



Quadratic Functions

Week 2 Part 1



Objectives:

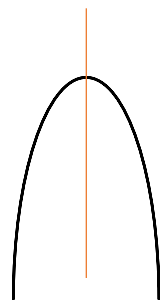
- Understand the definition of axis of symmetry and vertex of a Quadratic function.



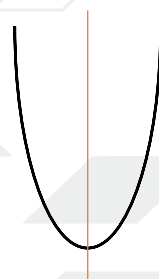
Quadratic Function

- A **quadratic function** is one of the form $f(x) = ax^2 + bx + c$, where **a**, **b**, and **c** are numbers with **a** not equal to zero.
- The graph of a quadratic function is a parabola.

If a is
Negative



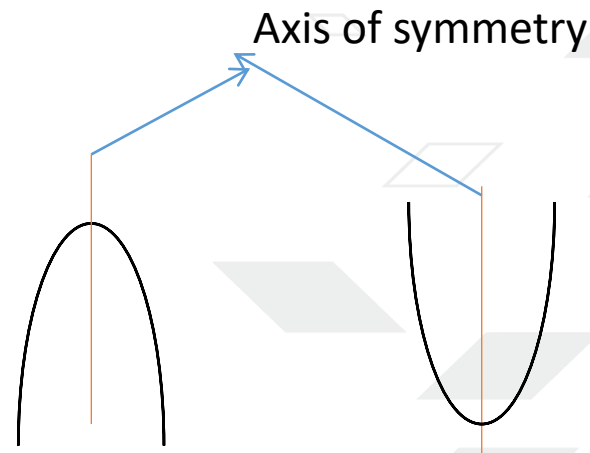
If a is
positive 😊



Axis of symmetry

The axis of symmetry is the line which divides a parabola into two equal halves that are reflections of each other

Axis of symmetry $x = \frac{-b}{2a}$



Example

Find the axis of symmetry of the function $f(x) = x^2 + 4x - 3$

Solution:

$$a = 1, b = 4$$

$$\text{Axis of symmetry } x = \frac{-b}{2a} = \frac{-4}{2 \times 1} = -2$$

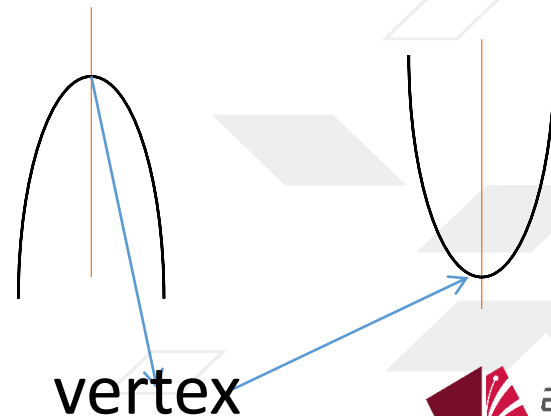
Click the below link to view the video on Axis of Symmetry

<https://youtu.be/0wCkENKihPM>

Vertex

Vertex is the lowest or highest point on the graph of a quadratic function $f(x) = ax^2 + bx + c$

$$\text{Vertex } (x, y) = \left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right) \right)$$



Example

Find the axis and vertex of the function $f(x) = -2x^2 + 4x - 5$

Solution:

$$a = -2, \quad b = 4$$

$$x = \frac{-b}{2a} = \frac{-4}{2 \times (-2)} = 1$$

So **Axis, $x = 1$**

$$y = f(1) = -2(1)^2 + 4(1) - 5 = -3$$

Vertex = $(1, -3)$

Click the below link to view the video on vertex

<https://youtu.be/WWpgbLzcZRA>

Exercise:

Find the Axis of symmetry and vertex for the following functions:

a) $f(x) = 3x^2 - 9x - 6$

b) $f(x) = \frac{5}{6}x^2 + 3x$

c) $f(x) = (x-7)^2 + 2$

d) $f(x) = -(x+1)^2 - 2$

Reference

- Pindling.org. (2019). *3.4 Transformation of Graphs*. [online] Available at: http://www.pindling.org/Math/CA/By_Examples/3_4_Transformation/3_4_Transformation.html [Accessed 17 Aug. 2019].