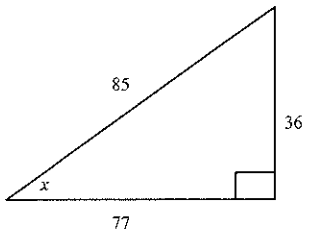
Name: _____ Class: _____ Date: _____ ID: A

Semester 2 Exam Review Questions: Ch 6 - Ch 9

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Solve for x in the given triangle to the nearest degree.



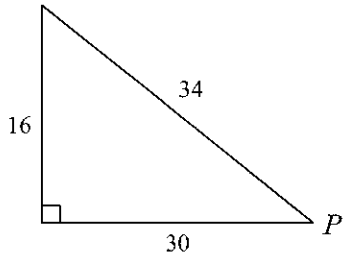
a. 25°
b. 35°
c. 65°
d. 42°

____ 2. A tree casts a shadow of 27 meters when the angle of elevation of the sun is 26°. Find the height of the tree to the nearest meter.
a. 24 m
b. 15 m
c. 320 m
d. 13 m

____ 3. Find cot θ if (8, 15) is a point on the terminal side of θ.
a. $\frac{15}{17}$
b. $\frac{8}{17}$
c. $\frac{8}{15}$
d. $\frac{15}{8}$

____ 4. Evaluate the expression $\cos\left(\frac{7}{4}\pi\right)$.
a. $\frac{\sqrt{2}}{2}$
b. $-\frac{\sqrt{2}}{2}$
c. 0
d. –1

____ 5. Find the trigonometric ratios for of csc P, sec P, cot P.



a. $\csc P = \frac{17}{8}$, $\sec P = \frac{17}{15}$, $\cot P = \frac{15}{8}$
b. 3
c. 5
d. 9

____ 6. What are all the exact t-values for which $\tan t = -\sqrt{3}$?

a. $\frac{\pi}{3} - n\pi$

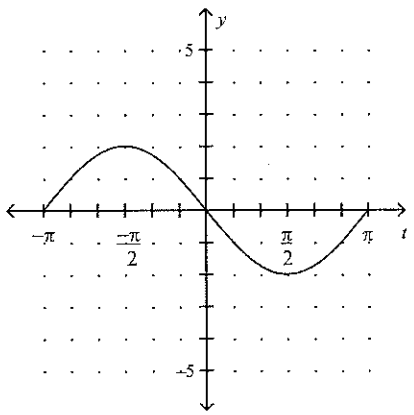
b. $-\frac{\pi}{3} + n\pi$

c. $\frac{\pi}{5} - n\pi$

d. $-\frac{\pi}{5} + n\pi$

____ 7. Which is the graph of $f(t) = -2 \tan t$?

a.



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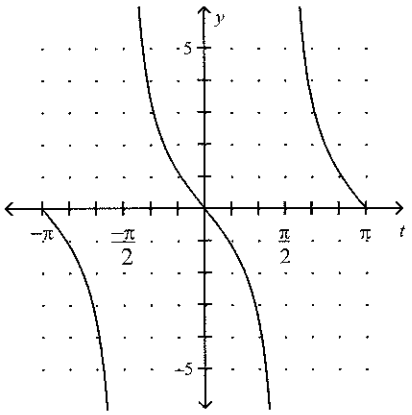

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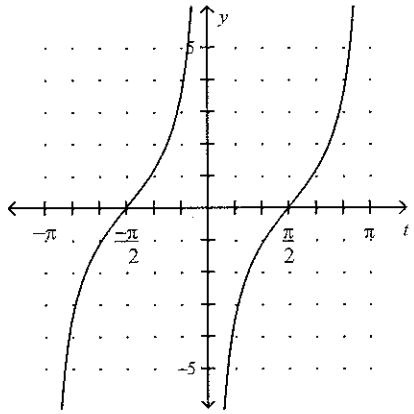
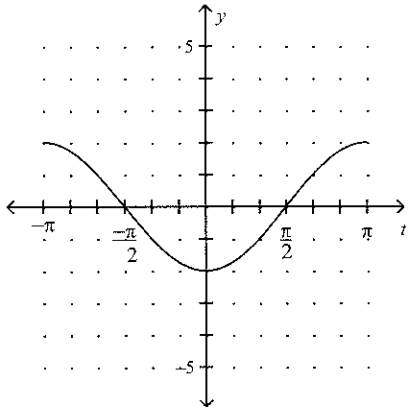
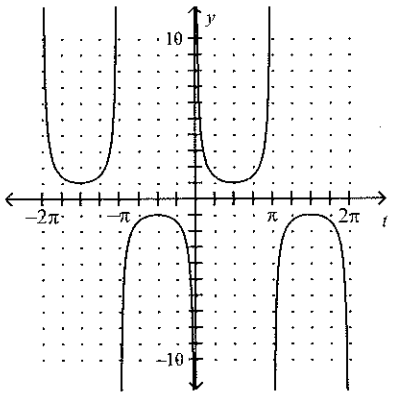


