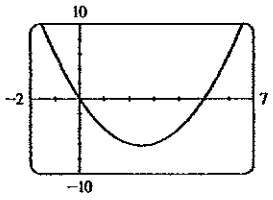
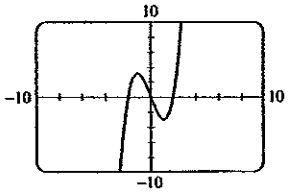
7. (a)



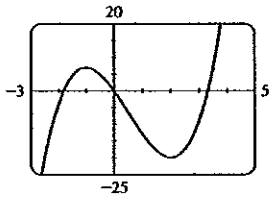
(b) Increasing on $[2.5, \infty)$; decreasing on $(-\infty, 2.5]$

8. (a)



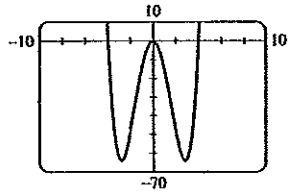
(b) Increasing on $(\infty, -1.15]$, $[1.15, \infty)$; decreasing on $[-1.15, 1.15]$

9. (a)



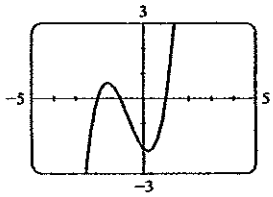
(b) Increasing on $(-\infty, -1]$, $[2, \infty)$; decreasing on $[-1, 2]$

10. (a)



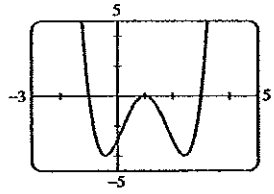
(b) Increasing on $[-2.83, 0]$, $[2.83, \infty)$; decreasing on $[-\infty, -2.83]$, $[0, 2.83]$

11. (a)



(b) Increasing on $(-\infty, -1.55]$, $[0.22, \infty)$; decreasing on $[-1.55, 0.22]$

12. (a)



(b) Increasing on $[-0.4, 1]$, $[2.4, \infty)$; decreasing on $(-\infty, -0.4]$, $[1, 2.4]$

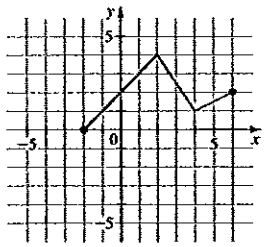
13. $\frac{2}{3}$ **14.** $-\frac{1}{2}$ **15.** $-\frac{4}{5}$ **16.** $\frac{2}{3}$ **17.** 3 **18.** $\frac{1}{2}$ **19.** 5
20. 6 **21.** 60 **22.** 21 **23.** $12 + 3h$ **24.** $-2 - h$
25. $-\dfrac{1}{a}$ **26.** $-\dfrac{2}{h+1}$ **27.** $\dfrac{-2}{a(a+h)}$
28. $\dfrac{1}{\sqrt{a+h}+\sqrt{a}}$
29. (a) $\frac{1}{2}$ **30.** (a) -4 **31.** (a) Increasing on $[0, 150]$, $[300, 365]$; decreasing on $[150, 300]$ (b) -0.25 ft/day
32. (a) Increasing on $[0, 25]$; decreasing on $[25, 50]$
(b) 0 (c) In this period the population increased the same amount as it decreased. **33.** (a) 245 persons/yr
(b) -328.5 persons/yr (c) 1997–2001 (d) 2001–2006
34. (a) 4.76 m/s (b) 2.68 m/s
(c) 6.25 m/s, 5.56 m/s, 5.00 m/s, 4.55 m/s, 3.92 m/s, 3.33 m/s, 2.78 m/s, 2.60 m/s; he is slowing down.
35. (a) 7.2 units/yr (b) 8 units/yr (c) -55 units/yr
(d) 2000–2001, 2001–2002

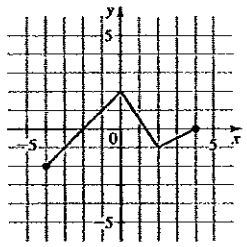
36.

