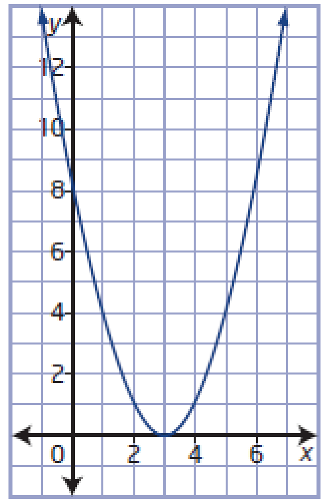
c) The coordinates of the vertex are (3, 0).
The equation of the axis of symmetry is $x = 3$.
The x-intercept is 3, and the y-intercept is 8.
The graph has a minimum value of 0, since the parabola opens upward.
The domain is $\{x \mid x \in R\}$ and the range is $\{y \mid y \geq 0, y \in R\}$.



Section 3.2 Page 174 Question 3

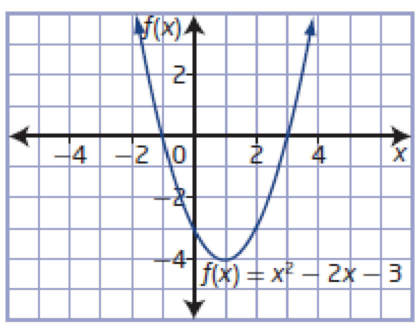
a) Expand $f(x) = 5x(10 - 2x)$ and write in standard form.
$f(x) = 5x(10 - 2x)$
$f(x) = 50x - 10x^2$
$f(x) = -10x^2 + 50x$

b) Expand $f(x) = (10 - 3x)(4 - 5x)$ and write in standard form.
$f(x) = (10 - 3x)(4 - 5x)$
$f(x) = 40 - 50x - 12x + 15x^2$
$f(x) = 15x^2 - 62x + 40$

Section 3.2 Page 174 Question 4

a)

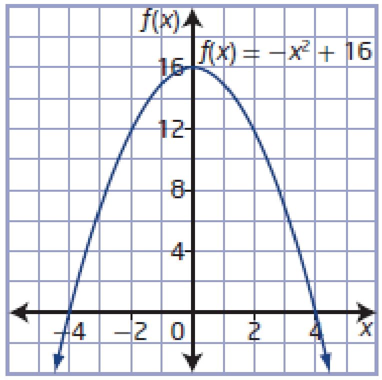
x	$f(x) = x^2 - 2x - 3$
–1	$f(-1) = (-1)^2 - 2(-1) - 3$ $= 0$
0	$f(0) = 0^2 - 2(0) - 3$ $= -3$
1	$f(1) = 1^2 - 2(1) - 3$ $= -4$
2	$f(2) = 2^2 - 2(2) - 3$ $= -3$
3	$f(3) = 3^2 - 2(3) - 3$ $= 0$



vertex: (1, –4)
axis of symmetry: $x = 1$
opens upward
minimum value: –4
domain: $\{x \mid x \in R\}$
range: $\{y \mid y \geq -4, y \in R\}$
x-intercepts: –1 and 3
y-intercept: –3

b)

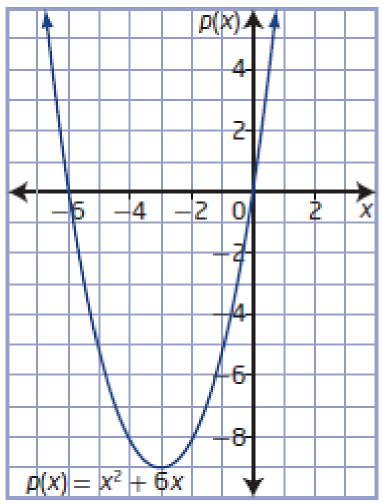
x	$f(x) = -x^2 + 16$
-4	$f(-4) = -(-4)^2 + 16$ $= 0$
-2	$f(-2) = -(-2)^2 + 16$ $= 12$
0	$f(0) = -(0)^2 + 16$ $= 16$
2	$f(2) = -(2)^2 + 16$ $= 12$
4	$f(4) = -(4)^2 + 16$ $= 0$



vertex: (0, 16)
axis of symmetry: $x = 0$
opens downward
maximum value: 16
domain: $\{x \mid x \in \mathrm{R}\}$
range:
$\{y \mid y \le 16, y \in \mathrm{R}\}$
x-intercepts: –4 and 4
y-intercept: 16

c)

