The third error occurs in line 5. She factored \( x^2 + 6x + 36 \) as the square of a binomial, \((x + 6)^2\).

The last errors occur in line 6. She did not distribute \(-4\) properly.

The correct solution is shown.

\[
\begin{align*}
y &= -4x^2 + 24x + 5 \\
y &= -4(x^2 - 6x) + 5 \\
y &= -4(x^2 - 6x + 9 - 9) + 5 \\
y &= -4((x^2 - 6x + 9) - 9) + 5 \\
y &= -4((x - 3)^2 - 9) + 5 \\
y &= -4(x - 3)^2 + 9 + 5 \\
y &= -4(x - 3)^2 + 41
\end{align*}
\]

Section 3.3  Page 197  Question 31

a) Let \( n \) represent the number of price increases. The new T-shirt price is $10 plus the
number of price increases times $1, or \(10 + n\).

The new number of T-shirts sold each month is 100 minus the number of price increases
5, or \(100 - 5n\).

Let \( R \) represent the expected monthly revenue, in dollars.

Revenue = (price)(number of sessions)

\[
R = (10 + n)(100 - 5n)
\]

\[
R = 1000 + 50n - 5n^2
\]

\[
R = -5n^2 + 50n + 1000
\]

b) By completing the square, you can determine the maximum monthly revenue and
price to charge to produce that maximum revenue. You can also determine the number of
T-shirts that must be sold to obtain the maximum revenue.

c) Answers may vary. Example: Assume that the market research for the price increase
and number of T-shirts holds true for all sales.

Chapter 3 Review

Chapter 3 Review  Page 198  Question 1

a) The graph of \( f(x) = (x + 6)^2 - 14 \) will have the same shape as the graph of \( f(x) = x^2 \),
since \( a = 1 \). Since \( p = -6 \) and \( q = -14 \), this represents a horizontal translation of 6 units
to the left and a vertical translation of 14 units down relative to the graph of \( f(x) = x^2 \).

The vertex is located at \((-6, -14)\).

The equation of the axis of symmetry is \( x = -6 \).

The parabola opens upward.

The minimum value is \(-14\).

The domain is \( \{ x \mid x \in \mathbb{R} \} \) and the range is \( \{ y \mid y \geq -14, y \in \mathbb{R} \} \).
b) The graph of \( f(x) = -2x^2 + 19 \) will have a shape that is narrower than the graph of \( f(x) = x^2 \) and be reflected in the x-axis, since \( a < -1 \). Since \( p = 0 \) and \( q = 19 \), this represents a vertical translation of 19 units up relative to the graph of \( f(x) = x^2 \).
   The vertex is located at \((0, 19)\).
   The equation of the axis of symmetry is \( x = 0 \).
   The parabola opens downward.
   The maximum value is 19.
   The domain is \( \{x \mid x \in \mathbb{R}\} \) and the range is \( \{y \mid y \leq 19, y \in \mathbb{R}\} \).

c) The graph of \( f(x) = \frac{1}{5} \) \((x - 10)^2 + 100\) will have a shape that is wider than the graph of \( f(x) = x^2 \), since \( 0 < a < 1 \). Since \( p = 10 \) and \( q = 100 \), this represents a horizontal translation of 10 units to the right and a vertical translation of 100 units up relative to the graph of \( f(x) = x^2 \).
   The vertex is located at \((10, 100)\).
   The equation of the axis of symmetry is \( x = 10 \).
   The parabola opens upward.
   The minimum value is 100.
   The domain is \( \{x \mid x \in \mathbb{R}\} \) and the range is \( \{y \mid y \geq 100, y \in \mathbb{R}\} \).

d) The graph of \( f(x) = -6(x - 4)^2 \) will have a shape that is narrower than the graph of \( f(x) = x^2 \) and be reflected in the x-axis, since \( a < -1 \). Since \( p = 4 \) and \( q = 0 \), this represents a horizontal translation of 4 units to the right relative to the graph of \( f(x) = x^2 \).
   The vertex is located at \((4, 0)\).
   The equation of the axis of symmetry is \( x = 4 \).
   The parabola opens downward.
   The maximum value is 0.
   The domain is \( \{x \mid x \in \mathbb{R}\} \) and the range is \( \{y \mid y \leq 0, y \in \mathbb{R}\} \).

