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highlighted selections are included in this sample

# QUADRATIC FUNCTIONS



Student Handouts

\*\*This file has been organized for double-sided printing. Blank pages are left intentionally.\*\*

### **PEADINESS STANDARDS**

A.6A determine domain and range of quadratic functions and represent using inequalities

A.7A graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry

**A.7C** determine the effects on the graph of the parent function  $f(x) = x^2$  when f(x) is replaced by af(x), f(x) + d, f(x - c), f(bx) for specific values of a, b, c, and d

### SUPPORTING STANDARDS

A.6B write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form  $(f(x) = a(x - h)^2 + k)$ , and rewrite the equation from vertex form to standard form  $(f(x) = ax^2 + bx + c)$ 

A.8B write, using technology, quadratic functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems

Included in this unit you will find the following:

#### Unit Overview

a sample pacing calendar, ideas and tips for teaching/introducing the concepts, unit vocabulary, big ideas, vertical alignment, and common misconceptions

#### Student Handouts

student-friendly notes and practice problems, homework/independent practice, quizzes, unit review, and unit assessment

#### Student Handouts as Google Slides

a Google Slide version of the unit (excluding assessments)

#### Answer Keys

an answer key for each page of the unit

#### Editable Unit Assessment

a PPT file of the unit test has been provided for you to make modifications

Need to get in touch? Please direct all questions to <u>contact@maneuveringthemiddle.com</u>.

Name	

Date Pd

## ATTRIBUTES OF QUADRATIC FUNCTIONS I

Eric is researching quadratic functions and creates the table of examples and non-examples shown. Based on his table, predict what makes something a quadratic function below:

EXAMPLES	NON-EXAMPLES
$f(x) = x^2 - 5$	$f(x) = x^3 + x^2$
$f(x) = -x^2$	y = -x + 6
$y = x^2 - 3x + 5$	f(x) = 2x + 3

QUADPATIC	• A function of degree The standard form of a quadratic function is
FUNCTIONS	<ul> <li>, where a, b, and c are real numbers and a ≠0.</li> <li>The graph of a quadratic function is called a</li> </ul>

For 1-3, complete the table and sketch the graph of the quadratic function. Then using the standard form of the function, determine the values of a, b, and c.



Graphs of quadratic functions have several key features. Use the definitions below to label each attribute on the parabola at the right.



Name	
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Date \_\_\_\_\_Pd\_\_\_\_

### ATTRIBUTES OF QUADRATIC FUNCTIONS I

Four students were given quadratic functions to analyze. Sketch a graph of each function in 1-4. Then, use the clues in A-D to determine each student's function.



Use your knowledge of quadratic functions to answer questions 5-10.

5. A quadratic function is shown on the graph. Which of the following statements are true?			
I. The vertex is at (-2, 8). II. The minimum of the function is -2. III. The y-intercept is at (0, 4). b. I and II c. I and III d. I, II, and III			



Identify the key features of g(x) shown on the graph. For #7, circle whether the graph has a maximum or minimum and then give the value.	
6. vertex:	
7. max or min?	-4
8. zero(s):	
9. y-intercept:	
10. Sandra is analyzing the quadratic function given on the graph. Sandra claims the function has no zeros. Do you agree or disagree? Justify your answer.	-10 -8 -6 -4 -2 -2 -4 -6 -8 -10 -12 -14 -14 -14 -14 -14 -16 -18

Ν	d	r	n	е
Ν	d	r	n	е

Date

\_\_\_\_\_

B

Α

D

Pd

E

С

### ATTRIBUTES OF QUADRATIC FUNCTIONS II

Dean's little sister Deena is studying symmetry in her math class and asks him to help her draw the lines of symmetry on figures A, B and C. Sketch the lines at the right and describe a line of symmetry in your own words below:

Deena notices Dean's homework and mentions that the parabolas have a line of symmetry. Sketch what Deena may be referring to on graphs D and E.

Similar to a line of symmetry, parabolas representing quadratic functions have an \_\_\_\_\_ of symmetry.



For each parabola below, identify the vertex. Then, draw a dashed line to represent the axis of symmetry and write the equation of the line.



