Section 7.3

1. a. Greatest common factor (GCF) and zero-product property (ZPP); the expression on the left side of the equation factors so that the ZPP can be used.

b. Factoring and the ZPP; the expression on the left side of the equation factors into the product of two binomials.

c. Graphing; find approximate solutions with the graphing calculator.

d. Square root principle; the equation is of the form $ax^2 + c = 0$.

e. Quadratic Formula; the expression on left side of the equation does not factor with integer coefficients and we need exact solutions.

3. a. $a = 2$, $b = 12$, $c = -5$

b. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$= \frac{-12 \pm \sqrt{144 + 40}}{2 \cdot 2}$$

$$= \frac{-12 \pm \sqrt{184}}{4}$$

$$= -3 \pm \frac{\sqrt{184}}{4}$$

These square roots simplify, we learn more about simplifying radicals in Chapter 9.

$x = -3.9$ or $x = 6.39$

5. The x-coordinate of the turning point is given by

$$x = \frac{-b}{2a}$$

$$= \frac{-10}{2 \cdot 5}$$

$$= -1$$

7. a. $x = \frac{-b}{2a}$

b. $x = \frac{-3}{2} = -1.5$

c. To find the y-coordinate of the vertex substitute $\frac{-3}{2}$ for $x$ into

$$y = 2x^2 + 6x - 10$$

$$= 2\left(\frac{-3}{2}\right)^2 + 6\left(\frac{-3}{2}\right) - 10$$

$$= 2\left(-\frac{9}{4}\right) - 10$$

$$= -\frac{9}{2} - 19$$

$$= -\frac{29}{2} = 14.5$$

d. X-intercepts

9. a., b.

The quadratic equation $0 = ax^2 + bx + c$ has

1. no real root when the discriminant is negative;
2. one real root when the discriminant is zero;
3. two real roots when the discriminant is positive.
11. a. 

![Graph of a quadratic equation](image)

b. The space between either x-intercept and the x-coordinate of the vertex is the same, see Figure 16 on p 278 of the text. If you plot the given points, you will find that the space on the left of the vertex is 4. The space on the right must also be 4 giving an x-intercept of (7, 0).

13. 

\[-4x^2 - 2x - 7 = 0\]

\[a = -4, b = -2, c = -7\]

\[x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\]

\[= \frac{-(-2) \pm \sqrt{(-2)^2 - 4 \cdot (-4) \cdot (-7)}}{2 \cdot (-4)}\]

\[= \frac{1 \pm \sqrt{-108}}{4} = \frac{1 \pm 3i}{4}\]

Stop here, the discriminant is negative; \(b^2 - 4ac = -108\). This means there is no real solution.

15. a. 

\[5x^2 + 4x - 1 = 0\]

Diagonal product = \(5x^2\):

1x, 5x is the factor pair of \(5x^2\) that adds to 4x.

\[5x^2 - 1x + 5x - 1 = 0\]

\[(5x - 1)(x + 1) = 0\]

\[5x - 1 = 0 \text{ or } x + 1 = 0\]

\[x = \frac{1}{5} \text{ or } x = -1\]

b. \(a = 5, b = 4, c = -1\)

\[x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\]

\[= \frac{-4 \pm \sqrt{4^2 - 4 \cdot 5 \cdot (-1)}}{2 \cdot 5}\]

\[= \frac{-4 \pm \sqrt{36}}{10} = \frac{-4 \pm 6}{10}\]

\[x = \frac{-4 - 3}{10} = \frac{-7}{10} \text{ or } x = \frac{-4 + 3}{10} = \frac{-1}{10}\]

\[x = \frac{3}{5} \text{ or } x = -1\]

17. The solutions to \(0.27x^2 - 96x + 2 = 0\) are the x-intercepts on the graph of Y1.

Y1 = \(0.27x^2 - 96x + 2\), Y2 = 0

Because this quadratic is not from a real-life problem we may need to experiment to find a good viewing window. Sometimes the preset windows in the ZOOM menu are helpful. Other times you may wish to calculate the vertex to start a window. Example 1 on p 284 and 285 of the text explain this method.

Windows may vary: Xmin = -9.4, Xmax = 9.4, Ymin = -3.1, Ymax = 3.1

Skills and Review 7.3

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19. a. Cheese = 1.3$d^2$

b. 

<table>
<thead>
<tr>
<th>Diameter (inches)</th>
<th>Cheese (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>47</td>
</tr>
<tr>
<td>10</td>
<td>130</td>
</tr>
<tr>
<td>14</td>
<td>255</td>
</tr>
</tbody>
</table>

c. 

![Graph showing the relationship between diameter and cheese weight.]

21. 

\[
\left( \frac{2x^2y^2}{x^3} \right)^2 \\
= (2x^{-1}y^2)^2 \\
= (2x^{-1}y^2)^2 \\
= 4x^{-2}y^4 \\
= \frac{4y^4}{x^2} \\
\]

23. 

\[ A = \frac{1}{2} (b_1 + b_2)h \]

\[
\frac{15}{2} \cdot \frac{1}{2} = \frac{1}{2} \cdot (b_1 + 4) \cdot 2 \\
\frac{15}{2} \cdot \frac{1}{2} = \frac{1}{2} \cdot 2 \cdot (b_1 + 4) \\
\frac{15}{2} = b_1 + 4 \\
\frac{15}{2} - 4 = b_1 \\
b_1 = \frac{7}{2} \text{ cm} = 3.5 \text{ cm} \\
\]

25. a. \[ \frac{73}{100} \]

b. 73%