PC 30

2.1 Radical Functions & Transformations

To graph and apply transformations to the function $y=\sqrt{x}$

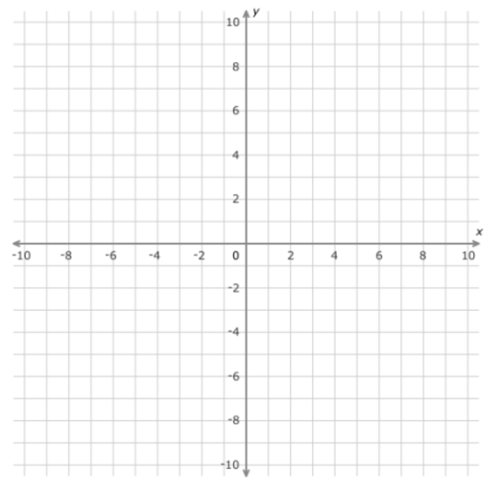
- The base radical function $y=\sqrt{x}$ involves a radical with a variable under the radicand.
- You can draw the graph of transformed radical functions by using tables of values or by using the transformation equation from last chapter: *y = af(b(x – h) + k*. The values of a, b, h and k behave in the same way they did previously

  NOTE: We can make the transformation equation more specific to radical functions by writing it more specifically as $y=a\sqrt{b(x-h)}+k$

Example #1: Use a table of values to graph the function $y=\sqrt{x}$

Are there any **RESTRICTIONS**?

x	y



Describe the following characteristics from your graph:

a) Left Endpoint:

b) Right Endpoint:

c) Shape:

d) Domain:

e) Range:

Example #2: Make a hypothesis about what the graph of the following functions will look like compared to the base function. What are the mapping notations?

a) $y=\sqrt{x-2}$

b) $y=\sqrt{x+2}$

c) $y=\sqrt{x}+3$

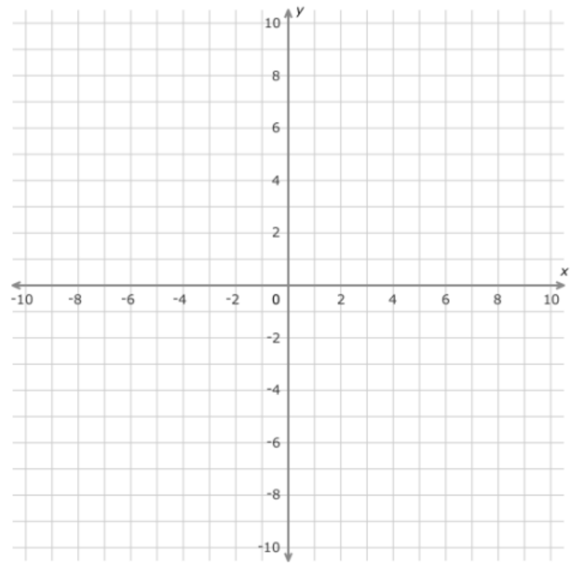
d) $y=2\sqrt{x}$

e) $y=\sqrt{\frac{1}{2}x}$

f) $y=-\sqrt{x}$

g) $y=\sqrt{-x}$

Example #3: Use a mapping diagram to create a set of values to sketch the graph of each of the following functions. State the domain and range



a) $y=\sqrt{x}$

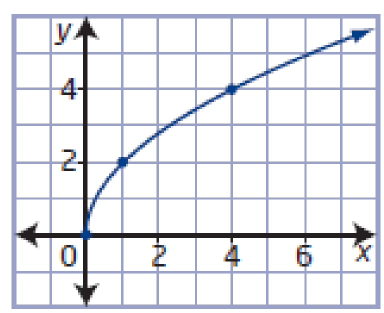
b) $y=\sqrt{x-2}$

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

d) $y=3\sqrt{-(x-1)}$

e) $y-3=-\sqrt{2x}$

Example #4: Mayleen is designing a symmetrical pattern. She sketches the curve shown and wants to determine its equation and the equation of its reflection in each quadrant. The graph is a transformation of the graph of $y=\sqrt{x}$. What are the equations of the four functions Mayleen needs to work with?



