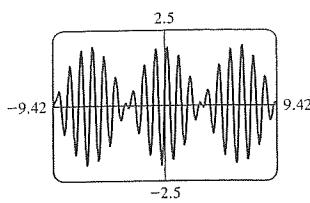
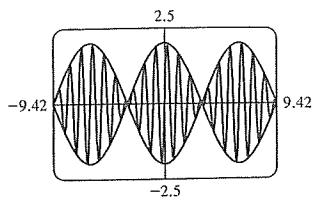


99. (a)



(c)

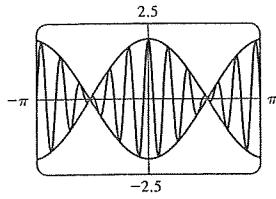


The graph of $y = f(x)$ lies between the two other graphs.

101. (a) $P(t) = 8t^4 - 8t^2 + 1$ (b) $Q(t) = 16t^5 - 20t^3 + 5t$

104. (b) 25 cm^2 (c) $7.07 \text{ cm} \times 3.54 \text{ cm}$

107. (a) and (c)

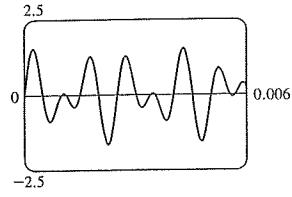


The graph of f lies between the graphs of $y = 2 \cos t$ and $y = -2 \cos t$. Thus, the loudness of the sound varies between $y = \pm 2 \cos t$.

108. (a) $y = \sin 1540\pi t + \sin 2418\pi t$

(b) $y = 2 \sin 1979\pi t \cos 439\pi t$

(c)



SECTION 7.4 ■ PAGE 522

1. infinitely many
2. no, infinitely many
3. $0.3; x \approx -9.7, -6.0, -3.4, 0.3, 2.8, 6.6, 9.1$
4. (a) $0.30, 2.84$
- (b) $2\pi, 0.30 + 2k\pi, 2.84 + 2k\pi$
5. $\frac{\pi}{3} + 2k\pi, \frac{2\pi}{3} + 2k\pi$
6. $-\frac{\pi}{4} + 2k\pi, \frac{5\pi}{4} + 2k\pi$
7. $(2k+1)\pi$
8. $\frac{\pi}{6} + 2k\pi, \frac{11\pi}{6} + 2k\pi$
9. $1.32 + 2k\pi, 4.97 + 2k\pi$
10. $-0.30 + 2k\pi, 3.45 + 2k\pi$
11. $-0.47 + 2k\pi, 3.61 + 2k\pi$
12. $1.25 + 2k\pi, 5.04 + 2k\pi$
13. $-\frac{\pi}{3} + k\pi$
14. $\frac{\pi}{4} + k\pi$
15. $1.37 + k\pi$
16. $-0.32 + k\pi$
17. $\frac{5\pi}{6} + 2k\pi, \frac{7\pi}{6} + 2k\pi;$
 $-7\pi/6, -5\pi/6, 5\pi/6, 7\pi/6, 17\pi/6, 19\pi/6$
18. $-\frac{\pi}{3} + 2k\pi, \frac{\pi}{3} + 2k\pi; -5\pi/3, -\pi/3, \pi/3, 5\pi/3, 7\pi/3, 11\pi/3$
19. $\frac{\pi}{4} + 2k\pi, \frac{3\pi}{4} + 2k\pi; -7\pi/4, -5\pi/4, \pi/4, 3\pi/4, 9\pi/4, 11\pi/4$
20. $-\frac{\pi}{3} + 2k\pi, \frac{4\pi}{3} + 2k\pi;$
 $-2\pi/3, -\pi/3, 4\pi/3, 5\pi/3, 10\pi/3, 11\pi/3$

