Math 102
E3 Preparation Part 1 Sections 3.3 to 3.4 v02
NO BOOK/ NO NOTES/YES CALCUATOR
Dressler Fall 2016

Name_____

Determine whether the given function is even, odd, or neither.

1) $f(x) = 4x^2 + 1$

1) _____

2) $f(x) = 5x^2 - 2$

2) _____

3) $f(x) = 3x^5 - 5x^3$

3) _____

4) $f(x) = 7x^5 - 9x^3$

4) _____

5) $f(x) = 5x^4 + 6x + 5$

5) _____

6) $f(x) = 4x^4 + 4x - 6$

6) _____

7) $f(x) = 7$

7) _____

8) $f(x) = -3$

8) _____

9) $f(x) = \dfrac{1}{x^2}$

9) _____

10) $f(x) = \dfrac{x}{x^2 - 3}$

10) _____

11) $f(x) = \dfrac{x}{x^2 - 4}$

11) _____

12) $f(x) = \dfrac{-x^3}{4x^2 - 7}$

12) _____

13) $f(x) = \dfrac{-x^3}{7x^2 + 2}$

13) _____

14)

x	−3	−2	−1	0	1	2	3
f(x)	−25.9	−19	−5.35	5	−5.35	−19	−25.9

14) _____

15)

x	−3	−2	−1	0	1	2	3
f(x)	−23.6	−13	−8.04	5	−8.04	−13	−23.6

15) _____

Use the graph of the function to find the following: a. the domain and range of the function; b. the intercepts, if any; c. the intervals on which the function is increasing, decreasing, or is constant; d. whether the function is even, odd, or neither.
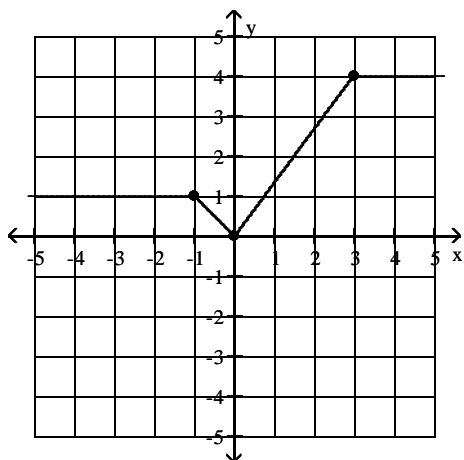
16)

16) _____
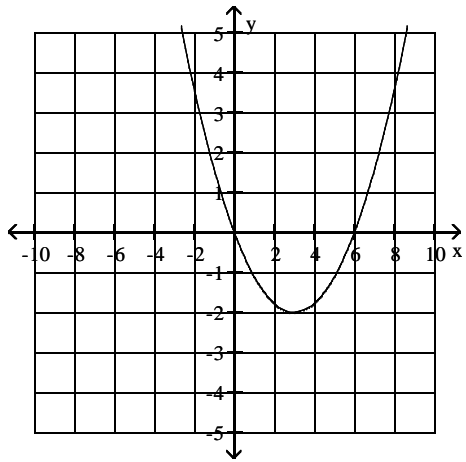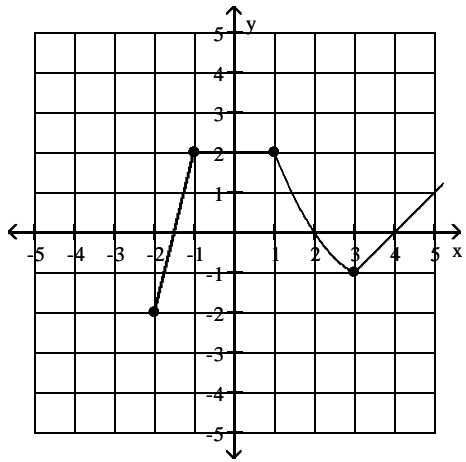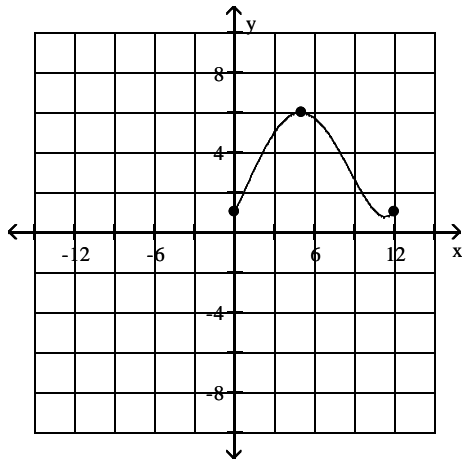
17)

17) _____

18)

19)
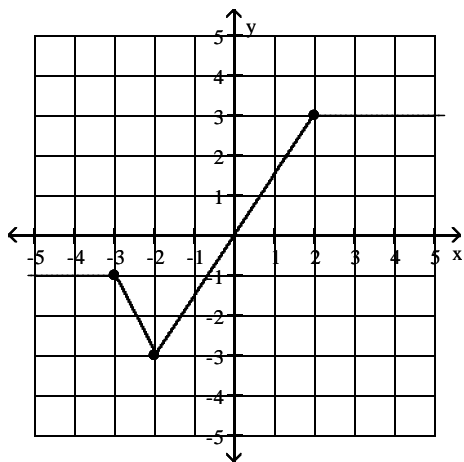
20)

Find the requested value.

21) Find f(10) for

$$f(x) = \begin{cases} 14, \text{ if } x < 7 \\ -14, \text{ if } x > 7 \end{cases}$$

22) Find f(8) for

$$f(x) = \begin{cases} 11, \text{ if } x < 2 \\ -11, \text{ if } x > 2 \end{cases}$$

23) Find f(1) for

$$f(x) = \begin{cases} 18, \text{ if } x < 0 \\ -18, \text{ if } x > 0 \end{cases}$$

24) Find f(-8) for

$$f(x) = \begin{cases} 6x, & \text{ if } x \le -1 \\ x - 4, & \text{ if } x > -1 \end{cases}$$

25) Find f(–1) for

$f(x) = \begin{cases} 3x, & \text{if } x \leq -1 \\ x - 7, & \text{if } x > -1 \end{cases}$

25) _____

26) Find f(–4) for

$f(x) = \begin{cases} 4x, & \text{if } x \leq -1 \\ x - 2, & \text{if } x > -1 \end{cases}$

26) _____

27) Find f(0) for

$f(x) = \begin{cases} x - 5, & \text{if } x < 6 \\ 8 - x, & \text{if } x \geq 6 \end{cases}$

27) _____

28) Find f(0) for

$f(x) = \begin{cases} x - 8, & \text{if } x < 4 \\ 5 - x, & \text{if } x \geq 4 \end{cases}$

28) _____

29) Find f(0) for

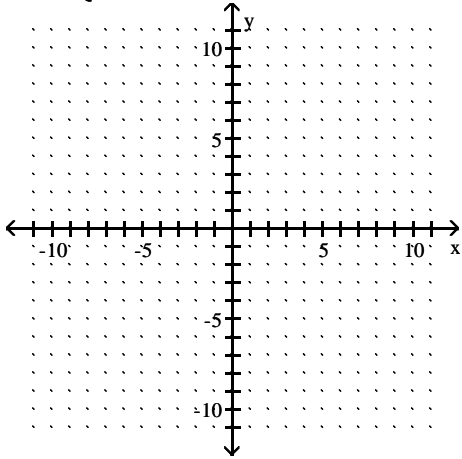$f(x) = \begin{cases} x - 7, & \text{if } x < 5 \\ 9 - x, & \text{if } x \geq 5 \end{cases}$

29) _____

Graph the function.