d.

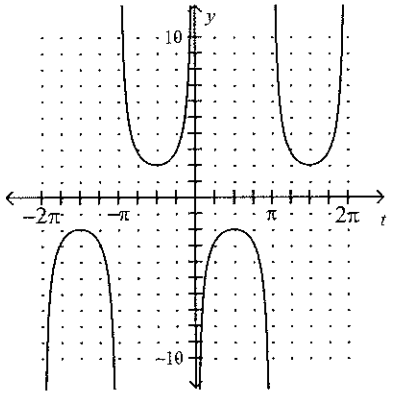


____ 8. Which is the graph of $f(t) = \csc t$?

a.



c.



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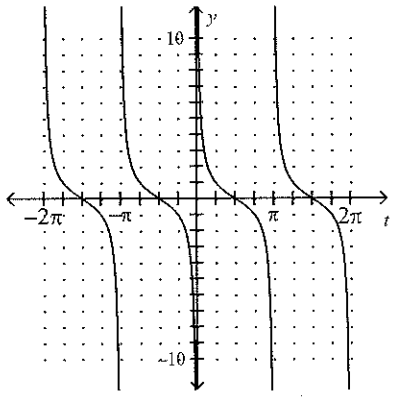
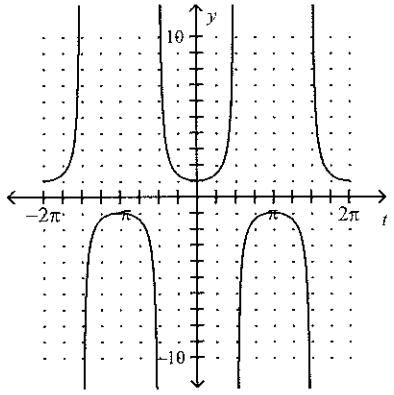
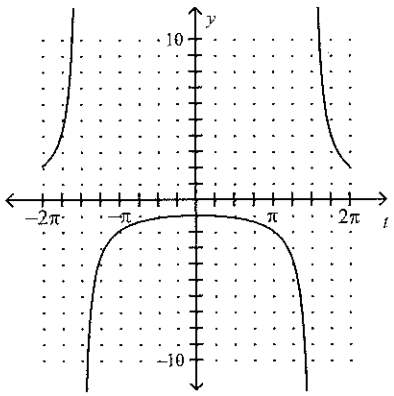


d.

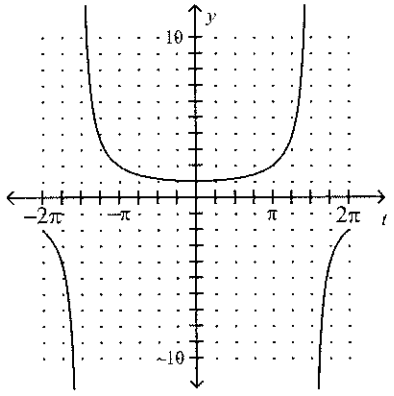


____ 9. Which is the graph of the function $f(t) = -\sec\left(\frac{1}{3}t\right)$?

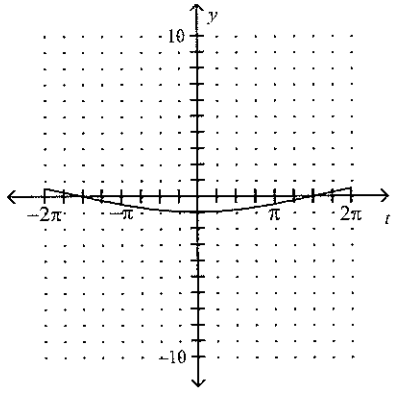
a.



