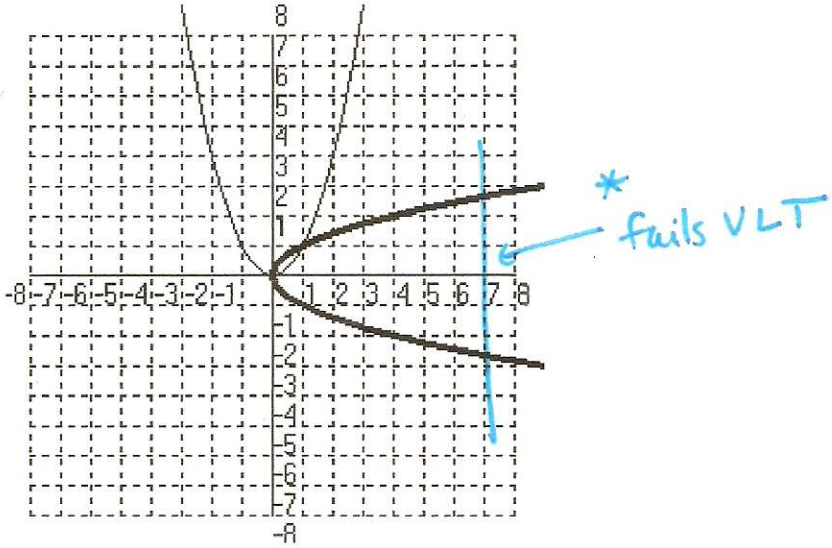
Algebra 2 Notes Name: Key

Section 8.7 – Radical Functions

Recall that exponential and logarithmic functions are inverse function. Quadratic functions have inverses as well. The graph below shows the quadratic parent function and its inverse in bold.

Quadratic Function $f(x) = x^2$ **and its inverse** $y = \pm\sqrt{x}$



* **Notice…**

that the inverse of $f(x) = x^2$ is NOT a function because it fails the vertical line test. However, if we limit the domain of $f(x) = x^2$ to $x \geq 0$, its inverse is the function.

A radical function is a function whose rule is a radical expression. A square-root function is a radical function involving $\sqrt{x}$.

MEMORIZE the following parent function.

$f(x) = \sqrt{x}$

Domain: $x \geq 0$

Range: $y \geq 0$

x	$y = \sqrt{x}$
0	0
1	1
4	2
9	3
16	4

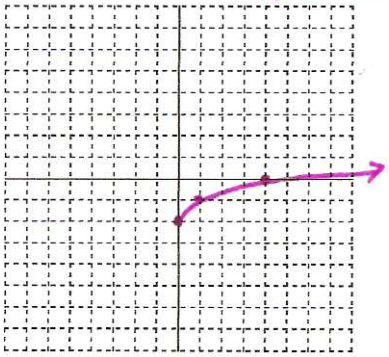
The graphs of the square root functions can be transformed by using methods similar to those used to transform linear, quadratic, polynomial, and exponential functions.

Example 1: Using the graph of $f(x)=\sqrt{x}$ as a guide, describe the transformation(s) and graph.

a. $g(x)=\sqrt{x}-2$

2 units down

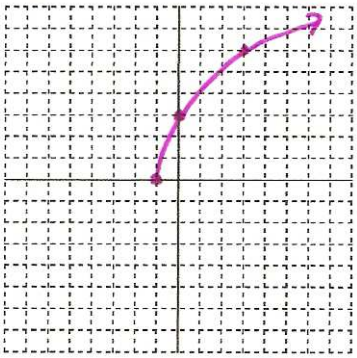
D: $x \geq 0$ R: $y \geq -2$



b. $g(x)=3\sqrt{x+1}$

vertical stretch factor 3
left 1

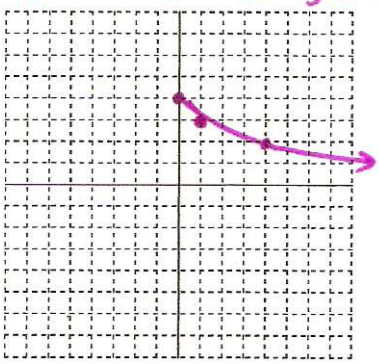
D: $x \geq -1$ R: $y \geq 0$



c. $g(x)=-\sqrt{x}+4$

reflected across x-axis
up 4

D: $x \geq 0$ R: $y \leq 4$



Example 2: Using the description to write the square-root function g.

a. The parent function $f(x)=\sqrt{x}$ is stretched horizontally by a factor of 2, reflected across the $y-$axis, and translated 3 units left.

$g(x) = \sqrt{-\frac{1}{2}(x+3)}$

b. The parent function $f(x)=\sqrt{x}$ is translated 2 units right and 4 units up.

$g(x) = \sqrt{x-2} + 4.$

c. The parent function $f(x)=\sqrt{x}$ is compressed vertically by a factor of $\frac{1}{3}$, reflected across the $x-$axis, and translated 5 units down.

$g(x) = -\frac{1}{3}\sqrt{x} - 5$

d. The parent function $f(x)=\sqrt{x}$ is stretched vertically by a factor of 4 and translated 1 unit left and 2 units down.

$g(x) = 4\sqrt{x+1} - 2$

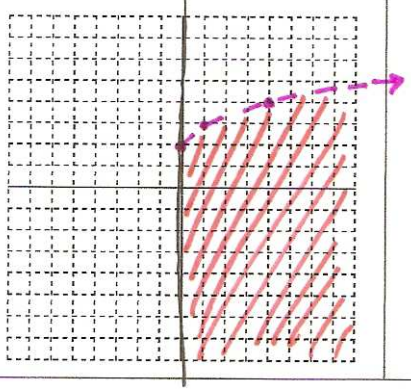
Example 3: Graph each inequality.

a. $y<\sqrt{x}+2$ up 2

dashed

pick (1,0)
$0 < \sqrt{1} + 2$
$0 < 3$ ✓

$x \geq 0$

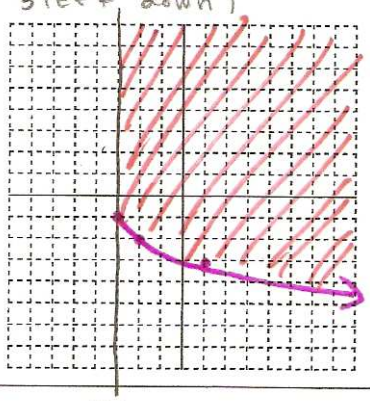


b. $y \geq -\sqrt{x+3}-1$

reflect across x-axis
3 left, down 1

solid

pick (0, 1)
$1 \geq -\sqrt{4} - 1$
$1 \geq -2-1$
$1 \geq -3$ ✓



$x \geq -3$