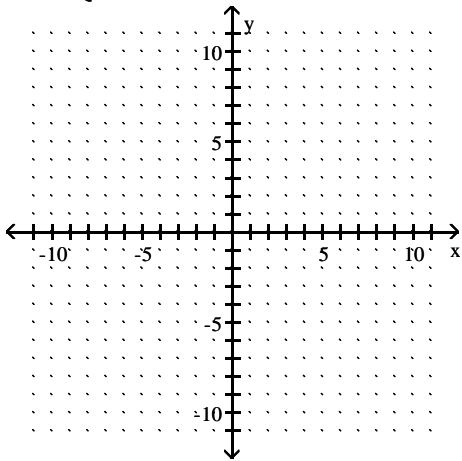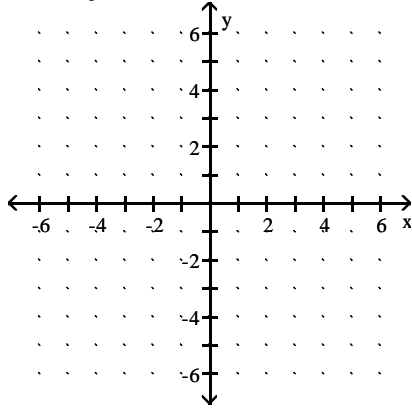30) $f(x) = \begin{cases} 3 & \text{if } x > 5 \\ -3 & \text{if } x \leq 5 \end{cases}$

30) _____

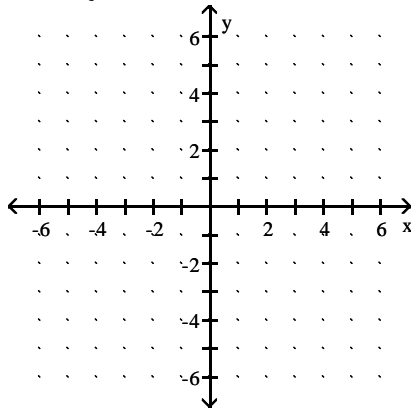31) $f(x) = \begin{cases} 5 & \text{if } x > 4 \\ -5 & \text{if } x \leq 4 \end{cases}$

31) _____

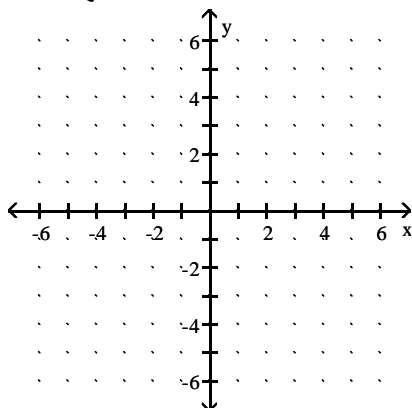32) $f(x) = \begin{cases} x - 3 & \text{if } x > 0 \\ -1 & \text{if } x \le 0 \end{cases}$

32) _____

33) $f(x) = \begin{cases} x + 5 & \text{if } x > 0 \\ 2 & \text{if } x \le 0 \end{cases}$

33) _____

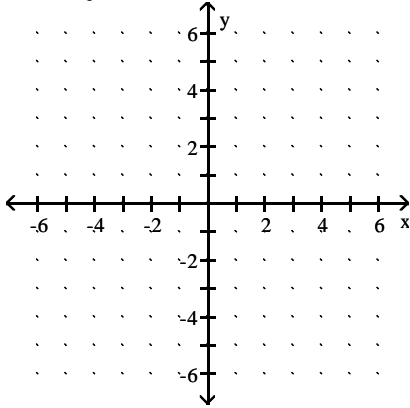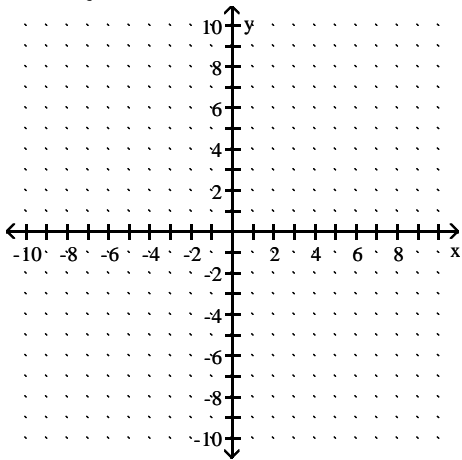34) $f(x) = \begin{cases} 2 & \text{if } x \ge 1 \\ -5 - x & \text{if } x < 1 \end{cases}$

34) _____

35) $f(x) = \begin{cases} 1 & \text{if } x \ge 1 \\ -3 - x & \text{if } x < 1 \end{cases}$

35) _____
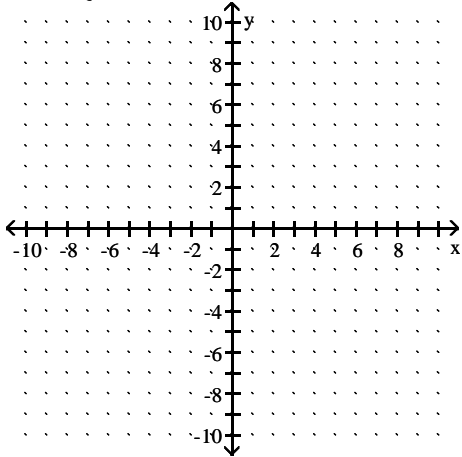
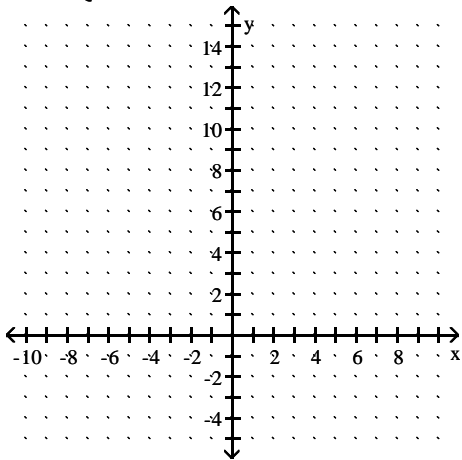36) $f(x) = \begin{cases} |x| & \text{if } x \le 1 \\ x^2 & \text{if } x > 1 \end{cases}$

36) _____

37) $f(x) = \begin{cases} |x| & \text{if } x \le -1 \\ x^2 & \text{if } x > -1 \end{cases}$

37) _____
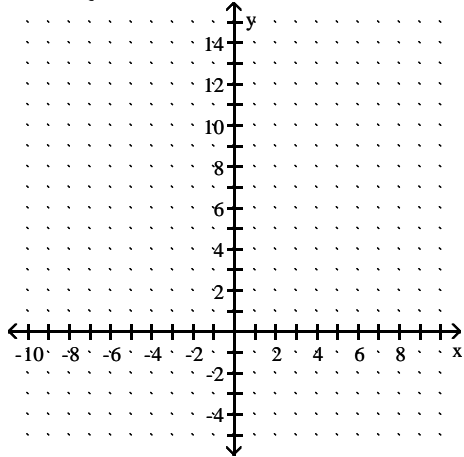
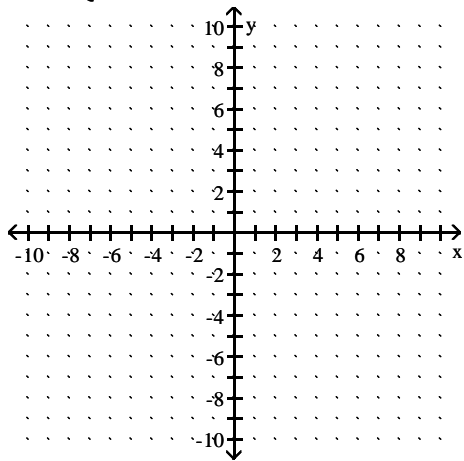38) $f(x) = \begin{cases} |x| & \text{if } x \le -3 \\ x^2 & \text{if } x > -3 \end{cases}$

38) _____

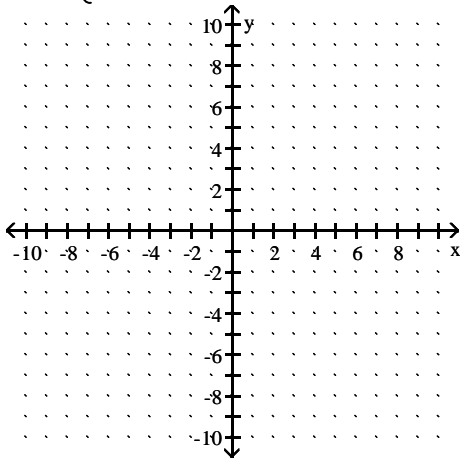39) $f(x) = \begin{cases} |x| & \text{if } x \le 3 \\ x^2 & \text{if } x > 3 \end{cases}$

39) _____

40) $f(x) = \begin{cases} x^3 & \text{if } x \le 1 \\ \sqrt[3]{x} & \text{if } x > 1 \end{cases}$

40) _____
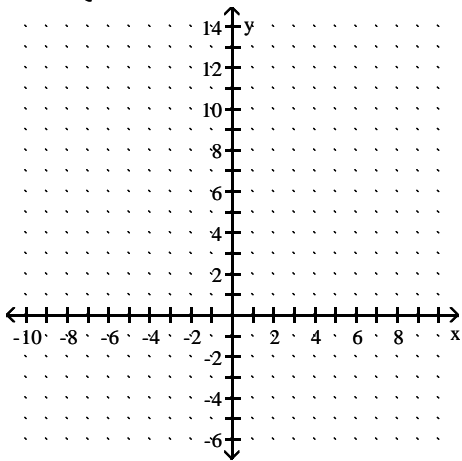
41) $f(x) = \begin{cases} x^3 & \text{if } x \le -1 \\ \sqrt[3]{x} & \text{if } x > -1 \end{cases}$

