Chapter 6 Review: Trigonometry 1

Name _____

1. The sales of a gardening store vary throughout the year based on seasons. The sales can be represented by the sinusoidal function $G(t) = 5 - 4\sin(\frac{\pi}{6}t)$, where $G(t)$ is the total amount of money earned in thousands of dollars and t is measured in months.

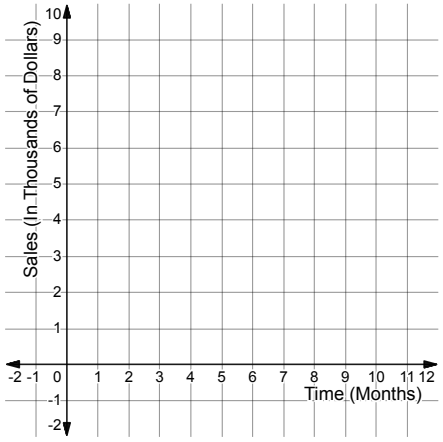
   a. Graph G for $0 \leq t \leq 12$.

   b. During which month were the sales the lowest?

   c. What was the average amount of sales per month?

   d. What was the maximum amount of sales made during the year?

   e. Predict the total amount of sales during month 19.



2. The population of squirrels in a small park varies throughout the year and can be measured with a sinusoidal function. The function $S(t) = 12 + 6\sin(\frac{\pi}{6}t)$ represents the number of squirrels in the park at time, t, measured in months.

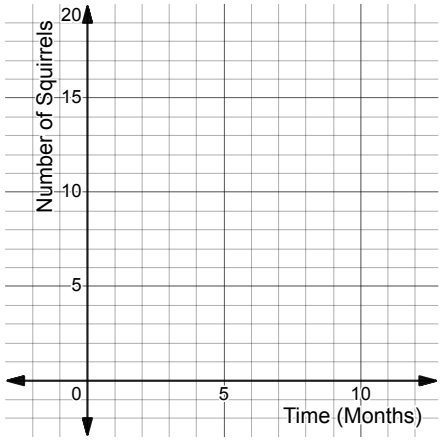
   a. Graph S for $0 \leq t \leq 12$.

   b. What is the average number of squirrels in the park?

   c. What is the minimum number of squirrels in the park?

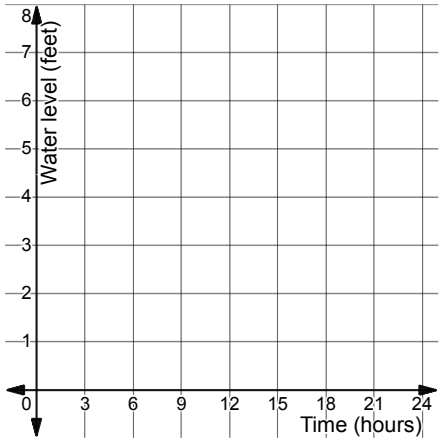
   d. During which month is squirrel population at its highest?

   e. Predict the total amount of squirrels in the park during month 17.



3. 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?

4. Brianna is swinging on a swing. Once she has reached her maximum height and is swinging consistently, her height above the ground can be modeled by the function $H(t) = 3\cos(\frac{2\pi}{3}t) + 4.5$,
where t is time in seconds since Brianna first reached her maximum height, and $H(t)$ is Brianna's height above the ground in feet.

a. What is the maximum height Brianna will reach?

b. How much time elapses between Brianna reaching her maximum height as she moves forward and her maximum height as she moves backward?

c. How high off the ground is Brianna at $t = 2.5$ seconds?

d. What is the first time after $t = 0$ that Brianna is 4.5 feet off the ground?

e. What is Brianna's height above the ground when the swing is at rest?

5. Sutton and April want to go surfing so they are determining the best time to begin and need to know the height of the ocean waves. The height of ocean waves measured during a day can be modeled by the function

$H(t) = 2.5\sin(\frac{2\pi}{24}t) + 3,$

where $H(t)$ is the height of the wave measured in meters, t is the time measured in hours and $t = 0$ represents midnight.

a. What is the height of the ocean waves at 9:00 AM? Round to the nearest hundredth of a meter.

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

c. At what time after midnight will the waves first reach their maximum height?

d. At what time after midnight will the waves first reach their minimum height?

6. 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 $t = 0$.

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

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.)

7. The average monthly temperature in degrees Fahrenheit, $H(t)$, in Holland Michigan can be modeled by the function $H(t) = 57 - 25\cos(\frac{\pi}{6}(t-1))$, where t is measured in months and $t = 1$ represents January.

a. What is the yearly average temperature in Holland, MI? How do you know?

b. According to the model, what is the temperature of Holland in March?

c. One year, the temperatures in Holland, MI were unseasonably warm. The maximum temperature occurred in the same month as the model suggests but rose to $90°$. The minimum temperature remained unchanged. Write an equation for the function that could be used to predict temperatures in this year.

8. The average daily temperature in degree Fahrenheit, $B(t)$, in Buenos Aires, Argentina can be modeled by the function $B(t) = 63 + 22\cos(\frac{2\pi}{365}(t-1))$, where t is measured in days and $t = 1$ represents January 1^{st}. 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

a. According to the model, what is the temperature in Buenos Aires on February 2^{nd}? Round to the nearest hundredth.

b. Which day of the year did Buenos Aires experience the coldest temperature?

c. The following year, Buenos Aires daily average temperature decreased to $54°$ F, and had the highest temperature of $97°$ F. What would be the minimum temperature for that year?

9. 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
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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?

10. A sinusoidal function has the form $f(x) = A\cos(Bx) + D$. If the maximum value of f is 38, the minimum value of f is 8, and the period of f is 16, find the value of A, B, and D.

11. A sinusoidal function has the form $f(x) = A\sin(Bx) + D$. If the maximum value of f is 84, the minimum value of f is 60, and the period of f is 12, find the value of A, B, and D.

12. 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.

13. Which of the following is not appropriately modeled by a sinusoidal function?

A) The amount of daylight in a certain city over a year.

B) The height of a plant measured over several weeks.

C) The daily temperature of a town.

D) The volume of air in a person's lungs.

14. Which of the follow could be modeled by a sinusoidal function?

A) The amount of money it costs to ride in a taxi

B) Profit made from selling t-shirts

C) The height of a Ferris wheel cart

D) A car depreciating in value

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

A) Money earning interest in a bank account

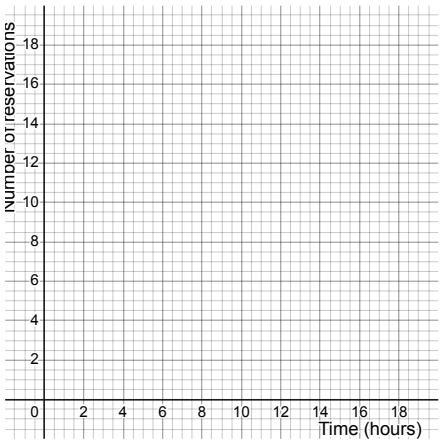
B) The height of a ball thrown up into the air

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

16. Many diners use apps on their phone to make restaurant reservations. The owner of Rosie's Cafe noticed that on Saturdays reservations made on the app increase during breakfast and lunch, but fall in the hours between those meals. She stated that the number of Saturday reservations made with the app can be modeled by the function $R(t) = 9\sin\left(\frac{\pi t}{3}\right) + 9$ where $R(t)$ is the number of reservations t hours after midnight for $6 \leq t \leq 18$.

a. According to the model, how many reservations will be made for 10 am? Round to the nearest whole number.



b. According to the model, what is the minimum number of reservations Rosie will have at one time? How do you know?

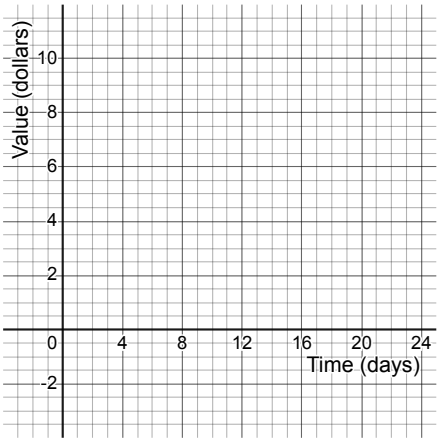
c. According to the model, what is the maximum number of reservations Rosie will have at one time? How do you know?

d. What is the period of this function? Explain what this means in the context of the function.

e. Graph the function R.

17. Values of stock shares sometimes fluctuate in cyclical patterns. Suppose the dollar value of one share of stock in the Halbert Company, $H(t)$, can be modeled by the function $H(t) = 5\sin\left(\frac{\pi t}{6}\right) + 3.5$ for $0 \leq t \leq 24$, where t is the number of days after January 1.

a. According to the model, what will be the value of one share 14 days after January 1?



b. What is the average value of one share of Halbert Company stock over the period $0 \leq t \leq 24$? How do you know?

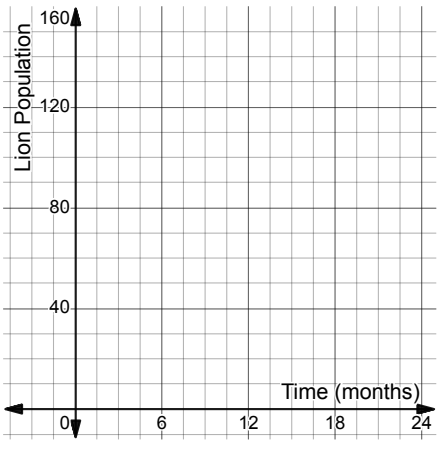
c. According to the model, what is the maximum value of one share of Halbert Company stock over the period $0 \leq t \leq 24$? How do you know?

d. Is the value of one share of Halbert Company stock ever negative? Explain your reasoning.

e. Graph the function H.

18. The population of lions in a region in South Africa was tracked by scientists for two years. The number of lions, $l(t)$, can be modeled by the function $l(t) = 40\cos\left(\frac{\pi t}{6}\right) + 90$ for $0 \leq t \leq 24$ where t is in months.

a. According to the model, what will the lion population be after 6 months



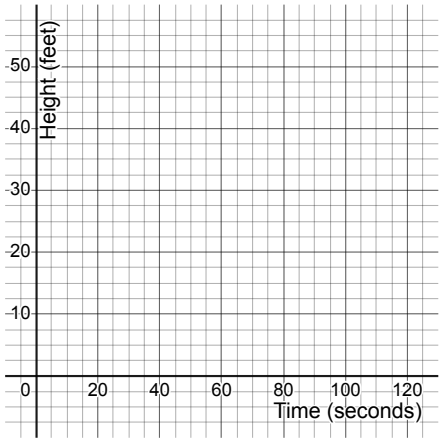
b. On average, how many lions are in this region? How do you know?

c. According to the model, what is the maximum number of lions that is ever in the park?

d. What is the period of this function? Explain what this means in the context of this problem.

e. Graph the function l.

19. Once the Ferris wheel at the county fair is fully loaded with passengers, the ride runs continuously for two minutes. The height in feet above the ground, $h(t)$, for riders who start at the bottom of the Ferris wheel can be modeled by the function $h(t) = -25\cos\left(\frac{\pi}{20}t\right) + 28$ for $0 \leq t \leq 120$, where t is the number of seconds since the ride begins.



a. Suppose a rider starts at the bottom of the Ferris wheel. According to the model, how high above the ground will the rider be after 30 seconds?

b. According to the model, what is the minimum height attained by a rider? How do you know?

c. According to the model, what is the maximum height attained by a rider? How do you know?

d. What is the period of this function? Explain what this means in the context of this problem

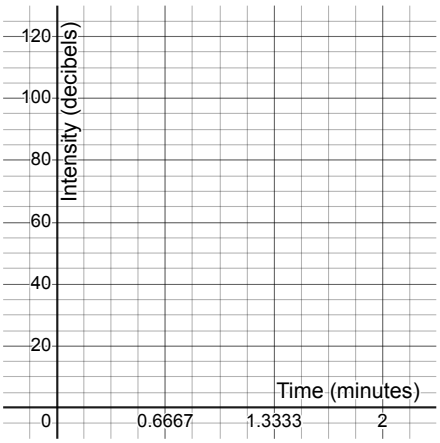
e. Graph the function h.

20. Kent County, Michigan, has numerous emergency sirens. These sirens rotate as they broadcast a warning and a person standing still will perceive the sound at varying volumes (intensity of sound). The intensity of the siren for a stationary person, $d(t)$ in decibels, can be modeled by the function $d(t) = 35\cos\left(\frac{3\pi}{2}t\right) + 85$, for $0 \le t \le 2$, where t is the number of minutes since the broadcast of the warning begins.

a. According to the model, what is the intensity of the siren 1 minute after the warning broadcast begins?

b. According to the model, what is the minimum intensity for this siren? How do you know?

c. According to the model, what is the maximum intensity for this siren? How do you know?

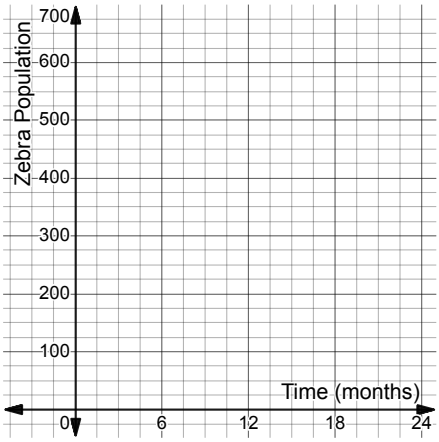


d. What is the midline of this function? Explain what this means in the context of this problem.

e. Graph the function d.

21. The population of zebras in a region in South Africa was tracked by scientists for two years. The number of zebras, $z(t)$, can be modeled by the function $z(t) = -250\sin\left(\frac{\pi t}{6}\right) + 400$ for $0 \le t \le 24$ where t is in months.

a. According to the model, what will be the zebra population after 9 months?



b. On average, how many zebras are in this region? How do you know?

c. According to the model, what is the minimum number of zebras in the park?

d. What is the period of this function? Explain what this means in the context of this problem.

e. Graph the function z.

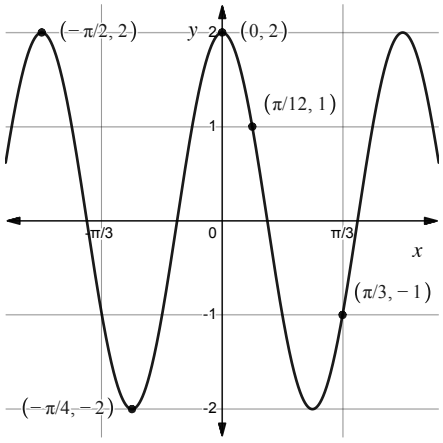
22. The equation for the graph below is given by $y = g\cos(hx)$. Find the values of g and h.

A) $g = 2, h = 4$

B) $g = 4, h = 2$

C) $g = 2, h = \frac{1}{4}$

D) $g = \frac{1}{4}, h = \frac{1}{2}$



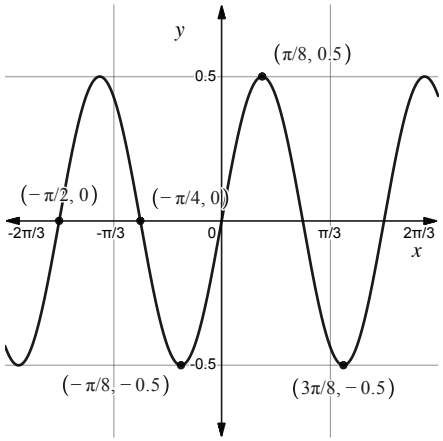
23. The equation for the graph below is given by $y = m\sin(nx)$. Find the values of m and n .

A) $m = 2, n = \pi$

B) $m = 4, n = 4$

C) $m = \frac{1}{2}, n = 4$

D) $m = \frac{1}{2}, n = \frac{\pi}{4}$



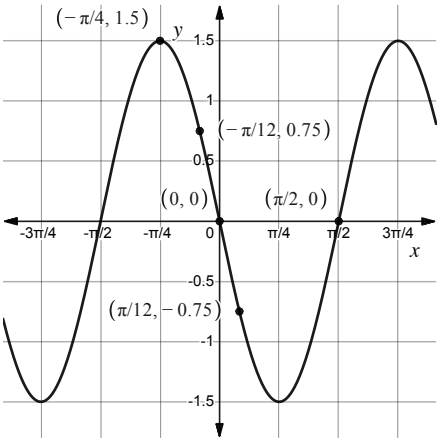
24. The equation for the graph below is given by $y = a\sin(bx)$. Find the values of a and b .

A) $a = 1.5, b = \frac{1}{2}$

B) $a = -1.5, b = 2$

C) $a = -\frac{3}{2}, b = \frac{1}{2}$

D) $a = \frac{1}{2}, b = 2$



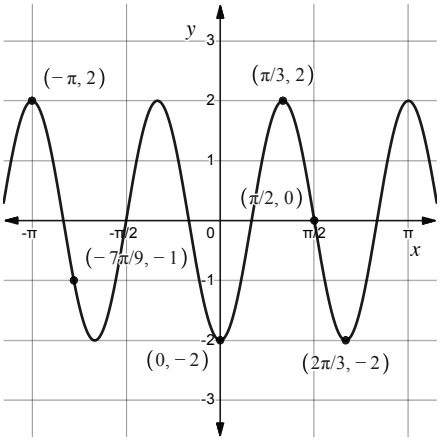
25. The equation for the graph below is given by $y = h\cos(px)$. Find the values of h and p .

A) $h = -2, p = 3$

B) $h = 2, p = -3$

C) $h = -2, p = \frac{\pi}{3}$

D) $h = 2, p = \frac{\pi}{9}$



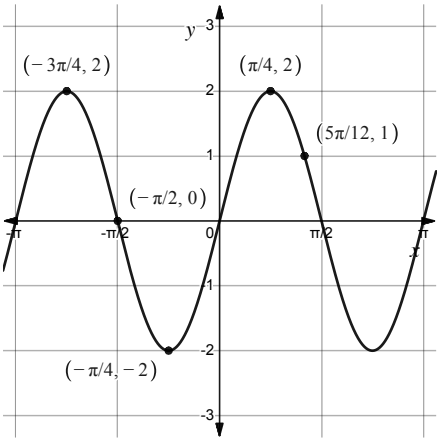
26. The equation for the graph below is given by $y = m\sin(nx)$. Find the values of m and n .

