

# UNIT 8: GRAPHING QUADRATIC FUNCTIONS

## Part A: Video Tutorial Section

Videos 1 and 2:

[https://www.youtube.com/watch?v=VdVPg04t\\_6w](https://www.youtube.com/watch?v=VdVPg04t_6w) (Understanding the Basic Vocabulary: vertex, axis of symmetry, y-intercept, x-intercept, domain, range, roots, parabola)

<https://www.youtube.com/watch?v=KRwb4YhQPwA> (More Examples of Basic Vocabulary)

Videos 3 and 4:

<https://www.youtube.com/watch?v=x4XI0bv3xBY> (How to Graph a Parabola)

[https://www.youtube.com/watch?v=\\_vkHw7caCN4](https://www.youtube.com/watch?v=_vkHw7caCN4) (More Examples of Graphing Parabolas)

Video 5:

<https://www.youtube.com/watch?v=t4rx2kTcyJI> Graphing  $y = ax^2 + c$

Video 6 and 7:

<https://www.youtube.com/watch?v=MQtsRYPx3v0> (Graphing  $y = ax^2 + bx + c$ )

<https://www.youtube.com/watch?v=MQtsRYPx3v0> (More examples of Graphing  $y = ax^2 + bx + c$ )

Videos 8 and 9:

<https://www.youtube.com/watch?v=9Bu0Hkxw88g> (Comparing Linear, Exponential and Quadratic Functions)

<https://www.youtube.com/watch?v=CxEFOozrMSE> (Comparing Linear, Exponential and Quadratic Functions)

## Part B : Vocabulary, Hints and Explanations

### Important Vocabulary Words That Students Need to Know!

Don't get confused!! A Parabola is the same thing as a Quadratic Function!

**Quadratic function:** in Unit 5 the student learned the definition of a function; a function has one and only one output for each input.

A quadratic function is non-linear.

It can be written as:  $y = ax^2 + bx + c$  where  $a \neq 0$

**Parabola:** the U shaped graph of a quadratic function.

The parabola may open upward or downward.

Equations with positive numbers open upward. Ex:  $y = 5x^2$  or  $y = 1/3x^2$

Equations with negative numbers open downward. Ex:  $y = -3x^2$  or  $y = -1/2x^2$

Functions decrease on the left side of the parabola and increase on the right side of the parabola. (like a number line. Numbers decrease going to the left and increase going to the right)

**Vertex:** the lowest or highest point of the parabola

**Axis of Symmetry:** the vertical line that divides the parabola into two equal symmetric parts. the axis of symmetry must pass through the vertex.

**Roots of a quadratic equation:** The roots of a quadratic equation are the x-intercepts of the graph.

In earlier units, students were solving quadratic equations by factoring to find the roots of the equations.

Initially students may work with a table to graph the solutions to a quadratic equation. At this stage, the student should become familiar and capable with the graphing calculator!!

- A quadratic equation has two roots if its graph has two x-intercepts
- A quadratic equation has one root if its graph has one x-intercept

- A quadratic equation has no real solutions if its graph has no x-intercepts.

**Focus of a parabola:** a fixed point on the axis of symmetry that the parabola wraps around.

**Graphing** – Properties of a graph of  $y = ax^2 + bx + c$

The graph will open upward when  $a > 0$ , bigger than a zero opens up!

The graph will open downward when  $a < 0$ , getting smaller (less than zero) drooping down!

The y-intercept is c. Remember when you graphed a linear equation in the form of  $y = mx + b$ , the y-intercept was b, or the last of the equation. So, in  $y = ax^2 + bx + c$ , the last of the equation is represented by a c and it is also the y-intercept.

The axis of symmetry is represented by:  $x = -b/2a$  (substitute the numbers that represent the a and b in the equation)

**Hint:** When you have a quadratic equation, write a over the first term, b over the second term, and c over the third term.

**Minimum value:** if a graph opens upward it has a minimum value, which is the y-coordinate of the vertex

**Maximum value:** if the graph opens downward, it has a maximum value, which is the y-coordinate of the vertex

## Comparing graphs:

**Linear function** (a line graph) is a straight line

$$y = mx + b$$

**Exponential function** is a curve

$$y = ab^x$$

**Quadratic function** is a parabola

$$y = ax^2$$