41) _____

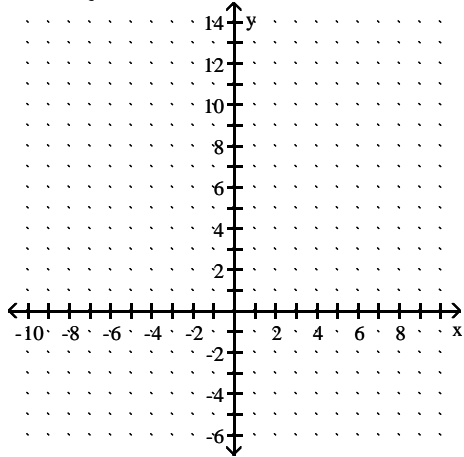42) $f(x) = \begin{cases} x^2 & \text{if } -1 < x \le 2 \\ x & \text{if } x > 2 \end{cases}$
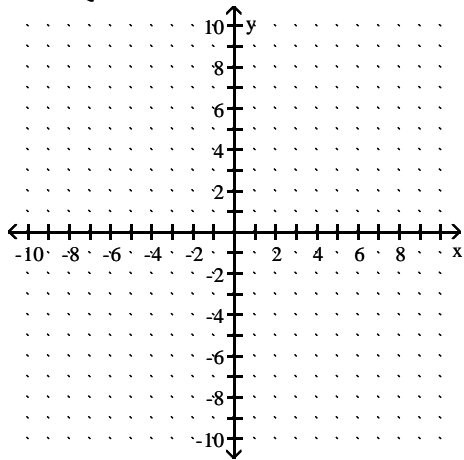
42) _____

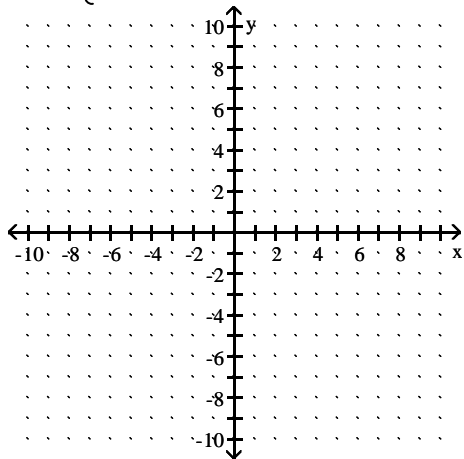43) $f(x) = \begin{cases} x^2 & \text{if } -2 < x \leq 2 \\ x & \text{if } x > 2 \end{cases}$

43) _____

44) $f(x) = \begin{cases} |x| & \text{if } x \leq 0 \\ x^2 & \text{if } 0 < x \leq 3 \end{cases}$

44) _____

45) $f(x) = \begin{cases} |x| & \text{if } x \le 0 \\ x^2 & \text{if } 0 < x \le 2 \end{cases}$

45) _____

Find the average rate of change of the function as x changes from a to b.

46) $f(x) = -3x + 7$; $a = -2$, $b = 3$

46) _____

47) $g(x) = 2x - 6$; $a = -3$, $b = 2$

47) _____

48) $h(x) = 3x^2$; $a = 3$, $b = 8$

48) _____

49) $f(x) = x^2 - 5$; $a = 1$, $b = 3$

49) _____

50) $g(x) = 2 - x^2$; $a = -1$, $b = 8$

50) _____

51) $h(x) = (8 - x)^2$; $a = 3$, $b = 4$

51) _____

52) $g(x) = (x - 4)^2$; $a = 4$, $b = 7$

52) _____

53) $f(x) = -x^3$; $a = 1$, $b = 2$

53) _____

54) $h(x) = \dfrac{3}{x}$; $a = -5$, $b = 2$

54) _____

55) $g(x) = \dfrac{3}{x + 2}$; $a = 2$, $b = 7$

55) _____

Compute $\dfrac{f(x + h) - f(x)}{h}$ ($h \neq 0$) for the given function.

56) $f(x) = 3x - 10$

56) _____

57) $f(x) = 6x - 5$

57) _____

58) $f(x) = 5x^2 + 2x$

58) _____

59) $f(x) = 7x^2 + 4x$

59) _____

60) $f(x) = \dfrac{1}{8x}$

60) _____

61) $f(x) = \dfrac{1}{2x}$

61) _____

Solve the problem.

62) If an object is dropped off of a tower, the velocity, V, of the object after t seconds can be obtained by multiplying t by 32 and adding 10 to the result. Express V as a linear function of t.

62) _____

63) If an object is dropped from a tower, then the velocity, V (in feet per second), of the object after t seconds can be obtained by multiplying t by 32 and adding 10 to the result. Find V as a linear function of t, and use this function to evaluate V(1.8), the velocity of the object at time t = 1.8 seconds.

63) _____

64) Assume that the sales of a certain appliance dealer are approximated by a linear function. Suppose that sales were $15,000 in 1982 and $61,500 in 1987. Let x = 0 represent 1982. Find the equation giving yearly sales S(x).

64) _____

65) The charges for renting a moving van are $50 for the first 30 miles and $8 for each additional mile. Assume that a fraction of a mile is rounded up. Find a symbolic representation for a function f that computes the cost of driving the van x miles, where $0 < x \le 100$. (Hint: express f as a piecewise–constant function.) Then, determine the cost of driving the van 91 miles.

65) _____

66) Sketch a graph showing the mileage that a person is from home after x hours if that individual drives at 32.5 mph to a lake 65 miles away, stays at the lake 1.5 hours, and then returns home at a speed of 65 mph.

66) _____

67) The table lists the average composite scores on a national entrance exam for selected years. 67) _____

Year	1980	1982	1984	1986	1988	1990	1992
Score	122.7	131.5	131.5	129.5	133.9	132.0	130.0

Make a line graph of the data. If the graph represents a piecewise–linear function f, find a symbolic representation for the piece of f located on the interval [1982, 1984].

68) The table lists the average composite scores on a national entrance exam for selected years. 68) _____

Year	1982	1984	1986	1988	1990	1992	1994
Score	122.7	131.5	131.5	129.5	133.9	132.0	130.0

Evaluate f(1989).

69) In Country X, the average hourly wage in dollars from 1945 to 1995 can be modeled by 69) _____

$$f(x) = \begin{cases} 0.071(x - 1945) + 0.35 & \text{if } 1945 \le x < 1970 \\ 0.188(x - 1970) + 3.03 & \text{if } 1970 \le x \le 1995 \end{cases}$$

Use f to estimate the average hourly wages in 1950, 1970, and 1990.

Describe the transformations that produce the graph of g from the graph of f.

70) $f(x) = |x|$; $g(x) = -9|x|$ 70) _____

71) $f(x) = |x|$; $g(x) = -5|x|$ 71) _____

72) $f(x) = \sqrt{x}$; $g(x) = -\sqrt{x + 10}$ 72) _____

73) $f(x) = \sqrt{x}$; $g(x) = -\sqrt{x + 9}$ 73) _____

74) $f(x) = x^2$; $g(x) = (x - 1)^2 - 8$ 74) _____

75) $f(x) = x^2$; $g(x) = (x - 7)^2 - 3$ 75) _____

76) $f(x) = x^3$; $g(x) = -2x^3 + 1$ 76) _____

77) $f(x) = x^3$; $g(x) = -5x^3 + 7$ 77) _____

78) $f(x) = \dfrac{1}{x}$; $g(x) = \dfrac{6}{x} + 11$ 78) _____

79) $f(x) = \dfrac{1}{x}$; $g(x) = \dfrac{9}{x} + 3$ 79) _____

80) $f(x) = \dfrac{1}{x}$; $g(x) = \dfrac{1}{x + 5} - 6$ 80) _____

81) $f(x) = \dfrac{1}{x}$; $g(x) = \dfrac{1}{x + 2} - 4$ 81) _____

82) $f(x) = x^2$; $g(x) = -(x - 11)^2 + 11$ 82) _____

83) $f(x) = x^2$; $g(x) = -(x - 3)^2 + 12$ 83) _____

Graph the function by starting with a function from the library of functions and then using the techniques of shifting, compressing, stretching, and/or reflecting.

