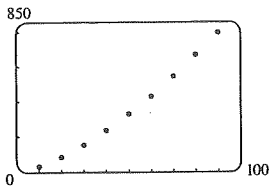
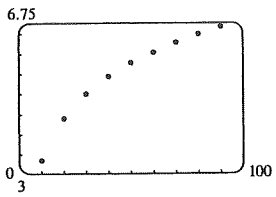
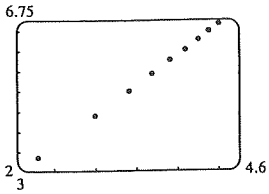
0. (a)



b)





c) The power function
d) $y = ax^b$, where $a = 0.893421326$ and $b = 1.50983$

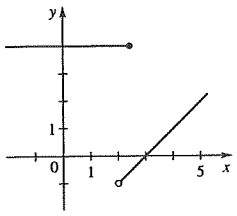
1. (a) $y = \dfrac{c}{1 + ae^{-bx}}$, where $a = 49.10976596$, $b = 0.4981144989$, and $c = 500.855793$ (b) 10.58 days

2. (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

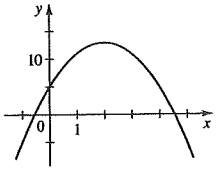
CUMULATIVE REVIEW TEST FOR CHAPTERS 2, 3, AND 4 ■ PAGE 367

1. (a) $(-\infty, \infty)$ (b) $[-4, \infty)$ (c) 12, 0, 0, 2, $2\sqrt{3}$, undefined (d) $x^2 - 4$, $\sqrt{x+6}$, $-4 + h^2$ (e) $\frac{1}{8}$ (f) $f \circ g = x + 4 - \sqrt{x+4}$, $g \circ f = |x - 2|$, $f(g(12)) = 0$, $g(f(12)) = 10$ (g) $g^{-1}(x) = x^2 - 4, x \geq 0$

2. (a) 4, 4, 4, 0, 1 (b)



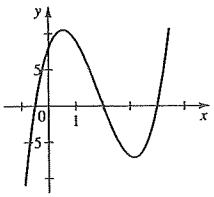
3. (a) $f(x) = -2(x - 2)^2 + 13$ (b) Maximum 13 (c)



(d) Increasing on $(-\infty, 2]$; decreasing on $[2, \infty)$
(e) Shift upward 5 units
(f) Shift to the left 3 units

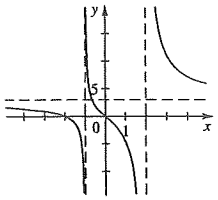
4. f, D; g, C; r, A; s, F; h, B; k, E

5. (a) $\pm 1, \pm 2, \pm 4, \pm 8, \pm\frac{1}{2}$ (b) $2, 4, -\frac{1}{2}$ (c) $P(x) = 2(x - 2)(x - 4)(x + \frac{1}{2})$ (d)

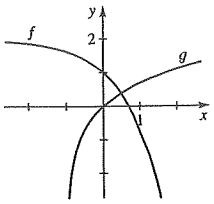


6. (a) 1 (multiplicity 2); -1, $1 + i$, $1 - i$ (multiplicity 1)
(b) $Q(x) = (x - 1)^2(x + 1)(x - 1 - i)(x - 1 + i)$
(c) $Q(x) = (x - 1)^2(x + 1)(x^2 - 2x + 2)$

7. x-intercepts 0, -2; y-intercept 0; horizontal asymptote $y = 3$; vertical asymptotes $x = 2$ and $x = -1$



8.



9. (a) -4 (b) $5 \log x + \frac{1}{2} \log(x - 1) - \log(2x - 3)$

10. (a) 4 (b) ln 2, ln 4 11. (a) \$29,396.15 (b) After 6.23 years (c) 12.837 years

