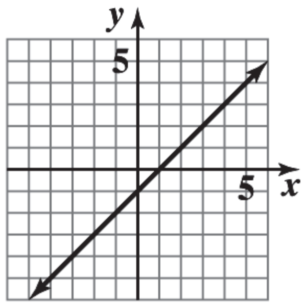
Contents

1 FUNCTIONS AND GRAPHS

EXERCISE 1-1

2.



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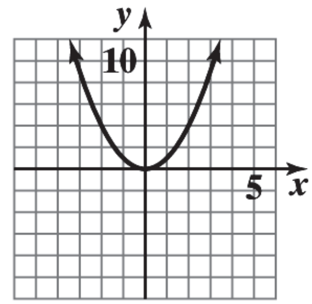

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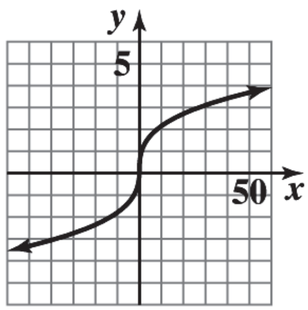

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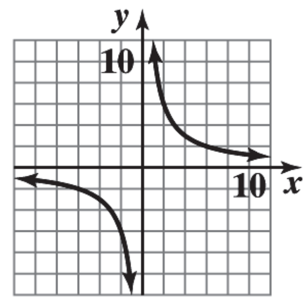


10. The table specifies a function, since for each domain value there corresponds one and only one range value.

12. The table does not specify a function, since more than one range value corresponds to a given domain value.
(Range values 1, 2 correspond to domain value 9.)

14. This is a function.

16. The graph specifies a function; each vertical line in the plane intersects the graph in at most one point.

18. The graph does not specify a function. There are vertical lines which intersect the graph in more than one point. For example, the y-axis intersects the graph in two points.

20. The graph does not specify a function.

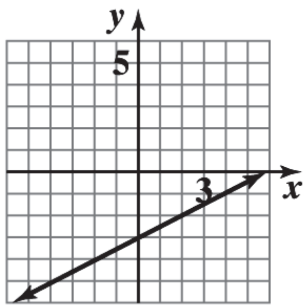
22. $y = 4x + \frac{1}{x}$ is neither linear nor constant.

24. $2x - 4y - 6 = 0$ is linear.

26. $x + xy + 1 = 0$ is neither linear nor constant.

28. $\frac{y-x}{2} + \frac{3+2x}{4} = 1$ simplifies to $y = \frac{1}{2}$ constant.

30.



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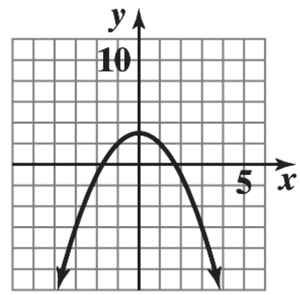

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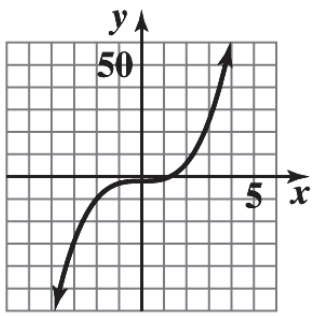

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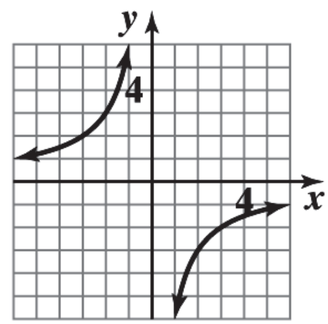
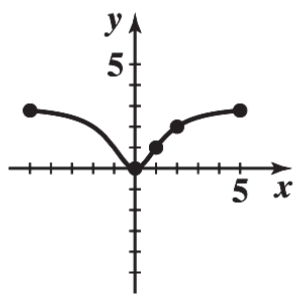


38. $f(x) = \dfrac{3x^2}{x^2+2}$. Since the denominator is bigger than 1, we note that the values of f are between 0 and 3. Furthermore, the function f has the property that $f(-x) = f(x)$. So, adding points $x = 3$, $x = 4$, $x = 5$, we have:

x	–5	–4	–3	–2	–1	0	1	2	3	4	5
$F(x)$	2.78	2.67	2.45	2	1	0	1	2	2.45	2.67	2.78

The sketch is:



40. $y = f(4) = 0$

42. $y = f(-2) = 3$

44. $f(x) = 4$ at $x = 5$.

46. $f(x) = 0$ at $x = -5, 0, 4$.

48. Domain**:** all real numbers.

50. Domain: all real numbers except $x = 2$**.**

52. Domain: $x \geq -5$ or $[-5, \infty)$.

54. Given $6x - 7y = 21$. Solving for y we have: $-7y = 21 - 6x$ and $y = \dfrac{6}{7}x - 3$.

This equation specifies a function. The domain is R, the set of real numbers.

56. Given $x(x+y)=4$. Solving for y we have: $xy+x^2=4$ and $y=\dfrac{4-x^2}{x}$.

This equation specifies a function. The domain is all real numbers except 0

58. Given $x^2+y^2=9$. Solving for y we have: $y^2=9-x^2$ and $y=\pm\sqrt{9-x^2}$.

This equation does not define y as a function of x. For example, when $x=0$, $y=\pm 3$.

60. Given $\sqrt{x}-y^3=0$.. Solving for y we have: $y^3=\sqrt{x}$ and $y=x^{1/6}$.

This equation specifies a function. The domain is all nonnegative real numbers, i.e., $x\ge 0$.