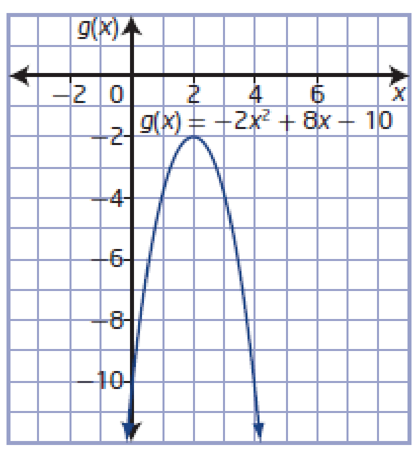
x	$f(x) = x^2 + 6x$
-6	$f(-6) = (-6)^2 + 6(-6)$ $= 0$
-4	$f(-4) = (-4)^2 + 6(-4)$ $= -8$
-3	$f(-3) = (-3)^2 + 6(-3)$ $= -9$
-2	$f(-2) = (-2)^2 + 6(-2)$ $= -8$
0	$f(0) = 0^2 + 6(0)$ $= 0$



vertex: (–3, –9)
axis of symmetry: $x = -3$
opens upward
minimum value: –9
domain: $\{x \mid x \in \mathrm{R}\}$
range:
$\{y \mid y \ge -9, y \in \mathrm{R}\}$;
x-intercepts: –6 and 0
y-intercept: 0

d)

x	$f(x) = -2x^2 + 8x - 10$
0	$f(0) = -2(0)^2 + 8(0) - 10$ $= -10$
1	$f(1) = -2(1)^2 + 8(1) - 10$ $= -4$
2	$f(2) = -2(2)^2 + 8(2) - 10$ $= -2$
3	$f(3) = -2(3)^2 + 8(3) - 10$ $= -4$
4	$f(4) = -2(4)^2 + 8(4) - 10$ $= -10$

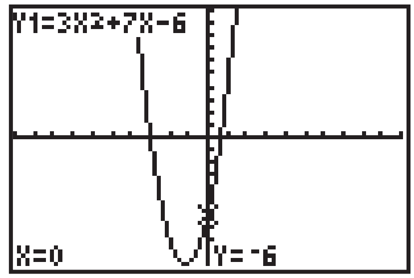


vertex: (2, –2)
axis of symmetry: $x = 2$
opens downward
maximum value: –2
domain: $\{x \mid x \in \mathrm{R}\}$
range:
$\{y \mid y \le -2, y \in \mathrm{R}\}$
x-intercepts: none
y-intercept: –10

Section 3.2 Page 174 Question 5

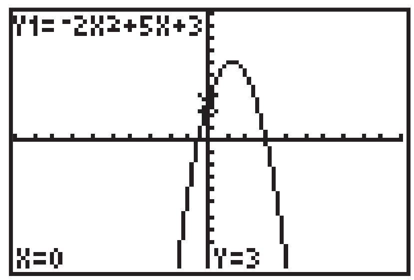
Use a graphing calculator.

a) Graph the function $y = 3x^2 + 7x - 6$ using window settings of x: [–10, 10, 1] and y: [–10, 10, 1].



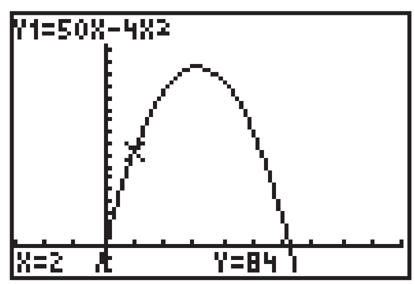
Use the minimum feature to find the vertex is located at approximately (–1.2, –10.1). So, the equation of the axis of symmetry is $x = -1.2$, and the graph opens upward with a minimum value of –10.1. The domain is $\{x \mid x \in \mathrm{R}\}$ and the range is $\{y \mid y \geq -10.1, y \in \mathrm{R}\}$. Use the zero feature to find the x-intercepts are –3 and approximately 0.7. The y-intercept is –6.

b) Graph the function $y = -2x^2 + 5x + 3$ using window settings of x: [–10, 10, 1] and y: [–10, 10, 1].



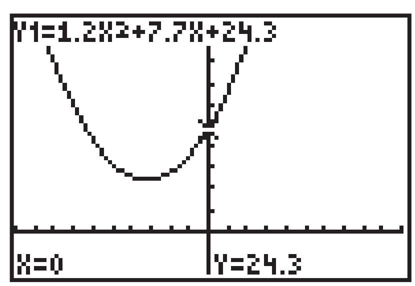
Use the maximum feature to find the vertex is located at approximately (1.3, 6.1). So, the equation of the axis of symmetry is $x = 1.3$, and the graph opens downward with a maximum value of 6.1. The domain is $\{x \mid x \in \mathrm{R}\}$ and the range is $\{y \mid y \leq 6.1, y \in \mathrm{R}\}$. Use the zero feature to find the x-intercepts are –0.5 and 3. The y-intercept is 3.

c) Graph the function $y = 50x - 4x^2$ using window settings of x: [–6, 20, 2] and y: [–20, 200, 10].