A) $m = 0.5, n = 2$

B) $m = 2, n = 0.5$

C) $m = 0.5, n = 0.5$

D) $m = 2, n = 2$



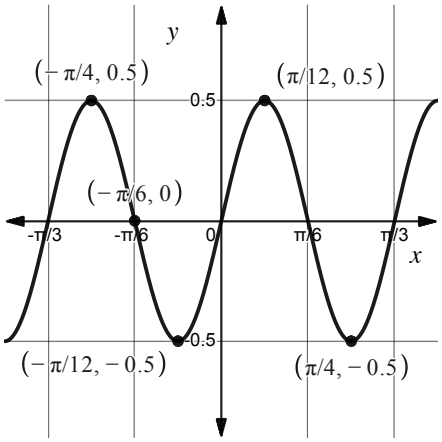
27. The equation for the graph below is given by $y = g\sin(hx)$. Find the values of g and h .

A) $g = 0.5, h = \frac{\pi}{3}$

B) $g = 1, h = 3$

C) $g = 0.5, h = 3$

D) $g = 0.5, h = 6$



28. Ellery is watching the minute hand slowly move around the clock during class. According to her teacher, the height of the minute hand can be represented by the function $H(t) = -\cos\left(\frac{\pi}{30}t\right) + 7$, where $H(t)$ is the height of the tip of the minute hand off the ground measured in feet and t is the time in minutes since class began.

a. How many minutes does it take for the minute hand to rotate around the clock once? How do you know?

b. What is the maximum height the tip of the minute hand reaches on the clock?

c. How many feet off the ground is the center of the clock?

d. What is one possible time that class began? How do you know?

29. Zina was riding her bike and ran over a piece of gum that stuck to the wheel. The height of the gum off the ground can be represented by the function $H(t) = 11 - 11\cos(4\pi t)$,where $H(t)$ is the height of the gum off the ground measured in inches, and t is time in seconds since the gum stuck to the wheel.

a. How many seconds does it take for the gum to rotate around the wheel once? How do you know?

b. What is the maximum height the gum reaches on the bike wheel?

c. How many inches off the ground is the center of the bike wheel?

d. How fast is the wheel rotating, in revolutions per minute?

30. The amount of air in a person's lungs takes on periodic behavior as the person inhales and exhales. The volume of air in a person's lungs can be represented by the function $V(t) = 1630 + 410\cos(\pi t)$,where $V(t)$ is the volume of air measured in milliliters, and t is the time in seconds.

a. What is the person's maximum volume of air?

b. What is the person's minimum volume of air?

c. How many seconds does each inhale and exhale cycle take? How do you know?

d. What is the average amount of air in a person's lungs?

31. A person's blood pressure takes on periodic behavior with each contraction of the heart muscle (representing a heartbeat). Pressure is measured in millimeters of mercury. The blood pressure of a person at rest can be modeled by the function $p(t) = 100 + 20\sin(160\pi t)$ where $p(t)$ is the pressure measured in millimeters of mercury (mmHG) and t is the time in minutes.

a. What is the person's maximum blood pressure?

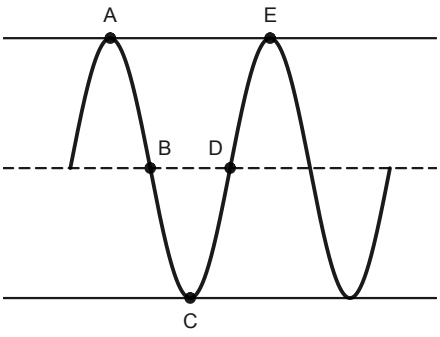
b. What is the person's minimum blood pressure?

c. How many seconds does each heart contraction take? How do you know?

d. What is the person's heart rate, in beats per minute? How do you know?

32. A river steamboat has a 22 -foot diameter paddlewheel that rotates to propel the boat forward. It completes a rotation every 9 seconds. A paddle on the wheel starts at its highest point above the water's surface and rotates above and below the water level. The paddle goes 8 feet underwater at its lowest point. The function P represents the paddle's height above the water's surface, $P(t)$, in feet, t seconds after the paddlewheel begins to move.

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

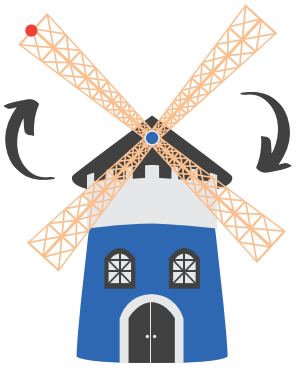


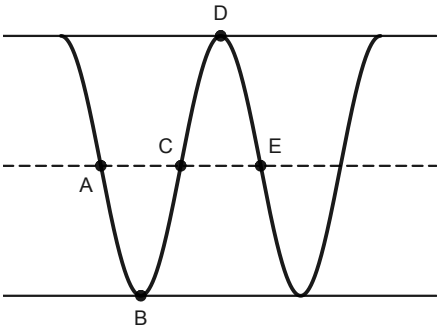
b. Write an equation for $P(t)$.

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

33. A windmill has a tower with four blades attached as shown. The tower is 280 feet tall, and each blade has a length of 122 feet. The blades are attached to the structure at a point that is 2 feet below the top of the tower. It takes the windmill 6 seconds to complete one full rotation and the blade spins clockwise. One of the blades is marked at its tip with a red dot. When facing the tower, the blade with the red dot starts parallel to the ground on the right side of the tower. The function W represents the height of the red dot above the ground, $W(t)$, in feet, t seconds after the windmill begins to spin.

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



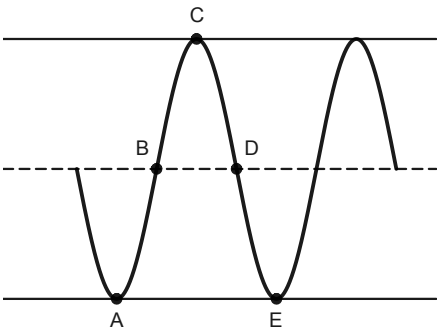


b. Write an equation for $W(t)$.

c. Between the two times corresponding to points D and E, is the rate of change of the red dot's height increasing or decreasing? Explain.

34. 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.

35. Laney and Keegan were analyzing the rising and falling tides at a beach. High tide occurs at midnight with a water level of 10.8 feet and low tide occurs at noon with a water level of 1.2 feet. Let $S(t)$ represent the water level in feet, t hours after midnight.

a. Keegan believes that the average water level is 5.4 feet. Do you think Keegan is correct? Explain why or why not.

b. Laney shared that she thinks the period of the graph of S is 12. Do you agree with Laney? Explain why or why not.

36. When Austen holds his yo-yo the minimum height of the yo-yo is 14 centimeters above the ground. The yo-yo string is 90 centimeters long. Starting at its highest point, it takes the yo-yo 2 seconds to reach its lowest point and return back to its highest point. Javier and Katie are trying to determine the sinusoidal function that models the height of Austen's yo-yo above the ground.

a. Javier believes that the amplitude for this sinusoidal function would be 90. Do you think Javier is correct? Explain why or why not.

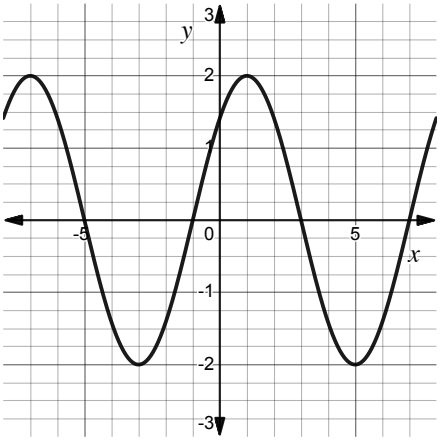
b. Katie added to the conversation that the graph would have a midline at 59 cm. Do you think Katie is correct? Explain why or why not.

37. 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°.

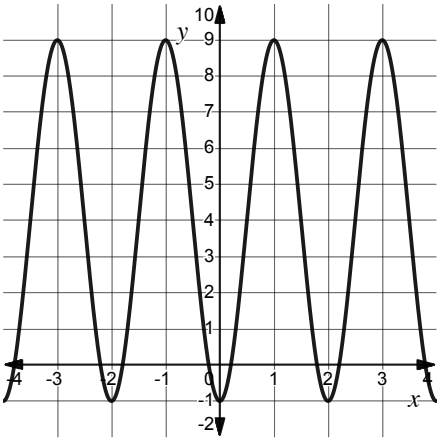
a. Jack predicts that the average temperature of 70° would be hit at roughly 9 PM and 9 AM. Do you think Jack is correct? Explain why or why not.

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.

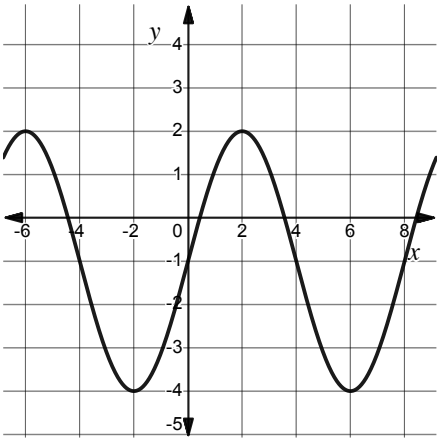
38. The graph of a function f is shown. Write an equation for $f(x)$.



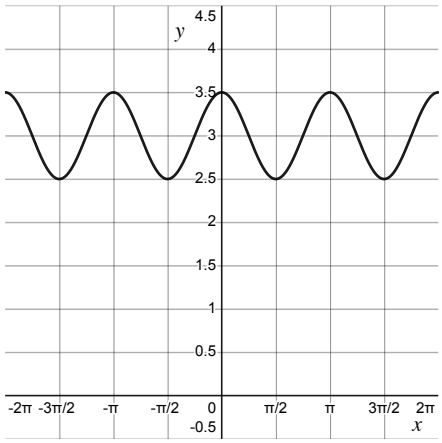
39. The graph of a function f is shown. Write an equation for $f(x)$.



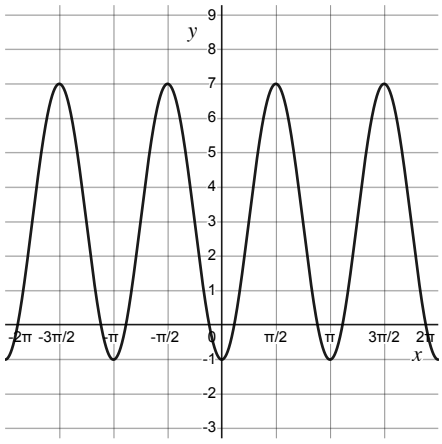
40. The graph of a function f is shown. Write an equation for $f(x)$.



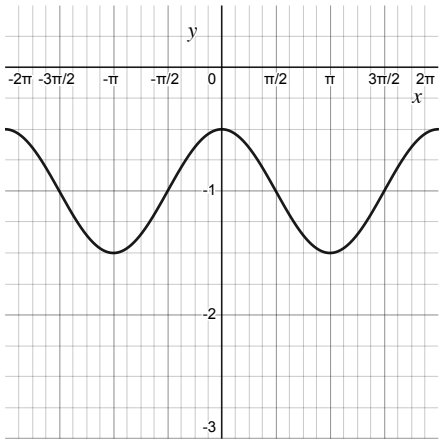
41. The graph of $y = a\cos(bx) + d$ is shown. Find the values of a and b.



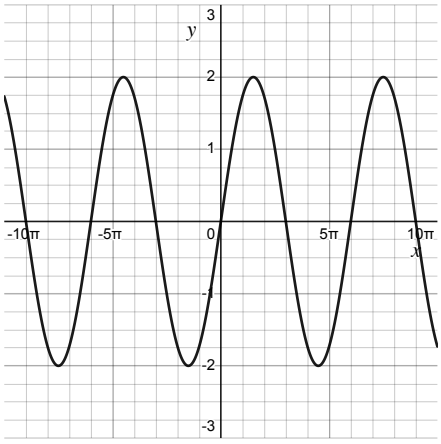
42. The graph of $y = a\cos(bx) + d$ is shown. Find the values of b and d.



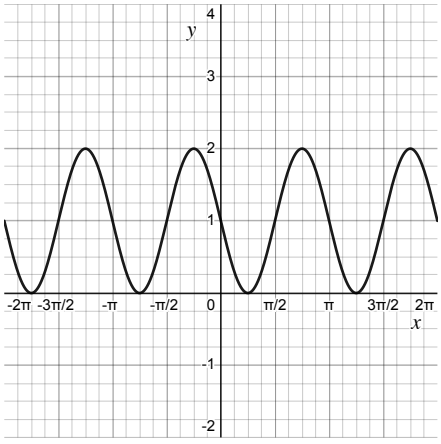
43. The graph of $y = a\cos(bx) + d$ is shown. Find the values of a and d.



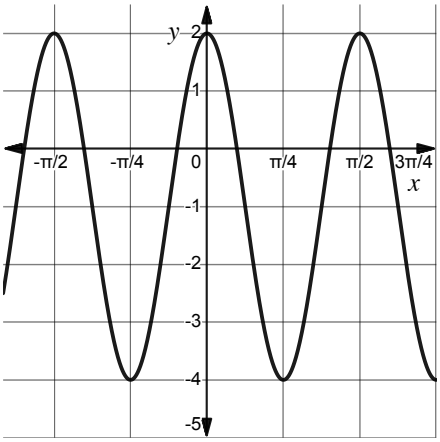
44. The graph of $y = a\sin(bx) + d$ is shown. Find the values of a and d.



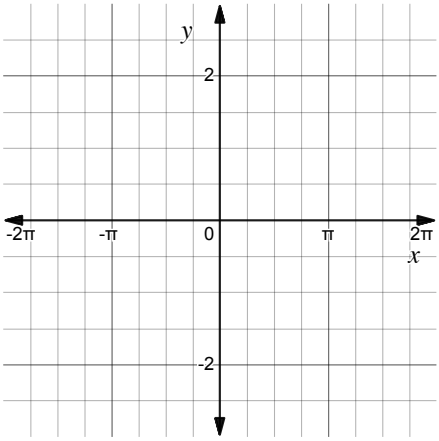
45. The graph of $y = a\sin(bx) + d$ is shown. Find the values of a and d.



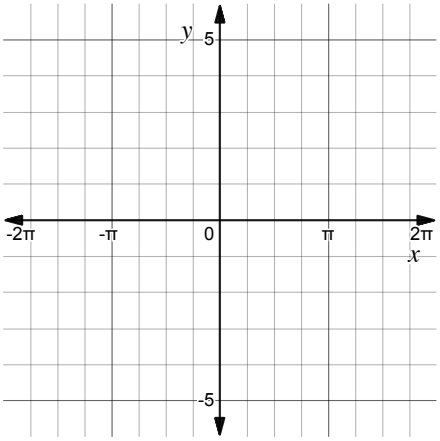
46. The graph of $y = a\cos(bx) + d$ is shown. Find the values of b and d.



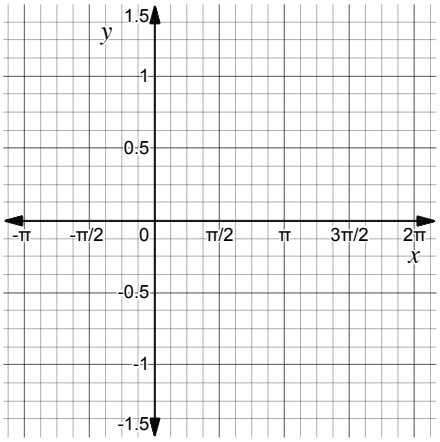
47. Graph $y = 2\sin(x - \pi)$.



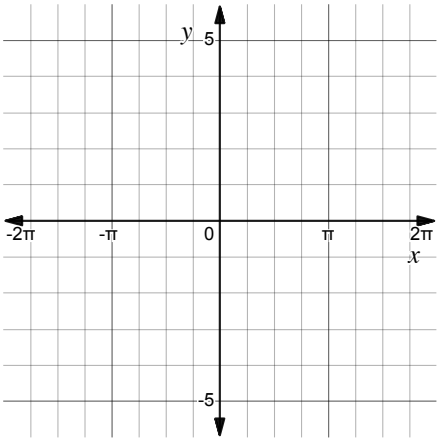
48. Graph $y = -\sin(x) + 3$.



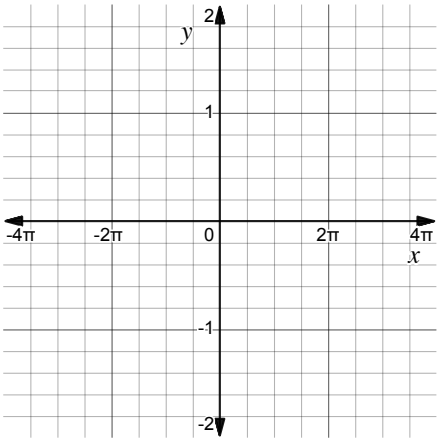
49. Graph $y = \sin(2x)$.



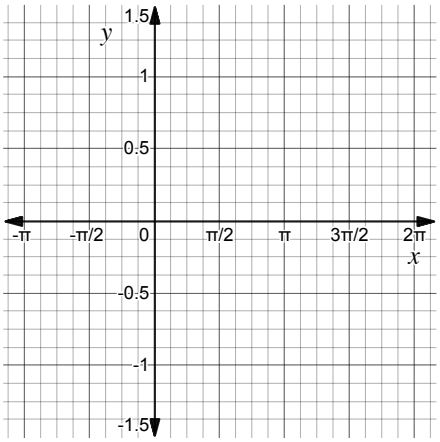
50. Graph $y = 3\cos(x) - 2$.



