



# Algebra 2

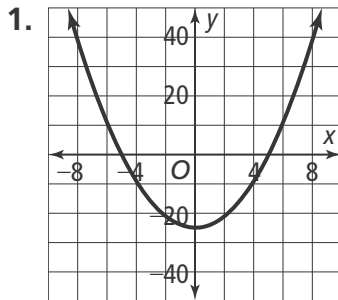
Week # 1



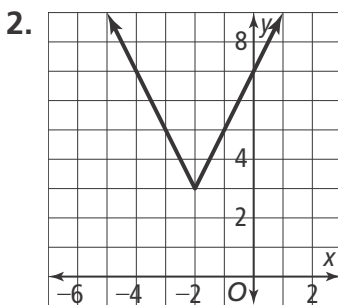
# 1-1 Additional Practice

## Key Features of Functions

For Items 1–2, identify the following information for the function of each graph:



Domain:  
 Range:  
 x-intercepts:  
 y-intercepts:  
 Interval positive:  
 Interval negative:  
 Interval increasing:  
 Interval decreasing:  
 Average rate of change over  $[-5, 0]$ :



Domain:  
 Range:  
 x-intercepts:  
 y-intercepts:  
 Interval positive:  
 Interval negative:  
 Interval increasing:  
 Interval decreasing:  
 Average rate of change over  $[-2, 0]$ :

3. Sketch a linear graph given the following key features:

Domain:  $(-\infty, \infty)$

Range:  $(-\infty, \infty)$

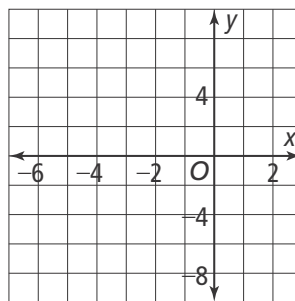
Increasing:  $(-\infty, \infty)$

x-intercepts:  $-2.5$

y-intercept:  $10$

Positive:  $(-2.5, \infty)$

Negative:  $(-\infty, -2.5)$



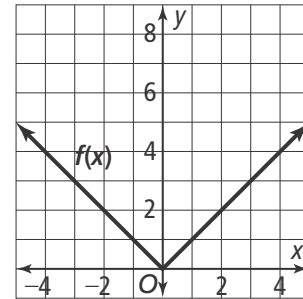
4. Chiang is filling a  $50 \text{ ft}^3$  container with water at a rate of  $0.5 \text{ ft}^3/\text{min}$ . Interpret the key features for this situation.



# 1-2 Additional Practice

## Transformations of Functions

1. Graph the function  $g(x) = |x| + 4$  as a translation of the parent function  $f$  shown. How did the transformation affect the domain and range?



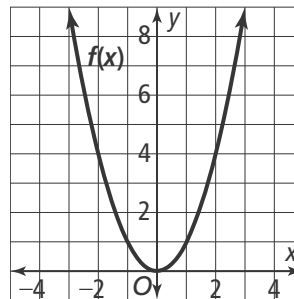
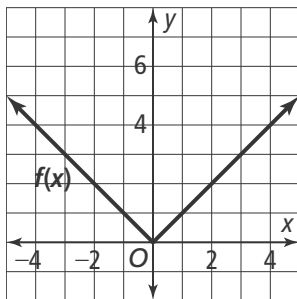
For Items 2 and 3, what is the equation for each reflected graph of  $f(x) = x^2 - 4$ ?

2. Reflect across the  $x$ -axis.
3. Reflect across the  $y$ -axis.

Graph each function as a vertical stretch or compression of the parent function  $f$ .

4.  $g(x) = 4.5|x|$

5.  $g(x) = 0.5x^2$



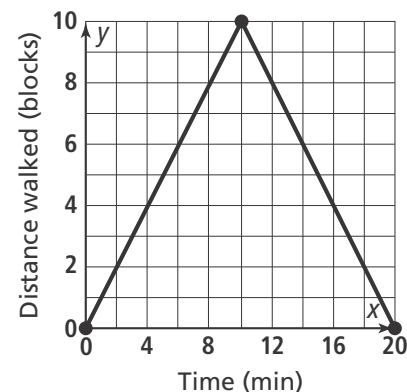
What transformations of  $f(x) = x^2$  are applied to get the function  $g$ ?

