

2.1

Radical Functions and Transformations

Focus on...

- investigating the function $y = \sqrt{x}$ using a table of values and a graph
- graphing radical functions using transformations
- identifying the domain and range of radical functions

Transformations of radical functions

$$y = \sqrt{x}$$

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

Vertical stretch: a

Vertical translation: k

Horizontal stretch: $\frac{1}{b}$

Horizontal translation: h

Mapping Rule: $(x, y) \rightarrow \left(\frac{1}{b}x + h, ay + k \right) \leftarrow \text{truth}$

Ch 2.1 Day 2

Graph the following $y = -2\sqrt{\frac{1}{2}x + 3} + 1$

need to put in factored form.

$$y = -2\sqrt{\frac{1}{2}(x+6)} + 1$$

VS 2 HS 2

VT 1 HT -6

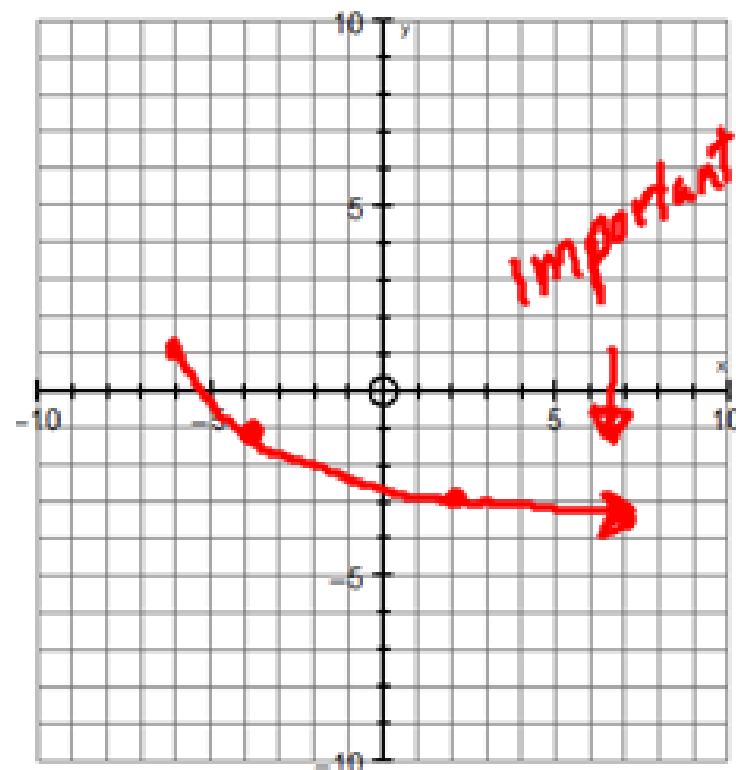
R_x YES R_y NO

$$(x, y) \rightarrow (2x-6, -2y+1)$$

$$\{x \mid x \geq -6\}$$

$$\{y \mid y \leq 1\}$$

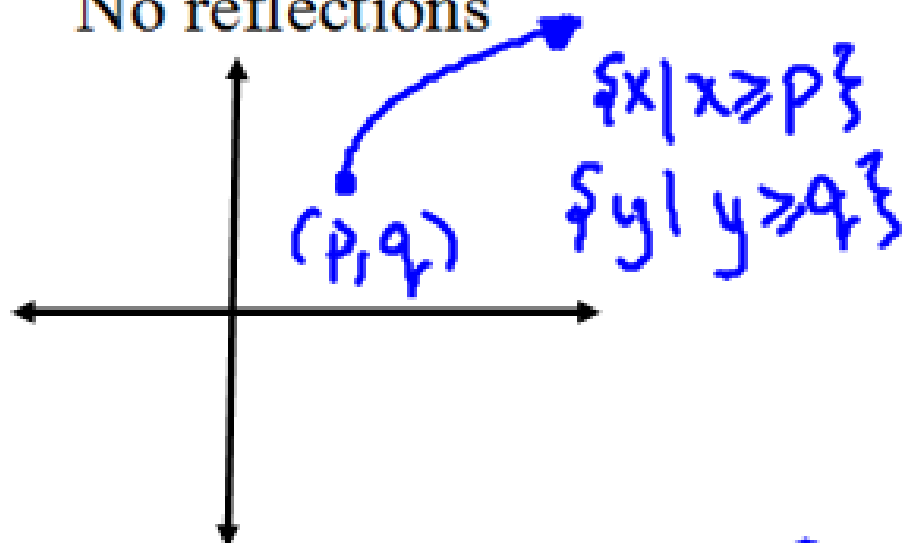
x	$y = \sqrt{x}$
0	0
1	1
4	2
9	3
16	4



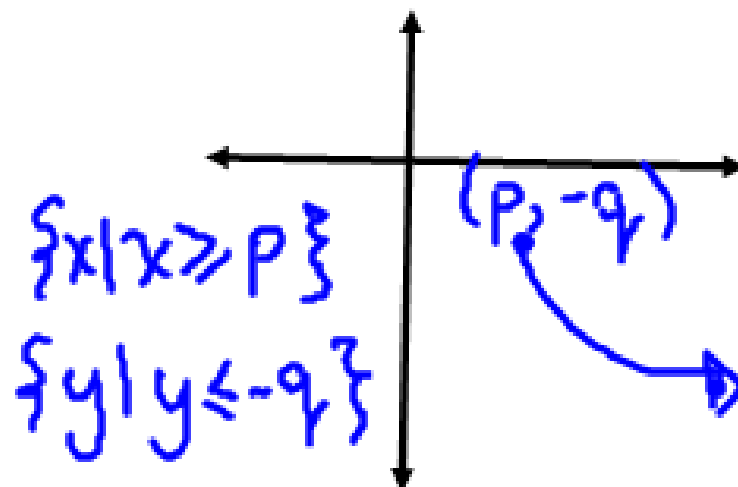
