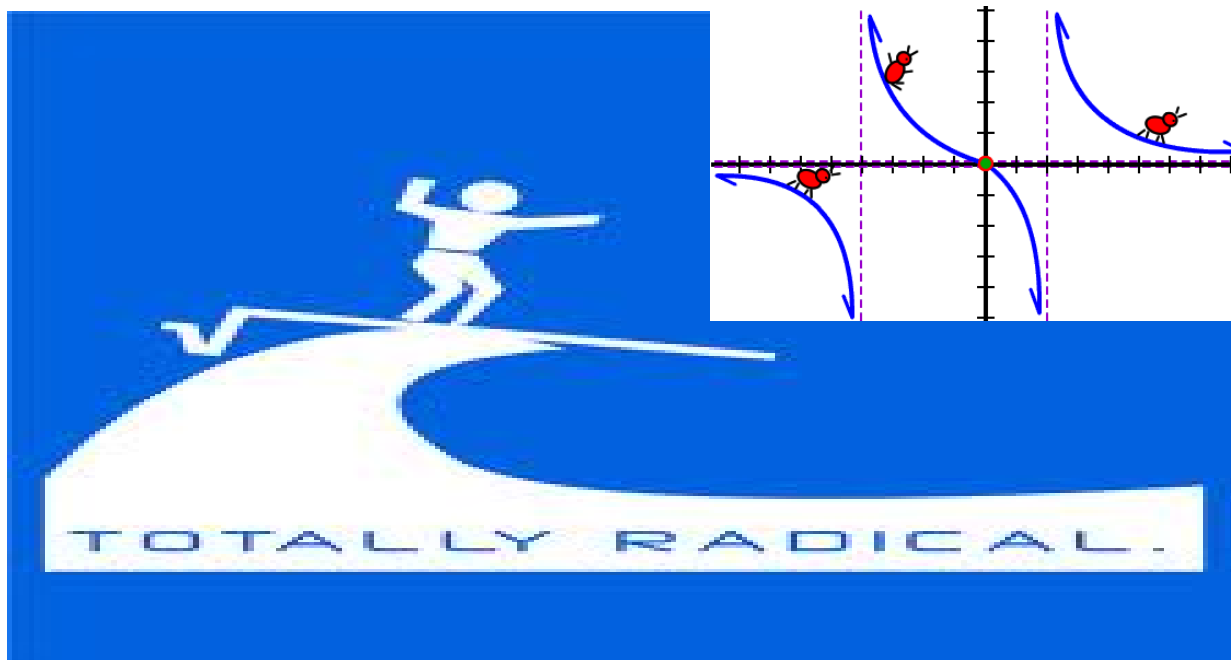


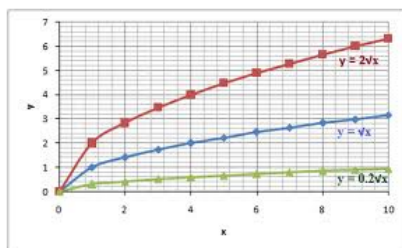
## Unit 2 Radical and Rational Functions



## Lesson 1

Part A - Radical Functions.

Radical Function - a function that has a radical with a variable in the radicand. ex:  $y = \sqrt{2x}$  or  $y = 3\sqrt{x-5}$



We can graph radical functions of the form

$$y = a\sqrt{b(x-h)} + k$$

using transformations as we did in Unit 1

Recall:

parameter 'a' results in a vertical stretch by a factor of a  
if  $a < 0$ , the graph is also reflected in the x-axis.

parameter 'b' results in a horizontal stretch by a factor of  $\frac{1}{|b|}$   
if  $b < 0$ , the graph is also reflected in the y-axis.

parameter 'h' results in a horizontal translation h units left or right

parameter 'k' results in a vertical translation k units up or down

Example 1: Consider the basic radical function  $f(x) = \sqrt{x}$ .

a. Make a table of values for the equations and then sketch the graphs. State the domain and range of each function.

Remember! The value of the radicand must be greater than or equal to zero so we don't try to take the square root of a negative!

