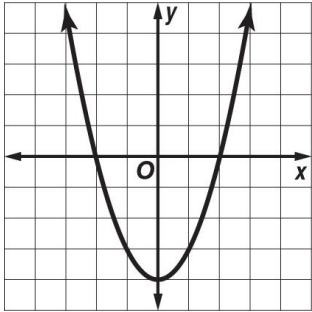


# 9-1 Skills Practice

## Graphing Quadratic Functions

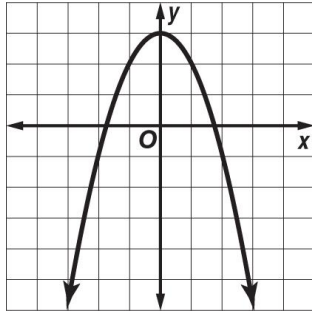
Use a table of values to graph each function. State the domain and the range.

1.  $y = x^2 - 4$



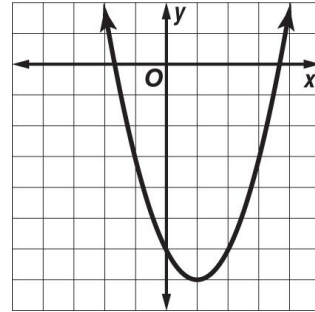
$D = \{\text{all real numbers}\}$   
 $R = \{y / y \geq -4\}$

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



$D = \{\text{all real numbers}\}$   
 $R = \{y / y \leq 3\}$

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



$D = \{\text{all real numbers}\}$   
 $R = \{y / y \geq -7\}$

Find the vertex, the equation of the axis of symmetry, and the y-intercept of the graph of each function.

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

$(2, -2)$ ;  $x = 2$ ; y-int 6

5.  $y = x^2 + 4x + 6$

$(-2, 2)$ ;  $x = -2$ ; y-int 6

6.  $y = -3x^2 - 12x + 3$

$(-2, 15)$ ;  $x = -2$ ; y-int 3

Consider each equation.

a. Determine whether the function has a *maximum* or a *minimum* value.

b. State the maximum or minimum value.

c. What are the domain and range of the function?

7.  $y = 2x^2$

minimum; 0;  
 $D = \{\text{all real numbers}\}$ ,  
 $R = \{y / y \geq 0\}$

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

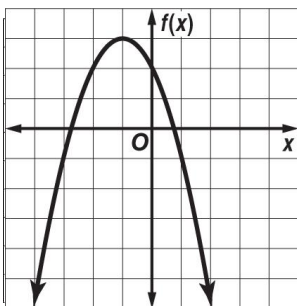
minimum; -6;  
 $D = \{\text{all real numbers}\}$ ,  
 $R = \{y / y \geq -6\}$

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

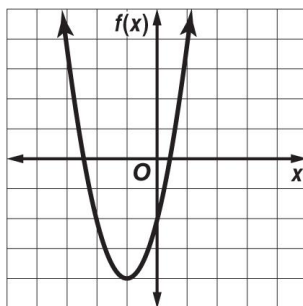
maximum; 3;  
 $D = \{\text{all real numbers}\}$ ,  
 $R = \{y / y \leq 3\}$

Graph each function.

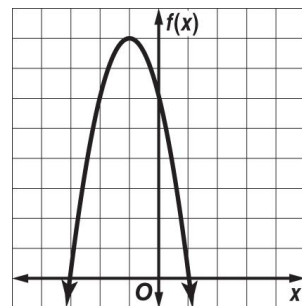
10.  $f(x) = -x^2 - 2x + 2$



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



12.  $f(x) = -2x^2 - 4x + 6$



# 9-2 Skills Practice

## Transformations of Quadratic Functions

Describe how the graph of each function is related to the graph of  $f(x) = x^2$ .

