Graphing Radical Equations, Characteristics and Transformations

Graphing Radical Functions

Parent Function:

Square root: $y = \sqrt{x}$ $x^{\frac{1}{2}}$

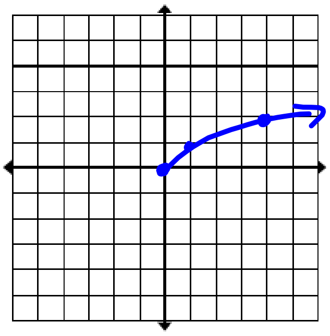
- **Important Point:** (h, k)
- **Generic Shape:** 
- **DOMAIN:** $[h, \infty)$ $x \geq h$
- **RANGE:** $[k, \infty)$ $y \geq k$
- **INTERVAL OF INCREASE:** $[h, \infty)$
- **INTERVAL OF DECREASE:** none
- **X-INTERCEPT:** (0, 0)
- **Y-INTERCEPT:** (0, 0)
- ~~RELATIVE~~ **MAX:** none
- ~~RELATIVE~~ **MIN:** (0, 0)
- **END BEHAVIOR:**
- as $x \to \underline{\infty}$ $f(x) \to \underline{\infty}$
  as $x \to \underline{0}$ $f(x) \to \underline{0}$

x	y
0	0
1	1
4	2
9	3
16	4

$x \geq 0$ $[0, \infty)$

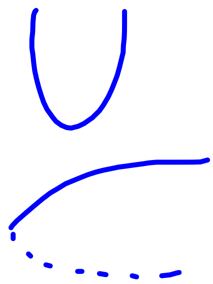
$y \geq 0$ $[0, \infty)$

$[0, \infty)$



$\sqrt{-1}$

$\sqrt{-4}$

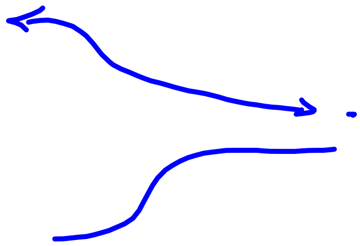


Graphing Radical Functions

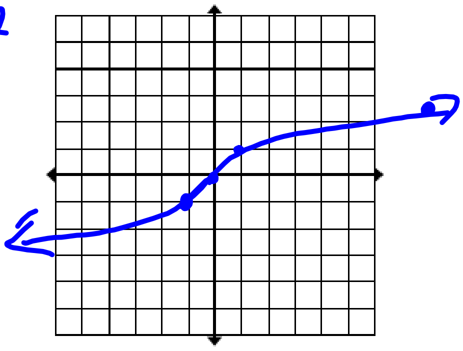
Parent Function:

Cube root: $y = \sqrt[3]{x}$ $x^{\frac{1}{3}}$

x	y
0	0
1	1
8	2
27	3



- **Important Point:** (h, k)
- **Generic Shape:** Flat S
- **DOMAIN:** $(-\infty, \infty)$ $\mathbb{R}$
- **RANGE:** $(-\infty, \infty)$ $\mathbb{R}$
- **INTERVAL OF INCREASE:** $(-\infty, \infty)$
- **INTERVAL OF DECREASE:** none
- **X-INTERCEPT:** (0, 0)
- **Y-INTERCEPT:** (0, 0)
- ~~RELATIVE~~ **MAX:** none
- ~~RELATIVE~~ **MIN:** none
- **END BEHAVIOR:**
- as $x \to \infty$, $f(x) \to \infty$; as $x \to -\infty$, $f(x) \to -\infty$



$\sqrt[3]{-1} = -1$

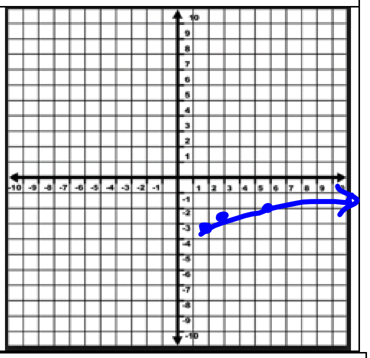
$\sqrt[3]{-8} = -2$

Graph the function $f(x)=\frac{1}{2}\sqrt{x-2}-3$ using a table of values and identify the characteristics.

