Chapter 3 – Quadratic Functions

3.7 – Families of Quadratic Functions

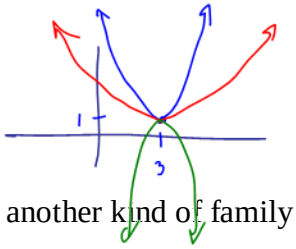
Consider the two quadratic functions:

"a" is different - they have different stretch factors

$f(x) = 2(x-3)^2 + 1$, 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)



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?**

stretch factor

Finally consider the third form of a quadratic. Consider

$f(x) = 3x^2 - 5x + 7$

$g(x) = -2x^2 + 7x + 7$

f & g are members of the y-int = 7 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 zeros form

$f(x) = a(x-3)(x+1)$

use $(x, f(x))$ $(5, 6)$ to calculate "a"

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

$\Rightarrow 6 = a(2)(6)$

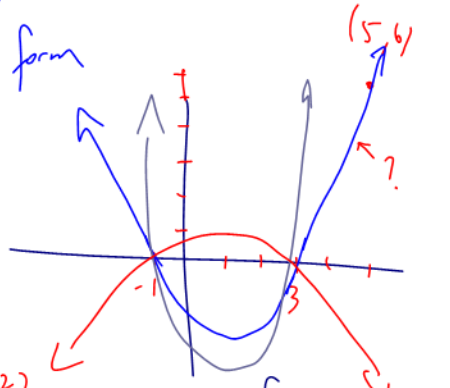
$12a = 6 \Rightarrow a = \frac{1}{2}$

$\therefore f(x) = \frac{1}{2}(x-3)(x+1)$

AOS: $x = \frac{+3+-1}{2} = \frac{3-1}{2} = 1$

$\Rightarrow$ vertex $(1, f(1)) = (+1, -2)$

$f(x) = \frac{1}{2}(x-1)^2 - 2$



into standard form - expand

$= \frac{1}{2}(x^2 - 2x - 3)$

$= \frac{1}{2}x^2 - x - \frac{3}{2}$.

Example 3.7.2

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

we are given: vertex $(-5, 3)$ | point $(2, -18)$

vertex form

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

use $(2, -19)$ to calculate "a"

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

$-18 = a(49) + 3$

$49a = -21$

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

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

Class/Homework

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