(c) The power function
(d) $y = ax^b$, where $a = 0.893421326$ and $b = 1.50983$
11. (a) $y = \dfrac{c}{1 + ae^{-bx}}$, where $a = 49.10976596$, $b = 0.4981144989$, and $c = 500.855793$ (b) 10.58 days
12. (a) $y = a + b \ln t$ where $a = -7154.888$, $b = 1061.007$, and y is metric tons of coal produced in the year t
(b) 915 metric tons

Chapter 4 Solutions

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7. $-\frac{4}{5}$ **8.** $\frac{24}{25}$ **9.** $-2\sqrt{2}/3$ **10.** $\sqrt{21}/5$ **11.** $3\sqrt{5}/7$
12. $\sqrt{5}/3$ **13.** $P(\frac{4}{5}, \frac{3}{5})$ **14.** $P(2\sqrt{2}/3, -\frac{1}{3})$
15. $P(-\sqrt{5}/3, \frac{2}{3})$ **16.** $P(2\sqrt{5}/5, -\sqrt{5}/5)$
17. $P(-\sqrt{2}/3, -\sqrt{7}/3)$ **18.** $P(-\frac{2}{5}, \sqrt{21}/5)$
19. $t = \pi/4, (\sqrt{2}/2, \sqrt{2}/2)$; $t = \pi/2, (0, 1)$;
$t = 3\pi/4, (-\sqrt{2}/2, \sqrt{2}/2)$; $t = \pi, (-1, 0)$;
$t = 5\pi/4, (-\sqrt{2}/2, -\sqrt{2}/2)$; $t = 3\pi/2, (0, -1)$;
$t = 7\pi/4, (\sqrt{2}/2, -\sqrt{2}/2)$; $t = 2\pi, (1, 0)$
20. $t = \pi/6, (\sqrt{3}/2, \frac{1}{2})$; $t = \pi/3, (\frac{1}{2}, \sqrt{3}/2)$; $t = \pi/2, (0, 1)$;
$t = 2\pi/3, (-\frac{1}{2}, \sqrt{3}/2)$; $t = 5\pi/6, (-\sqrt{3}/2, \frac{1}{2})$; $t = \pi, (-1, 0)$;
$t = 7\pi/6, (-\sqrt{3}/2, -\frac{1}{2})$; $t = 4\pi/3, (-\frac{1}{2}, -\sqrt{3}/2)$;
$t = 3\pi/2, (0, -1)$; $t = 5\pi/3, (\frac{1}{2}, -\sqrt{3}/2)$;
$t = 11\pi/6, (\sqrt{3}/2, -\frac{1}{2})$; $t = 2\pi, (1, 0)$
21. $(0, 1)$ **22.** $(0, -1)$ **23.** $(-\sqrt{3}/2, \frac{1}{2})$ **24.** $(-\sqrt{3}/2, -\frac{1}{2})$
25. $(\frac{1}{2}, -\sqrt{3}/2)$ **26.** $(\frac{1}{2}, -\sqrt{3}/2)$ **27.** $(-\frac{1}{2}, \sqrt{3}/2)$
28. $(0, -1)$ **29.** $(-\sqrt{2}/2, -\sqrt{2}/2)$ **30.** $(\sqrt{3}/2, -\frac{1}{2})$
31. (a) $(-\frac{3}{5}, \frac{4}{5})$ (b) $(\frac{3}{5}, -\frac{4}{5})$ (c) $(-\frac{3}{5}, -\frac{4}{5})$ (d) $(\frac{3}{5}, \frac{4}{5})$
32. (a) $(\frac{3}{4}, -\sqrt{7}/4)$ (b) $(\frac{3}{4}, \sqrt{7}/4)$ (c) $(-\frac{3}{4}, \sqrt{7}/4)$
(d) $(-\frac{3}{4}, -\sqrt{7}/4)$
33. (a) $\pi/4$ (b) $\pi/3$ (c) $\pi/3$ (d) $\pi/6$
34. (a) $\pi/6$ (b) $\pi/6$ (c) $\pi/3$ (d) $\pi/4$
35. (a) $2\pi/7$ (b) $2\pi/9$ (c) $\pi - 3 \approx 0.14$
(d) $2\pi - 5 \approx 1.28$
36. (a) $\pi/5$ (b) $2\pi/7$ (c) $2\pi - 6 \approx 0.28$
(d) $7 - 2\pi \approx 0.72$
37. (a) $\pi/3$ (b) $(-\frac{1}{2}, \sqrt{3}/2)$
38. (a) $\pi/3$ (b) $(-\frac{1}{2}, -\sqrt{3}/2)$
39. (a) $\pi/4$ (b) $(-\sqrt{2}/2, \sqrt{2}/2)$
40. (a) $\pi/3$ (b) $(\frac{1}{2}, \sqrt{3}/2)$
41. (a) $\pi/3$ (b) $(-\frac{1}{2}, -\sqrt{3}/2)$
42. (a) $\pi/6$ (b) $(-\sqrt{3}/2, \frac{1}{2})$
43. (a) $\pi/4$ (b) $(-\sqrt{2}/2, -\sqrt{2}/2)$
44. (a) $\pi/6$ (b) $(\sqrt{3}/2, \frac{1}{2})$
45. (a) $\pi/6$ (b) $(-\sqrt{3}/2, -\frac{1}{2})$
46. (a) $\pi/4$ (b) $(\sqrt{2}/2, \sqrt{2}/2)$
47. (a) $\pi/3$ (b) $(\frac{1}{2}, \sqrt{3}/2)$
48. (a) $\pi/6$ (b) $(-\sqrt{3}/2, -\frac{1}{2})$
49. (a) $\pi/3$ (b) $(-\frac{1}{2}, -\sqrt{3}/2)$
50. (a) $\pi/4$ (b) $(\sqrt{2}/2, -\sqrt{2}/2)$ **51.** $(0.5, 0.8)$
52. $(-0.8, 0.6)$ **53.** $(0.5, -0.9)$ **54.** $(-0.6, -0.9)$

