Topic: IM2 – 3.4 (N – 3) Graphing Quadratics by Hand: Squaring from the Vertex	Standard(s): F.IF.7a	Notes

Essential Question: How can I graph a parabola by hand, squaring from the vertex, without a graphing calculator?

Questions / Big Ideas	Squaring from the Vertex
	1. Write the parent function: $f(x) = ax^2$.

2. Graph the coordinate of the vertex onto a coordinate plane.

3. Use $f(x) = ax^2$ to calculate the output values (vertical moves). Create a table if needed.

   - Create a table with using following x-values as inputs and the quadratic parent function and dilation as outputs:

x	$f(x) = ax^2$
-3	
-2	
-1	
0	
1	
2	
3	

These input / output pairs are NOT coordinates.

x represents the number of units to MOVE horizontally from the vertex. f(x) represents the number of units to move vertically from the vertex.

4. Determine the concavity of the parabola from the equation:
   - Positive leading coefficient ($+a$ value): concave UP
   - Negative leading coefficient ($-a$ value): concave DOWN

5. Starting with the vertex, move horizontally (to the right), then vertically (up or down).

6. Continue through your positive x-values until you have plotted about 3 or 4 points.

7. Use the Axis of Symmetry to help create symmetric points for the negative input values.

8. Connect the points with a smooth curve. |

Questions / Big Ideas	Guided Practice
	1. Determine the vertical moves needed to square from the vertex.

a. Calculate the vertical moves for each given horizontal move:

x	$f(x) = ax^2$ when $a = 1$
-5	
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	
5	

b. Calculate the perfect squares below:

$6^2 =$ _____ $11^2 =$ _____

$7^2 =$ _____ $12^2 =$ _____

$8^2 =$ _____ $13^2 =$ _____

$9^2 =$ _____ $14^2 =$ _____

$10^2 =$ _____ $15^2 =$ _____

Questions / Big Ideas

Horizontal Moves: x	Vertical Moves: $f(x) = \frac{1}{2}x^2$
-3	$\frac{1}{2}(\quad)^2 =$
-2	$\frac{1}{2}(\quad)^2 =$
-1	$\frac{1}{2}(\quad)^2 =$
0	$\frac{1}{2}(\quad)^2 =$
1	$\frac{1}{2}(\quad)^2 =$
2	$\frac{1}{2}(\quad)^2 =$
3	$\frac{1}{2}(\quad)^2 =$

