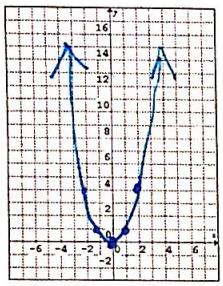
Unit 2 Lesson 1 – Quadratic Transformations Lab

Name: _____ Date: _____

SWBAT: _____

Work together in your group with graphing calculators. Do each of the following tasks and answer each question in **complete sentences** wherever appropriate.

1. **Enter the function** $f(x) = x^2$ **into the graphing calculator.** Draw an accurate sketch on the grid.
2. What are the coordinates of the vertex? (0,0)



3. Which direction does the parabola open? up
4. Describe the symmetry of the graph. symmetrical about the axis of symmetry
5. Give the *equation* of the axis of symmetry: x=0
6. **Now change the equation of your graph to:** $f(x) = x^2 + 3$
7. Describe the change: moved up 3 units

You have just done a **transformation** of the parabola!

8. Without graphing, make a conjecture about the graph of $f(x) = x^2 + 5$: Move up 5 units
9. **Now enter the above function into the graphing calculator.** Were you correct? yes
10. What are the coordinates of the vertex of $f(x) = x^2 + 3$? (0,3)
11. What are the coordinates of the vertex of $f(x) = x^2 + 5$? (0,5)
12. Make another conjecture about the graph of $f(x) = x^2 - 4$. Move down 4 units
13. Complete this sentence: "**The graph of** $f(x) = x^2 + k$ **moves** k units up/down **and the vertex of this parabola is at** (0,k)."

14. **Now enter the equation** $f(x) = (x-3)^2$ **into your calculator,** and describe the transformation. shifted right 3 units
15. What are the coordinates of the vertex of this parabola? (3,0)
16. **Now enter the equation** $f(x) = (x+4)^2$ **into your calculator,** and describe the transformation. Shifted left 4 units
17. What are the coordinates of the vertex of this parabola? (-4,0)

inside, opposite
outside, same

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18. Notice that the graph moved **left** when you + something to x in the parentheses, and moved **right** when you − something from x in the parentheses. (INSIDE PARENTHESES)
19. Complete this sentence: "**The graph of** $f(x) = (x-h)^2$ **will move** right **and its vertex is at** (0,h). **The graph of** $f(x) = (x+h)^2$ **will move** left **and its vertex is at** (0,-h)."

Now, please clear all equations out of the graphing calculator and proceed.

20. **Now enter the equations** $f(x) = 2x^2$, $f(x) = -5x^2$, $f(x) = 0.5x^2$, **and** $f(x) = -0.2x^2$.
21. What do all these graphs have in common? all parabolas, same vertex @ (0,0)
22. How are they different? open up/down, narrower/wider
23. How would $f(x) = -3x^2$ look different from $f(x) = x^2$? Be clear and specific. more narrow, opens down
24. How would $f(x) = \frac{1}{3}x^2$ look different from $f(x) = x^2$? $f(x) = \frac{1}{3}x^2$ is wider than $f(x) = x^2$
25. Describe as clearly and completely as you can what happens to $f(x) = ax^2$ as a changes. Be sure to include various kinds of numbers.
    - **If** $a > 1$, **then the graph of** $f(x) = ax^2$ **is** narrower than $f(x) = x^2$
    - **The bigger** a **gets,** the more narrow it gets
    - **If** $0 < a < 1$, **then the graph of** $f(x) = ax^2$ **is** wider than $f(x) = x^2$
    - **If** $a < 0$, **then the graph of** $f(x) = ax^2$ **is** opens down
26. **It's time to summarize and combine what you've found. Use the variables** a, h, **and** k **to write the vertex form of a quadratic equation.** $f(x) =$ $a(x-h)^2 + k$ (hint: You are extremely hard to know!)
    vertex: (h, k)
27. A quick test: **In the function** $f(x) = -4(x-7)^2 - 3$ **the vertex coordinates are** (7,-3) **the graph opens** down **and the graph is** narrower **than a normal parabola.**

Great job! Now it's time to practice.