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# 3.1 Solving Quadratic Equations

**For use with Exploration 3.1**

**Essential Question** How can you use the graph of a quadratic equation to determine the number of real solutions of the equation?

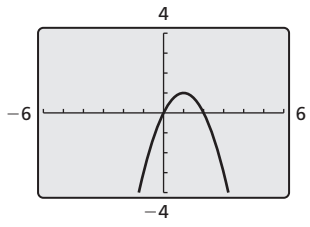
## 1 EXPLORATION: Matching a Quadratic Function with Its Graph

**Work with a partner.** Match each quadratic function with its graph. Explain your reasoning. Determine the number of $x$-intercepts of the graph.

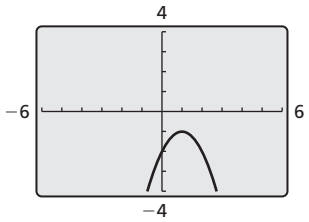
**a.** $f(x) = x^2 - 2x$ **b.** $f(x) = x^2 - 2x + 1$ **c.** $f(x) = x^2 - 2x + 2$

**d.** $f(x) = -x^2 + 2x$ **e.** $f(x) = -x^2 + 2x - 1$ **f.** $f(x) = -x^2 + 2x - 2$

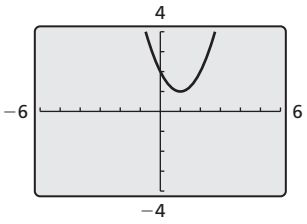
**A.**



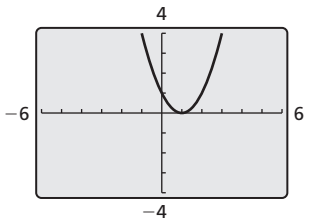

**B.**



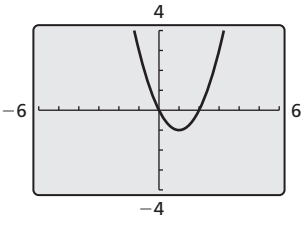

**C.**



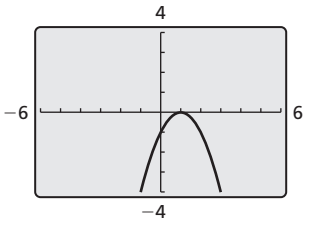

**D.**




**E.**




**F.**



## 2 EXPLORATION: Solving Quadratic Equations

**Work with a partner.** Use the results of Exploration 1 to find the real solutions (if any) of each quadratic equation.

**a.** $x^2 - 2x = 0$ **b.** $x^2 - 2x + 1 = 0$ **c.** $x^2 - 2x + 2 = 0$

**d.** $-x^2 + 2x = 0$ **e.** $-x^2 + 2x - 1 = 0$ **f.** $-x^2 + 2x - 2 = 0$

## Communicate Your Answer

**3.** How can you use the graph of a quadratic equation to determine the number of real solutions of the equation?

**4.** How many real solutions does the quadratic equation $x^2 + 3x + 2 = 0$ have? How do you know? What are the solutions?

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# 3.1 Notetaking with Vocabulary

**For use after Lesson 3.1**

**In your own words, write the meaning of each vocabulary term.**

quadratic equation in one variable

root of an equation

zero of a function

## Core Concepts

### Solving Quadratic Equations

**By graphing** Find the $x$-intercepts of the related function $y = ax^2 + bx + c$.

**Using square roots** Write the equation in the form $u^2 = d$, where $u$ is an algebraic expression, and solve by taking the square root of each side.

**By factoring** Write the polynomial equation $ax^2 + bx + c = 0$ in factored form and solve using the Zero-Product Property.

### Notes:

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## 3.1 Notetaking with Vocabulary (continued)

### Zero-Product Property

**Words** If the product of two expressions is zero, then one or both of the expressions equal zero.

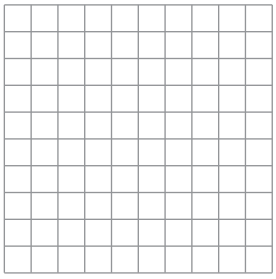
**Algebra** If $A$ and $B$ are expressions and $AB = 0$, then $A = 0$ or $B = 0$.

### Notes:

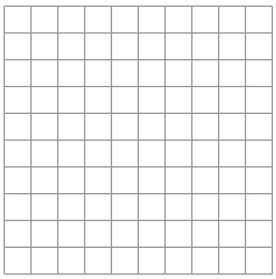
## Extra Practice

**In Exercises 1–3, solve the equation by graphing.**

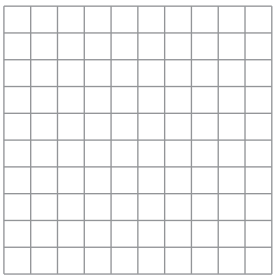
**1.** $x^2 - 11x + 24 = 0$



**2.** $13 = -x^2 - 12$



**3.** $12x^2 = 5x + 2$



**In Exercises 4–6, solve the equation using square roots.**

**4.** $t^2 = 400$

**5.** $(2k + 3)^2 - 19 = 81$

**6.** $\frac{1}{7}p^2 = \frac{5}{7}p^2 - 20$

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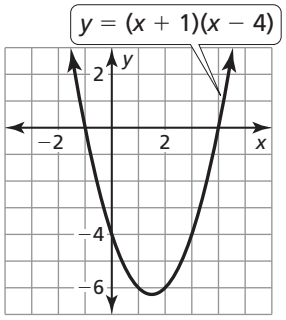
## 3.1 Notetaking with Vocabulary (continued)

**In Exercises 7–9, solve the equation by factoring.**

**7.** $0 = x^2 - 12x + 36$ **8.** $x^2 = 14x - 40$ **9.** $5x^2 + 5x - 1 = -x^2 + 4x$

**10.** Which equations have roots that are equivalent to the $x$-intercepts of the graph shown?




**A.** $-2x^2 - 10x - 8 = 0$

**B.** $x^2 - 3x = 4$

**C.** $(x - 1)(x + 4) = 0$

**D.** $(x - 1)^2 + 4 = 0$

**E.** $6x^2 = 18x + 24$

**11.** A skydiver drops out of an airplane that is flying at an altitude of 4624 feet.

**a.** Use the formula $h = -16t^2 + h_0$ to write an equation that gives the skydiver's height $h$ (in feet) during free fall $t$ seconds after the skydiver drops out of the airplane.

**b.** It is possible for the skydiver to wait 18 seconds before pulling the parachute cord? Explain.