Chapter 9

Fair Game Review

1. -6 **2.** 11 **3.** $\frac{2}{7}$ **4.** ± 1.5

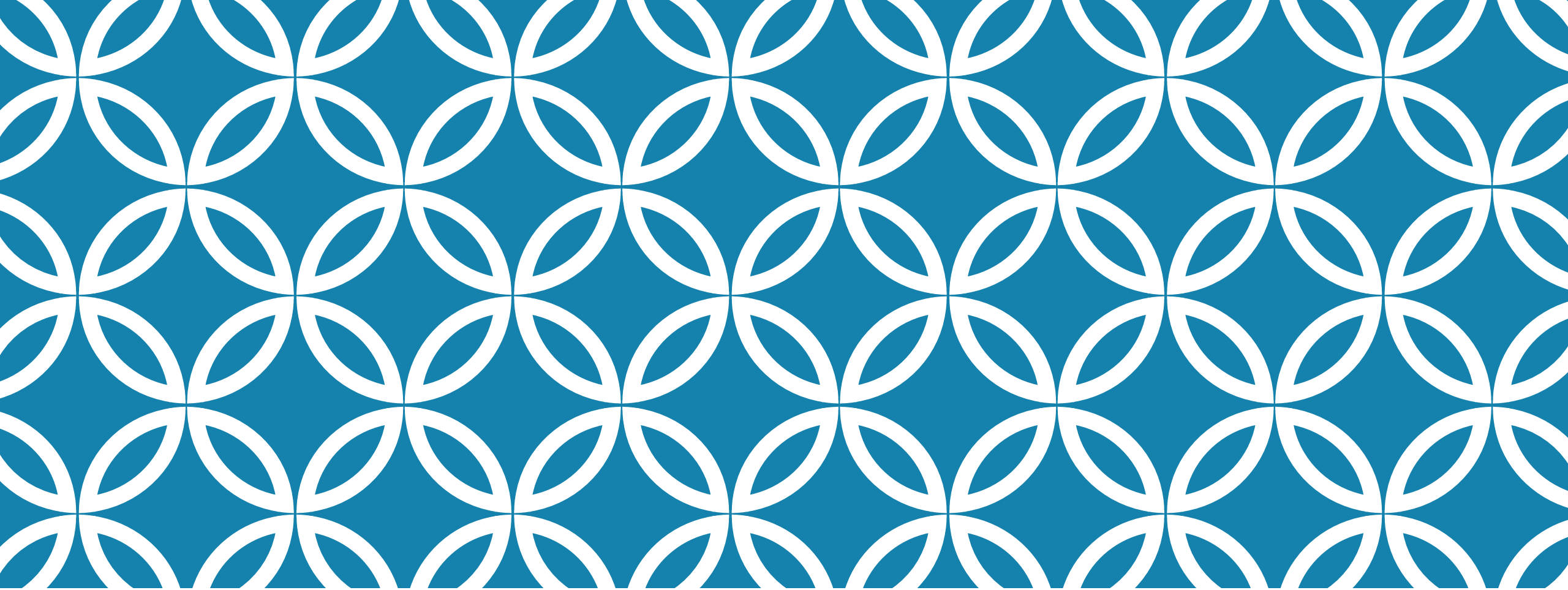
5. 3 ft **6.** 0.5 m **7.** $2\sqrt{5}$ **8.** $3\sqrt{7}$

9. $6\sqrt{3}$ **10.** $12\sqrt{2}$ **11.** $5\sqrt{5}$ ft

12. $8\sqrt{3}$ m **13.** $(y - 3)^2$ **14.** $(b + 9)^2$

15. $(n + 14)^2$ **16.** $(h - 8)^2$

17. a. $(x - 25)$ in. **b.** $4(x - 25)$ in.



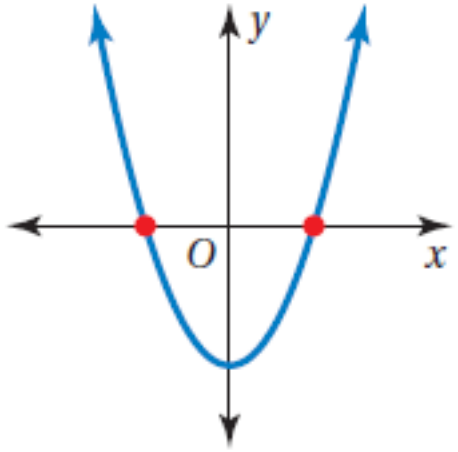
SOLVING QUADRATIC FUNCTIONS BY GRAPHING

Lesson 9.1

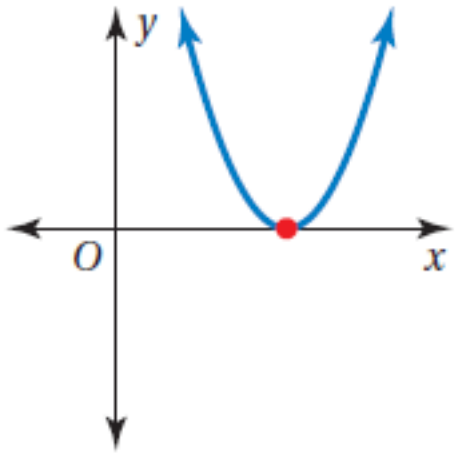
In Chapter 7, you solved quadratic equations by factoring. You can also solve quadratic equations in standard form by finding the x-intercept(s) of the graph of the related function $y = ax^2 + bx + c$.