1.  $g(x) = x^2 + 2$

translation of  $f(x) = x^2$   
up 2 units

2.  $g(x) = (x - 1)^2$

translation of  $f(x) = x^2$   
to the right 1 unit

3.  $g(x) = x^2 - 8$

translation of  $f(x) = x^2$   
down 8 units

4.  $g(x) = 7x^2$

dilation of  $f(x) = x^2$   
stretched vertically

5.  $g(x) = \frac{1}{5}x^2$

dilation of  $f(x) = x^2$   
compressed vertically

6.  $g(x) = -6x^2$

dilation of  $f(x) = x^2$   
stretched vertically and  
reflected across the  $x$ -axis

7.  $g(x) = -x^2 + 3$

reflection of  $f(x) = x^2$   
across the  $x$ -axis and  
translated up 3 units

8.  $g(x) = 5 - \frac{1}{5}x^2$

dilation of  $f(x) = x^2$   
compressed vertically,  
reflected across the  $x$ -axis,  
and translated up 5 units

9.  $g(x) = 4(x - 1)^2$

dilation of  $f(x) = x^2$   
stretched vertically  
and translated to  
the right 1 unit

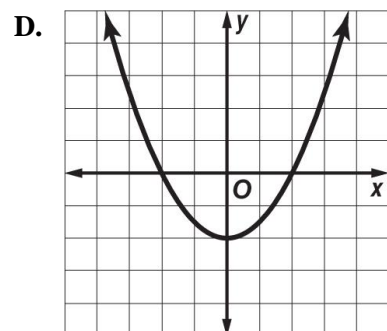
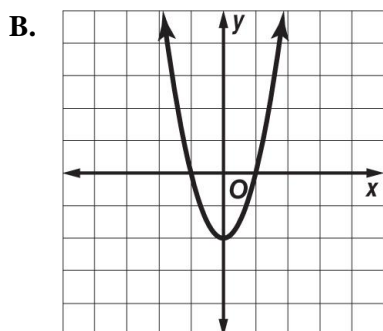
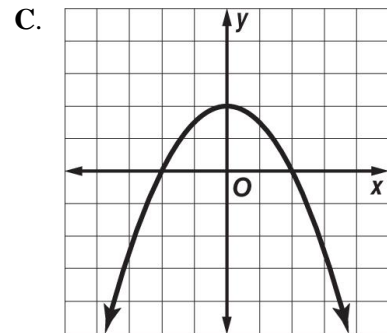
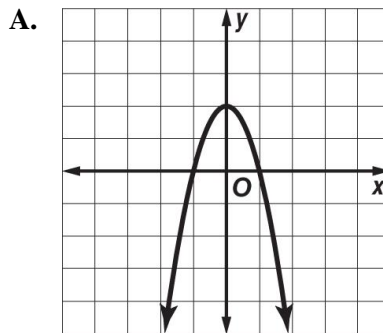
Match each equation to its graph.

10.  $y = 2x^2 - 2$     **B**

11.  $y = \frac{1}{2}x^2 - 2$     **D**

12.  $y = -\frac{1}{2}x^2 + 2$     **C**

13.  $y = -2x^2 + 2$     **A**

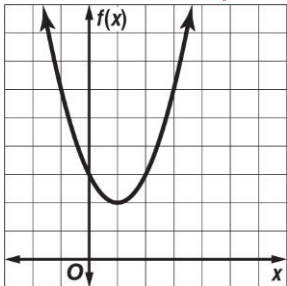


# 9-3 Skills Practice

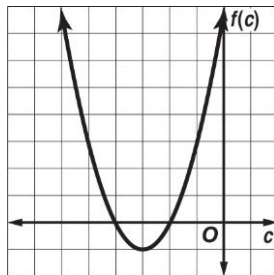
## Solving Quadratic Equations by Graphing

Solve each equation by graphing.

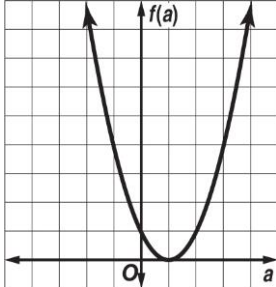
1.  $x^2 - 2x + 3 = 0$   $\emptyset$



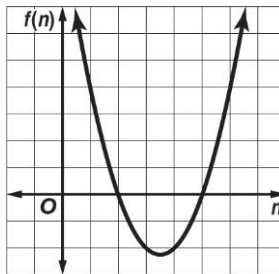
2.  $c^2 + 6c + 8 = 0$   $-4, -2$



3.  $a^2 - 2a = -1$   $1$

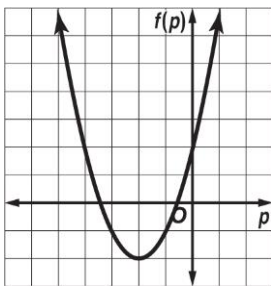


4.  $n^2 - 7n = -10$   $2, 5$



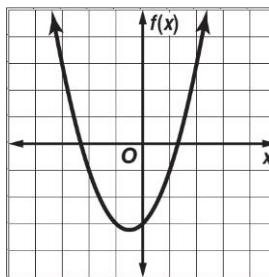
Solve each equation by graphing. If integral roots cannot be found, estimate the roots to the nearest tenth.

