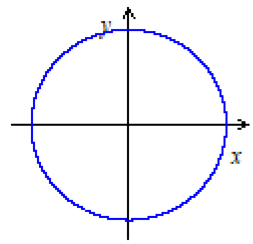
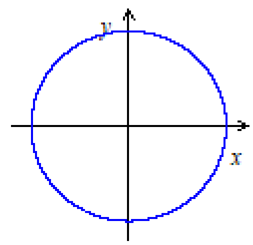
Week 1 Practice Worksheet

Angles, Arc-length, and Periodic Functions

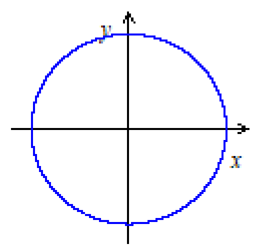
1. a. Draw 140° in standard position on the provided coordinate plane.



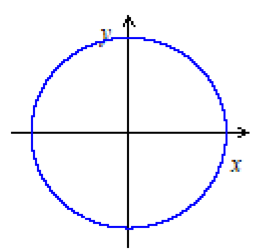
b. Draw -250° in standard position on the provided coordinate plane.



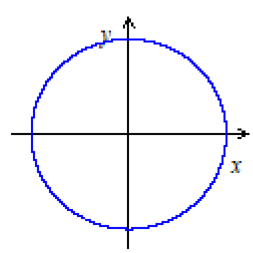
c. Draw $\frac{4\pi}{5}$ radians in standard position on the provided coordinate plane.



d. Draw 4 radians in standard position on the provided coordinate plane.



d. Draw -3 radians in standard position on the provided coordinate plane.



2. The Greek letters θ and ϕ are often used as variables in mathematics. They are ***different*** symbols so it's important to distinguish between them. Which of these symbols is pronounced "phi"? And which is pronounced "theta"?

3. **a.** Convert $\frac{\pi}{10}$ radians into degrees.

b. Convert 4 radians into degrees.

c. Convert 10° into radians.

d. Convert 140° into radians.

e. Convert 1200° into radians.

4. **a.** Find both a positive and a negative angle that are coterminal with 140°.
(Answer in degrees.)

b. Find both a positive and a negative angle that are coterminal with $-\frac{5\pi}{8}$.
(Answer in radians.)

c. Represent infinitely many different angles that are coterminal with 70°.

d. Represent infinitely many different angles that are coterminal with $\frac{3\pi}{5}$.

5. Complete the table below.

θ (degrees)	0°	30°		60°	90°		270°	360°	
θ (radians)			$\frac{\pi}{4}$			π			20π

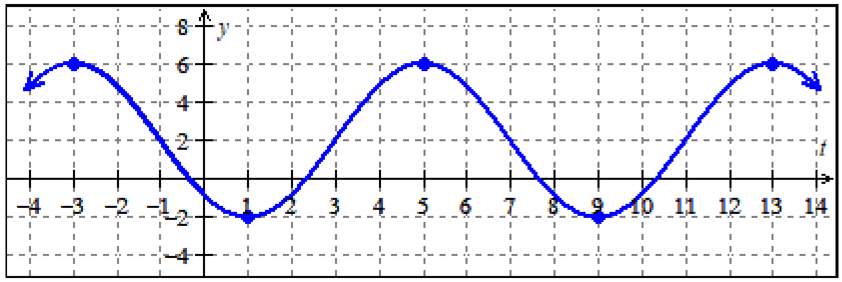
6. What is the length of the arc spanned by the angle 4 radians on a circle of radius 20 yards?

7. What is the length of the arc spanned by the angle 25° on a circle of radius 30 inches?

8. What is the length of the arc spanned by the angle $\frac{4\pi}{5}$ radians on a circle of radius 15 feet?

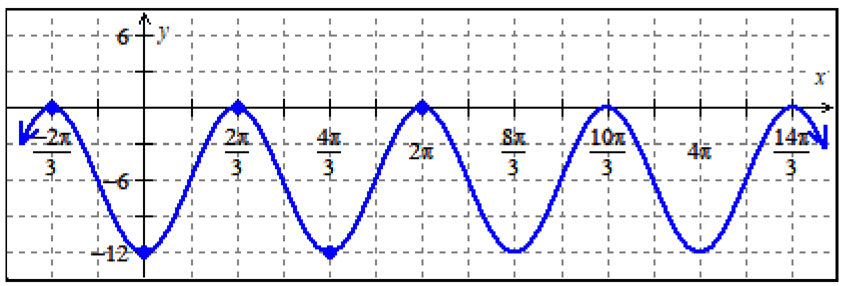
9. What is the length of the arc spanned by the angle 135° on a circle of radius 8 meters?

10. Determine the period, midline and amplitude of the function $y = f(t)$ graphed below. Note that the following points are on the graph: $(-3, 6)$, $(1, -2)$, $(5, 6)$, $(9, -2)$, and $(13, 6)$.



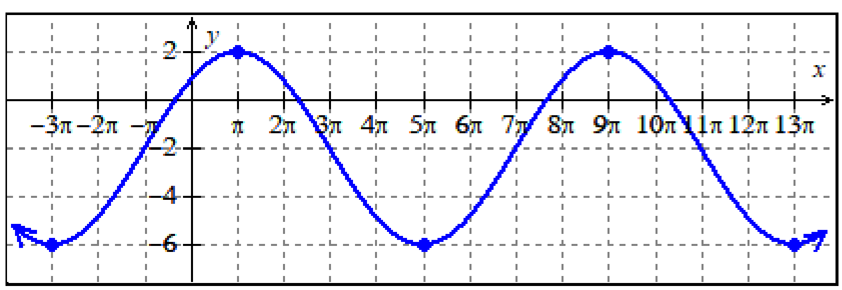
The graph of $y = f(t)$.