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1. $t = \pi/4, \sin t = \sqrt{2}/2, \cos t = \sqrt{2}/2$; $t = \pi/2, \sin t = 1$, $\cos t = 0$; $t = 3\pi/4, \sin t = \sqrt{2}/2, \cos t = -\sqrt{2}/2$;
$t = \pi, \sin t = 0, \cos t = -1$; $t = 5\pi/4$,
$\sin t = -\sqrt{2}/2, \cos t = -\sqrt{2}/2$; $t = 3\pi/2, \sin t = -1$,
$\cos t = 0$; $t = 7\pi/4, \sin t = -\sqrt{2}/2, \cos t = \sqrt{2}/2$;
$t = 2\pi, \sin t = 0, \cos t = 1$
2. $t = \pi/6, \sin t = \frac{1}{2}, \cos t = \sqrt{3}/2$;
$t = \pi/3, \sin t = \sqrt{3}/2, \cos t = \frac{1}{2}$;
$t = \pi/2, \sin t = 1, \cos t = 0$;
$t = 2\pi/3, \sin t = \sqrt{3}/2, \cos t = -\frac{1}{2}$;
$t = 5\pi/6, \sin t = \frac{1}{2}, \cos t = -\sqrt{3}/2$;
$t = \pi, \sin t = 0, \cos t = -1$;
$t = 7\pi/6, \sin t = -\frac{1}{2}, \cos t = -\sqrt{3}/2$;
$t = 4\pi/3, \sin t = -\sqrt{3}/2, \cos t = -\frac{1}{2}$;
$t = 3\pi/2, \sin t = -1, \cos t = 0$;
$t = 5\pi/3, \sin t = -\sqrt{3}/2, \cos t = \frac{1}{2}$;
$t = 11\pi/6, \sin t = -\frac{1}{2}, \cos t = \sqrt{3}/2$;
$t = 2\pi, \sin t = 0, \cos t = 1$
3. (a) $\sqrt{3}/2$ (b) $-1/2$ (c) $-\sqrt{3}$
4. (a) $1/2$ (b) $-\sqrt{3}/2$ (c) $-\sqrt{3}/3$
5. (a) $-1/2$ (b) $-1/2$ (c) $-1/2$
6. (a) $1/2$ (b) $1/2$ (c) $1/2$
7. (a) $-\sqrt{2}/2$ (b) $-\sqrt{2}/2$ (c) $\sqrt{2}/2$
8. (a) $\sqrt{2}/2$ (b) $-\sqrt{2}/2$ (c) $-\sqrt{2}/2$
9. (a) $\sqrt{3}/2$ (b) $2\sqrt{3}/3$ (c) $\sqrt{3}/3$
10. (a) $1/2$ (b) 2 (c) $-\sqrt{3}$ **11.** (a) -1 (b) 0 (c) 0
12. (a) 1 (b) 0 (c) 0 **13.** (a) 2 (b) $-2\sqrt{3}/3$ (c) 2
14. (a) $-\sqrt{3}/2$ (b) $-2\sqrt{3}/3$ (c) -2
15. (a) $-\sqrt{3}/3$ (b) $\sqrt{3}/3$ (c) $-\sqrt{3}/3$
16. (a) $-\sqrt{3}/3$ (b) $-\sqrt{3}/3$ (c) $-\sqrt{3}/3$
17. (a) $\sqrt{2}/2$ (b) $-\sqrt{2}$ (c) -1
18. (a) $-\sqrt{2}/2$ (b) $-\sqrt{2}$ (c) 1
19. (a) -1 (b) 1 (c) -1 **20.** (a) -1 (b) -1 (c) 1
21. (a) 0 (b) 1 (c) 0 **22.** (a) 1 (b) 0 (c) 0
23. $\sin 0 = 0, \cos 0 = 1, \tan 0 = 0, \sec 0 = 1$, others undefined
24. $\sin \pi/2 = 1, \cos \pi/2 = 0, \cot \pi/2 = 0, \csc \pi/2 = 1$, others undefined
25. $\sin \pi = 0, \cos \pi = -1, \tan \pi = 0, \sec \pi = -1$, others undefined
26. $\sin 3\pi/2 = -1, \cos 3\pi/2 = 0, \cot 3\pi/2 = 0$, $\csc 3\pi/2 = -1$, others undefined
27. $\frac{4}{5}, \frac{3}{5}, \frac{4}{3}$ **28.** $\frac{4}{5}, -\frac{3}{5}, -\frac{4}{3}$ **29.** $-\sqrt{11}/4, \sqrt{5}/4, -\sqrt{55}/5$
30. $-2\sqrt{2}/3, -1/3, 2\sqrt{2}$ **31.** $\sqrt{13}/7, -6/7, -\sqrt{13}/6$
32. $\frac{9}{41}, \frac{40}{41}, \frac{9}{40}$ **33.** $-\frac{12}{13}, -\frac{5}{13}, \frac{12}{5}$ **34.** $2\sqrt{5}/5, \sqrt{5}/5, 2$
35. $\frac{21}{29}, -\frac{20}{29}, -\frac{21}{20}$ **36.** $-\frac{7}{25}, \frac{24}{25}, -\frac{7}{24}$ **37.** (a) 0.8 (b) 0.84147
38. (a) 0.7 (b) 0.69671 **39.** (a) 0.9 (b) 0.93204
40. (a) 0.3 (b) 0.28366 **41.** (a) 1 (b) 1.02964
42. (a) -3.6 (b) -3.60210 **43.** (a) -0.6 (b) -0.57482
44. (a) 0.9 (b) 0.88345 **45.** Negative **46.** Negative