You can also use your calculator by putting the equation into  $y=$  and then looking at the table or using trace

$$y = \sqrt{x}$$

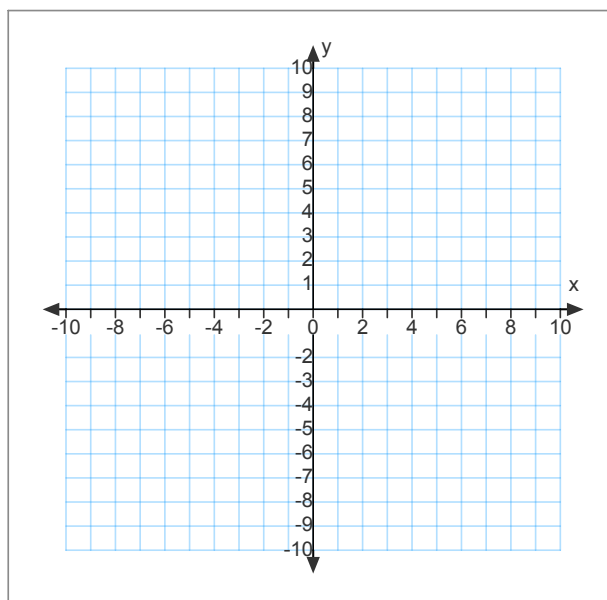
$$y = \sqrt{x-3}$$

$$y = \sqrt{x} - 1$$

$x$	$y$

$x$	$y$

$x$	$y$



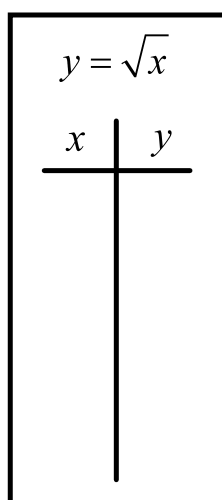
Use the input values 9, 4, 1, 0, for the basic function. What values could you choose for the others so you don't need a calculator?

Describe what the changes to the basic function did to the graph of  $y = \sqrt{x}$ .

Graphing radical functions using transformations.

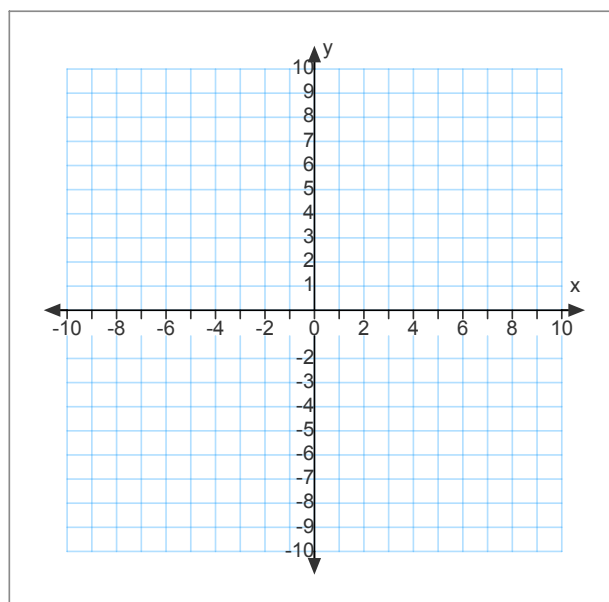
Example 2: Sketch the graph of the functions  $y = \sqrt{x}$  and  $y = -2\sqrt{4(x-3)} + 1$

Describe each transformation using the parameters  $a, b, h, k$ .  
Identify the domain and range of the transformed function.



You can map the points

$(x, y) \rightarrow ( \quad , \quad )$



Domain:

Range:

Domain:

Range:

parameter  $a =$  \_\_\_\_\_, resulting in a \_\_\_\_\_ by a factor of \_\_\_\_\_.  
Since  $a$  is negative, the graph is reflected in the \_\_\_\_\_.

parameter  $b =$  \_\_\_\_\_, resulting in a \_\_\_\_\_ by a factor of \_\_\_\_\_.

parameter  $h =$  \_\_\_\_\_, so the graph is translated \_\_\_\_\_ by \_\_\_\_\_ units.

parameter  $k =$  \_\_\_\_\_, so the graph is translated \_\_\_\_\_ by \_\_\_\_\_ units.

Your Turn: Sketch the graph of the functions  $y = \sqrt{x}$  and  $y = 4\sqrt{-2(x+3)} - 5$

Describe each transformation using the parameters  $a$ ,  $b$ ,  $h$ ,  $k$ .  
Identify the domain and range of the transformed function.

$a =$  \_\_\_\_\_, resulting in a \_\_\_\_\_ by a factor of \_\_\_\_\_.

