Radical Transformations

ID: 11575

Time Required
10–15 minutes

Activity Overview

In this activity, students will use sliders to examine how the square root function is transformed on the coordinate plane. As an extension, students will examine similar transformations on a cube root function.

Topic: Radical Functions

- *Domain, Range*
- *Square root*
- *Transformations*

Teacher Preparation and Notes

- *Students need to be able to change pages to work this document.*
- *Questions are self check and can be checked by pressing* ctrl + ▲.
- *Students can answer questions in the document or use the student worksheet.*
- ***To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter "11575" in the keyword search box.***

Associated Materials

- *RadicalTransformations_Student.doc*
- *RadicalTransformations.tns*
- *RadicalTransformations_Soln.tns*

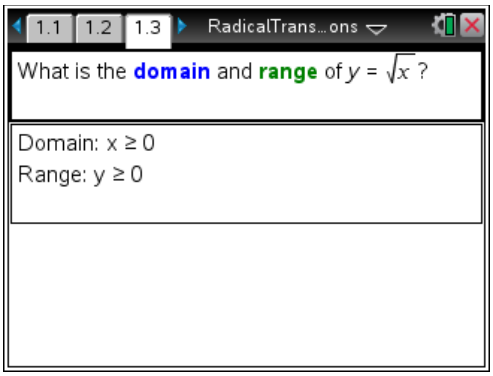
Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

- *Radical Functions (TI-Nspire technology) — 8978*
- *Exponential Functions and the Natural Logarithm (TI-Nspire technology) — 16115*
- *Inverses of Functions (TI-Nspire technology) — 11405*

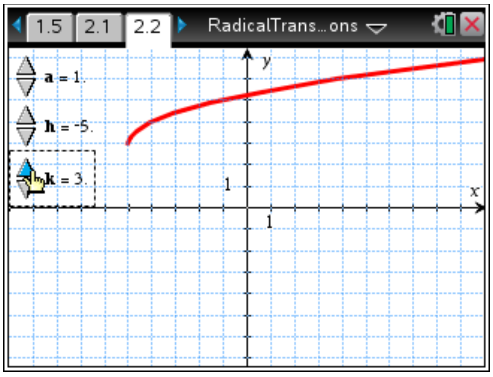
Problem 1 – The General Radical Function

Students will examine the graph of $y = \sqrt{x}$ and determine the domain and range of the function. Students will also conjecture if the graph is always in the first quadrant.



Problem 2 – Transformations

In Problem 2, students will change values in the general equation of a square root graph. Students will determine the domain and range of a square root function based on the general equation. They will revisit the question of where the graph lies in the plane. They will also describe the transformation performed on the graph by changing each variable.

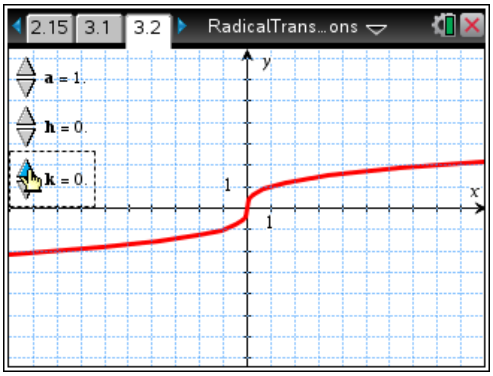


Discussion Questions:

- *How does each variable affect the graph of the function?*
- *How can we algebraically show the domain and range of the function?*
- *Why does the graph "stop" (no longer exist) on one side?*
- *How does the variable a affect the graph?*

Extension – Cube Root Functions

In this problem, students will repeat the exploration above for the cube root function and determine domain, range, and transformations on the graph.



Student Solutions

1. Domain: $x \geq 0$; Range: $y \geq 0$

2. Sample response: The function is not defined for values less than zero because the square root becomes negative.

3. Sometimes (Incorrect answer is okay. This is a conjecture question.)

4. Sample response: The graph is a straight line because the square root is multiplied by zero making the function $y = 0$.

5. Sometimes (Now students should have the correct answer.)

6. Sample responses must have $\sqrt{x-3}$

7. $x \geq -2$

8. h

9. Sample response must have –2 after square root

10. $y \geq 3$

11. k

12. Sample response: Positive 4 opens down (concave down); negative 4 opens up (concave up)

13. Sample response: Positive 4 is steeper than positive 2.

14. Sample response: Flips the graph open up or open down. Makes the graph steeper as $|a|$ gets larger.

15. $x \geq h$

16. $y \geq k$

17. Domain and range: all real numbers

18. h is a horizontal shift; k is a vertical shift; a makes the branches steeper and flips the graph.