The ***x*-intercepts** (when y = 0) of a quadratic function are the **solutions** to the related quadratic equation, also referred to as **roots** or **zeros**.

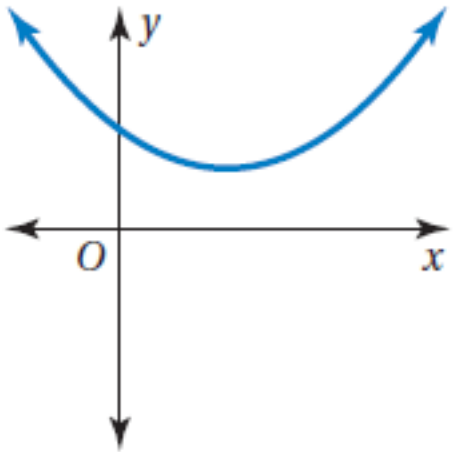
Quadratic equations may have two real solutions, one real solution, or no real solutions.



- two real solutions
- two x-intercepts



- one real solution
- one x-intercept



- no real solutions
- no x-intercepts

EXAMPLE 1 Solving a Quadratic Equation: Two Real Solutions

Solve $x^2 + 2x - 3 = 0$ by graphing.

Step 1: Find the vertex. Use $-\frac{b}{2a}$ to find the *x*-coordinate.

$$-\frac{2}{2(1)} = -1$$

Step 2: Substitute *x*-coordinate, to find the *y*-coordinate.

$$(-1)^2 + 2(-1) - 3$$

$$= 1 - 2 - 3$$

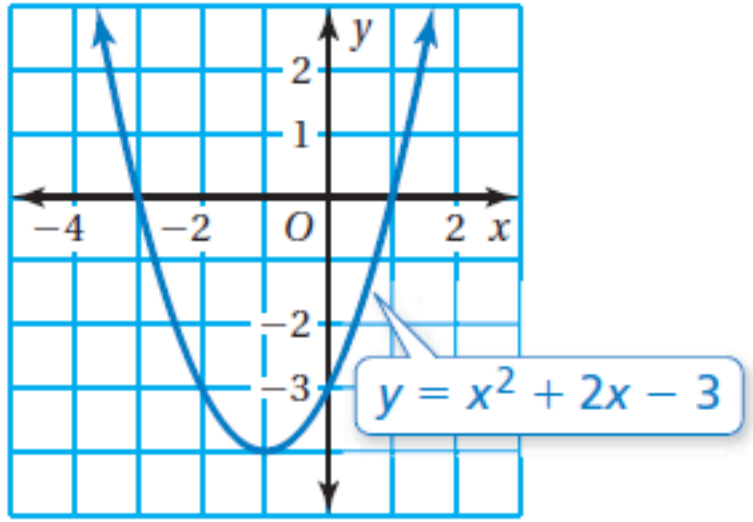
$$= -4$$

Step 3: Plot vertex. (-1, -4)

Step 4: Find *x*-intercepts.

$$(x + 3)(x - 1) = 0$$

$$x = -3 \quad or \quad x = 1$$



So, the solutions are $x = -3$ and $x = 1$.

EXAMPLE 2 Solving a Quadratic Equation: One Real Solution

Solve $x^2 - 8x = -16$ by graphing.

Step 1: Rewrite the equation in standard form.

$$x^2 - 8x + 16 = 0$$

Step 2: Find the vertex. Use $-\frac{b}{2a}$ to find the x-coordinate.

$$-\frac{(-8)}{2(1)} = \frac{8}{2} = 4$$

Step 3: Substitute x-coordinate, to find the y-coordinate.