Year	Number of Books
1980	420
1981	460
1982	500
1985	620
1990	820
1992	900
1995	1020
1997	1100
1998	1140
1999	1180
2000	1220

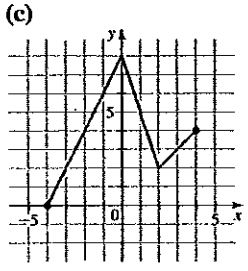
Section 3.4 ≡ page 428

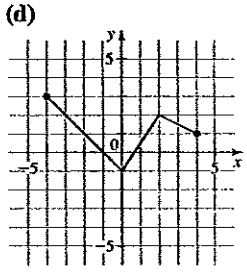
1. (a) Shift downward 5 units (b) Shift right 5 units
2. (a) Shift left 7 units (b) Shift up 7 units **3.** (a) Shift left $\frac{1}{2}$ unit (b) Shift up $\frac{1}{2}$ unit **4.** (a) Reflect in the x-axis (b) Reflect in the y-axis **5.** (a) Reflect in the x-axis and stretch vertically by a factor of 2 (b) Reflect in the x-axis and shrink vertically by a factor of $\frac{1}{2}$ **6.** (a) Reflect in the x-axis, then shift up 5 units (b) Stretch vertically by a factor of 3, then shift down 5 units **7.** (a) Shift right 4 units and upward $\frac{3}{4}$ unit (b) Shift left 4 units and downward $\frac{3}{4}$ unit
8. (a) Shift left 2 units, stretch vertically by a factor of 2, then shift down 2 units (b) Shift right 2 units, stretch vertically by a factor of 2, then shift up 2 units **9.** (a) Shrink horizontally by a factor of $\frac{1}{4}$ (b) Stretch horizontally by a factor of 4 **10.** (a) Shrink horizontally by a factor of $\frac{1}{2}$, then reflect in the x-axis (b) Shrink horizontally by a factor of $\frac{1}{2}$, then shift down 1 unit **11.** $g(x) = (x-2)^2$
12. $g(x) = x^3 + 3$ **13.** $g(x) = |x+1| + 2$
14. $g(x) = 2|x|$ **15.** $g(x) = -\sqrt{x+2}$
16. $g(x) = -(x-2)^2 + 1$ **17.** (a) 3 (b) 1 (c) 2 (d) 4 **18.** (a) 2 (b) 3 (c) 1 (d) 4
19. (a) (b)



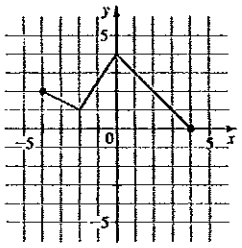


(c) (d)

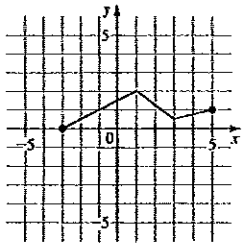




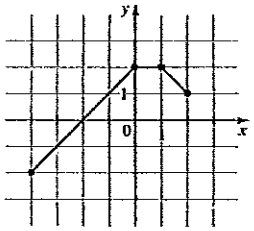
(e)



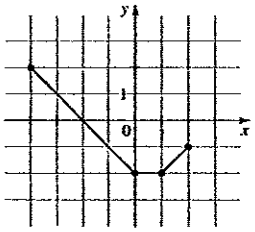
(f)



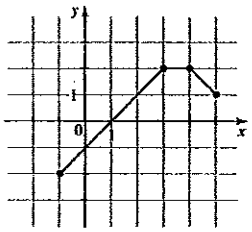
20. (a)



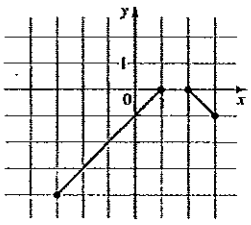
(b)



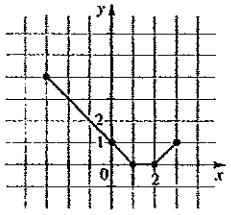
(c)



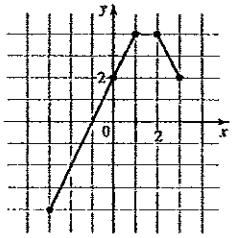
(d)



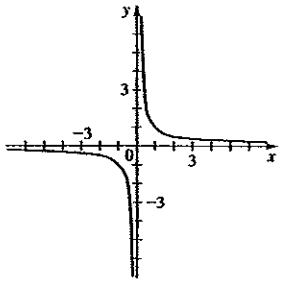
(e)