6.  $g(x) = 3(x + 2)^2$

7.  $g(x) = -(x - 5)^2 + 1$

8. Derek walks to his best friend's house at a rate of 1 block per minute, then turns around and walks home. The graph shows the distance Derek walks in the given amount of time. Write an equation for the graph.

9. Given the parent function  $f(x) = x^2$ , what is the new equation if the function is translated 4 units to the right and 3 units down?





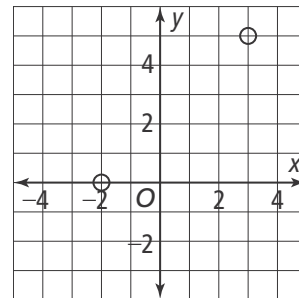
# 1-3 Additional Practice

## Piecewise-Defined Functions

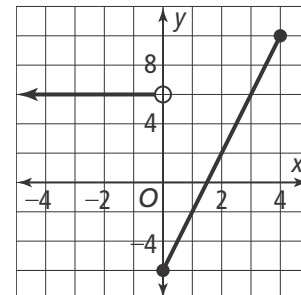
1. A phone company offers a monthly data plan for \$10 a month. The plan includes 2 megabytes of data, and charges \$0.10 per megabytes above the 2 megabytes of data. Write a piecewise-defined function for  $M(x)$ , the cost for  $x$  megabytes of data used in a month.

2. Graph the piecewise-defined function. State the domain and range. Identify whether the function is increasing, constant, or decreasing on each interval of the domain.

$$f(x) = \begin{cases} 2, & -4 \leq x \leq -2 \\ x + 2, & -2 < x < 3 \\ -3x + 12, & 3 \leq x \leq 5 \end{cases}$$



3. Write the rule that defines the piecewise-defined function in the graph.



4. Write the function  $f$  as a piecewise-defined function.

$$f(x) = |2x - 8|$$

5. A shipping service uses the weight of a package to determine its postage. The charge is \$3 for the first pound and \$2 for each additional pound up to 5 pounds. What are the domain and range of the function?

$$f(x) = \begin{cases} 3, & 0 < x \leq 1 \\ 5, & 1 < x \leq 2 \\ 7, & 2 < x \leq 3 \\ 9, & 3 < x \leq 4 \\ 11, & 4 < x \leq 5 \end{cases}$$

6. You plan to rent a car from XYZ Car Rental Company for a flat rate of \$35 a day. If you plan to use the car for 3 days or fewer, you must also pay a \$10 insurance fee per day. If you plan to use the car for more than 3 days, there is a \$5 insurance fee per day. Write a piecewise-defined function that models this function.



# 1-4 Additional Practice

## Arithmetic Sequences and Series

Are the following sequences arithmetic? If so, what is the common difference?  
What is the next term in the sequence?

1.  $0, -3, -6, -9, \dots$

2.  $2, 3, 5, 8, \dots$

3.  $127, 140, 153, 166, \dots$

Translate between the recursive and explicit definitions for each sequence.

4.  $a_n \begin{cases} 6, n = 1 \\ a_{n-1} + 3, n > 1 \end{cases}$

5.  $a_n = 12 - 2(n - 1)$

6.  $a_n = 5 - 4(n - 1)$

7. Each year, a volunteer organization expects to add 5 more people for whom the group provides home maintenance services. This year, the organization provides the service for 32 people.
- Write an explicit formula for the number of people the organization expects to serve each year.
  - How many people would the organization expect to serve during the year, 20 years from now?

Find the sum of an arithmetic series with the given number of terms,  $a_1$  and  $a_n$ .

8. 9 terms; 2, 5, 8, 11, ...

9. 12 terms;  $-2, 2, 6, 10, \dots$

10. 20 terms; 5, 10, 15, 20, ...

Find the sum of each of the following series.

11.  $\sum_{n=2}^5 (5n + 3)$

12.  $\sum_{n=1}^4 (2n + 0.5)$

13.  $\sum_{n=1}^4 (-n - 3)$

14. A marching band formation consists of 6 rows. The first row has 9 musicians, the second has 11, the third has 13 and so on. How many musicians are in the last row and how many musicians are there in all?
15. A student identifies the series 10, 15, 20, 25, 30 as an infinite arithmetic series. Is he correct? Explain.



# 1-5 Additional Practice

## Solving Equations and Inequalities by Graphing

Use a graph to solve each equation.