84) $g(x) = x^2 - 2$ 84) _____
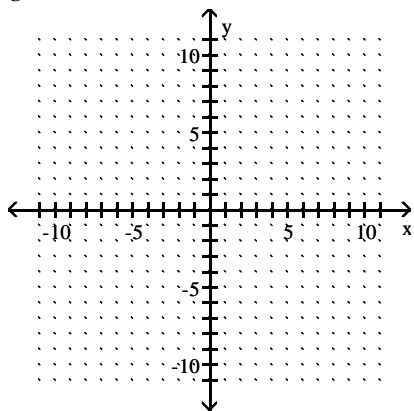
Write an equation for a function whose graph fits the given description.

85) The graph of $f(x) = x^2$ is vertically stretched by a factor of 3, and the resulting graph is reflected across the x–axis.   85) _____

86) The graph of $f(x) = x^2$ is vertically stretched by a factor of 5, and the resulting graph is reflected across the x–axis.   86) _____

87) The graph of $f(x) = x^2$ is shifted 6 units to the left and 3 units downward.   87) _____

88) The graph of $f(x) = x^2$ is shifted 4 units to the left and 5 units downward.   88) _____

89) The graph of $f(x) = x^2$ is shifted 2 units to the left. This graph is then vertically stretched by a factor of 6 and reflected across the x–axis. Finally, the graph is shifted 8 units downward.

89) _____

90) The graph of $f(x) = x^2$ is shifted 4 units to the left. This graph is then vertically stretched by a factor of 5 and reflected across the x–axis. Finally, the graph is shifted 7 units downward.

90) _____

91) The graph of $f(x) = x^2$ is shifted 4 units to the left. This graph is then vertically shrunk by a factor of $\frac{1}{5}$ and reflected across the x–axis. Finally, the graph is shifted 8 units downward.

91) _____

92) The graph of $f(x) = x^2$ is shifted 4 units to the left. This graph is then vertically shrunk by a factor of $\frac{1}{6}$ and reflected across the x–axis. Finally, the graph is shifted 7 units downward.

92) _____

93) The graph of $f(x) = |x|$ is vertically stretched by a factor of 6, and the resulting graph is reflected across the x–axis.

93) _____

94) The graph of $f(x) = |x|$ is vertically stretched by a factor of 3, and the resulting graph is reflected across the x–axis.

94) _____

95) The graph of $f(x) = |x|$ is reflected across the y–axis. This graph is then vertically stretched by a factor of 2.2. Finally, the graph is shifted 4 units downward.

95) _____

96) The graph of $f(x) = |x|$ is reflected across the y–axis. This graph is then vertically stretched by a factor of 2.5. Finally, the graph is shifted 2 units downward.

96) _____

97) The graph of $f(x) = |x|$ is reflected across the y-axis and vertically shrunk by a factor of $\frac{1}{5}$.   97) _____

     This graph is then reflected across the x-axis. Finally, the graph is shifted 4 units upward.

98) The graph of $f(x) = |x|$ is reflected across the y-axis and vertically shrunk by a factor of $\frac{2}{3}$.   98) _____

     This graph is then reflected across the x-axis. Finally, the graph is shifted 4 units upward.

99) The graph of $f(x) = \sqrt{x}$ is shifted 3 units to the right.   99) _____

100) The graph of $f(x) = \sqrt{x}$ is shifted 6 units to the right.   100) _____

101) The graph of $f(x) = \sqrt{x}$ is shifted 4 units to the left and then shifted 9 units upward.   101) _____

102) The graph of $f(x) = \sqrt{x}$ is shifted 8 units to the left and then shifted 7 units upward.   102) _____

103) The graph of $f(x) = x^4$ shifted right 3 units and up 5 units.   103) _____

104) The graph of $f(x) = x^4$ shifted right 5 units and up 3 units.   104) _____

Graph the function by starting with a function from the library of functions and then using the techniques of shifting, compressing, stretching, and/or reflecting.

105) $g(x) = (x - 3)^2 - 6$

105) _____
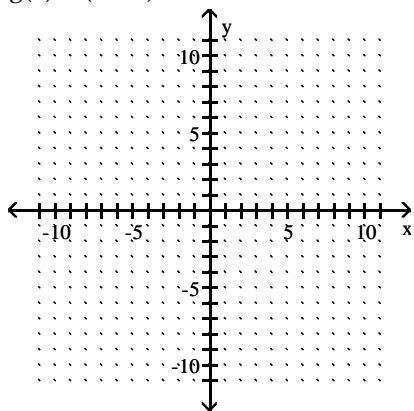
106) $g(x) = -4(x + 3)^2 + 5$

106) _____
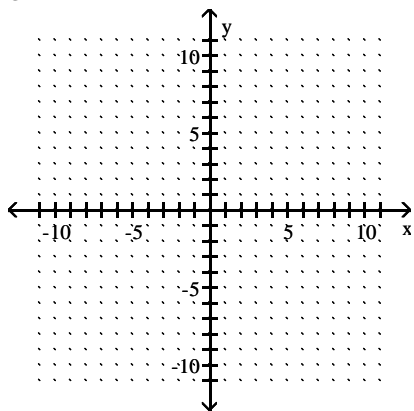
107) $g(x) = -4|x|$

107) _____
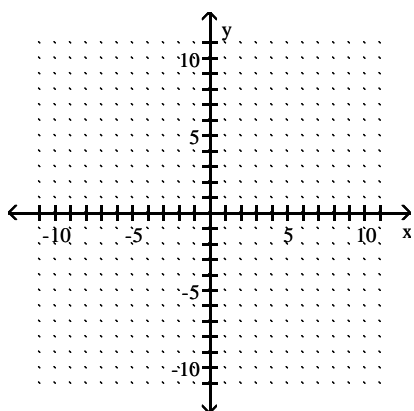
108) $g(x) = \frac{1}{4}| x + 6 | - 5$

108) _____
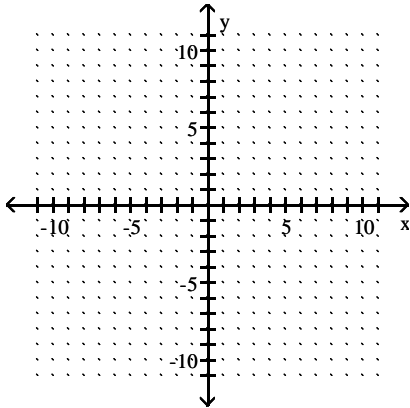
109) $g(x) = | x - 2 |$

109) _____
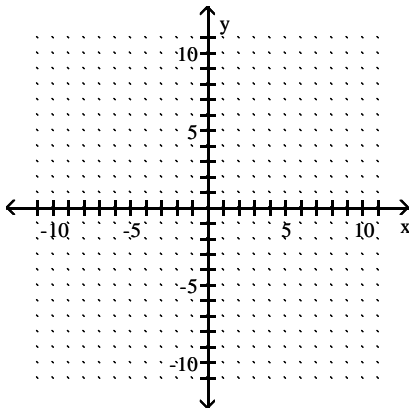
110) $g(x) = (x + 2)^3$

110) _____
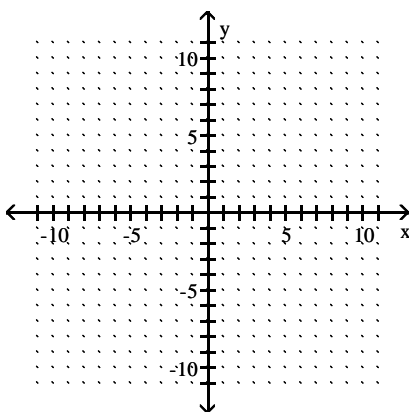
111) $g(x) = -\sqrt{x + 1} - 2$

111) _____
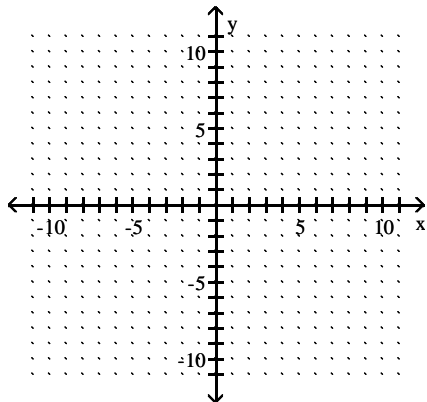
Graph the function y = g(x), given the graph of y = f(x).