c.



b.



d. None of these

____ 10. Which is the rule of a function g whose graph is the graph of $f(t) = \sec t$ compressed vertically by a factor of $\frac{1}{4}$ and shifted 8 units to the right and down 8 units.

a. $g(t) = \frac{1}{4}\sec(t-8)+8$

b. $g(t) = \frac{1}{4}\sec(t-8)-8$

c. $g(t) = 4\sec(t-8)+8$

d. $g(t) = 4\sec(t-8)-8$

____ 11. A water wave is created in a wave tank. It has an amplitude of 3 and a period of $\frac{4\pi}{5}$. Find the equation of this wave as a sine function.

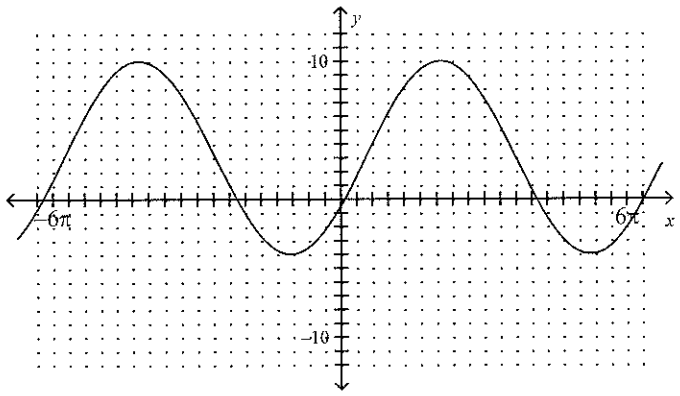
a. $f(t) = 3\sin\frac{5t}{2}$

b. $f(t) = \frac{5}{2}\sin 3t$

c. $f(t) = \frac{4\pi}{5}\sin\frac{t}{3}$

d. $f(t) = 3\sin\frac{4\pi t}{5}$

____ 12. What is the rule of a function of the form $f(t) = a\sin(bt+c)+d$ whose graph appears to be identical to the given graph?



a. $7\sin\left(\frac{1}{3}t-\frac{\pi}{6}\right)+3$

b. $-7\sin\left(\frac{1}{3}t-\frac{\pi}{6}\right)-3$

c. $7\sin\left(\frac{1}{3}t+\frac{\pi}{6}\right)-3$

d. $7\sin\left(3t-\frac{\pi}{6}\right)+3$

____ 13. Find the exact functional value without using a calculator.

$\sin^{-1}(\sin\frac{2}{3}\pi)$

a. $-\frac{2}{3}\pi$

b. $\frac{1}{3}\pi$

c. $-\frac{1}{3}\pi$

d. $-\frac{3}{2}\pi$

____ 14. Which is $\cos\left(2\cos^{-1}v\right)$ written as an algebraic expression in v?

a. $\frac{4}{v}$

b. $4-v$

c. $2v^2-1$

d. $4+v$

____ 15. Find all solutions of $\sin 2x - \frac{\sqrt{3}}{2} = 0$.

a. $\frac{1}{6}\pi + 2k\pi, \frac{1}{6}\pi + 2k\pi$

b. $\frac{1}{6}\pi + k\pi, \frac{1}{3}\pi + k\pi$

c. $\pm\frac{1}{6}\pi + k\pi$

d. $\frac{1}{6}\pi + k\pi, \frac{1}{6}\pi + k\pi$

____ 16. Use factoring, the quadratic formula, or identities to solve $3\sin x + 3 = 2\cos^2 x$. Find all solutions on the interval $[0, 2\pi)$.