62. $f(-3x)=(-3x)^2-4=9x^2-4$

64. $f(x-1)=(x-1)^2-4=x^2-2x+1-4=x^2-2x-3$

66. $f(x^3)=(x^3)^2-4=x^6-4$

68. $f(\sqrt[4]{x})=\left(x^{1/4}\right)^2-4=x^{1/2}-4=\sqrt{x}-4$

70. $f(-3)+f(h)=(-3)^2-4+h^2-4=5+h^2-4=h^2+1$

72. $f(-3+h)=(-3+h)^2-4=9-6h+h^2-4=5-6h+h^2$

74. $f(-3+h)-f(-3)=\left[(-3+h)^2-4\right]-\left[(-3)^2-4\right]=(9-6h+h^2-4)-(9-4)=-6h+h^2$

76. (A) $f(x+h)=-3(x+h)+9=-3x-3h+9$

(B) $f(x+h)-f(x)=(-3x-3h+9)-(-3x+9)=-3h$

(C) $\dfrac{f(x+h)-f(x)}{h}=\dfrac{-3h}{h}=-3$

78. (A) $f(x+h)=3(x+h)^2+5(x+h)-8$
$=3(x^2+2xh+h^2)+5x+5h-8$
$=3x^2+6xh+3h^2+5x+5h-8$

(B) $f(x+h)-f(x)=\left(3x^2+6xh+3h^2+5x+5h-8\right)-\left(3x^2+5x-8\right)$
$=6xh+3h^2+5h$

(C) $\dfrac{f(x+h)-f(x)}{h}=\dfrac{6xh+3h^2+5h}{h}=6x+3h+5$

80. (A) $f(x+h)=x^2+2xh+h^2+40x+40h$

(B) $f(x+h)-f(x)=2xh+h^2+40h$

(C) $\dfrac{f(x+h)-f(x)}{h}=2x+h+40$

82. Given $A = l\,w = 81$.

Thus, $w = \frac{81}{l}$. Now $P = 2l + 2w = 2l + 2\frac{81}{l} = 2l + \frac{162}{l}$.

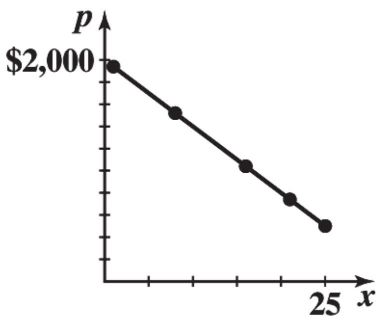
The domain is $l > 0$.

84. Given $P = 2\ell + 2w = 160$ or $\ell + w = 80$ and $\ell = 80 - w$.

Now $A = \ell w = (80 - w)w$ and $A = 80w - w^2$.

The domain is $0 \le w \le 80$. [Note: $w \le 80$ since $w > 80$ implies $\ell < 0$.]

86. (A)



(B) $p(11) = 1{,}340$ dollars per computer
$p(18) = 920$ dollars per computer

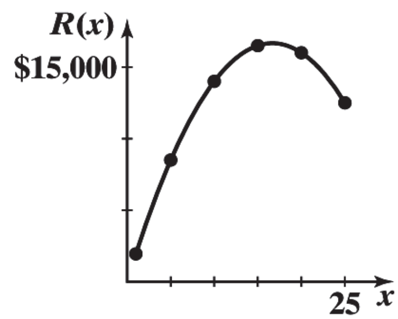
88. (A) $R(x) = xp(x)$
$= x(2{,}000 - 60x)$ thousands of dollars

Domain: $1 \le x \le 25$

(B) Table 11 Revenue

x(thousands)	$R(x)$(thousands)
1	$1,940
5	8,500
10	14,000
15	16,500
20	16,000
25	12,500

(C)



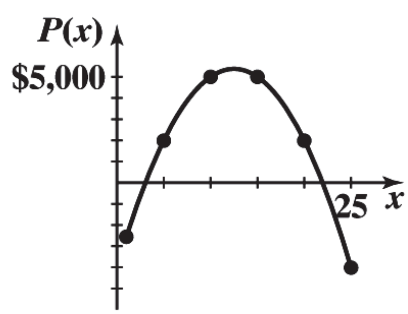
90. (A) $P(x) = R(x) - C(x)$
$= x(2{,}000 - 60x) - (4{,}000 + 500x)$ thousand dollars
$= 1{,}500x - 60x^2 - 4{,}000$

Domain: $1 \le x \le 25$

(B) Table 13 Profit

x (thousands)	$P(x)$ (thousands)
1	–$2,560
5	2,000
10	5,000
15	5,000
20	2,000
25	–4,000

(C)



92. (A) Given $5v - 2s = 1.4$. Solving for v, we have:
$v = 0.4s + 0.28$.
If $s = 0.51$, then $v = 0.4(0.51) + 0.28 = 0.484$ or 48.4%.

(B) Solving the equation for s, we have:
$s = 2.5v - 0.7$.
If $v = 0.51$, then $s = 2.5(0.51) - 0.7 = 0.575$ or 57.5%.

EXERCISE 1-2

2. $f(x) = 1 + \sqrt{x}$ Domain: $[0, \infty)$; range: $[1, \infty)$.

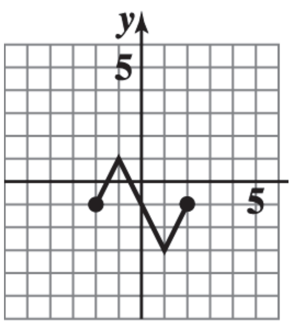
4. $f(x) = x^2 + 10$ Domain: all real numbers; range: $[10, \infty)$.

6. $f(x) = 5x + 3$ Domain: all real numbers; range: all real numbers.

8. $f(x) = 15 - 20|x|$ Domain: all real numbers; range: $(-\infty, 15]$.

10. $f(x) = -8 + \sqrt[3]{x}$ Domain: all real numbers; range: all real numbers.

