

Math 2 Unit 10 Notes 2**Vertex Form:** $y = a(x - h)^2 + k$ **Name:** _____**Date:** _____ **Per:** _____

$y = a(x - h)^2 + k$ where “ a ”, “ h ”, and “ k ” are numbers (either whole, fractions, or decimals).

The values of a , h , and k will cause a parabola to make certain movements and/or shift. The goal of this worksheet is to help you become aware of these mathematical concepts.

Section A: Identifying the values of a , h , and k .

Directions: Fill out the chart by identifying the values of a , h , and k for each equation.

Save vertex column and questions below until after you finish **Section B**

Equation	“ a ” value	“ h ” value	“ k ” value	Vertex
1. $y = 2(x - 5)^2 + 3$				
2. $y = -4(x - 2)^2 + 8$				
3. $y = 6(x - 5)^2 - 7$				
4. $y = (x - 1)^2$				
5. $y = -3(x + 5)^2 + 1$				
6. $y = -(x + 3)^2 - 4$				
7. $y = (x + 1)^2 - 2$				

- 4) What does changing the “ a ” value do to the graph of a quadratic?
- 5) Given $f(x) = 2(x - 4)^2 - 5$, write an equation of a parabola that is narrower than $f(x)$ and upside down.
- 6) What does changing the “ h ” value do to the graph of a quadratic when in vertex form?
- 7) If “ h ” is positive, how does the parabola move?
- 8) If “ h ” is negative, how does the parabola move?
- 9) What does changing the “ k ” value do to the graph of a quadratic when in vertex form?
- 10) If “ k ” is positive, how does the parabola move?
- 11) If “ k ” is negative, how does the parabola move?
- 12) Write down all FOUR conclusions you can make about each equation and how the parabola will be moved:
- a. $y = -4(x - 3)^2 + 12$
- b. $y = \frac{2}{3}(x + 5)^2 - 14$

Section B: Determining what changing the values of a , h , and/or k do to the graph of the equation.

Directions: (1) Go on the line to www.desmos.com or use the app on your phone, (2) Graph each equation by accurately plotting the vertex and at least 1 point on each side of the vertex. Use the table function at www.desmos.com, (3) fill out the table.

