

Study Guide and Review - Chapter 12

State whether each sentence is *true* or *false*. If *false*, replace the underlined term to make a true sentence.

1. The Law of Cosines is used to solve a triangle when two angles and any sides are known.

ANSWER:

false, Law of Sines

2. An angle on the coordinate plane is in standard position if the vertex is at the origin and one ray is on the positive x -axis.

ANSWER:

true

3. Coterminal angles are angles in standard position that have the same terminal side.

ANSWER:

true

4. A horizontal translation of a periodic function is called a phase shift.

ANSWER:

true

5. The inverse of the sine function is the cosecant function.

ANSWER:

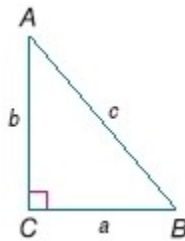
false, arcsine function

6. The cycle of the graph of a sine or cosine function equals half the difference between the maximum and minimum values of the function.

ANSWER:

false, amplitude

Solve $\triangle ABC$ by using the given measurements. Round measures of sides to the nearest tenth and measures of angles to the nearest degree.



7. $c = 12, b = 5$

ANSWER:

$a = 10.9; A = 65^\circ; B = 25^\circ$

8. $a = 10, B = 55^\circ$

ANSWER:

$A = 35^\circ; c = 17.4; b = 14.3$

9. $B = 75^\circ, b = 15$

ANSWER:

$A = 15^\circ; a = 4.0; c = 15.5$

10. $B = 45^\circ, c = 16$

ANSWER:

$a = 11.3; b = 11.3; A = 45^\circ$

11. $A = 35^\circ, c = 22$

ANSWER:

$B = 55^\circ; a = 12.6; b = 18.0$

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12. $\sin A = \frac{2}{3}$, $a = 6$

ANSWER:

$$A = 42^\circ; B = 48^\circ; b = 6.7; c = 9.0$$

13. **TRUCK** The back of a moving truck is 3 feet off of the ground. What length does a ramp off the back of the truck need to be in order for the angle of elevation of the ramp to be 20° ?

ANSWER:

about 8.8 ft

Rewrite each degree measure in radians and each radian measure in degrees.

14. 215°

ANSWER:

$$\frac{43\pi}{36}$$

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

ANSWER:

$$450^\circ$$

16. -3π

ANSWER:

$$-540^\circ$$

17. -315°

ANSWER:

$$-\frac{7\pi}{4}$$

Find one angle with positive measure and one angle with negative measure coterminal with each angle.

18. 265°

ANSWER:

$$625^\circ, -95^\circ$$

19. -65°

ANSWER:

$$295^\circ, -425^\circ$$

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

ANSWER:

$$\frac{11\pi}{2}, -\frac{\pi}{2}$$

21. **BICYCLE** A bicycle tire makes 8 revolutions in one minute. The tire has a radius of 15 inches. Find the angle θ in radians through which the tire rotates in one second.



ANSWER:

$$\frac{4\pi}{15}$$

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Find the exact value of each trigonometric function.

22. $\cos 135^\circ$

ANSWER:

$$-\frac{\sqrt{2}}{2}$$

23. $\tan 150^\circ$

ANSWER:

$$-\frac{\sqrt{3}}{3}$$

24. $\sin 2\pi$

ANSWER:

0

25. $\cos \frac{3\pi}{2}$

ANSWER:

0

The terminal side of θ in standard position contains each point. Find the exact values of the six trigonometric functions of θ .