12.



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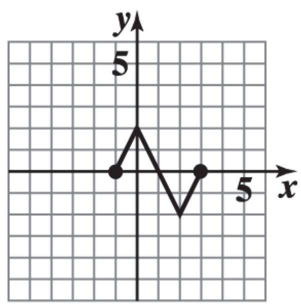

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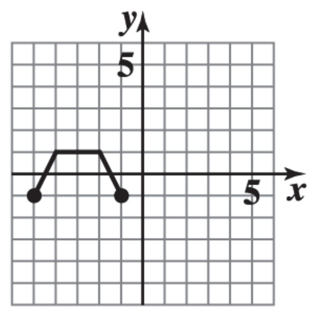

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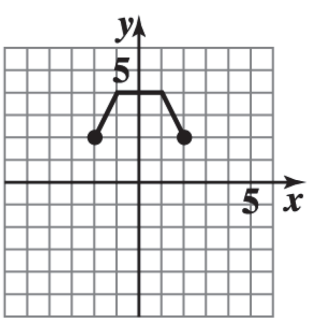

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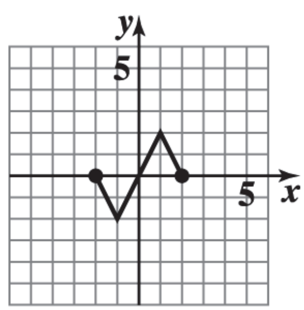

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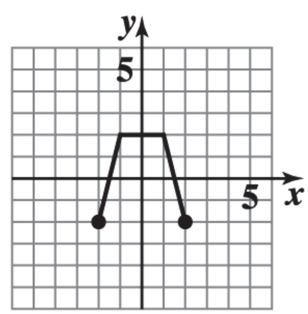

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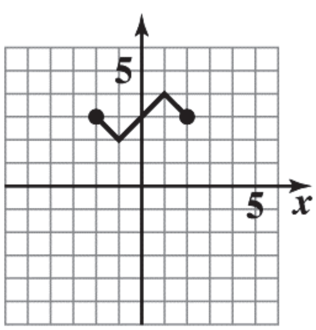

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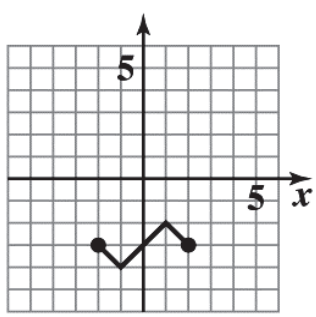
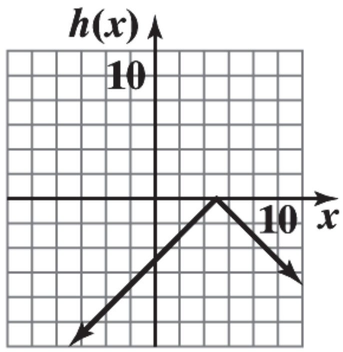
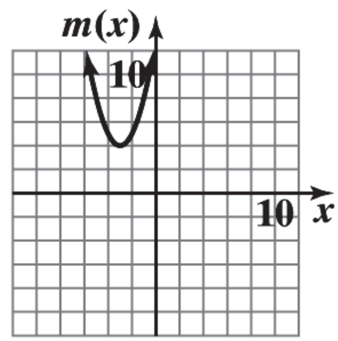


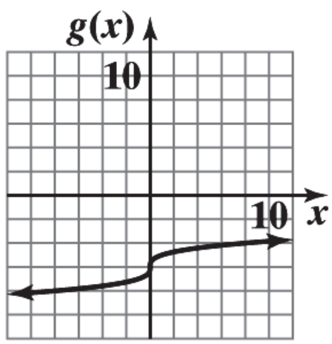
28. The graph of $h(x) = -|x - 5|$ is the graph of $y = |x|$ reflected in the x axis and shifted 5 units to the right.



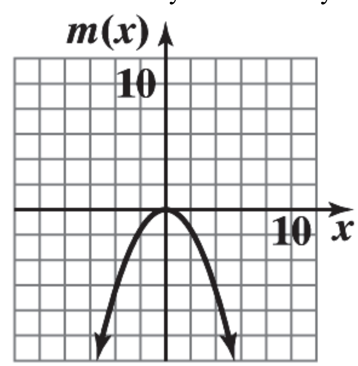
30. The graph of $m(x) = (x + 3)^2 + 4$ is the graph of $y = x^2$ shifted 3 units to the left and 4 units up.



32. The graph of $g(x) = -6 + \sqrt[3]{x}$ is the graph of $y = \sqrt[3]{x}$ shifted 6 units down.



34. The graph of $m(x) = -0.4x^2$ is the graph of $y = x^2$ reflected in the x axis and vertically contracted by a factor of 0.4.



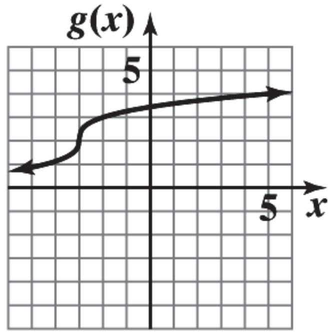
36. The graph of the basic function $y = |x|$ is shifted 3 units to the right and 2 units up. $y = |x - 3| + 2$

38. The graph of the basic function $y = |x|$ is reflected in the x axis, shifted 2 units to the left and 3 units up.
Equation: $y = 3 - |x + 2|$

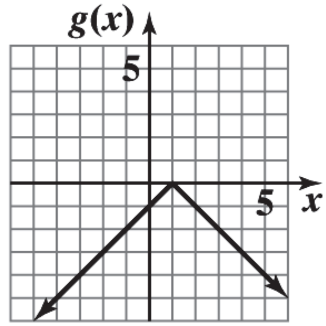
40. The graph of the basic function $\sqrt[3]{x}$ is reflected in the x axis and shifted up 2 units. Equation: $y = 2 - \sqrt[3]{x}$