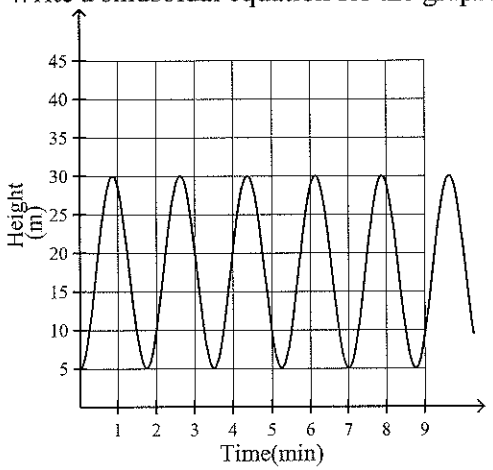
a. $x = \frac{7}{6}\pi, x = \frac{11}{6}\pi, x = \frac{3}{2}\pi$

b. $x = \frac{6}{7}\pi, x = \frac{11}{6}\pi, x = \frac{1}{3}\pi$

c. $x = \frac{6}{7}\pi, x = \frac{13}{6}\pi, x = \frac{3}{2}\pi$

d. $x = \frac{7}{6}\pi, x = \frac{11}{6}\pi, x = \frac{1}{3}\pi$

____ 17. A number of real-life situations occur in cycles. These situations can be modeled with trigonometric functions. For example, the graph below shows height as a function of time for a ride on a ferris wheel. Write a sinusoidal equation for the graph.



a. $y = \frac{25}{2}\sin(\frac{8}{7}\pi x - \frac{\pi}{2}) + 17.5$

b. $y = \frac{25}{2}\cos(\frac{8}{7}\pi x - \frac{\pi}{2}) + 17.5$

c. $y = \frac{25}{2}\sin(\frac{8}{7}\pi x + \frac{\pi}{2}) + 19.5$

d. $y = \frac{25}{2}\sin(\frac{8}{7}\pi x + \frac{\pi}{2}) + 17.5$

____ 18. Which identities could be used to prove $-\sin(x + 2\pi) = \sin(-x)$?

a. reciprocal and negative angle identities

b. periodicity and reciprocal identities

c. Pythagorean and negative angle identities

d. periodicity and negative angle identities

____ 19. What is the simplified form of $\sin(x + 2\pi)$?

a. $\sin x$

b. $-\sin x$

c. $\cos x$

d. $-\cos x$

____ 20. Find the exact value of $\cos\left(\frac{-5\pi}{12}\right)$.

a. $6 + \sqrt{2}$

b. $\frac{2 + \sqrt{6}}{2}$

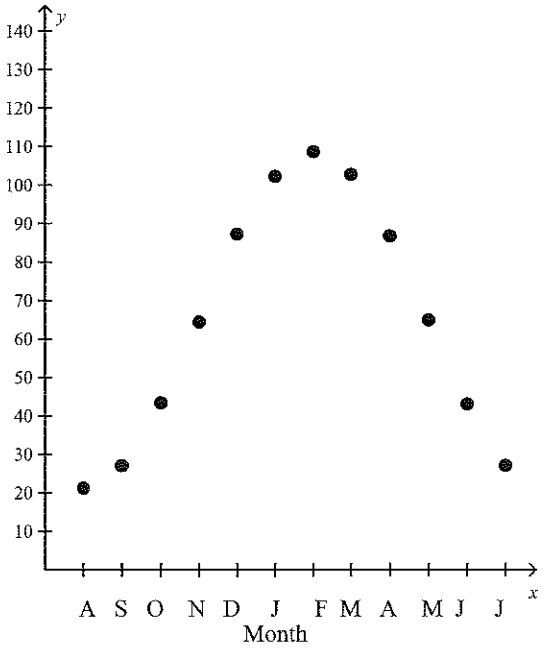
c. $-2 - \sqrt{6}$

d. $\frac{\sqrt{6} - \sqrt{2}}{4}$

____ 21. The data below represents the average monthly cost of natural gas in an Oregon home.

Month	Aug	Sep	Oct	Nov	Dec	Jan
Temp(°F)	21.2	27.05	43.35	64.4	87.25	102.25

Month	Feb	Mar	Apr	May	Jun	Jul
Temp(°F)	108.6	102.75	86.75	64.9	43.05	27.05



Which sine function best describes the data?

