9.6 Solving Nonlinear Systems of Equations
For use with Exploration 9.6

Essential Question: How can you solve a system of two equations when one is linear and the other is quadratic?

1 EXPLORATION: Solving a System of Equations

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

Work with a partner. Solve the system of equations by graphing each equation and finding the points of intersection.

System of Equations

\[ y = x + 2 \] Linear
\[ y = x^2 + 2x \] Quadratic

2 EXPLORATION: Analyzing Systems of Equations

Work with a partner. Match each system of equations with its graph (shown on the next page). Then solve the system of equations.

a.\[ y = x^2 - 4 \]
\[ y = -x - 2 \]

b.\[ y = x^2 - 2x + 2 \]
\[ y = 2x - 2 \]

c.\[ y = x^2 + 1 \]
\[ y = x - 1 \]

d.\[ y = x^2 - x - 6 \]
\[ y = 2x - 2 \]
Solving Nonlinear Systems of Equations (continued)

2. **EXPLORATION: Analyzing Systems of Equations (continued)**

   A. \[ \text{Graph 1} \]

   B. \[ \text{Graph 2} \]

   C. \[ \text{Graph 3} \]

   D. \[ \text{Graph 4} \]

**Communicate Your Answer**

3. How can you solve a system of two equations when one is linear and the other is quadratic?

4. Write a system of equations (one linear and one quadratic) that has (a) no solutions, (b) one solution, and (c) two solutions. Your systems should be different from those in Explorations 1 and 2.
9.6 Notetaking with Vocabulary
For use after Lesson 9.6

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

system of nonlinear equations

Notes:
9.6 Notetaking with Vocabulary (continued)

Extra Practice

In Exercises 1–6, solve the system by graphing.

1. \( y = x^2 + 5x + 6 \)
   \( y = -x + 1 \)

2. \( y = x^2 + x - 3 \)
   \( y = x + 1 \)

3. \( y = \frac{1}{2}x^2 - 2x + 1 \)
   \( y = -x + 1 \)

4. \( y = -3x^2 - 3x + 2 \)
   \( y = 2x \)

5. \( y = -\frac{1}{3}x^2 + x - 2 \)
   \( y = -2 \)

6. \( y = 6x^2 + 3x - 5 \)
   \( y = -3x - 5 \)

In Exercises 7–9, solve the equation by substitution.

7. \( y - 2 = x^2 \)
   \( y = 6 \)

8. \( y = -2x^2 \)
   \( y = 3x + 2 \)

9. \( y = x - 4 \)
   \( y = x^2 + 3x - 4 \)
In Exercises 10–12, solve the equation by elimination.

10. \( y = x^2 \quad \text{and} \quad y = x - 3 \)

11. \( y = x^2 + 3x - 5 \quad \text{and} \quad y = 3x - 1 \)

12. \( y = x^2 + x - 2 \quad \text{and} \quad y = x + 14 \)

In Exercises 13–18, solve the equation. Round your solution(s) to the nearest hundredth, if necessary.

13. \(-6x + 14 = x^2 - 9x + 16\)

14. \(-x^2 + 4x = -2x + 8\)

15. \(4x^2 - 9 = 4x - 1\)

16. \(\frac{1}{2}x + 1 = -x^2 + 4x\)

17. \(2x^2 - 4 = -x^2 + 6\)

18. \(-3\left(\frac{2}{3}\right)^x + 2 = x^2 - 2\)