2. Key Characteristics Given
   a. $Vertex: (6, -3)$
   b. $Concave: Up$
   c. $Dilation: Compressed\ by\ \frac{1}{2}$
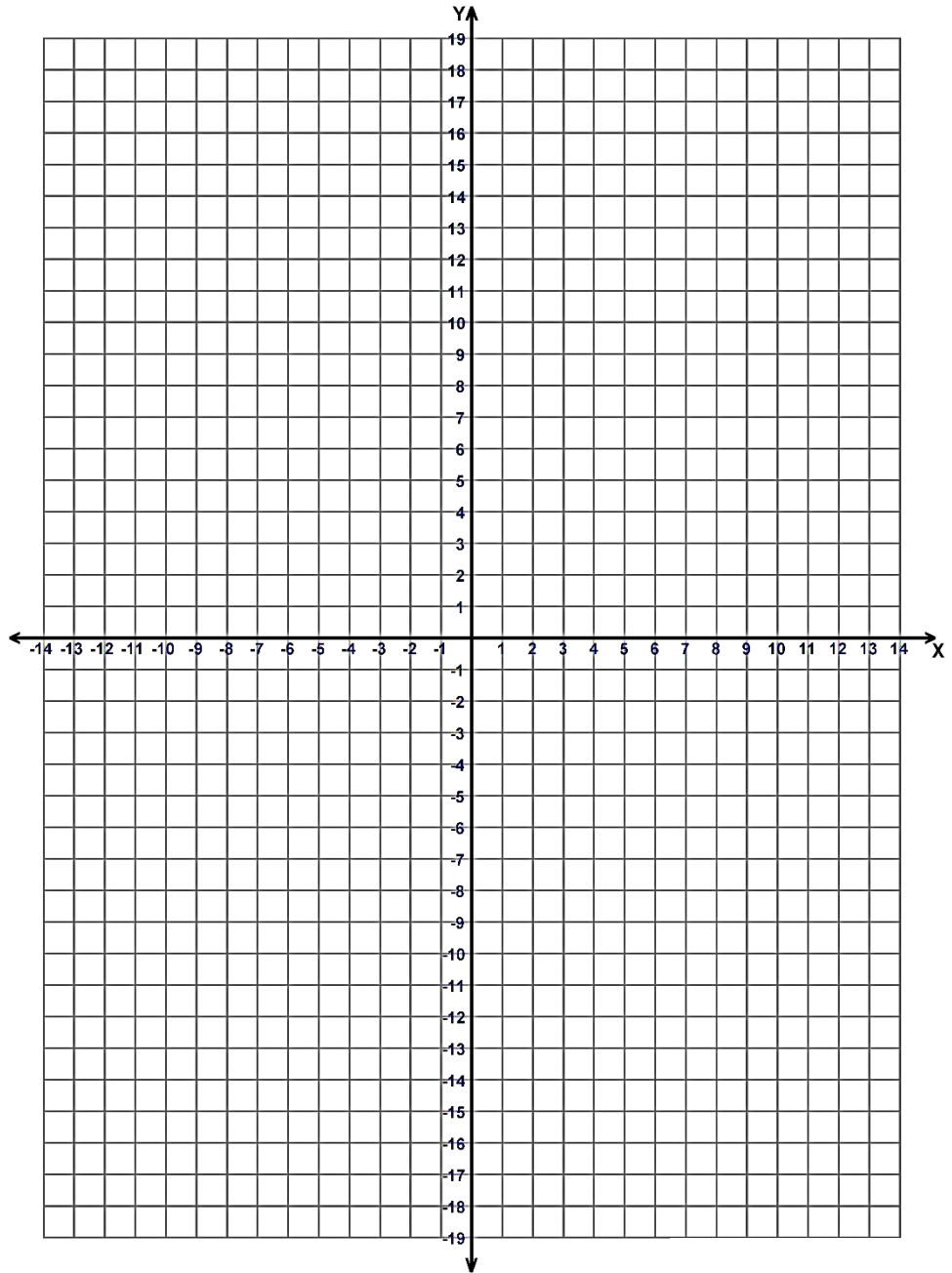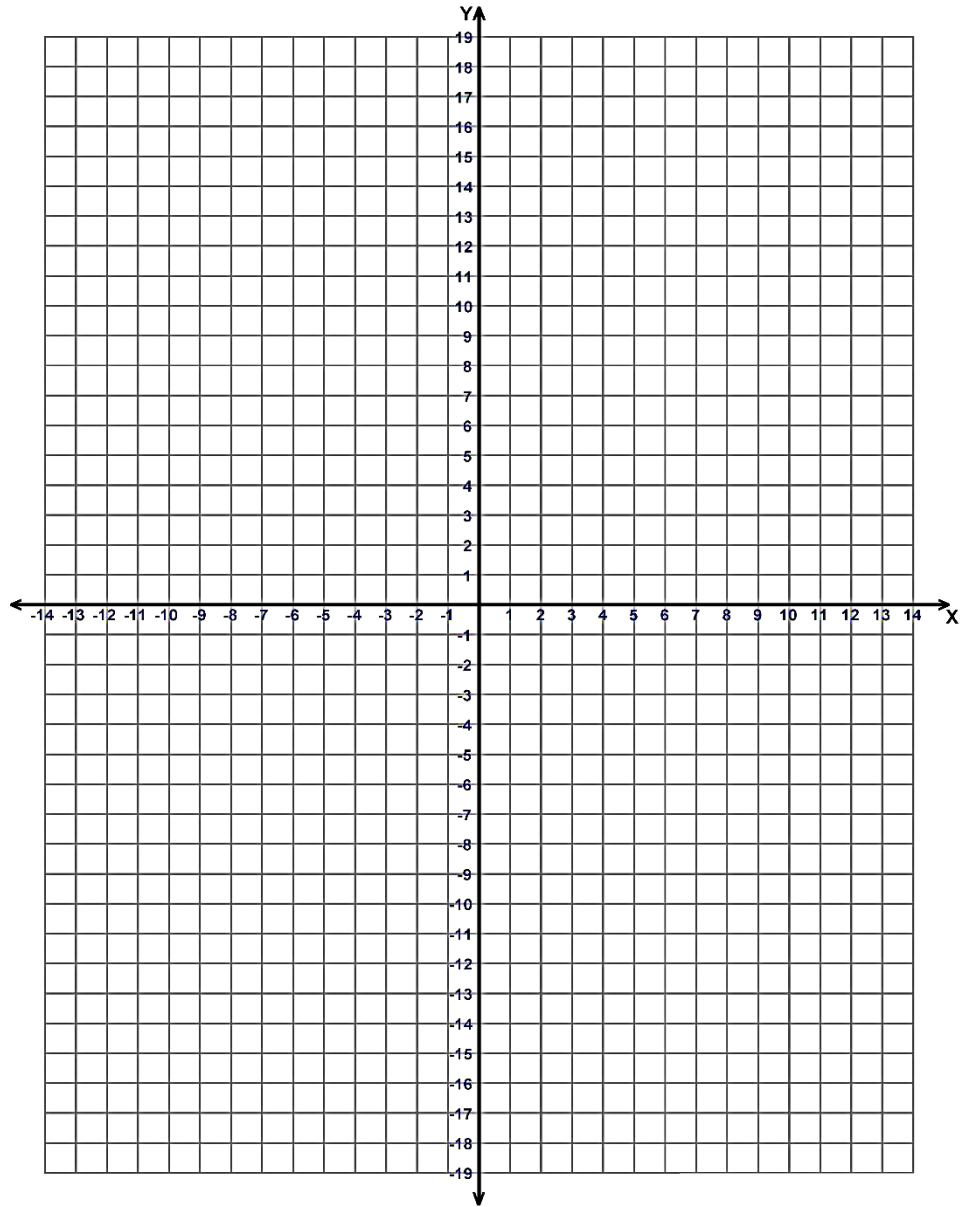
Questions / Big Ideas

Horizontal Moves: x	Vertical Moves: $f(x) = 2x^2$
-3	$2(\quad)^2 =$
-2	$2(\quad)^2 =$
-1	$2(\quad)^2 =$
0	$2(\quad)^2 =$
1	$2(\quad)^2 =$
2	$2(\quad)^2 =$
3	$2(\quad)^2 =$

3. Key Characteristics Given
   - $Vertex: (-4,\ 12)$
   - $Concave: Down$
   - $Dilation: Stretch\ by\ 2$

Summary: _____

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