11. Determine the period, midline and amplitude of the function $y = g(t)$ graphed below. Note that the following points are on the graph: $\left(-\frac{2\pi}{3}, 0\right)$, $(0, -12)$, $\left(\frac{2\pi}{3}, 0\right)$, and $\left(\frac{4\pi}{3}, -12\right)$.



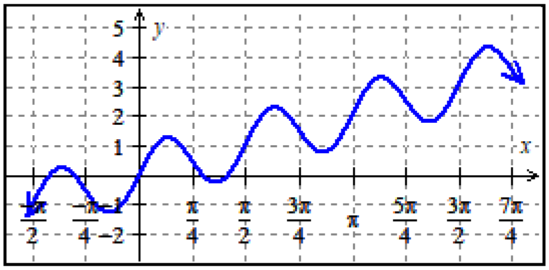
The graph of $y = g(t)$.

12. Determine the period, midline and amplitude of the function $y = p(x)$ graphed below. Note that the following points are on the graph: $(-3\pi, -6)$, $(\pi, 2)$, $(5\pi, -6)$, and $(9\pi, 2)$.

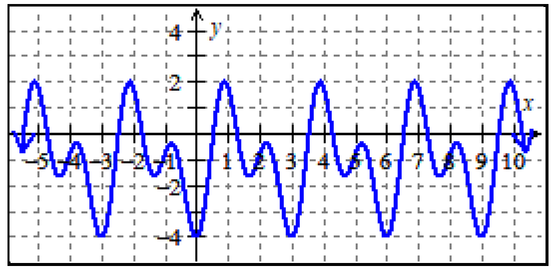


The graph of $y = p(x)$.

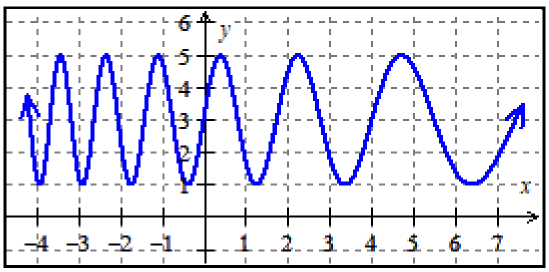
13. Determine which of the functions graphed below are periodic functions and find the period, midline, and amplitude of the periodic functions.



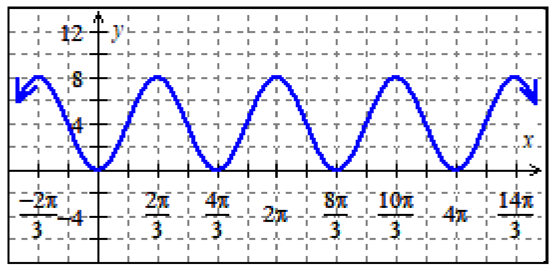
$y = A(x)$



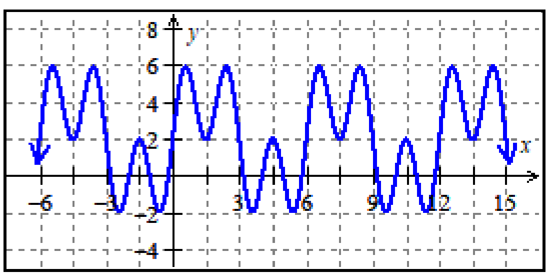
$y = B(x)$



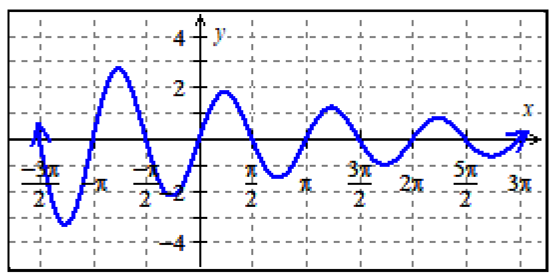
$y = C(x)$ is



$y = D(x)$



$y = E(x)$



$y = F(x)$

14. There's a Ferris wheel with a diameter of 80 feet. The wheel rotates at a constant rate, and completes a full rotation every 20 minutes. The wheel is lifted 10 feet above the ground level, and passengers load into carriages at the lowest point in the wheel's travel (so passengers start their trip 10 feet above the ground). Determine the period, midline and amplitude of the function that associates amount of time a passenger spends in a carriage travelling around the wheel with the height (in feet) above the ground of such a passenger.

15. The following verbally-described functions are approximately-periodic: assume that they are truly periodic functions and determine reasonable values for their periods, midlines, and amplitudes.

a. Determine the period, midline, and amplitude of the function that associates calendar date (so input-values for this function are dates like 01/01/2023, 01/02/2023, … , 12/31/2023, … and continue for a few years) with the high temperature (in degrees Fahrenheit) at PDX on that date.

b. Determine the period, midline, and amplitude of the function that associates calendar date (same input values as in part (a)) with the number of hours of daylight (i.e., time between sunrise and sunset) at PDX on that date.

c. Suppose that the water depth in a harbor oscillates between 40 feet at high tide and 10 feet at low tide, and then back to 40 feet at the next high tide 12 hours after the previous high tide. Determine the period, midline, and amplitude of the function that associates time-of-day (e.g., 12am, 1am, …, 10pm, 11pm, … and continue for a few days) and the water depth in the harbor at that time-of-day.