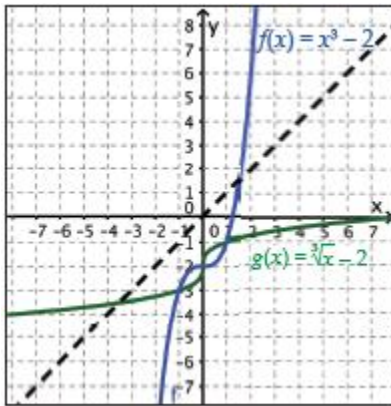# Study Guide and Intervention
Cube Root Functions

Example Using graphs and tables, verify whether or not $f(x) = x^3 - 3$ and $g(x) = \sqrt[3]{x} - 2$ are inverses, including checking any domain restrictions.

Solution

Step 1 Graph f(x) and g(x) on the same coordinate plane. Use the line of reflection y = x to determine whether the functions could be inverses.

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The graphs do not appear to be reflections of one another over the line *y = x*.

Step 2 Examine the tables side by side to determine whether the functions could be inverses.

x	$f(x)$
- 3	- 29
- 2	- 10
- 1	- 3
0	- 2
1	- 1
2	6

x	$g(x)$
- 10	- 4.154
- 3	- 3.442
- 2	- 3.26
- 1	- 3
0	- 2
1	- 1

Although $f(x) = x^3 - 3$ and $g(x) = \sqrt[3]{x} - 2$ have similar parameters, they are not inverse functions.

Exercises

Generate the inverse of each cubic function.

1. $y = 2(3x + 4)^3 - 1$

2. $y = \dfrac{1}{4}(x - 4)^3 + 8$

3. $y = \dfrac{1}{2}(2x + 1)^3 + 3$

4. $y = -\dfrac{1}{3}(6x + 4)^3 + 1$

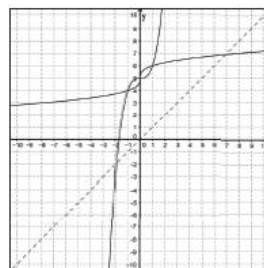**Determine if each pair of equations, tables, or graphs represent a cubic function and its inverse.**

5. $f(x) = x^3 + 1$ and $g(x) = \sqrt[3]{x} - 1$

6. $f(x) = x^3 + 4$ and $g(x) = \sqrt[3]{x - 4}$

7.

x	$f(x)$
-2	-16
-1	-2
0	0
1	2
2	16

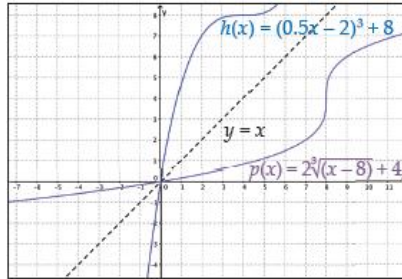| x	$g(x)$
-2	-1
-1	-0.7937
0	0
1	0.7937
2	1

8.

Study Guide and Intervention
Cube Root Functions (cont.)

Example Compare the domain and range as well as any intercepts, if they exist, of the functions graphed below. Write domain and range as inequalities, intervals, or in set builder notation.

Solution

Step 1 **Determine the domain and range of the cubic function h(x).**

Since $h(x)$ is a cubic function, its domain and range contains all real numbers.

Step 2 **Determine the domain and range of the cube root function p (x).**

Since $p(x)$ is a cube root function, its domain and range contains all real numbers.

Step 3 Compare the domains and ranges of the two functions.

The range of $h(x)$ is the same as the domain of $p(x)$. And the domain of $h(x)$ is the same as the range of $p(x)$.

Step 4 **Determine the x- and y-intercepts of h(x) and p(x).**

Examining the graph, both the x- and y-intercepts of $h(x)$ and $p(x)$ are (0, 0).

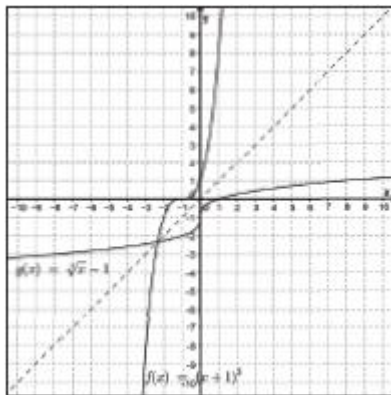**Step 5** **Compare the intercepts of the two functions.**

These functions are inverses of one another. Their domain and range both contain all real numbers, their x- and y-intercepts are at the origin, which is their point of intersection.

Exercises

Compare the domain and range as well as any intercepts, if they exist, of the functions graphed below. Write domain and range as inequalities, intervals, or in set builder notation.

9.

10.