112) $g(x) = 2f(x)$

112) _____
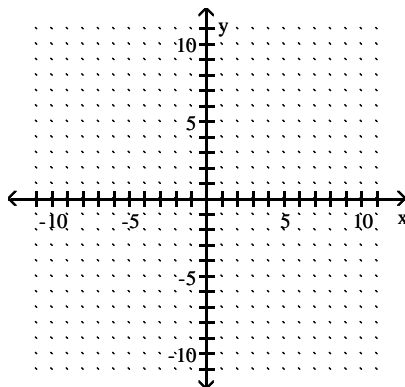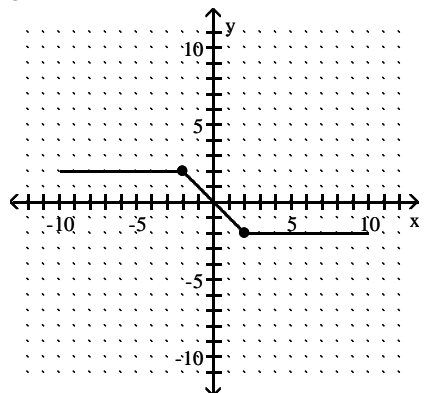
Write the new function.

113) The linear function $f(x) = 223x + 6320$ provides an approximation of the annual cost (in dollars) to rent an apartment at the Leisure Village Retirement Community, where $x = 1$ represents 1975, $x = 2$ represents 1976, and so on. Write a new function, $g(x)$, that yields the same $f(x)$–values when the exact year number is entered.

113) _____

114) The linear function $f(x) = 225x + 6320$ provides an approximation of the annual cost (in dollars) to rent an apartment at the Leisure Village Retirement Community, where $x = 1$ represents 1980, $x = 2$ represents 1981, and so on. Write a new function, $g(x)$, that yields the same $f(x)$–values when the exact year number is entered.

114) _____

115) The linear function f(x) = 223x + 6320 provides an approximation of the annual cost (in dollars) to rent an apartment at the Leisure Village Retirement Community, where x = 1 represents 1990, x = 2 represents 1991, and so on. Write a new function, g(x), that yields the same f(x)–values when the exact year number is entered.

115) _____

116) The linear function f(x) = 72.38x + 1034 provides an approximation of the value (in dollars) of an account opened on January 1, 1993, in the amount of $1034 and earning 7% simple interest, where x = 0 represents January 1, 1993, x = 1 represents January 1, 1994, x = 2 represents January 1, 1995, and so on. Write a new function, g(x), that yields the same f(x)–values when the exact year number is entered.

116) _____

117) The linear function f(x) = 84x + 1200 provides an approximation of the value (in dollars) of an account opened on January 1, 1997, in the amount of $1200 and earning 7% simple interest, where x = 0 represents January 1, 1997, x = 1 represents January 1, 1998, x = 2 represents January 1, 1999, and so on. Write a new function, g(x), that yields the same f(x)–values when the exact year number is entered.

117) _____

118) The linear function f(x) = 460x + 3420 provides an approximation of the annual cost (in dollars) of health insurance for a family of three, where x = 1 represents 1989, x = 2 represents 1990, and so on. Write a new function, g(x), that yields the same f(x)–values when the exact year number is entered.

118) _____

119) The linear function f(x) = 458x + 3420 provides an approximation of the annual cost (in dollars) of health insurance for a family of three, where x = 1 represents 1982, x = 2 represents 1983, and so on. Write a new function, g(x), that yields the same f(x)–values when the exact year number is entered.

119) _____

Graph the function y = g(x), given the graph of y = f(x).

120) $g(x) = -\dfrac{1}{2}f(x)$

120) _____
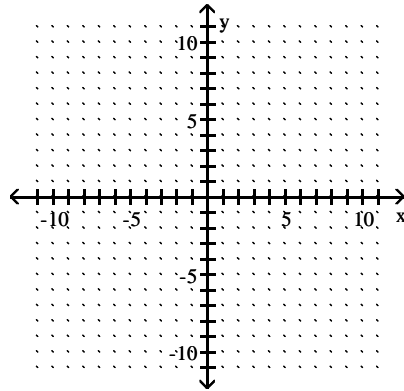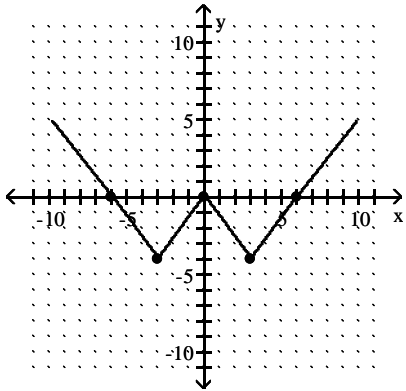
121) $g(x) = f(2x)$

121) _____
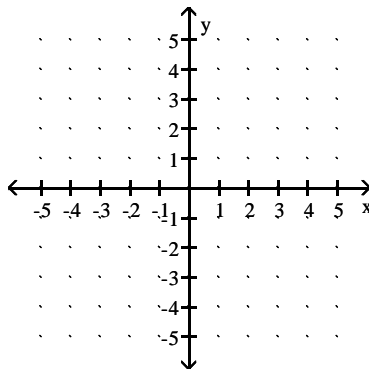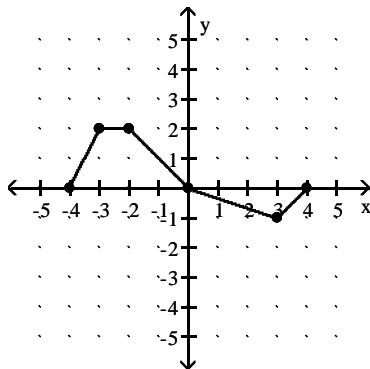
122) $g(x) = f\left(-\dfrac{1}{2}x\right)$

122) _____
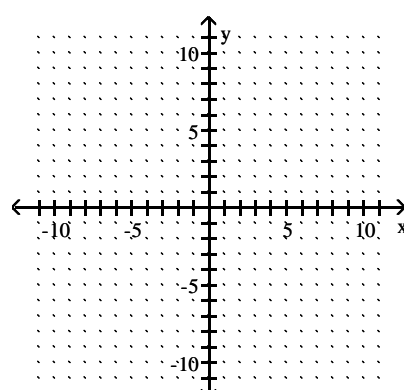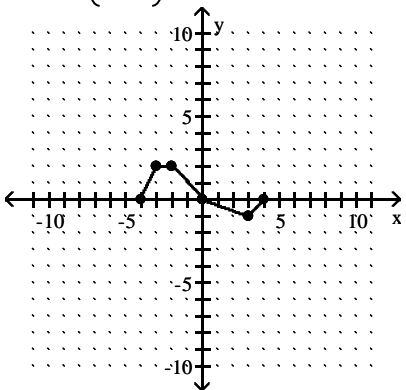
123) $g(x) = -2f(x + 1) - 3$

