Lesson 18: Graphing Cubic, Square Root, and Cube Root Functions

Classwork

Opening Exercises

1. Evaluate x^2 when $x = 7$.

2. Evaluate $\sqrt{x}$ when $x = 81$.

3. Evaluate x^3 when $x = 5$.

4. Evaluate $\sqrt[3]{x}$ when $x = 27$.

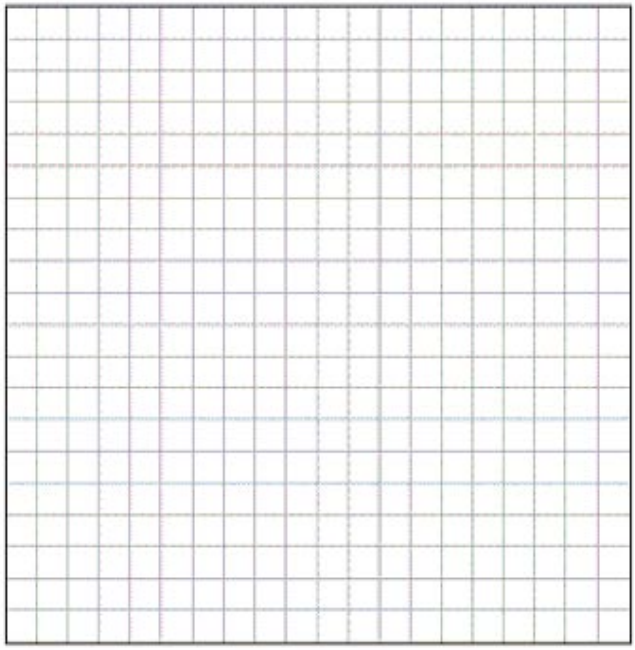
Exploratory Challenge 1

Use your graphing calculator to create a data table for the functions $y = x^2$ and $y = \sqrt{x}$ for a variety of x-values. Use both negative and positive numbers, and round decimal answers to the nearest hundredth.

x	$y = x^2$	$y = \sqrt{x}$

Exploratory Challenge 2

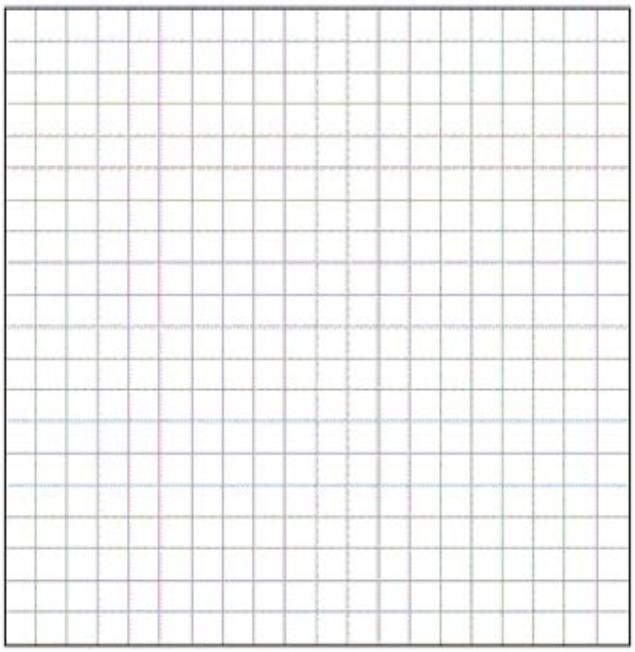
Create the graphs of $y = x^2$ and $y = \sqrt{x}$ on the same set of axes.



Exploratory Challenge 3

Create a data table for $y = x^3$ and $y = \sqrt[3]{x}$, and graph both functions on the same set of axes. Round decimal answers to the nearest hundredth.

x	$y = x^3$	$y = \sqrt[3]{x}$
-8		
-2		
-1		
0		
1		
2		
8		



Lesson Summary

- The square root parent function is a reflection of the quadratic parent function across the line $y = x$, when x is non-negative.
- The domain of quadratic, cubic, and cube root parent functions is all real numbers. The domain of square root functions is $x \geq 0$.
- The range of quadratic and square root parent functions is $[0, \infty)$. The range of the cubic and cube root parent functions is all real numbers.
- The cube root and cubic parent functions are symmetrical about the origin and are reflections of each other across the line $y = x$, and the two operations reverse each other.

Problem Set

1. Create the graphs of the functions $f(x) = x^2 + 2$ and $g(x) = \sqrt{x} + 2$ using the given values. Use a calculator to help with decimal approximations.

x	$f(x)$	$g(x)$
-4		
-2		
-1		
0		
1		
2		
4		

2. Why are the first three rows in the table under $g(x)$ crossed out?

3. Describe the relationship between the graphs given by the equations $y = x^2 + 2$ and $y = \sqrt{x} + 2$. How are they alike? How are they different?

4. Refer to your class notes for the graphs of $y = x^2$ and $y = \sqrt{x}$. How are the graphs of $y = x^2$ and $y = \sqrt{x}$ transformed to generate the graphs of $y = x^2 + 2$ and $y = \sqrt{x} + 2$?

5. Create the graphs of $p(x) = x^3 - 2$ and $q(x) = \sqrt[3]{x} - 2$ using the given values for x. Use a calculator to help with decimal approximations.

x	$p(x)$	$q(x)$
-8		
-2		
-1		
0		
1		
2		
8		

6. Why aren't there any rows crossed out in the table from Problem 5?

7. Describe the relationship between the domains and ranges of the functions $p(x) = x^3 - 2$ and $q(x) = \sqrt[3]{x} - 2$. Describe the relationship between their graphs.

8. Refer to your class notes for the graphs of $y = x^3$ and $y = \sqrt[3]{x}$. How are the graphs of $y = x^3$ and $y = \sqrt[3]{x}$ transformed to generate the graphs of $y = x^3 - 2$ and $y = \sqrt[3]{x} - 2$?

9. Using your responses to Problems 4 and 8, how do the functions given in Problems 1 and 5 differ from their parent functions? What effect does that difference seem to have on the graphs of those functions?

10. Create your own functions using $r(x) = x^2 - \square$ and $s(x) = \sqrt{x} - \square$ by filling in the box with a positive or negative number. Predict how the graphs of your functions will compare to the graphs of their parent functions based on the number that you put in the blank boxes. Generate a table of solutions for your functions, and graph the solutions.