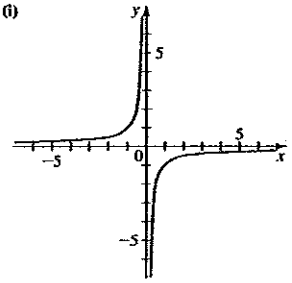
(f)



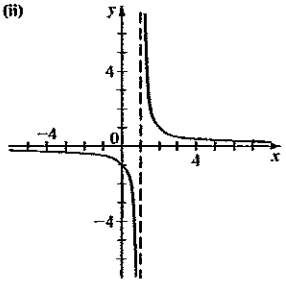
21. (a)



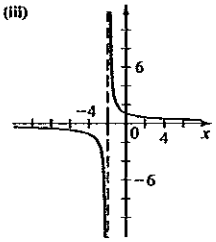
(b) (i)



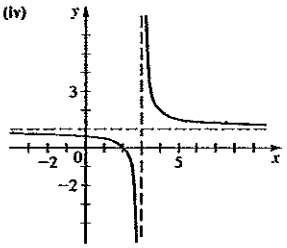
(ii)



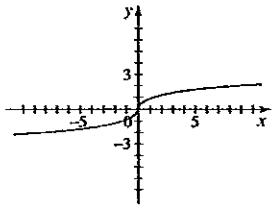
(iii)



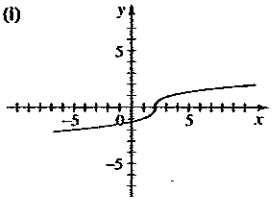
(iv)



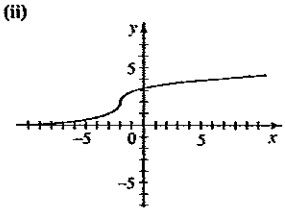
22. (a)



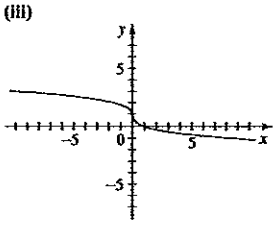
(b) (i)



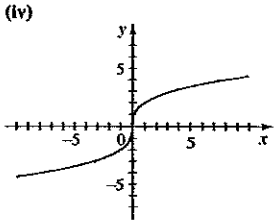
(ii)



(iii)



(iv)



23. (a) Shift left 2 units (b) Shift up 2 units

24. (a) Shift right 4 units (b) Shift down 4 units

25. (a) Stretch vertically by a factor of 2

(b) Shift right 2 units, then shrink vertically by a factor of $\frac{1}{2}$

26. (a) Stretch vertically by a factor of 3, then shift up 1 unit

(b) Shift left 1 unit, then reflect in the x-axis

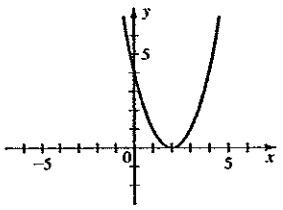
27. $g(x) = (x - 2)^2 + 3$ **28.** $g(x) = (x + 4)^3 - 1$

29. $g(x) = -5\sqrt{x + 3}$ **30.** $g(x) = \frac{1}{2}\sqrt[3]{-x} + \frac{3}{5}$

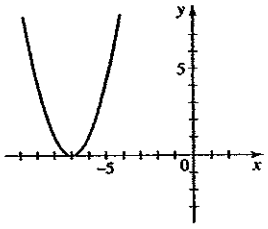
31. $g(x) = 0.1|x - \frac{1}{2}| - 2$

32. $g(x) = 3|x + 1| + 10$

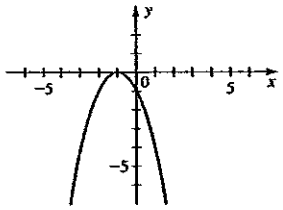
33.



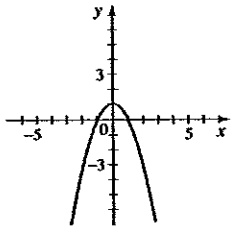
34.



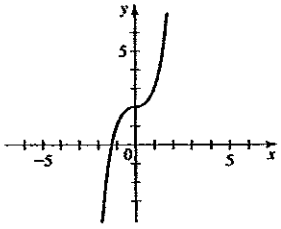
35.