42. The graph of the basic function $y = x^3$ is reflected in the x axis, shifted to the right 3 units and up 1 unit.
Equation: $y = 1 - (x - 3)^3$

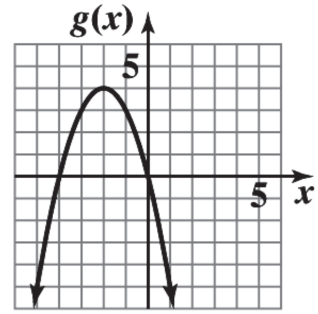
44. $g(x) = \sqrt[3]{x+3} + 2$



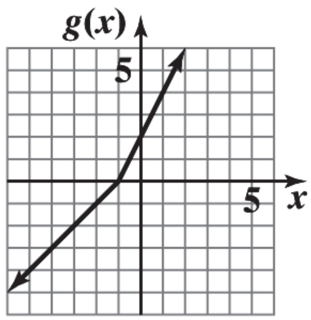
46. $g(x) = -|x - 1|$



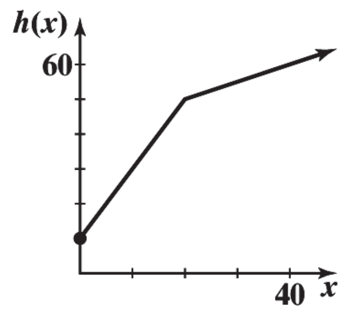
48. $g(x) = 4 - (x + 2)^2$



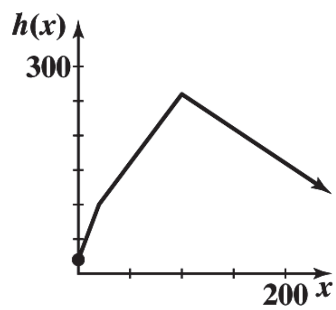
50. $g(x) = \begin{cases} x+1 & \text{if } x < -1 \\ 2+2x & \text{if } x \geq -1 \end{cases}$



52. $h(x) = \begin{cases} 10+2x & \text{if} \quad 0 \leq x \leq 20 \\ 40+0.5x & \text{if} \quad x > 20 \end{cases}$



54. $h(x) = \begin{cases} 4x+20 & \text{if} \quad 0 \leq x \leq 20 \\ 2x+60 & \text{if} \quad 20 < x \leq 100 \\ -x+360 & \text{if} \quad x > 100 \end{cases}$



56. The graph of the basic function $y = x$ is reflected in the x axis and vertically expanded by a factor of 2. Equation: $y = -2x$

58. The graph of the basic function $y = |x|$ is vertically expanded by a factor of 4. Equation: $y = 4|x|$

60. The graph of the basic function $y = x^3$ is vertically contracted by a factor of 0.25. Equation: $y = 0.25x^3$.

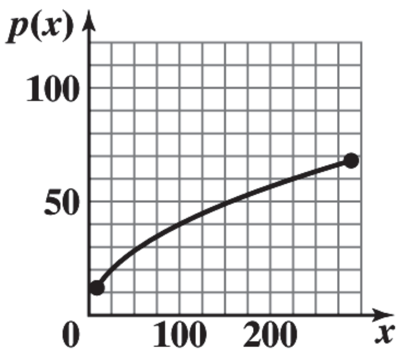
62. Vertical shift, reflection in y axis.
Reversing the order does not change the result. Consider a point (a, b) in the plane. A vertical shift of k units followed by a reflection in y axis moves (a, b) to $(a, b + k)$ and then to $(-a, b + k)$. In the reverse order, a reflection in y axis followed by a vertical shift of k units moves (a, b) to $(-a, b)$ and then to $(-a, b + k)$. The results are the same.

64. Vertical shift, vertical expansion.
Reversing the order can change the result. For example, let (a, b) be a point in the plane. A vertical shift of k units followed by a vertical expansion of h $(h > 1)$ moves (a, b) to $(a, b + k)$ and then to $(a, bh + kh)$. In the reverse order, a vertical expansion of h followed by a vertical shift of k units moves (a, b) to (a, bh) and then to $(a, bh + k)$; $(a, bh + kh) \neq (a, bh + k)$.

66. Horizontal shift, vertical contraction.
Reversing the order does not change the result. Consider a point (a, b) in the plane. A horizontal shift of k units followed by a vertical contraction of h $(0 < h < 1)$ moves (a, b) to $(a + k, b)$ and then to $(a + k, bh)$. In the reverse order, a vertical contraction of h followed by a horizontal shift of k units moves (a, b) to (a, bh) and then to $(a + k, bh)$. The results are the same.

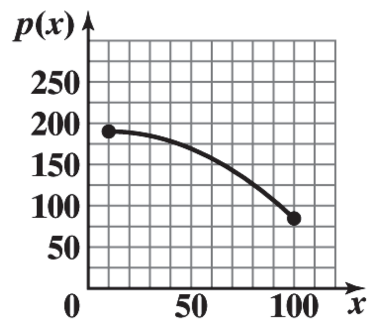
68. (A) The graph of the basic function $y = \sqrt{x}$ is vertically expanded by a factor of 4.

(B)



70. (A) The graph of the basic function $y = x^2$ is reflected in the x axis, vertically contracted by a factor of 0.013, and shifted 10 units to the right and 190 units up.