21. $1.29 + 2k\pi, 5.00 + 2k\pi; -5.00, -1.29, 1.29, 5.00, 7.57, 11.28$
22. $1.19 + k\pi; -5.09, -1.95, 1.19, 4.33, 7.47, 10.61$
23. $-1.47 + k\pi; -7.75, -4.61, -1.47, 1.67, 4.81, 7.95$
24. $-1.12 + 2k\pi, 4.26 + 2k\pi; -2.02, -1.12, 4.26, 5.16, 10.54,$
11.44
25. $(2k+1)\pi$
26. $\frac{3\pi}{2} + 2k\pi$
27. $-\frac{\pi}{4} + 2k\pi, \frac{5\pi}{4} + 2k\pi$
28. $-\frac{\pi}{4} + 2k\pi, \frac{\pi}{4} + 2k\pi$
29. $0.20 + 2k\pi, 2.94 + 2k\pi$
30. $1.82 + 2k\pi, 4.46 + 2k\pi$
31. $-\frac{\pi}{6} + k\pi, \frac{\pi}{6} + k\pi$
32. $\frac{3\pi}{4} + k\pi$
33. $\frac{\pi}{4} + k\pi, \frac{3\pi}{4} + k\pi$
34. $\frac{\pi}{3} + k\pi, \frac{2\pi}{3} + k\pi$
35. $-1.11 + k\pi, 1.11 + k\pi$
36. $-0.34 + k\pi, 0.34 + k\pi$
37. $\frac{\pi}{4} + k\pi, \frac{3\pi}{4} + k\pi$
38. $\frac{\pi}{6} + k\pi, \frac{5\pi}{6} + k\pi$
39. $-1.11 + k\pi, 1.11 + k\pi, \frac{2\pi}{3} + 2k\pi, \frac{4\pi}{3} + 2k\pi$
40. $-0.25 + k\pi, 1.11 + k\pi, 0.25 + k\pi$
41. $\frac{\pi}{3} + 2k\pi, \frac{5\pi}{3} + 2k\pi$
42. $\frac{7\pi}{6} + 2k\pi, \frac{11\pi}{6} + 2k\pi, \frac{\pi}{2} + 2k\pi$
43. $0.34 + 2k\pi, 2.80 + 2k\pi$
44. $\pm 1.25 + k\pi, \pm 1.11 + k\pi$
45. $\frac{\pi}{3} + 2k\pi, \frac{5\pi}{3} + 2k\pi$
46. $\frac{3\pi}{2} + 2k\pi$
47. No solution
48. No solution
49. $\frac{3\pi}{2} + 2k\pi$
50. $k\pi, \frac{\pi}{6} + k\pi, \frac{5\pi}{6} + k\pi$
51. $\frac{\pi}{2} + k\pi, \frac{7\pi}{6} + 2k\pi, \frac{11\pi}{6} + 2k\pi$
52. $\frac{\pi}{4} + 2k\pi, \frac{7\pi}{4} + 2k\pi$
53. $\frac{\pi}{2} + k\pi$
54. $k\pi, \frac{3\pi}{4} + k\pi$
55. $k\pi, 0.73 + 2k\pi, 2.41 + 2k\pi$
56. $\frac{\pi}{2} + k\pi, -0.85 + 2k\pi, 3.99 + 2k\pi$
57. 44.95°
58. 41.1°
59. (a) 0° (b) $60^\circ, 120^\circ$ (c) $90^\circ, 270^\circ$ (d) 180°

SECTION 7.5 ■ PAGE 528

1. $\sin x = 0, k\pi$
2. $\sin x + 2 \sin x \cos x = 0,$
 $\sin x = 0, 1 + 2 \cos x = 0$
3. $-\frac{\pi}{6} + 2k\pi, \frac{7\pi}{6} + 2k\pi, \frac{\pi}{2} + 2k\pi$
4. No solution
5. $(2k+1)\pi, 1.23 + 2k\pi, 5.05 + 2k\pi$
6. $-\frac{\pi}{4} + k\pi, 0.46 + k\pi$
7. $k\pi, 0.72 + 2k\pi, 5.56 + 2k\pi$
8. $k\pi, 1.23 + 2k\pi, 5.05 + 2k\pi$
9. $\frac{\pi}{6} + 2k\pi, \frac{5\pi}{6} + 2k\pi$
10. $\frac{\pi}{4} + k\pi, \frac{3\pi}{4} + k\pi$
11. $\frac{\pi}{3} + 2k\pi, \frac{5\pi}{3} + 2k\pi, (2k+1)\pi$
12. $\frac{\pi}{3} + k\pi, \frac{2\pi}{3} + k\pi$
13. $(2k+1)\pi, \frac{\pi}{2} + 2k\pi$
14. $2k\pi, \frac{3\pi}{2} + 2k\pi$
15. $2k\pi$
16. $-1.24 + k\pi, \frac{\pi}{4} + k\pi$