2.1 ASSIGNMENT (Must use loose graph paper):

2.1 FA: P72 #1ad, 2abd, 3, 5abcd, 10bc

2.1 MLA: P72 #4, 6ab, 9a, 12

2.1 ULA: P72 #12, 13, 14, 15, 16, 19

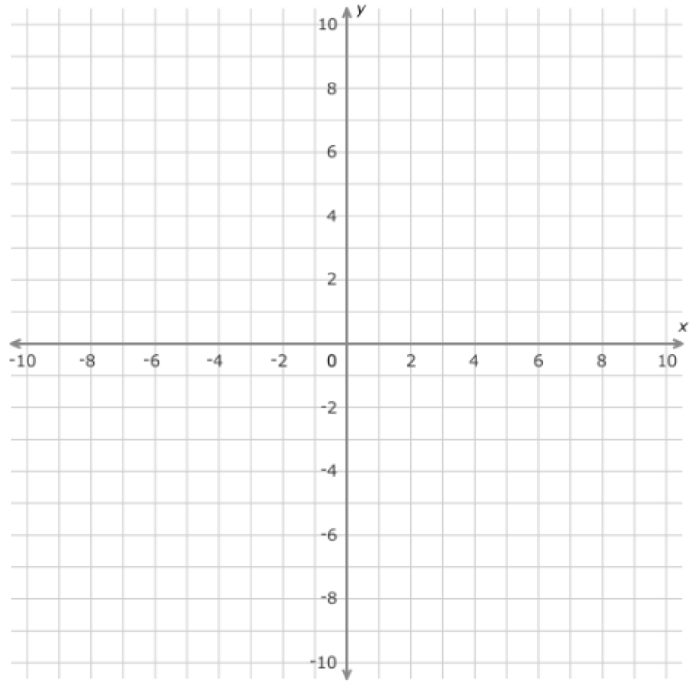
PC 30 — 2.2 Square Root of a Function

To sketch the graph of the square root of a function and to compare the domains and ranges of those functions.

- The function $y=\sqrt{f(x)}$ is the square root of the function y = f(x) and is only defined for f(x) $\geq$ 0
- For example the function $y=\sqrt{2x+1}$ represents the square root of the function y = 2x + 1

Example #1: Given f(x) = -2x + 3, what is the equation for the square root of the function? Sketch both. Find the mapping notation, the invariant points and the domain and range of both functions.

REVIEW: What is the fastest way to graph f(x)? How can we use that method to graph our new function?

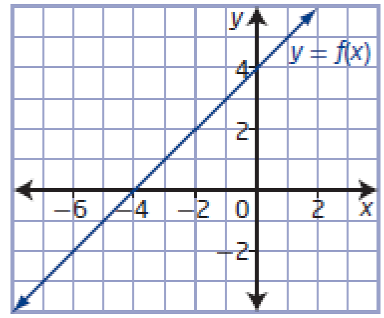


INVARIANT POINT RULE: Which points on our original function f(x) will always be invariant points on the graph of $\sqrt{f(x)}$?

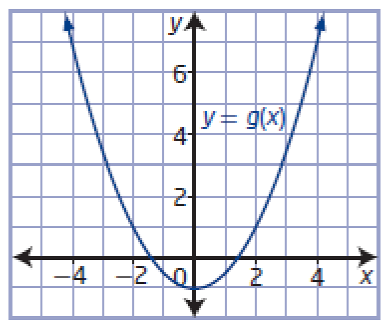
Example #2: Use the graph of y = f(x) to sketch the graph of $y=\sqrt{f(x)}$

STEPS:

- Locate invariant points on the original function. When graphing the square root of a function, invariant points will occur at points with heights of y = 0 and y = 1
- Draw the portion of the graph between the invariant points that are positive but less than one. Sketch a smooth curve above those points. (WHY?!)
- Locate other key points on the original function where the values are greater than 1. Transform these points to locate image points on the new graph.
- Sketch smooth curves between the image points (with the exception of between the invariant points the curve will be below the original graph (WHY?!)



