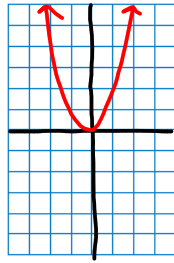




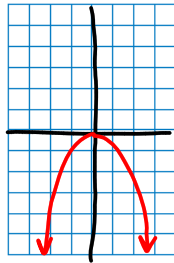
2.5 Characteristics of Quadratics

Let's Graph some Quadratics!

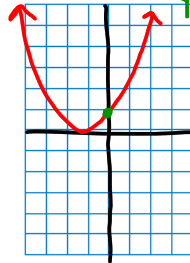
$y = x^2$



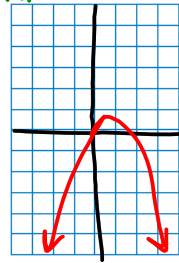
$y = -x^2$



$y = x^2 + 2x + 1$



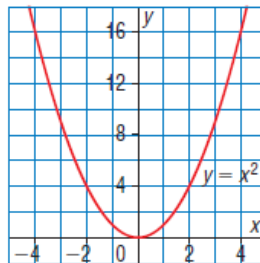
$y = -x^2 + 2x$



Do you notice any patterns?



For any number, x , its square, y , is a function of x . This is a quadratic function with equation $y = x^2$.



Quadratic Function

A quadratic function is any function that can be written in the form $y = ax^2 + bx + c$, where a, b , and $c \in \mathbb{R}$ and $a \neq 0$. This is called the general form of the equation of a quadratic function.

Standard

The **Shape** of a Quadratic is a curve called a parabola.



Characteristics of Quadratics in General Form:
 $ax^2 + bx + c = 0$

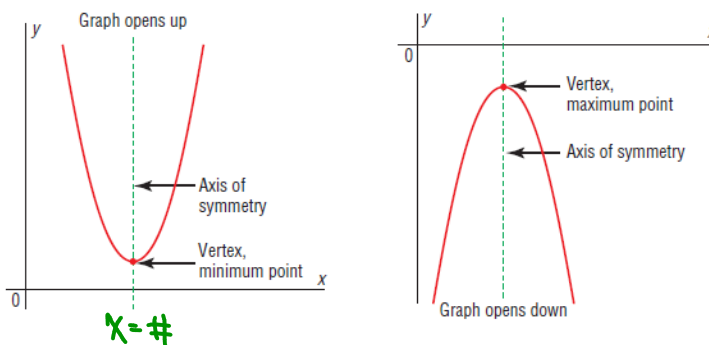
In this General Form what do the parameters **a**, **b** and **c** tell us?

- a** = direction of opening $a > 0$ opens up
 $a < 0$ opens down
- b** = related to horizontal shift
- c** = y-int (vertical shift)

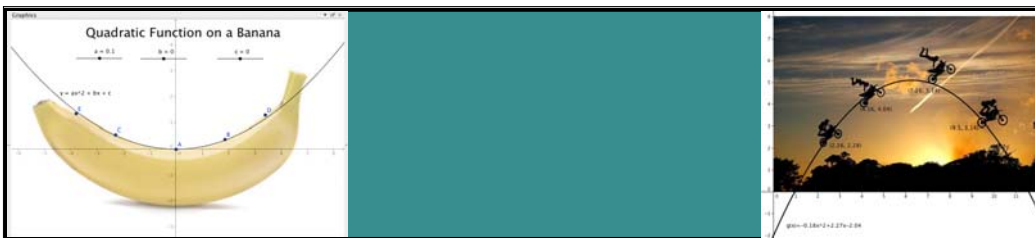


Characteristics of Quadratics:

- 1 The vertex of a parabola is always its highest or lowest point.
- 2 The vertex must be a minimum or maximum point.

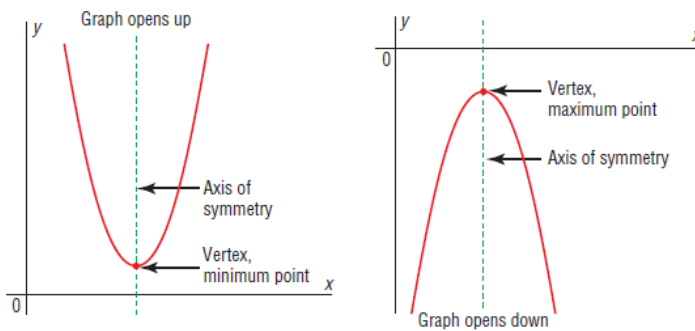


- 3 The axis of symmetry intersects the parabola at the vertex. The parabola is symmetrical about this line.



