

Analyzing the Family of Functions and Their Inverses

Lesson Plan

Objective

Given the family of functions, students will be able to determine the domain and range for the function and its inverse using a graphing calculator. The student will discuss the results in a written paragraph.

Engage

Discuss with students what is meant by a function. Discuss what is meant by the inverse of a function and how to obtain its inverse.

Explore

1. Students should graph each function individually using the graphing calculator and determine the domain and range. These values are to be entered into the table. For the constant function, use $y = 5$ and for the linear function use $y = 2x + 1$.
2. Students should then graph the inverse of the function using the graphing calculator and determine its domain and range. These values are to be entered into the table.

Explain

Students will answer questions and summarize the change for each function and compare it to other functions.

Elaborate

Students will be asked to summarize the relationship between a function and its inverse. They will discuss the difference between a quadratic function and a cubic function and give an explanation for the difference.

Evaluate

The student will be able to determine the domain and range of a given function and discuss the limits of the functions.

Extensions

1. The students could explore the results of transformations of functions and how the transformations relate to the domain and range of the function.
2. The students could explore implicit functions and their inverses.

Student Activity: Analyzing the Family of Functions and Their Inverses

Objective:

Given the family of functions, the students will graph the function on a graphing calculator and determine its domain and range. The students will then find the graph of the inverse of the function using the graphing calculator and find its domain and range. The students will compare the domains and ranges of the various functions.

Introduction:

A function is defined as a relation in which there is a one-to-one relationship between the x and y values. There is a family of relationships that are considered to be the parents of other functions. In this activity, you will explore the relationship between each parent function and its inverse.

Materials:

- Family of Functions
- Graphing Calculator

Questions:

For each question, graph the function using the graphing calculator, and find its domain and range. Write down the inverse of the function, use the graphing calculator to graph the inverse, and find its domain and range. Answer the questions.

1. Constant Function

Function	Domain	Range	Inverse	Domain	Range
$y = 5$					

- Is the inverse of the Constant Function also a function? _____
- How does the domain and range of the function compare to that of its inverse?

2. Linear Function

Function	Domain	Range	Inverse	Domain	Range
$y = 2x + 1$					

- Is the inverse of the Linear Function also a function? _____
- How does the domain and range of the function compare to that of its inverse?

3. Identity Function

Function	Domain	Range	Inverse	Domain	Range
$y = x$					

- Is the inverse of the Identity Function also a function? _____
- How does the domain and range of the function compare to that of its inverse?

4. Quadratic Function

Function	Domain	Range	Inverse	Domain	Range
$y = x^2$					

- a. Is the inverse of the Quadratic Function also a function? _____
 b. How does the domain and range of the function compare to that of its inverse?

- c. How is this different from the previous functions?

5. Cubic Function

Function	Domain	Range	Inverse	Domain	Range
$y = x^3$					

- a. Is the inverse of the Cubic Function also a function? _____
 b. How does the domain and range of the function compare to that of its inverse?

- c. How is this compare to the Quadratic Function?

6. Absolute Value Function

Function	Domain	Range	Inverse	Domain	Range
$y = x $					

- a. Is the inverse of the Absolute Value Function also a function? _____
 b. How does the domain and range of the function compare to that of its inverse?

- c. How is this compare to the Quadratic Function?

7. Square Root Function

Function	Domain	Range	Inverse	Domain	Range

y =					
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- a. Is the inverse of the Square Root Function also a function? _____
- b. How does the domain and range of the function compare to that of its inverse?

- c. How is this compare to the Quadratic Function?

8. Reciprocal Function

Function	Domain	Range	Inverse	Domain	Range
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y =					
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- a. Is the inverse of the Reciprocal Function also a function? _____
 b. How does the domain and range of the function compare to that of its inverse?

c. How is this compare to the Identity Function?

9. Greatest Integer Function

Function	Domain	Range	Inverse	Domain	Range
y = int x					

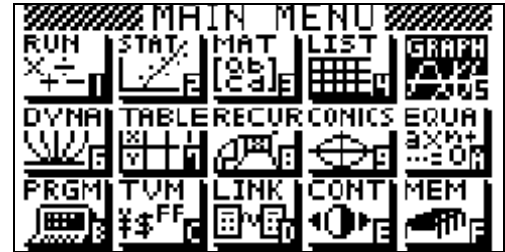
- a. Is the inverse of the Greatest Integer Function also a function? _____
 b. How does the domain and range of the function compare to that of its inverse?

c. How is this compare to the Constant Function?

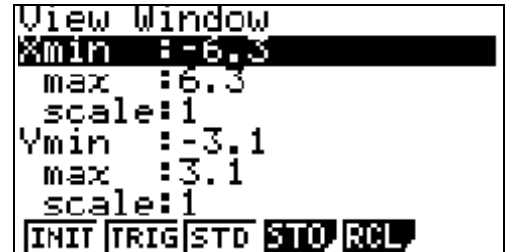
10. On a separate sheet of paper, write a summary in your own words describing the relationship between a function and its inverse. Give examples to support your statements.

Calculator Notes:

1. Turn on the calculator and select the GRAPH Menu as shown on the right. Press **EXE**.



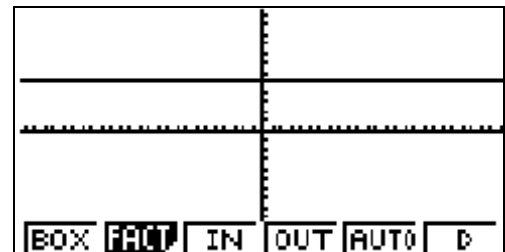
2. Press **SHIFT** and **F3** to set up the View Window. Press **F1** to get the initial screen. The screen should look like the one on the right. This will cause the graphs to be shown on a square coordinate axes. Press **EXE**.



3. Enter the first function $y = 5$ into Y1: by pressing 5 and pressing **EXE**. The screen should look like the one on the right.



4. Press **EXE** again to graph the function. The scale is too small to see the graph, therefore, press **SHIFT F2** and **F4** to zoom out and display the graph. The screen should look like the one on the right.



5. Press **EXIT** twice and the **Up Arrow** to get back to **Y1:** and enter the next function. For each of the other functions, you will only have to press **EXIT** and you will be ready for the next graph.