Graphing Square Root Functions

Summary
In this lesson, students learn to graph the parent function for square roots, $y = \sqrt{x}$. Then, they use their knowledge of graphing by transformation to create a book that describes the vertical stretch, the reflection, and the horizontal and vertical shift transformations on this function.

Utah State Core Standard
• Sketch the graph of a square root function. • Perform the transformations of stretching, shifting, and reflecting the graphs of linear, absolute value, quadratic, and **radical** functions. • Identify the domain and range of the absolute value, quadratic, **radical**, sine, and cosine functions.

Desired Results

Benchmark/Enduring Understanding

Essential Questions	Skills
• What does the graph of $y = \sqrt{x}$ look like? • How do the transformations relate to square root functions?	

Assessment Evidence
The books that students create can be used as assessment of the understanding of square root graphs.

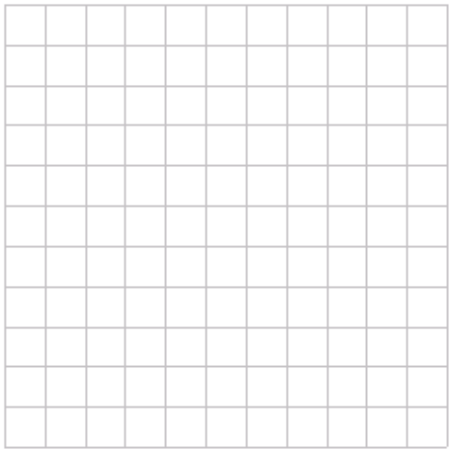
Instructional Activities
Launch: Students should find the graph of the parent function, $y = \sqrt{x}$. Before starting on the books, this graph and its domain and range should be discussed with the class. Teachers should model for students how they might conjecture about one of the transformation graphs and test the conjecture on the graphing calculator. This modeling will help students to work independently to discover how the transformations work for square root graphs. **Explore:** Students can work independently or in pairs to create their books. It is helpful to have graphing calculators available so that students can confirm their graphs. The books can be created using the foldable tiny book pattern available at the Glencoe web site or by contacting one of the district math specialists. **Summarize:** Before submitting their books for a grade, it is useful to have

students create a scoring rubric and review each other's books. This allows them to revise their work before receiving a grade. The teacher should summarize the conclusions of the class and support building fluency in graphing square root functions by using the Quickdraws available on this web site.
Materials Needed
Graphing calculators Copies of worksheet

The Parent Function $y = \sqrt{x}$

Use a table and plot the graph of $y = \sqrt{x}$

x	$y = \sqrt{x}$	(x, y)



What is the domain of $y = \sqrt{x}$?

What is the range of $y = \sqrt{x}$?

Is there a maximum and/or minimum value? If so identify the maximum or minimum points.

Your Quest

Your quest, should you choose to undertake it, is to find out how the transformations work for square root functions. Please be aware that there is a new transformation for $y = \sqrt{x}$: a reflection over the y-axis. You will have to be tricky to figure this one out, but you may use your calculator.

When you have finished figuring out the transformations, you will be creating a manual for future explorers. Your little manual must contain the following pages:

- A title page
- The parent function $y = \sqrt{x}$ (include the graph and the important characteristics)
- The vertical shift
- The reflection over the x-axis
- The vertical stretch
- The horizontal shift
- The reflection over the y-axis
- Combinations with all of the transformations of $y = \pm a\sqrt{x \pm b} \pm c$

For each transformation, your page should include:

- A short explanation of the transformation
- At least one example of an equation that shows the transformation
- A graph of your example equation
- A table with at least four values
- The domain and range for your example