

Extra Review Questions for Chapter 13

Sketch the angle in standard form and find the reference angle.

1. $\theta = \frac{17\pi}{11}$ 2. $\theta = 681^\circ$ 3. $\theta = -307^\circ$ 4. $\theta = -\frac{23\pi}{5}$

Find the reference angle.

5. $\frac{15\pi}{7}$ 6. 215° 7. $-\frac{8\pi}{13}$ 8. 640° 9. $\frac{2\pi}{3}$
10. 225° 11. $-\frac{7\pi}{6}$ 12. 300° 13. $\frac{5\pi}{6}$ 14. 135°
15. 2π 16. 240°

Convert to radians or degrees.

17. 240° 18. $\frac{11\pi}{6}$ 19. 225° 20. $\frac{3\pi}{2}$ 21. 330°
22. $\frac{2\pi}{3}$ 23. 500° 24. $\frac{4\pi}{9}$ 25. -310° 26. $\frac{19\pi}{4}$
27. 180° 28. $\frac{5\pi}{6}$ 29. -270° 30. $\frac{7\pi}{4}$

State 3 angles that are coterminal with θ .

31. $\theta = 55^\circ$ 32. $\theta = -72^\circ$ 33. $\theta = 530^\circ$

Identify an angle θ in the domain $0^\circ \leq \theta \leq 360^\circ$ that is coterminal with θ .

34. $\theta = -38^\circ$ 35. $\theta = 1700^\circ$ 36. $\theta = -375^\circ$

Identify an angle in the domain $[0, 2\pi]$ that is coterminal with θ .

37. $\frac{7\pi}{2}$ 38. $-\frac{5\pi}{6}$

Find each value.

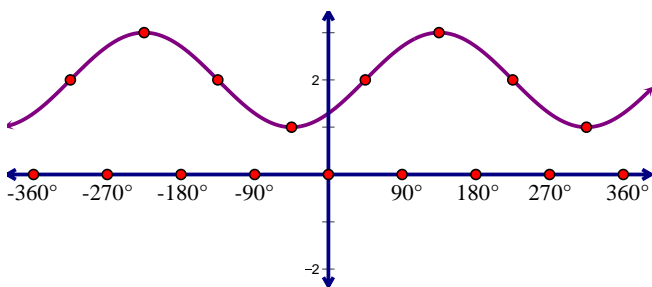
39. $\cos 180^\circ$ 40. $\cos \frac{5\pi}{6}$ 41. $\sin \frac{7\pi}{4}$ 42. $\cos \frac{\pi}{3}$
43. $\cos 210^\circ$ 44. $\sin \frac{11\pi}{6}$ 45. $\cos \frac{\pi}{6}$ 46. $\sin \frac{\pi}{3}$
47. $\sin 210^\circ$ 48. $\cos \frac{11\pi}{6}$ 49. $\sin \frac{\pi}{2}$ 50. $\sin \frac{2\pi}{3}$
51. $\sin 135^\circ$ 52. $\cos 315^\circ$ 53. $\sin(-60^\circ)$

Find the value(s) for θ in the domain $[0^\circ, 360^\circ]$ or $[0, 2\pi]$ that make the equation true.

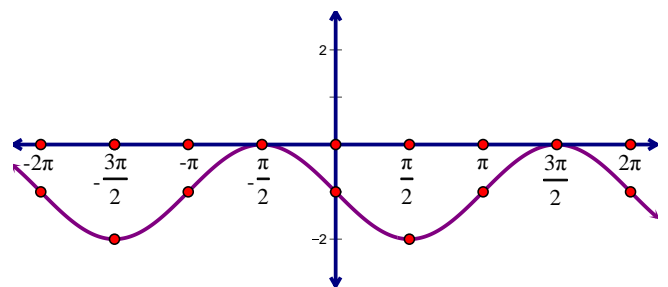
54. **D** $\sin \theta = \frac{\sqrt{2}}{2}$ 55. **R** $\cos \theta = -\frac{1}{2}$ 56. **D** $\cos \theta = 1$
57. **R** $\sin \theta = -\frac{\sqrt{3}}{2}$ 58. **R** $\cos \theta = \frac{\sqrt{2}}{2}$ 59. **R** $\sin \theta = -\frac{1}{2}$
60. **D** $\sin \theta = 1$ 61. **R** $\cos \theta = -\frac{\sqrt{3}}{2}$

Find the sine and the cosine equations of the graph.