47. Negative **48.** Positive **49.** II **50.** III **51.** II **52.** II

53. $\sin t = \sqrt{1 - \cos^2 t}$ **54.** $\cos t = \sqrt{1 - \sin^2 t}$

55. $\tan t = (\sin t)/\sqrt{1 - \sin^2 t}$ **56.** $\tan t = -\dfrac{\sqrt{1 - \cos^2 t}}{\cos t}$

57. $\sec t = -\sqrt{1 + \tan^2 t}$ **58.** $\csc t = -\sqrt{1 + \cot^2 t}$

59. $\tan t = \sqrt{\sec^2 t - 1}$ **60.** $\sin t = -\dfrac{\sqrt{\sec^2 t - 1}}{\sec t}$

61. $\tan^2 t = (\sin^2 t)/(1 - \sin^2 t)$ **62.** $\sec^2 t \sin^2 t = \dfrac{1 - \cos^2 t}{\cos^2 t}$

63. $\cos t = -\frac{4}{5}$, $\tan t = -\frac{3}{4}$, $\csc t = \frac{5}{3}$, $\sec t = -\frac{5}{4}$, $\cot t = -\frac{4}{3}$

64. $\sin t = -\frac{3}{5}$, $\tan t = \frac{3}{4}$, $\csc t = -\frac{5}{3}$, $\sec t = -\frac{5}{4}$, $\cot t = \frac{4}{3}$

65. $\sin t = -2\sqrt{2}/3$, $\cos t = \frac{1}{3}$, $\tan t = -2\sqrt{2}$, $\csc t = -\frac{3}{4}\sqrt{2}$, $\cot t = -\sqrt{2}/4$