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

$a =$ _____

$h =$ _____

$k =$ _____

Domain: _____

Range: _____

Color used: _____

2. $y = 2(x + 3)^2 + 1$

$a =$ _____

$h =$ _____

$k =$ _____

Domain: _____

Range: _____

Color used: _____

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

$a =$ _____

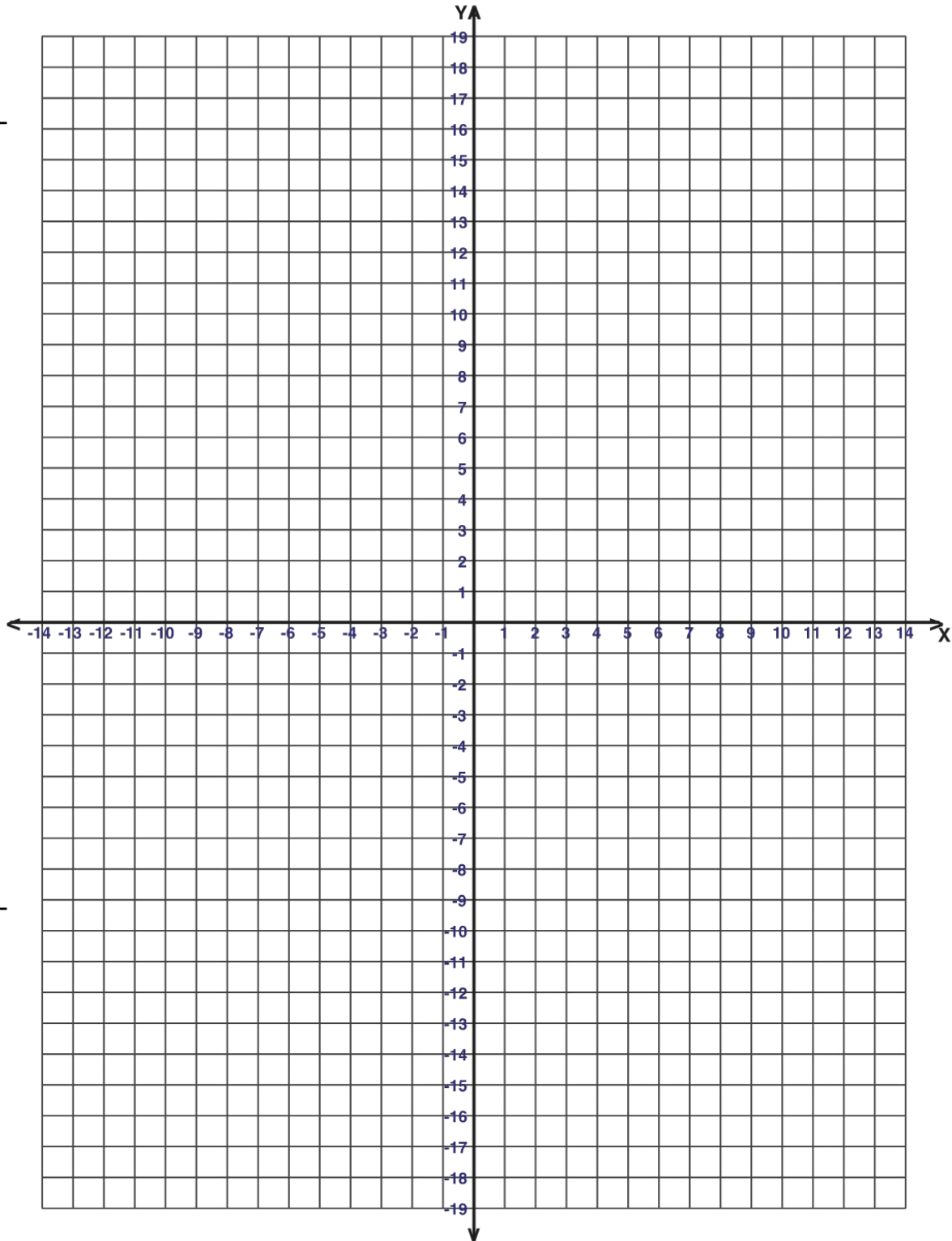
$h =$ _____

$k =$ _____

Domain: _____

Range: _____

Color used: _____

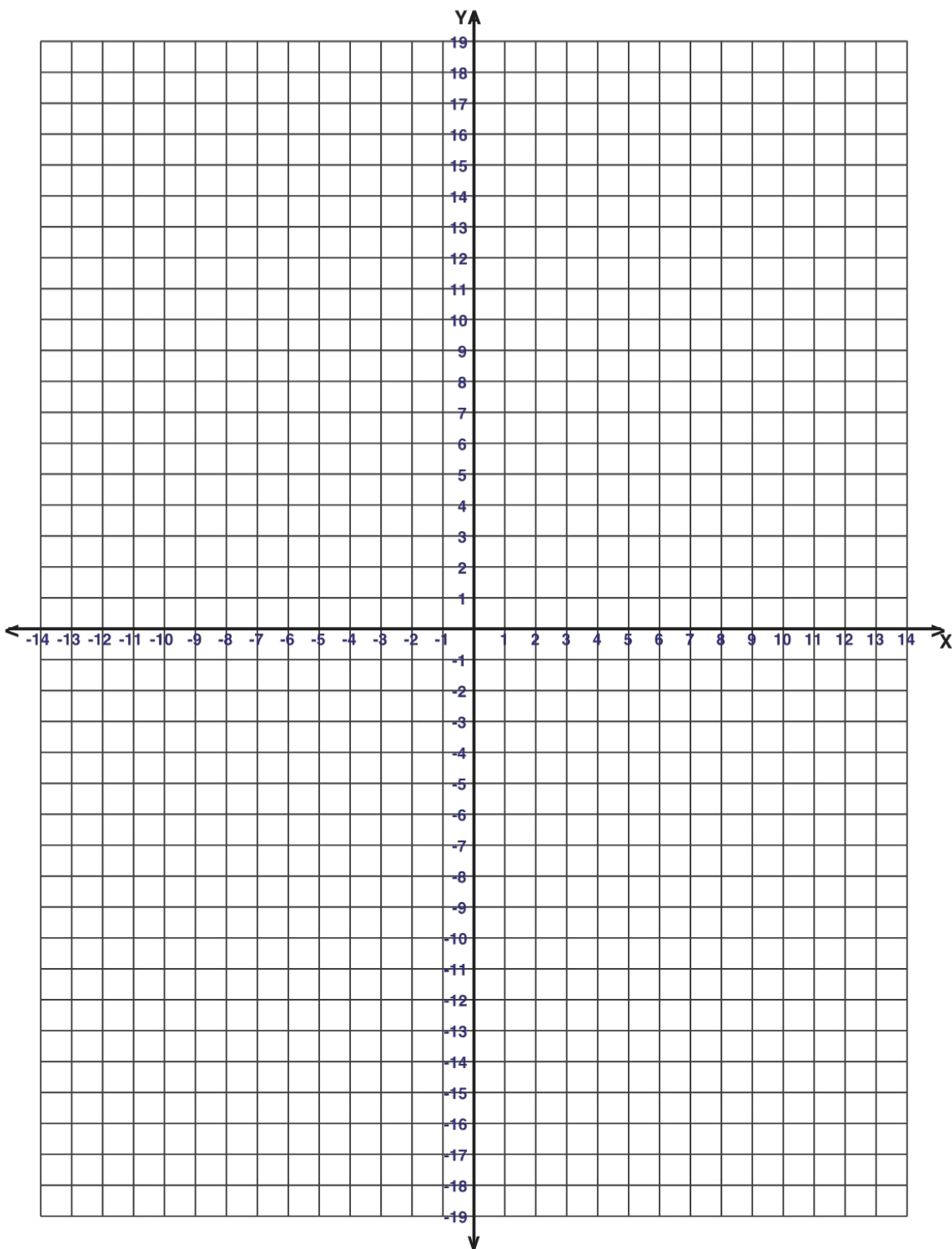


4. Use the patterns you observe in the graphs above to answer the questions below the table in **Section A**.

Section C: Determining how the h and k values are related to the vertex and axis of symmetry.

Directions: (1) Go on the line to www.desmos.com or use the app on your phone, (2) graph each equation, (3) use the graph and the equation to help you fill out the chart.

Equation
<p>1. $y = (x - 4)^2 + 1$</p> <p>$h =$ $k =$ vertex =</p> <p><i>min or max?</i></p> <p>AOS: $x =$</p> <p>Domain:</p> <p>Range:</p>
<p>2. $y = (x - 1)^2 - 5$</p> <p>$h =$ $k =$ vertex =</p> <p><i>min or max?</i></p> <p>AOS: $x =$</p> <p>Domain:</p> <p>Range:</p>
<p>3. $y = (x + 4)^2 + 7$</p> <p>$h =$ $k =$ vertex =</p> <p><i>min or max?</i></p> <p>AOS: $x =$</p> <p>Domain:</p> <p>Range:</p>



Section C Questions:

Directions: Answer each question carefully, accurately, and in complete sentences (when necessary).

Vertex Form: $y = a(x - h)^2 + k$

- How do the values of “ h ” and “ k ” relate to the coordinates of the vertex and the equation of the axis of symmetry?
- Write your own quadratic equation in vertex form: _____
 - What the coordinates of the vertex?
 - What is the equation for the line (axis) of symmetry?
- Finish the Table in **Section A**, adding the coordinates of the vertex for each equation.