Chapter 3 Review  Page 198  Question 2

a) For \( f(x) = 2(x + 1)^2 - 8 \), \( a = 2 \), \( p = -1 \), and \( q = -8 \).
To sketch the graph of \( f(x) = 2(x + 1)^2 - 8 \), transform the graph of \( f(x) = x^2 \) by
   • multiplying the \( y \)-values by a factor of 2
   • translating 1 unit to the left and 8 units down
   vertex: \((-1, -8)\)
   axis of symmetry: \( x = -1 \)
   domain: \( \{x \mid x \in \mathbb{R}\} \)
   range: \( \{y \mid y \geq -8, y \in \mathbb{R}\} \)
   \( x \)-intercepts: \(-3 \) and \( 1 \)
   \( y \)-intercept: \(-6 \)
b) For \( f(x) = -0.5(x - 2)^2 + 2 \), \( a = -0.5 \), \( p = 2 \), and \( q = 2 \).
To sketch the graph of \( f(x) = -0.5(x - 2)^2 + 2 \), transform the graph of \( f(x) = x^2 \) by
- multiplying the \( y \)-values by a factor of 0.5
- reflecting in the \( x \)-axis
- translating 2 units to the right and 2 units up

vertex: \((2, 2)\)
axis of symmetry: \( x = 2 \)
domain: \{x \mid x \in \mathbb{R}\}
range: \{y \mid y \leq 2, y \in \mathbb{R}\}
x-intercepts: 0 and 4
\( y \)-intercept: 0

Chapter 3 Review  Page 198  Question 3

a) For \( y = -3(x - 5)^2 + 20 \), \( a = -3 \), \( p = 5 \), and \( q = 20 \).
The vertex is located at \((5, 20)\), which is above the \( x \)-axis. The graph opens downward, since \( a < 0 \). So, there are two \( x \)-intercepts.

b) Since the range is \{\( y \mid y \geq 0, y \in \mathbb{R}\}\}, the vertex is located on the \( x \)-axis. So, there is one \( x \)-intercept.

c) For \( y = 9 + 3x^2 \), \( a = 3 \), \( p = 0 \), and \( q = 9 \).
The vertex is located at \((0, 9)\), which is above the \( x \)-axis. The graph opens upward, since \( a > 0 \). So, there are no \( x \)-intercepts.

d) Given a vertex at \((-4, -6)\), the parabola either has no \( x \)-intercepts if it opens downward or two \( x \)-intercepts if it opens upward.

Chapter 3 Review  Page 198  Question 4

a) vertex at \((0, 0)\), passing through the point \((20, -150)\).
Since \( p = 0 \) and \( q = 0 \), the function is of the form \( y = ax^2 \).
Substitute the coordinates of the given point to find \( a \).
\[-150 = a(20)^2\]
\[-150 = 400a\]
\[a = -\frac{3}{8}\]

The quadratic function in vertex form with the given characteristics is \( y = -\frac{3}{8}x^2 \).
b) vertex at \((8, 0)\), passing through the point \((2, 54)\)
Since \(p = 8\) and \(q = 0\), the function is of the form \(y = a(x - 8)^2\).
Substitute the coordinates of the given point to find \(a\).
\[54 = a(2 - 8)^2\]
\[54 = 36a\]
\[a = \frac{3}{2}\]
The quadratic function in vertex form with the given characteristics is \(y = \frac{3}{2}(x - 8)^2\).

c) minimum value of \(12\) at \(x = -4\) and \(y\)-intercept of \(60\)
Since \(p = -4\) and \(q = 12\), the function is of the form \(y = a(x + 4)^2 + 12\).
Substitute the coordinates of the \(y\)-intercept to find \(a\).
\[60 = a(0 + 4)^2 + 12\]
\[48 = 16a\]
\[a = 3\]
The quadratic function in vertex form with the given characteristics is \(y = 3(x + 4)^2 + 12\).

d) \(x\)-intercepts of \(2\) and \(7\) and maximum value of \(25\)
The \(x\)-coordinate is halfway between the \(x\)-intercepts. So, \(p = 4.5\).
Since \(p = 4.5\) and \(q = 25\), the function is of the form \(y = a(x - 4.5)^2 + 25\).
Substitute the coordinates of one of the \(x\)-intercepts to find \(a\).
\[0 = a(2 - 4.5)^2 + 25\]
\[-25 = 6.25a\]
\[a = -4\]
The quadratic function in vertex form with the given characteristics is \(y = -4(x - 4.5)^2 + 25\).