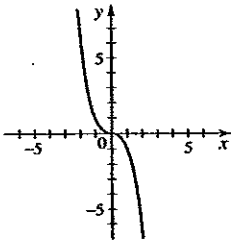
36.



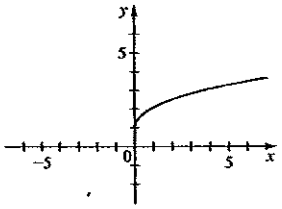
37.



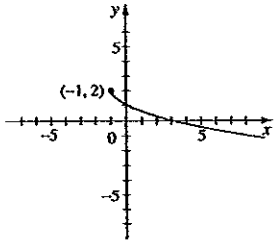
38.



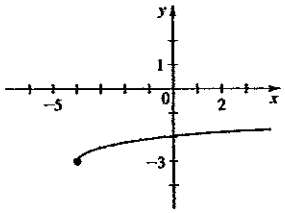
39.



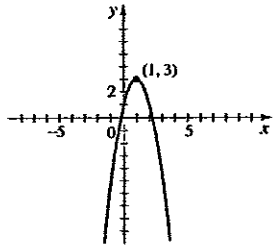
40.



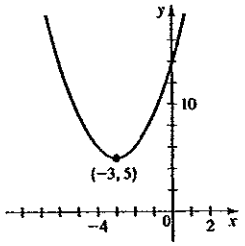
41.



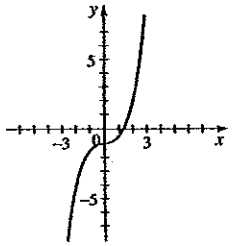
42.



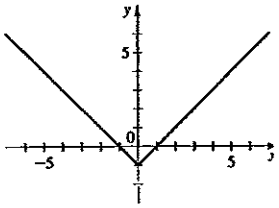
43.



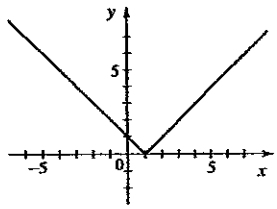
44.



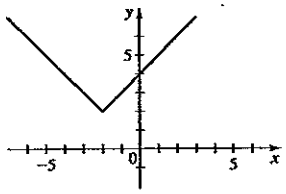
45.



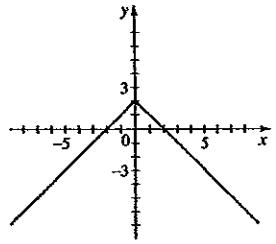
46.



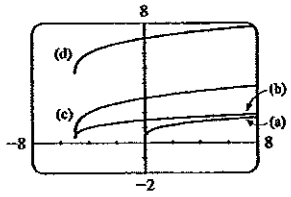
47.



48.

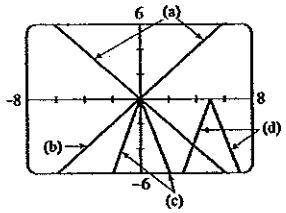


49.



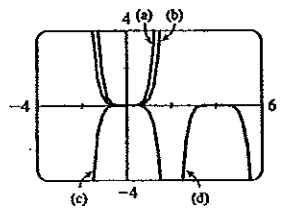
For part (b) shift the graph in (a) left 5 units; for part (c) shift the graph in (a) left 5 units and stretch vertically by a factor of 2; for part (d) shift the graph in (a) left 5 units, stretch vertically by a factor of 2, and then shift upward 4 units.

50.



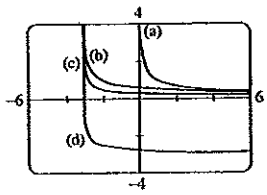
For (b), reflect in the x-axis; for (c), stretch vertically by a factor of 3 and reflect in the x-axis; for (d), shift right 5 units, stretch vertically by a factor of 3, and reflect in the x-axis.

51.



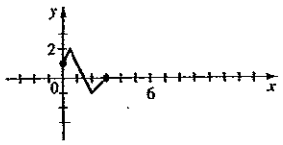
For part (b) shrink the graph in (a) vertically by a factor of $\frac{1}{3}$; for part (c) shrink the graph in (a) vertically by a factor of $\frac{1}{3}$ and reflect in the x-axis; for part (d) shift the graph in (a) right 4 units, shrink vertically by a factor of $\frac{1}{3}$, and then reflect in the x-axis.