$2x-6$	$-2y+1$
-6	1
-4	1
2	-3
12	-5

The general shape of a radical function

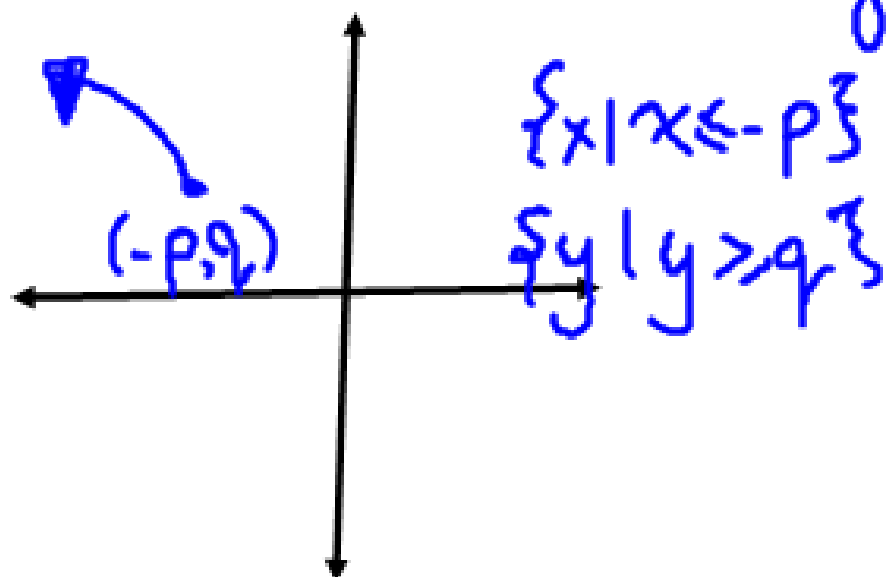
No reflections



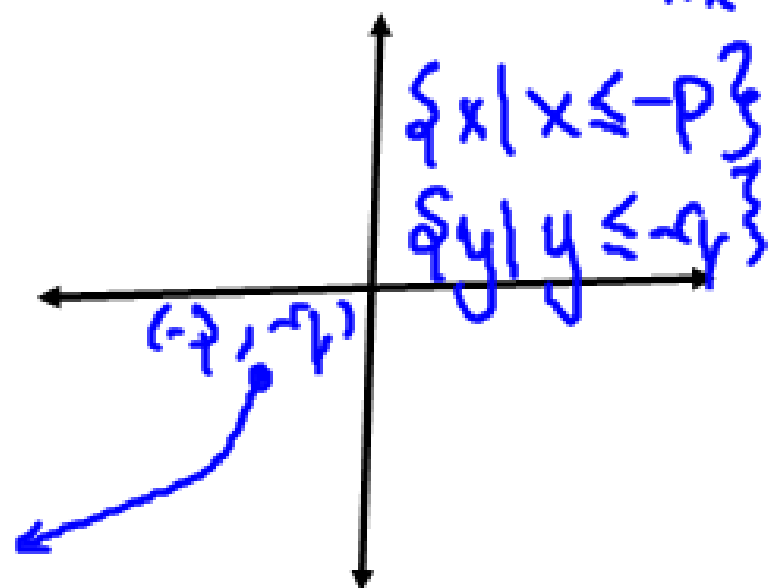
Vertical Reflection R_x



Horizontal Reflection R_y

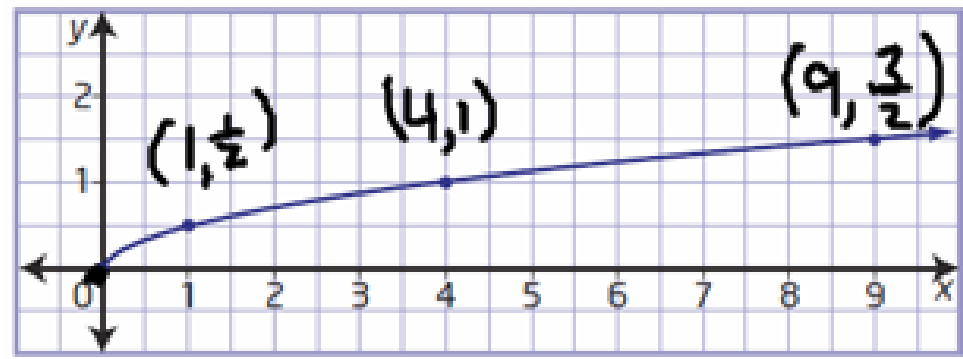


Both Reflections $R_x + R_y$



Your Turn

- a) Determine two forms of the equation for the function shown.
The function is a transformation of the function $y = \sqrt{x}$.
- b) Show algebraically that the two equations are equivalent.
- c) What is the equation of the curve reflected in each quadrant?



With a VS

$$y = a\sqrt{x}$$

$$1 = a\sqrt{4}$$

$$1 = 2a$$

$$\frac{1}{2} = a$$

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

With a HS

$$y = \sqrt{bx}$$

$$1 = \sqrt{b(4)}$$

$$(1)^2 = (\sqrt{4b})^2$$

$$1 = 4b$$

$$\frac{1}{4} = b$$

$$y = \sqrt{\frac{1}{4} \cdot x}$$

ⓑ

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

$$= \sqrt{\left(\frac{1}{2}\right)^2 \cdot x}$$

$$= \sqrt{\frac{1}{4} \cdot x}$$