26. $P(-4, 3)$

ANSWER:

$$\sin \theta = \frac{3}{5}, \cos \theta = -\frac{4}{5},$$

$$\tan \theta = -\frac{3}{4}, \csc \theta = \frac{5}{3},$$

$$\sec \theta = -\frac{5}{4}, \cot \theta = -\frac{4}{3}$$

27. $P(5, 12)$

ANSWER:

$$\sin \theta = \frac{12}{13}, \cos \theta = \frac{5}{13},$$

$$\tan \theta = \frac{12}{5}, \csc \theta = \frac{13}{12},$$

$$\sec \theta = \frac{13}{5}, \cot \theta = \frac{5}{12}$$

28. $P(16, -12)$

ANSWER:

$$\sin \theta = -\frac{3}{5}, \cos \theta = \frac{4}{5},$$

$$\tan \theta = -\frac{3}{4}, \csc \theta = -\frac{5}{3},$$

$$\sec \theta = \frac{5}{4}, \cot \theta = -\frac{4}{3}$$

29. **BALL** A ball is thrown off the edge of a building at an angle of 70° and with an initial velocity of 5 meters per second. The equation that represents the horizontal distance of the ball x is $x = v_0(\cos \theta)t$,

where v_0 is the initial velocity, θ is the angle at which it is thrown, and t is the time in seconds. About how far will the ball travel in 10 seconds?

ANSWER:

about 17.1 meters

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Determine whether each triangle has *no* solution, *one* solution, or *two* solutions. Then solve each triangle. Round measures of sides to the nearest tenth and measures of angles to the nearest degree.

30. $C = 118^\circ$, $c = 10$, $a = 4$

ANSWER:

one solution; $A \approx 21^\circ$, $B \approx 41^\circ$, $b \approx 7.4$

31. $A = 25^\circ$, $a = 15$, $c = 18$

ANSWER:

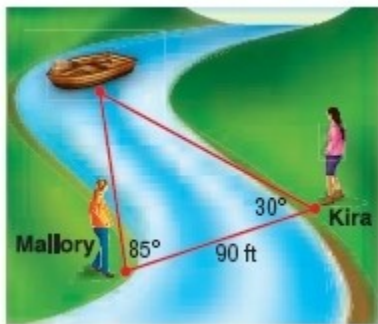
two solutions; First solution: $C = 30^\circ$, $B = 125^\circ$, $b = 29.1$; second solution: $C = 150^\circ$, $B = 5^\circ$, $b = 3.1$

32. $A = 70^\circ$, $a = 5$, $c = 16$

ANSWER:

no solution

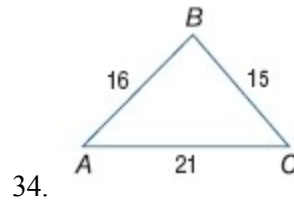
33. **BOAT** Kira and Mallory are standing on opposite sides of a river. How far is Kira from the boat? Round to the nearest tenth if necessary.



ANSWER:

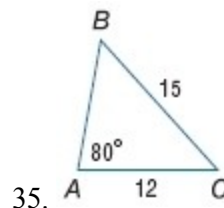
98.9 ft

Determine whether each triangle should be solved by beginning with the Law of *Sines* or Law of *Cosines*. Then solve each triangle. Round measures of sides to the nearest tenth and measures of angles to the nearest degree.



ANSWER:

Law of Cosines; $A \approx 46^\circ$, $B \approx 85^\circ$, $C \approx 49^\circ$



ANSWER:

Law of Sines; $B \approx 52^\circ$, $C \approx 48^\circ$, $c \approx 11.3$

36. $C = 75^\circ$, $a = 5$, $b = 7$

ANSWER:

Law of Cosines; $A = 40^\circ$, $B = 65^\circ$, $c = 7.5$

37. $A = 42^\circ$, $a = 9$, $b = 13$

ANSWER:

Law of Sines;

$B \approx 75^\circ$, $C \approx 63^\circ$, $c \approx 12.0$ or $B \approx 105^\circ$, $C \approx 33^\circ$, $c \approx 7.3$

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38. $b = 8.2, c = 15.4, A = 35^\circ$

ANSWER:

Law of Cosines; $a \approx 9.9, B \approx 28^\circ, C \approx 117^\circ$

39. **FARMING** A farmer wants to fence a piece of his land. Two sides of the triangular field have lengths of 120 feet and 325 feet. The measure of the angle between those sides is 70° . How much fencing will the farmer need?