123) _____

124) $g(x) = \frac{1}{2}f(x - 1) + 3$

124) _____
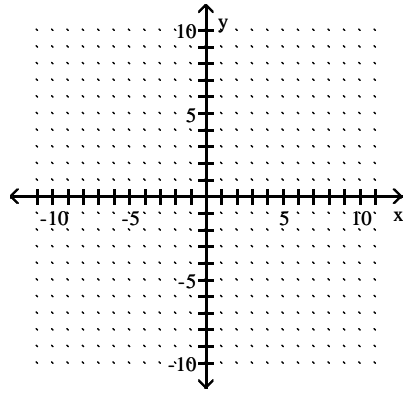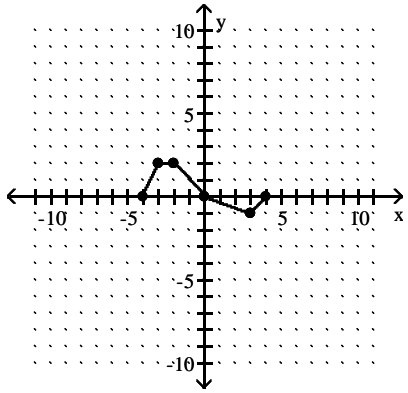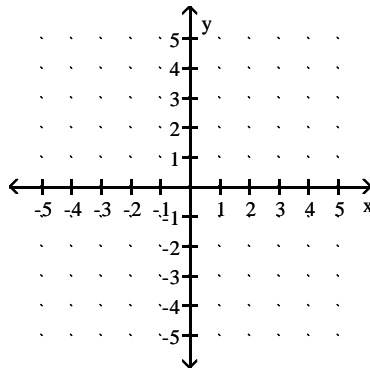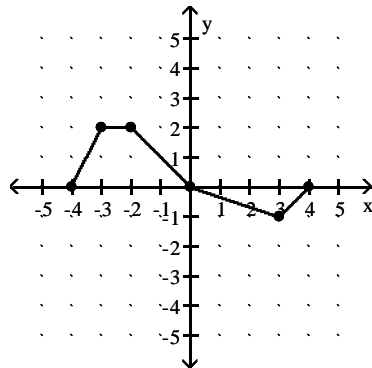
1) Even
2) Even
3) Odd
4) Odd
5) Neither
6) Neither
7) Even
8) Even
9) Even
10) Odd
11) Odd
12) Odd
13) Odd
14) Even
15) Even
16) a. Domain: $(-\infty, \infty)$; Range: $[-3:3]$
   b. x–intercept: 0; y–intercept: 0
   c. constant on $(-\infty, -3)$, decreasing on $(-3,-2)$, increasing on $(-2,2)$, constant on $(2, \infty)$
   d. Neither even nor odd.
17) a. Domain: $(-\infty, \infty)$; Range: $[0:4]$
   b. x–intercept: 0; y–intercept: 0
   c. constant on $(-\infty, -1)$, decreasing on $(-1, 0)$, increasing on $(0, 3)$, constant on $(3, \infty)$
   d. Neither even nor odd.
18) a. Domain: $(-\infty, \infty)$; Range: $[-2, \infty)$
   b. x–intercepts: 0, 6; y–intercept: 0
   c. decreasing on $(-\infty, 3)$, increasing on $(3, \infty)$
   d. Neither even nor odd.
19) a. Domain: $[-2, \infty)$; Range: $[-2, \infty)$
   b. x–intercepts: $-\dfrac{3}{2}$, 2, 4; y–intercept: 2

   c. increasing on $(-2, -1)$, constant on $(-1, 1)$, decreasing on $(1, 3)$, increasing on $(3, \infty)$
   d. Neither even nor odd.
20) a. Domain: $[0, 12]$; Range: $[1:6]$
   b. x–intercept: none; y–intercept: 1
   c. increasing on $(0, 5)$, decreasing on $(5, 12)$
   d. Neither even nor odd.
21) –14
22) –11
23) –18
24) –48
25) –3
26) –16
27) –5
28) –8
29) –7
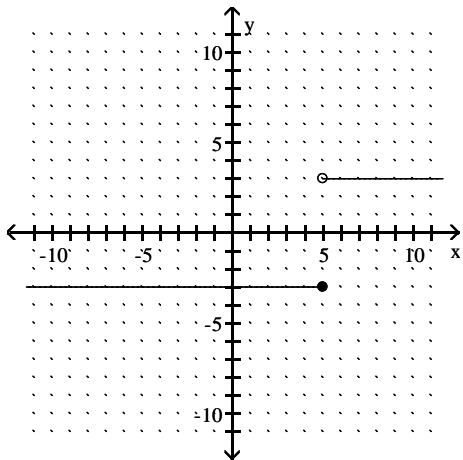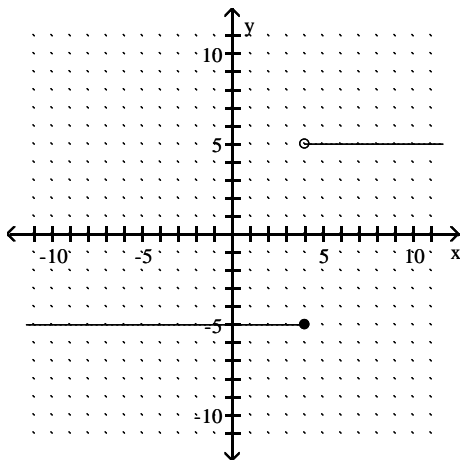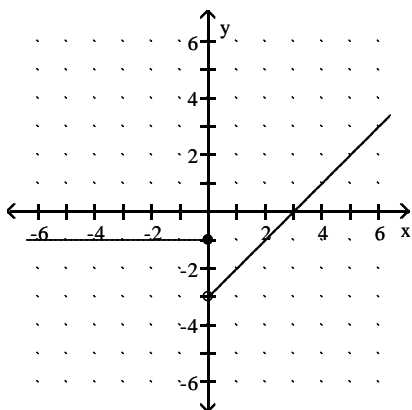
30)

31)