**Chapter 3 Review \quad Page 198 \quad Question 5**

a) Since the vertex is located at \((-3, -4)\), \(p = -3\) and \(q = -6\).
So, the function is of the form \(y = a(x + 3)^2 - 6\). Substitute \((1, -2)\) and solve for \(a\).
\[-2 = a(1 + 3)^2 - 6\]
\[4 = 16a\]
\[a = \frac{1}{4}\]
The quadratic function in vertex form is \(y = \frac{1}{4}(x + 3)^2 - 6\).
b) Since the vertex is located at (1, 5), \(p = 1\) and \(q = 5\). So, the function is of the form \(y = a(x - 1)^2 + 5\). Substitute \((0, 3)\) and solve for \(a\).

\[3 = a(0 - 1)^2 + 5\]
\[3 = a + 5\]
\[a = -2\]

The quadratic function in vertex form is \(y = -2(x - 1)^2 + 5\).

Chapter 3 Review Page 198 Question 6

Answers may vary. Example:
Choose the location of the origin to be the lowest point in the centre of the mirror. Let \(x\) and \(y\) represent the horizontal and vertical distances from the low point of the mirror, respectively. Then, the vertex is at \((0, 0)\) and the quadratic function is of the form \(y = ax^2\). From the diagram, another point on the parabola is \((90, 56)\).
Use the coordinates of this point to find \(a\).

\[56 = a(90)^2\]
\[56 = 8100a\]
\[a = \frac{14}{2025}\]

A quadratic function that represents the cross-sectional shape is \(y = \frac{14}{2025}x^2\).

Chapter 3 Review Page 199 Question 7

a) i) The location of the origin is the lowest point in the centre of the cables.
Let \(x\) and \(y\) represent the horizontal and vertical distances from the low point of the cables, respectively. Then, the vertex is at \((0, 0)\) and the quadratic function is of the form \(y = ax^2\). From the diagram, another point on the parabola is \((137, 22)\).
Use the coordinates of this point to find \(a\).

\[22 = a(137)^2\]
\[22 = 18769a\]
\[a = \frac{22}{18769}\]

A quadratic function that represents the shape of the cables is \(y = \frac{22}{18769}x^2\).
ii) The location of the origin is the point on the water's surface directly below the minimum point of the cables. Then the vertex is at $(0, 30)$.
Let $x$ and $y$ represent the horizontal and vertical distances, respectively. The quadratic function is of the form $y = ax^2 + 30$. Another point on the parabola is $(137, 52)$. Use the coordinates of this point to find $a$.

\[
52 = a(137)^2 + 30
\]

\[
22 = 18769a
\]

\[
a = \frac{22}{18769}
\]

A quadratic function that represents the shape of the cables is $y = \frac{22}{18769} x^2 + 30$.

iii) The location of the origin is the base of the tower on the left. Then the vertex is at $(137, 30)$.
Let $x$ and $y$ represent the horizontal and vertical distances, respectively. The quadratic function is of the form $y = a(x - 137)^2 + 30$. Another point on the parabola is $(0, 52)$. Use the coordinates of this point to find $a$.

\[
52 = a(0 - 137)^2 + 30
\]

\[
22 = 18769a
\]

\[
a = \frac{22}{18769}
\]

A quadratic function that represents the shape of the cables is $y = \frac{22}{18769} (x - 137)^2 + 30$.

b) Answers may vary. Example: The function will change as the seasons change with the heat or cold changing the length of the cable.

**Chapter 3 Review Page 199 Question 8**

The location of the origin is at the point from which the flea jumped. Let $x$ and $y$ represent the horizontal and vertical distances, respectively. Then, the vertex is at $(7.5, 30)$ and the quadratic function is of the form $y = a(x - 7.5)^2 + 30$. From the diagram, another point on the parabola is $(0, 0)$.
Use the coordinates of this point to find $a$.

\[
0 = a(0 - 7.5)^2 + 30
\]

\[
-30 = 56.25a
\]

\[
a = \frac{8}{15}
\]

A quadratic function that represents the path of the flea is $y = \frac{8}{15} (x - 7.5)^2 + 30$. 

