<u>Transforming and Analyzing Quadratic Functions</u>

For questions 2-7, describe the transformation of the quadratic parent function, $f(x) = x^2$, that will result in the graph of the quadratic function given.

2. $g(x) = 2(x – 3)^2$

   ANSWER:

   |a| > 1, so the graph is vertically stretched by a factor of 2

   c = 3, so horizontal shift 3 units to right

4. $g(x) = (4x – 7)^2$

   ANSWER:

   b = 4, so the graph is horizontally compressed by a factor of $\frac{1}{|4|} = \frac{1}{4}$

   c = 7, so the graph will translate $|\frac{7}{4}| = \frac{7}{4}$ or 1.75 units to the right

6. $g(x) = -3(x + 2)^2 + 6$

   ANSWER:

   $g(x) = -3(x – (-2))^2 + 6$

   a < 0, so the graph is reflected over the x-axis

   |a| > 1, so the graph is vertically stretched by a factor of 3

   c = -2, so the graph will translate 2 to the left

   d = 6, so the graph will translate 6 units up

8. The graph of g(x) is produced by transforming the quadratic parent function, $f(x) = x^2$, by vertically stretching its graph by a factor or 3 and translating it 7.5 units upward. Determine the equation that represents g(x).

   ANSWER:

   $g(x) = 3(x)^2 + 7.5$

For questions 10-12, identify the vertex, and determine whether it is a maximum or a minimum value.

10. $g(x) = -(x – 1.5)^2 – 4$

   SOLUTION:

   a < 0, so the graph opens down, therefore the vertex will be a maximum

   the vertex is found at $(\frac{c}{b}, d)$

   the vertex will be at (1.5, -4)

   ANSWER:

   Maximum value at (1.5, -4)

12. $g(x) = (2x – 5)^2 + 3$

   a > 0, so the graph opens up, therefore the vertex will be a minimum

   the vertex is found at $(\frac{c}{b}, d)$

   the vertex will be at $(\frac{5}{2}, 3) = (2.5, 3)$

   ANSWER:

   Minimum value at $(\frac{5}{2}, 3)$ or (2.5, 3)

For questions 13-17, identify the domain, range, x-intercept, y-intercept and vertex of each quadratic function. Write the domain and range in three different ways: as an inequality, interval, and in set builder notation.

14.

x	$f(x) = -(x + 1)^2 + 9$
-5	-7
-4	0
-3	5
-2	8
-1	9
0	8
1	5
2	0

SOLUTION:

Since this is a quadratic function, the domain is *all real numbers.* The range, from the table, appears to be numbers less than 9.

There are going to be x-intercepts (y = 0) at (-4, 0) and (2, 0), and a y-intercept (x = 0) at (0, 8)

The vertex is at $(\frac{c}{b}, d)$; (-1, 9)

ANSWER:

Domain: -∞ < x < ∞; (-∞, ∞); {x|x ∈ ℝ}

Range: -∞ < y ≤ 9; (-∞, 9]; {y|y ≤ 9}

x-intercept: (-4, 0) and (2, 0)

y-intercept: (0, 8)

16.

x	$g(x) = 2(x + 3)^2 - 5$
-5	3
-4	-3
-3	-5
-2	-3
-1	3
0	13
1	27

SOLUTION:

Since this is a quadratic function, the domain is *all real numbers.* The range, from the table, appears to be numbers greater than -5.

There are going to be x-intercepts (y = 0) at

$(\frac{c\pm\sqrt{(\frac{-d}{a})}}{b}, 0)$; $(\frac{-3\pm\sqrt{(\frac{-(-5)}{2})}}{1}, 0)$ = $(\frac{-3\pm\sqrt{(\frac{5}{2})}}{1}, 0)$ =

$(-3 \pm \sqrt{(\frac{5}{2})}, 0)$ = $(-3 + \sqrt{(\frac{5}{2})}, 0)$ and $(-3 - \sqrt{(\frac{5}{2})}, 0)$

The y-intercept (x = 0) at (0, 13)

The vertex is at $(\frac{c}{b}, d)$; (-3, -5)

ANSWER:

Domain: -∞ < x < ∞; (-∞, ∞); {x|x ∈ ℝ}

Range: -5 ≤ y < ∞; [-5, ∞) ; {y|y ≥ -5}

x-intercept: $(-3 + \sqrt{(\frac{5}{2})}, 0)$ and $(-3 - \sqrt{(\frac{5}{2})}, 0)$

or (-1.42, 0) and (-4.58, 0)

y-intercept: (0, 13)

vertex: (-3, -5)