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44)
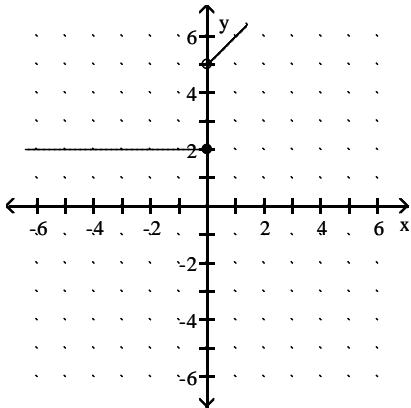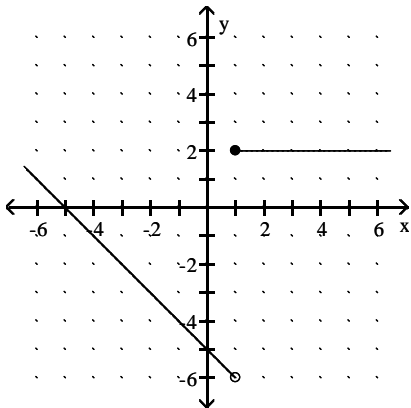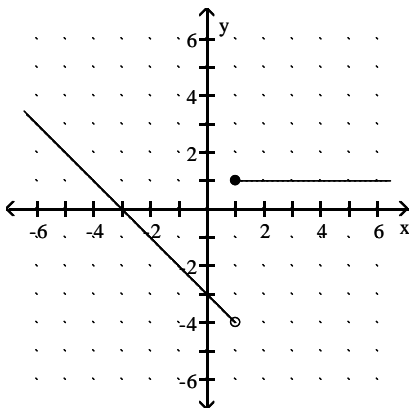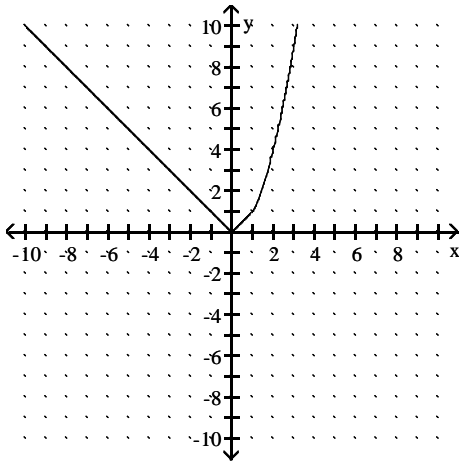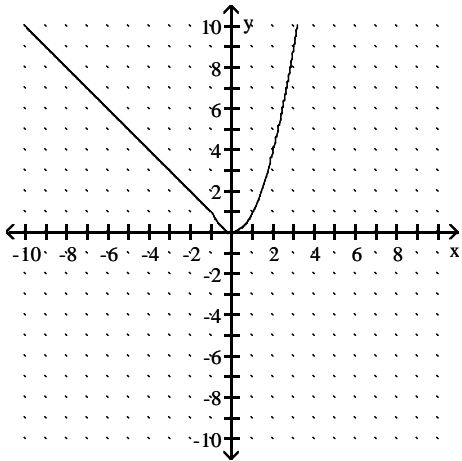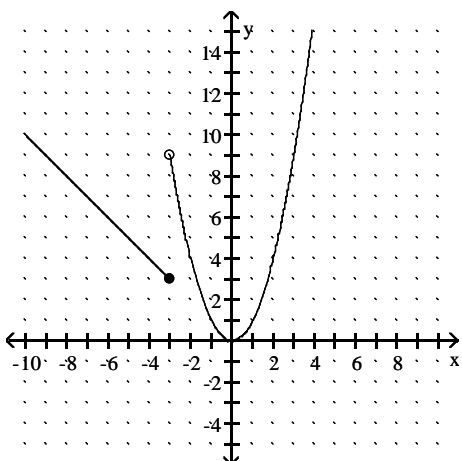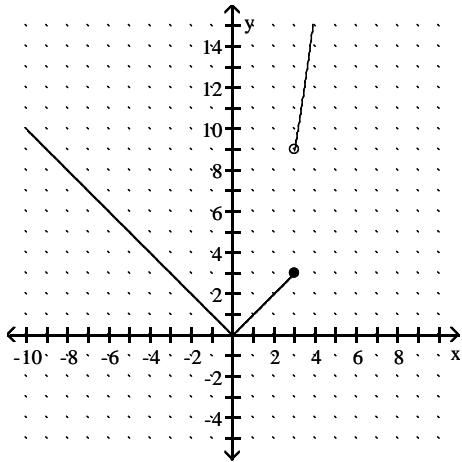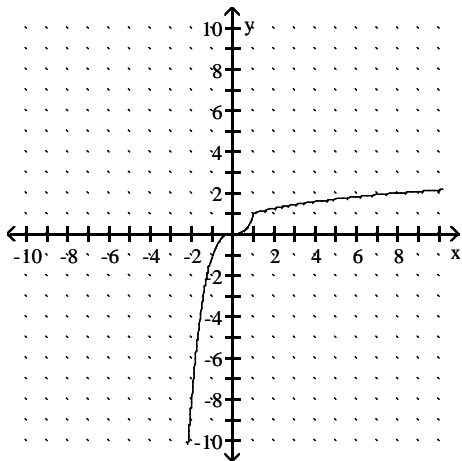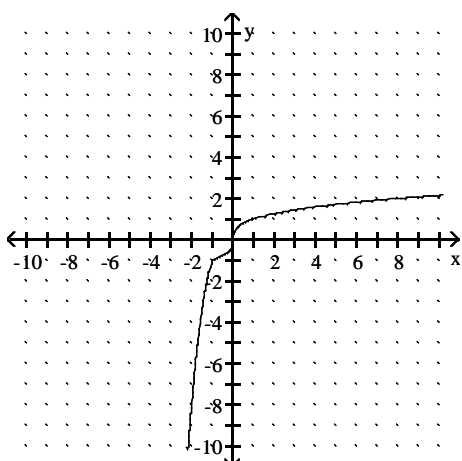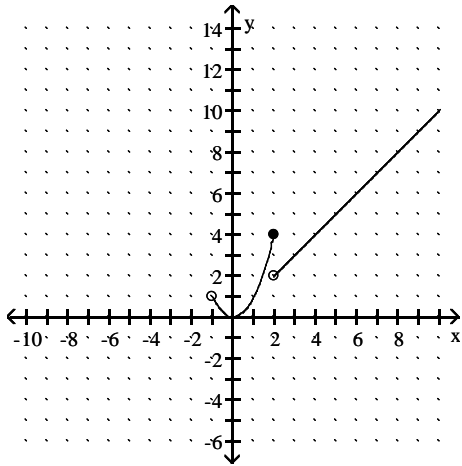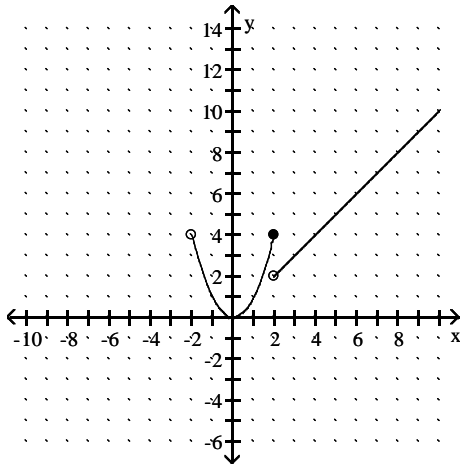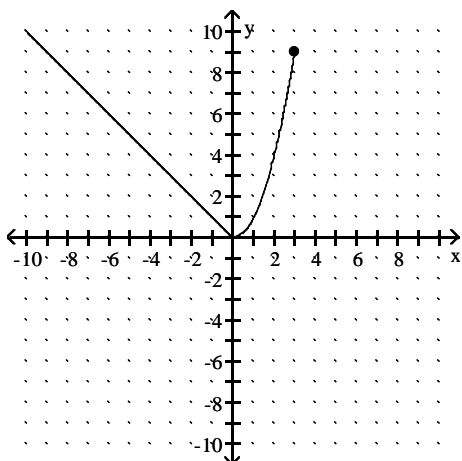
45)
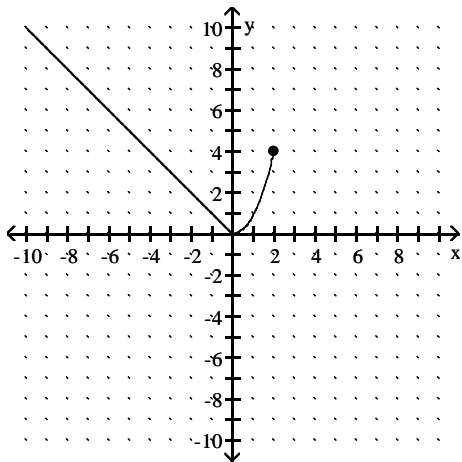
46) –3

47) 2

48) 33

49) 4

50) –7

51) –9

52) 3

53) –7

54) $\dfrac{3}{10}$

55) $-\dfrac{1}{12}$

56) 3

57) 6

58) $10x + 5h + 2$

59) $14x + 7h + 4$

60) $\dfrac{-1}{8x\,(x+h)}$

61) $\dfrac{-1}{2x\,(x+h)}$
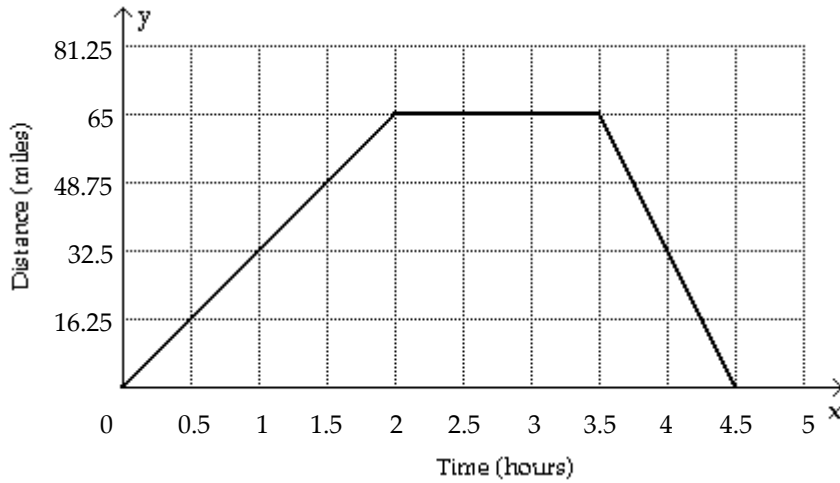
62) $V(t) = 32t + 10$

63) $V(1.8) = 67.6$ ft/sec

64) $S(x) = 9300x + 15{,}000$

65) $f(x) = \begin{cases} 50 & \text{if } 0 < x \le 30 \\ 50 + 8(x - 30) & \text{if } 30 < x \le 100 \end{cases}$; \$538

66)

67) f(x) = 131.5 if 1982 ≤ x ≤ 1984
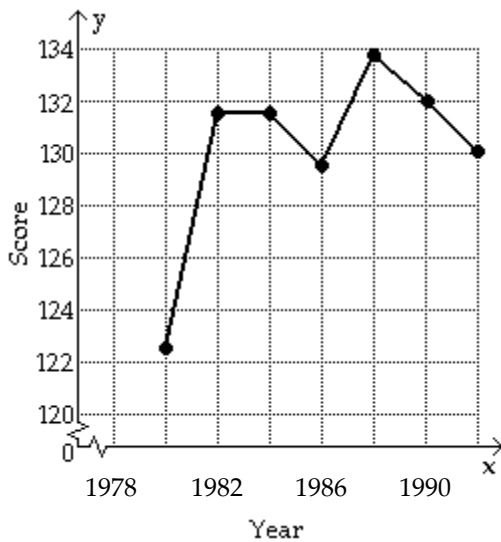
68) 131.7
69) $0.71, $3.03, $6.79
70) Stretch vertically by a factor of 9. Reflect it across the x–axis.
71) Stretch vertically by a factor of 5. Reflect it across the x–axis.
72) Shift 10 units to the left. Reflect it across the x–axis.
73) Shift 9 units to the left. Reflect it across the x–axis.
74) Shift 1 units to the right and 8 units downward.
75) Shift 7 units to the right and 3 units downward.
76) Stretch vertically by a factor of 2. Reflect it across the x–axis. Shift it 1 units upward.
77) Stretch vertically by a factor of 5. Reflect it across the x–axis. Shift it 7 units upward.
78) Stretch vertically by a factor of 6. Shift it 11 units up.
79) Stretch vertically by a factor of 9. Shift it 3 units up.
80) Shift it 5 units to the left and 6 units down.
81) Shift it 2 units to the left and 4 units down.
82) Shift it 11 units to the right. Reflect it across the x–axis. Shift it 11 units up.
83) Shift it 3 units to the right. Reflect it across the x–axis. Shift it 12 units up.

