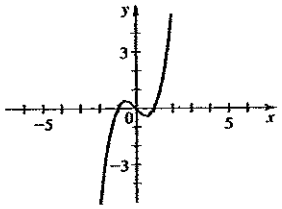
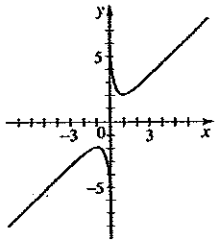
65. Odd



66. Neither

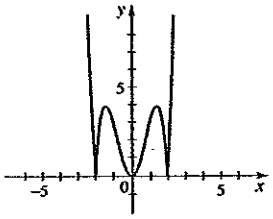
67. Neither

68. Odd

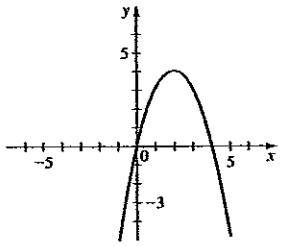


69. To obtain the graph of g, reflect in the x-axis the part of the graph of f that is below the x-axis.

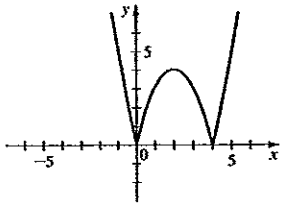
70.



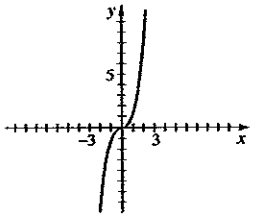
71. (a)



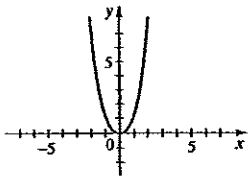
(b)



72. (a)



(b)



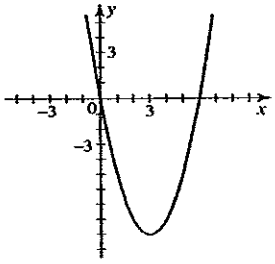
73. (a) Shift up 4 units, shrink vertically by a factor of 0.01
(b) Shift right 10 units; $g(t) = 4 + 0.01(t - 10)^2$

74. (a) Shrink vertically by a factor of $\frac{1}{2}$, then shift up 2 units
(b) Stretch vertically by a factor of $\frac{9}{5}$, then shift up 32 units; $F(t) = \frac{9}{10}t^2 + \frac{178}{5}$

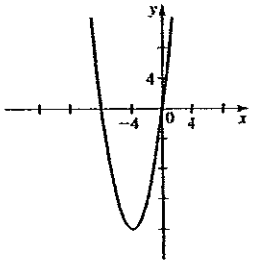
Section 3.5

1. (a) $(3, 4)$ (b) 4 **2.** (a) $(-2, 8)$ (b) 8 **3.** (a) $(1, -3)$ (b) -3 **4.** (a) $(-1, -4)$ (b) -4

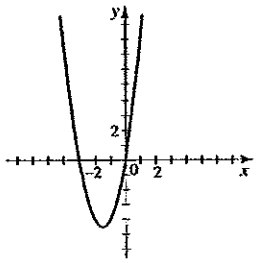
5. (a) $f(x) = (x - 3)^2 - 9$
(b) Vertex $(3, -9)$
x-intercepts 0, 6
y-intercept 0
(c)



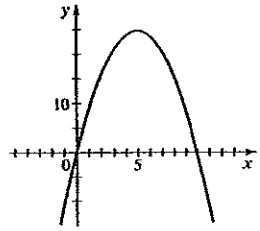
6. (a) $f(x) = (x + 4)^2 - 16$
(b) Vertex $(-4, -16)$
x-intercepts 0, -8
y-intercept 0
(c)



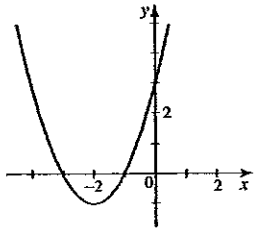
7. (a) $f(x) = 2(x + \frac{3}{2})^2 - \frac{9}{2}$
(b) Vertex $(-\frac{3}{2}, -\frac{9}{2})$
x-intercepts 0, -3,
y-intercept 0
(c)