Chapter 3 Review  Page 199  Question 9

a) The coordinates of the vertex are (2, 4). The equation of the axis of symmetry is \( x = 2 \). The graph has a maximum value of 4, since the parabola opens downward. The domain is \( \{ x \mid x \in \mathbb{R} \} \) and the range is \( \{ y \mid y \leq 4, y \in \mathbb{R} \} \). The x-intercepts are −2 and 6, and the y-intercept is 3.

b) The coordinates of the vertex are (−4, 2). The equation of the axis of symmetry is \( x = −4 \). The graph has a minimum value of 2, since the parabola opens upward. The domain is \( \{ x \mid x \in \mathbb{R} \} \) and the range is \( \{ y \mid y \geq 2, y \in \mathbb{R} \} \). There are no x-intercepts, and the y-intercept is 10.

Chapter 3 Review  Page 199  Question 10

a) Expand \( y = 7(x + 3)^2 - 41 \).
\[
y = 7(x^2 + 6x + 9) - 41
\]
\[
y = 7x^2 + 42x + 63 - 41
\]
\[
y = 7x^2 + 42x + 22
\]
The function \( y = 7(x + 3)^2 - 41 \) is quadratic, since when expanded it is a polynomial of degree two.

b) Expand \( y = (2x + 7)(10 - 3x) \).
\[
y = 20x - 6x^2 + 70 - 21x
\]
\[
y = -6x^2 - x + 70
\]
The function \( y = (2x + 7)(10 - 3x) \) is quadratic, since when expanded it is a polynomial of degree two.
CHAPTER 3 REVIEW ANSWERS

Chapter 3 Review  Page 199  Question 11

a) \[ f(x) = -2x^2 + 3x + 5 \]

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) = -2(-1)^2 + 3(-1) + 5 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>-4</td>
</tr>
</tbody>
</table>

vertex: (0.75, 6.125)
axis of symmetry: \( x = 0.75 \)
opens downward
maximum value: 6.125
domain: \( \{ x | x \in \mathbb{R} \} \)
range: \( \{ y | y \leq 6.125, y \in \mathbb{R} \} \)
x-intercepts: -1 and 3
y-intercept: 5

b) Answers may vary. Example: The vertex is the highest point on the parabola. The axis of symmetry is defined by the \( x \)-coordinate of the vertex. Since \( a < 0 \), the graph opens downward. The maximum value is the \( y \)-coordinate of the vertex. The domain is all real numbers. The range is less than or equal to the maximum value. The \( x \)-intercepts are where the graph crosses the \( x \)-axis, and the \( y \)-intercept is where the graph crosses the \( y \)-axis.

Chapter 3 Review  Page 200  Question 12

a) Model the path of the soccer ball with a graph.

b) The maximum height of the ball is 20 m when the ball is 25 m downfield.
c) The ball hits the ground 50 m downfield.

d) Since both height and distance must be positive, the domain is \( \{x \mid 0 \leq x \leq 50, x \in \mathbb{R}\} \) and the range is \( \{y \mid 0 \leq y \leq 20, y \in \mathbb{R}\} \).

### Chapter 3 Review Page 200 Question 13

a) Create a function model for the area, \( A \).
\[
A = (31 - 2x)(5x + 15)
\]
\[
A = 155x + 465 - 10x^2 - 30x
\]
\[
A = -10x^2 + 125x + 465
\]

b) Use a graphing calculator to graph the function with window settings of \( x: [-4, 16, 1] \) and \( y: [-100, 1000, 50] \).

c) The portion of the graph above the \( x \)-axis represents the possible areas for the rectangle. So, the \( x \)-intercepts give the possible range of \( x \)-values that produce these areas.

d) The function has a maximum value and a minimum value (the minimum is 0 because of the context—it is an area).

e) The vertex gives the maximum area and the \( x \)-value for which it occurs.

f) The domain is \( \{x \mid -3 \leq x \leq 15.5, x \in \mathbb{R}\} \) and the range is \( \{A \mid 0 \leq A \leq 855.625, A \in \mathbb{R}\} \). The domain represents the values for \( x \) that will produce dimensions of a rectangle. The range represents the possible values of the area of the rectangle.

