10-1 Notes Graphing Parabolas

Objectives:

1. Discover how adding a constant to the parent function affects the graph of the function.

2. Use the zeros of a quadratic function to find the vertex of the graph and rewrite in vertex form.

Recall:

Standard Form of a Quadratic Trinomial $y = ax^2 + bx + c$

Useful to solve by factoring, but we need to take it one step further.

Let's go back to parent functions and transformations

NEW MATERIAL:

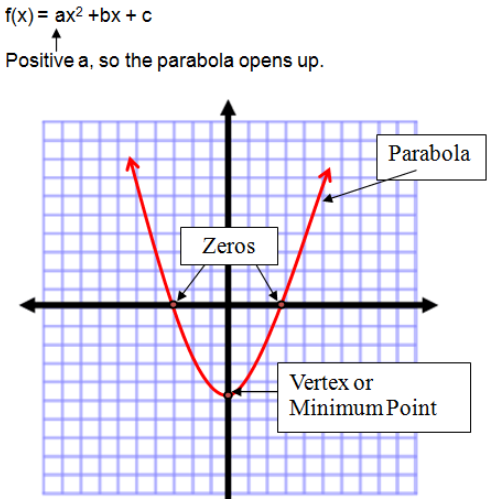
The parent function for quadratics is $y = x^2$

We expand that parent function to what is known as **VERTEX FORM.**

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

The values of "h" and "k" give us the coordinates of the vertex of the parabola.

V(h,k)



"h" and "k" will move the parent function either horizontally or vertically.

* "h" will move the graph **horizontally**
    *Remember it moves opposite the sign.
        *(x-h) moves right
        *(x+h) moves left
* "k" will move the graph **vertically**
        +k moves up
        -k moves down

The value of "a" (the leading coefficient) tells how the graph opens.

If a>0 (Positive) then the graph opens upward.
If a<0 (Negative) then the graph opens downward.

The **axis of symmetry** is a vertical line which cuts the parabola in half. It runs through the vertex.

If we know the x-coordinate of the vertex, then we know the equation of **axis of symmetry**.

It is in the form x=h

So, for example if we have an equation of $y = (x-3)^2 + 1$, then the value of "h" is 3. Therefore the axis of symmetry would be x=3.

We can also use the **zeros** of a function to find the vertex and axis of symmetry, if we know something about the graph of a parabola. The graph is symmetric. That should tell us:

1. The vertex is half-way between the zeros.
2. The axis of symmetry is also half-way between the zeros.

Let's take a look at how we can use the **zeros** of the function to find the vertex and axis of symmetry…

How to find the Vertex and Axis of Symmetry of a Parabola by using the zeros of the function.

Step #1. Find the zeros of the function by factoring.
Step #2. Find the x-value half-way between the zeros.
Step #3. Plug that x-value back into the original function to find the y-value.

Here's an example:

$$y = x^2 - 6x + 5$$

Step #1.

$$y = x^2 - 6x + 5$$
$$y = (x-5)(x-1)$$
$$x - 5 = 0$$
$$x = 5$$
$$x - 1 = 0$$
$$x = 1$$

Step #2. $\frac{5+1}{2} = \frac{6}{2} = 3$

Step #3.

$$y = x^2 - 6x + 5$$
$$y = (3)^2 - 6(3) + 5$$
$$y = 9 - 18 + 5$$
$$y = -4$$

Therefore the coordinate of the vertex is (3,-4)

We can use that vertex to get the axis of symmetry. Remember that the axis of symmetry is x=h, so the axis of symmetry is x=3

Also, we can rewrite the function in vertex form now that we know the vertex.

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

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

You try a few. **Page 484**

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Homework Section 10-1

Use the zeros to find the vertex and axis of symmetry. Then rewrite the function in vertex form.

1. $y = x^2 - 2x - 15$

2. $y = x^2 + 8x + 15$

3. $y = x^2 + 4x - 5$

4. $y = x^2 + 6x - 7$

5. $y = x^2 + 2x - 24$