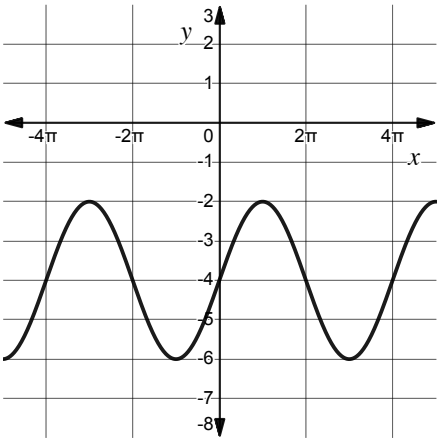
51. Graph $y = -\cos(\frac{1}{2}x)$.



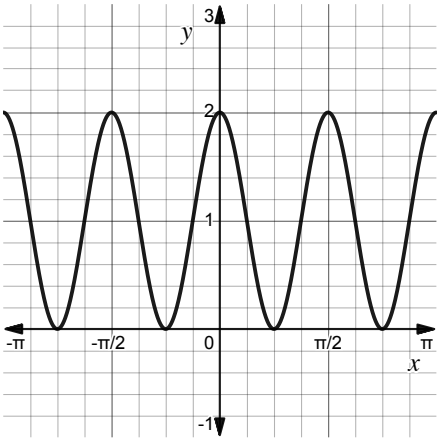
52. Graph $y = \frac{1}{2}\cos(x + \pi)$.



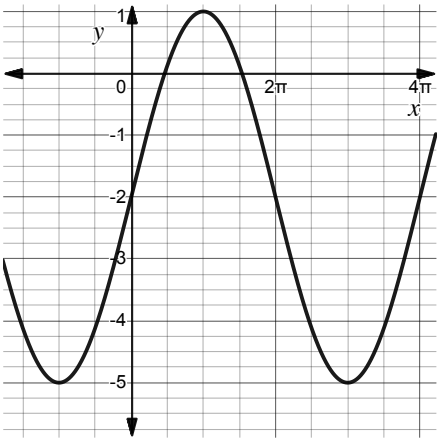
53. Identify the midline, amplitude, domain, and range of the function shown in the graph.



54. Identify the midline, period, amplitude, domain, and range of the sinusoidal function shown in the graph.



55. Identify the midline, amplitude, domain, and range of the sinusoidal function shown in the graph.



56. Consider the function $y = a\sin(b(x-c)) + d$ where a, b, c, and d are real numbers. Which of the following is TRUE?

A) The value a affects the period

B) The value b changes the amplitude

C) The value c affects the phase shift

D) The value d affects the domain

57. Consider the function $y = a\sin(b(x-c)) + d$, where a, b, c, and d are real numbers. Find the amplitude of the function.

A) $2a$

B) $\frac{a}{d}$

C) $|a|$

D) ad

58. Consider the function $y = a\sin(b(x-c)) + d$, where a, b, c, and d are real numbers greater than or equal to 0 . Find the period of the function.

A) 2π

B) $\frac{2\pi}{b}$

C) $\frac{a}{b}$

D) $2\pi - d$

59. Consider the function $y = a\cos(b(x-c)) + d$, where a, b, c, and d are real numbers greater than or equal to 0. Find the range of the function.

A) $[-1, 1]$

B) $(-\infty, \infty)$

C) $(d-a, d+a)$

D) $(a-d, a+d)$

60. Consider the function $y = a\cos(b(x-c)) + d$, where a, b, c, and d are real numbers. Write an equation for the midline of the function.

A) $y = d$

B) $y = \frac{\pi}{2}$

C) $y = \frac{a}{2}$

D) $y = bx + c$

61. Consider the function $y = a\sin(b(x-c)) + d$, where a, b, c, and d are real numbers greater than or equal to 0. Find the range of the function.

A) $[-d, d]$

B) $[-a, a]$

C) $[a-c, a+c]$

D) $[d-a, d+a]$

62. Which of the following has the same amplitude as $y = a\cos(bx)$?

A) $y = -a\sin(2bx)$

B) $y = b\sin(ax)$

C) $y = \frac{a}{2}\cos(2bx)$

D) $y = -b\cos(ax)$

63. Which of the following is NOT true about the period of a trigonometric function?

A) The period is the shortest horizontal distance for one complete cycle of the graph

B) A phase shift does not affect the period of a trigonometric function

C) A horizontal shrink does not affect the period of a trigonometric function

D) A vertical stretch does not affect the period of a trigonometric function

64. Which of the following does NOT describe the midline of a sine or cosine function?

A) A horizontal line through $\frac{\max + \min}{2}$.

B) $y = a$ when $y = a + \cos x$.

C) The x -axis when $y = \sin x$.

D) A line connecting all the maximum values of the function.

65. For the trigonometric function given by $f(x) = G\sin(H(x - J) + K$, for positive constants G, H, J, and K , which of the following represents the minimum value of f ?

A) $K - G$

B) $G - K$

C) $K - H$

D) $H - J$

66. Which of the following best describes the period of a trigonometric function?

A) The distance between the minimum and maximum values of the graph

B) $\frac{2\pi}{a}$, where a is the amplitude

C) $\frac{\pi}{b}$, where b is the phase shift

D) The shortest horizontal distance to complete one full cycle of the graph

67. Which of the following is NOT a correct way to find the amplitude of a sine or cosine function?

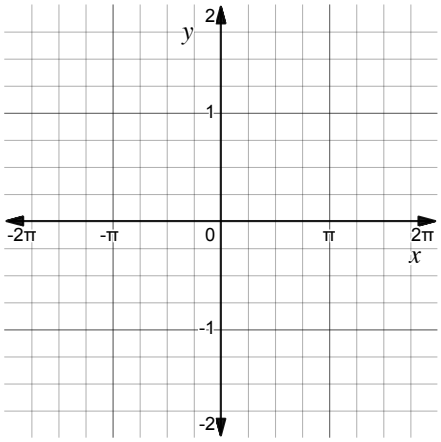
A) The distance between the midline and the maximum

B) $\frac{\text{Max} - \text{Min}}{2}$

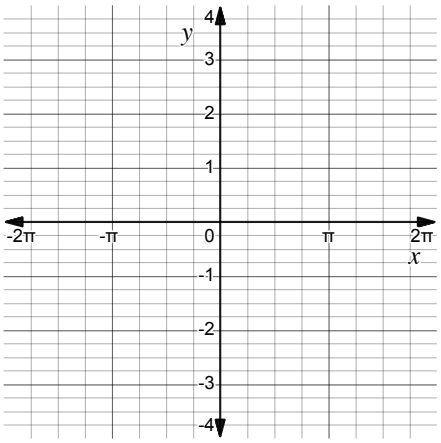
C) $\frac{2\pi}{b}$ where b is the horizontal stretch or shrink factor

D) The absolute value of the vertical stretch or shrink factor

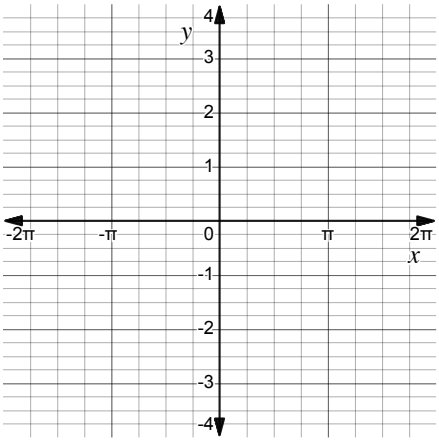
68. Graph $y = 0.5 \sin x + 1$.



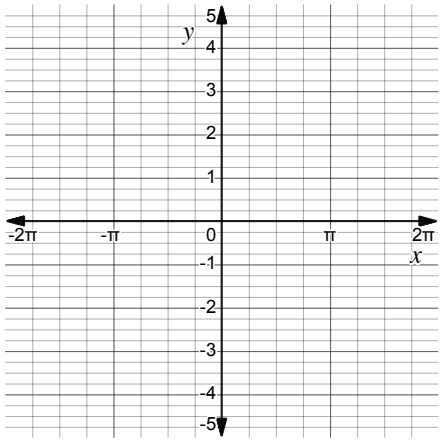
69. Graph $y = -\cos x + 2$.



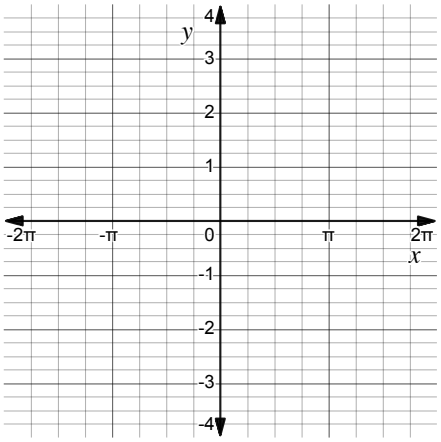
70. Graph $y = 2 \sin x - 1$.



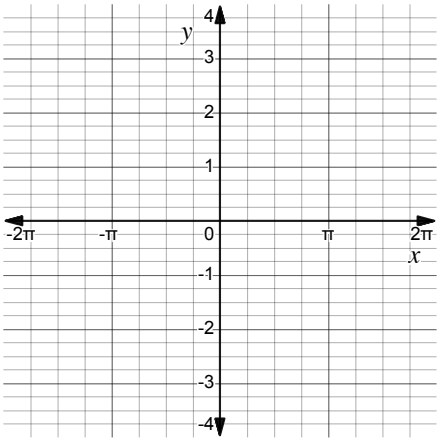
71. Graph $y = -3\cos x - 1$.



72. Graph $y = -\sin x + 2$.



73. Graph $y = -2\cos x + 1$



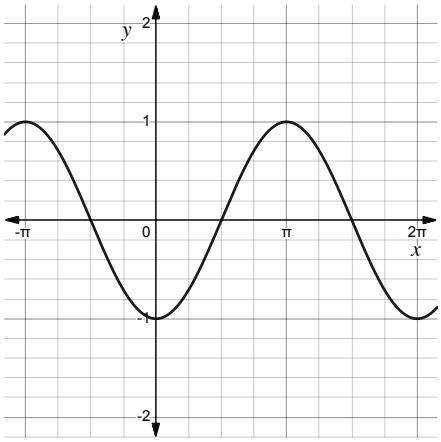
74. Which of the following is NOT an equation for the graph shown?

A) $y = \cos(x - \pi)$

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

C) $y = -\cos x$

D) $y = -\sin(x + \pi)$



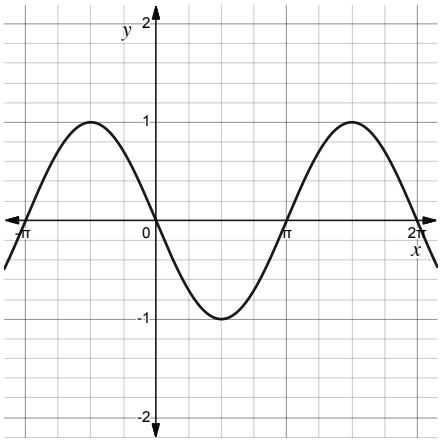
75. Which of the following is NOT an equation for the graph shown?

A) $y = \cos\left(x + \frac{\pi}{2}\right)$

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

C) $y = -\sin x$

D) $y = \sin(x + \pi)$



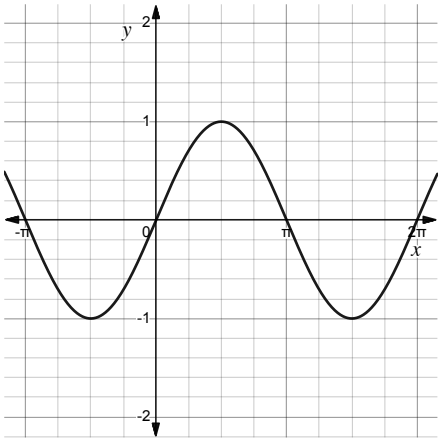
76. Which of the following is NOT an equation for the graph shown?

A) $y = \sin(-x)$

B) $y = \cos\left(x - \frac{\pi}{2}\right)$

C) $y = \sin x$

D) $y = -\sin(x + \pi)$



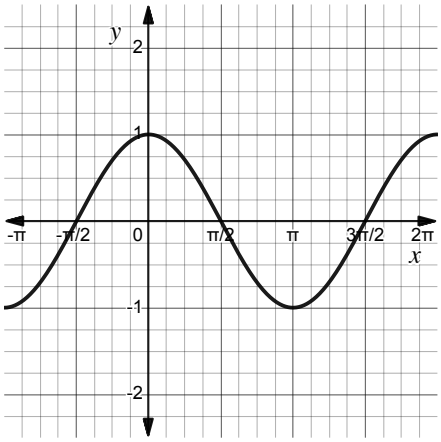
77. Which of the following is NOT an equation for the graph shown?

A) $y = \cos x$

B) $y = \sin\left(x + \frac{\pi}{2}\right)$

C) $y = -\cos x$

D) $y = \cos(-x)$



78. Let $g(x) = -3\sin\left(\frac{1}{4}x\right) - 7$.

a. Write an equation for the midline of the graph of g.

b. Identify the amplitude of the graph of g.

c. Identify the period of the graph of g.

d. Identify the phase shift of the graph of g, or state that there is none.

79. Let $g(x) = -4\sin(x - 2\pi) + 1$.

a. Write an equation for the midline of the graph of g.

b. Identify the amplitude of the graph of g.

c. Identify the period of the graph of g.

d. Identify the phase shift of the graph of g, or state that there is none.

80. Let $g(x) = 0.75\sin(x + 5) - 2$.

a. Write an equation for the midline of the graph of g .

b. Identify the amplitude of the graph of g .

c. Identify the period of the graph of g .

d. Identify the phase shift of the graph of g , or state that there is none.

81. Let $g(x) = -\cos(\pi x) + 4$.

a. Write an equation for the midline of the graph of g .

b. Identify the amplitude of the graph of g .

c. Identify the period of the graph of g .

d. Identify the phase shift of the graph of g , or state that there is none.

82. Let $g(x) = 2\cos(x + 1) - 3$.

a. Write an equation for the midline of the graph of g .

b. Identify the amplitude of the graph of g .

c. Identify the period of the graph of g .

d. Identify the phase shift of the graph of g , or state that there is none.

83. Let $g(x) = -3\cos(2x) + 5$.

a. Write an equation of the midline of the graph of g .

b. Identify the amplitude of the graph of g .

c. Identify the period of the graph of g .

d. Identify the phase shift of the graph of g , or state that there is none.

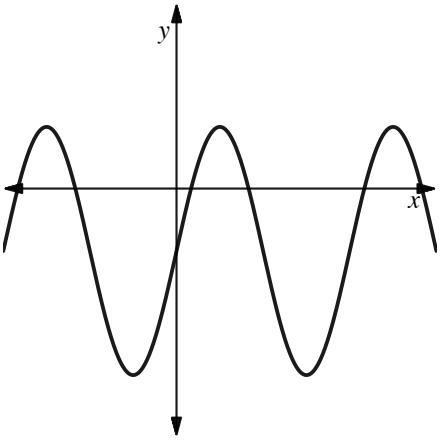
84. Which of the following equations could represent the graph shown?

A) $y = 2\sin x - 1$

B) $y = -\sin x - 2$

C) $y = 2\cos x + 3$

D) $y = -3\cos x + 1$



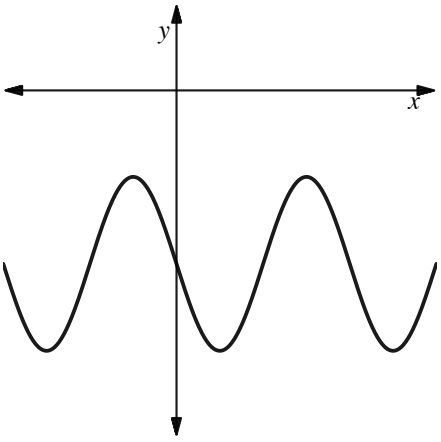
85. Which of the following equations could represent the graph shown?

A) $y = 2\sin x - 1$

B) $y = -\sin x - 2$

C) $y = 2\cos x + 3$

D) $y = -3\cos x + 1$



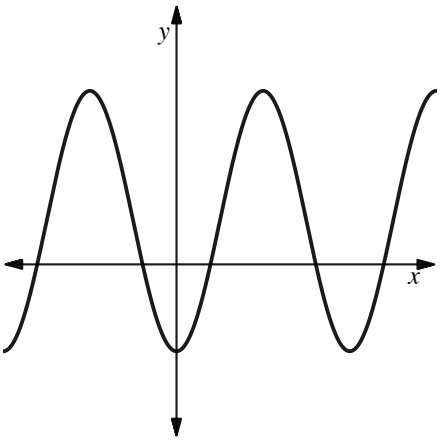
86. Which of the following equations could represent the graph shown?

A) $y = 2\sin x - 1$

B) $y = -\sin x - 2$

C) $y = 2\cos x + 3$

D) $y = -3\cos x + 1$



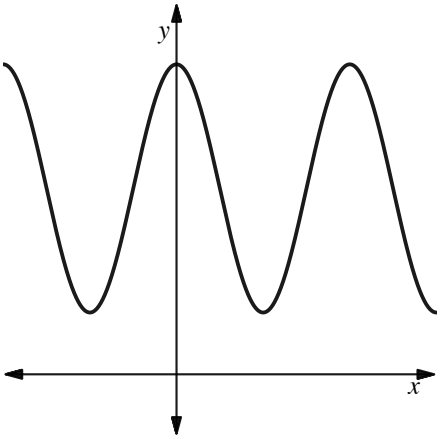
87. Which of the following equations could represent the graph shown?