84)
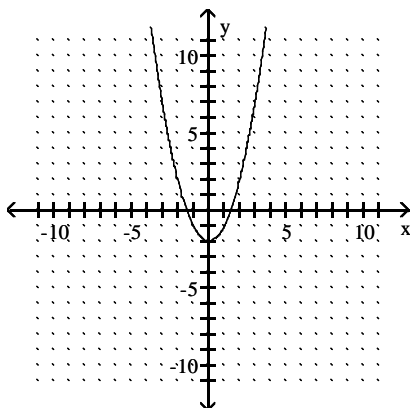
85) $f(x) = -3x^2$

86) $f(x) = -5x^2$

87) $y = (x + 6)^2 - 3$

88) $y = (x + 4)^2 - 5$

89) $y = -6(x + 2)^2 - 8$

90) $y = -5(x + 4)^2 - 7$

91) $y = -\dfrac{1}{5}(x + 4)^2 - 8$

92) $y = -\dfrac{1}{6}(x + 4)^2 - 7$

93) $y = -6|x|$

94) $y = -3|x|$

95) $f(x) = 2.2|-x| - 4$

96) $f(x) = 2.5|-x| - 2$

97) $y = -\dfrac{1}{5}|-x| + 4$

98) $y = -\dfrac{2}{3}|-x| + 4$

99) $y = \sqrt{x - 3}$

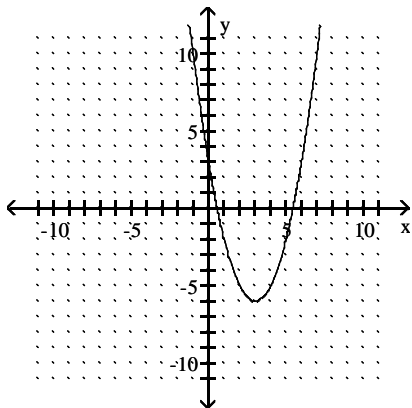100) $y = \sqrt{x - 6}$

101) $f(x) = \sqrt{x + 4} + 9$

102) $f(x) = \sqrt{x + 8} + 7$

103) $y = (x - 3)^4 + 5$

104) $y = (x - 5)^4 + 3$
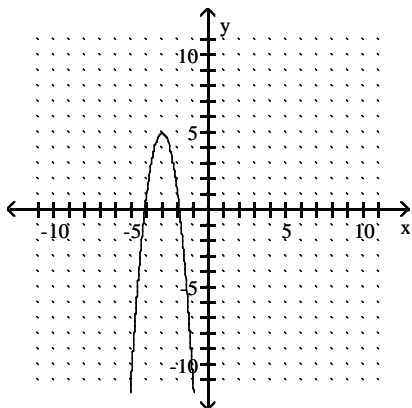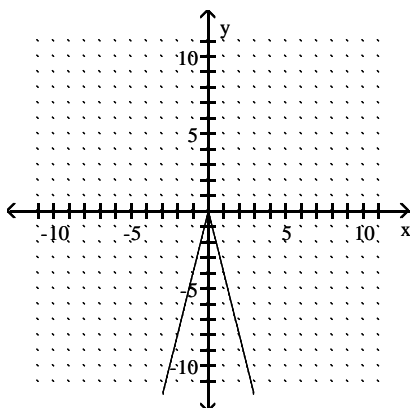
105)

106)

107)

108)

109)

110)
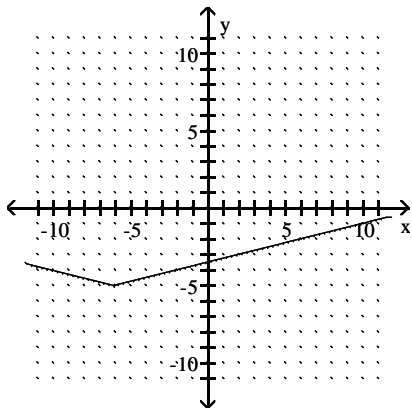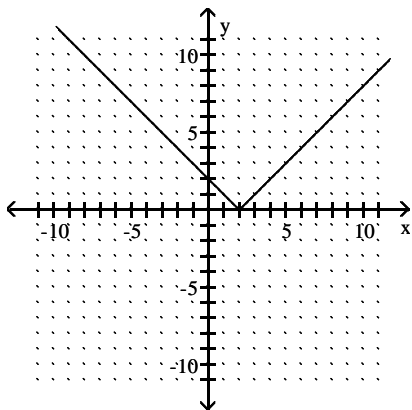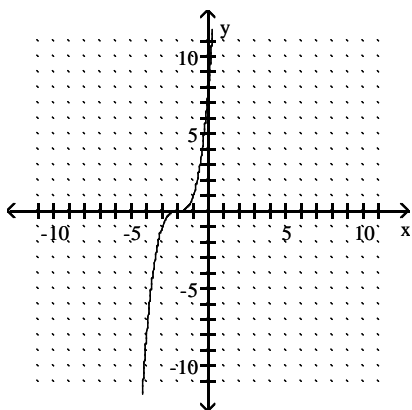
111)
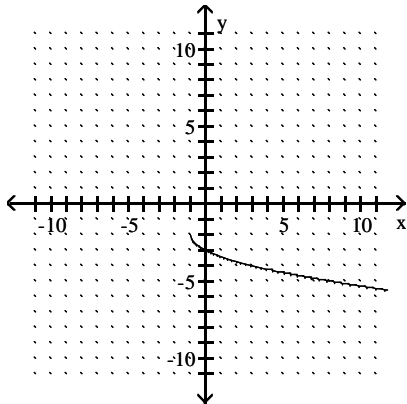
112)
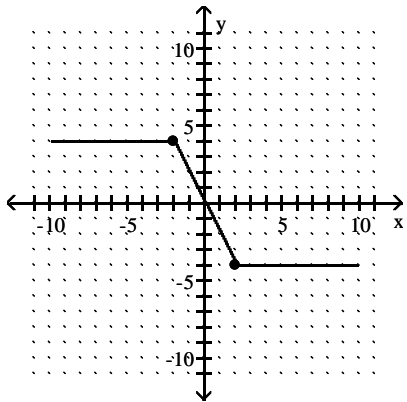
113) $g(x) = 223(x - 1974) + 6320$
114) $g(x) = 225(x - 1979) + 6320$
115) $g(x) = 223(x - 1989) + 6320$
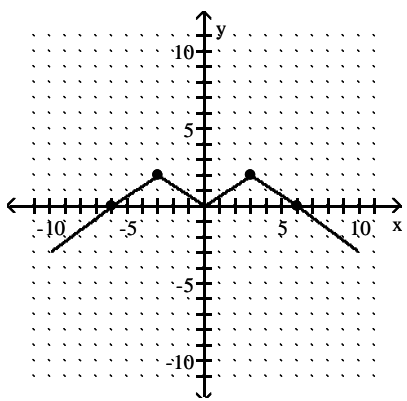116) $g(x) = 72.38(x - 1993) + 1034$
117) $g(x) = 84(x - 1997) + 1200$
118) $g(x) = 460(x - 1988) + 3420$
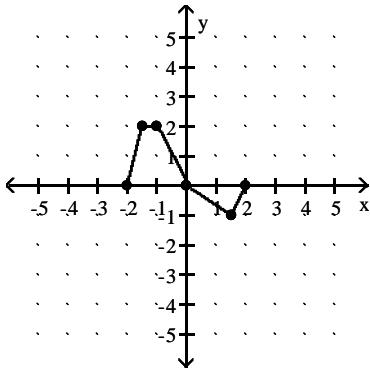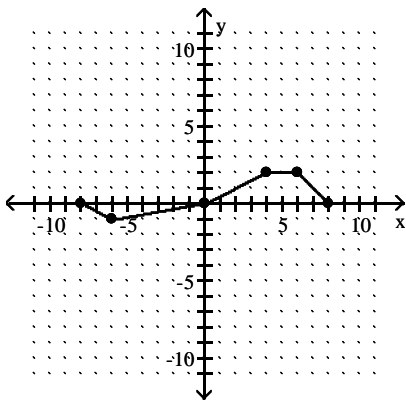119) $g(x) = 458(x - 1981) + 3420$
120)

121)

122)

123)

124)