$$= \sqrt{\frac{1}{4}x}$$

OR

$$y = \sqrt{\frac{1}{4}x}$$

$$= \sqrt{\frac{1}{4}} \cdot \sqrt{x}$$

$$= \frac{1}{2}\sqrt{x}$$

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

↑ ↑
VS HS

$$\rightarrow y = \sqrt{4x} \quad \text{HS } \frac{1}{4}$$

$$y = \sqrt{4} \cdot \sqrt{x}$$

$$y = 2\sqrt{x} \quad \text{VS } 2$$

c)

QII R_y

$$y = \frac{1}{2} \sqrt{-x}$$

QIV R_x

$$y = -\frac{1}{2} \sqrt{x}$$

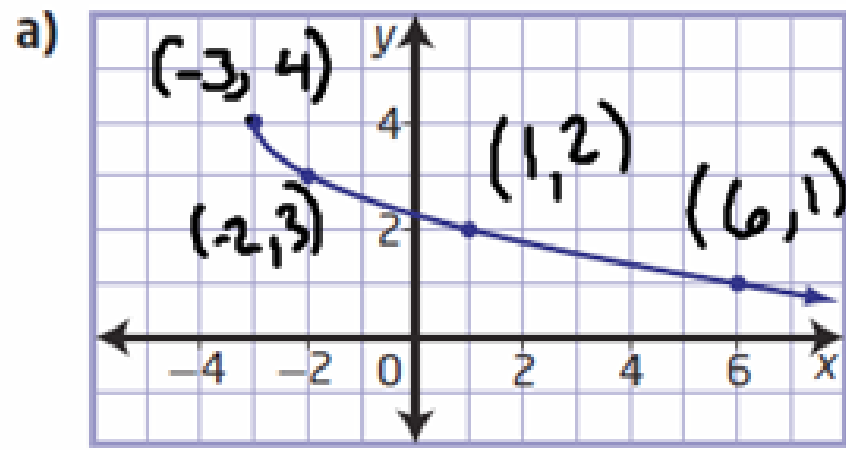


QIII ($R_x + R_y$)

$$y = -\frac{1}{2} \sqrt{-x}$$

pg 74 ☺

10. For each graph, write the equation of a radical function of the form $y = a\sqrt{b(x - h)} + k$.



HT-3
VT+4

$$y = a\sqrt{x+3} + 4$$
$$2 = a\sqrt{1+3} + 4$$
$$-2 = a\sqrt{4}$$
$$-2 = 2a$$
$$-1 = a$$
$$y = -1\sqrt{x+3} + 4$$

11. Write the equation of a radical function with each domain and range.

a) $\{x \mid x \geq 6, x \in \mathbb{R}\}$, $\{y \mid y \geq 1, y \in \mathbb{R}\}$



$$y = \sqrt{x-6} + 1$$

$$y = 3\sqrt{4(x-6)} + 1$$

HW: pg 73 #6, 8-
12, 15, 16, 19, 20