

7.4

Solving Polynomial Equations in Factored Form

For use with Exploration 7.4

Essential Question How can you solve a polynomial equation?

1 EXPLORATION: Matching Equivalent Forms of an Equation

Work with a partner. An equation is considered to be in *factored form* when the product of the factors is equal to 0. Match each factored form of the equation with its equivalent standard form and nonstandard form.

<p style="text-align: center;">Factored Form</p> <p>a. $(x - 1)(x - 3) = 0$</p> <p>b. $(x - 2)(x - 3) = 0$</p> <p>c. $(x + 1)(x - 2) = 0$</p> <p>d. $(x - 1)(x + 2) = 0$</p> <p>e. $(x + 1)(x - 3) = 0$</p>	<p style="text-align: center;">Standard Form</p> <p>A. $x^2 - x - 2 = 0$</p> <p>B. $x^2 + x - 2 = 0$</p> <p>C. $x^2 - 4x + 3 = 0$</p> <p>D. $x^2 - 5x + 6 = 0$</p> <p>E. $x^2 - 2x - 3 = 0$</p>	<p style="text-align: center;">Nonstandard Form</p> <p>1. $x^2 - 5x = -6$</p> <p>2. $(x - 1)^2 = 4$</p> <p>3. $x^2 - x = 2$</p> <p>4. $x(x + 1) = 2$</p> <p>5. $x^2 - 4x = -3$</p>
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2 EXPLORATION: Writing a Conjecture

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Substitute 1, 2, 3, 4, 5, and 6 for x in each equation and determine whether the equation is true. Organize your results in the table. Write a conjecture describing what you discovered.

	Equation	x = 1	x = 2	x = 3	x = 4	x = 5	x = 6
a.	$(x - 1)(x - 2) = 0$						
b.	$(x - 2)(x - 3) = 0$						
c.	$(x - 3)(x - 4) = 0$						
d.	$(x - 4)(x - 5) = 0$						
e.	$(x - 5)(x - 6) = 0$						
f.	$(x - 6)(x - 1) = 0$						

7.4 Solving Polynomial Equations in Factored Form (continued)**3 EXPLORATION: Special Properties of 0 and 1**

Work with a partner. The numbers 0 and 1 have special properties that are shared by no other numbers. For each of the following, decide whether the property is true for 0, 1, both, or neither. Explain your reasoning.

- a. When you add ____ to a number n , you get n .

- b. If the product of two numbers is ____, then at least one of the numbers is 0.

- c. The square of ____ is equal to itself.

- d. When you multiply a number n by ____, you get n .

- e. When you multiply a number n by ____, you get 0.

- f. The opposite of ____ is equal to itself.

Communicate Your Answer

4. How can you solve a polynomial equation?

5. One of the properties in Exploration 3 is called the Zero-Product Property. It is one of the most important properties in all of algebra. Which property is it? Why do you think it is called the Zero-Product Property? Explain how it is used in algebra and why it is so important.

7.4**Notetaking with Vocabulary**

For use after Lesson 7.4

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

factored form

Zero-Product Property

roots

repeated roots

Core Concepts**Zero-Product Property**

Words If the product of two real numbers is 0, then at least one of the numbers is 0.

Algebra If a and b are real numbers and $ab = 0$, then $a = 0$ or $b = 0$.

Notes:

7.4 Notetaking with Vocabulary (continued)**Extra Practice**

In Exercises 1–12, solve the equation.

1. $x(x + 5) = 0$

2. $a(a - 12) = 0$

3. $5p(p - 2) = 0$

4. $(c - 2)(c + 1) = 0$

5. $(2b - 6)(3b + 18) = 0$

6. $(3 - 5s)(-3 + 5s) = 0$

7. $(x - 3)^2 = 0$

8. $(3d + 7)(5d - 6) = 0$

9. $(2t + 8)(2t - 8) = 0$

10. $(w + 4)^2(w + 1) = 0$

11. $g(6 - 3g)(6 + 3g) = 0$

12. $(4 - m)\left(8 + \frac{2}{3}m\right)(-2 - 3m) = 0$

7.4 Notetaking with Vocabulary (continued)

In Exercises 13–18, factor the polynomial.

13. $6x^2 + 3x$

14. $4y^4 - 20y^3$

15. $18u^4 - 6u$

16. $7z^7 + 2z^6$

17. $24h^3 + 8h$

18. $15f^4 - 45f$

In Exercises 19–24, solve the equation.

19. $6k^2 + k = 0$

20. $35n - 49n^2 = 0$

21. $4z^2 + 52z = 0$

22. $6x^2 = -72x$

23. $22s = 11s^2$

24. $7p^2 = 21p$

25. A boy kicks a ball in the air. The height y (in feet) above the ground of the ball is modeled by the equation $y = -16x^2 + 80x$, where x is the time (in seconds) since the ball was kicked. Find the roots of the equation when $y = 0$. Explain what the roots mean in this situation.