1, \frac{4}{3}\right)$ (B) $\left(-1, \frac{2}{3}\right)$ (C) $\left(-\frac{4}{3}, 1\right)$ (D) $\left(-\frac{2}{3}, 1\right)$ (E) $(-1, 1)$

6. Use the Unit Circle to solve $\cot x = -\sqrt{3}$ on the interval $[-2\pi, 2\pi]$.

- (A) $\frac{7\pi}{6}, \frac{\pi}{6}, -\frac{5\pi}{6}, -\frac{11\pi}{6}$ (B) $-\frac{4\pi}{3}, -\frac{\pi}{3}, \frac{2\pi}{3}, \frac{5\pi}{3}$ (C) $-\frac{7\pi}{6}, -\frac{\pi}{6}, \frac{5\pi}{6}, \frac{11\pi}{6}$ (D) $\frac{4\pi}{3}, \frac{\pi}{3}, -\frac{2\pi}{3}, -\frac{5\pi}{3}$

7. Use the Unit Circle to solve $\csc x = \frac{2\sqrt{3}}{3}$ on the interval $[-2\pi, 2\pi]$.

- (A) $-\frac{4\pi}{3}, \frac{2\pi}{3}$ (B) $-\frac{2\pi}{3}, \frac{4\pi}{3}$ (C) $-\frac{4\pi}{3}, -\frac{\pi}{3}, \frac{2\pi}{3}, \frac{5\pi}{3}$ (D) $-\frac{5\pi}{3}, -\frac{2\pi}{3}, \frac{\pi}{3}, \frac{4\pi}{3}$ (E) None of these

8. What is the period of the function $f(\theta) = \cot \frac{\pi\theta}{8}$?
 (A) $P = 8$ (B) $P = 16/\pi$ (C) $P = 8/\pi$ (D) $P = 16$ (E) the function is not periodic

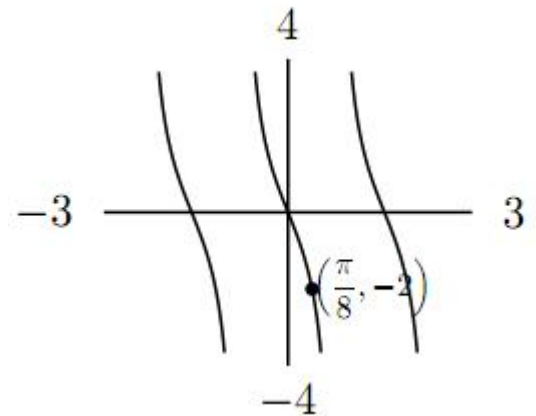
9. What is the period of $y = 2 \sec\left(\pi - \frac{7}{2}\pi x\right)$?
 (A) $P = \frac{4}{7}$ (B) $P = \frac{7}{4}$ (C) $P = \frac{7}{2}$ (D) $P = 7$ (E) $P = \frac{2}{7}$

Short Answer

10. The graph at right is for $f(x) = a \tan bx$. Given the fact that

$$-\tan \frac{\pi}{4} = -1$$

- (a) Find the value of b .



- (b) Find the value of a

For 11 through 16, match the trigonometric function with one of the graphs from I through VI.