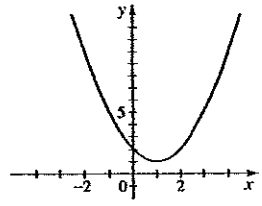
8. (a) $f(x) = -(x - 5)^2 + 25$
(b) Vertex $(5, 25)$
x-intercepts 0, 10
y-intercept 0
(c)



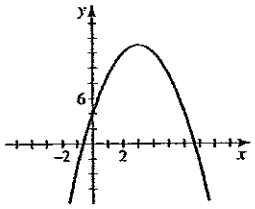
9. (a) $f(x) = (x + 2)^2 - 1$
(b) Vertex $(-2, -1)$
x-intercepts -1, -3
y-intercept 3
(c)



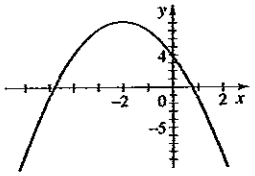
10. (a) $f(x) = (x - 1)^2 + 1$
(b) Vertex $(1, 1)$
no x-intercepts
y-intercept 2
(c)



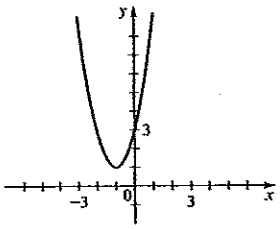
11. (a) $f(x) = -(x - 3)^2 + 13$ (b) Vertex $(3, 13)$; x-intercepts $3 \pm \sqrt{13}$; y-intercept 4
(c)



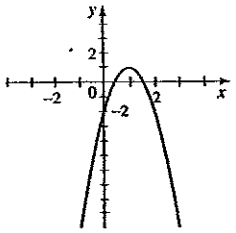
12. (a) $f(x) = -(x + 2)^2 + 8$ (b) Vertex $(-2, 8)$; x-intercepts $-2 \pm 2\sqrt{2}$; y-intercept 4
(c)



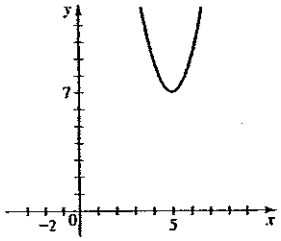
13. (a) $f(x) = 2(x + 1)^2 + 1$ (b) Vertex $(-1, 1)$; no x-intercept; y-intercept 3
(c)



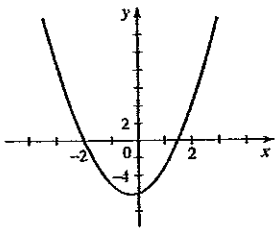
14. (a) $f(x) = -3(x - 1)^2 + 1$ (b) Vertex $(1, 1)$; x-intercepts $1 \pm \sqrt{\frac{1}{3}}$; y-intercept -2
)



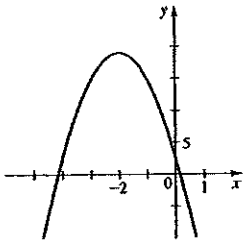
15. (a) $f(x) = 2(x - 5)^2 + 7$ (b) Vertex $(5, 7)$; no x-intercept; y-intercept 57
(c)



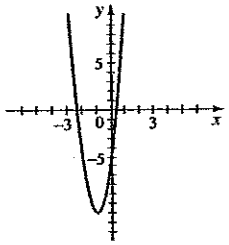
16. (a) $f(x) = 2(x + \frac{1}{4})^2 - \frac{49}{8}$ (b) Vertex $(-\frac{1}{4}, -\frac{49}{8})$; x-intercepts $-2, \frac{3}{2}$; y-intercept -6
(c)



