20 Trigonometric Graphs Worksheet

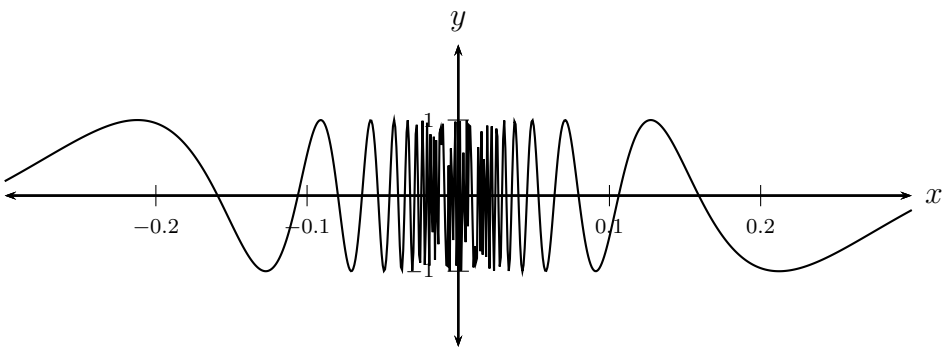
Concepts:

- Period, Amplitude, and Phase Shift
- The csc, sec, and cot Functions
- The Graphs of the csc, sec, and cot Functions

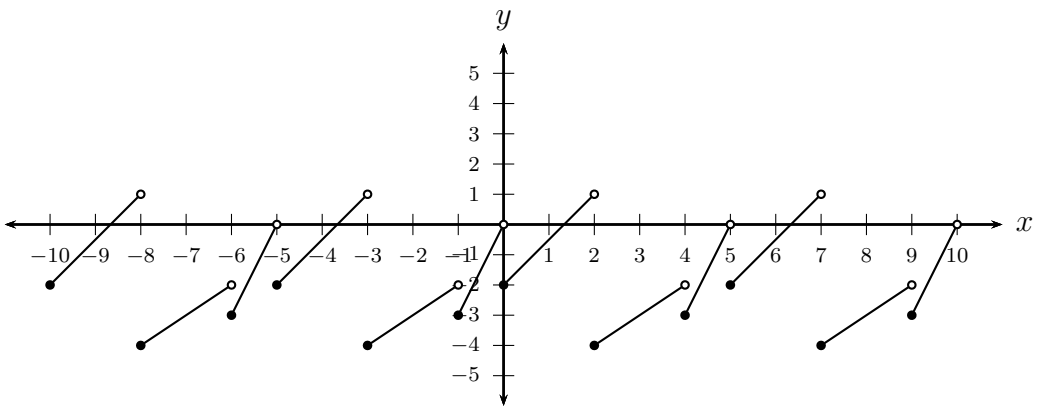
(Sections 6.5 and 6.6)

1. For each graph, (i) find the period if it is defined and (ii) find the amplitude if it is defined.

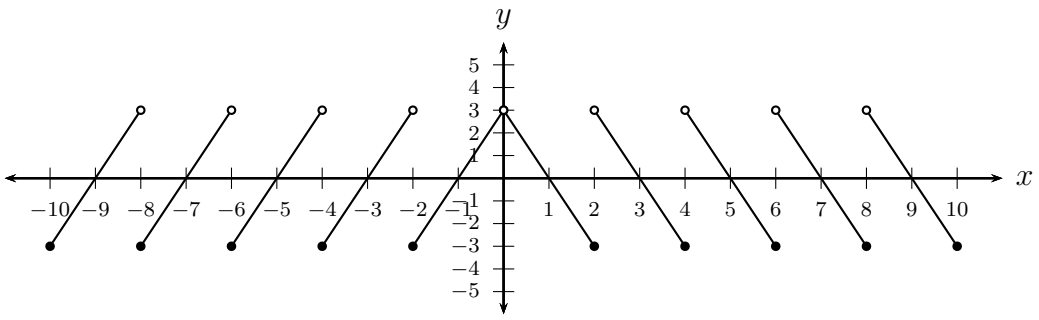
(a)



