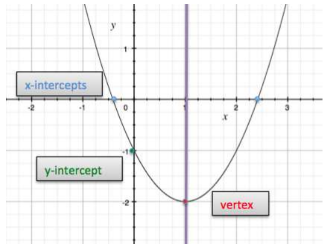
Secondary 2
lesson 6.2



Graphing Quadratics by Hand

Objectives:

- To be able to list all pertinent information about a quadratic equation
- To be able to graph a quadratic equation from the listed information

1

Remember Standard Form

f(x)= $ax^2 + bx + c$

*this equation, when the degree is 2, is a **QUADRATIC EQUATION**. The graph is always a Parabola.

2

Parabola is the graph of a quadratic equation

Why talk about a parabola?

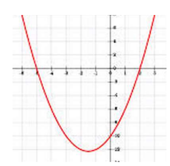
What exactly is a parabola? Well it could quite possibly be the most powerful shape that our world has ever known. The parabola is used in suspension bridges, doors, buildings, the reflector of automobile headlights, and in physics with laws of gravity, the path for thrown objects such as baseballs, satellite dishes and radio telescopes.

3

1) How do we know if the graph goes up or down by looking at the equation?

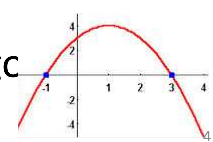
- When $f(x)= \mathbf{ax^2 + bx + c}$
- Or when $f(x) = a(x-h)+k$

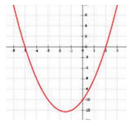
Look to the "a"



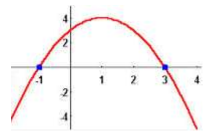
When "a" is positive (+) the graph goes up

When "a" is negative (-) the graph gc





UP or Down?



- $g(x) = x^2 - 6x + 9$
- $f(x) = -5x^2 + 7$
- $h(x) = -3x^2 + 2x - 11$
- $f(x) = 4x^2$

2) How to find a vertex

When $f(x) = a(x - h)^2 + k$ (this is called **vertex form**)
The vertex is represented by (h,k) where *h* is the *x* coordinate of the vertex and *k* is the *y* coordinate.

When f(x) = $ax^2 + bx + c$ (this is **standard form**)
The vertex can be found with two steps. The *x* coordinate can be found by calculating $\frac{-b}{2a}$. The *y* is then found by replacing *x* in the equation and solving for *y*.

(**factored form**)
When f(x) is factored just solve for the two *x*'s, add them and divide by 2. This will give you the *x* coordinate. The *y* is found as above.

Find each vertex.

a. $f(x) = (x-6)^2 - 10$ b. $g(x) = -2(x-4)^2 + 5$

c. $f(x) = (x+4)^2 + 5$ d. $f(x) = 2(x+4)^2 - 8$

7

Find the vertex:

e. $f(x) = x^2 + 6x - 10$ f. $g(x) = -2x^2 + 8x + 15$

g. $f(x) = x(x+6)$ h. $g(x) = (x+4)(x-2)$

8

3) Find the x-intercepts - Remember y is always 0: (x,0)

You have choices: A) if it's in vertex form, solve by square roots.
B) If not, you can factor then set each factor equal to 0. Later you can
C) use your calculator to find the zero's (these are the x-intercepts). Or
D) you can use the quadratic formula to solve for x's (x-intercepts).

i. $g(x) = x^2 + 7x + 6$

j. $f(x) = (2x + 1)(x - 3)$

9

4) Find the y-intercept - (remember x is always 0: (0,y)

To find the y-intercepts just find f(0). ie replace x with 0.

k. $f(x) = 2x^2 - 6x + 13$

l. $g(x) = -2(3x + 1)(x - 7)$

10

Now put these four ideas together. For every given equation list the vertex, direction of opening, x-intercepts, y-intercept and draw the graph. On the graph label the points.

m. $f(x) = x^2 - 5x + 4$ *Graph:*

- Up or down:
- Vertex:
- x-intercepts:
- y-intercept:

n. $f(x) = -2x^2 - 5x + 3$ *Graph:*

- Up or down:
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o. $f(x) = (x+6)(x-4)$ *Graph:*

- Up or down:
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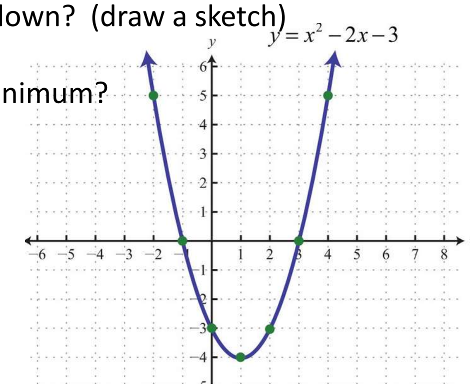
Describe the essential parts of this graph by just looking at it.

This is what we want to know

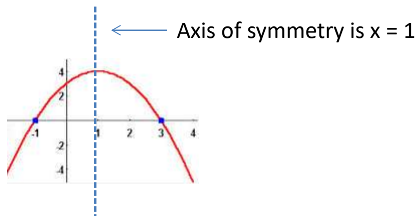
1. Is the graph opening up or down? (draw a sketch)
2. NEW! Is it a maximum or minimum?
3. Describe the y- intercept.
4. Describe the x- intercepts.
5. Give the vertex.



6. NEW! Describe where the graph is increasing and decreasing.

One last note you need for Math XL: once you find the vertex, the x-coordinate is the place where the axis of symmetry goes. For example if the vertex is (4,2), the axis of symmetry is x = 4.

Fyi; if you remember from Secondary 1, the axis of symmetry is the line that you can fold the graph across and have both sides be the same.



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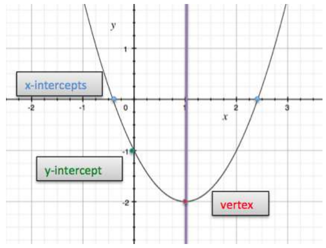

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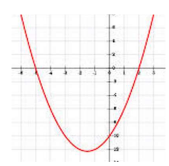

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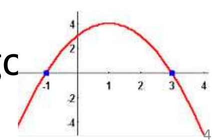

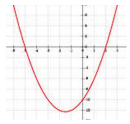

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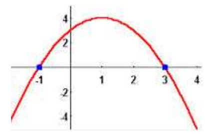

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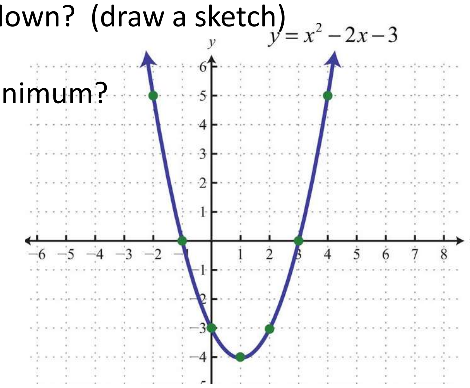

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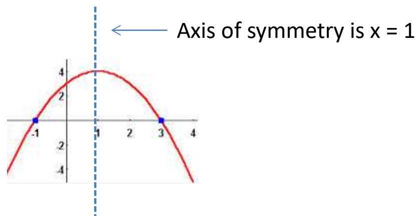

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