17. (a) $\frac{\pi}{9} + \frac{2k\pi}{3}, \frac{5\pi}{9} + \frac{2k\pi}{3}$ (b) $\pi/9, 5\pi/9, 7\pi/9, 11\pi/9, 13\pi/9, 17\pi/9$ 18. (a) $\frac{\pi}{3} + k\pi, \frac{2\pi}{3} + k\pi$
 (b) $\pi/3, 2\pi/3, 4\pi/3, 5\pi/3$ 19. (a) $\frac{\pi}{3} + k\pi, \frac{2\pi}{3} + k\pi$
 (b) $\pi/3, 2\pi/3, 4\pi/3, 5\pi/3$ 20. (a) $\frac{7\pi}{18} + \frac{2k\pi}{3}, \frac{11\pi}{18} + \frac{2k\pi}{3}$
 (b) $7\pi/18, 11\pi/18, 19\pi/18, 23\pi/18, 31\pi/18, 35\pi/18$
 21. (a) $\frac{5\pi}{18} + \frac{k\pi}{3}$ (b) $5\pi/18, 11\pi/18, 17\pi/18, 23\pi/18, 29\pi/18, 35\pi/18$ 22. (a) $\frac{\pi}{12} + \frac{k\pi}{2}, \frac{5\pi}{12} + \frac{k\pi}{2}$
 (b) $\pi/12, 5\pi/12, 7\pi/12, 11\pi/12, 13\pi/12, 17\pi/12, 19\pi/12, 23\pi/12$
 23. (a) $4k\pi$ (b) 0 24. (a) $\frac{8\pi}{3} + 4k\pi$ (b) None
 25. (a) $4\pi + 6k\pi, 5\pi + 6k\pi$ (b) None 26. (a) $2k\pi$ (b) 0
 27. (a) $0.62 + \frac{k\pi}{2}$ (b) 0.62, 2.19, 3.76, 5.33
 28. (a) $0.15 + \frac{k\pi}{3}, 0.89 + \frac{k\pi}{3}$ (b) 0.15, 0.89, 1.20, 1.94, 2.24,
 2.98, 3.29, 4.03, 4.34, 5.08, 5.39, 6.13 29. (a) $k\pi$ (b) 0, π
 30. (a) $2k\pi/3$ (b) 0, $2\pi/3, 4\pi/3$
 31. (a) $\frac{\pi}{6} + k\pi, \frac{\pi}{4} + k\pi, \frac{5\pi}{6} + k\pi$
 (b) $\pi/6, \pi/4, 5\pi/6, 7\pi/6, 5\pi/4, 11\pi/6$
 32. (a) $\frac{\pi}{6} + 2k\pi, \frac{2\pi}{3} + 2k\pi, \frac{5\pi}{6} + 2k\pi, \frac{4\pi}{3} + 2k\pi$
 (b) $\pi/6, 2\pi/3, 5\pi/6, 4\pi/3$
 33. (a) $\frac{\pi}{6} + 2k\pi, \frac{5\pi}{6} + 2k\pi, \frac{3\pi}{4} + k\pi$
 (b) $\pi/6, 3\pi/4, 5\pi/6, 7\pi/4$
 34. (a) $\frac{\pi}{4} + k\pi, \frac{3\pi}{4} + k\pi$ (b) $\pi/4, 3\pi/4, 5\pi/4, 7\pi/4$
 35. (a)
 (b) $((2k+1)\pi, -2)$
 36. (a)
 (b) $(\pm 6.28, 1), (\pm 4.71, 1), (\pm 3.14, 1), (\pm 1.57, 1), (0, 1)$
 37. (a)
 (b) $(1.04, 1.73)$
 38. (a)
 (b) $(-\pi/3 + k\pi, 1)$
 (b) $(\pi/3 + k\pi, \sqrt{3})$
 (b) $(\pi + 2k\pi, -1), \left(\frac{\pi}{2} + 2k\pi, 0\right)$