(b)



(c)



2. For each of the following equations, what is the period, amplitude and phase shift of the graph?

   (a) $y = 4\sin(3x)$

   (b) $y = 3\cos\left(\frac{x}{\pi}\right)$

   (c) $y = 2\sin\left(x - \frac{\pi}{3}\right)$

   (d) $y = -\tan\left(x + \frac{\pi}{4}\right)$

   (e) $y = u\cos(vx + w)$. (Assume that u, v, and w are positive.)

3. Evaluate the csc, sec, and cot functions at each of the following angles.

   (a) $\theta = \frac{\pi}{3}$

   (b) $\theta = -\frac{9\pi}{4}$

   (c) $\theta = 4\pi$

   (d) $\theta = \frac{17\pi}{6}$

4. (a) The terminal side of an angle, θ, in standard position contains the point $(-5, 9)$. Evaluate the csc, sec, and cot functions at θ.

   (b) The terminal side of an angle, θ, in standard position contains the point $(11, 4)$. Evaluate the csc, sec, and cot functions at θ.

5. Suppose θ is in the fourth quadrant and $\cos(\theta) = \frac{1}{5}$. Evaluate the csc, sec, and cot functions on θ.

6. Sketch the graphs of the following equations. Be sure that the graph is well-labeled.

   (a) $y = \csc(x) + 3$

   (b) $y = 5\sec\left(\frac{x}{2}\right) + 3$

   (c) $y = \cot\left(x - \frac{3\pi}{4}\right)$

7. Use algebra and identities to simplify the expression. Assume all denominators are nonzero.

   (a) $\frac{\sin(t)}{\tan(t)}$

   (b) $\frac{1}{\cos(t)} - \sin(t)\tan(t)$

8. Solve each of the following equations.

   (a) $\cos(x)=0$

   (b) $\sin^3 t - \sin t = 0$

   (c) $\cos^2 t - 2\cos t = -1$

9. (Question 43 from Section 6.5 of your textbook)

   Burke's blood pressure can be modeled by the function

   $$g(t) = 21\cos(2.5\pi t) + 113,$$

   where t is the time (in seconds) and $f(t)$ is in millimeters of mercury. The highest pressure (systolic) occurs when the heart beats, and the lowest pressure (diastolic) occurs when the heart is at rest between beats. The blood pressure is the ratio systolic/diastolic.

   (a) Graph the blood pressure function over a period of two seconds and determine Burke's blood pressure.

   (b) Find Burke's pulse rate (number of heartbeats per minute).

   (c) According to current guidelines, someone with systolic pressure above 140 or diastolic pressure above 90 has high blood pressure and should see a doctor about it. What would you advise the person in this case?

10. (Question 47 from Section 6.5 of your textbook)

    The current generated by an AM radio transmitter is given by a function of the form $f(t) = A\sin(2000\pi mt)$, where $550 \leq m \leq 1600$ is the location on the broadcast dial and t is measured in seconds. For example, a station at 980 on the AM dial has a function of the form

    $$f(t) = A\sin(2000\pi(980)t) = A\sin(1960000\pi t).$$

    Sound information is added to this signal by varying (modulating) A, that is, by changing the amplitude of the waves being transmitted. (AM means "amplitude modulation.") For a station at 980 on the dial, what is the period of the function f? What is the frequency (number of complete waves per second)?

11. (Question 48 from Section 6.5 of your textbook)

    The number of hours of daylight in Winnipeg, Manitoba, can be approximated by

    $$d(t) = 4.15\sin(.0172t - 1.377) + 12,$$

    where t is measured in days, with $t = 1$ being January 1.

    (a) On what day is there the most daylight? The least? How much daylight is there on these days?

    (b) On which days are there 11 hours or more of daylight? What do you think the period of this function is? Why?