1.  $4x + 6 = 8x - 10$

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

3.  $|4 - 2x| + 5 = 9$

Use a graph to solve each inequality.

4.  $x^2 + 4x - 5 < 0$

5.  $x^2 - x - 12 \geq 0$

6.  $-2x + 5 < -7 - 3x$

Use a graph and a table to solve the equation. Round to the nearest thousandth if necessary.

7.  $x^2 + 3x - 5 = 4x + 3$

8.  $x^2 - 7x - 5 = \frac{1}{2}x - 4$

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

Use graphing technology to approximate the solutions of the equation to the nearest tenth.

10.  $\frac{1}{3}x^2 + 2x - 9 = 6 + |x - 2|$

11.  $x^2 + 5x - 2 = 6 + |3x + 1|$

12.  $3 + |x - 3| = \frac{1}{3}|x + 2| + 5$

13. David begins the summer with a savings of \$54.00 more than Fatima. David's job pays \$8.25 per hour. Fatima's job pays \$9.75. If they both work the same amount of time each day, how many hours of work will it take David to have as much money as Fatima? Write an inequality and then solve.

14. If you use a graph and a table to solve an equation that shows two expressions equal to one another, how can you use algebra to check your answer?



# 1-6 Additional Practice

## Linear Systems

Solve the following system of equations.

1. 
$$\begin{cases} y = 7 - x \\ x + 3y = 7 \end{cases}$$

2. 
$$\begin{cases} 4x + 3y = -16 \\ -x + y = 4 \end{cases}$$

3. 
$$\begin{cases} 2x - 4y = -4 \\ 3x - y = 4 \end{cases}$$

Solve the following system of equations.

4. 
$$\begin{cases} 2x + 3y - z = 9 \\ -2x - y + 2z = 2 \\ x + y - 2z = 3 \end{cases}$$

5. 
$$\begin{cases} 4x - 2y - z = 5 \\ x + 4y - z = -1 \\ 2x - 2y - 2z = -2 \end{cases}$$

6. 
$$\begin{cases} -3x + 2y + 5z = -10 \\ -x - 2y + 3z = 6 \\ 2x - y - z = 8 \end{cases}$$

Write the matrix for the system of equations.

7. 
$$\begin{cases} 3x + y = -4 \\ -2x + 4y = 7 \end{cases}$$

8. 
$$\begin{cases} 4x - y + 2z = 10 \\ 5x + 2y - 3z = 0 \\ x - 3y + z = 6 \end{cases}$$

9. 
$$\begin{cases} 3x - 2y + z = 6 \\ 4x - 6z = 6 \\ -3x - 4z = -10 \end{cases}$$

10. Last year, a baseball team paid \$20 per bat and \$12 per glove, spending a total of \$552. They bought 34 pieces of equipment. What are a system of equations and an augmented matrix that can represent this situation?

11. Write the system of equations for the matrix. 
$$\left[ \begin{array}{ccc|c} 2 & 5 & 0 & 13 \\ -3 & 1 & 2 & 6 \\ 4 & 0 & -3 & 5 \end{array} \right]$$



## 2-1 Additional Practice

### Vertex Form of a Quadratic Function

Graph each function. Describe how it was translated from  $f(x) = x^2$ .

1.  $f(x) = x^2 + 4$

2.  $f(x) = (x - 3)^2$

3.  $f(x) = (x + 2)^2 - 1$

Identify the vertex, axis of symmetry, the maximum or minimum value, and the domain and the range of each function.

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

5.  $f(x) = -0.2(x + 3)^2 + 2$

6.  $y = (x + 4)^2 - 1$

Write the equation of each parabola in vertex form.

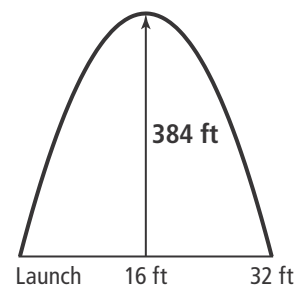
7. vertex  $(3, -2)$ ,  
point  $(2, 3)$

8. vertex  $(-4, -24)$ ,  
point  $(-5, -25)$

9. vertex  $(-12.5, 35.5)$ ,  
point  $(1, 400)$

10. Given the function  $f(x) = x^2$ , Write the equation function  $g(x)$  whose graph is a translation 5 units left and 3 units down.

11. The diagram shows the path of a model rocket launched from the ground. It reaches a maximum altitude of 384 ft when it is above a location 16 ft from the launch site. What quadratic function models the height of the rocket?