66. $\sin t = -\sqrt{17}/17$, $\cos t = -4\sqrt{17}/17$, $\csc t = -\sqrt{17}$, $\sec t = -\sqrt{17}/4$, $\cot t = 4$

67. $\sin t = -\frac{3}{5}$, $\cos t = \frac{4}{5}$, $\csc t = -\frac{5}{3}$, $\sec t = \frac{5}{4}$, $\cot t = -\frac{4}{3}$

68. $\sin t = -\sqrt{3}/2$, $\cos t = \frac{1}{2}$, $\tan t = -\sqrt{3}$, $\csc t = -2\sqrt{3}/3$, $\cot t = -\sqrt{3}/3$

69. $\cos t = -\sqrt{15}/4$, $\tan t = \sqrt{15}/15$, $\csc t = -4$, $\sec t = -4\sqrt{15}/15$, $\cot t = \sqrt{15}$

70. $\sin t = 4\sqrt{17}/17$, $\cos t = -\sqrt{17}/17$, $\csc t = \sqrt{17}/4$, $\sec t = -\sqrt{17}$, $\cot t = -\frac{1}{4}$

71. Odd **72.** Even **73.** Odd **74.** Neither **75.** Even

76. Even **77.** Neither **78.** Even

79. $y(0) = 4$, $y(0.25) = -2.828$, $y(0.50) = 0$, $y(0.75) = 2.828$, $y(1.00) = -4$, $y(1.25) = 2.828$

80. (a) 87 mmHg (b) 82.7 mmHg (c) 80 mmHg (d) 73.9 mmHg **81.** (a) 0.49870 amp (b) −0.17117 amp

82. $H(0) = 175$ m, $H(1) = 150.4$ m, $H(2) = 100$ m, $H(4) = 38.6$ m, $H(6) = 100$ m, $H(8) = 150.3$ m, $H(12) = 58.8$ m

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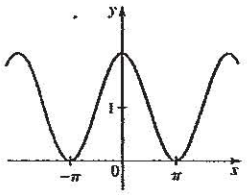
1.



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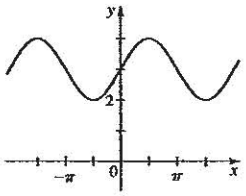

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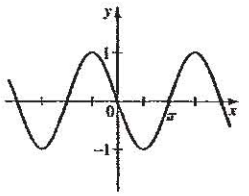

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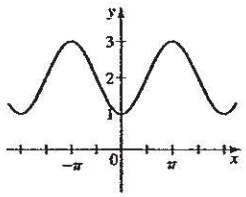

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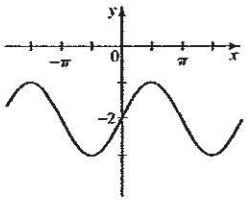

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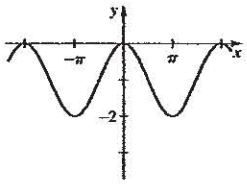

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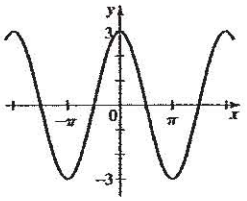

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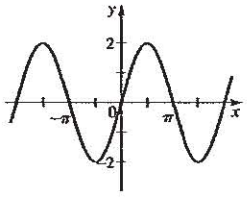

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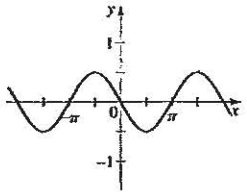

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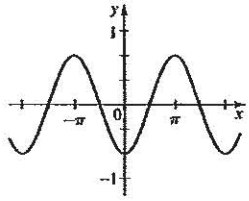

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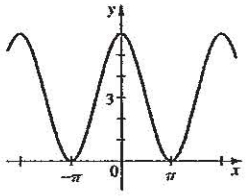

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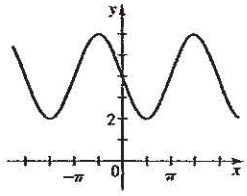

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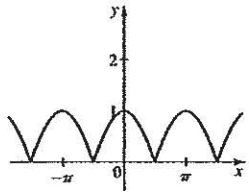

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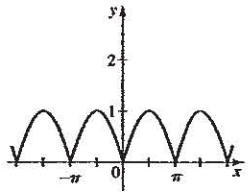
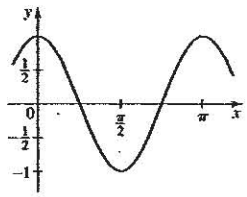


15. 1, π



16. 1, π