$b =$  \_\_\_\_\_, resulting in a \_\_\_\_\_ by a factor of \_\_\_\_\_.  
Since  $b$  is negative, the graph is reflected in the \_\_\_\_\_.

$h =$  \_\_\_\_\_, so the graph is translated \_\_\_\_\_ by \_\_\_\_\_ units.

$k =$  \_\_\_\_\_, so the graph is translated \_\_\_\_\_ by \_\_\_\_\_ units.

$$y = \sqrt{x}, x \geq 0$$

Map the points

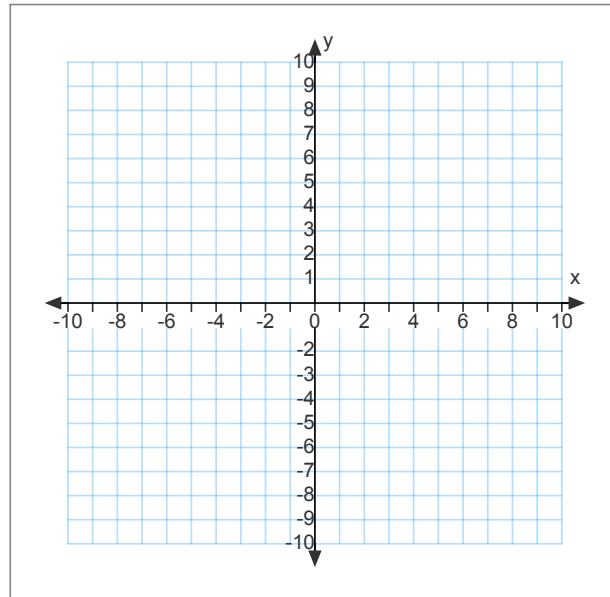
$x$	$y$	$(x, y) \rightarrow ($	$,$	$)$
0				
1				
4				
9				

Domain:

Range:

Domain:

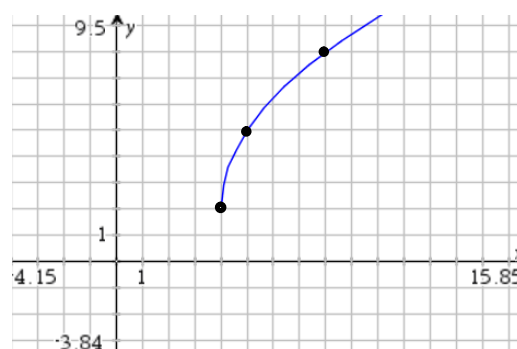
Range:



Example 3: Determine a radical function from its graph.

Method 1: Substitute coordinates of a point.

1. Determine the end point of the graph.  
This endpoint represents the parameters  $h$  and  $k$ .
2. Use the coordinates of one point on the graph for  $x$  and  $y$ .
3. Substitute  $h, k, x, y$  into:



Viewed as a vertical stretch

$$y = a\sqrt{x-h} + k$$

and solve for parameter  $a$

or

Viewed as a horizontal stretch

$$y = \sqrt{b(x-h)} + k$$

and solve for parameter  $b$

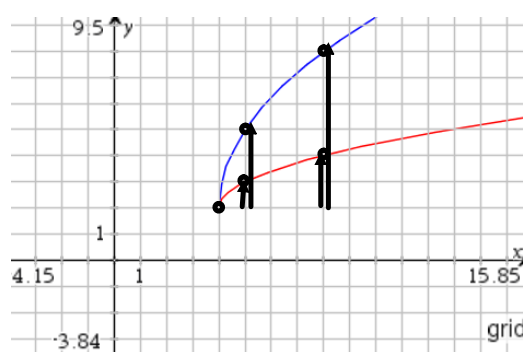
Method 2: Compare to the basic graph  $y = \sqrt{x}$

1. Compare vertical or horizontal distances

2. Use the endpoint to determine  $h, k$

in this case, only vertical distances have changed

$$y = a\sqrt{(x-h)} + k$$





MATH  
IS  
√RADICAL  
DUDE!

# Homework

1. Assignment Handout BLM 2-2, "Transforming Radical Functions"
2. Text Pages 72 - 75, Exercises # 2 - 6, 8 - 10, 15, 19, C1



Transforming Radicals.pdf

Sources: <http://www.pebblebrookhigh.typepad.com>  
<http://www.mathisfun.com>  
<http://www.elizabethadebayo.wordpress.com>



## Attachments

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Translations Assignment 1.doc

Transforming Radicals.pdf