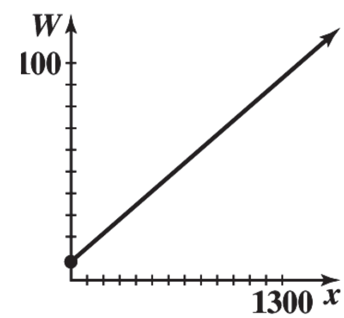
(B)



72. (A) Let x = number of kwh used in a winter month. For $0 \le x \le 700$, the charge is $8.5 + .065x$. At $x = 700$, the charge is \$54. For $x > 700$, the charge is
$54 + .053(x - 700) = 16.9 + 0.053x$.
Thus,

$$W(x) = \begin{cases} 8.5 + .065x & \text{if } 0 \le x \le 700 \\ 16.9 + 0.053x & \text{if } x > 700 \end{cases}$$

(B)

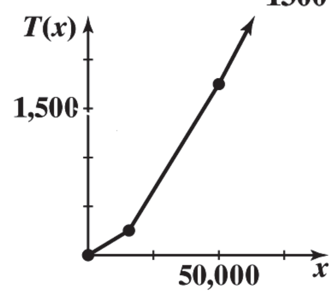


74. (A) Let x = taxable income.
If $0 \le x \le 12{,}500$, the tax due is \$$.02x$. At $x = 12{,}500$, the tax due is \$250. For $12{,}500 < x \le 50{,}000$, the tax due is $250 + .04(x - 12{,}500) = .04x - 250$. For $x > 50{,}000$, the tax due is $1{,}250 + .06(x - 50{,}000) = .06x - 1{,}250$.

Thus,

$$T(x) = \begin{cases} 0.02x & \text{if } 0 \le x \le 12{,}500 \\ 0.04x - 250 & \text{if } 12{,}500 < x \le 50{,}000 \\ 0.06x - 1{,}250 & \text{if } x > 50{,}000 \end{cases}$$

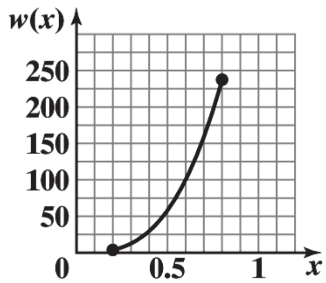
(B)



(C) $T(32{,}000) = \$1{,}030$
$T(64{,}000) = \$2{,}590$

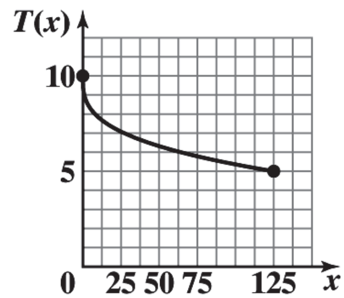
76. (A) The graph of the basic function $y = x^3$ is vertically expanded by a factor of 463.

(B)



78. (A) The graph of the basic function $y = \sqrt[3]{x}$ is reflected in the x axis and shifted up 10 units.

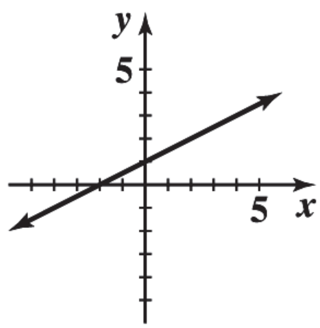
(B)



EXERCISE 1-3

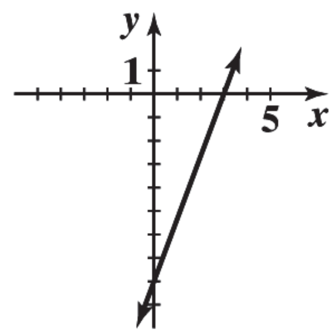
2. $y = \dfrac{x}{2} + 1$

x	y
0	1
2	2
4	3



4. $8x - 3y = 24$

x	y
0	−8
3	0
6	8



6. Slope: $m = 3$

y- intercept: $b = 2$

8. Slope: $m = -\dfrac{10}{3}$

y- intercept: $b = 4$

10. Slope: $m = -4$; x-intercept: 3

12. Slope: $m = -3$; x-intercept: 2

14. Slope: $m = -9/2$; x-intercept: 4/9

16. $y = x + 5$

18. $m = \dfrac{6}{7}$, $b = -\dfrac{9}{2}$; $y = \dfrac{6}{7}x - \dfrac{9}{2}$

20. x- intercept: 1; y- intercept: 3; $y = -3x + 3$

22. x- intercept: 2, y- intercept: -1; $y = \dfrac{1}{2}x - 1$

24. (A) g (B) m (C) n (D) f

26. (A) x-intercepts: -5, -1; y- intercept: -5 (B) Vertex: $(-3, 4)$
(C) Maximum: 4 (D) Range: $y \le 4$ or $(-\infty, 4]$

28. (A) x- intercepts: 1, 5; y- intercept: 5 (B) Vertex: $(3, -4)$
(C) Minimum: -4 (D) Range: $y \ge -4$ or $[-4, \infty)$

30. $g(x) = -(x+2)^2 + 3$

(A) x- intercepts: $-(x+2)^2 + 3 = 0$
$$(x+2)^2 = 3$$
$$x + 2 = \pm\sqrt{3}$$
$$x = -2 - \sqrt{3},\ -2 + \sqrt{3}$$

y- intercept: -1

(B) Vertex: $(-2, 3)$ (C) Maximum: 3 (D) Range: $y \le 3$ or $(-\infty, 3]$

32. $n(x) = (x - 4)^2 - 3$

(A) x- intercepts: $(x - 4)^2 - 3 = 0$
$$(x-4)^2 = 3$$
$$x - 4 = \pm\sqrt{3}$$
$$x = 4 - \sqrt{3},\ 4 + \sqrt{3}$$

y- intercept: 13

(B) Vertex: $(4, -3)$ (C) Minimum: -3 (D) Range: $y \ge -3$ or $[-3, \infty)$

34. (A) Slope: $m = \frac{5-2}{3-1} = \frac{3}{2}$. (B) Point-slope form: $y - 2 = \frac{3}{2}(x-1)$.