a. $f(x) = 43.7 \sin\left(\frac{\pi}{6}x - \frac{2\pi}{3}\right) + 64.9$

c. $f(x) = 43.7 \sin\left(\frac{\pi}{6}x + \frac{2\pi}{3}\right) + 64.9$

b. $f(x) = 43.7 \sin\left(\frac{\pi}{6}x - \frac{2\pi}{3}\right) + 129.8$

d. $f(x) = 43.7 \sin\left(\frac{\pi}{6}x - \frac{2\pi}{3}\right) - 64.9$

____ 22. What is the simplified form of $\cot^2\left(\frac{\pi}{2} - x\right) + 1$?

a. $\csc^2 x$

c. $\sec^2 x$

b. $\tan^2 x$

d. $-\tan^2 x$

____ 23. Find all solutions of the equation on the interval $[0, 2\pi)$.

$\tan^2 x = -\frac{\sqrt{3}}{6}\sec x$

a. $\frac{5\pi}{6}, \frac{7\pi}{6}$

c. $\frac{\pi}{6}, \frac{5\pi}{6}$

b. $\frac{\pi}{7}, \frac{8\pi}{7}$

d. None of these

____ 24. Find all solutions of the equation on the interval $[0, 2\pi)$.

$2\tan^2 2x = 3\sec 2x$

a. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$

c. $\pi, \frac{5\pi}{2}, \frac{7\pi}{2}, \frac{11\pi}{2}$

b. $\pi, \frac{\pi}{5}, \frac{7\pi}{5}, \frac{11\pi}{5}$

d. $\frac{\pi}{7}, \frac{5\pi}{6}$

____ 25. Find all solutions of the equation on the interval $[0, 2\pi)$.

$3\sin 2x - (3/2)\sqrt{3} = 0$

a. $\pi, \frac{\pi}{8}, \frac{5\pi}{8}, \frac{7\pi}{8}$

c. $\pi, \frac{\pi}{2}, \frac{5\pi}{2}, \frac{7\pi}{3}$

b. $\frac{\pi}{6}, \frac{\pi}{3}, \frac{7\pi}{6}, \frac{4\pi}{3}$

d. $\frac{\pi}{11}, \frac{\pi}{3}$

____ 26. Find all solutions of the equation on the interval $[0, 2\pi)$.

$2\sec^2\frac{x}{2} - 3\sec\frac{x}{2} - 2 = 0$

a. $\frac{11}{15}\pi$

c. $\frac{2}{3}\pi$

b. $\frac{2}{11}\pi$

d. $\frac{7}{2}\pi$

____ 27. Solve $\cos 2x + 5\sin x = -2$ on the interval $[-\pi, \pi]$.

a. $x = -\frac{\pi}{6}, -\frac{5\pi}{6}$

c. $x = -\frac{\pi}{6}, -\frac{5\pi}{6}, \frac{\pi}{3}, \frac{2\pi}{3}$

b. $x = \frac{\pi}{6}, \frac{5\pi}{6}$

d. $x = \frac{\pi}{3}, \frac{2\pi}{3}$

____ 28. A weight attached to the end of a spring is pulled down 6 centimeters. It takes 9 seconds for it to complete one cycle of moving from its equilibrium position to 6 centimeters below, then rising to 6 centimeters above, and then finally returning to equilibrium. (This is assuming a spring with perfect elasticity and ignoring all other forces.)
a. Find a sinusoidal function to represent the motion of the moving spring.
b. Use the function from part (a) to predict the position of the weight after 11 seconds.

a. $h(t) = 9\sin\frac{2\pi}{9}t, \approx 5.9$ cm

c. $h(t) = 6\sin\frac{2\pi}{9}t, \approx 5.9$ cm

b. $h(t) = 6\sin\frac{2\pi}{9}t, \approx -6.9$ cm

d. $h(t) = 9\sin\frac{2\pi}{9}t, \approx -27.6$ cm

Short Answer

29. Find one positive angle and one negative angle that are coterminal with an angle of $-328°$ in standard position.

30. Find the degree of the angle in standard position formed by rotating the terminal side by $\frac{22}{45}$ of a circle.

