Lesson 6: Equation of a Quadratic Function

Investigate:

1. Using graphing software, graph each of the following quadratic functions. How are the graphs the same? How are they different?

$f(x) = x^2 - 3x - 10$
$g(x) = -2x^2 + 6x + 20$
$h(x) = 4x^2 - 12x - 40$
$k(x) = -0.5x^2 + 1.5x + 5$

Same x intercepts
Same AOS
different vertices
different directions of opening

$\rightarrow -0.5(x^2 - 3x - 10)$

2. Write each function in factored form. What do you notice?

$f(x) = (x-5)(x+2)$
$g(x) = -2(x-5)(x+2)$
$h(x) = 4(x-5)(x+2)$
$k(x) = -0.5(x-5)(x+2)$

They all have the same r & s.

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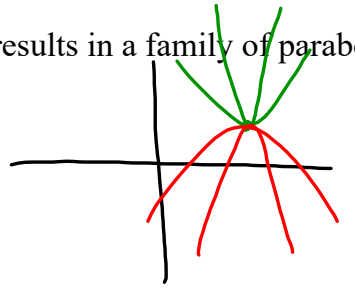
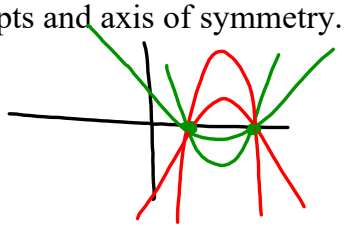
3. This group of functions forms a **family of quadratic functions**. What is the **common characteristic** of these families?

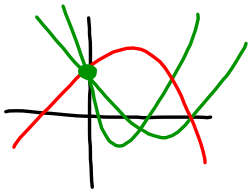
Vertex Form: Where **"a"** is varied, this results in a family of parabolas with the same vertex and axis of symmetry.



Factored Form: Where **"a"** is varied, this results in a family of parabolas with the same x-intercepts and axis of symmetry.



Standard Form: Where **"a"** and **"b"** are varied, this results in a family of parabolas with the same y-intercept.



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Example : Write the equation (in standard form) of the quadratic function that passes through the point (2, -9), if the roots of the corresponding quadratic equation are 5 and -7.

(x, y) $r = 5$ $s = -7$

① $y = a(x-r)(x-s)$

$-9 = a(2-5)(2+7)$

$-9 = a(-3)(9)$

$-9 = a(-27)$

$\frac{-9}{-27} = a$

$\frac{1}{3} = a$

② $y = \frac{1}{3}(x-5)(x+7)$

$y = \frac{1}{3}(x^2+2x-35)$

$y = \frac{1}{3}x^2 + \frac{2}{3}x - \frac{35}{3}$

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Recall: Expand $(5-6\sqrt{3})(5+6\sqrt{3})$

$= 25 + 30\sqrt{3} - 30\sqrt{3} - 36\sqrt{9}$

$= 25 - 36 \cdot 3$

$= 25 - 108$

$= -83$

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Example: Write the equation (in standard form) of the quadratic function that passes through the point (-1, 3), if the roots of the corresponding quadratic equation are $5 \pm 3\sqrt{2}$

(x, y)

$r = 5+3\sqrt{2}$ $s = 5-3\sqrt{2}$

① $y = a(x-r)(x-s)$

$y = a(x-5-3\sqrt{2})(x-5+3\sqrt{2})$

$y = a(x^2 - 5x + 3\sqrt{2}x - 5x + 25 - 15\sqrt{2} - 3\sqrt{2}x + 15\sqrt{2} - 9\sqrt{4})$

$-9 \cdot 2 = -18$

② $y = a(x^2 - 10x + 7)$

plug in $(-1, 3)$ to solve for a:

$3 = a((-1)^2 - 10(-1) + 7)$

$3 = a(1 + 10 + 7)$

$3 = a(18)$

$\frac{3}{18} = a$

$\frac{1}{6} = a$

③ plug in "a" and simplify:

$y = \frac{1}{6}(x^2 - 10x + 7)$

$y = \frac{1}{6}x^2 - \frac{10}{6}x + \frac{7}{6}$

$y = \frac{1}{6}x^2 - \frac{5}{3}x + \frac{7}{6}$

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HW U1L6:

1. p. 192 # 1-3, 4cd, 6, 8, 9,16
2. sign and correct quizzes

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