5.  $p^2 + 4p + 2 = 0$



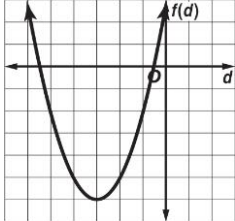
$-3.4, -0.6$

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



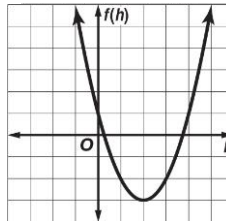
$-2.3, 1.3$

7.  $d^2 + 6d = -3$



$-5.4, -0.6$

8.  $h^2 + 1 = 4h$



$0.3, 3.7$

# 9-4 Skills Practice

## Solving Quadratic Equations by Factoring

Solve each equation. Check the solutions.

1.  $x^2 = 36$        $\{\pm 6\}$

2.  $b^2 - 7b + 12 = 0$        $\{3, 4\}$

3.  $2x^2 + 7x + 3 = 0$        $\left\{-3, -\frac{1}{2}\right\}$

4.  $3w^2 + 14w + 8 = 0$        $\left\{-4, -\frac{2}{3}\right\}$

5.  $m^2 + 5m + 6 = 0$        $\{-3, -2\}$

6.  $d^2 + 7d + 10 = 0$        $\{-5, -2\}$

7.  $16x^2 - 9 = 0$        $\left\{\pm \frac{3}{4}\right\}$

8.  $25p^2 - 16 = 0$        $\left\{\pm \frac{4}{5}\right\}$

9.  $x^2 = 81$        $\{\pm 9\}$

10.  $4p^2 + 4p + 1 = 0$        $\left\{-\frac{1}{2}\right\}$

11.  $y^2 - 2y - 24 = 0$        $\{-4, 6\}$

12.  $5d^2 - 22d + 8 = 0$        $\left\{\frac{2}{5}, 4\right\}$

13.  $n^2 - \frac{9}{25} = 0$        $\left\{\pm \frac{3}{5}\right\}$

14.  $(k + 1)^2 = 9$        $\{-4, 2\}$

15.  $9y^2 + 18y - 12 = 6y$        $\left\{-2, \frac{2}{3}\right\}$

16.  $w^2 + 30 = 11w$        $\{5, 6\}$

17.  $3n^2 - 7n + 2 = 0$        $\left\{-\frac{1}{3}, 2\right\}$

18.  $6h^2 + 8h + 2 = 0$        $\left\{-1, -\frac{1}{3}\right\}$

19.  $16d^2 = 4$        $\left\{\pm \frac{1}{2}\right\}$

20.  $\frac{1}{16}y^2 = 81$        $\{\pm 36\}$

21.  $8p^2 - 16p = 10$        $\left\{-\frac{1}{2}, \frac{5}{2}\right\}$

22.  $x^2 + 30x + 150 = -75$        $\{-15\}$

23.  $10b^2 - 15b = 8b - 12$        $\left\{\frac{4}{5}, \frac{3}{2}\right\}$

24.  $y^2 - 16y + 64 = 81$        $\{-1, 17\}$

25.  $81 - 4b^2 = 0$        $\left\{\pm \frac{9}{2}\right\}$

26.  $(m - 4)^2 = 7$        $\{4 \pm \sqrt{7}\}$

## 9-5 Skills Practice

### Solving Quadratic Equations by Completing the Square

Find the value of  $c$  that makes each trinomial a perfect square.

1.  $x^2 + 6x + c$  **9**

2.  $x^2 + 4x + c$  **4**

3.  $x^2 - 14x + c$  **49**

4.  $x^2 - 2x + c$  **1**

5.  $x^2 - 18x + c$  **81**

6.  $x^2 + 20x + c$  **100**

7.  $x^2 + 5x + c$  **6.25**

8.  $x^2 - 70x + c$  **1225**

9.  $x^2 - 11x + c$  **30.25**

10.  $x^2 + 9x + c$  **20.25**

Solve each equation by completing the square. Round to the nearest tenth if necessary.