When a function is in standard form, (\_\_\_\_\_\_), we can use the formula at the right to find the axis of symmetry equation, as well as the x-value of the vertex.



3. The graph of  $f(x) = x^2 + 8x + 13$  is shown at the right. Complete a-d and check your answers with the graph of the function.

a. Fill in each value: a = \_\_\_\_\_ b = \_\_\_\_ c = \_\_\_\_

- b. Write the equation for the axis of symmetry.
- c. If  $-\frac{b}{2a}$  is the x-value of the vertex, how can this be used to find the y-value of the vertex?
- d. Find the vertex.

For each quadratic function below, use  $-\frac{b}{2a}$  to find the axis of symmetry equation and the vertex.



Unit: Quadratic	Functions
Homework 2	

Name		
Date	Pd	

### ATTRIBUTES OF QUADRATIC FUNCTIONS II

In 1 & 2, sketch a line to represent the axis of symmetry. Then, identify the vertex and write the equation for the axis of symmetry.



For 3-5, use  $-\frac{b}{2a}$  to find the axis of symmetry equation and the vertex.





Ν	d	r	r	١	e

Date \_\_\_\_\_

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#### Pd

### DOMAIN AND PANGE OF QUADPATIC FUNCTIONS

Marta graphs the function  $f(x) = x^2 + 4x + 2$ . She wants to determine the domain and range of f(x). Use the graph to complete a-d.

- a. Describe in your own words the meaning of "domain." Label the arrow that represents the domain.
- b. Describe in your own words the meaning of "range." Label the arrow that represents the range.
- c. Find the domain and range of f(x).
  - Domain:
  - Range:
- d. What key features of the graph help determine domain and range?





For 3 & 4, find the domain and range of the quadratic functions.



The domain and range of a quadratic function can be determined from a quadratic equation. The domain of a quadratic function in standard form will always be \_\_\_\_\_\_. To determine the range, use the steps in the box shown below. Find the domain and range of g(x).

FINDING RANGE FROM EQUATIONS	$g(x) = 5x^2 + 10x + 8$
1. Look at theto determine whether the function has a maximum or minimum.	
<ol> <li>Find the maximum or minimum of the function by finding the</li> </ol>	Domain:
3. Write the using the maximum or minimum.	Range:

For 5 & 6, find the domain and range of each quadratic function from the equation. Check your answers by graphing each function.

5. $f(x) = -x^2 + 6x - 14$	6. $y = 2x^2 - 12x + 9$		
domain:	domain:		
range:	range:		
7. The table shows some coordinate points of a quadratic function, including the vertex point. Can the range be determined from this set of data? If so, find the range. If not, explain your reasoning.	8. Sketch a quadratic function with a domain of all real numbers and a range of $y \ge -7$ .		
<b>x</b> -4 -3 -2 -1 2			
<b>y</b> 5 11 13 11 -19			
	-6 -9 -9		
9. Raul is hiding in the grass and launches a nerf bullet into the air. The function $h(t) = -16t^2 + 24t$ represents the height of the bullet over time, t. 10			
a. What is the domain of the function?			
b. What is the range of the function?			
c. If a bird is flying 10 feet above the ground, could Raul hit the bird? Explain.			

Unit: Quadratic	Functions
Homework 3	

Date \_\_\_\_\_Pd\_\_\_\_

### DOMAIN AND PANGE OF QUADPATIC FUNCTIONS

In 1-3, find the domain and range of each quadratic function.



Use the quadratic function to find the domain and range. Show your work.

4. $p(x) = 8x^2 - 16x + 4$	5. $y = -3x^2 + 6x + 4$
domain:	domain:
range:	range:

Use your knowledge of domain and range to answer the following questions.

6. Eva claims the domain of the fu araphed below is $-7 < x < -2$ while	nction Eranco	7. Salina finds the range of the function $y = -4x^2 + 8x + 7$ by calculating the vertex.
claims it is all real		Her work is shown in the box below.
numbers. Who do		Determine her error and find the range of the
		r unction.
-8 -6 -4 -2	2 4 6 8	
-2-		range: $y \ge 11$





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