A) $y = 3\cos x + 2$

B) $y = -\sin x + 1$

C) $y = 2\cos x + 3$

D) $y = -3\cos x + 1$



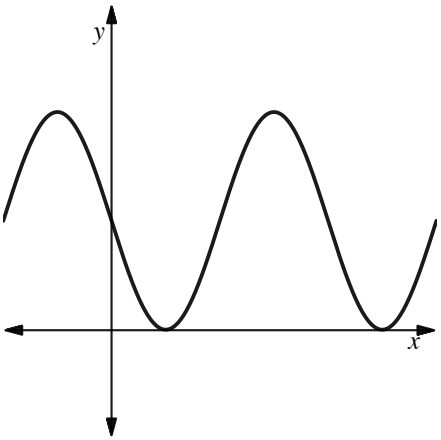
88. Which of the following equations could represent the graph shown?

A) $y = 3\cos x + 2$

B) $y = -\sin x + 1$

C) $y = 2\cos x + 3$

D) $y = -3\cos x + 1$



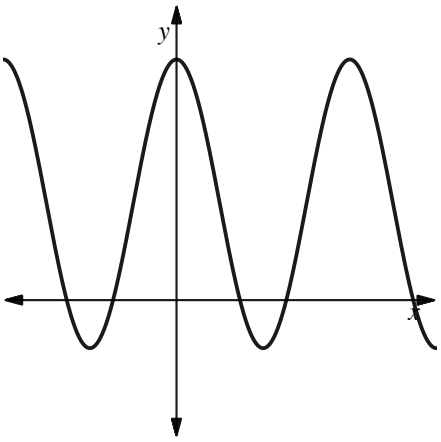
89. Which of the following equations could represent the graph shown?

A) $y = 3\cos x + 2$

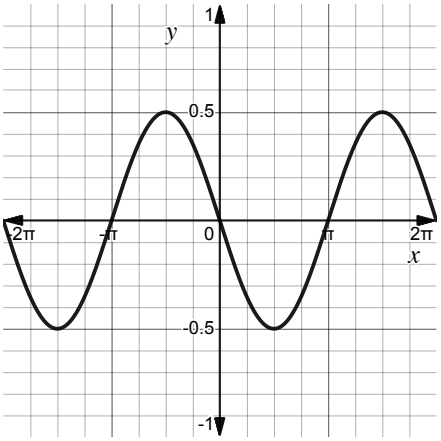
B) $y = -\sin x + 1$

C) $y = 2\cos x + 3$

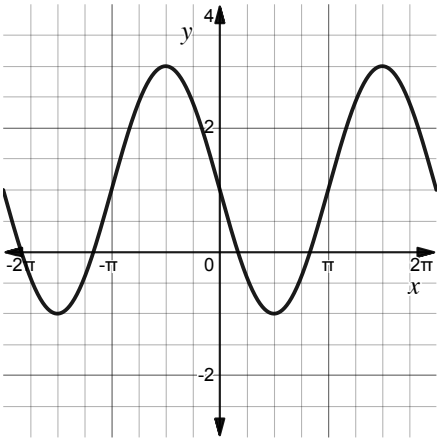
D) $y = -3\cos x + 1$



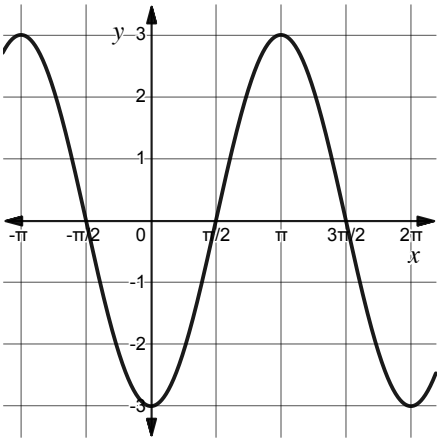
90. Write two equations for the graph shown, one using sine and one using cosine.



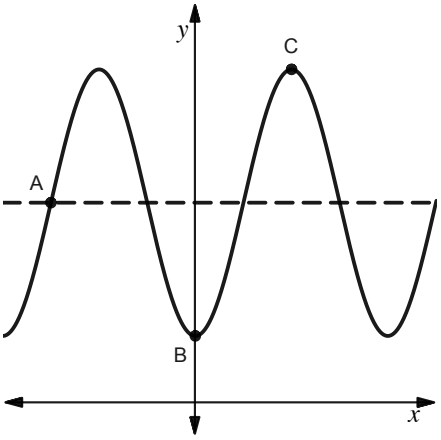
91. Write two equations for the graph shown, one using sine and one using cosine.



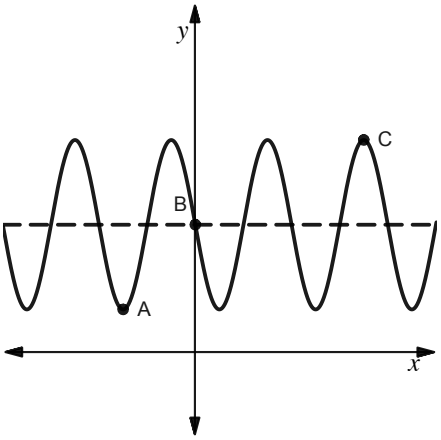
92. Write two equations for the graph shown, one using sine and one using cosine.



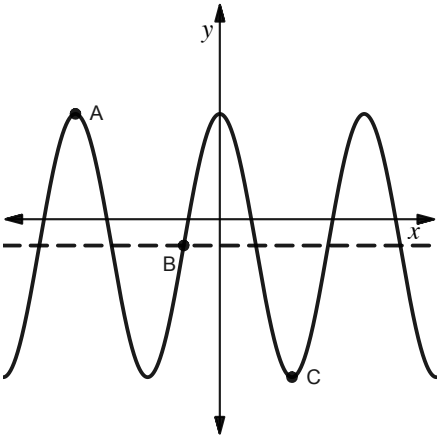
93. The sinusoidal function $y = h(x)$ shown below has a midline at $y = 6$, a period of 2π, and an amplitude of 4. Give the coordinates of points A, B, and C.



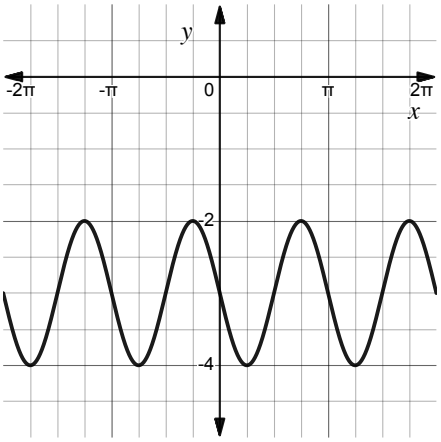
94. The sinusoidal function $y = g(x)$ shown below has a midline at $y = 3$, a period of π, and an amplitude of 2. Give the coordinates of points A, B, and C.



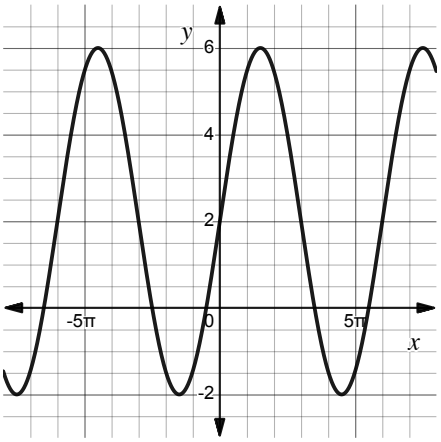
95. The sinusoidal function $y = f(x)$ shown below has a midline at $y = -2$, a period of 4π, and an amplitude of 5. Give the coordinates of points A, B, and C.



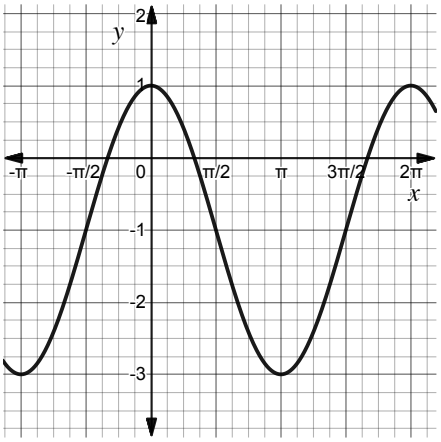
96. The graph of $y = A\sin(Bx) + D$ is shown for some constants A, B, and D. Find the values of A, B, and D.



97. The graph of $y = A\sin(Bx) + D$ is shown for some constants A, B, and D. Find the values of A, B, and D.



98. The graph of $y = A\cos(x - C) + D$ is shown for some constants A, C, and D. Find the values of A, C, and D.



99. The period of the function $f(x) = 3\cos(Bx) + 5$ is 10π. Find the value of B.

100. Determine the period of the graph of $y = -\frac{1}{2}\cos(6x) + 8$.

101. The period of the graph of $y = 7\sin(Bx) - 3$ is $\frac{\pi}{2}$. Find the value of B.

102. The graph of $y = \cos x$ is vertically stretched by a factor of 5 and horizontally shifted to the right $\frac{\pi}{2}$. Which of the following is affected?

I. Domain
II. Range
III. Amplitude
IV. Period

A) I and II

B) II and III

C) II and IV

D) III and IV

103. The graph of $y = \sin x$ is vertically shifted down 2 units and horizontally stretched by a factor of 4. Which of the following is affected?

I. Domain
II. Range
III. Amplitude
IV. Period

A) I and III

B) II and III

C) I, II, and IV

D) II and IV

104. The graph of $y = \cos x$ is reflected across the y-axis and horizontally stretched by a factor of $\frac{1}{3}$. Which of the following is affected?

A) Range

B) Amplitude

C) Period

D) Domain

105. Consider the graph of $f(x)$, where $f(x) = 4\cos(\frac{1}{2}x) - 3$.

a. Identify the period of f.

b. Identify the amplitude of f.

c. Identify the midline of the graph of f.

d. Identify the range of f.

106. Consider the graph of $f(x)$, where $f(x) = -3\sin(2x)$.

a. Identify the amplitude of f.

b. Identify the midline of the graph of f.

c. Identify the period of f.

d. Identify the range of f.

107. Consider the graph of $y = f(x)$ where $f(x) = 2 + 5\cos x$.

a. Identify the midline of the graph of f.

b. Identify the period of f.

c. Identify the range of f.

d. Identify the amplitude of f.

108. Describe the transformations of the parent function $f(x) = \sin(x)$, that produce the graph of $f(x) = 3\sin(\frac{1}{2}x) - 3$.

109. Describe the transformations of the parent function $f(x) = \cos x$, that produce the graph of $f(x) = \frac{1}{2}\cos(4x) + 1$.

110. Describe the transformations of the parent function $f(x) = \sin x$, that produce the graph of $f(x) = -3\sin(x + \frac{\pi}{4})$.

111. Consider the graph of $y = \sin x$.

a. Identify the ordered pairs of three x-intercepts of $y = \sin x$.

b. What does an x-intercept on the graph of $y = \sin x$ represent? Explain using your knowledge of the unit circle.

c. Can you come up with a rule for identifying all the x-intercepts of $y = \sin x$?

112. Consider the graph of $y = \cos x$.

a. Identify the ordered pairs of three x-intercepts of $y = \cos x$.

b. What does an x-intercept on the graph of $y = \cos x$ represent? Explain using your knowledge of the unit circle.

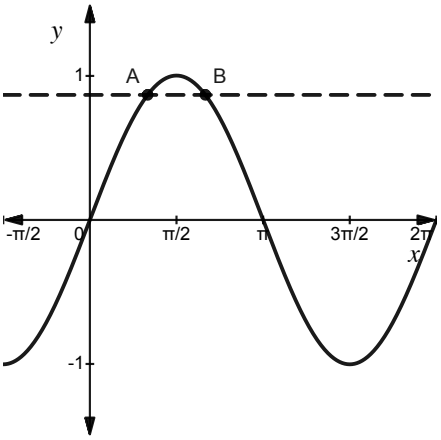
c. Can you come up with a rule for identifying all the x-intercepts of $y = \cos x$?

d. Is the distance between the x-intercepts the same as the period of the function? Why or why not?

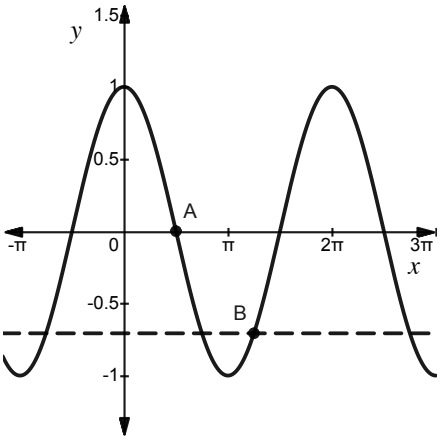
113. Nevaeh explains to her group that the graph of $y = \sin x$ has a range of $[0, 1]$ since the amplitude of $y = \sin x$ is 1. Is Nevaeh correct? Explain.

114. Kai says the amplitude of $y = \cos x$ is 2 since the distance between the maximum and the minimum value is 2. Is Kai correct? Explain.

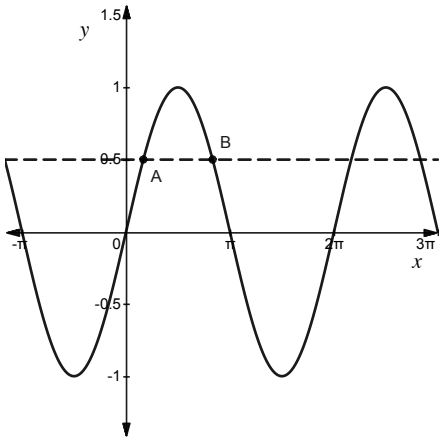
115. The graph of $y = \sin x$ is shown. The dashed line represents $y = \frac{\sqrt{3}}{2}$. Find the coordinates of points A and B.



116. The graph of $y = \cos x$ is shown. The dashed line represents $y = -\frac{\sqrt{2}}{2}$. Find the coordinates of points A and B.



117. The graph of $y = \sin x$ is shown. Find the coordinates of points A and B.



118. For which of the following statements is NOT true for $f(x) = \sin x$?

A) $f(-2\pi) = f(2\pi)$

B) $f\left(-\frac{\pi}{6}\right) = -f\left(\frac{\pi}{6}\right)$

C) $f\left(\frac{3\pi}{2}\right) = f\left(-\frac{\pi}{2}\right)$

D) $f\left(\frac{\pi}{3}\right) = f\left(-\frac{\pi}{3}\right)$

119. For which of the following statements is NOT true for $f(x) = \cos x$?

A) $f\left(\frac{\pi}{2}\right) = f\left(-\frac{\pi}{2}\right)$

B) $f(0) = f(2\pi)$

C) $f(-\pi) = -f(\pi)$

D) $f\left(-\frac{\pi}{4}\right) = f\left(\frac{\pi}{4}\right)$

120. For which of the following functions is it true that $f(-x) = f(x)$?

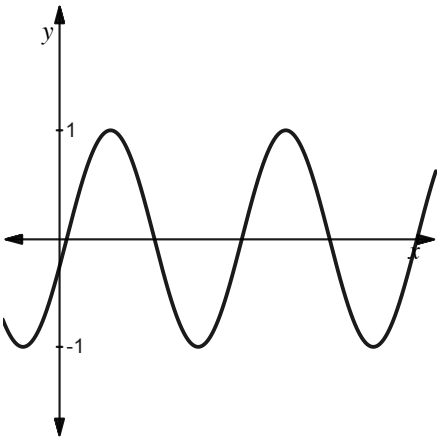
A) $f(x) = \sin x$

B) $f(x) = \cos x$

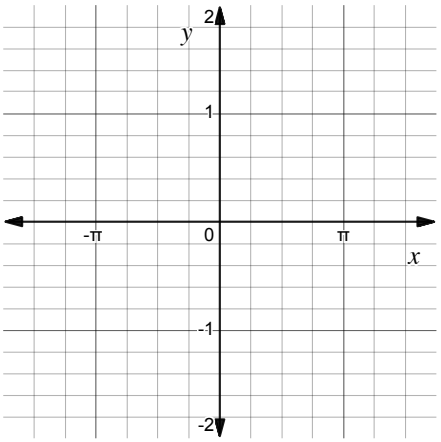
C) Both $f(x) = \sin x$ and $f(x) = \cos x$.

D) Neither $f(x) = \sin x$ nor $f(x) = \cos x$.

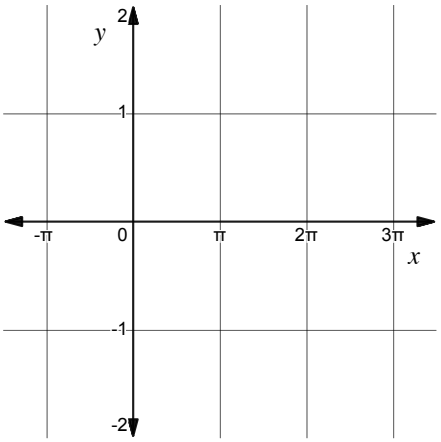
121. Could this be the graph of $y = \sin x$? Why or why not?



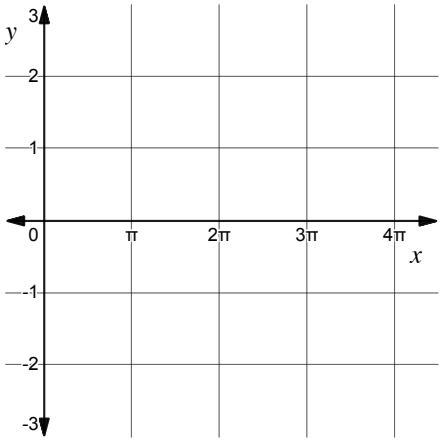
122. Graph $y = \cos x$ for $-\frac{3\pi}{2} \leq x \leq \frac{3\pi}{2}$.