$$(4)^2 - 8(4) + 16$$

$$= 16 - 32 + 16$$

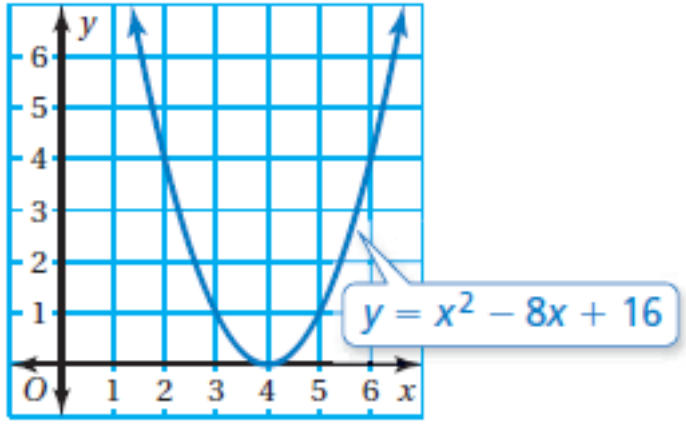
$$= 0$$

Step 4: Plot vertex: (4, 0)

Step 5: Find x-intercepts.

$$(x - 4)(x - 4) = 0$$

$$x = 4$$



The only x-intercept is at the vertex (4, 0).

So, the solution is $x = 4$.

EXAMPLE 3 Solving a Quadratic Equation: No Real Solutions

Solve $-x^2 = 4x + 5$ by graphing.

Step 1: Rewrite the equation in standard form.

$$y = x^2 + 4x + 5$$

Step 2: Find the vertex. Use $-\frac{b}{2a}$ to find the *x*-coordinate.

$$-\frac{4}{2(1)} = -\frac{4}{2} = -2$$

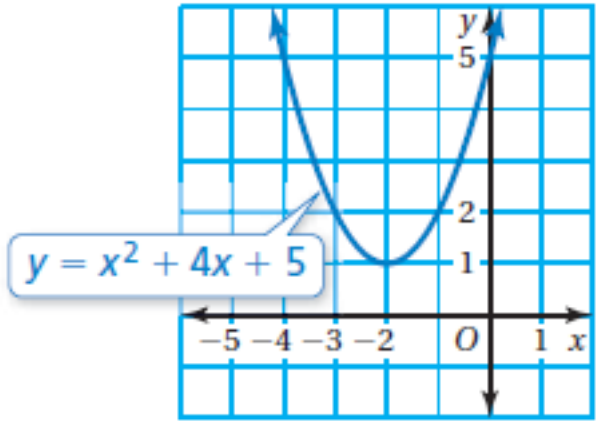
Step 3: Substitute *x*-coordinate, to find the *y*-coordinate.

$$(-2)^2 + 4(-2) + 5$$

$$= 4 - 8 + 5$$

$$= 1$$

Step 4: Plot vertex: (-2, 1)



The vertex is above the *x*-axis, and since a > 0, the parabola will open up and never intersect the *x*-axis. So, $-x^2 = 4x + 5$ has no real solutions.

On Your Own

Solve the equations by graphing or factoring.

1. $x^2 - x - 2 = 0$

2. $x^2 + 7x + 10 = 0$

3. $x^2 + x = 12$

4. $x^2 + 1 = 2x$

5. $x^2 + 4x = 0$

6. $x^2 + 10x = -25$

7. $x^2 = 3x - 3$

8. $x^2 + 7x = -6$

On Your Own

Solve the equations by graphing or factoring.

1. $x^2 - x - 2 = 0$

$x = -1, x = 2$

2. $x^2 + 7x + 10 = 0$

3. $x^2 + x = 12$

4. $x^2 + 1 = 2x$

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On Your Own

Solve the equations by graphing or factoring.

1. $x^2 - x - 2 = 0$

$x = -1, x = 2$

2. $x^2 + 7x + 10 = 0$

$x = -5, x = -2$

3. $x^2 + x = 12$

4. $x^2 + 1 = 2x$

5. $x^2 + 4x = 0$

6. $x^2 + 10x = -25$

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2. $x^2 + 7x + 10 = 0$

$x = -5, x = -2$

3. $x^2 + x = 12$

$x = -4, x = 3$

4. $x^2 + 1 = 2x$

5. $x^2 + 4x = 0$

6. $x^2 + 10x = -25$

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no real solutions

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On Your Own

Solve the equations by graphing or factoring.