Example #3: Use the graph of y = g(x) to sketch the graph of $y=\sqrt{g(x)}$



2.2 ASSIGNMENT (Must use loose graph paper):

2.2 FA: P86 # 1, 2, 3, 4, 8a, 11
2.2 MLA: P86 #5ac, 6ab, 12, 16, 17
2.2 ULA: P 86 #13, 14, 15, 19

PC 30

2.3 Solving Radical Equations Graphically

To solve a radical equation algebraically and graphically using a graphing calculator.

You can solve many types of equations both algebraically and graphically. Algebraic solutions sometimes produce extraneous roots whose answers are inadmissible in the context of the domain whereas graphical solutions do not produce extraneous roots. However, algebraic solutions are generally exact while graphical solutions are often approximate. You can solve equations by graphing the equations and finding their solutions which occur at the x intercepts of the graph.

Example #1:

a) Determine the roots of $\sqrt{x+5}-3=0$ algebraically. (This is review from PC 20)

b) Using a graphing calculator (if you have an android phone there is a free app called Wabbitemu which will give you the exact graphing calculator on your phone) or a graphing program such as Desmos you can graph the function and find the x intercepts.

NOTE: The equation $\sqrt{x+5}-3=0$ will be written as $y=\sqrt{x+5}-3$ where the 0 is replaced by the y.

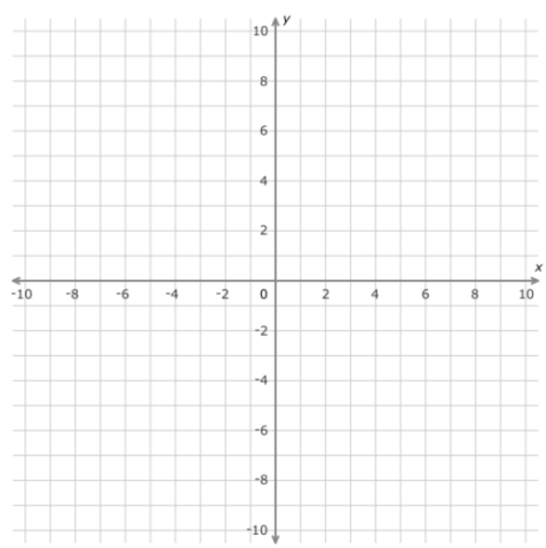
Example #2:

Solve the equation $\sqrt{3x^2-5}=x+4$ algebraically AND GRAPHICALLY (please add this to student notes).

a) Graphically:

Note: There are two methods to solving this graphically. Try each method.

- We can bring all terms to one side, replace the zero with y and graph to find the x intercepts.
- Alternatively we can look at this equation as two separate functions (one on each side but equal to each other). We can graph each of these functions separately and determine where they are equal to each other by finding where they cross. The x value(s) of where they cross are the solution(s)



b) Identify the values of x for which the radical is defined and then solve the original equation algebraically.

Example #3:

An engineer designs a roller coaster that involves a vertical drop section just below the top of the ride. She uses the equation $v = \sqrt{(v_0)^2 + 2ad}$ to model the velocity, *v*, in feet per second, of the ride's cars after dropping a distance, *d*, in feet, with an initial velocity, v_0, in feet per second, at the top of the drop, and constant acceleration, *a*, in feet per second squared. The design specifies that the speed of the ride's cars be 120 ft/s at the bottom of the vertical drop section. If the initial velocity of the coaster at the top of the drop is 10 ft/s and the only acceleration is due to gravity, 32 ft/s², what vertical drop distance should be used, to the nearest foot?

2.3 ASSIGNMENT:

2.3 FA: P96 # 1, 2, 3ac, 5ac, 6abd
2.3 MLA: P96 #9, 10, 11, 13, 15
2.3 ULA: P96 #16, C1, C3

VIDEO LINKS THAT MAY AIDE IN UNDERSTANDING

Section 2.1

- https://goo.gl/Z1TjKm
- https://goo.gl/EpVpwu
- https://goo.gl/fpw6d4
- https://goo.gl/tx3DGX

Section 2.2

- https://goo.gl/GyCp2Y
- https://goo.gl/4lomMQ

Section 2.3

- https://goo.gl/X4RRHp