123. Graph $y = \sin x$ for $-\pi \leq x \leq 3\pi$.



124. Graph $y = \cos x$ for $\pi \leq x \leq 4\pi$.



125. Is the point $\left(\frac{3\pi}{2}, -1\right)$ on the graph of $y = \sin x$? Explain.

126. Is the point $(\pi, 0)$ on the graph of $y = \cos x$? Explain.

127. Is the point $\left(\frac{\pi}{2}, 0\right)$ on the graph of $y = \sin x$? Explain.

128. Which of the following is true about the graph of $y = f(x)$ where $f(x) = \cos x$?

A) The graph of f has a rate of change of 0 at $x = \frac{\pi}{2}$.

B) The graph of f has an absolute maximum at $x = \pi$.

C) The graph of f is increasing on the interval $(\pi, 2\pi)$.

D) The graph of f has a x -intercept at $x = \pi$.

129. Which of the following is true about the graph of $y = f(x)$ where $f(x) = \sin x$?

A) The graph of f has an x -intercept at $x = \frac{\pi}{2}$.

B) The graph of f has an absolute minimum at $x = \frac{3\pi}{2}$.

C) The graph of f is increasing on the interval $(0, \pi)$.

D) The graph of f has a rate of change of 0 at $x = 0$.

130. Which of the following is true about the graph of $y = f(x)$ where $f(x) = \cos x$?

A) The graph of f has a y -intercept at $y = 1$.

B) The graph of f has an absolute minimum at $x = \frac{\pi}{2}$.

C) The graph of f is increasing on the interval $\left(0, \frac{\pi}{2}\right)$.

D) The graph of f has a rate of change of 0 at $x = \frac{3\pi}{2}$.

131. Which of the following is true about the graph of $y = f(x)$ where $f(x) = \sin x$?

A) The graph of f has a y -intercept at $y = 1$.

B) The graph of f has an absolute minimum at $x = \frac{\pi}{2}$.

C) The graph of f is decreasing on the interval $\left(0, \frac{\pi}{2}\right)$.

D) The graph of f has a rate of change of 0 at $x = \frac{3\pi}{2}$.

132. Which of the following are the coordinates of a point on the graph of $y = \cos x$?

A) $\left(\frac{\pi}{2}, 0\right)$

B) $\left(\frac{7\pi}{6}, -\frac{1}{2}\right)$

C) $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

D) $\left(\frac{\pi}{3}, -\frac{\sqrt{2}}{2}\right)$

133. Which of the following are the coordinates of a point on the graph of $y = \sin x$?

A) $\left(\frac{\pi}{2}, 0\right)$

B) $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

C) $\left(\frac{7\pi}{6}, -\frac{1}{2}\right)$

D) $\left(\frac{\pi}{3}, -\frac{\sqrt{2}}{2}\right)$

134. Which of the following are NOT the coordinates of a point on the graph of $y = \cos x$?

A) $(\pi, 0)$

B) $\left(\frac{4\pi}{3}, -\frac{1}{2}\right)$

C) $\left(\frac{\pi}{6}, \frac{\sqrt{3}}{2}\right)$

D) $\left(\frac{3\pi}{4}, -\frac{\sqrt{2}}{2}\right)$

135. Which of the following are NOT the coordinates of a point on the graph of $y = \sin x$?

A) $\left(\frac{\pi}{2}, 1\right)$

B) $\left(\frac{5\pi}{3}, -\frac{\sqrt{3}}{2}\right)$

C) $(\pi, 0)$

D) $\left(\frac{7\pi}{6}, \frac{1}{2}\right)$

136. Which of the following are NOT the coordinates of a point on the graph of $y = \cos x$?

A) $(2\pi, 1)$

B) $\left(\frac{11\pi}{6}, \frac{\sqrt{3}}{2}\right)$

C) $(\pi, -1)$

D) $\left(\frac{7\pi}{4}, -\frac{\sqrt{2}}{2}\right)$

137. Which of the following are NOT the coordinates of a point on the graph of $y = \sin x$?

A) $(2\pi, 0)$

B) $\left(\frac{5\pi}{6}, \frac{\sqrt{3}}{2}\right)$

C) $\left(\frac{3\pi}{2}, -1\right)$

D) $\left(\frac{7\pi}{4}, -\frac{\sqrt{2}}{2}\right)$

138. Determine the x -intercept(s) of the function $f(x) = \cos x$.

139. Determine the maximum and minimum values of the function $f(x) = \sin x$.

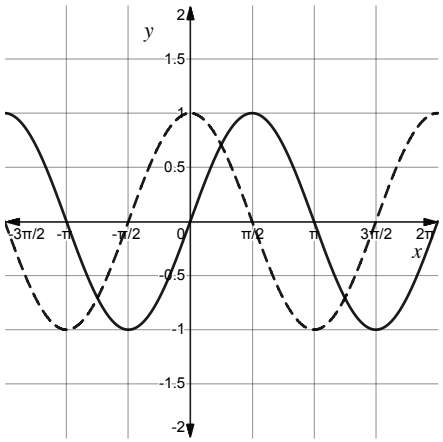
140. Determine the y -intercept of the function $y = f(x)$ where $f(x) = \sin x$.

141. Determine the y -intercept of the function $y = f(x)$ where $f(x) = \cos x$.

142. The graphs of $y = \sin x$ and $y = \cos x$ are shown in the xy -coordinate plane for $-\frac{3\pi}{2} \leq x \leq 2\pi$.

a. Find the difference between the x -coordinate of each pair of consecutive intersection points shown in the figure. Then write a general rule for the x -coordinate of all the points of intersection of the graphs $y = \sin x$ and $y = \cos x$.

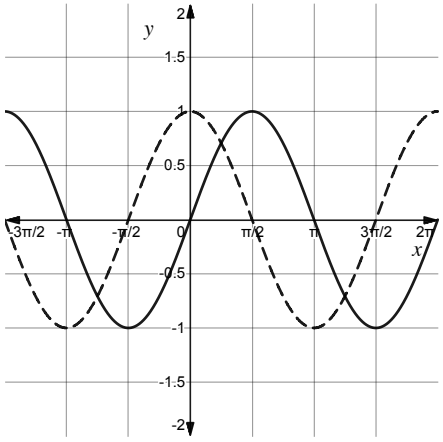
b. Identify a transformation that would shift the graph of $y = \sin x$ on to the graph of $y = \cos x$.



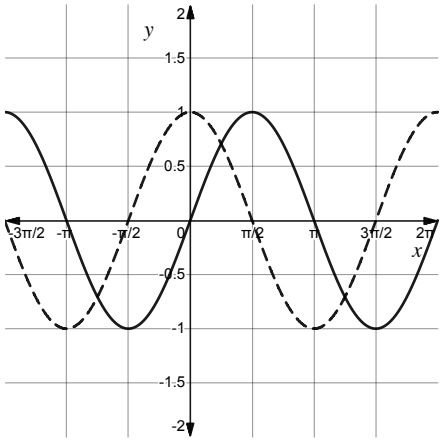
143. The graphs of $y = \cos x$ and $y = \sin x$ are shown in the xy -coordinate plane for $-\frac{3\pi}{2} \leq x \leq 2\pi$.

a. Identify a transformation that would shift the graph of $y = \cos x$ on to the graph $y = \sin x$.

b. Identify an interval of the domain where $\sin x > \cos x$ and explain why this is true using the graph.



144. The graphs of $y = \cos x$ and $y = \sin x$ are shown in the xy coordinate plane for $-\frac{3\pi}{2} \leq x \leq 2\pi$.



a. Identify the ordered pairs of two intersection points and explain what these intersections represent.

b. Identify an interval of the domain where $\cos x > \sin x$ and explain why this is true using the graph.

145. Below is a table representing five points for the graph of $y = \cos x$. Describe the inputs and the outputs on the table.

x	y
0	1
$\frac{\pi}{2}$	0
π	-1
$\frac{3\pi}{2}$	0
2π	1

146. When graphing $y = \sin x$ on the xy -coordinate plane, describe what is measured on the x -axis and y -axis.

147. When graphing $y = \cos x$ on the xy -coordinate plane, describe what is measured on the x -axis and y -axis.

148. For $0 \leq \theta \leq 2\pi$, name all the measures of the angles on the unit circle where $\tan\theta = \pm\frac{\sqrt{3}}{3}$. What do you notice about these angles?

149. For $0 \leq \theta \leq 2\pi$, name all the measures of the angles on the unit circle where $\sin\theta = \pm\frac{\sqrt{2}}{2}$. What do you notice about these angles?

150. For $0 \leq \theta \leq 2\pi$ name all the measures of the angles on the unit circle where $\cos\theta = \pm\frac{1}{2}$. What do you notice about these angles?

151. Explain how to find the value of $\tan\left(\frac{31\pi}{4}\right)$ using the unit circle.

152. Explain how to find the value of $\cos\left(\frac{-15\pi}{4}\right)$ using the unit circle.

153. Explain how to find the value of $\sin\left(\frac{28\pi}{3}\right)$ using the unit circle.

154. If θ is an angle in the third quadrant and $\tan\theta = \sqrt{3}$, find $\cos\theta$.

155. If θ is an angle in the first quadrant and $\cos\theta = \frac{1}{2}$, find $\sin\theta$.

156. If θ is an angle in the second quadrant and $\sin\theta = \frac{\sqrt{2}}{2}$, find $\tan\theta$.

157. For $\frac{\pi}{6} < \theta < \frac{\pi}{4}$, determine if each statement is true of false.

a. $\frac{\sqrt{2}}{2} < \cos\theta < \frac{\sqrt{3}}{2}$

b. $\frac{\sqrt{2}}{2} < \sin\theta < \frac{\sqrt{3}}{2}$

c. $\tan\theta < 1$

158. For $\frac{3\pi}{4} < \theta < \frac{5\pi}{6}$, determine if each statement is true of false.

a. $\tan\theta < 1$

b. $\frac{1}{2} < \sin\theta < \frac{\sqrt{2}}{2}$

c. $-\frac{\sqrt{2}}{2} < \cos\theta < -\frac{1}{2}$

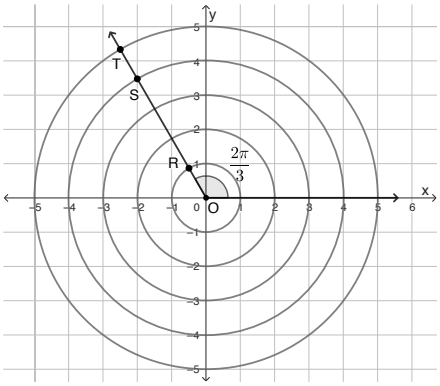
159. For $\frac{3\pi}{2} < \theta < \frac{5\pi}{3}$, determine if each statement is true or false.

a. $-\frac{\sqrt{3}}{2} < \sin\theta < -\frac{1}{2}$

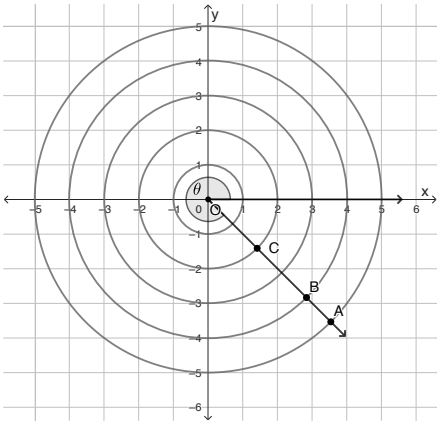
b. $0 < \cos\theta < \frac{1}{2}$

c. $\tan\theta > 1$

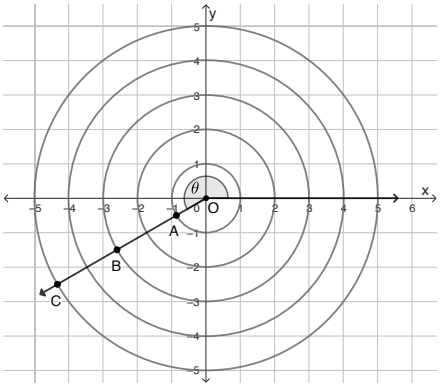
160. An angle, θ, is shown in standard position. Find the exact coordinates of points R, S, and T.



161. An angle, θ, is shown in standard position, where $\theta = \frac{7\pi}{4}$. Find the exact coordinates of points A, B, and C.



162. An angle, θ, is shown in standard position, where $\theta = \frac{7\pi}{6}$. Find the exact coordinates of points A, B, and C.



163. Which of the following has a negative value?

A) $\sin\left(-\frac{7\pi}{6}\right)$

B) $\sin\left(-\frac{\pi}{4}\right)$

C) $\tan\left(\frac{4\pi}{3}\right)$

D) $\cos\left(\frac{23\pi}{6}\right)$

164. Which of the following has a positive value?

A) $\cos\left(\frac{7\pi}{6}\right)$

B) $\tan\left(\frac{2\pi}{3}\right)$

C) $\sin\left(\frac{15\pi}{4}\right)$

D) $\tan\left(\frac{4\pi}{3}\right)$

165. Which of the following has a negative value?

A) $\tan\left(\frac{5\pi}{4}\right)$

B) $\sin\left(\frac{5\pi}{6}\right)$

C) $\cos\left(\frac{4\pi}{3}\right)$

D) $\cos\left(\frac{13\pi}{6}\right)$

166. For which angle(s) between 0 and 2π is $\tan\theta = \sqrt{3}$?

167. For which angle(s) between 0 and 2π is $\sin\theta = -\frac{1}{2}$?

168. For which angle(s) between 0 and 2π is $\cos\theta = \frac{\sqrt{2}}{2}$?

169. Evaluate.

a. $\tan\left(\frac{3\pi}{2}\right)$

b. $\sin\left(\frac{3\pi}{4}\right)$

c. $\tan\left(\frac{11\pi}{6}\right)$

d. $\cos\left(\frac{11\pi}{3}\right)$

170. Evaluate.

a. $\tan\left(\frac{7\pi}{4}\right)$

b. $\cos\left(\frac{5\pi}{6}\right)$

c. $\sin\left(\frac{4\pi}{3}\right)$

d. $\cos\left(\frac{9\pi}{2}\right)$

171. Evaluate.

a. $\sin\left(\frac{4\pi}{3}\right)$

b. $\cos\left(\frac{11\pi}{6}\right)$

c. $\tan(5\pi)$

d. $\sin\left(\frac{5\pi}{4}\right)$

172. Which of these expressions has the least value?

A) $\sin\left(\frac{\pi}{4}\right)$

B) $\sin\left(\frac{\pi}{3}\right)$

C) $\sin\left(\frac{\pi}{2}\right)$

D) $\sin\pi$

173. Which of these expressions is a negative value?

A) $\cos\left(\frac{-\pi}{6}\right)$

B) $-\sin\left(\frac{4\pi}{3}\right)$

C) $\cos\left(\frac{-5\pi}{6}\right)$

D) $\sin\left(\frac{7\pi}{3}\right)$

174. Which of these expressions is not equal to the other three?

A) $-\cos\left(\frac{\pi}{6}\right)$

B) $\sin\left(\frac{\pi}{3}\right)$

C) $\cos\left(\frac{-11\pi}{6}\right)$

D) $\sin\left(\frac{-5\pi}{3}\right)$

175. Which of these expressions has the greatest value?

A) $\tan 0$

B) $-\tan\left(\frac{\pi}{4}\right)$

C) $\tan\left(\frac{\pi}{3}\right)$

D) $\tan\left(-\frac{\pi}{4}\right)$

176. Which of these expressions is not equivalent to 0.5 ?

A) $\frac{\tan\left(\frac{\pi}{4}\right)}{2}$

B) $\sin\left(\frac{17\pi}{6}\right)$

C) $\cos\left(\frac{5\pi}{6}\right)$

D) $\cos\left(\frac{2\pi}{6}\right)$

177. Which of these is not equivalent to the other three?

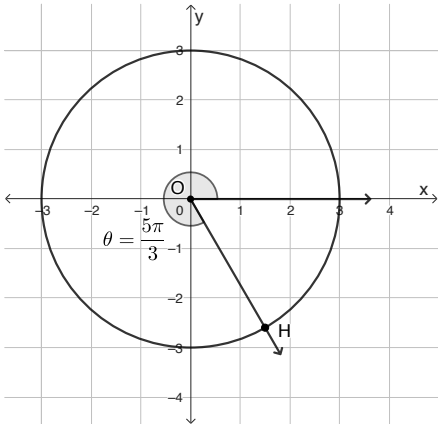
A) $\cos\left(\frac{5\pi}{6}\right)$

B) $\sin\left(\frac{\pi}{6}\right)$

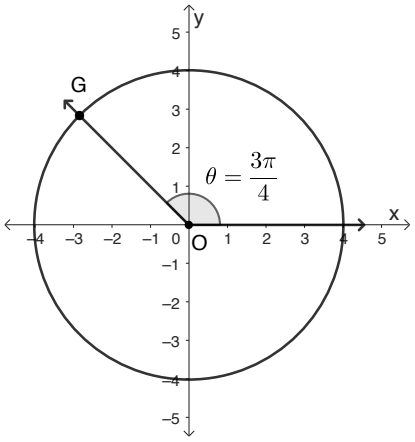
C) $\sin\left(\frac{5\pi}{3}\right)$

D) $\cos\left(\frac{7\pi}{6}\right)$

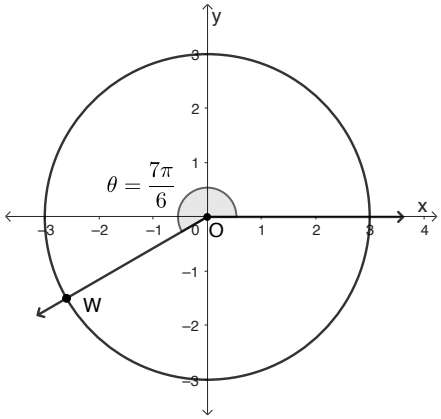
178. Give the exact coordinates of Point H .



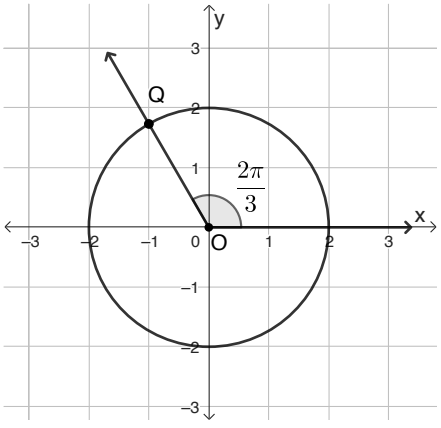
179. Give the exact coordinates of Point G .