11.  $x^2 + 4x - 12 = 0$  **-6, 2**

12.  $x^2 - 8x + 15 = 0$  **3, 5**

13.  $x^2 + 6x = 7$  **-7, 1**

14.  $x^2 - 2x = 15$  **-3, 5**

15.  $x^2 - 14x + 30 = 6$  **2, 12**

16.  $x^2 + 12x + 21 = 10$  **-11, -1**

17.  $x^2 - 4x + 1 = 0$  **0.3, 3.7**

18.  $x^2 - 6x + 4 = 0$  **0.8, 5.2**

19.  $x^2 - 8x + 10 = 0$  **1.6, 6.4**

20.  $x^2 - 2x = 5$  **-1.4, 3.4**

Write the vertex form of each parabola.

21.  $y = x^2 + 8x + 7$   **$y = (x + 4)^2 - 9$**

22.  $y = x^2 - 12x + 16$   **$y = (x - 6)^2 - 20$**

# 9-6 Skills Practice

## Solving Quadratic Equations by Using the Quadratic Formula

Solve each equation by using the Quadratic Formula. Round to the nearest tenth if necessary.

1.  $x^2 - 49 = 0$      **-7, 7**

2.  $x^2 - x - 20 = 0$      **-4, 5**

3.  $x^2 - 5x - 36 = 0$      **-4, 9**

4.  $x^2 + 11x + 30 = 0$      **-6, -5**

5.  $x^2 - 7x = -3$      **0.5, 6.5**

6.  $x^2 + 4x = -1$      **-3.7, -0.3**

7.  $x^2 - 9x + 22 = 0$       $\emptyset$

8.  $x^2 + 6x + 3 = 0$      **-5.4, -0.6**

9.  $2x^2 + 5x - 7 = 0$       **$-3\frac{1}{2}, 1$**

10.  $2x^2 - 3x = -1$       **$\frac{1}{2}, 1$**

11.  $2x^2 + 5x + 4 = 0$       $\emptyset$

12.  $2x^2 + 7x = 9$       **$-4\frac{1}{2}, 1$**

13.  $3x^2 + 2x - 3 = 0$      **-1.4, 0.7**

14.  $3x^2 - 7x - 6 = 0$       **$-\frac{2}{3}, 3$**

State the value of the discriminant for each equation. Then determine the number of real solutions of the equation.

15.  $x^2 + 4x + 3 = 0$   
**4; 2 real solutions**

16.  $x^2 + 2x + 1 = 0$   
**0; 1 real solution**

17.  $x^2 - 4x + 10 = 0$   
**-24; no real solutions**

18.  $x^2 - 6x + 7 = 0$   
**8; 2 real solutions**

19.  $x^2 - 2x - 7 = 0$   
**32; 2 real solutions**

20.  $x^2 - 10x + 25 = 0$   
**0; 1 real solution**

21.  $2x^2 + 5x - 8 = 0$   
**89; 2 real solutions**

22.  $2x^2 + 6x + 12 = 0$   
**-60; no real solutions**

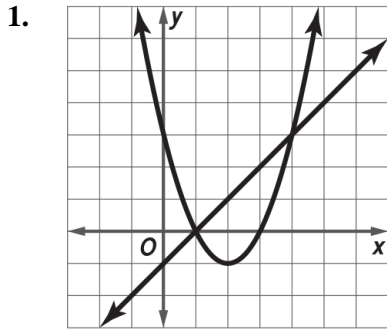
23.  $2x^2 - 4x + 10 = 0$   
**-64; no real solutions**

24.  $3x^2 + 7x + 3 = 0$   
**13; 2 real solutions**

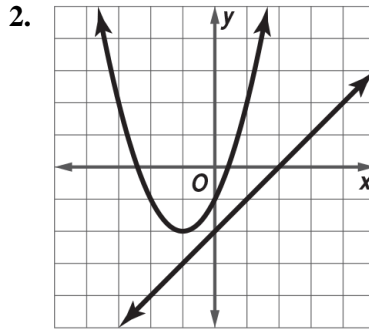
# 9-7 Skills Practice

## Solving Systems of Linear and Quadratic Equations

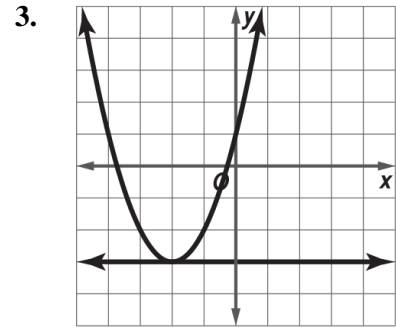
Solve the system of equations represented by each graph.