39. $\pi/8, 3\pi/8, 5\pi/8, 7\pi/8, 9\pi/8, 11\pi/8, 13\pi/8, 15\pi/8$
 40. $\pi/3, 5\pi/3$ 41. $\pi/3, 2\pi/3$ 42. $0, \pi/2, \pi, 3\pi/2$
 43. $\pi/2, 7\pi/6, 3\pi/2, 11\pi/6$ 44. $0, \pi/2, 3\pi/2$ 45. 0
 46. $\pi/8, 3\pi/8, 5\pi/8, 7\pi/8, 9\pi/8, 11\pi/8, 13\pi/8, 15\pi/8$
 47. 0, π 48. $\pi/3, 2\pi/3, 4\pi/3, 5\pi/3$
 49. $0, \pi/3, 2\pi/3, \pi, 4\pi/3, 5\pi/3$ 50. $0, \pi/9, \pi/3, 5\pi/9, 2\pi/3, 7\pi/9, \pi, 11\pi/9, 4\pi/3, 13\pi/9, 5\pi/3, 17\pi/9$ 51. $\pi/6, 3\pi/2$
 52. 1.15, 3.57 53. $k\pi/2$ 54. $k\pi/6$
 55. $\frac{\pi}{2} + k\pi, \frac{\pi}{9} + \frac{2k\pi}{3}, \frac{5\pi}{9} + \frac{2k\pi}{3}$
 56. $\frac{\pi}{8} + \frac{k\pi}{4}, \frac{\pi}{6} + 2k\pi, \frac{5\pi}{6} + 2k\pi$ 57. $0, \pm 0.95$
 58. 1.17, -2.66, -2.94 59. 1.92 60. $0, \pm 0.93$ 61. ± 0.71
 62. 0 63. 0.94721° or 89.05279° 64. $0, \frac{1}{2}, 1, \frac{3}{2}, \dots$
 65. (a) 34th day (February 3), 308th day (November 4)
 (b) 275 days 66. (b) $1.047 \text{ rad} \approx 60^\circ$
- CHAPTER 7 REVIEW ■ PAGE 530**
1. LHS = $\sin \theta \left(\frac{\cos \theta}{\sin \theta} + \frac{\sin \theta}{\cos \theta} \right) = \cos \theta + \frac{\sin^2 \theta}{\cos \theta}$
 $= \frac{\cos^2 \theta + \sin^2 \theta}{\cos \theta} = \text{RHS}$
 2. LHS = $\sec^2 \theta - 1 = \text{RHS}$
 3. LHS = $(1 - \sin^2 x) \csc x - \csc x$
 $= \csc x - \sin^2 x \csc x - \csc x$
 $= -\sin^2 x \frac{1}{\sin x} = \text{RHS}$
 4. LHS = $\frac{1}{\cos^2 x} = \sec^2 x = \text{RHS}$
 5. LHS = $\frac{\cos^2 x}{\sin^2 x} - \frac{\tan^2 x}{\sin^2 x} = \cot^2 x - \frac{1}{\cos^2 x} = \text{RHS}$
 6. LHS = $\frac{1}{\sec x} + 1 = 1 + \cos x = (1 + \cos x) \cdot \frac{1 - \cos x}{1 - \cos x}$
 $= \frac{1 - \cos^2 x}{1 - \cos x} = \text{RHS}$
 7. LHS = $\frac{\cos x}{\frac{1}{\cos x}(1 - \sin x)} = \frac{\cos x}{\frac{1}{\cos x} - \frac{\sin x}{\cos x}} = \frac{\cos x}{\frac{1 - \sin x}{\cos x}} = \text{RHS}$
 8. LHS = $1 - \cot x - \tan x + \tan x \cot x$
 $= 2 - (\cot x + \tan x)$
 $= 2 - \left(\frac{\cos x}{\sin x} + \frac{\sin x}{\cos x} \right) = 2 - \frac{\cos^2 x + \sin^2 x}{\cos x \sin x}$
 $= 2 - \frac{1}{\cos x \sin x} = \text{RHS}$
 9. LHS = $\sin^2 x \frac{\cos^2 x}{\sin^2 x} + \cos^2 x \frac{\sin^2 x}{\cos^2 x} = \cos^2 x + \sin^2 x = \text{RHS}$
 10. LHS = $\left(\frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} \right)^2 = \left(\frac{\sin^2 x + \cos^2 x}{\cos x \sin x} \right)^2$
 $= \left(\frac{1}{\cos x \sin x} \right)^2 = \text{RHS}$
 11. LHS = $\frac{2 \sin x \cos x}{1 + 2 \cos^2 x - 1} = \frac{2 \sin x \cos x}{2 \cos^2 x} = \frac{2 \sin x}{2 \cos x} = \text{RHS}$
 12. LHS = $\frac{\cos x \cos y - \sin x \sin y}{\cos x \sin y}$
 $= \frac{\cos x \cos y}{\cos x \sin y} - \frac{\sin x \sin y}{\cos x \sin y} = \frac{\cos y}{\sin y} - \frac{\sin x}{\cos x} = \text{RHS}$