12. (a) $P(t) = 120e^{0.0565t}$ (b) 917 (c) After 49.8 months

CHAPTER 5

SECTION 5.1 ■ PAGE 375

1. (a) $(0, 0)$, 1 (b) $x^2 + y^2 = 1$ (c) (i) 0 (ii) 0 (iii) 0 (iv) 0 2. (a) terminal (b) $(0, 1), (-1, 0), (0, -1), (1, 0)$
9. $-\frac{4}{5}$ 10. $\frac{24}{25}$ 11. $-2\sqrt{2}/3$ 12. $\sqrt{21}/5$ 13. $3\sqrt{5}/7$
14. $\sqrt{5}/3$ 15. $P(\frac{4}{5}, \frac{3}{5})$ 16. $P(2\sqrt{2}/3, -\frac{1}{3})$
17. $P(-\sqrt{5}/3, \frac{2}{3})$ 18. $P(2\sqrt{5}/5, -\sqrt{5}/5)$
19. $P(-\sqrt{2}/3, -\sqrt{7}/3)$ 20. $P(-\frac{2}{5}, \sqrt{21}/5)$
21. $t = \pi/4, (\sqrt{2}/2, \sqrt{2}/2)$; $t = \pi/2, (0, 1)$;
$t = 3\pi/4, (-\sqrt{2}/2, \sqrt{2}/2)$; $t = \pi, (-1, 0)$;
$t = 5\pi/4, (-\sqrt{2}/2, -\sqrt{2}/2)$; $t = 3\pi/2, (0, -1)$;
$t = 7\pi/4, (\sqrt{2}/2, -\sqrt{2}/2)$; $t = 2\pi, (1, 0)$
22. $t = \pi/6, (\sqrt{3}/2, \frac{1}{2})$; $t = \pi/3, (\frac{1}{2}, \sqrt{3}/2)$; $t = \pi/2, (0, 1)$;
$t = 2\pi/3, (-\frac{1}{2}, \sqrt{3}/2)$; $t = 5\pi/6, (-\sqrt{3}/2, \frac{1}{2})$; $t = \pi, (-1, 0)$;
$t = 7\pi/6, (-\sqrt{3}/2, -\frac{1}{2})$; $t = 4\pi/3, (-\frac{1}{2}, -\sqrt{3}/2)$;
$t = 3\pi/2, (0, -1)$; $t = 5\pi/3, (\frac{1}{2}, -\sqrt{3}/2)$;
$t = 11\pi/6, (\sqrt{3}/2, -\frac{1}{2})$; $t = 2\pi, (1, 0)$
23. $(0, 1)$ 24. $(0, -1)$ 25. $(-\sqrt{3}/2, \frac{1}{2})$ 26. $(-\sqrt{3}/2, -\frac{1}{2})$
27. $(\frac{1}{2}, -\sqrt{3}/2)$ 28. $(\frac{1}{2}, -\sqrt{3}/2)$ 29. $(-\frac{1}{2}, \sqrt{3}/2)$
30. $(0, -1)$ 31. $(-\sqrt{2}/2, -\sqrt{2}/2)$ 32. $(\sqrt{3}/2, -\frac{1}{2})$
33. (a) $(-\frac{3}{5}, \frac{4}{5})$ (b) $(\frac{3}{5}, -\frac{4}{5})$ (c) $(-\frac{3}{5}, -\frac{4}{5})$ (d) $(\frac{3}{5}, \frac{4}{5})$
34. (a) $(\frac{3}{4}, -\sqrt{7}/4)$ (b) $(\frac{3}{4}, \sqrt{7}/4)$ (c) $(-\frac{3}{4}, \sqrt{7}/4)$ (d) $(-\frac{3}{4}, -\sqrt{7}/4)$
35. (a) $\pi/4$ (b) $\pi/3$ (c) $\pi/3$ (d) $\pi/6$
36. (a) $\pi/6$ (b) $\pi/6$ (c) $\pi/3$ (d) $\pi/4$
37. (a) $2\pi/7$ (b) $2\pi/9$ (c) $\pi - 3 \approx 0.14$ (d) $2\pi - 5 \approx 1.28$
38. (a) $\pi/5$ (b) $2\pi/7$ (c) $2\pi - 6 \approx 0.28$ (d) $7 - 2\pi \approx 0.72$
39. (a) $\pi/3$ (b) $(-\frac{1}{2}, \sqrt{3}/2)$
40. (a) $\pi/3$ (b) $(-\frac{1}{2}, -\sqrt{3}/2)$
41. (a) $\pi/4$ (b) $(-\sqrt{2}/2, \sqrt{2}/2)$
42. (a) $\pi/3$ (b) $(\frac{1}{2}, \sqrt{3}/2)$
43. (a) $\pi/3$ (b) $(-\frac{1}{2}, -\sqrt{3}/2)$
44. (a) $\pi/6$ (b) $(-\sqrt{3}/2, \frac{1}{2})$
45. (a) $\pi/4$ (b) $(-\sqrt{2}/2, -\sqrt{2}/2)$
46. (a) $\pi/6$ (b) $(\sqrt{3}/2, \frac{1}{2})$
47. (a) $\pi/6$ (b) $(-\sqrt{3}/2, -\frac{1}{2})$
48. (a) $\pi/4$ (b) $(\sqrt{2}/2, \sqrt{2}/2)$
49. (a) $\pi/3$ (b) $(\frac{1}{2}, \sqrt{3}/2)$