180. Give the exact coordinates of Point W .



181. Give the exact coordinates of Point Q .



182. If $\sin\theta = \frac{1}{2}$ and $0 < \theta < \frac{\pi}{2}$, find the value of θ .

183. If $\cos\theta = -\frac{\sqrt{2}}{2}$ and $\frac{\pi}{2} < \theta < \pi$, find the value of θ.

184. If $\sin\theta = -\frac{\sqrt{3}}{2}$ and θ is an angle in the third quadrant, find the value of θ.

185. If $\cos\theta = \frac{\sqrt{3}}{2}$ and θ is an angle in the fourth quadrant, find the value of θ.

186. Evaluate:

a. $\tan\left(\frac{11\pi}{6}\right)$

b. $\cos\left(\frac{5\pi}{3}\right)$

187. Evaluate:

a. $\tan\left(\frac{\pi}{6}\right)$

b. $\sin\left(-\frac{3\pi}{2}\right)$

188. Evaluate:

a. $\cos\left(-\frac{5\pi}{6}\right)$

b. $\sin\left(\frac{3\pi}{4}\right)$

189. Evaluate:

a. $\sin\left(\frac{\pi}{6}\right)$

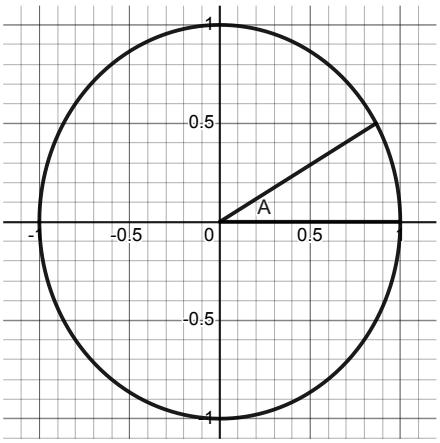
b. $\cos\left(\frac{4\pi}{3}\right)$

190. Evaluate:

a. $\tan\left(\frac{5\pi}{3}\right)$

b. $\cos\left(-\frac{3\pi}{4}\right)$

191. Angle A is shown in standard position on a unit circle. Find the measure of angle A.



192. If $\cos\theta > \sin\theta > 0$, which of the following could be the measure of θ?

A) $\frac{\pi}{6}$

B) $\frac{5\pi}{6}$

C) $\frac{\pi}{3}$

D) $\frac{5\pi}{3}$

193. If $\sin\theta > \cos\theta > 0$, which of the following could be the measure of θ?

A) $\frac{\pi}{6}$

B) $\frac{7\pi}{6}$

C) $\frac{2\pi}{3}$

D) $\frac{\pi}{3}$

194. If $\sin\theta < \cos\theta < 0$, which of the following could be the measure of θ?

A) $\frac{\pi}{6}$

B) $\frac{7\pi}{6}$

C) $\frac{4\pi}{3}$

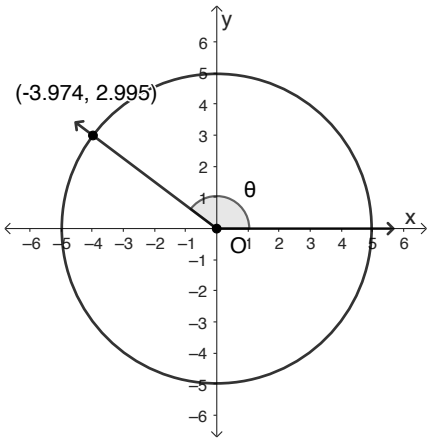
D) $\frac{5\pi}{3}$

195. For an angle θ in quadrant 2, $\sin\theta = 0.25$. Find $\cos\theta$ and $\tan\theta$. Give an exact answer and show how you arrived at your answer.

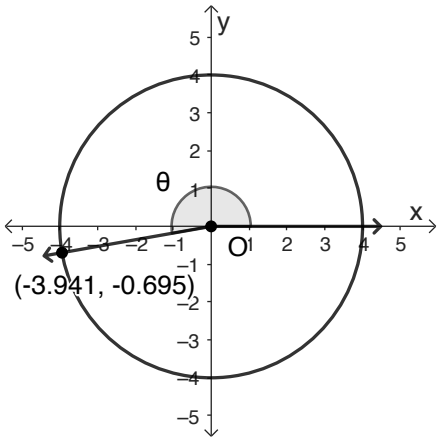
196. For an angle θ in quadrant 3, $\sin\theta = -\frac{2}{3}$. Find $\cos\theta$ and $\tan\theta$. Give an exact answer and show how you arrived at your answer.

197. Angle θ is in standard position with a terminal side in quadrant 4. Given that $\cos\theta = 0.75$, find $\sin\theta$ and $\tan\theta$. Give exact answers and show how you arrived at your answers.

198. A point on the terminal ray of angle θ is shown. Find $\sin\theta$, $\cos\theta$, and $\tan\theta$.



199. A point on the terminal ray of angle θ is shown. Find $\sin\theta$, $\cos\theta$, and $\tan\theta$.



200. An angle in standard position has a measure of $\frac{11\pi}{9}$ radians. The terminal ray of the angle intersects a circle centered at the origin with a radius of 1, at point A.

a. What quadrant is Point A in?

b. What is the ratio of the vertical displacement of Point A to the horizontal displacement of Point A? Round to the nearest thousandth.

201. An angle in standard position has a measure of 3 radians. The terminal ray of the angle intersects a circle centered at the origin with a radius of 1, at point A.

a. What quadrant is Point A in?

b. What is the slope of the terminal ray of the angle? Round to the nearest thousandth.

202. An angle in standard position has a measure of 5 radians. The terminal ray of the angle intersects a circle centered at the origin with a radius of 1, at point A.

a. What quadrant is Point A in?

b. What is the ratio of the vertical displacement of Point A to the horizontal displacement of Point A ? Round to the nearest thousandth.

203. At which other angle on the interval $0 \leq \theta \leq 2\pi$ is the cosine ratio the same as the cosine ratio at $\theta = \frac{4\pi}{11}$?

204. At which other angle on the interval $0 \leq \theta \leq 2\pi$ is the sine ratio the same as the sine ratio at $\theta = \frac{3\pi}{5}$?

205. At which other angle on the interval $0 \leq \theta \leq 2\pi$ is the cosine ratio the same as the cosine ratio at $\theta = \frac{5\pi}{7}$?

206. Which of the following has a negative value?

A) $\sin\left(\frac{5\pi}{6}\right)$

B) $\sin\left(-\frac{\pi}{4}\right)$

C) $\tan\left(\frac{4\pi}{3}\right)$

D) $\cos\left(\frac{23\pi}{6}\right)$

207. Which of the following has a positive value?

A) $\cos\left(\frac{7\pi}{6}\right)$

B) $\tan\left(\frac{2\pi}{3}\right)$

C) $\sin\left(\frac{15\pi}{4}\right)$

D) $\tan\left(\frac{4\pi}{3}\right)$

208. Which of the following has a negative value?

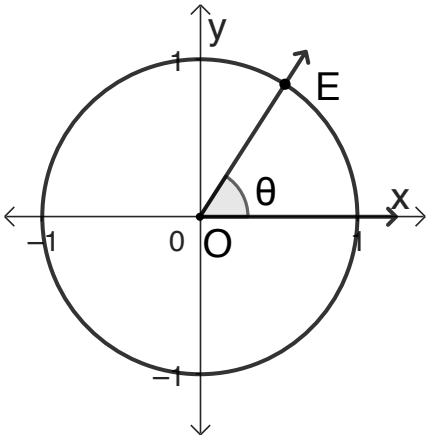
A) $\tan\left(\frac{5\pi}{4}\right)$

B) $\sin\left(\frac{5\pi}{6}\right)$

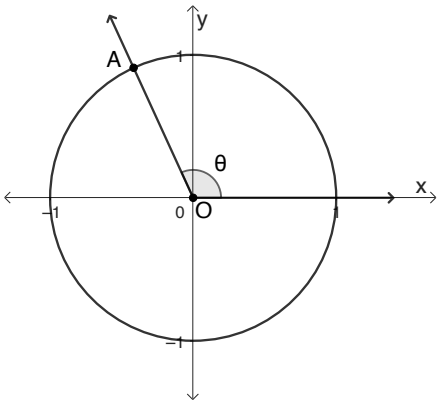
C) $\cos\left(\frac{4\pi}{3}\right)$

D) $\cos\left(\frac{13\pi}{6}\right)$

209. In the figure below, $\theta = 1$. Give the coordinates of Point E, to the nearest thousandth.



210. In the figure below, $\theta = 2$ radians. Give the coordinates of Point A, to the nearest thousandth.

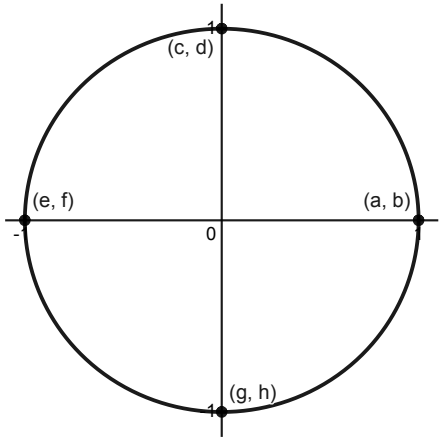


211. Four points and their coordinates are shown on the unit circle. Which value (a, b, c, d, e, f, g, or h) is equal to...

a. $\cos\left(\frac{3\pi}{2}\right)$

b. $\cos(0)$

c. $\sin(\pi)$

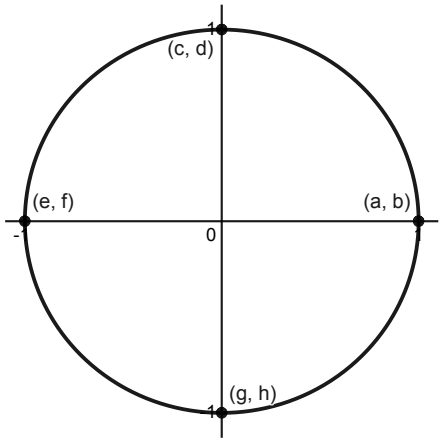


212. Four points and their coordinates are shown on the unit circle. Which value (a, b, c, d, e, f, g, or h) is equal to...

a. $\cos(\pi)$

b. $\sin\left(\frac{\pi}{2}\right)$

c. $\sin(2\pi)$

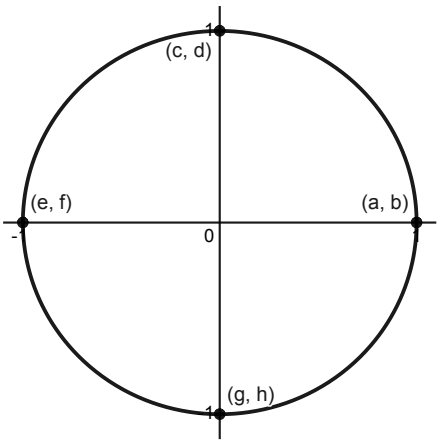


213. Four points and their coordinates are shown on the unit circle. Which value (a, b, c, d, e, f, g, or h) is equal to...

a. $\sin\left(\frac{3\pi}{2}\right)$

b. $\cos(2\pi)$

c. $\cos\left(\frac{\pi}{2}\right)$



214. Which of the following supports the fact that $\sin(80\pi) = 0$?

A) The sine function is a periodic function with a period of 2π . Since $\sin(80\pi) = \sin(0 + 40(2\pi))$ and 40 is an integer, $\sin(80\pi) = \sin(0) = 0$

B) The sine of every angle that is a multiple of π is 0 .

C) An angle of measure 80π is coterminal with an angle of measure 2π , so $\sin(80\pi) = \sin(2\pi) = 0$.

D) All of the above.

215. Is $\sin(\theta) = \sin(\theta + 27\pi)$ for all values of θ ? Explain why or why not.

A) Yes, θ and $(\theta + 27\pi)$ are coterminal angles.

B) No, $\sin(\theta)$ is 27π less than $\sin(\theta + 27\pi)$.

C) No, for $\theta = \frac{\pi}{2}$, $\sin\left(\frac{\pi}{2}\right) = 1$ but adding 27π to $\frac{\pi}{2}$ corresponds to an angle whose terminal ray is at the bottom of the unit circle where the sine ratio is equal to -1 .

D) Yes, adding a multiple of π to θ gives a coterminal angle.

216. Which of the following best explains why $\cos\theta = \cos(-\theta)$?

A) Cosine is positive for all θ .

B) Points on the unit circle with measures θ and $-\theta$ have the same horizontal displacement from the y -axis, so the cosine of each of the angles will be the same.

C) All x -coordinates are the same on the unit circle.

D) θ and $-\theta$ are coterminal angles so they have the same cosine.

217. Which of the following supports the fact that $\cos(127\pi) = -1$?

A) Every angle with measure of an odd multiple of π is coterminal with an angle of measure π and $\cos \pi = -1$.

B) The cosine of every angle that is a multiple of π is -1 .

C) An angle of measure 127π is coterminal with an angle of measure 2π , so $\cos(127\pi) = -\cos(2\pi)$.

D) 127π lines up with the bottom of the unit circle where the y -value is -1 .

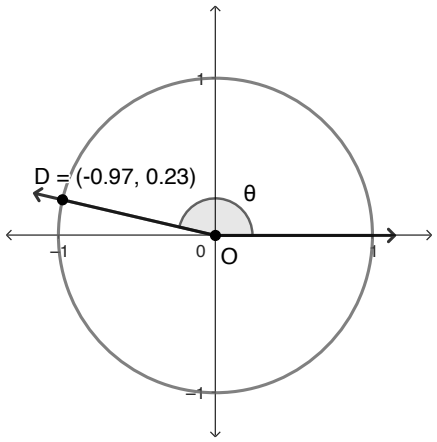
218. Angle θ is shown in standard position with terminal ray passing through point D . Find $\sin(-\theta)$.

A) -0.97

B) -0.23

C) 0.23

D) $-\dfrac{0.23}{0.97}$



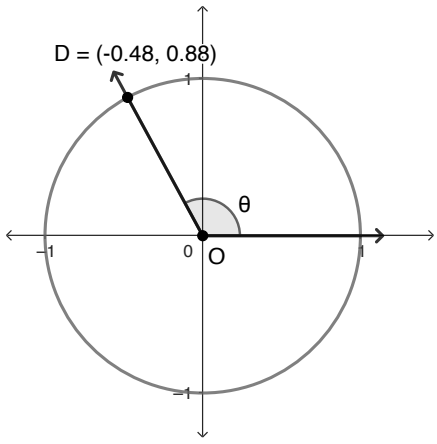
219. Angle θ is shown in standard position with terminal ray passing through point D . Find $\cos(-\theta)$.

A) 0.88

B) 0.48

C) -0.48

D) -0.88



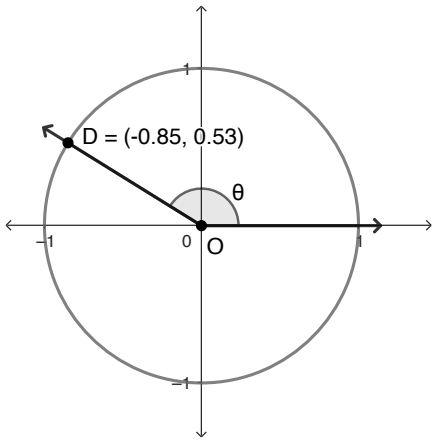
220. Angle θ is shown in standard position with terminal ray passing through point D. Find $\sin(2\pi - \theta)$.

A) -0.85

B) -0.53

C) 0.53

D) 0.85



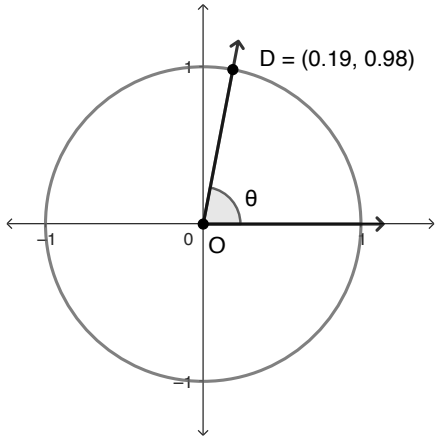
221. Angle θ is shown in standard position with terminal ray passing through point D. Find $\tan(2\pi - \theta)$.

A) 0.19

B) -0.98

C) $-\frac{0.98}{0.19}$

D) $\frac{0.19}{0.98}$



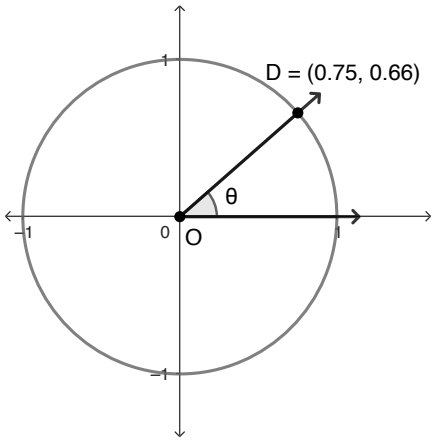
222. Angle θ is shown in standard position with terminal ray passing through point D. Find $\cos(\pi - \theta)$.

A) -0.75

B) -0.66

C) 0.66

D) $\frac{-0.66}{0.75}$



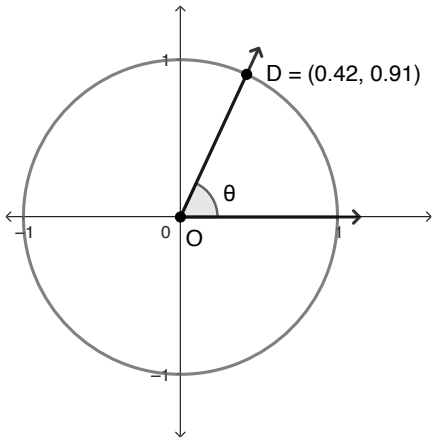
223. Angle θ is shown in standard position with terminal ray passing through point D. Find $\sin(2\pi - \theta)$.

