**Study Guide and Intervention**

***Transforming and Analyzing Cubic Functions***

 **Describe the transformation.**

**What transformations of the cubic parent function, *f(x) =* x3, will result in the graph of the cubic function *g(x) =* -2(x + 3)3 + 4.5?**

**Solution**

**Step 1 Rewrite the equation of g(x) in general form to determine the values of the parameters a, b, c, and d.**

*g(x) = -*2(x + 3)3 + 4.5

*g(x) = -*2(x – (-3))3 + 4.5

Therefore, a = -2, b = 1, c = -3, and d = 4.5

**Step 2 Use the values of the parameters to describe the transformations of the cubic parent function f(x) that are necessary to produce g(x).**

a = -2, so |a| > 1. The range values (y-coordinates) of the cubic parent function are multiplied by a factor of 2 in order to vertically stretch the graph

since a < 0, the graph will be reflected across the x-axis

b = 1, so there is no change.

c = -3, so c < 0. The graph of the cubic parent function will translate $|\frac{-3}{1}$| = 3 units to the left

d = 4.5**,** so the graph will translate 4.5 units up

**Exercises**

**For questions 1-4, describe the transformation of the cubic parent function, f(x) = x3 that will result in the graph of the cubic function given.**

**1.** h(x) = (2x – 1)3

**3.** h(x) = - $\frac{3}{4}$(x – 6)3 + 3

**2.** h(x) = 2(x + 2)3

**4.** h(x) = -3($\frac{1}{4}$x – 1)3 + 5

**Study Guide and Intervention**

***Transforming and Analyzing Cubic Functions (cont.)***

**Identify the domain, range, relative minimum, relative maximum, x-intercept and y-intercept of the cubic function described by the equation shown below. Write the domain and range as intervals, and in set builder notation.**

**f(x) = (x + 1) (x – 3) (2x – 1)**

**Solution**

**Step 1 Determine the domain and range of f(x).**

Since this is a cubic function, the domain and range are *all real numbers*; the range is found using the equation*.*

 As an interval

Domain: (-∞, ∞) Range: [-2, ∞)

 Set builder notation

Domain: {x|x$ \in $ $R$} Range: {y|y$ $≥ -2}

**Step 2 Determine the x-intercept of f(x).**

***Use your calculator to find the x-intercepts***

(-1, 0); (3, 0); (.5, 0)

**Step 3 Determine the y-intercept of f(x).**

The y-intercept is found when x = 0, or can be found using (0, -ac3 + d)

(x + 1) (x – 3) (2x – 1)

(0 + 1) (0 – 3) (2\*0 – 1)

(1) (-3) (-1) = 3

(0, 3)

**Step 4 Determine the relative minimum and maximum**

***Use your calculator to find the relative minimum and maximum***

Min: (2, -9)

Max: (-.33, 3.7)

**Exercises**

**For questions 5-7, identify the domain, range, x-intercept and y-intercept of the cubic function described by the equation shown below. Write the domain and range as intervals, and in set builder notation.**

**5**. f(x) = (3x + 2)3  **6.** f(x) = 2(-$\frac{1}{4}$x + 2)3 – 3 **7.** f(x) = 7(-3x - 12)3 - 14

**For questions 8-9, identify the domain, range, relative minimum, relative maximum, x-intercept and y-intercept of the cubic function described by the equation shown below. Write the domain and range as intervals, and in set builder notation.**

**8.** f(x) = (2x + 5) (x – 3) (4x – 1) **9.** f(x) = (x – 4) (x + 2) (3x + 1)