

## Unit 8 Lesson 3 Notes – The Square Root Function

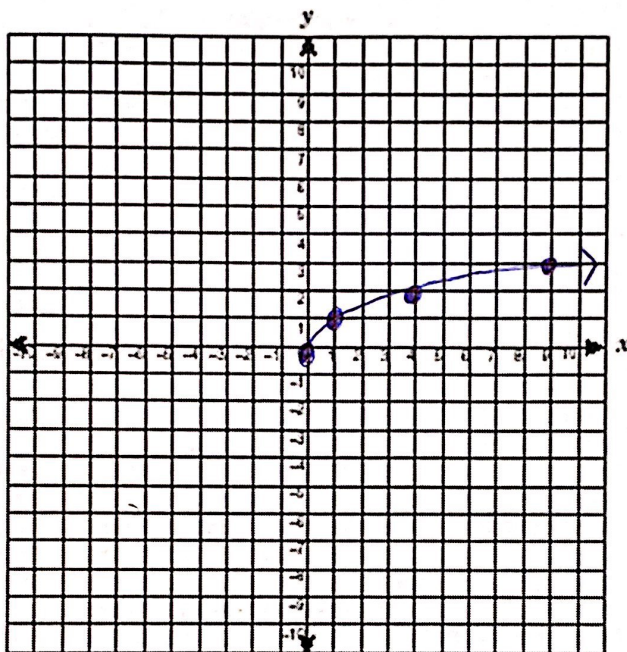
We previously studied a quadratic that in its most basic form is  $y = x^2$

Inverse Operations are operations that Reverse or “Undo” each other.

When we studied quadratics previously we learned that to undo squaring (second power) we must Square Root.

Complete the table to help you graph the function  $y = \sqrt{x}$  (the Square Root Parent Function).

x	y
-9	—
-4	—
-1	—
0	0
1	1
4	2
9	3



**Key Features:**

Anchor Point: (0,0)

Max or Min

x-intercept(s): (0,0)

y-intercept: (0,0)

Domain:  $x \geq 0 / [0, \infty)$

Range:  $y \geq 0 / [0, \infty)$

Increasing:  $x > 0 / (0, \infty)$

Decreasing: Never

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

### Part A: The Effect of $a$

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

What was the transformation?

Reflect over x-axis

Domain:  $x \geq 0 / [0, \infty)$

Range:  $y \leq 0 / (-\infty, 0]$

x-intercept: (0,0)

y-intercept: (0,0)

Increasing: Never

Decreasing:  $x \geq 0 / [0, \infty)$

2.  $y = 3\sqrt{x}$

What was the transformation?

Vertical stretch by a factor of 3

Domain:  $x \geq 0 / [0, \infty)$

Range:  $y \geq 0 / [0, \infty)$

x-intercept: (0,0)

y-intercept: (0,0)

3.  $y = \frac{1}{2}\sqrt{x}$

What was the transformation?

Vertical compression by a factor of 1/2

Domain:  $x \geq 0 / [0, \infty)$

Range:  $y \geq 0 / [0, \infty)$

x-intercept: (0,0)

y-intercept: (0,0)

## Part B: The Effect of $h$ Changes Domain

1.  $y = \sqrt{x-4}$

What was the transformation?

Right 4

Domain:  $x \geq 4 / [4, \infty)$

Range:  $y \geq 0 / [0, \infty)$

x-intercept:  $(4, 0)$

y-intercept: NONE

2.  $y = \sqrt{x+5}$

What was the transformation?

Left 5

Domain:  $x \geq -5 / [-5, \infty)$

Range:  $y \geq 0 / [0, \infty)$

x-intercept:  $(-5, 0)$

y-intercept:  $(0, 2.36)$

## Part C: The Effect of $k$ Changes Range

1.  $y = \sqrt{x} - 4$

What was the transformation?

down 4

Domain:  $x \geq 0 / [0, \infty)$

Range:  $y \geq -4 / [-4, \infty)$

x-intercept:  $(16, 0)$

y-intercept:  $(0, -4)$

2.  $y = \sqrt{x} + 5$

What was the transformation?

up 5

Domain:  $x \geq 0 / [0, \infty)$

Range:  $y \geq 5 / [5, \infty)$

x-intercept: none

y-intercept:  $(0, 5)$

## Part D: Putting it all together

1.  $y = -\sqrt{x+2} - 3$

What was the transformation?

Reflect over x-axis  
left 2, down 3

Domain:  $x \geq -2 / [-2, \infty)$

Range:  $y \leq -3 / (-\infty, -3]$

x-intercept: None

y-intercept:  $(0, -4.41)$

3.  $y = 2\sqrt{x+3}$

What was the transformation?

Vertical stretch by a factor of 2  
left 3

Domain:  $x \geq -3 / [-3, \infty)$

Range:  $y \geq 0 / [0, \infty)$

x-intercept:  $(-3, 0)$

y-intercept:  $(0, 3.464)$

Examples: Describe the transformations from the parent graph of  $y = \sqrt{x}$ .

a.  $y = \sqrt{x+2} - 4$

Left 2, down 4

b.  $y = 3\sqrt{x-5} + 2$

Vertical stretch by  
a factor of 3,  
Right 5, up 2

c.  $y = -\frac{1}{2}\sqrt{x} + 3$

Reflect over x-axis  
Vertical compression by a factor  
of  $\frac{1}{2}$   
Up 3.