31. Convert $\frac{23}{10}\pi$ to degrees.

32. Find the exact value of $\cos\frac{\pi}{6} + \sin\frac{\pi}{3}$. Do not use a calculator.

33. Simplify the expression $\frac{9 + 7\cos\theta}{\sin\theta} + \frac{7\sin\theta}{1 + \cos\theta}$.

34. Express $\cos\theta\csc\theta$ in terms of $\tan\theta$.

35. Find all the exact t-values for which $\cos t = \frac{\sqrt{2}}{2}$.

36. For what values of t on the interval $[0, 2\pi]$ is $\sin t = \frac{\sqrt{3}}{2}$?

37. Sketch a graph of $f(t) = -9\sin t + 1$.

38. List the transformations that change the graph of $f(t) = \sin t$ into the graph of $g(t) = -9\sin t - 2$.

39. Graph the function $f(t) = -3\cot t$.

40. For the function $f(x) = -\frac{1}{2}\cos(3t + 3\pi) - 3$, identify:

    a. the amplitude.
    b. the period.
    c. the phase shift.
    d. the vertical shift.

41. Write a sine function with the given amplitude, period, phase shift, and vertical shift.

    amplitude: 2; period: π; phase shift: $-\frac{1}{8}\pi$; vertical shift: 3

42. Find the exact functional value without using a calculator.

    $\tan\left(\sin^{-1}\frac{\sqrt{2}}{2}\right)$

43. Use factoring, the quadratic formula, or identities to solve $2\cot^2 x - 3\csc x = 0$. Find all solutions on the interval $[0, 2\pi)$.

44. Use factoring, the quadratic formula, or identities to solve $2\sin x\cos x + \cos x = 0$. Find all solutions on the interval $[0, 2\pi)$.

45. Prove the identity.
    $\cos x\cot x + \sin x = \csc x$

46. Prove the identity.
    $\csc 2x - \cot 2x = \tan x$

47. Prove the identity.
    $\frac{-6 - 6\sin x}{5\cos x} = \frac{-6\cos x}{5(1 - \sin x)}$

48. Prove the identity $\sin(x + \pi) = -\sin x$.

49. Simplify:
    $\sin 4\cos 5 + \cos 4\sin 5$

50. Prove $\csc x = \sec\left(\frac{\pi}{2} - x\right)$. You may use previously proved cofunction identities.

51. Find all solutions of the equation on the interval $[0, 2\pi)$.
    $-\sqrt{3}\cos x + \sin x = -\sqrt{3}$

52. Find all solutions of the equation on the interval $[0, 2\pi)$.
    $2\sin x\cos x + \cos x = 0$

Semester 2 Exam Review Questions: Ch 6 - Ch 9
Answer Section

MULTIPLE CHOICE

1. ANS: A PTS: 1 OBJ: 6.2.1 Solve triangles using trigonometric ratios.
2. ANS: D PTS: 1 OBJ: 6.2.2 Solve applications using triangles.
3. ANS: C PTS: 1
   OBJ: 6.4.1 Define the trigonometric ratios in the coordinate plane.
4. ANS: A PTS: 1
   OBJ: 6.4.2 Define the trigonometric functions in terms of the unit circle.
5. ANS: A PTS: 1
   OBJ: 6.1.2 Evaluate trigonometric ratios, using triangles and on a calculator.
6. ANS: B PTS: 1
   OBJ: 7.1.2 State all values in the domain of a basic trigonometric function that correspond to a given value of the range.
7. ANS: C PTS: 1
   OBJ: 7.1.3 Graph transformations of the sine, cosine, and tangent graphs.
8. ANS: A PTS: 1
   OBJ: 7.2.1 Graph the cosecant, secant, and cotangent functions.
9. ANS: A PTS: 1
   OBJ: 7.2.2 Graph transformations of the cosecant, secant, and cotangent graphs.
10. ANS: B PTS: 1
    OBJ: 7.2.2 Graph transformations of the cosecant, secant, and cotangent graphs.
11. ANS: A PTS: 1
    OBJ: 7.3.1 State the period and amplitude (if any) given the function rule or the graph of a sine, cosine, or tangent function.
12. ANS: A PTS: 1
    OBJ: 7.4.1 State the period, amplitude, vertical shift, and phase shift given the function rule or graph of a sine or cosine function.
13. ANS: B PTS: 1 OBJ: 8.2.2 Use inverse trigonometric function notation.
14. ANS: C PTS: 1 OBJ: 8.2.2 Use inverse trigonometric function notation.
15. ANS: B PTS: 1 OBJ: 8.3.1 Solve trigonometric equations algebraically.
16. ANS: A PTS: 1 OBJ: 8.3.1 Solve trigonometric equations algebraically.
17. ANS: A PTS: 1
    OBJ: 8.4.1 Write a sinusoidal function whose graph resembles a given graph.
18. ANS: D PTS: 1 OBJ: 9.1.2 Apply strategies to prove identities.
19. ANS: A PTS: 1
    OBJ: 9.2.1 Use the addition and subtraction identities for sine, cosine, and tangent functions.
20. ANS: D PTS: 1
    OBJ: 9.2.1 Use the addition and subtraction identities for sine, cosine, and tangent functions.
21. ANS: A PTS: 1
    OBJ: 8.4.3 Find a sinusoidal model for a set of data, and use the model to make predictions.
22. ANS: C PTS: 1 OBJ: 9.2.2 Use the cofunction identities.
23. ANS: A PTS: 1 OBJ: 9.4.1 Use identities to solve trigonometric equations.
24. ANS: A PTS: 1 OBJ: 9.4.1 Use identities to solve trigonometric equations.
25. ANS: B PTS: 1 OBJ: 9.4.1 Use identities to solve trigonometric equations.
26. ANS: C PTS: 1 OBJ: 9.4.1 Use identities to solve trigonometric equations.
27. ANS: A PTS: 1 OBJ: 9.4.1 Use identities to solve trigonometric equations.