52.

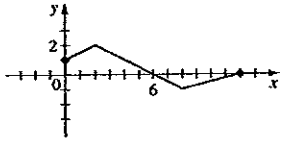


For (b), shift left 3 units; for (c), shift left 3 units and shrink vertically by a factor of $\frac{1}{2}$; for (d), shift left 3 units, shrink vertically by factor of $\frac{1}{2}$, and then shift down 3 units.

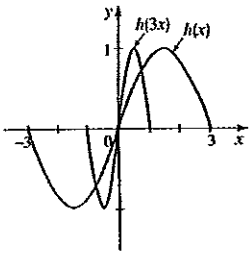
53. (a)



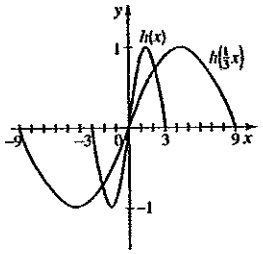
(b)



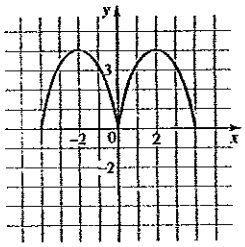
54. (a)



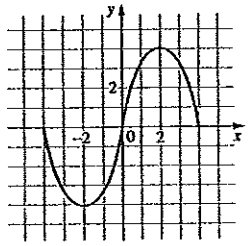
(b)



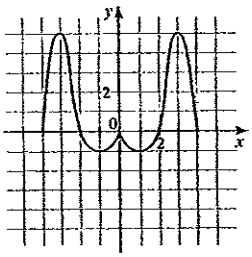
55. (a)



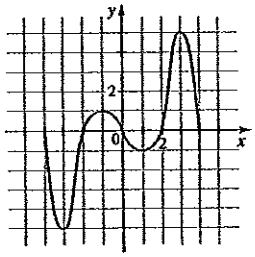
(b)



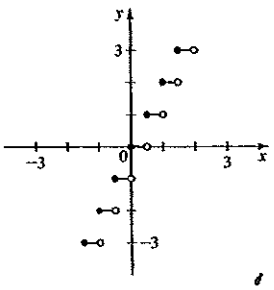
56. (a)



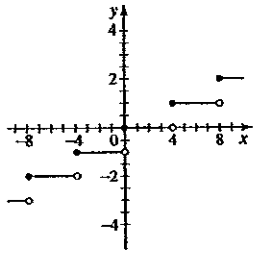
(b)



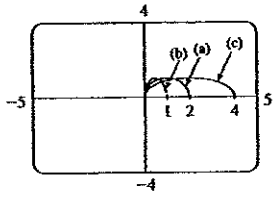
57.



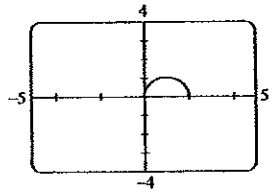
58.



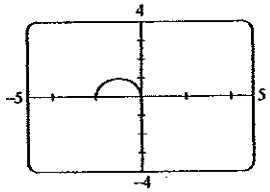
59.



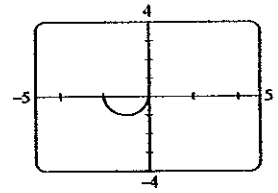
60. (a)



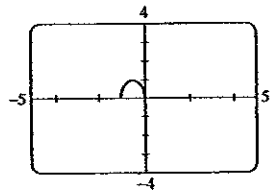
(b) Reflect in y-axis



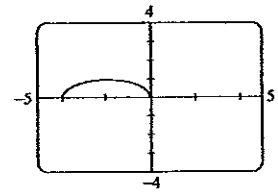
(c) Reflect in origin



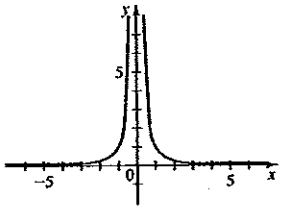
(d) Reflect in y-axis, then horizontally shrink by a factor of 2