4 When the coefficient of x^2 is positive, the parabola opens up and its vertex is a minimum point.

When the coefficient of x^2 is negative, the parabola opens down and its vertex is a maximum point.



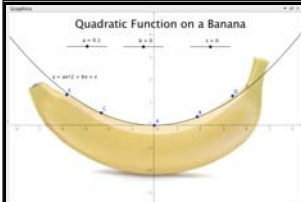
5 *The domain of a quadratic function is all possible x-values.


*The domain is $x \in \mathbb{R}$.
 $\{x \in \mathbb{R}\}$
 $\{x | x \in \mathbb{R}\}$

6 *The range of a quadratic function is all possible y-values.

*The range _____.
 min. max. $\{y | y \geq \text{min}\}$ $\{y = 3\}$
 $\{y | y \leq \text{max}\}$

7 The y-intercept = parameter "c"





Analyzing Quadratics

To analyze Quadratics enter the quadratic into your calculator into the **y=**. Then, use the features in the **Second Trace** menu to solve each of the following:

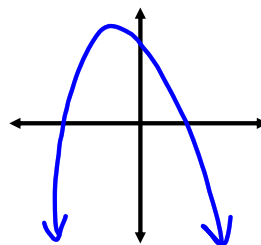
	$y=x^2+2x-3$	$y=-2x^2+x+7$
Vertex	$(-1, -4)$	$(0.25, 7.13)$
X-Intercepts	$(-3, 0) (1, 0)$	$(-1.64, 0) (2.14, 0)$
Y-intercepts	$(0, -3)$	$(0, 7)$
Axis of Symmetry	$x = -1$	$x = 0.25$
Domain	$x \in \mathbb{R}$	$x \in \mathbb{R}$
Range	$y \geq -4$	$y \leq 7.13$
Min or Max	min.	max

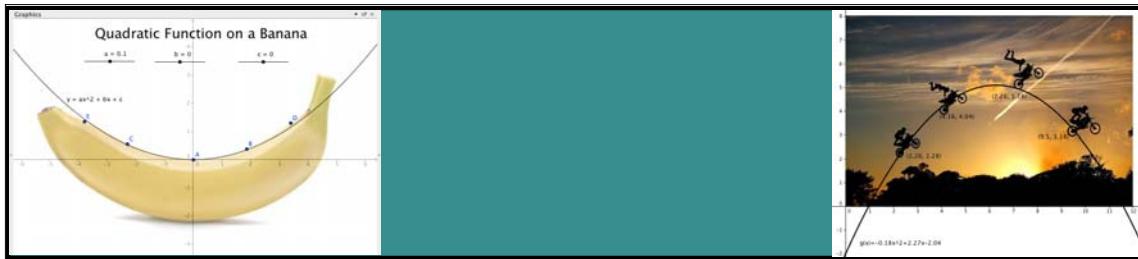




Ex.) Graph $y = -2x^2 - 6x + 20$ and identify...

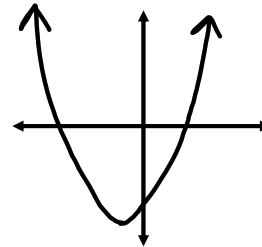
- i) the intercepts $(0, 20) (-5, 0) (2, 0)$
- ii) the co-ordinates of the vertex $(-1.5, 24.5)$
- iii) the equation for the axis of symmetry $x = -1.5$
- iv) the domain of the function $x \in \mathbb{R}$
- v) the range of the function $y \leq 24.5$
- vi) sketch the function





Ex.) Graph $y = 2x^2 + 4x - 6$ and identify...

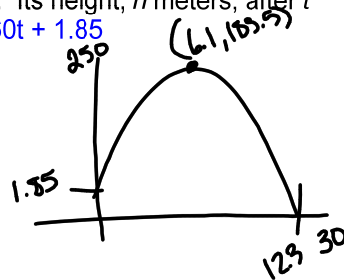
- i) the intercepts $(0, -6)$ $(-3, 0)$ $(1, 0)$
- ii) the co-ordinates of the vertex $(-1, -8)$
- iii) the equation for the axis of symmetry $x = -1$
- iv) the domain of the function $x \in \mathbb{R}$
- v) the range of the function $y \geq -8$
- vi) sketch the function



Ex.) An object is fired upward with a speed 60 m/s. Its height, h meters, after t seconds is modelled by the equation $h = -4.9t^2 + 60t + 1.85$

- a) Graph the quadratic function.
- b) Identify and explain the significance of:

- i) intercepts $(0, 1.85)$ $(12.3, 0)$
- ii) vertex $(6.1, 185.5)$
- iii) domain $0 \leq t \leq 12.3$
- iv) range $0 \leq h \leq 185.5$



Pg. 174 #1, 2, 5, 6, 7.

