*5-1-15 Algebra*

**Using Technology to Explore Quadratics**

Use a Chromebook to log onto www.Desmos.com. Click on the “Launch the Calculator” button.

1. Review- (USE YOUR NOTES FROM LAST CLASS IF YOU NEED TO.)

Graph the equation y=x^2+4x+3. What do we call the resulting shape? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the vertex? ( , ) What are the roots? \_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_\_\_

What is the equation of the line of symmetry? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Graph it to test it out!

**2.** Consider the following equation: y = -2x2 - 4x + 6.

 If x=0, what is the value of y? \_\_\_\_\_\_\_\_ What is this point on the graph called? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Using Desmos.com, graph y = -2x2 - 4x + 6.

What are the roots? \_\_\_\_\_\_ and \_\_\_\_\_\_. What is the vertex? ( , )

What is the equation of the line of symmetry? \_\_\_\_\_\_\_\_\_\_ Graph it to be sure!

*Exploring Sliders and y =* a*x2*

3. Let’s explore what happens when we multiply our parent function x2 by some number a. Delete your other graphs, (use the X to the right of your equations to delete them.) Enter the equation y = *a*x^2. It will ask if you want to create a slider for *a*. Click on the blue box to make it one. Once you’ve created your slider, you can play around and see what happens to your graph for different values of a.

a. For what values of *a* does the graph open up?

b. For what values of *a* does the graph open down?

c. What happens to the parabola when the values for *a* get larger and larger?

d. For what value of a is the graph no longer a parabola?

*Using a Slider to Explore y = x 2 + c*

4. Delete all of your other equations. Graph the equation y = x2 AND the equation y = x2 + c. It will ask if you want to make *c* a slider. Click on the blue button to make it happen. Once you’ve created your slider, you can play around and see what happens to your graph for different values of c.

a. What happens to your parabola as the values for c get larger?

b. What happens to your parabola as the values for c get smaller?

c. How does the graph of y = x2 + 4 compare to the parent function y = x2?

d. How does the graph of y = x2 - 5 compare to the parent function y = x2?

*Using a Slider to Explore y = x 2 + bx*

5. Delete all of your other equations. Graph the equation y = x2 AND the equation y = x2 + bx. It will ask if you want to make *b* a slider. Click on the blue button to make it happen. Once you’ve created your slider, you can play around and see what happens to your graph for different values of b.

a. What happens to your parabola as the values for b get larger?

b. What happens to your parabola as the values for b get smaller?

*Exploring Factored Form y = (x-r1)(x-r2)*

6. So far, we’ve only explored quadratics in standard form, (y = ax2 + bx + c.) There are other forms we will use. Let’s explore factored form, y = (x-r1)(x-r2) for a bit.

a. Delete your other equations. Graph the equation y = (x-3)(x-5).

What are the roots? \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_ What is the vertex? ( , )

What is the equation of the line of symmetry? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Test it by graphing!

b. Delete your other equations. Graph the equation y = (x+2)(x+1).

What are the roots? \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_ What is the vertex? ( , )

What is the equation of the line of symmetry? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Test it by graphing!

c. Delete your other equations. Graph the equation y = (x+0)(x+8).

What are the roots? \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_ What is the vertex? ( , )

What is the equation of the line of symmetry? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Test it by graphing!

d. Are you noticing a pattern yet? WITHOUT GRAPHING, guess what the roots will be for the equation y = (x - 4)(x - 6). Can you PREDICT what the line of symmetry will be without graphing?

Guess for the roots \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_ Line of Symmetry \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Actual roots\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_ Actual Line of symmetry \_\_\_\_\_\_\_\_\_\_\_\_\_\_

e. Try another! What will be the roots and line of symmetry for the equation y = (x + 2)(x – 6 )? Check your solutions.

Conclusion Time!

Let’s generalize what we’ve learned about factored form. Given an equation in factored form, how do we know what the roots will be? Explain! Discuss your results with a classmate.

Once we know the roots, how do we know what the equation of the line of symmetry will be WITHOUT graphing? Explain! Discuss your results with a classmate.

*Wrapping up the Investigation-*

Answer WITHOUT graphing.

1. Consider the equation y = -4x2 + 2x + 5. Will the graph open UP or DOWN? How do you know?

2. How does the graph of y = x2 + 3 compare to the graph of y = x2.

3. Which graph is wider, y = 2x2 or y = 8x2 ?

4. What are the roots and line of symmetry of the equation y = (x - 1) ( x - 5)?

Check ALL of your solutions by graphing. Please return and PLUG IN the Chromebooks.

**Calculating the Roots Algebraically by Factoring**

For some quadratic equations, we can find the roots by setting y = 0 and factoring. From there we can use the Zero Product Property and set each factor equal to zero and solve to find the roots.

 **Example** Find the roots of y = 2x2 + 7x + 3.

First we set y = 0. All x-intercepts have a y-value of 0. 0 = 2x2 + 7x + 3

Next we factor. I need two numbers that multiply to 6 and add to 7. 0 = 2x2 + 1x + 6x + 3

We then factor by grouping. 0 = x (2x + 1) + 3 (2x + 1)

 0 = (x + 3) (2x + 1)

If a·b = 0, then either a=0 or b=0. Set each factor equal to 0 x + 3 = 0 and 2x + 1 = 0

and solve! Roots: x = -3 and x = -1/2

**Practice**

**ALGEBRAICALLY, calculate the roots of each quadratic equation. (You can check your work graphically using desmos.com at home. This is a nice way to visual see what the solutions mean!)**

1. y = x2 + 13x + 12 2. y = x2 – 16x +15

3. y = 2x2 - 9x + 4 4. y = 4x2 + 4x - 3

5. y = 6x2 - 13x – 5