A) -0.91

B) -0.42

C) $\dfrac{0.91}{0.42}$

D) 0.91



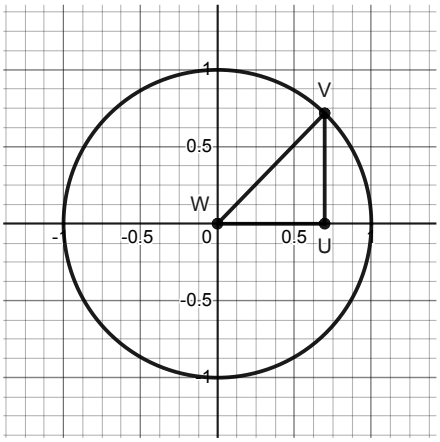
224. Right triangle VUW is shown. Which of the following statements is true?

A) $\sin W < 0.5$

B) $30^\circ < m\angle W < 60^\circ$

C) $\cos W = VU$

D) $WU + UV = 1$



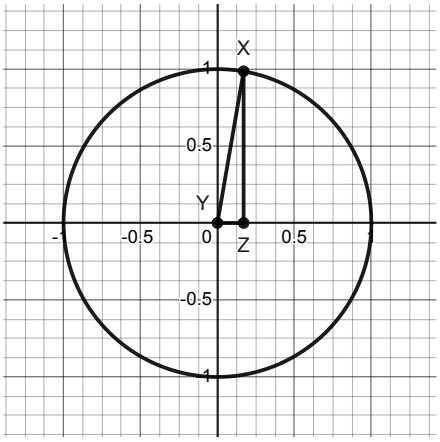
225. Right triangle XYZ is shown. Which of the following statements is FALSE?

A) $(YZ)^2 + (XZ)^2 = 1$

B) $\tan Y = \dfrac{XZ}{YZ}$

C) $\sin Y < \cos Y$

D) $\cos Y < 0.5$



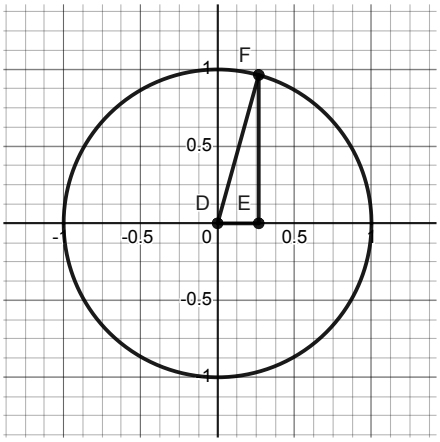
226. Right triangle FED is shown. Which of the following statements is FALSE?

A) $\tan D < 1$

B) $0 < \cos D < 0.5$

C) $0.75 < \dfrac{FE}{FD} < 1$

D) $m\angle D > 60^\circ$



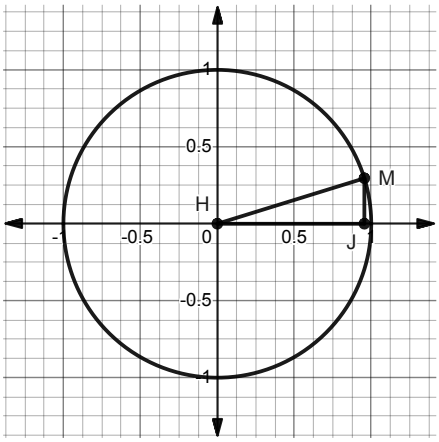
227. Right triangle JMH is shown. Which of the following statements is FALSE?

A) $0.5 < \sin H < 0.75$

B) $\tan H = \dfrac{MJ}{HJ}$

C) $(HJ)^2 + (JM)^2 = 1$

D) $\cos H > 0.75$



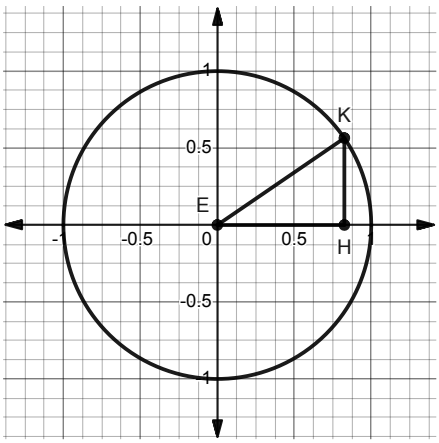
228. Right triangle EKH is shown. Which of the following statements is FALSE?

A) $\cos E > 0.5$

B) $\sin E > 0.5$

C) $30^\circ < m\angle E < 60^\circ$

D) $(EH)^2 + (HK)^2 < 1$



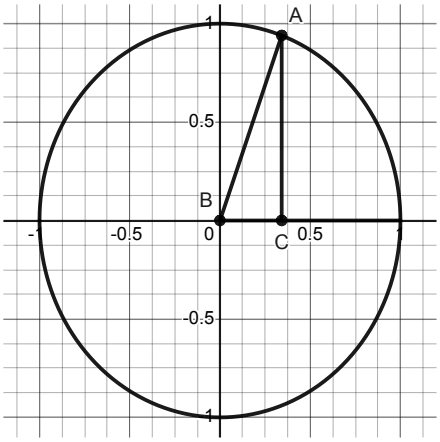
229. Right triangle ABC is shown. Which of the following statements is FALSE?

A) $AB = 1$

B) $\tan B > 1$

C) $0.75 < \sin B < 1$

D) $0 < \cos B < 0.25$



230. For $\pi < \theta < 2\pi$, which of the following statements is true?

A) $\tan\theta$ is decreasing.

B) $\sin\theta$ is increasing.

C) $\sin\theta$ is decreasing.

D) $\cos\theta$ is increasing.

231. For $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$, which of the following statements is true?

A) $\tan\theta$ is undefined.

B) $\tan\theta$ is decreasing.

C) $\sin\theta$ is increasing.

D) $\cos\theta$ is decreasing.

232. For $\frac{\pi}{2} < \theta < \frac{3\pi}{2}$, which of the following statements is true?

A) $\sin\theta$ is decreasing.

B) $\cos\theta$ is increasing.

C) $\tan\theta$ is decreasing.

D) $\sin\theta$ is increasing.

233. For $0 < \theta < \pi$, which of the following statements is true?

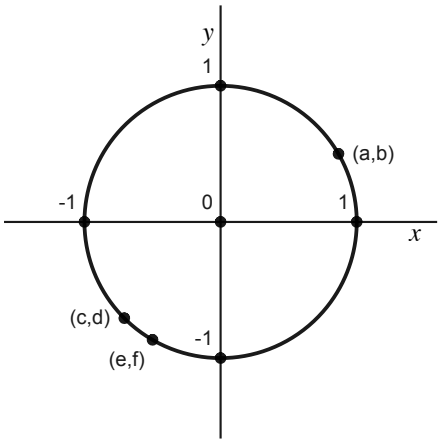
A) $\sin\theta$ is increasing.

B) $\cos\theta$ is decreasing.

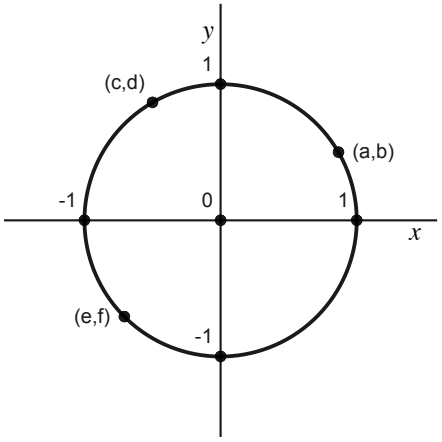
C) $\tan\theta$ is increasing.

D) $\tan\theta$ is decreasing.

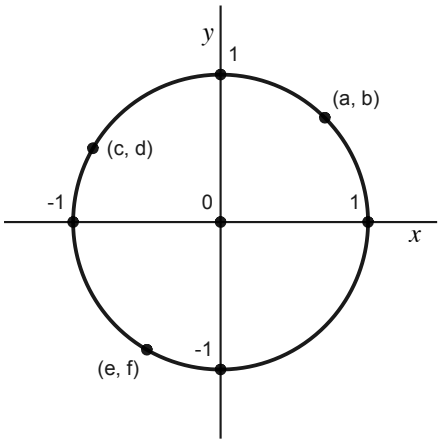
234. Three points and their coordinates are shown on the unit circle. Which value, a, b, c, d, e, or f , is equal to $\cos\left(\frac{\pi}{6}\right)$?



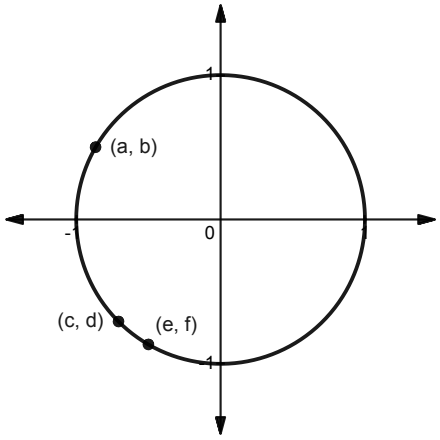
235. Three points and their coordinates are shown on the unit circle. Use the letters $a - f$ to write an expression for $\sin\left(-\frac{3\pi}{4}\right)$.



236. Three points and their coordinates are shown on the unit circle. Use the letters $a - f$ to write an expression for $\tan\left(\frac{5\pi}{6}\right)$.



237. Three points and their coordinates are shown on the unit circle. Which value, a, b, c, d, e, or f, is equal to $\sin\left(\frac{5\pi}{4}\right)$?



238. Let M be a real number.

a. Explain why there are always two angles on the interval $[0, 2\pi]$ where $\tan\theta = M$.

b. Describe the relationship between the measures of the two angles.

239. Let M be a real number where $-1 \leq M \leq 1$.

a. Explain why there are always two angles on the interval $[0, 2\pi]$ where $\cos\theta = M$.

b. Describe the relationship between the measures of the two angles.

240. Let M be a real number where $-1 \leq M \leq 1$.

a. Explain why there are always two angles on the interval $[0, 2\pi]$ where $\sin\theta = M$.

b. Describe the relationship between the measures of the two angles.

241. Which angle(s) is coterminal with $\frac{\pi}{2}$?

I. $-\frac{\pi}{2}$

II. $\frac{5\pi}{2}$

III. $-\frac{9\pi}{2}$

A) I only

B) II only

C) I and III only

D) I, II, and II

242. Which angle(s) is coterminal with $\frac{5\pi}{3}$?

I. $-\frac{5\pi}{3}$

II. $\frac{11\pi}{3}$

III. $\frac{\pi}{3}$

A) I only

B) II only

C) I and III only

D) I, II, and III

243. Which angle(s) is coterminal with $\frac{7\pi}{6}$?

I. $-\frac{5\pi}{6}$

II. $\frac{19\pi}{6}$

III. $-\frac{17\pi}{6}$

A) I only

B) III only

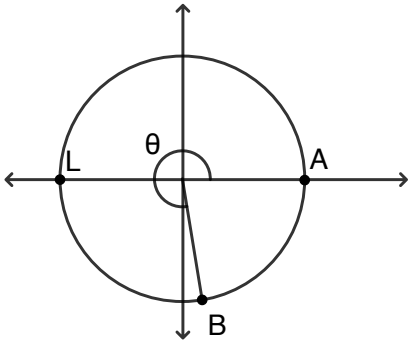
C) I and II only

D) I, II, and III

244. The diameter of the circle shown is 8 inches. Use the figure to answer the following questions.

a. What is the circumference of the circle?

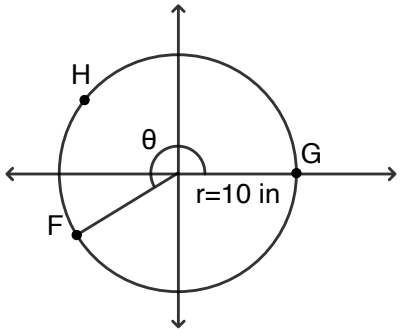
b. If the length of $\overset{\frown}{ALB}$ is 6.4π inches, find the measure of θ, in radians. Give an exact answer.



245. Use the figure shown to answer the following questions.

a. Find the circumference of the circle.

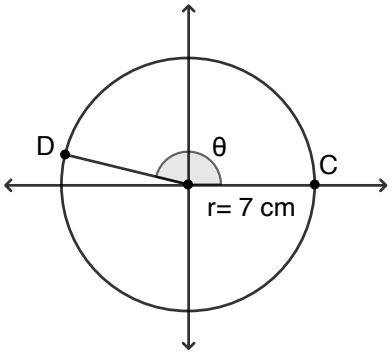
b. If $\theta = \frac{9\pi}{8}$, what fraction of the circumference of the circle is encompassed by the length of $\overset{\frown}{GHF}$?



246. Use the figure shown to answer the following questions.

a. Find the circumference of the circle.

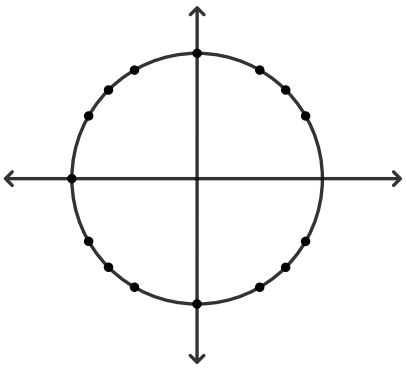
b. If the length of $\overset{\frown}{DC}$ is 6π, find the measure of θ, in radians. Give an exact answer.



247. The points shown represent multiples of $\frac{\pi}{6}$ or $\frac{\pi}{4}$.

a. An angle in standard position has a measure of $-\frac{11\pi}{6}$ radians. Label a point S, where the terminal ray of the angle intersects the circle.

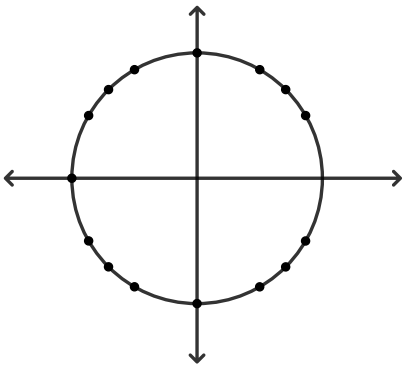
b. An angle in standard position has a measure of $\frac{28\pi}{3}$ radians. Label a point T, where the terminal ray of the angle intersects the circle.



248. The points shown represent multiples of $\frac{\pi}{6}$ or $\frac{\pi}{4}$.

a. An angle in standard position has a measure of $-\frac{5\pi}{6}$ radians. Label a point S, where the terminal ray of the angle intersects the circle.

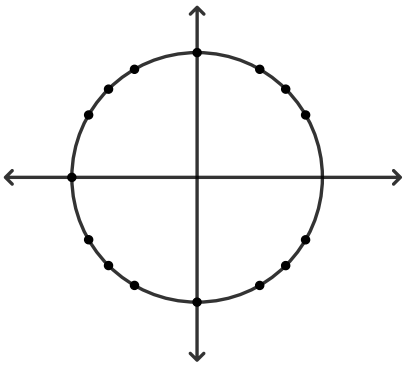
b. An angle in standard position has a measure of $\frac{15\pi}{2}$ radians. Label a point T, where the terminal ray of the angle intersects the circle.



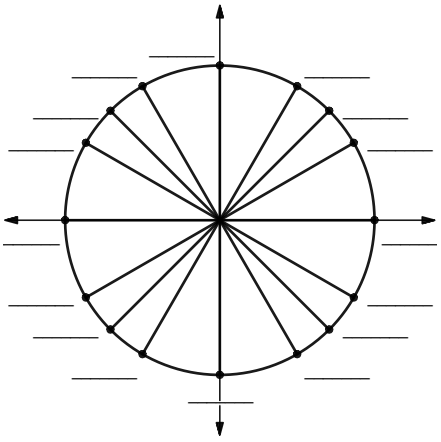
249. The points shown represent multiples of $\frac{\pi}{6}$ or $\frac{\pi}{4}$.

a. An angle in standard position has a measure of $-\frac{\pi}{4}$ radians. Label a point S, where the terminal ray of the angle intersects the circle.

b. An angle in standard position has a measure of $-\frac{22\pi}{3}$ radians. Label a point T, where the terminal ray of the angle intersects the circle.



250. Fill in the blanks with the radian measures of the angles represented on the unit circle.



251. An angle in standard position has a measure of $\frac{3\pi}{4}$ radians. Find the radian measures of three angles coterminal with this angle.

252. An angle in standard position has a measure of $\frac{4\pi}{3}$ radians. Find the radian measures of three angles coterminal with this angle.

253. An angle in standard position has a measure of $\frac{11\pi}{6}$ radians. Find the radian measures of three angles coterminal with this angle.

254. An angle in standard position has a measure of 4.5 radians. In what quadrant is the terminal side of the angle?

255. An angle in standard position has a measure of 2.1 radians. In what quadrant is the terminal side of the angle?

256. An angle in standard position has a measure of 5.8 radians. In which quadrant is the terminal side of the angle?

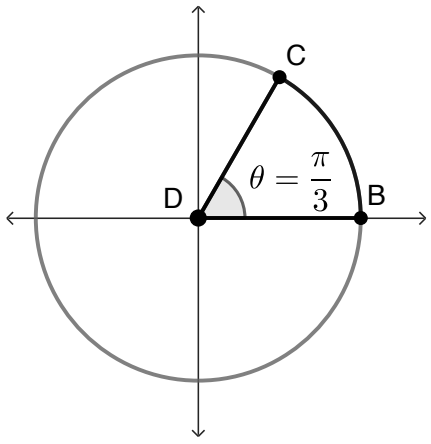
257. The circumference of the circle shown is 4π inches. Find the approximate length of arc BC .