(C) Slope-intercept form: $y = \frac{3}{2}x + \frac{1}{2}$. (D) Standard form: $3x - 2y = -1$.

36. (A) Slope: $m = \frac{7-3}{-3-2} = -\frac{4}{5}$. (B) Point-slope form: $y - 3 = -\frac{4}{5}(x-2)$.

(C) Slope-intercept form: $y = -\frac{4}{5}x + \frac{23}{5}$. (D) Standard form: $4x + 5y = 23$.

38. (A) Slope: $m = \frac{4-4}{0-1} = 0$. (B) Point-slope form: $y - 4 = 0$.

(C) Slope-intercept form: $y = 4$. (D) Standard form: $y = 4$.

40. (A) Slope: $m = \frac{-3}{0}$ not defined (B) Point-slope form: none.

(C) Slope-intercept form: none. (D) Standard form: $x = 2$.

42. $g(x) = x^2 - 6x + 5 = x^2 - 6x + 9 - 4 = (x - 3)^2 - 4$

(A) x- intercepts: $(x - 3)^2 - 4 = 0$
$$(x-3)^2 = 4$$
$$x - 3 = \pm 2$$
$$x = 1, 5$$

y- intercept: 5

(B) Vertex: $(3, -4)$ (C) Minimum: -4 (D) Range: $y \ge -4$ or $[-4, \infty)$

44. $s(x) = -4x^2 - 8x - 3 = -4\left[x^2 + 2x + \frac{3}{4}\right] = -4\left[x^2 + 2x + 1 - \frac{1}{4}\right] = -4\left[(x+1)^2 - \frac{1}{4}\right]$

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

(A) x- intercepts: $-4(x+1)^2 + 1 = 0$

$$4(x+1)^2 = 1$$
$$(x+1)^2 = \frac{1}{4}$$
$$x + 1 = \pm\frac{1}{2}$$
$$x = -\frac{3}{2}, -\frac{1}{2}$$

y- intercept: -3

(B) Vertex: $(-1, 1)$ (C) Maximum: 1 (D) Range: $y \le 1$ or $(-\infty, 1]$

46. $v(x) = 0.5x^2 + 4x + 10 = 0.5[x^2 + 8x + 20] = 0.5[x^2 + 8x + 16 + 4] = 0.5[(x+4)^2 + 4] = 0.5(x+4)^2 + 2$

(A) x- intercepts: none
y- intercept: 10

(B) Vertex: $(-4, 2)$ (C) Minimum: 2 (D) Range: $y \ge 2$ or $[2, \infty)$

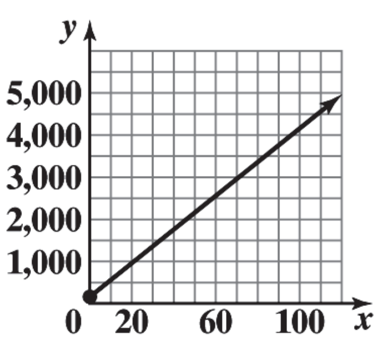
48. $9x + 54 > 0,\quad x > -\frac{54}{6} = -6;$ solution set: $(-6, \infty)$

50. $-4x + 44 \le 0,\quad -4x \le -44,\quad x \ge 11;$ solution set: $[11, \infty)$

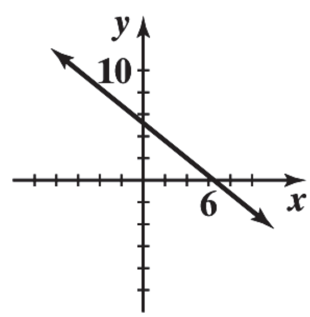
52. $(x+6)(x-3) < 0$
Therefore, either $(x+6) < 0$ and $(x-3) > 0$ or $(x+6) > 0$ and $(x-3) < 0$. The first case is impossible. The second case implies $-6 < x < 3$. Solution set: $(-6, 3)$.

54. $x^2 + 7x + 12 = (x+3)(x+4) \ge 0$
Therefore, either $(x+3) \ge 0$ and $(x+4) \ge 0$ or $(x+3) \le 0$ and $(x+4) \le 0$. The first case implies $x \ge -3$ and the second case implies $x \le -4$. Solution set: $(-\infty, -4] \cup [-3, \infty)$.

56.



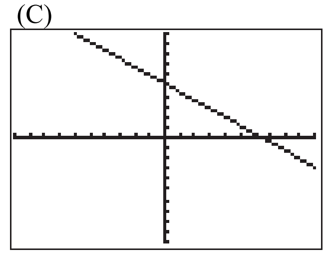
58. (A)



(B) Set $f(x) = 0$,

$-0.8x + 5.2 = 0$, $x = 6.5$.
Set $x = 0$, $y = 5.2$.