## 2-2 Additional Practice

### Standard Form of a Quadratic Function

Find the vertex of a quadratic function written in standard form.

1.  $f(x) = 3x^2 + 18x + 32$

2.  $f(x) = x^2 + 2x - 5$

3.  $f(x) = -3x^2 + 18x - 27$

Find the vertex, axis of symmetry, and y-intercept of the functions, then sketch the graph.

4.  $f(x) = x^2 - 8x + 19$

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

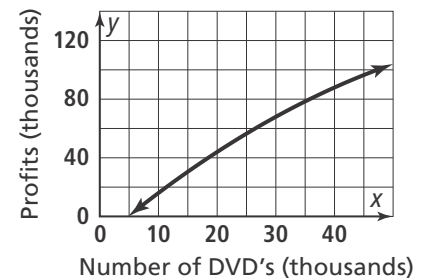
Vertex
Axis of symmetry
Y-intercept

Vertex
Axis of symmetry
Y-intercept

Interpret the graph of a quadratic function.

6. A small independent movie company determines the profit  $P$  for producing  $n$  DVD copies of a recent release is  $P = -0.02n^2 + 3.40n - 16$ .  $P$  is the profit in thousands of dollars and  $n$  is in thousands of units.

- How many DVDs should the company produce to maximize the profit?
- What will the maximum profit be?



What is the equation of a parabola that passes through the following points?

7.  $(1, -1), (2, -5), (3, -7)$

8.  $(2, -8), (3, -8), (6, 4)$

9.  $(-3, 2), (1, -6), (4, 9)$



## 2-3 Additional Practice

### Factored Form of a Quadratic Function

Factor each quadratic expression.

1.  $x^2 + 4x - 21$

2.  $x^2 - 2x - 15$

3.  $2x^2 - 17x + 30$

Identify the zeros of each function.

4.  $y = 5(x - 3)(x + 5)$

5.  $y = (x - 9)(x + 4)$

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

Solve each quadratic equation by factoring.

7.  $x^2 = -5x$

8.  $-2x^2 + 5x + 12 = 0$

9.  $7x^2 + 25x + 12$

10.  $5x^2 = 3x + 2$

11.  $-4x^2 + 15x + 4 = 0$

12.  $x^2 - 4x + 3 = 0$

Identify the interval(s) on which each quadratic function is positive or negative as shown.

13.  $y = 2x^2 - 17x + 30$  Positive

14.  $y = -7x^2 + 35x - 28$  Positive

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

16.  $y = 2x^2 - 4x - 16$  Negative

17. A rock is thrown upward from the edge of a bridge and onto a road that is 10 feet below the bridge. The function  $h(x) = -x^2 + 3x + 10$  gives the height,  $h$ , in feet, the rock travels in  $x$  seconds from the time it was thrown. When will the rock hit the road?

18. Write an equation of a parabola with  $x$ -intercepts at  $(\frac{1}{4}, 0)$  and  $(-7, 0)$  which passes through the point  $(0, 7)$ .



## 2-4 Additional Practice

### Complex Numbers and Operations

Use square roots to solve each equation. Write your solutions using the imaginary unit,  $i$ .

1.  $x^2 = -81$

2.  $x^2 = -625$

3.  $x^2 = -144$

Solve each problem.

4.  $(-2 + 3i) + (5 - 2i)$

5.  $(-6 + 7i) + (6 - 7i)$

6.  $(8 + 5i) + (6 - 7i)$

Write each product in the form  $a + bi$ .

7.  $(4 - 3i)(-5 + 4i)$

8.  $(2 - i)(-3 + 6i)$

9.  $(5 - 3i)(5 + 3i)$

Write the quotient in the form  $a + bi$ .

10.  $\frac{5 + 2i}{4i}$

11.  $\frac{3 - 2i}{4 - 3i}$

12.  $\frac{3i}{-2 + i}$

13. Why does multiplying  $a + bi$  by the complex conjugate  $a - bi$  eliminate  $i$  from the expression?

Solve the equations below using factoring.

14.  $x^2 + 36$

15.  $x^2 + 4$

16.  $x^2 + 1$

17. The total resistance of a circuit is given by the formula  $R_T = \frac{1}{R_1} + \frac{1}{R_2}$ .  $R_1 = 4 + 6i$  ohms and  $R_2 = 2 - 4i$  ohms. What is  $R_T$ ?