A) 2.09 inches

B) 6.28 inches

C) 3.14 inches

D) 0.67 inches



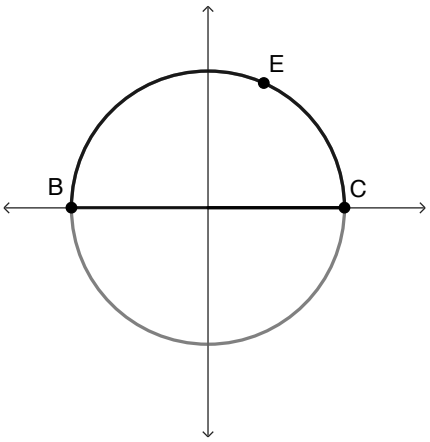
258. The length of arc CEB is 10π inches. Find the length of the radius of the circle.

A) 5 inches

B) 10 inches

C) 5π inches

D) 10π inches



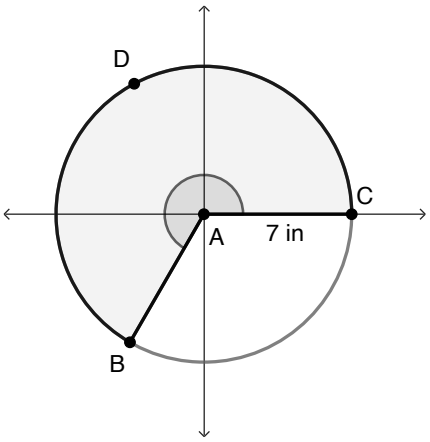
259. The length of arc CDB is $\frac{28\pi}{3}$ inches. Find θ.

A) $\frac{2\pi}{3}$

B) $\frac{4}{3}$

C) $\frac{4\pi}{3}$

D) $\frac{2}{3}$



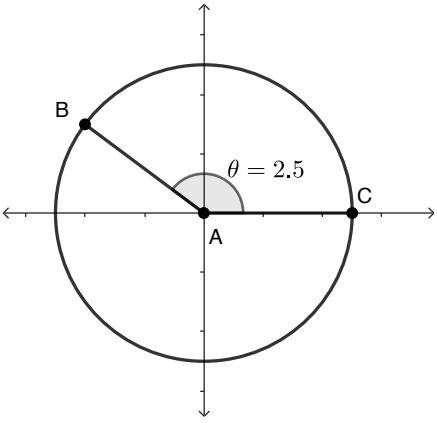
260. The radius of the circle shown is 5 inches. Find the length of arc BC.

A) 2.5 inches

B) 5 inches

C) 2.5π inches

D) 12.5 inches



261. The terminal side of an angle of -4 radians is in which quadrant?

262. The terminal side of an angle of $\frac{5}{4}$ radians is in which quadrant?

263. The terminal side of an angle of $\frac{3\pi}{5}$ radians is in which quadrant?

264. The terminal side of an angle of -0.5 radians is in which quadrant?

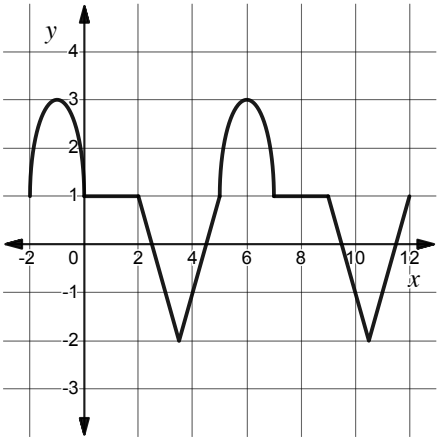
265. The terminal side of an angle of 7 radians is in which qudrant?

266. The graph shows two complete periods of a periodic function $y = f(x)$ whose domain is all real numbers.

a. What is the period of f ?

b. Find $f(62)$.

c. Does f have a positive, negative, or undefined slope at $x = 129$? Explain.

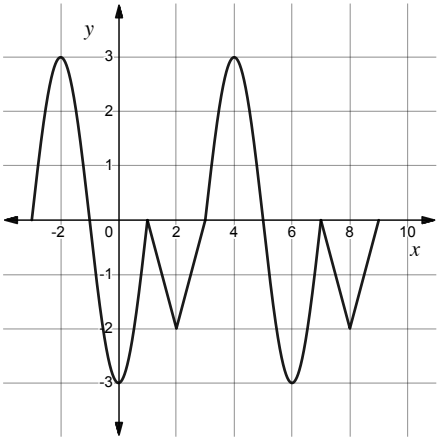


267. The graph shows two complete periods of a periodic function $y = f(x)$ whose domain is all real numbers.

a. What is the period of f ?

b. Find $f(55)$.

c. Does f have a positive, negative, or undefined slope at $x = 128$? Explain.

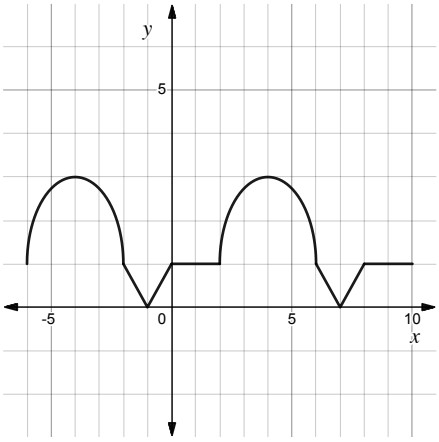


268. The graph shows two complete periods of a periodic function $y = f(x)$ whose domain is all real numbers.

a. What is the period of f ?

b. Find $f(56)$.

c. Does f have a positive, negative, or undefined slope at $x = 131$? Explain

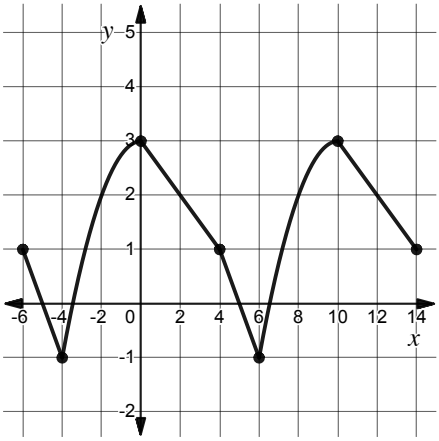


269. The graph shows two complete periods of a periodic function $y = f(x)$ whose domain is all real numbers.

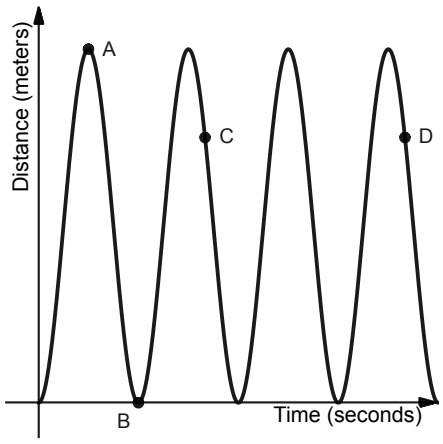
a. What is the period of f ?

b. Find $f(34)$.

c. Does f have a positive, negative, or undefined slope at $x = 102$? Explain.



270. Raghav runs laps around a track to train for an upcoming cross-country race. One lap of the track is 400 meters, and it takes Raghav about 75 seconds to complete half a lap. The graph models the distance Raghav is from his starting point, in meters, as a function of the number of seconds he has run.



a. Find the coordinates of Point A and interpret your answer in the context of this problem.

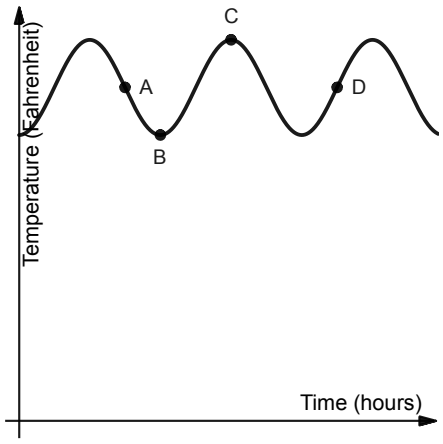
b. Find the coordinates of Point B and interpret your answer in the context of this problem.

c. At points C and D, Raghav is 150 meters from his starting point on the track. How many seconds have passed between Point C and Point D? Give a reason for your answer.

d. Approximate the next time after Raghav is at Point C that he is 150 meters from his starting point on the track.

e. Pratham says that since Raghav runs 400 meters every 150 seconds, he must be running at a constant rate. Do you agree or disagree? Explain.

271. Melanie checked the temperature for a 3-day weekend in Charlotte, NC. The weather report included the graph shown with a minimum starting temperature at 60 degrees Fahrenheit on Friday at 2 am. The report goes through Monday at 2 am and the maximum temperature during the 3-day weekend is 80 degrees Fahrenheit.



a. Find the coordinates of Point B and interpret your answer in the context of this problem.

b. Find the coordinates of Point C and interpret your answer in the context of this problem.

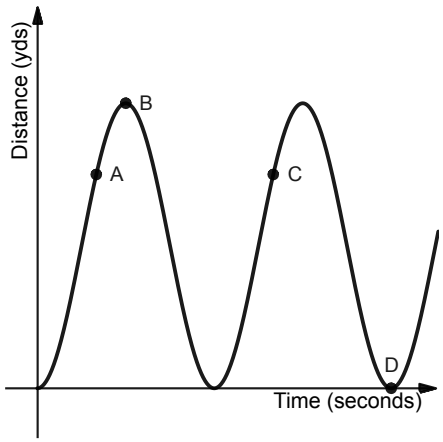
c. At points A and D, the temperature is 70 degrees Fahrenheit. How many hours have passed between Point A and Point D? Give a reason for your answer.

d. Approximate the next time after Point A that the temperature is 70 degrees Fahrenheit.

e. Peter says that since the temperature changes by 20 degrees every 12 hours, the temperature is changing at a constant rate. Do you agree or disagree? Explain.

272. Michael swims laps in the pool at the local recreational center. The pool is 25 yards long and it takes him about 21 seconds to get from one side to the other. This is considered one lap. The graph shows Michael's distance from the south end of the pool during his swim.

a. Find the coordinates of Point B and interpret your answer in the context of this problem.



b. Find the coordinates of Point D and interpret your answer in the context of this problem.

c. At points A and C, Michael is 18.75 yards away from the south end of the pool. How many seconds have passed between Point A and Point C? Give a reason for your answer.

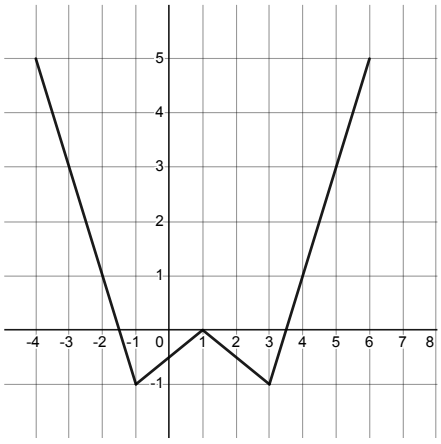
d. Approximate the next time after Michael is at Point A that he is 18.75 yards away from the south end of the pool.

e. Callie says that since Michael swims 25 yards every 21 seconds, he must be swimming at a constant rate. Do you agree or disagree? Explain.

273. One cycle of a periodic function, f, is shown.

a. Find $f(153)$.

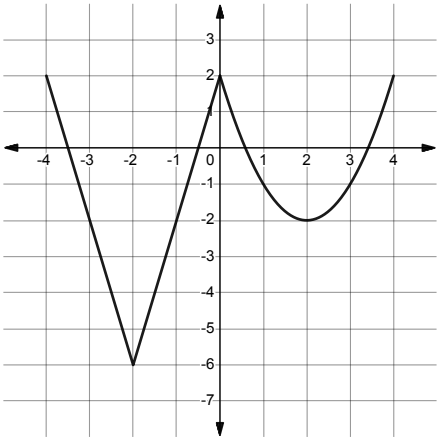
b. Is f increasing, decreasing, or neither at $x = 42$?



274. One cycle of a periodic function, f, is shown.

a. Find $f(156)$.

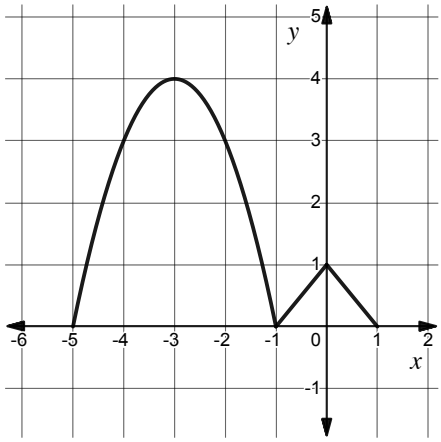
b. Is f concave up, concave down, or neither at $x = 66$?



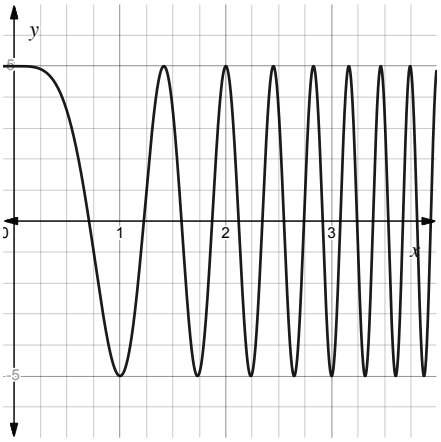
275. One cycle of a periodic function, f, is shown.

a. Find $f(160)$.

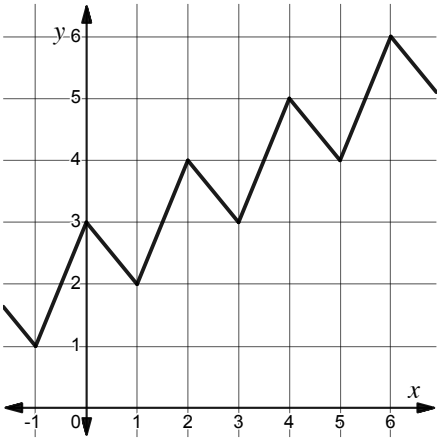
b. Is the rate of change of f positive, negative, zero, or undefined at $x = 45$?



276. Is the following graph periodic? Explain.



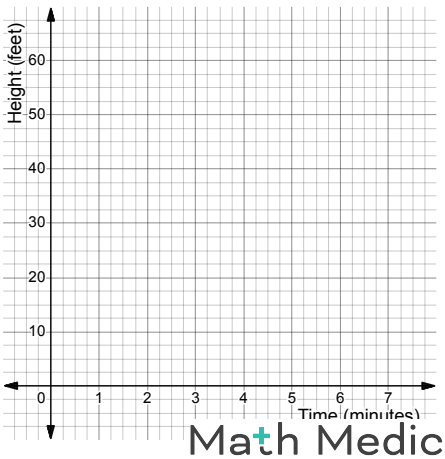
277. Is the following graph periodic? Explain.



278. Ranbir climbs into a car on a Ferris Wheel that has a diameter of 60 feet. The bottom car is 2 feet above the ground when he climbs in. The car travels in a circular motion up to the very top of the Ferris Wheel and back down repeatedly. Ranbir's car makes 12 full trips around the circle in 21 minutes.

a. Sketch a graph that gives the height of Ranbir's car above the ground over a 7-minute period.

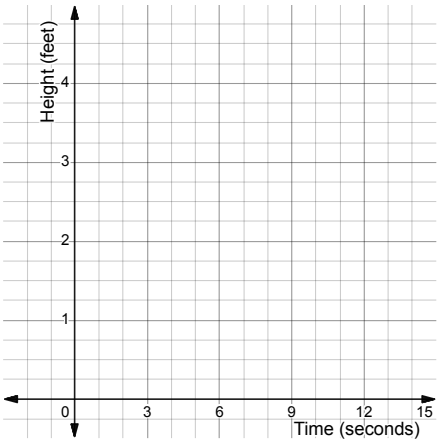
b. Identify the period of your graph. Interpret your answer in the context of this problem.



279. Shlok is holding a yo-yo in his hands 4 feet above the ground. When he releases the yo-yo, it takes 1.5 seconds for the bottom of the yo-yo to reach 6 inches above the ground. The yo-yo takes the same amount of time to return to Shlok's hand at the same position. Shlok immediately starts again and repeats the process for 15 seconds.

a. Sketch a graph that gives the height of the yo-yo above the ground over a 15 -second time interval.

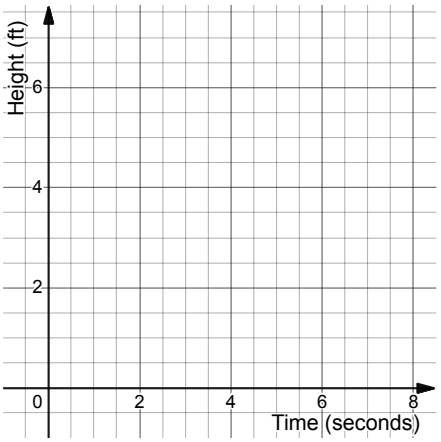
b. Identify the period of your graph. Interpret your answer in the context of this problem.



280. Kara is 5 feet and 9 inches tall. When she stands with her arms to her side, her fingertips are 3 feet and 3 inches from the ground. When her two hands meet above her head with straight arms, her fingertips are 1 foot above her head. Kara is doing jumping jacks. She starts each jumping jack with her arms flat against her sides. It takes Kara 30 seconds to do 20 jumping jacks.

a. Sketch a graph that gives the height of Kara's fingertips above the ground over an 8 -second time interval.

b. Identify the period of your graph. Interpret your answer in the context of this problem.



281. The periodic function f has a domain of all real numbers and a period of length 6. Two periods of f are shown in the graph.

a. Find $f(-25)$.

b. On which subintervals of $[-12, 12]$ is f decreasing?

c. Does f have a positive, negative, or zero slope at $x = 123$? Explain.