(C)



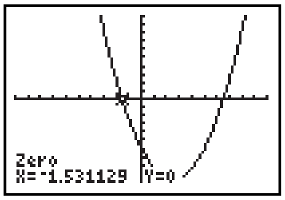
(D) x-intercept: $x = 6.5$,
y-intercept: $y = 5.2$

(E) $-0.8x + 5.2 < 0$
$x > 6.5$

60. $g(x) = -0.6x^2 + 3x + 4$

(A) $g(x) = -2$: $-0.6x^2 + 3x + 4 = -2$

$0.6x^2 - 3x - 6 = 0$

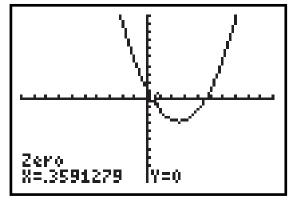


$x = -1.53, 6.53$

(B) $g(x) = 5$: $-0.6x^2 + 3x + 4 = 5$

$-0.6x^2 + 3x - 1 = 0$

$0.6x^2 - 3x + 1 = 0$

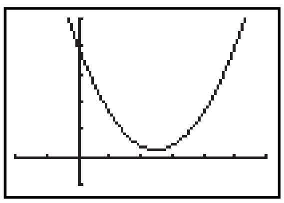


$x = 0.36, 4.64$

(C) $g(x) = 8$: $-0.6x^2 + 3x + 4 = 8$

$-0.6x^2 + 3x - 4 = 0$

$0.6x^2 - 3x + 4 = 0$



No solution

62. Using a graphing utility with $y = 100x - 7x^2 - 10$ and the calculus option with maximum command, we obtain 347.1429 as the maximum value.

64. The slope of the line through (x_1, y_1) and (x_2, y_2) is $\frac{y_2 - y_1}{x_2 - x_1}$; the slope of the line through (x_1, y_1) and (x_3, y_3) is $\frac{y_3 - y_1}{x_3 - x_1}$. By Problem 57, $\frac{y_2 - y_1}{x_2 - x_1} = \frac{-A}{B} = \frac{y_3 - y_1}{x_3 - x_1}$.

66. We have two representations of (d, P): (0, 14.7) and (34, 29.4).

(A) A line relating P to d passes through the above two points.
Its equation is:

$$P - 14.7 = \frac{(29.4 - 14.7)}{(34 - 0)}(d - 0)$$

or $P \approx 0.432d + 14.7$

(B) The rate of change of pressure with respect to depth is approximately 0.432 lbs/in^2 per foot.

(C) For $d = 50$,

$P = 0.432(50) + 14.7 \approx 36.3$ lbs/in^2

(D) For $P = 4$ atmospheres, we have $P = 4(14.7) = 58.8$ lbs/in^2 and hence

$$58.8 = 0.432d + 14.7$$

or $d = \dfrac{58.8 - 14.7}{0.432} \approx 102$ ft.

68. We have two representations of (t, a): (0, 2,880) and (180, 0).

(A) The linear model relating altitude a to the time in air t has the following equation:

$$a - 2{,}880 = \frac{(0 - 2{,}880)}{(180 - 0)}(t - 0)$$

or $a = -16t + 2{,}880$

(B) The rate of descent for an ATPS system parachute is 16 ft/sec.

(C) It is 16 ft/sec.

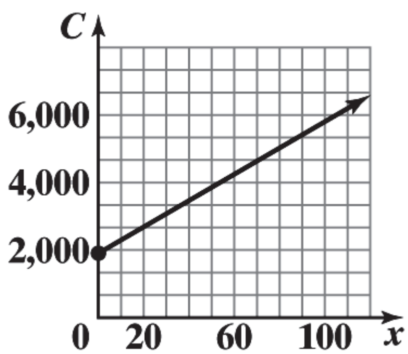
70. Let y be daily cost of producing x tennis rackets. Then we have two points for (x, y): (50, 3,855) and (60, 4,245).

(A) Since x and y are linearly related, then the two points (50, 3,855) and (60, 4,245) will lie on the line expressing the linear relationship between x and y. Therefore

$$y - 3{,}855 = \frac{(4{,}245 - 3{,}855)}{(60 - 50)}(x - 50)$$

or $y = 39x + 1{,}905$

(B)



(C) The y intercept, \$1,905, is the fixed cost and the slope, \$39, is the cost per racket.

72. We observe that for (t, V) two points are given: (0, 224,000) and (16, 115,200)

(A) A linear model will be a line passing through the two points (0, 224,000) and (16, 115,200). The equation of this line is:

$$V - 115{,}200 = \frac{(224{,}000 - 115{,}200)}{(0 - 16)}(t - 16) \text{ or}$$

$$V = -6{,}800t + 224{,}000$$

(B) For $t = 10$

$$V = -6{,}800(10) + 224{,}000 = \$156{,}000$$

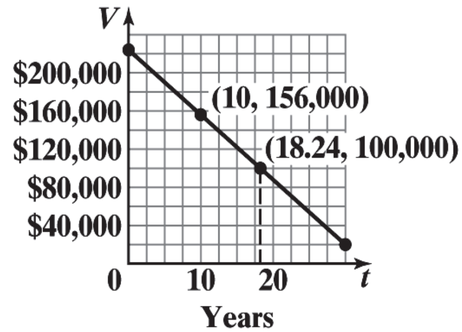
(C) For $V = \$100{,}000$

$100{,}000 = -6{,}800t + 224{,}000$

or $t = \dfrac{(224{,}000 - 100{,}000)}{6{,}800} \approx 18.24$

So, during the 19th year, the depreciated value falls below $100,000.

(D)



74. Let T be the true airspeed at the altitude A (thousands of feet). Since T increases 1.6%, $T(1000) = 200(1.016) = 203.2.$

(A) A linear relationship between A and T has slope

$m = \dfrac{(203.2 - 200)}{1} = 3.2$. Therefore, $T = 3.2A + 200.$

(B) For $A = 6.5$ (6,500 feet), $T = 3.2(6.5) + 200 = 20.8 + 200 = 220.8$ mph

76. (A) For (x, p) we have two representations: (9,800, 1.94) and (9,400, 1.82).
The slope is

$m = \dfrac{(1.94 - 1.82)}{(9{,}800 - 9{,}400)} = 0.0003$

Using one of the points, say (9,800, 1.94), we find b:

$1.94 = (0.0003)(9{,}800) + b$

or $b = -1$

So, the desired equation is: $p = 0.0003x - 1$.