### Chapter 3 Review Page 200 Question 14

a) Complete the square to write \( y = x^2 - 24x + 10 \) in vertex form.
\[
y = x^2 - 24x + 10
\]
\[
y = (x^2 - 24x) + 10
\]
\[
y = (x^2 - 24x + 144 - 144) + 10
\]
\[
y = (x^2 - 24x + 144) - 144 + 10
\]
\[
y = (x - 12)^2 - 134
\]
Expand \( y = (x - 12)^2 - 134 \) to verify the two forms are equivalent.
\[ y = (x - 12)^2 - 134 \]
\[ y = (x^2 - 24x + 144) - 134 \]
\[ y = x^2 - 24x + 10 \]

b) Complete the square to write \( y = 5x^2 + 40x - 27 \) in vertex form.
\[ y = 5x^2 + 40x - 27 \]
\[ y = 5(x^2 + 8x) - 27 \]
\[ y = 5(x^2 + 8x + 16 - 16) - 27 \]
\[ y = 5[(x^2 + 8x + 16) - 16] - 27 \]
\[ y = 5[(x + 4)^2 - 16] - 27 \]
\[ y = 5(x + 4)^2 - 80 - 27 \]
\[ y = 5(x + 4)^2 - 107 \]
Expand \( y = 5(x + 4)^2 - 107 \) to verify the two forms are equivalent.
\[ y = 5(x + 4)^2 - 107 \]
\[ y = 5(x^2 + 8x + 16) - 107 \]
\[ y = 5x^2 + 40x + 80 - 107 \]
\[ y = 5x^2 + 40x - 27 \]

c) Complete the square to write \( y = -2x^2 + 8x \) in vertex form.
\[ y = -2x^2 + 8x \]
\[ y = -2(x^2 - 4x) \]
\[ y = -2[(x^2 - 4x + 4) - 4] \]
\[ y = -2[(x - 2)^2 - 4] \]
\[ y = -2(x - 2)^2 + 8 \]
Expand \( y = -2(x - 2)^2 + 8 \) to verify the two forms are equivalent.
\[ y = -2(x - 2)^2 + 8 \]
\[ y = -2(x^2 - 4x + 4) + 8 \]
\[ y = -2x^2 + 8x - 8 + 8 \]
\[ y = -2x^2 + 8x \]

d) Complete the square to write \( y = -30x^2 - 60x + 105 \) in vertex form.
\[ y = -30x^2 - 60x + 105 \]
\[ y = -30(x^2 + 2x) + 105 \]
\[ y = -30(x^2 + 2x + 1 - 1) + 105 \]
\[ y = -30[(x^2 + 2x + 1) - 1] + 105 \]
\[ y = -30(x + 1)^2 - 30 + 105 \]
\[ y = -30(x + 1)^2 + 75 \]
Expand \( y = -30(x + 1)^2 + 75 \) to verify the two forms are equivalent.
\[ y = -30(x + 1)^2 + 135 \]
\[ y = -30(x^2 + 2x + 1) + 135 \]
\[ y = -30x^2 - 60x - 30 + 135 \]
\[ y = -30x^2 - 60x + 105 \]

**Chapter 3 Review  Page 200  Question 15**

Write \( f(x) = 4x^2 - 10x + 3 \) in vertex form.
\[ f(x) = 4(x^2 - 2.5x) + 3 \]
\[ f(x) = 4([x^2 - 2.5x + 1.5625] - 1.5625) + 3 \]
\[ f(x) = 4[(x - 1.25)^2 - 1.5625] + 3 \]
\[ f(x) = 4(x - 1.25)^2 - 6.25 + 3 \]
\[ f(x) = 4(x - 1.25)^2 - 3.25 \]

For \( f(x) = 4(x - 1.25)^2 - 3.25 \), \( a = 4, p = 1.25 \), and \( q = -3.25 \).

- **vertex:** \((1.25, -3.25)\)
- **axis of symmetry:** \( x = 1.25 \)
- **minimum value:** \(-3.25 \)
- **domain:** \( \{ x \mid x \in \mathbb{R} \} \)
- **range:** \( \{ y \mid y \geq -3.25, y \in \mathbb{R} \} \)

**Chapter 3 Review  Page 200  Question 16**

a) **Amy's solution**
\[ y = -22x^2 - 77x + 132 \]
\[ y = -22(x^2 + 3.5x) + 132 \]
\[ y = -22(x^2 + 3.5x + 12.25 - 12.25) + 132 \]
\[ y = -22(x^2 + 3.5x + 12.25 - 269.5 + 132) \]
\[ y = -22(x + 3.5)^2 - 137.5 \]

There is an error in line 2. Amy incorrectly factored \(-22\) from \(77x\). The result should be \(+3.5x\). There is also an error in line 3. Amy should have added and subtracted the square of half the coefficient of the \(x\)-term, not subtracted and added the square of the coefficient of the \(x\)-term.

