9.6 Start Thinking

Use a graphing calculator to graph each system of equations separately.

System 1 $y = x^2 - 10$
$y = 8$

System 2 $y = 4x + 4$
$y = -x^2 + 4x + 4$

System 3 $y = -4x^2 - 3x$
$y = 6 + 2x$

Determine which system has two solutions, which has one solution, and which has no solution. Explain.

9.6 Warm Up

Solve using any method.

1. $-y = -3x + 6$
$y = -3$

2. $5x + 4y = -17$
$y = 2x - 1$

3. $4x = -7y + 3$
$x = y - 2$

4. $6x + 4y = 24$
$y = 5x - 7$

9.6 Cumulative Review Warm Up

Graph the linear equation. Identify the *x*-intercept.

1. $y = x - 5$

2. $y = 3x$

3. $2x - 2y = -2$

4. $y - 3x = 1$

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9.6 Practice A

In Exercises 1–4, solve the system by graphing.

1. $y = 2x^2 - 3x - 1$
$y = -x - 1$

2. $y = x^2 + 4x + 5$
$y = 2x + 1$

3. $y = -3x^2 + 6x$
$y = 3$

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

In Exercises 5–8, solve the system by substitution.

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

6. $y = 8x - 8$
$y = 2x^2$

7. $y = x^2 - 5x + 9$
$y = 3x + 2$

8. $y = -x^2 + 3$
$y = 3x - 7$

In Exercises 9–12, solve the system by elimination.

9. $y = x^2 - 2x - 1$
$y = -x + 1$

10. $y = -4x^2 + 8x - 8$
$y = -8x + 4$

11. $y = x^2 + 4x + 5$
$y = 2x - 4$

12. $y = 2x^2 + x - 6$
$y = x + 2$

In Exercises 13 and 14, use the table to describe the location of the zeros of the quadratic function *f*.

13.

x	-4	-3	-2	-1	0	1
$f(x)$	-3	-1	0	0	-1	-3

14.

x	-1	0	1	2	3	4
$f(x)$	9	7	3	-2	-1	2

15. You shoot an arrow at a target, and your friend throws a javelin at the same target. The height of an arrow can be modeled by $h = -16t^2 + 20t + 14$. The height of the javelin can be modeled by $h = 0.3t + 1$. When will the arrow and the javelin be at the same height?

Name _____ Date _____

9.6 Practice B

In Exercises 1–4, solve the system by graphing.

1. $y = 4x^2 + 2x - 1$
$y = -2x + 7$

2. $y = \frac{1}{3}x^2 - 6x + 5$
$y = -5x + 5$

3. $y = 4x^2 - 8x$
$y = -4$

4. $y = 3x^2 - 2x + 8$
$y = -x$

In Exercises 5–8, solve the system by substitution.

5. $y = 6x$
$y = x^2 + 9$

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

7. $y = -x^2 - 2x + 4$
$y = 3x - 10$

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

In Exercises 9–12, solve the system by elimination.

9. $y = x^2 - x - 1$
$y = x - 2$

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

11. $y = x^2 - 4x + 7$
$y = -x + 11$

12. $y = -x^2 + 1$
$y = 2x - 2$

In Exercises 13 and 14, use the table to describe the location of the zeros of the quadratic function *f*.

13.

x	-2	-1	0	1	2	3
$f(x)$	-3	-2	-2	0	1	2

14.

x	-1	0	1	2	3	4
$f(x)$	3	2	-1	2	3	5

15. The graphs of $f(x) = 1.6x^2 + 2x - 0.6$ and $g(x) = -2.5x^2 - 2x - 4.2$ do not intersect. Change the value(s) of c in one or both functions f and g until the two graphs do intersect. Write your new system of equations and determine the intersection point(s), rounding to the nearest hundredth if necessary.

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9.6 Enrichment and Extension

Challenge Non-Linear Systems

Solve using your knowledge of systems of non-linear equations.

1. A science class is studying gravity. The students launch an object up in the air at an initial velocity of 64 feet per second. The object is launched from a height of 6 feet off the ground. Its height H (in feet) after t seconds is given by the equation $H(t) = -16t^2 + v_o t + h_0$.

   a. At what time is the object 54 feet off the ground?

   b. How long, to the nearest hundredth of a second, does it take the object to hit the ground?

2. The profit a jacket company makes each day is modeled by the equation $P(x) = -x^2 + 120x - 2000$, where P is the profit and x is the price of each jacket sold. For what value(s) of x does the company make a profit of \$1200?

3. A small electronic company models its annual profits using the function $P(x) = x^2 + 20x - 300$, where P represents the company's profit when x items are sold. Last year, its profits were \$197,625. How many items did the company sell?

4. You and your friends are trying to dunk a basketball. You need to jump at least 2.4 feet above the ground to reach the rim. Your jump is modeled by the function $H(t) = -18t^2 + 14t$.

   a. Will you jump high enough to dunk the basketball?

   b. When will you reach 2.4 feet?

5. A diver is jumping from a 12-foot diving board into the school pool. She jumps with an initial upward velocity of 6 feet per second. Use the formula $h(t) = -16t^2 + v_o t + h_o$, where h_o is the initial height, and v_o is the initial upward velocity.

   a. At what time is the diver 10 feet above the water?

   b. When will the diver hit the water?

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9.6 Puzzle Time

Why Did The Acrobat Join The Circus?

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

Solve the system by substitution.

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

2. $y = x^2 + 6x + 5$
$y = -3x + 5$

3. $y = -x^2 + 9x - 4$
$y = x + 8$

4. $y = -x^2 + 10$
$y + 2x = 7$

5. $y = x^2 - 6x - 2$
$y = -x - 8$

6. $y = x^2 + 22x + 17$
$y = 9x - 25$

Solve the system by elimination.

7. $y = x^2 + 4x - 24$
$y = 6x + 11$

8. $y = -3x^2 + x + 16$
$y = 7x - 8$

9. $y = x^2 + 4x - 19$
$y = -4x + 29$

10. $y = x^2 + 17x - 27$
$y = 12x + 23$

11. $y = 2x^2 - 22x + 1$
$y = -7x + 9$

12. $y = x^2 - 2x - 5$
$y = 6x + 15$

13. $y = 3x^2 + 6x + 12$
$y = 2x + 11$

14. $y = x^2 - 9x - 16$
$y = -5x + 16$

Answers

L. $(2, 10), (6, 14)$

V. $(-2, 3), (10, 75)$

O. $(-5, -19), (7, 53)$

L. $(-4, 36), (8, -24)$

E. $(-10, -97), (5, 83)$

T. $(0, 3), (1, 4)$

A. $(-7, -88), (-6, -79)$

B. $(-1, 9), \left(-\frac{1}{3}, \frac{31}{3}\right)$

A. $(-9, 32), (0, 5)$

O. $\left(-\frac{1}{2}, \frac{25}{2}\right), (8, -47)$

T. $(2,-10),(3,-11)$

B. $(-12, 77), (4, 13)$

I. $(-4, -36), (2, 6)$

E. $(-1, 9), (3, 1)$

5	11		9	4		2	13	7	12	10		8	1		6	14	3