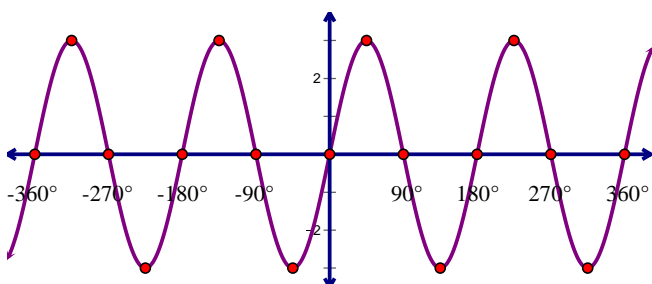
62.



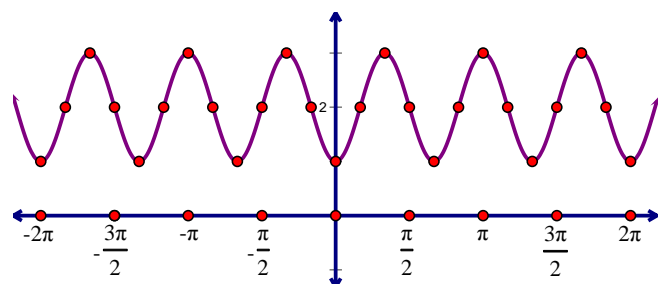
63.



64.



65.



Sketch a complete graph.

66. $f(\theta) = 2\sin\left(\theta - \frac{\pi}{6}\right)$

67. $g(\theta) = \frac{5}{2}\cos\left(\frac{\pi}{4}\theta\right)$

68. $h(\theta) = \cos\left(2\left(\theta + \frac{\pi}{4}\right)\right) - 2$

69. $j(\theta) = 2\sin\left(\frac{2}{3}\theta\right) + 3$

70. Allen is riding a Ferris wheel. He noticed that his height follows the function $h(t) = 20\sin\left(\frac{\pi}{2}(t-1)\right) + 30$ where h is Allen's height in feet and t is time in minutes.

- Identify the period, phase shift, axis, and amplitude of the function. Then sketch a complete graph.
- What is Allen's maximum height and when does it first occur?
- How long does it take Allen to go around the wheel twice?

71. The depth of water at my favorite surfing spot varies from 4 feet to 16 feet, depending on the time. Last Sunday, high tide occurred at 5:00am and the next high tide occurred at 7:00pm.

- Find a sinusoidal equation for the depth of water (in feet) of time t (in hours) since midnight on Sunday morning.
- When will the depth of the water be at its lowest point for the first time?
- What is the depth of the water on Monday at 4:00pm?

72. The height of a piston in a cylinder can be modeled by a sinusoidal function. A piston is at its lowest point in a cylinder, 8cm from the bottom, at $t=1$ seconds. The piston is at its highest point, 38 cm from the bottom, at $t=9$ seconds.

- Find a sinusoidal equation for the height of the piston, in cm, at any given time t and graph it.
- How long does it take the piston to reach 23 cm from the bottom for the third time?
- Find the height of the piston 45 seconds after the engine has started.

