9.2 Start Thinking

Use a graphing calculator to graph the function $y = x^2 - 2x - 3$. How many times does the parabola cross the x-axis? Name the point(s) where the graph crosses the x-axis.

Use the CALC feature on the graphing calculator to find the zeros of the function. How does this relate to the points you found? Explain why these points are called zeros.

9.2 Warm Up

Solve.

1. $9x - 4 = 5x - 12$

2. $14b = 5b + 18$

3. $4x = 12 + x$

4. $5y + 1 = -14 + 2y$

5. $5y + 7 = 2y + 7$

6. $10 + 3n = 15 - 2n$

9.2 Cumulative Review Warm Up

Solve the equation.

1. $x(x - 9) = 0$

2. $11t(2t + 4) = 0$

3. $(s + 10)s = 0$

4. $(3a + 6)(4a - 16) = 0$

5. $(6m - 3)^2 = 0$

6. $(4 + g)(8 - 2g) = 0$

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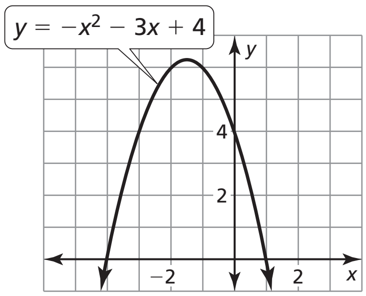
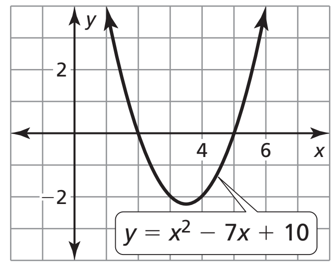
9.2 Practice A

In Exercises 1 and 2, use the graph to solve the equation.

1. $-x^2 - 3x + 4 = 0$



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



In Exercises 3–5, write the equation in standard form.

3. $3x^2 = 15$

4. $-x^2 = -14$

5. $4x - 2x^2 = 5$

In Exercises 6–11, solve the equation by graphing.

6. $x^2 + 3x = 0$

7. $x^2 + 2x + 1 = 0$

8. $x^2 - 3x + 6 = 0$

9. $x^2 - 4x - 5 = 0$

10. $-x^2 = 7x + 18$

11. $x^2 = -2x + 3$

12. The height y (in feet) of a toss in bocce ball can be modeled by $y = -x^2 + 4x$, where x is the horizontal distance (in feet).

a. Interpret the x-intercepts of the graph of the equation.

b. How far away does the bocce ball land on the ground?

In Exercises 13–15, solve the equation by using Method 2 from Example 3.

13. $x^2 = 4x + 12$

14. $8x - 15 = x^2$

15. $x^2 + 9x = 10$

In Exercises 16–19, graph the function. Approximate the zeros of the function to the nearest tenth when necessary.

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

17. $f(x) = -x^2 + 8x - 6$

18. $y = \frac{1}{3}x^2 + 2x - 4$

19. $y = -2x^2 + 3x - 2$

20. The area (in square feet) of an x-foot-wide sidewalk can be modeled by $y = -0.002x^2 + 0.006x$. Find the width of the sidewalk to the nearest foot.

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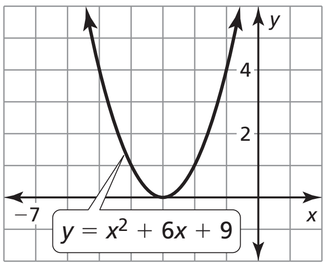
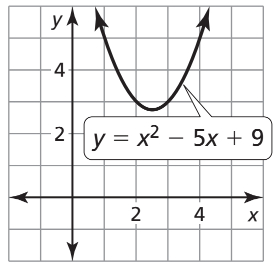
9.2 Practice B

In Exercises 1 and 2, use the graph to solve the equation.

1. $x^2 + 6x + 9 = 0$



2. $x^2 - 5x + 9 = 0$



In Exercises 3–5, write the equation in standard form.

3. $-x^2 = 23$

4. $3 - 5x^2 = 9x$

5. $6 - 2x = 7x^2$

In Exercises 6–11, solve the equation by graphing.

6. $-x^2 + 6x = 0$

7. $x^2 - 12x + 36 = 0$

8. $x^2 - 4x + 8 = 0$

9. $6x - 7 = -x^2$

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

11. $9 - x^2 = -8x$

12. The height h (in feet) of a fly ball in a baseball game can be modeled by $h = -16t^2 + 28t + 8,$ where t is the time (in seconds).

a. Do both t-intercepts of the graph of the function have meaning in this situation? Explain.

b. No one caught the fly ball. After how many seconds did the ball hit the ground?

In Exercises 13–15, solve the equation by using Method 2 from Example 3.