28. ANS: C PTS: 1
OBJ: 8.4.2 Write a sinusoidal function to represent a given simple harmonic motion, and use the function to solve problems.

SHORT ANSWER

29. ANS:
Positive coterminal angle: 32°
Negative coterminal angle: −688°

PTS: 1
OBJ: 6.3.1 Use a rotating ray to extend the definition of angle measure to negative angles and angles greater than 180°.

30. ANS:
176°

PTS: 1
OBJ: 6.3.1 Use a rotating ray to extend the definition of angle measure to negative angles and angles greater than 180°.

31. ANS:
414°

PTS: 1
OBJ: 6.3.2 Define radian measure and convert angle measures between degrees and radians.

32. ANS:
$\frac{2\sqrt{3}}{2}$

PTS: 1 OBJ: 6.4.2 Define the trigonometric functions in terms of the unit circle.

33. ANS:
$\frac{16}{\sin\theta}$

PTS: 1 OBJ: 6.5.1 Develop basic trigonometric identities.

34. ANS:
$\cos\theta \csc\theta = \frac{1}{\tan\theta}$

PTS: 1 OBJ: 6.5.1 Develop basic trigonometric identities.

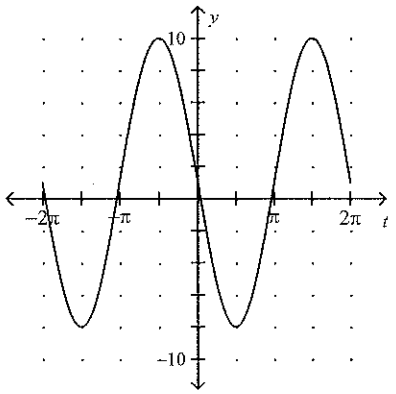
35. ANS:
$\pm\frac{\pi}{4} + n\pi$, n is an integer

PTS: 1
OBJ: 7.1.2 State all values in the domain of a basic trigonometric function that correspond to a given value of the range.

36. ANS:
$\frac{\pi}{3}, \frac{2\pi}{3}$

PTS: 1
OBJ: 7.1.2 State all values in the domain of a basic trigonometric function that correspond to a given value of the range.

37. ANS:

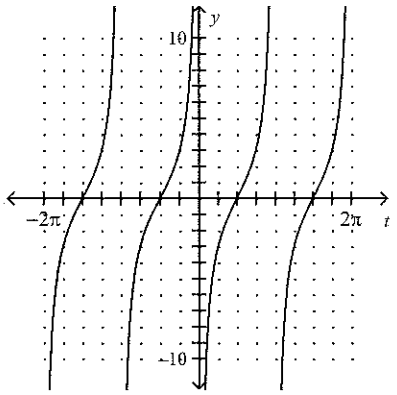


PTS: 1 OBJ: 7.1.3 Graph transformations of the sine, cosine, and tangent graphs.