Directions: Fill out the table below using each quadratic equation. Do NOT use DESMOS.

Equation	Vertex	Equation of the axis of symmetry (AOS)
4. $f(x) = (x - 13)^2 + 8$		
5. $y = (x - 5)^2 - 27$		
6. $f(x) = -3(x + 3)^2 + 15$		
7. $y = 7(x - 1)^2$		

Section D: Comparing two quadratic equations.

- If the graph of $f(x) = x^2$ is compared to the graph of $g(x) = (x + 3)^2 - 2$, $f(x)$ is mapped on to $g(x)$ by the transformation of which choice:
 - Right 3 units and up 2 units which can be written $(x, y) \rightarrow (x + 3, y + 2)$.
 - Right 3 units and down 2 units which can be written $(x, y) \rightarrow (x + 3, y - 2)$.
 - Left 3 units and up 2 units which can be written $(x, y) \rightarrow (x - 3, y + 2)$.
 - Left 3 units and down 2 units which can be written $(x, y) \rightarrow (x - 3, y - 2)$.
- If the graph of $f(x) = x^2$ is compared to the graph of $g(x) = (x - 4)^2 + 5$, $f(x)$ is mapped on to $g(x)$ by the transformation of which choice:
 - Right 4 units and up 5 units which can be written $(x, y) \rightarrow (x + 4, y + 5)$.
 - Right 4 units and down 5 units which can be written $(x, y) \rightarrow (x + 4, y - 5)$.
 - Left 4 units and up 5 units which can be written $(x, y) \rightarrow (x - 4, y + 5)$.
 - Left 4 units and down 5 units which can be written $(x, y) \rightarrow (x - 4, y - 5)$.
- If the graph of $f(x) = x^2$ is compared to the graph of $g(x) = (x - 7)^2 - 3$, $f(x)$ is mapped on to $g(x)$ by the transformation of which choice:
 - Right 7 units and up 3 units which can be written $(x, y) \rightarrow (x + 7, y + 3)$.
 - Right 7 units and down 3 units which can be written $(x, y) \rightarrow (x + 7, y - 3)$.
 - Left 7 units and up 3 units which can be written $(x, y) \rightarrow (x - 7, y + 3)$.
 - Left 7 units and down 3 units which can be written $(x, y) \rightarrow (x - 7, y - 3)$.