(B) Here the two representations of (x, p) are: (9,300, 1.94) and (9,500, 1.82). The slope is

$m = \dfrac{(1.94 - 1.82)}{(9{,}300 - 9{,}500)} = -0.0006$

Using one of the points, say (9,300, 1.94) we find b:

$1.94 = -0.0006(9{,}300) + b$

or $b = 7.52$

So, the desired equation is: $p = -0.0006x + 7.52$.

(C) To find the equilibrium point, we need to solve $0.0003x - 1 = -0.0006x + 7.52$ for x. Observe that

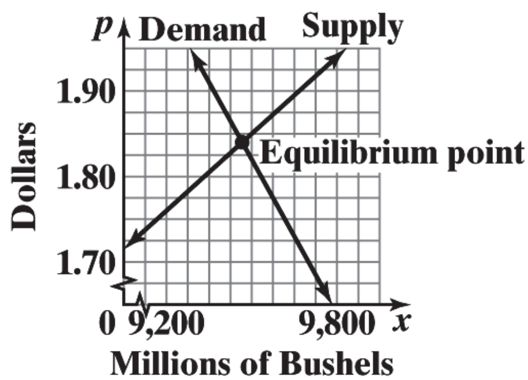
$0.0009x = 8.52$ or

$x = \dfrac{8.52}{0.0009} = 9{,}467$

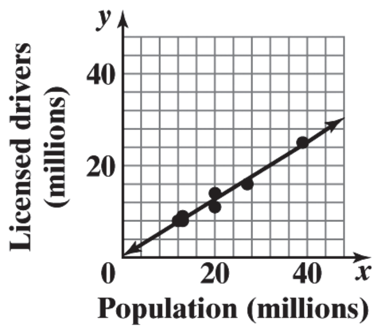
Substituting $x = 9{,}467$ in either of equations in (A) or (B) we obtain $p = .0003(9{,}467) - 1 \approx 1.84$

So, the desired point is (9,467, 1.84).

(D)



78.



(B) At $x = 9.9$, $y = 0.62(9.9) + 0.29 = 6.428$. There were approximately 6,428,000 licensed drivers in Michigan in 2014.

(C) Solve $0.62x + 0.29 = 6.7$ for x:

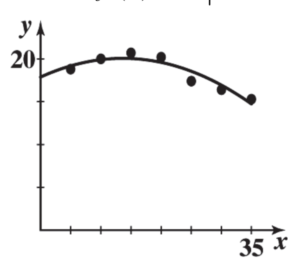
$0.62x = 6.771, \quad x \approx 10.339$

The population of Georgia in 2014 was approximately 10,339,000.

80. Mathematical model: $f(x) = -0.0117x^2 + 0.32x + 17.9$

(A)

x	5	10	15	20	25	30	35
Market Share	18.8	20.0	20.7	20.2	17.4	16.4	15.3
$f(x)$	19.2	19.9	20.0	19.6	18.5	16.9	14.8



(B)

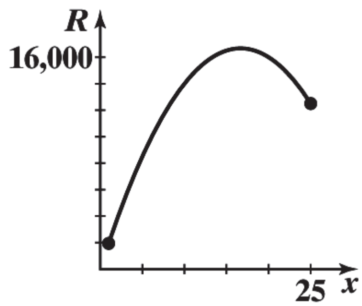
(C) For 2025, $x = 45$ and $f(45) = -0.0117(45)^2 + 0.32(45) + 17.9 \approx 8.6$, i.e., 8.6%

For 2028, $x = 48$ and $f(48) = -0.0117(48)^2 + 0.32(48) + 17.9 \approx 6.3$, i.e., 6.3%

(D) Ford's market share rose from 18.8% in 1985 to a high of 20.7% in 1995. After that, Ford's market share decreased each year, reaching a low of 15.3%

82. Verify

84. (A)



(B) $R(x) = 2{,}000x - 60x^2$

$$= -60\left(x^2 - \frac{100}{3}x\right)$$

$$= -60\left[x^2 - \frac{100}{3}x + \frac{2500}{9} - \frac{2500}{9}\right]$$

$$= -60\left[\left(x - \frac{50}{3}\right)^2 - \frac{2500}{9}\right]$$

$$= -60\left(x - \frac{50}{3}\right)^2 + \frac{50{,}000}{3}$$

16.667 thousand computers(16,667 computers);
16,666.667 thousand dollars ($16,666,667)

(C) $1,000

86. (A) The rate of change of height with respect to Dbh is 1.66 ft/in.

(B) One inch increase in Dbh produces a height increase of approximately 1.66 ft.

(C) For $x = 12$, we have: $y = 1.66(12) - 5.14 \approx 15$ ft.

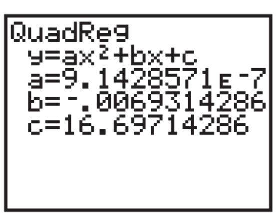
(D) For $y = 25$, we have:

$25 = 1.66x - 5.14$ or $x = \dfrac{25 + 5.14}{1.66} \approx 18$ in.

88. Men: $y = -0.247x + 119.097$
Women: $y = -0.122x + 128.494$

The graphs of these lines indicate that the women will not catch up with the men. To see this algebraically, if we set the equations equal to each other and solve, then we obtain $x = -75.18$, so the lines intersect at a point outside of the domain of our functions. Also, the men's slope is steeper so their times, already lower, are decreasing more rapidly.

90.



For $x = 2{,}300$, the estimated fuel consumption is
$y = a(2{,}300)^2 + b(2{,}300) + c = 5.6$ mpg.

EXERCISE 1-4

2. $f(x) = x^2 - 5x + 6$

(A) Degree: 2

(B) $x^2 - 5x + 6 = 0$

$(x-2)(x-3) = 30$

$x = 2, 3$

x-intercepts: $x = 2, 3$