## 2-5 Additional Practice

### Completing the Square

Use square roots to solve quadratic equations and find the solutions to the following equations.

1.  $x^2 + 12x + 36 = 25$

2.  $x^2 - 10x + 25 = 144$

3.  $x^2 + 6x + 9 = \frac{49}{4}$

4.  $x^2 - 22x + 121 = 225$

Rewrite the equations in the form  $(x - p)^2 = q$

5.  $x^2 + 4x + 3 = 0$

6.  $x^2 - 6x + 13 = 0$

Solve each quadratic equation by completing the square.

7.  $x^2 + 10x - 1 = 0$

8.  $x^2 + 2x - 7 = 0$

9.  $-x^2 + 6x + 10 = 0$

10.  $x^2 + 5x = 3x + 11$

Write each equation in vertex form.

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

12.  $y = x^2 + 14x + 50$

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

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

15. The quadratic equation  $d = -t^2 + 4t + 33$  models the depth of water,  $d$ , in feet in a flood channel  $t$  hours after a rainstorm.

a. Solve the equation  $-t^2 + 4t + 33 = 0$ .

b. Approximate the positive solution found in part (a) to two decimal places.

c. Interpret the answer to part (b) in terms of the problem.

16. While in orbit, a space scientist measures the pressure inside a container as it is being heated and then cooled. She records the information and discovers the pressure,  $p$ , in pounds per square inch, is related to the time,  $t$ , in minutes after the experiment began according to the equation  $p = -0.2t^2 + 1.6t$ . Complete the square in the expression  $-0.2t^2 + 1.6t$ .



## 2-6 Additional Practice

### The Quadratic Formula

Use the Quadratic Formula to solve the equation. Show your work.

1.  $x^2 - 15x + 7 = 0$

2.  $3x^2 + 2x + 1 = 0$

Use two different methods to solve the equations. Show your work.

3.  $x^2 + 4x - 5 = 0$

Use the discriminant to describe the solutions as one real, two real, or two imaginary solutions.

4.  $x^2 - 15x + 12 = 0$

5.  $3x^2 - 6x + 4 = 0$

6. Find the value(s) of  $k$  that will cause the equation  $4x^2 + kx + 4$  to have zero real solutions, one real solution, or two real solutions.

7. Margaret runs a business. This year's revenue is given by the function  $R = -0.5x^2 - 200x$ . Can her revenue be at least \$25,000 this year?



## 2-7 Additional Practice

### Linear-Quadratic Systems

Determine the number of solutions for the system of equations.

1. 
$$\begin{cases} y = -x^2 + 3x + 2 \\ y = 3x + 2 \end{cases}$$

2. 
$$\begin{cases} y = -x^2 + 2x + 18 \\ y = 5x - 10 \end{cases}$$

3. 
$$\begin{cases} y = x^2 + 3x - 5 \\ y = -x^2 - 2x + 1 \end{cases}$$

Use substitution to solve the system of equations.

4. 
$$\begin{cases} y = x^2 + 5x - 2 \\ y = 3x - 2 \end{cases}$$

5. 
$$\begin{cases} y = -x^2 + x + 12 \\ y = 2x - 8 \end{cases}$$

6. 
$$\begin{cases} y = x^2 - 2x - 3 \\ y = 2x - 3 \end{cases}$$

Solve each system of inequalities using shading.

7. 
$$\begin{cases} y > 3x^2 + 3x - 5 \\ y < -3x - 5 \end{cases}$$

8. 
$$\begin{cases} y > 4x^2 + 8x + 8 \\ 4x + 8 > y \end{cases}$$

9. In business, the break-even point is the point  $(x, y)$  at which the graphs of the revenue and cost functions intersect. This is the point where the revenue and the expenses are equal. The business is not losing money, but it is not making money either. For one manufacturing company, the revenue from producing  $x$  items is given by the function  $y = 2x + 12$  and the cost of producing  $x$  items is given by  $y = -x^2 + 10x + 5$ . The numbers represent thousands. Find all break-even points. Interpret the results.
10. Two skaters are practicing at the same time on the same rink. A coordinate grid is superimposed on the ice. One skater follows the path  $y = -2x + 32$ , while the other skater follows the curve  $y = -2x^2 + 18x$ . Find all points where they might collide if they are not careful.