Use the maximum feature to find the vertex is located at approximately (6.3, 156.3). So, the equation of the axis of symmetry is $x = 6.3$, and the graph opens downward with a maximum value of 156.3. The domain is $\{x \mid x \in \mathrm{R}\}$ and the range is $\{y \mid y \leq 156.3, y \in \mathrm{R}\}$. Use the zero feature to find the x-intercepts are 0 and 12.5. The y-intercept is 0.

d) Graph the function $y = 1.2x^2 + 7.7x + 24.3$ using window settings of x: [–10, 10, 1] and y: [–10, 50, 5].



Use the minimum feature to find the vertex is located at approximately (–3.2, 11.9). So, the equation of the axis of symmetry is $x = -3.2$, and the graph opens upward with a minimum value of 11.9. The domain is $\{x \mid x \in \mathrm{R}\}$ and the range is $\{y \mid y \geq 11.9, y \in \mathrm{R}\}$. There are no x-intercepts and the y-intercept is 24.3.

Section 3.2 Page 175 Question 6

a) For $y = x^2 + 6x + 2$, $a = 1$, $b = 6$, and $c = 2$.

Use $x = \dfrac{-b}{2a}$ to find the x-coordinate of the vertex.

$x = \dfrac{-6}{2(1)}$

$x = -3$

Substitute $x = -3$ into $y = x^2 + 6x + 2$ to find the y-coordinate of the vertex.

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

$y = -7$

The vertex is located at (–3, –7).

b) For $y = 3x^2 - 12x + 5$, $a = 3$, $b = -12$, and $c = 5$.

Use $x = \dfrac{-b}{2a}$ to find the x-coordinate of the vertex.

$x = \dfrac{-(-12)}{2(3)}$

$x = 2$

Substitute $x = 2$ into $y = 3x^2 - 12x + 5$ to find the y-coordinate of the vertex.

$y = 3(2)^2 - 12(2) + 5$

$y = -7$

The vertex is located at (2, –7).

c) For $y = -x^2 + 8x - 11$, $a = -1$, $b = 8$, and $c = -11$.

Use $x = \dfrac{-b}{2a}$ to find the x-coordinate of the vertex.

$x = \dfrac{-8}{2(-1)}$

$x = 4$

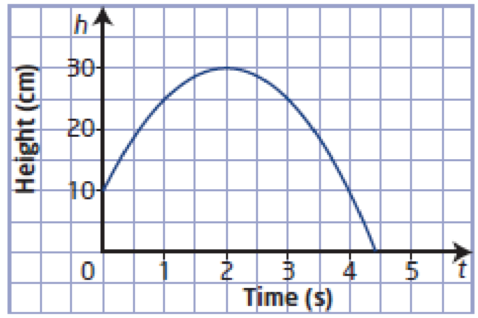
Substitute $x = 4$ into $y = -x^2 + 8x - 11$ to find the y-coordinate of the vertex.

$y = -(4)^2 + 8(4) - 11$

$y = 5$

The vertex is located at (4, 5).

Section 3.2 Page 175 Question 7



a) The y-intercept of the graph represents the height of the rock that the siksik jumped from, 10 cm.

b) The vertex of the graph gives the maximum height of the siksik as 30 cm at a time of 2 s.

c) The x-intercept of the graph gives the time that the siksik was in the air, or approximately 4.4 s.

d) The domain is $\{t \mid 0 \leq t \leq 4.4, t \in \mathrm{R}\}$. The range is $\{h \mid 0 \leq h \leq 30, h \in \mathrm{R}\}$.

e) Answers may vary. Example: Unlikely: the siksik rarely stay in the air for more than 4 s.

Section 3.2 Page 175 Question 8

a) For a quadratic function with an axis of symmetry of $x = 0$ and a maximum value of 8, the parabola opens downward and the vertex is (0, 8). A parabola that opens downward with a vertex above the x-axis has two x-intercepts. Since the axis of symmetry is $x = 0$, one x-intercept will be negative and one positive.

b) For a quadratic function with a vertex at (3, 1), passing through the point (1, –3), the parabola opens downward. A parabola that opens downward with a vertex above the x-axis has two x-intercepts. Since the axis of symmetry is $x = 3$ and the x-intercept to the left of it is positive, then the x-intercept to the right will also be positive.

c) For a quadratic function with a range of $y \geq 1$, the parabola opens upward and its vertex is above the x-axis. So, there are no x-intercepts.

d) For a quadratic function with a y-intercept of 0 and an axis of symmetry of $x = -1$, the parabola could open upward with a vertex below the x-axis or open downward with a vertex above the x-axis. For either case, there are two x-intercepts. One x-intercept, to the right of the axis of symmetry ($x = -1$), is given as zero. So, the other x-intercept will be to the left, or less than –1, which is negative.