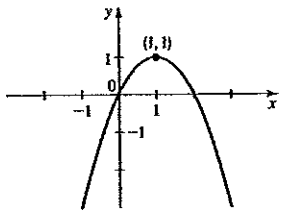
17. (a) $f(x) = -4(x + 2)^2 + 19$ (b) Vertex $(-2, 19)$; x-intercepts $-2 \pm \frac{1}{2}\sqrt{19}$; y-intercept 3
(c)



18. (a) $f(x) = 6(x + 1)^2 - 11$ (b) Vertex $(-1, -11)$; x-intercepts $\dfrac{-6 \pm \sqrt{66}}{6}$; y-intercept -5
(c)

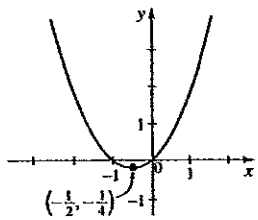


19. (a) $f(x) = -(x - 1)^2 + 1$
(b)



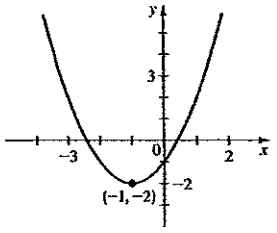
(c) Maximum $f(1) = 1$

20. (a) $f(x) = (x + \frac{1}{2})^2 - \frac{1}{4}$
(b)



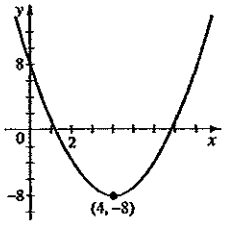
(c) Minimum $f(-\frac{1}{2}) = -\frac{1}{4}$

21. (a) $f(x) = (x + 1)^2 - 2$
(b)



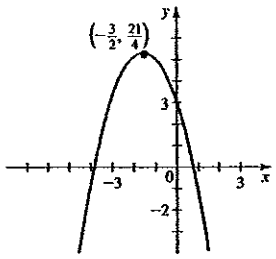
(c) Minimum $f(-1) = -2$

22. (a) $f(x) = (x - 4)^2 - 8$
(b)



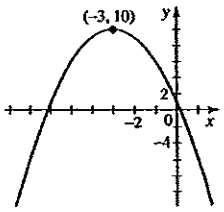
(c) Minimum $f(4) = -8$

23. (a) $f(x) = -\left(x + \frac{3}{2}\right)^2 + \frac{21}{4}$
(b)



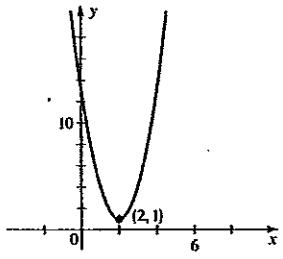
(c) Maximum $f\left(-\frac{3}{2}\right) = \frac{21}{4}$

24. (a) $f(x) = -(x + 3)^2 + 10$
(b)



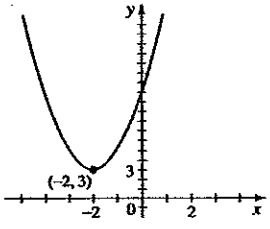
(c) Maximum $f(-3) = 10$

25. (a) $g(x) = 3(x - 2)^2 + 1$
(b)



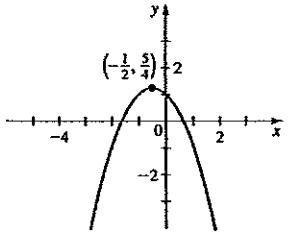
(c) Minimum $g(2) = 1$

26. (a) $g(x) = 2(x + 2)^2 + 3$
(b)



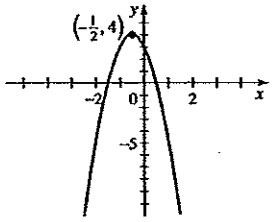
(c) Minimum $g(-2) = 3$

27. (a) $h(x) = -\left(x + \frac{1}{2}\right)^2 + \frac{5}{4}$
(b)



(c) Maximum $h\left(-\frac{1}{2}\right) = \frac{5}{4}$

28. (a) $h(x) = -4\left(x + \frac{1}{2}\right)^2 + 4$
(b)