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5. $x^2 + 4x = 0$

$x = -4, x = 0$

6. $x^2 + 10x = -25$

$x = -5$

7. $x^2 = 3x - 3$

no real solutions

8. $x^2 + 7x = -6$

$x = -6, x = -1$

EXAMPLE 4 Real-Life Application

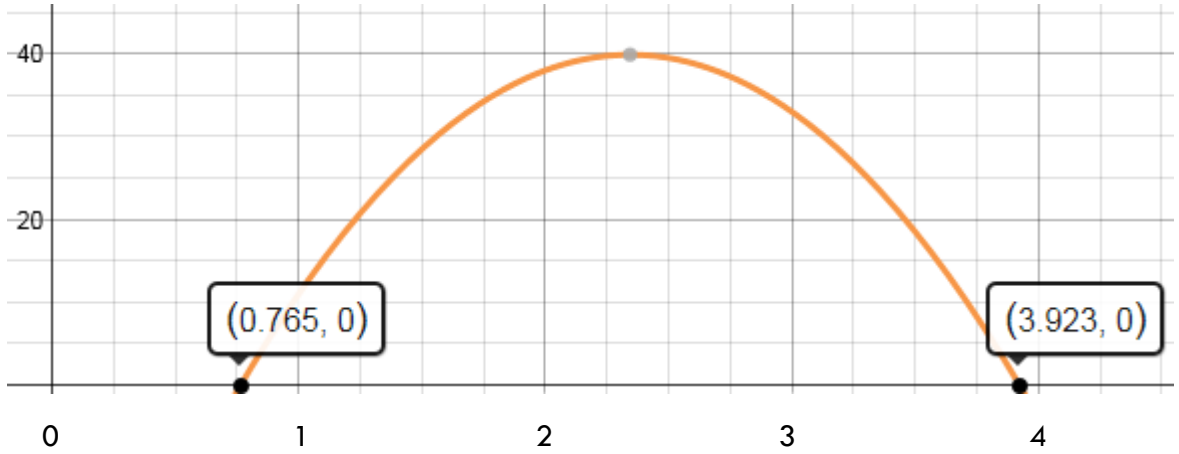
A football player kicks a football 2 feet above the ground with an upward velocity of 75 feet per second. The function $h = -16t^2 + 75t + 2$ gives the height h (in feet) of the football after t seconds. After how many seconds is the football 50 feet above the ground?

To determine when the football is 50 feet above the ground, find the t-values for which $h = 50$. So, solve the equation $-16t^2 + 75t + 2 = 50$.

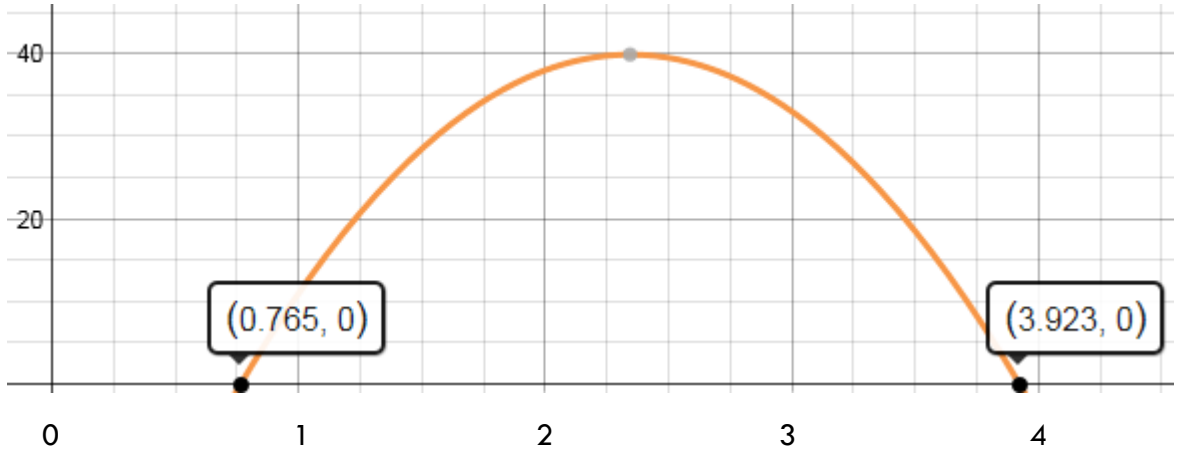
Step 1: Rewrite the equation in standard form.

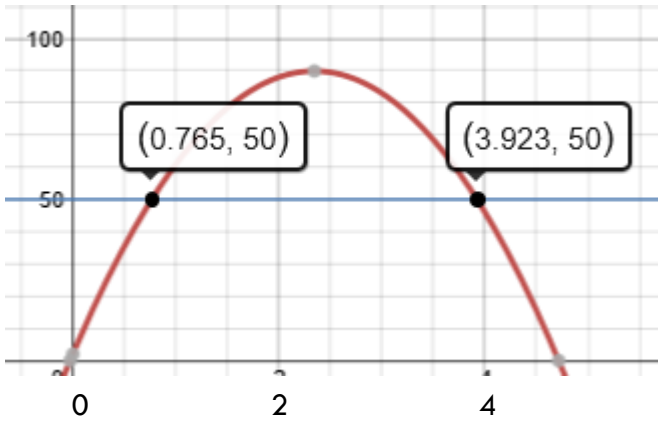
$$-16t^2 + 75t - 48 = 0$$

Step 2: Use a graphing calculator or go to desmos.com to graph the related function.



The football is 50 feet above the ground after about 0.8 second and about 3.9 seconds.





The graph shows the height of the object over time, not the path of the object

Homework

Textbook pages: 459 - 461: 4-8, 9-33 mod 3, 41, 48-50