The corrected solution is shown.
\[ y = -22x^2 - 77x + 132 \]
\[ y = -22(x^2 + 3.5x) + 132 \]
\[ y = -22(x^2 + 3.5x + 3.0625 - 3.0625) + 132 \]
\[ y = -22(x^2 + 3.5x + 3.0625) + 67.375 + 132 \]
\[ y = -22(x + 1.75)^2 + 199.375 \]
b) Answers may vary. Example: To verify an answer, either work backward to show the functions are equivalent or use technology to show the graphs of the functions are identical.

\[ y = -22(x + 1.75)^2 + 199.375 \]
\[ y = -22(x^2 + 3.5x + 3.0625) + 199.375 \]
\[ y = -22x^2 - 77x - 67.375 + 199.375 \]
\[ y = -22x^2 - 77x + 132 \]

Chapter 3 Review  Page 200  Question 17

a) Let \( n \) represent the number of price decreases. The new price is \( \$40 \) minus the number of price decreases times \( \$2 \), or \( 40 - 2n \).

The new number of coats sold is \( 10,000 \) plus the number of price decreases times \( 500 \), or \( 10,000 + 500n \).

Let \( R \) represent the expected revenue, in dollars.

Revenue = \( \text{price} \times \text{number of sessions} \)

\[ R = (40 - 2n)(10,000 + 500n) \]

\[ R = 400,000 - 1000n^2 \]

\[ R = -1000n^2 + 400,000 \]

b) The function \( R = -1000n^2 + 400,000 \) is in vertex form.

The maximum revenue the manager can expect is \( \$400,000 \) when a coat sells for \( 40 - 2(0) \), or \( \$40 \).

c) Use a graphing calculator to graph the function with window settings of

\( x: [-2, 24, 2] \) and

\( y: [-60,000, 500,000, 20,000] \).

d) The y-intercept represents the maximum revenue. The positive x-intercept indicates the number of price decreases that will produce revenue.

e) For the number of price decrease, the domain is \( \{ x \mid 0 \leq x \leq 20, x \in \mathbb{R} \} \) and the range is \( \{ y \mid 0 \leq y \leq 400,000, y \in \mathbb{R} \} \).
f) Answers may vary. Example: Assume that the market research regarding price and number of coats sold holds true.

**Chapter 3 Practice Test**

**Chapter 3 Practice Test**  Page 201  Question 1

The function \( f(x) = 3(x - 9) + 6 \) is linear, not quadratic. The answer is D.

**Chapter 3 Practice Test**  Page 201  Question 2

The vertex of the parabola shown is \((-4, -4)\). Then, \( p = -4 \) and \( q = -4 \). So, the function in vertex form is \( y = (x + 4)^2 - 4 \). The answer is C.

**Chapter 3 Practice Test**  Page 201  Question 3

For the function \( y = -6(x - 6)^2 + 6 \), \( a = -6 \), \( p = 6 \), and \( q = -6 \). Since \( a < 0 \), the parabola opens downward and the range is \( \{y \mid y \leq 6, y \in \mathbb{R}\} \). The answer is A.

**Chapter 3 Practice Test**  Page 201  Question 4

Write \( y = x^2 - 2x - 5 \) in vertex form.

\[
y = (x^2 - 2x) - 5
\]

\[
y = (x^2 - 2x + 1 - 1) - 5
\]

\[
y = (x - 1)^2 - 6
\]

The answer is D.

**Chapter 3 Practice Test**  Page 201  Question 5

The graph of \( y = 1 + ax^2 \) if \( a < 0 \) is a parabola that opens downward with vertex \((0, 1)\). The answer is D.

**Chapter 3 Practice Test**  Page 201  Question 6

For the function \( f(x) = a(x - p)^2 + q \) to have no \( x \)-intercepts, either \( a > 0 \) and \( q > 0 \) or \( a < 0 \) and \( q < 0 \). The answer is A.