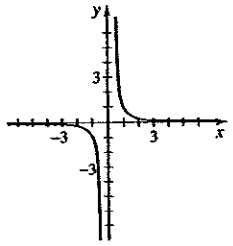
(e) Reflect in y-axis, then horizontally stretch by a factor of 2



61. Even

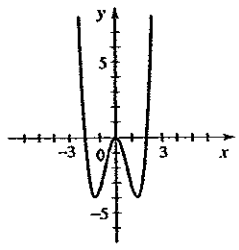


62. Odd

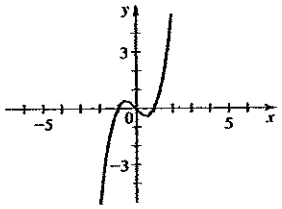


63. Neither

64. Even



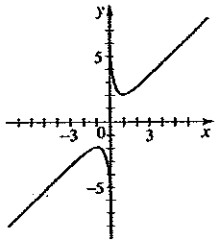
65. Odd



66. Neither

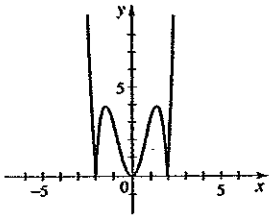
67. Neither

68. Odd

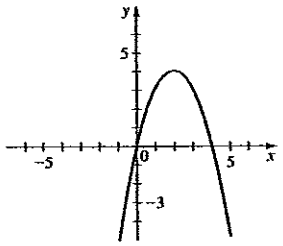


69. To obtain the graph of g, reflect in the x-axis the part of the graph of f that is below the x-axis.

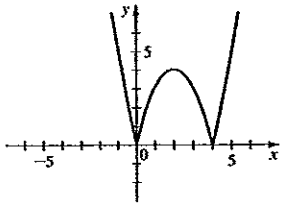
70.



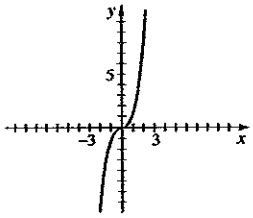
71. (a)



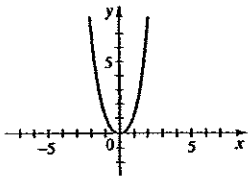
(b)



72. (a)



(b)



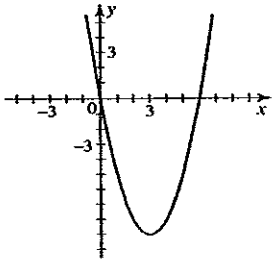
73. (a) Shift up 4 units, shrink vertically by a factor of 0.01
(b) Shift right 10 units; $g(t) = 4 + 0.01(t - 10)^2$

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; $F(t) = \frac{9}{10}t^2 + \frac{178}{5}$

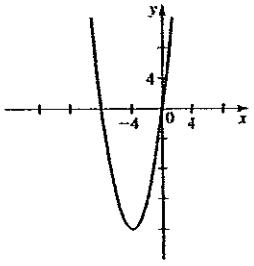
Section 3.5

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

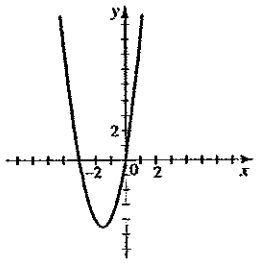
5. (a) $f(x) = (x - 3)^2 - 9$
(b) Vertex $(3, -9)$
x-intercepts 0, 6
y-intercept 0
(c)



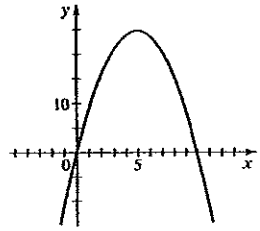
6. (a) $f(x) = (x + 4)^2 - 16$
(b) Vertex $(-4, -16)$
x-intercepts 0, -8
y-intercept 0
(c)



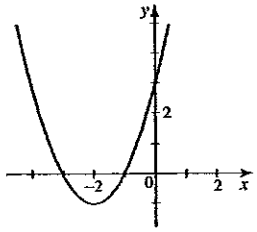
7. (a) $f(x) = 2(x + \frac{3}{2})^2 - \frac{9}{2}$
(b) Vertex $(-\frac{3}{2}, -\frac{9}{2})$
x-intercepts 0, -3,
y-intercept 0
(c)



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)