11. $f(x) = \tan\left(x + \frac{\pi}{4}\right)$

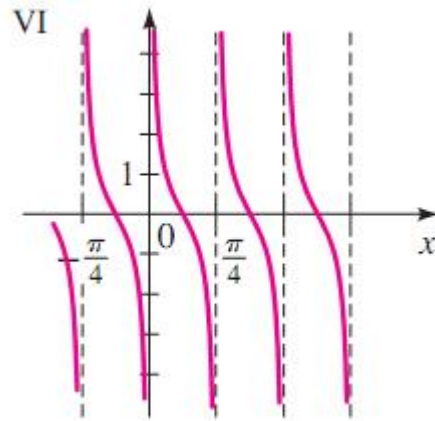
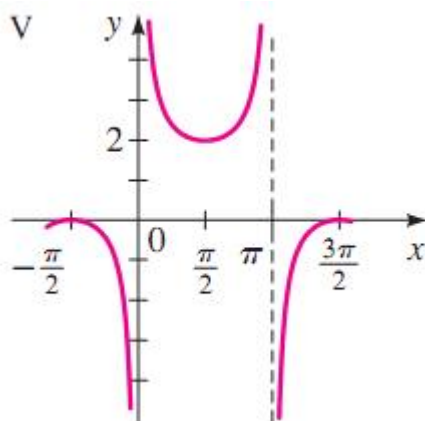
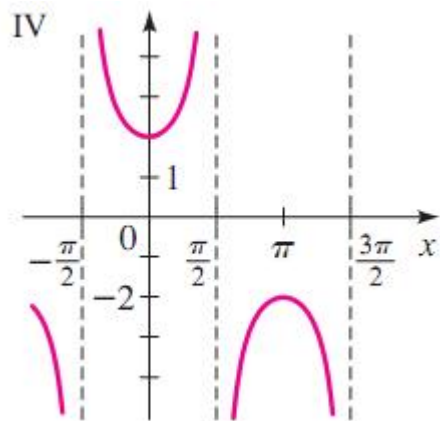
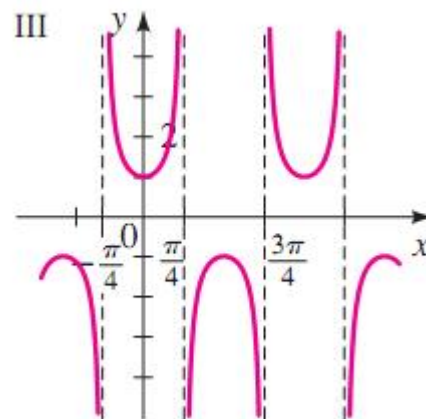
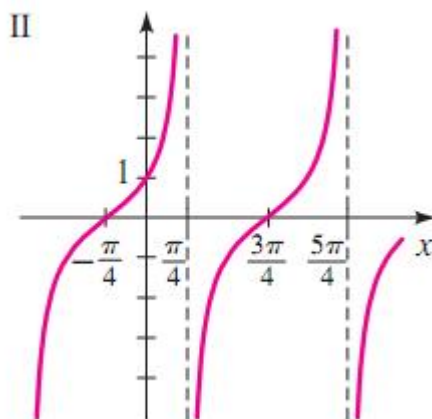
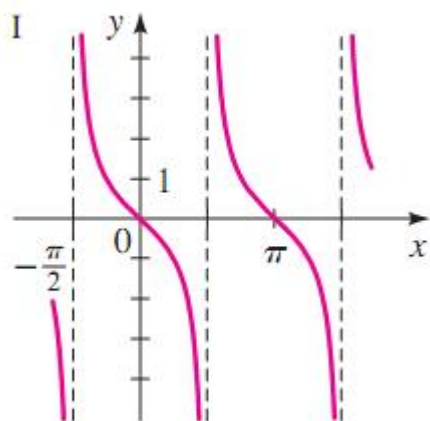
12. $f(x) = \sec 2x$

13. $f(x) = \cot 4x$

14. $f(x) = -\tan x$

15. $f(x) = 2 \sec x$

16. $f(x) = 1 + \csc x$



For 17-19 find the period, then sketch at least two cycles of the function. **Then** write an equivalent equation of the graph in terms of each function's cofunction.

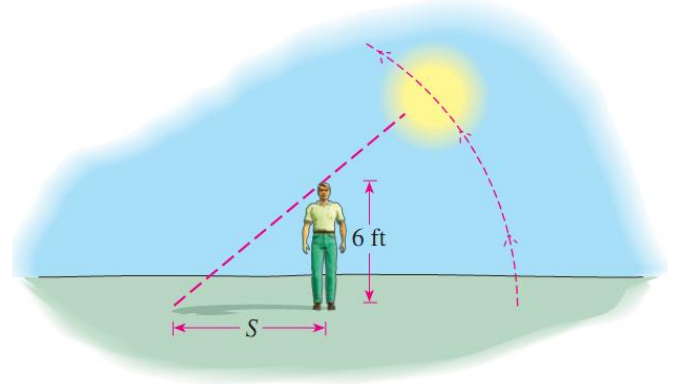
$$17. y = 2 \csc\left(\pi x - \frac{\pi}{3}\right)$$

$$18. y = 2 \csc\left(3x + \frac{\pi}{2}\right) - 1$$

$$19. y = 3 \tan\left(\frac{2}{3}x - \frac{\pi}{6}\right) + 1$$

$$20. y = \frac{1}{2} \cot(\pi - \pi x) + 3$$

21. (Calculator Permitted) On a day when the sun passes directly overhead at noon, a six-foot-tall man casts a shadow of length $S(t) = 6 \left| \cot \frac{\pi}{12} t \right|$ where S is measured in feet and t is the number of hours since 6 A.M.



- (a) Find the length of the shadow at 8:00 A.M., noon, 2:00 P.M., and 5:45 P.M. Show your set-ups.
- (b) Sketch a graph of the function S for $0 < t < 12$.
- (c) From the graph determine the values for t at which the length of the shadow equals the man's height. To what time of day does each of these values correspond?
- (d) Explain what happens to the shadow as the time approaches 6 P.M., that is, explain the meaning of $\lim_{t \rightarrow 12^-} S(t)$.
- (e) Find $S(6)$ both with and without the calculator. Why do you get different answers? Why does your calculator give you an "undefined" value?