38. ANS:
Reflect the graph of f across the x-axis and stretch vertically by a factor of 9, then shift the resulting graph vertically 2 units downwards.

PTS: 1 OBJ: 7.1.3 Graph transformations of the sine, cosine, and tangent graphs.

39. ANS:



PTS: 1 OBJ: 7.2.2 Graph transformations of the cosecant, secant, and cotangent graphs.

40. ANS:

a. amplitude: $\frac{1}{2}$; period: $\frac{2}{3}\pi$; phase shift: π; vertical shift: -3

PTS: 1
OBJ: 7.4.1 State the period, amplitude, vertical shift, and phase shift given the function rule or graph of a sine or cosine function.

41. ANS:

$f(x) = \pm 2\sin\left(2t + \frac{1}{4}\pi\right) + 3$

PTS: 1
OBJ: 7.4.1 State the period, amplitude, vertical shift, and phase shift given the function rule or graph of a sine or cosine function.

42. ANS:

1

PTS: 1 OBJ: 8.2.2 Use inverse trigonometric function notation.

43. ANS:

$x = \frac{1}{6}\pi, \frac{5}{6}\pi$

PTS: 1 OBJ: 8.3.1 Solve trigonometric equations algebraically.

44. ANS:

$\frac{1}{2}\pi, \frac{7}{6}\pi, \frac{3}{2}\pi, \frac{11}{6}\pi$

PTS: 1 OBJ: 8.3.1 Solve trigonometric equations algebraically.

45. ANS:

Rewrite $\cos x \cot x + \sin x = \csc x$ as $\cos x \frac{\cos x}{\sin x} + \sin x = \frac{1}{\sin x}$.

Then multiply by $\sin x$ to get the identity $\cos^2 x + \sin^2 x = 1$.

PTS: 1 OBJ: 9.1.2 Apply strategies to prove identities.

46. ANS:

$\csc 2x - \cot 2x = \frac{1}{\sin 2x} - \frac{\cos 2x}{\sin 2x} = \frac{2\sin^2 x}{(2\sin x)(\cos x)} = \frac{\sin x}{\cos x} = \tan x$

PTS: 1 OBJ: 9.1.2 Apply strategies to prove identities.

47. ANS:

$\frac{-6 - 6\sin x}{5\cos x} = \frac{-6 - 6\sin x}{5\cos x} \cdot \frac{1 - \sin x}{1 - \sin x}$

$\frac{-6 - 6\sin x}{5\cos x} \cdot \frac{1 - \sin x}{1 - \sin x} = \frac{-6 + 6\sin^2 x}{5\cos x(1 - \sin x)}$

$\frac{-6 + 6\sin^2 x}{5\cos x(1 - \sin x)} = \frac{-6\cos^2 x}{5\cos x(1 - \sin x)}$

$\frac{-6\cos^2 x}{5\cos x(1 - \sin x)} = \frac{-6\cos x}{5(1 - \sin x)}$

PTS: 1 OBJ: 9.1.2 Apply strategies to prove identities.

48. ANS:

$\sin(x + \pi) = \sin x \cos \pi + \cos x \sin \pi = \sin x \cdot (-1) + \cos x \cdot (0) = -\sin x$

PTS: 1
OBJ: 9.2.1 Use the addition and subtraction identities for sine, cosine, and tangent functions.

49. ANS:
$\sin 9$

PTS: 1
OBJ: 9.2.1 Use the addition and subtraction identities for sine, cosine, and tangent functions.

50. ANS:
$\sec\left(\frac{\pi}{2}-x\right)=\frac{1}{\cos\left(\frac{\pi}{2}-x\right)}=\frac{1}{\sin x}=\csc x$

PTS: 1 OBJ: 9.2.2 Use the cofunction identities.

51. ANS:
$x=0,\ x=\frac{5}{3}\pi$

PTS: 1 OBJ: 9.4.1 Use identities to solve trigonometric equations.

52. ANS:
$\frac{\pi}{2}, \frac{7\pi}{6}, \frac{3}{2}\pi, \frac{11}{6}\pi$

PTS: 1 OBJ: 9.4.1 Use identities to solve trigonometric equations.