

Chapter 3 – Quadratic Functions

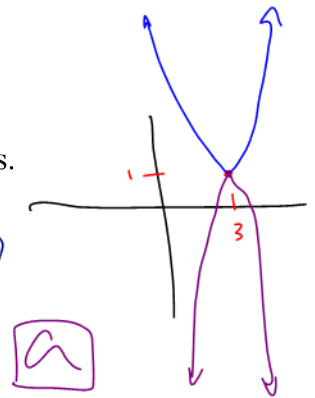
3.7 – Families of Quadratic Functions

Learning Goal: We are learning the properties of families of quadratic functions.

Consider the two quadratic functions: *these share the same vertex (3,1)*

$$f(x) = 2(x-3)^2 + 1, \text{ and } g(x) = -3(x-3)^2 + 1$$

What's Different?



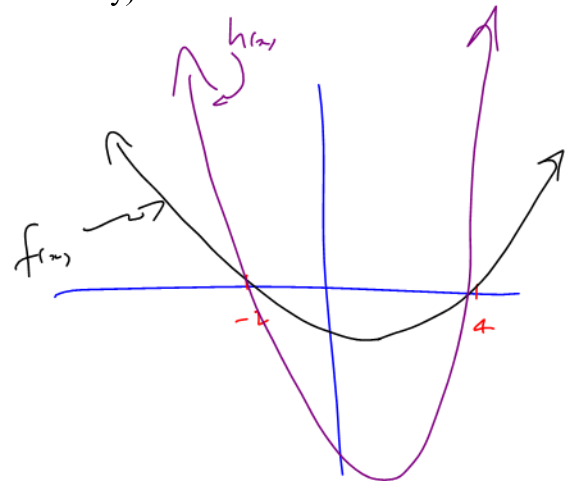
Clearly $f(x)$ and $g(x)$ are different functions, but they do share the same vertex, and the same axis of symmetry. These quadratics are said to be in the same “family” (some might say they are in the same vertex family)

But “a” is different. “a” distinguishes between all parabolas with the vertex (3,1)

Next, consider $h(x) = 3(x+2)(x-4)$, and $f(x) = \frac{2}{3}(x+2)(x-4)$. We see another kind of family here because $h(x)$ and $f(x)$ share the same zeros, and the same axis of symmetry.

(some might say these quadratics are in the same zeroes family) **What's Different?**

“a” distinguishes between



Finally consider the third form of a quadratic. Consider

“family members”

$$f(x) = 3x^2 - 5x + 2$$

$$g(x) = -5x^2 + 3x + 2$$

f(x) & g(x) share the same y-int

(not very important “family”)

Example 3.7.1

Determine the equation of the quadratic with zeros $x=3$, and $x=-1$ and that passes through the point $(5,6)$.

use zero form
 $(x, g(x))$

$$g(x) = a(x-r)(x-s)$$

$$\Rightarrow g(x) = a(x-3)(x+1)$$

to find "a" use $(5,6)$

$$6 = a(5-3)(5+1)$$

$$6 = 12a$$

$$\Rightarrow a = \frac{6}{12} = \frac{1}{2}$$

$$\therefore \text{our eqn is } g(x) = \frac{1}{2}(x-3)(x+1)$$

Determine the equation of the quadratic function $f(x)$ with a max value of 3 and axis of symmetry with equation $x=-5$ if $f(2)=-18$.

Example 3.7.2

\hookrightarrow x-value of vertex

the point $(2, -18)$

\uparrow "y"-value of vertex

Vertex $(-5, 3) = (h, k)$

vertex $f(x) = a(x-h)^2 + k$

$$\Rightarrow f(x) = a(x+5)^2 + 3$$

use the point $(2, -18)$ to find a

$$-18 = a(2+5)^2 + 3$$

$$-18 = 49a + 3$$

$$a = \frac{-21}{49} = -\frac{3}{7}$$

$$\Rightarrow -21 = 49a$$

\therefore our eqn is

Success Criteria:

- I can solve for "a" if given either the vertex or zeros

and another point.

$$f(x) = -\frac{3}{7}(x+5)^2 + 3$$

