APPC Lesson 6.7 Homework

Name _____

1. Which of the following could be modeled by a sinusoidal function?

A) Money earning interest in a bank account

B) The height of a ball thrown up into the air

C) A town's warbler population, a species of bird that migrates in the winter

D) The height of a tree since it is planted

2. A sinusoidal function has the form $f(x) = A\sin(Bx) + D$. If the maximum value of f is 30, the minimum value of f is 14, and the period of f is 3, find the value of A, B, and D.

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3. The number of hours of sunlight, $S(t)$, in the city of Anchorage, Alaska can be modeled by the function $S(t) = -6.7\cos(\frac{2\pi}{365}(t - 355)) + 12.4$, where t is the day of the year. The following table shows the day of the year for the 1^{st} of each month in a non-leap year.

	Day of year		Day of year
January 1	1	July 1	182
February 1	32	August	213
March 1	60	September 1	244
April 1	91	October 1	274
May 1	121	November 1	305
June 1	152	December 1	335

Answer the following based on the given model. Assume a non-leap year.

a. What is the average number of daylight hours in Anchorage? How do you know?

b. Nikki is traveling to Anchorage on September 1^{st}. How many hours of daylight should she expect on that day?

c. What is the period of the function S? What does this represent in the context?

d. Which day of the year has the least number of daylight hours? In which month does this occur? How many hours of daylight does this day have?

e. Which day has the greatest number of daylight hours? In which month does this occur? How many hours of daylight does this day have?

4. Shelly observes the moon outside her window each night. The percentage of the moon she can see can be modeled by the sinusoidal function given below where P is the percent of the moon that is visible and t is the day. She started observing on June 7^{th} which she represents as $t = 0$.

$P = 50 \sin\left(\frac{2\pi}{28}t\right) + 50$

a. What is the period of this function? Interpret this value in context.

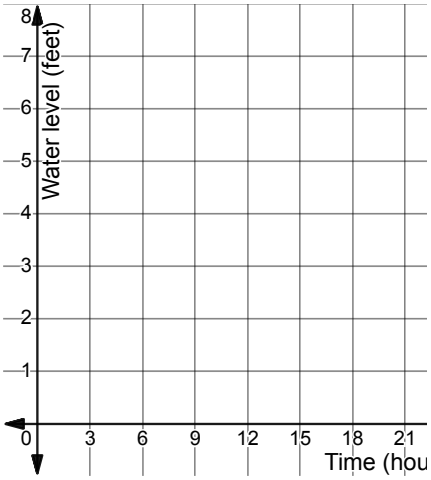
b. What percentage of the moon will Shelly be able to see on June 10^{th} ?

c. On which day will Shelly first observe a Full Moon?

d. On which day will Shelly first observe a New Moon? (New Moon refers to the day when the moon is not visible.)

5. The height of the tide in San Diego, California can be roughly modeled by the function $H(t) = 4 + 3\cos(\frac{\pi}{6}t)$, where $H(t)$ is the height of the water in feet, and t is the time in hours with $t = 0$ corresponding to 12 PM (noon).

a. Graph H for $0 \leq t \leq 24$.

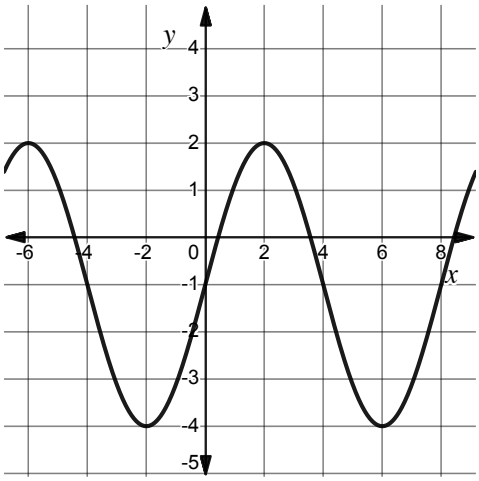


b. What is the average height of the tide in San Diego?

c. Candace is staying in San Diego for exactly one week. How many tide cycles will she experience? How do you know?

d. What is the water level at high tide? What is the water level at low tide?

6. The graph of a function f is shown. Write an equation for $f(x)$.



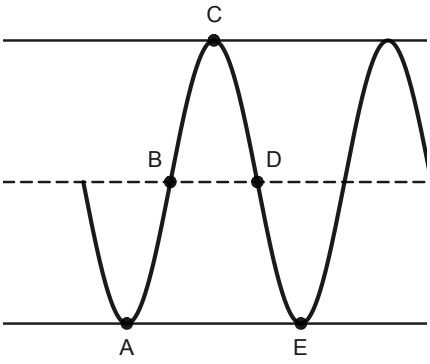
7. The temperature of a town over a 24-hour period can be modeled by a sinusoidal function. The highest temperature of the day occurred at 3 PM, when the temperature hit $78°$ F. The lowest temperature of the day occurred at 3 AM, when the temperature hit $62°$.

a. Jack predicts that the average temperature of $70°$ would be hit at roughly 9 PM and 9 AM. Do you think Jack is correct? Explain why or why not.

b. Sally predicts that the temperature will hit $74°$ at roughly noon and midnight. Do you think Sally is correct? Explain why or why not.

8. The Navy Pier Ferris Wheel has a diameter of 186 feet. A ride on the wheel is one full rotation, which takes 5 minutes. When riders are at the top of the wheel, they are 196 feet above the ground. The function H represents a rider's height above the ground, in feet, t minutes after the ride begins.

a. The graph of H is shown for two full cycles where the dashed line represents the midline of the graph. Determine possible coordinates $(t, H(t))$ for points A, B, C, D, and E.



b. Write an equation for H, a rider's height above the ground, in feet, t minutes after the ride begins.

c. Between the two times corresponding to points B and C, is the rider's height increasing at an increasing rate or is the rider's height increasing at a decreasing rate? Explain.