

Chapter 3 – Quadratic Functions

3.6 – Zeroes of Quadratic Functions

Learning Goal: We are learning to determine the number of zeros of a quadratic function.

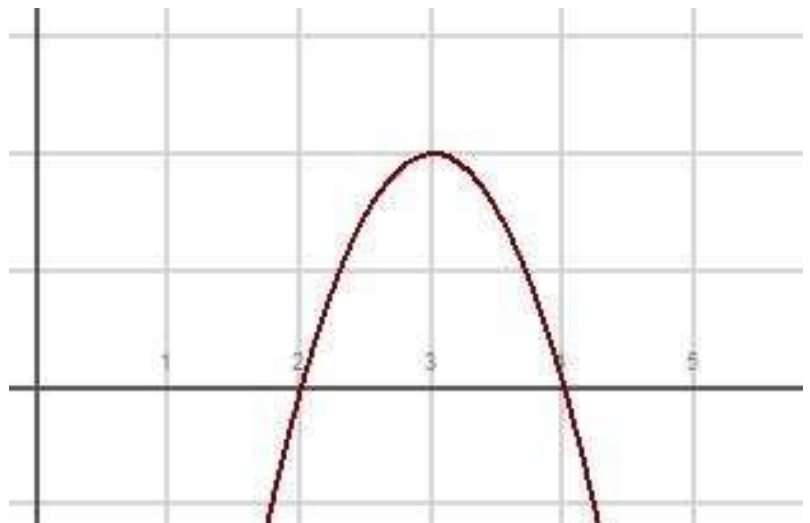
Before we begin, let's think about a couple of things...

Remember – **FUNCTIONS CAN BE DESCRIBED AS A SET OF ORDERED PAIRS**, where the “ordered pair” is a pair of numbers: a **domain value** and a **range value** which can look like $(x, f(x))$. We have talked about the vertex of a parabola. Consider a parabola opening down (which means it will have a maximum value).

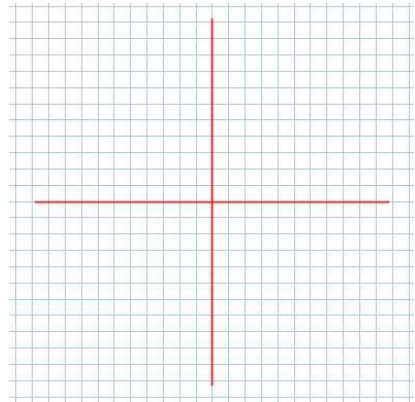
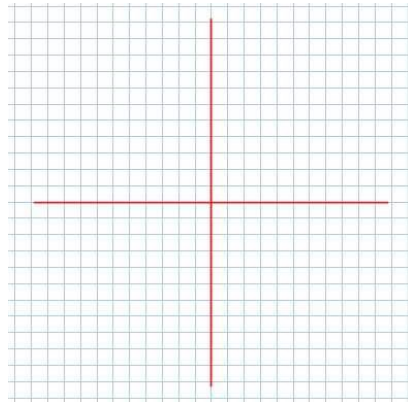
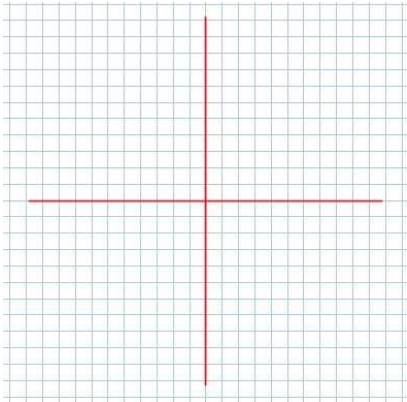
The vertex of that parabola is NOT the maximum. Instead, the vertex is a POINT which is made up of two special numbers. The domain value is WHERE the max occurs and the functional value (the “y” value) is the maximum.

When we talk about the ZEROS of a quadratic we need to understand what we mean by that.

Consider the sketch of the graph of the quadratic function $f(x) = -2(x-3)^2 + 2$



Q. Do all quadratics have 2 zeros? NO!!!!!!!



Finding the Zeros of a Quadratic

We can find those pesky zeros in a number of ways:

- 1) Writing the quadratic in zeros form (by factoring)
- 2) Writing the quadratic in vertex form, and doing some algebra (a bit nasty)
- 3) Using the quadratic formula (but the quadratic *MUST BE IN STANDARD FORM* -
 $f(x) = ax^2 + bx + c$)
- 4) Using graphing technology (lame, but legit)

Example 3.6.1

Determine the zeros:

a) $f(x) = x^2 - 3x - 4$

b) $g(x) = 2x^2 + x - 1$

Example 3.6.2

Determine why the quadratic $f(x) = 2(x-1)^2 + 2$ has no zeros.

Example 3.6.3

Determine the zeros of $g(x) = -(x+1)^2 + 8$

Example 3.6.4

Using the quadratic formula, determine the zeros of the quadratic:

In case you've forgotten, the quadratic formula is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

a) $f(x) = 2x^2 + 3x - 7$

b) $g(x) = 3x^2 - 2x + 4$



The Discriminant

The Discriminant of the quadratic formula is called the **DISCRIMINANT** because

The Discriminant is $b^2 - 4ac$

1) If $b^2 - 4ac$

2) If $b^2 - 4ac$

3) If $b^2 - 4ac$

Example 3.6.5

Determine the number of zeros using the discriminant:

a) $f(x) = 2x^2 + 3x - 2$

b) $g(x) = -x^2 + 4x - 4$

c) $h(x) = 3x^2 + 5x + 6$

Success Criteria:

- I can recognize that a quadratic function may have 0, 1, or 2 zeros
- I can use the discriminant of the quadratic formula to determine the number of zeros