ANSWER:

about 750.5 ft

Find the exact value of each function.

40. $\cos(-210^\circ)$

ANSWER:

$$-\frac{\sqrt{3}}{2}$$

41. $(\cos 45^\circ)(\cos 210^\circ)$

ANSWER:

$$-\frac{\sqrt{6}}{4}$$

42. $\sin -\frac{7\pi}{4}$

ANSWER:

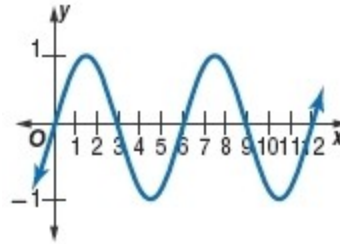
$$\frac{\sqrt{2}}{2}$$

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

ANSWER:

0

44. Determine the period of the function.



ANSWER:

6

45. A wheel with a diameter of 18 inches completes 4 revolutions in 1 minute. What is the period of the function that describes the height of one spot on the outside edge of the wheel as a function of time?

ANSWER:

15 seconds

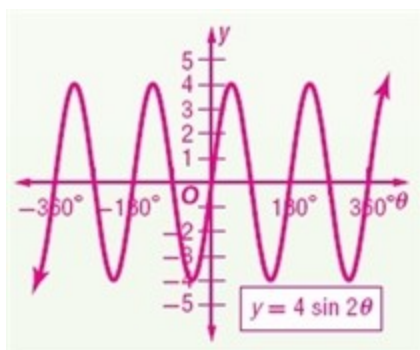
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Find the amplitude, if it exists, and period of each function. Then graph the function.

46. $y = 4 \sin 2\theta$

ANSWER:

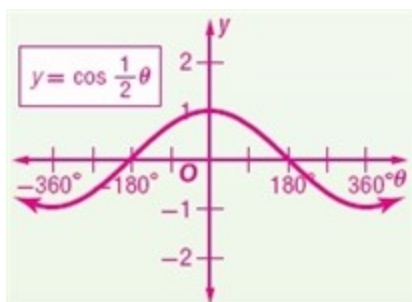
amplitude: 4, period: 180°



47. $y = \cos \frac{1}{2}\theta$

ANSWER:

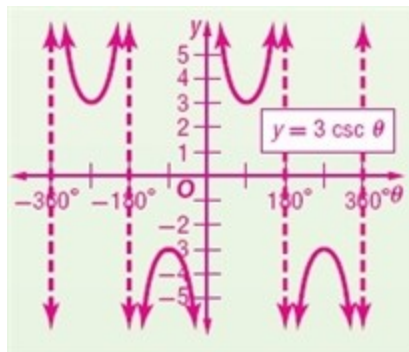
amplitude: 1, period: 720°



48. $y = 3 \csc \theta$

ANSWER:

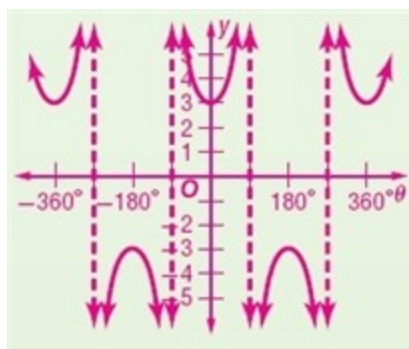
amplitude: not defined, period: 360°



49. $y = 3 \sec \theta$

ANSWER:

amplitude: not defined, period: 360°

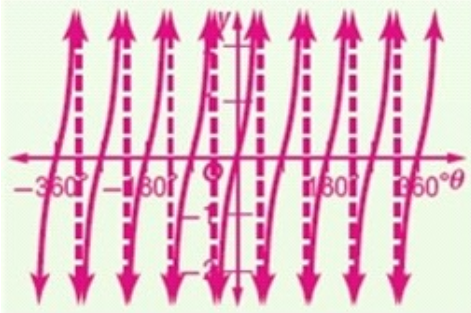


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50. $y = \tan 2\theta$

ANSWER:

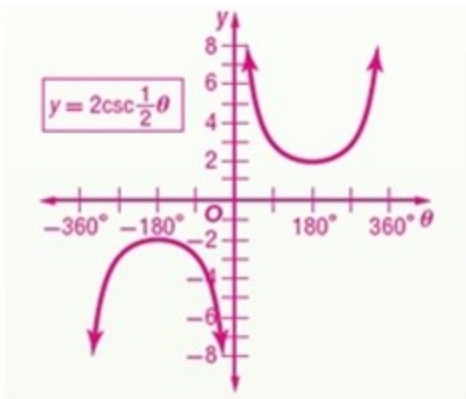
amplitude: not defined, period: 90°



51. $y = 2 \csc \frac{1}{2}\theta$

ANSWER:

amplitude: not defined, period: 720°



52. When Lauren jumps on a trampoline it vibrates with a frequency of 10 hertz. Let the amplitude equal 5 feet. Write a sine equation to represent the vibration of the trampoline y as a function of time t .

ANSWER:

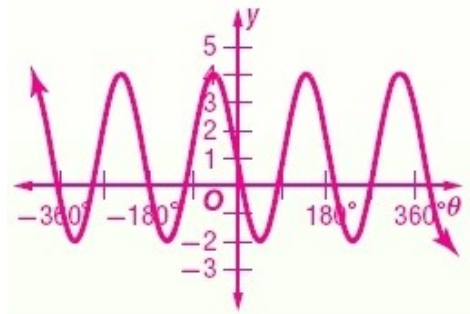
$y = 5 \sin 20 \pi t$

State the vertical shift, amplitude, period, and phase shift of each function. Then graph the function.

53. $y = 3 \sin [2(\theta - 90^\circ)] + 1$

ANSWER:

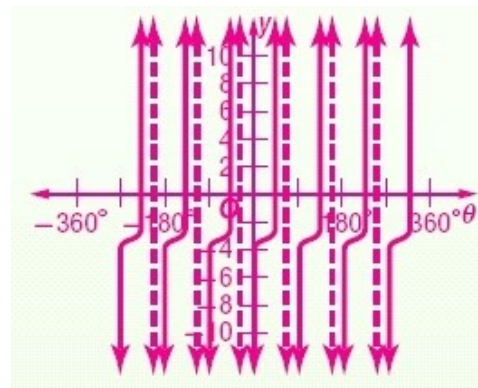
vertical shift: up 1 amplitude: 3 period: 180° phase shift: 90° right



54. $y = \frac{1}{2} \tan [2(\theta - 30^\circ)] - 3$

ANSWER:

vertical shift: down 3, amplitude: undefined, period: 90° , phase shift: 30° right



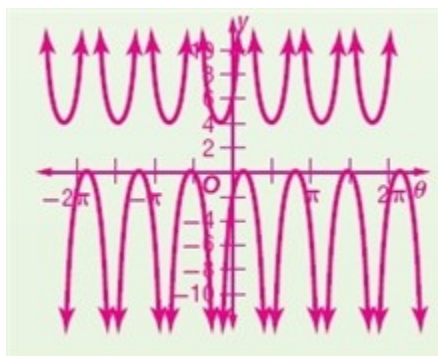
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$$55. y = 2 \sec \left[3 \left(\theta - \frac{\pi}{2} \right) \right] + 2$$

ANSWER:

vertical shift: up 2, amplitude: not defined, period:

$\frac{2\pi}{3}$, phase shift: $\frac{\pi}{2}$ right

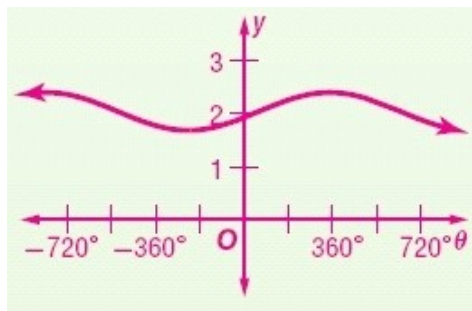


$$57. y = \frac{1}{3} \sin \left[\frac{1}{3} (\theta - 90^\circ) \right] + 2$$

ANSWER:

vertical shift: up 2; amplitude: $\frac{1}{3}$; period: 1080° ;

phase shift: 90° right

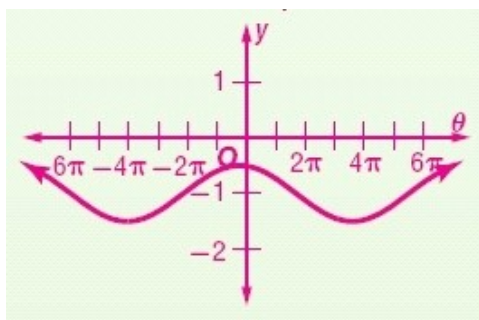


$$56. y = \frac{1}{2} \cos \left[\frac{1}{4} \left(\theta + \frac{\pi}{4} \right) \right] - 1$$

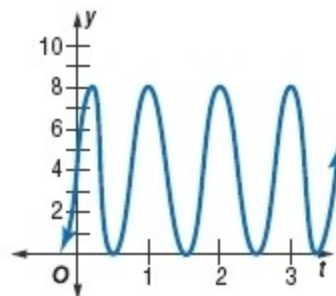
ANSWER:

vertical shift: down 1; amplitude: $\frac{1}{2}$; period: 8π ;

phase shift: $\frac{\pi}{4}$ left



58. The graph approximates the height y of a rope that two people are twirling as a function of time t in seconds. Write an equation for the function.



ANSWER:

$$y = 4 \sin 360t + 4$$

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Evaluate each inverse trigonometric function.
Write angle measures in degrees and radians.

59. $\sin^{-1}(1)$

ANSWER:

$$90^\circ, \frac{\pi}{2}$$

60. $\arctan(0)$

ANSWER:

$$0^\circ, 0$$

61. $\arcsin \frac{\sqrt{3}}{2}$

ANSWER:

$$60^\circ, \frac{\pi}{3}$$

62. $\cos^{-1} \frac{\sqrt{2}}{2}$

ANSWER:

$$45^\circ, \frac{\pi}{4}$$

63. $\tan^{-1} 1$

ANSWER:

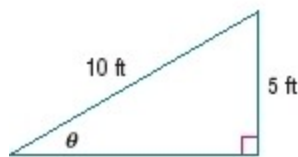
$$45^\circ, \frac{\pi}{4}$$

64. $\arccos 0$

ANSWER:

$$90^\circ, \frac{\pi}{2}$$

65. **RAMPS** A bicycle ramp is 5 feet tall and 10 feet long, as shown below. Write an inverse trigonometric function that can be used to find θ , the angle the ramp makes with the ground. Then find the angle.



ANSWER:

$$\sin^{-1} \frac{5}{10} = \theta ; 30^\circ$$

Evaluate each inverse trigonometric function.
Round to the nearest hundredth if necessary.

66. $\tan\left(\cos^{-1} \frac{1}{3}\right)$

ANSWER:

$$2.83$$

67. $\sin\left(\arcsin -\frac{\sqrt{2}}{2}\right)$

ANSWER:

$$-0.71$$

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68. $\sin(\tan^{-1}0)$

ANSWER:

0

Solve each equation. Round to the nearest tenth if necessary.

69. $\tan \theta = -1.43$

ANSWER:

-55.0°

70. $\sin \theta = 0.8$

ANSWER:

53.1°

71. $\cos \theta = 0.41$

ANSWER:

65.8°