Names: _____ Date: _____ Period:_____

Objective: To discover the function that every part of the vertex form of the parabola has

Group size: 2-4 students

<u>**Directions and questions:**</u>

1) Go to the website https://www.desmos.com/calculator/fmxds1uvhe using your phone.

2) Enter "0" for "a". What kind of graph do you have?

3) Enter 1 for "a". What kind of graph do you have? To which direction is your graph pointing?

4) Enter -1 for "a". What kind of graph do you now have? To which direction is your graph pointing?

5) Move the slider for "a" from left to right while paying attention to the numbers and the direction of your graph. What conclusion can you make about the sign of "a" and the direction of your graph?

6) Move the slider for "a" from 0 to 4 (to the right) while paying attention to the width of your graph. What happens to the width of the graph as you increase the value for "a"?

7) Now move the slide for "a" from 0 to -4 (to the left) while paying attention to the width of your graph. What happens to the width of the graph as you decrease the value of "a"?

8) Combining your observations from questions #6 and #7 above, what can you conclude about the value of "a" and the width of the graph? (Hint: Would ignoring the sign of "a" make it easier to make a conclusion that works for both #6 and #7 above? If so, what allows us to ignore those signs?)

10) Now set your "a" to 1, and "h" to 0 and "k" to 0. What are the coordinates of the vertex of the parabola?

11) Move your "h" slider from left to right while paying attention to the vertex of the graph. What is happening to the vertex of the parabola?

12) Based on your observation from question #11, what does the "h" represent in the vertex form of a parabola?

13) Change your "h" back to 0, and move your "k" slider from left to right while paying attention to the vertex of the graph. What is happening to the vertex of the parabola?

14) Based on your observation from question #13, what does the "k" represent in the vertex form of a parabola?

15) If you were given the equation $y=2(x-3)^2+4$, what do you predict the coordinates of the vertex of the parabola would be?

16) To check your prediction, replace the vertex form in ox #1 in desmos by the equation listed above (i.e., $y=2(x-3)^2+4$). Was your prediction correct? If not, what was different? Why do you think that happened?

17) So, how would we plot the coordinates of the vertex of a parabola in the vertex form?

18) Would knowing its vertex be enough to write the equation of a parabola in vertex form? If not, what else would we need?

19) If you are only given the vertex and a point in the parabola, what could you do to find "a"?

20) Try your conclusions above to write the equation of the parabola with vertex (-3, 2) that goes through the point (1, 7).