**(1, 0) and (4, 3)**



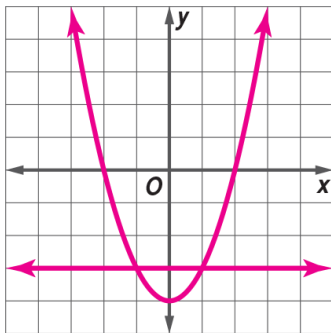
**no solution**



**(-2, -3)**

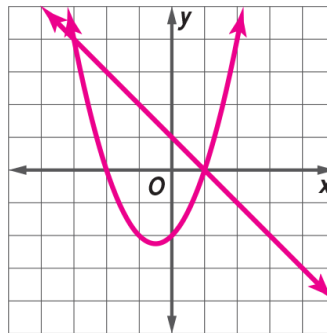
Solve each system of equations by graphing.

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



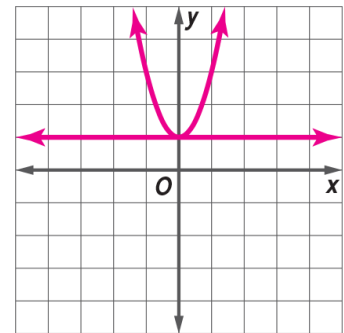
**(-1, -3) and (1, -3)**

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



**(-3, 4) and (1, 0)**

6.  $y = 2x^2 + 1$   
 $y = 1$



**(0, 1)**

Solve each system of equations algebraically.

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

**(-2, 3) and (4, 3)**

8.  $y = x^2 + 4x - 1$   
 $y = 3x + 1$

**(-2, -5) and (1, 4)**

9.  $y = x^2 - 6x + 5$   
 $x + y = -1$

**(2, -3) and (3, -4)**

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

**(0, 1)**

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

**(-2, 7) and (3, -3)**

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

**$(-\frac{1}{2}, 2)$  and (2, 7)**

## 9-9 Skills Practice

### Combining Functions

Given that  $f(x) = x - 9$ ,  $g(x) = 3x^2 - 2x + 5$ , and  $h(x) = -6x$ , find each function.

1.  $(f + g)(x)$

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

2.  $(f - g)(x)$

$$(f - g)(x) = -3x^2 + 3x - 14$$

3.  $(f + h)(x)$

$$(f + h)(x) = -5x - 9$$

4.  $(g - f)(x)$

$$(g - f)(x) = 3x^2 - 3x + 14$$

5.  $(g - h)(x)$

$$(g - h)(x) = 3x^2 + 4x + 5$$

6.  $(g + h)(x)$

$$(g + h)(x) = 3x^2 - 8x + 5$$

7.  $(h - g)(x)$

$$(h - g)(x) = -3x^2 - 4x - 5$$

8.  $(f - h)(x)$

$$(f - h)(x) = 7x - 9$$

Given that  $f(x) = 11x$ ,  $g(x) = x^2 - 6x + 3$ , and  $h(x) = -x + 4$ , find each function.

11.  $(f \cdot g)(x)$

$$(f \cdot g)(x) = 11x^3 - 66x^2 + 33x$$

12.  $(f \cdot h)(x)$

$$(f \cdot h)(x) = -11x^2 + 44x$$

13.  $(g \cdot h)(x)$

$$(g \cdot h)(x) = -x^3 + 10x^2 - 27x + 12$$

14.  $(f \cdot f)(x)$

$$(f \cdot f)(x) = 121x^2$$

Given that  $p(x) = -2x$ ,  $q(x) = x^2 + 5$ , and  $r(x) = x^2 - x + 2$ , find each function.

15.  $(p \cdot q)(x)$

$$(p \cdot q)(x) = -2x^3 - 10x$$

16.  $(p \cdot r)(x)$

$$(p \cdot r)(x) = -2x^3 + 2x^2 - 4x$$

17.  $(q \cdot r)(x)$

$$(q \cdot r)(x) = x^4 - x^3 + 7x^2 - 5x + 10$$

18.  $(q \cdot q)(x)$

$$(q \cdot q)(x) = x^4 + 10x^2 + 25$$