(c) Maximum $h\left(-\frac{1}{2}\right) = 4$

29. Minimum $f\left(-\frac{1}{2}\right) = \frac{3}{4}$ **30.** Maximum $f\left(\frac{3}{2}\right) = \frac{13}{4}$
31. Maximum $f(-3.5) = 185.75$ **32.** Minimum $f(-2) = 73$
33. Minimum $f(0.6) = 15.64$ **34.** Minimum $g\left(\frac{15}{2}\right) = -5625$
35. Minimum $h(-2) = -8$ **36.** Maximum $f(-3) = 10$
37. Maximum $f(-1) = \frac{7}{2}$ **38.** Minimum $g(2) = -1$
39. $f(x) = 2x^2 - 4x$ **40.** $f(x) = -3(x - 3)^2 + 4$
41. $(-\infty, \infty)$, $(-\infty, 1]$ **42.** $(-\infty, \infty)$, $[-4, \infty)$
43. $(-\infty, \infty)$, $\left(-\frac{23}{2}, \infty\right)$ **44.** $(-\infty, \infty)$, $(-\infty, 7)$
45. (a) -4.01 (b) -4.011025
46. (a) 1.18 (b) $\dfrac{8 + \sqrt{2}}{8} \approx 1.176777$
47. Local maximum 2; local minimums -1, 0 **48.** Local maximums 1, 2; local minimum -1 **49.** Local maximums 0, 1; local minimums -2, -1 **50.** Local maximums 2, 3; local minimums 0, -1 **51.** Local maximum ≈ 0.38 when $x \approx -0.58$; local minimum ≈ -0.38 when $x \approx 0.58$
52. Local maximum ≈ 4.00 when $x \approx 1.00$; local minimum ≈ 2.81 when $x \approx -0.33$
53. Local maximum ≈ 0 when $x = 0$; local minimum ≈ -13.61 when $x \approx -1.71$; local minimum ≈ -73.32 when $x \approx 3.21$
54. Local maximum ≈ 13.02 when $x \approx 1.04$; local maximum ≈ -7.87 when $x \approx -1.93$; local minimum ≈ -13.02 when $x \approx -1.04$; local minimum ≈ 7.87 when $x \approx 1.93$
55. Local maximum ≈ 5.66 when $x \approx 4.00$
56. Local maximum ≈ 0.32 when $x \approx 0.75$ **57.** Local maximum ≈ 0.38 when $x \approx -1.73$; local minimum ≈ -0.38 when $x \approx 1.73$ **58.** Local maximum ≈ 1.33 when $x \approx -0.5$
59. 25 ft **60.** (a) 55 ft (b) 204.9 ft **61.** \$4000, 100 units
62. \$450, 1500 cans **63.** 30 times **64.** 150 min, 4.5 mg/L
65. 50 trees per acre **66.** 7.5 mi/h **67.** 20 mi/h **68.** 3.96°C
69. $r \approx 0.67$ cm

3.6

Section 3.6 page 210

1. $A(w) = 3w^2, w > 0$ **2.** $A(w) = w^2 + 10w$
3. $V(w) = \frac{1}{2}w^3, w > 0$ **4.** $V(r) = 4\pi r^3$
5. $A(x) = 10x - x^2, 0 < x < 10$ **6.** $P(x) = 2x + \dfrac{32}{x}, x > 0$
7. $A(x) = (\sqrt{3}/4)x^2, x > 0$ **8.** $S(V) = 6V^{2/3}, V > 0$
9. $r(A) = \sqrt{A/\pi}, A > 0$ **10.** $A(C) = C^2/(4\pi), C > 0$
11. $S(x) = 2x^2 + 240/x, x > 0$ **12.** $L(d) = \frac{5}{7}d$
13. $D(t) = 25t, t \geq 0$ **14.** $P(x) = 60x - x^2$
15. $A(b) = b\sqrt{4 - b}, 0 < b < 4$ **16.** $P(x) = (3 + \sqrt{5})x$