The Graphing Form of a Quadratic Function

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PRE-CALCULUS 11
QUADRATIC FUNCTIONS
THE GRAPHING FORM OF A QUADRATIC FUNCTION

A. Definitions

1. **general form:** any quadratic function that can be written in the form:
$y = ax^2 + bx + c$ or $f(x) = ax^2 + bx + c$.

2. **standard form:** any quadratic function that can be written in the form:
$y = a(x - p)^2 + q$ or $f(x) = a(x - p)^2 + q$

3. **x-intercept:** the place where the shape crosses the x-axis. These are also referred to as the roots or zeros of the function.

4. **y-intercept:** the place where the shape crosses the y-axis. In the general form of the quadratic function the c value represents the y-intercept.

5. **vertex:** the highest or lowest point of a quadratic function

6. **axis of symmetry:** the imaginary line, through the vertex, that divides the quadratic function into two perfect halves

B. The Standard Form (Graphing Form) of a Quadratic Function

Remember from last class that when translating a quadratic function, the values of a, p and q represent the specific changes that happen to the Parent Graph $y = x^2$

$y = ax^2$: invert, vertically compress, vertically expand

$y = (x - p)^2$: shifts the vertex left or right.

$y = x^2 + q$: shifts the vertex up or down.

In Standard Form (Graphing Form) of the quadratic function $y = a(x-p)^2 + q$, the values still represent the same changes to the Parent Graph $y = x^2$.

a = invert, vertically compress, vertically expand
p = shifts vertex left or right
q = shifts vertex up or down.

Additionally, the values of (p,q) form the coordinates of the vertex of the parabola.

C. Examples

1) Determine the coordinates of the vertex for the following quadratic functions.

a) $y = (x-4)^2 - 1$

a = 1
p = 4
q = -1

Vertex (4, -1)

b) $y = 2x^2 + 6$

a = 2
p = 0
q = 6

Vertex (0, 6)

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

a = $-\frac{1}{2}$
p = -7
q = 0

Vertex (-7, 0)

d) $y = -0.4(x+2.8)^2 + 4.9$

a = -0.4
p = -2.8
q = 4.9

Vertex (-2.8, 4.9)

2) Describe the transformation that is applied to the Parent Graph $y = x^2$, to get the following function.

a) $y = -2x^2 - 3$

$a = -2$

$p = 0$

$q = -3$

- inverted & vertical expansion
- vertex moves to $(0, -3)$

b) $y = \frac{1}{4}(x+1)^2 + 5$

$a = \frac{1}{4}$

$p = -1$

$q = 5$

- vertical compression
- vertex moves to $(-1, 5)$

Assignment: Pg. 284 #2 – 6a