Answers

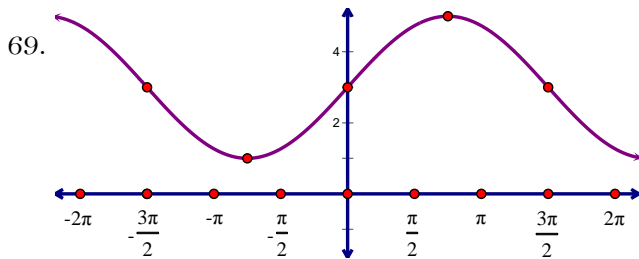
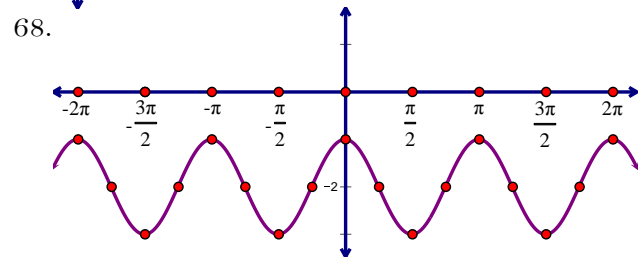
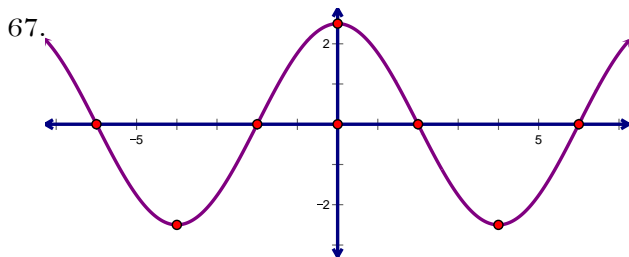
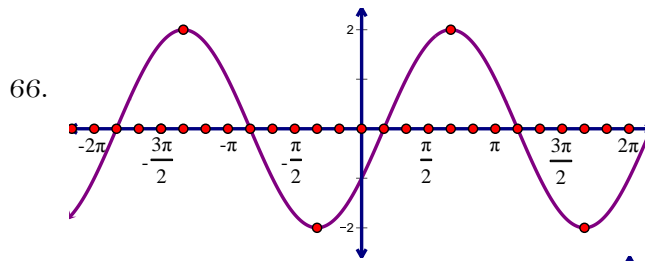
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|--------------------------------------|--------------------------|--|--|--|---------------------------|--------------------------------------|
| 1. $\frac{4\pi}{11}$ | 2. 39° | 3. 53° | 4. $\frac{3\pi}{5}$ | 5. $\frac{\pi}{7}$ | 6. 35° | 7. $\frac{5\pi}{13}$ |
| 8. 80° | 9. $\frac{\pi}{3}$ | 10. 45° | 11. $\frac{\pi}{6}$ | 12. 60° | 13. $\frac{\pi}{6}$ | 14. 45° |
| 15. 0 | 16. 60° | 17. $\frac{4\pi}{3}$ | 18. 330° | 19. $\frac{5\pi}{4}$ | 20. 270° | 21. $\frac{11\pi}{6}$ |
| 22. 120° | 23. $\frac{25\pi}{9}$ | 24. 80° | 25. $-\frac{31\pi}{18}$ | 26. 855° | 27. π | 28. 150° |
| 29. $-\frac{3\pi}{2}$ | 30. 315° | 31. $-305^\circ, 415^\circ, 775^\circ$ | 32. $-432^\circ, 288^\circ, 648^\circ$ | 33. $-190^\circ, 170^\circ, 890^\circ$ | | |
| 34. 332° | 35. 260° | 36. 345° | 37. $\frac{3\pi}{2}$ | 38. $\frac{7\pi}{6}$ | 39. -1 | 40. $-\frac{\sqrt{3}}{2}$ |
| 41. $-\frac{\sqrt{2}}{2}$ | 42. $\frac{1}{2}$ | 43. $-\frac{\sqrt{3}}{2}$ | 44. $-\frac{1}{2}$ | 45. $\frac{\sqrt{3}}{2}$ | 46. $\frac{\sqrt{3}}{2}$ | 47. $-\frac{1}{2}$ |
| 48. $\frac{\sqrt{3}}{2}$ | 49. 1 | 50. $\frac{\sqrt{3}}{2}$ | 51. $\frac{\sqrt{2}}{2}$ | 52. $-\frac{\sqrt{2}}{2}$ | 53. $-\frac{\sqrt{3}}{2}$ | 54. $45^\circ, 135^\circ$ |
| 55. $\frac{2\pi}{3}, \frac{4\pi}{3}$ | 56. $0^\circ, 360^\circ$ | 57. $\frac{4\pi}{3}, \frac{5\pi}{3}$ | 58. $\frac{\pi}{4}, \frac{7\pi}{4}$ | 59. $\frac{7\pi}{6}, \frac{11\pi}{6}$ | 60. 90° | 61. $\frac{5\pi}{6}, \frac{7\pi}{6}$ |