Table:

x	F(x)
2	-3
3	-2.5
6	-2
11	-1.5
18	-1
4	2.293
5	2.1334

Graph:



2 -3 **Characteristics:**

Domain:	Range:	x-intercept / y-intercept
$x \geq 2$ $[2,\infty)$	$y \geq -3$ $[-3,\infty)$	x-intercept: $(38,0)$ y-intercept: none
Interval of Increase: $[2,\infty)$ Interval of Decrease: None	Relative Maximum: none Relative Minimum: $(2,-3)$	End Behavior: as $x \to \infty$, $f(x) \to \infty$ as $x \to 2$, $f(x) \to -3$

x-int.

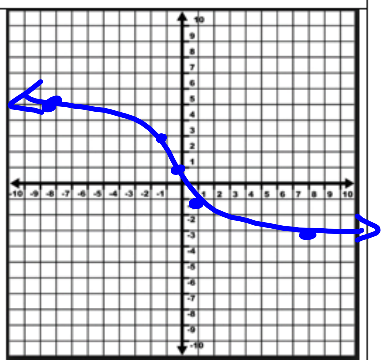
$$0=\frac{1}{2}\sqrt{x-2}-3$$
$$+3 \qquad\qquad +3$$
$$2(3)=2\left(\frac{1}{2}\sqrt{x-2}\right)$$
$$(6)^2=\left(\sqrt{x-2}\right)^2$$
$$36=x-2$$
$$+2 \qquad +2$$
$$38=x$$

Graph the function $h(x) = -2\sqrt[3]{x} + 1$ using a table of values and identify the characteristics.

Table:

X	F(x)
-8	5
-1	3
0	1
1	-1
8	-3

Graph:



Characteristics:

Domain: $\mathbb{R}$ $(-\infty, \infty)$	Range: $\mathbb{R}$ $(-\infty, \infty)$	x-intercept: ______ y-intercept: $(0, 1)$
Interval of Increase: NONE Interval of Decrease: $(-\infty, \infty)$	Relative Maximum: none Relative Minimum: none	End Behavior: as x $\to \infty$, $f(x) \to -\infty$; as x $\to -\infty$, $f(x) \to \infty$

$0 = -2\sqrt[3]{x} + 1$

$-1 \qquad -1$

$-1 = -2\sqrt[3]{x}$

$\frac{-1}{-2} = \frac{-2\sqrt[3]{x}}{-2}$

-2

$\left(\frac{1}{2}\right)^3 = \left(\sqrt[3]{x}\right)^3$

$\frac{1}{8} = x$

$(\frac{1}{8}, 0)$ $(.12, 0)$

Little 3 $\boxed{2nd}$ $x^{\square}$

Graphing $\boxed{\text{Math}}$ #4

GENERAL FORM FOR TRANSFORMATIONS of FUNCTION f(x): $a \bullet f(x - h) + k$

"h" = horizontal shift	"k" = vertical shift	"a" = vertical dilation, contraction, and reflection
+h left	+k up	a = neg reflects over x axis
-h Right	-k down	a > 1 Stretches
		0 < a < 1 Shrinks

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

$a\sqrt[3]{x-h} + k$

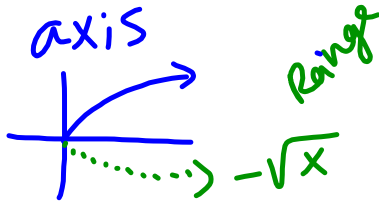
State the transformation for the given examples below.

1. $f(x) = \sqrt{x+1} + 4$

$(h,k) \rightarrow (-1, 4)$

left 1 unit
up 4 units

Reflect over the x axis

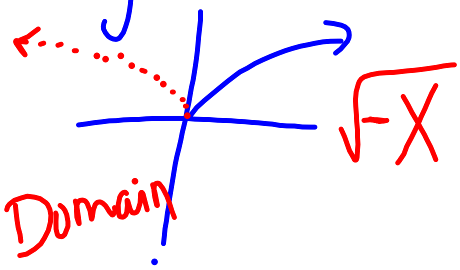


2. $f(x) = \sqrt[3]{x-3} - 1$

$(h,k) \rightarrow (3,-1)$

Right 3 units
down 1 unit

Reflect over the y-axis



Write the EQUATIONS with described shifts and given parent functions.

3. $y = \sqrt[3]{x}$; Reflects and Right 3

over
x-axis

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

4. $y = \sqrt{x}$ Down 2, Reflects, Vertical shrink of 1/6

over
x-axis

$$-\sqrt{x} - 2$$

$$\boxed{y = -\frac{1}{6}\sqrt{x} - 2}$$