13. $x^2 = 6x + 7$

14. $-20 = x^2 + 9x$

15. $x^2 - 24 = 10x$

In Exercises 16–19, graph the function. Approximate the zeros of the function to the nearest tenth when necessary.

16. $f(x) = x^2 + 5x + 2$

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

18. $y = -x^2 + 3x - 5$

19. $y = \frac{1}{2}x^2 - 3x + 1$

20. The area (in square feet) of an x-foot-wide path can be modeled by $y = -0.002x^2 + 0.006x.$ Find the width of the path to the nearest foot.

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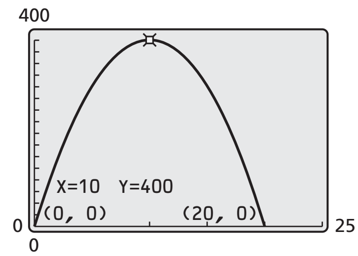
9.2 Enrichment and Extension

Graphical Representations of Quadratic Word Problems

To solve real-life quadratic word problems, you can use a graphing calculator to interpret data and yield solutions to the problems at hand. By using the *calculate* function on the calculator, you can find maximum and minimum values as well as zeros of the function. You can also use the table feature to find other values needed.



$$f(t) = -4t^2 + 80t$$

Solve the exercise by analyzing the graph of the equation and using the features of your graphing calculator.

1. The height h (in feet) of a rocket above the ground after t seconds of motion is given by the formula $h(t) = -16t^2 + 100t$.

   a. How long does it take the rocket to reach a height of 144 feet? Round your answer to the nearest hundredth of a second.

   b. How long does it take the rocket to hit the ground? Round your answer to the nearest hundredth of a second.

2. The opening of a tunnel underneath a mountain can be modeled by the function $h(f) = -\frac{1}{30}f^2 + 2f$, where h is the height of the tunnel (in feet) and f is the distance (in feet) from the bottom of the left edge of the tunnel opening. What is the width across the bottom of the tunnel?

3. The function $I(t) = -0.2t^2 + 3.4t$ represents the yearly income or loss I (in dollars) from a real estate investment, where t is time in years after 1990. During what year did the investor earn the maximum amount of income?

4. The equation for cost C (in dollars) of producing each individual automobile tire in a vehicle factory is $C(x) = 0.00003x^2 - 0.06x + 65$, where x represents the number of tires produced.

   a. Find the number of tires the factory should make to minimize the cost of each individual tire.

   b. What would be the cost of each tire?

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9.2 Puzzle Time

Why Do They Call The New Dance The Elevator?

Write the letter of each answer in the box containing the exercise number.

Write the equation in standard form.

1. $5x^2 = 14$

2. $-3x^2 = 16$

3. $7x - 8x^2 = 6$

4. $9 + 10x = 12x^2$

Solve the equation by graphing.

5. $x^2 - 6x = 0$

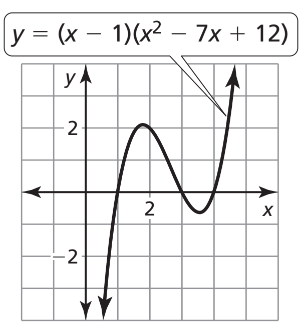
6. $x^2 - 3x + 7 = 0$

7. $x^2 = -8x - 16$

8. $-x^2 = -10x + 24$

Find the zero(s) of *f*. Approximate the zero(s) of *f* to the nearest tenth when necessary.

9.



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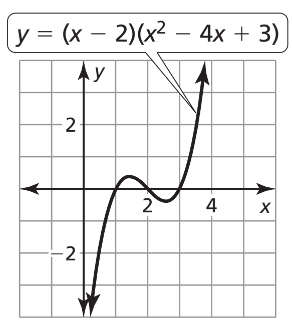

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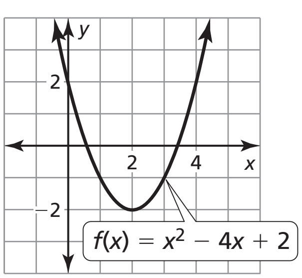
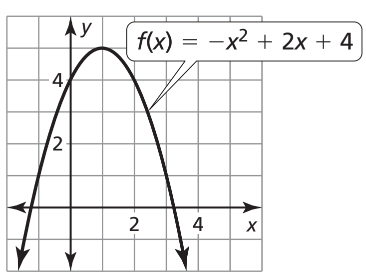


12.



Answers

S. $3x^2 + 16 = 0$

T. $12x^2 - 10x - 9 = 0$

N. $8x^2 - 7x + 6 = 0$

A. $5x^2 - 14 = 0$

E. 4, 6

S. no solution

H. 0.6, 3.4

T. 0, 6

P. 1, 2, 3

I. -4

O. 1, 3, 4

S. -1.2, 3.2

7	4		11	1	6		3	9		12	5	8	10	2

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