62. $f(x) = \sin(x - 45^\circ) + 2$
 $g(x) = \cos(x - 135^\circ) + 2$

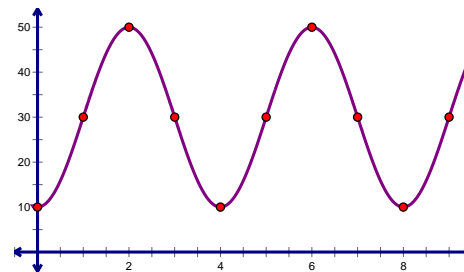
63. $f(x) = \sin(x - \pi) - 1$
 $g(x) = \cos\left(x - \frac{3\pi}{2}\right) - 1$

64. $f(x) = 3\sin(2x)$
 $g(x) = 3\cos\left(2\left(x - 45^\circ\right)\right)$

65. $f(x) = \sin\left(3\left(x - \frac{\pi}{6}\right)\right) + 2$
 $g(x) = \cos\left(3\left(x - \frac{\pi}{3}\right)\right) + 2$

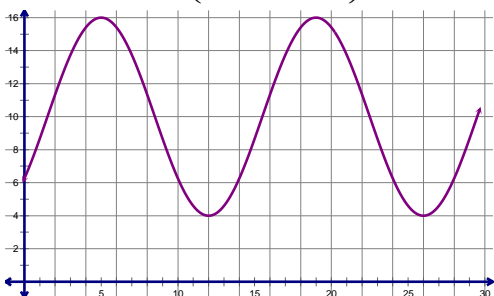


70. a. P: 4 mins, P.S.: right 1, A: $y = 30$, Amp: 20



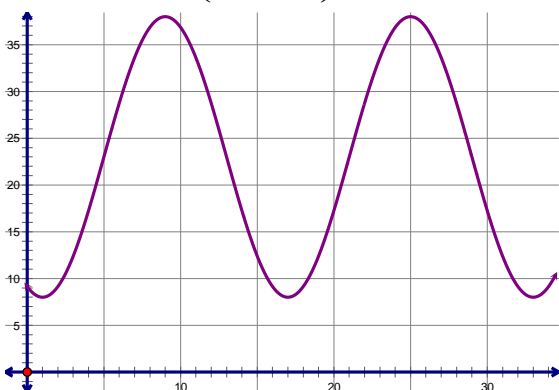
b. 50 ft after 2 mins c. 8 mins

71. a. $d(t) = 6\sin\left(\frac{\pi}{7}(t - 15.5)\right) + 10$ or $d(t) = 6\cos\left(\frac{\pi}{7}(t - 5)\right) + 10$ b. 12:00pm



c. 4 feet

72. a. $h(t) = 15\sin\left(\frac{\pi}{8}(t - 5)\right) + 23$ or $h(t) = 15\cos\left(\frac{\pi}{8}(t - 9)\right) + 23$ b. 21 seconds



c. 23 cm