Algebra I

Lesson 9.4 – Transforming Quadratic Equations

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Back in Chapter 5 we were introduced to function families and in particular the linear family of functions. We discovered that by changing values of the slope and y-intercept, we could accurately predict how the nature of the line would change through transformations and translations. Today we will study in detail the **Quadratic Parent Function** and how it may be transformed.

Vocabulary:

Quadratic parent function $f(x) = x^2$ This is the simplest form of the quadratic function and is identified as the parent function.

1. The **axis of symmetry is** $x = 0$;
2. **the vertex is** $(0, 0)$; and
3. **the function only has one zero,** $(0, 0)$

The values of a, b, and c all affect the nature of the parabola. Below are some of the possible transformations:

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$f(x) = x^2$
$or \quad y = x^2$

$g(x) = -x^2$
$a\ negative\ reflects\ the\ parabola$
$across\ the\ x - axis$

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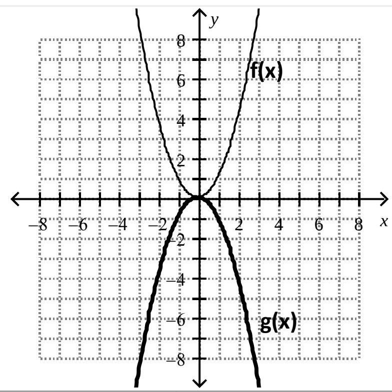

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$f(x) = x^2$

$g(x) = \frac{1}{4}x^2$
$\leftrightarrow\ width\ of\ parabola\ gets\ wider$
The width of the parabola will get wider as $|a|$ gets smaller ***remember fat/flat/fraction***
$h(x) = 2x^2$
$\rightarrow\leftarrow\ width\ of\ parabla\ gets\ narrower$

The width of the parabola will get narrower as $|a|$ gets larger

compare the leading coefficient of a quadratic to the slope of a linear function??????

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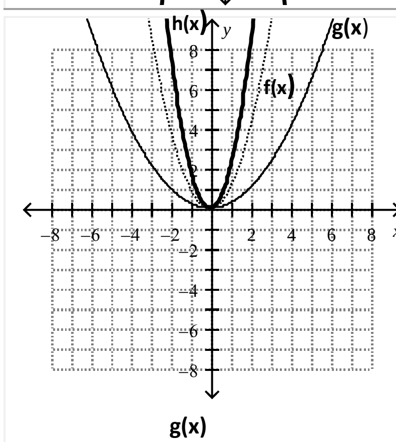

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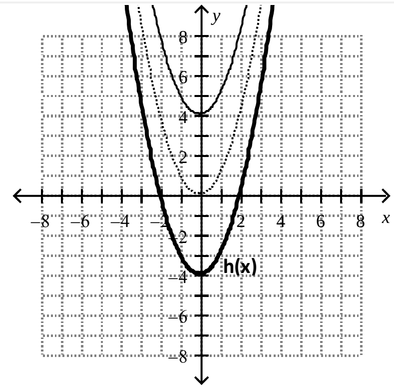
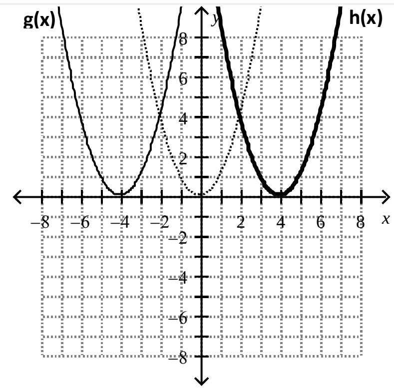
$f(x) = x^2$ $g(x) = x^2 + 4$ y-intercept is (0, 4) $\uparrow$ *translated up for* $c > 0$ $h(x) = x^2 - 4$ y-intercept is (0, - 4) $\downarrow$ *translated down for* $c < 0$ The value of c determines the value of the y-intercept. It also determines the vertical translation.	
$f(x) = x^2$ $g(x) = (x + 4)^2$ $\leftarrow$ *translated to the left* $h(x) = (x - 4)^2$ $\rightarrow$ *translated to the right* *in Algebra 1 you will see the left/right movement with the presence of the* ***bx*** *term in the quadratic equation.*	

Order the functions from narrowest to widest

$$f(x) = \frac{3}{4}x^2, \quad g(x) = -2x^2, \quad h(x) = -8x^2, \quad j(x) = \frac{1}{2}x^2$$

$$f(x) = x^2, \quad g(x) = -\frac{4}{5}x^2, \quad h(x) = 3x^2, \quad j(x) = \frac{1}{2}x^2$$

Compare the graph of each function with the graph of $f(x) = x^2$

$g(x) = x^2 + 6$ $\qquad g(x) = \frac{1}{3}x^2$ $\qquad g(x) = -2x^2 + 5$ $\qquad g(x) = -\frac{1}{4}x^2 - 2$