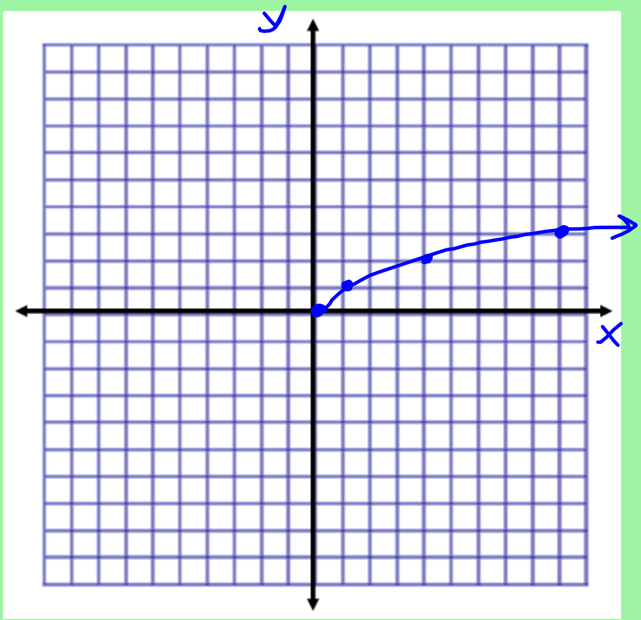
8.6 Part 1
GRAPHING SQUARE ROOT FUNCTIONS

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

Example 1
Graph $y = \sqrt{x}$.

x		y
-9	$\sqrt{-9}$	—
-4	$\sqrt{-4}$	—
-1	$\sqrt{-1}$	—
0	$\sqrt{0}$	0
1	$\sqrt{1}$	1
4	$\sqrt{4}$	2
9	$\sqrt{9}$	3



GRAPHS OF SQUARE ROOT FUNCTIONS

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

(h,k) is the starting point

h is the opposite of what you see

k is exactly what you see

Make a table of values.
You want what is under the radical to be a perfect square.

0, 1, 4, 9, 16, ...

Example 2

$x+1=1$, $-1\ \ -1$, $x=0$ $\qquad$ $x+1=4$, $-1\ \ -1$, $x=3$ $\qquad$ $x+1=9$, $-1\ \ -1$, $x=8$

Graph the function below.

Then state the domain and range.

D: $x \geq -1$

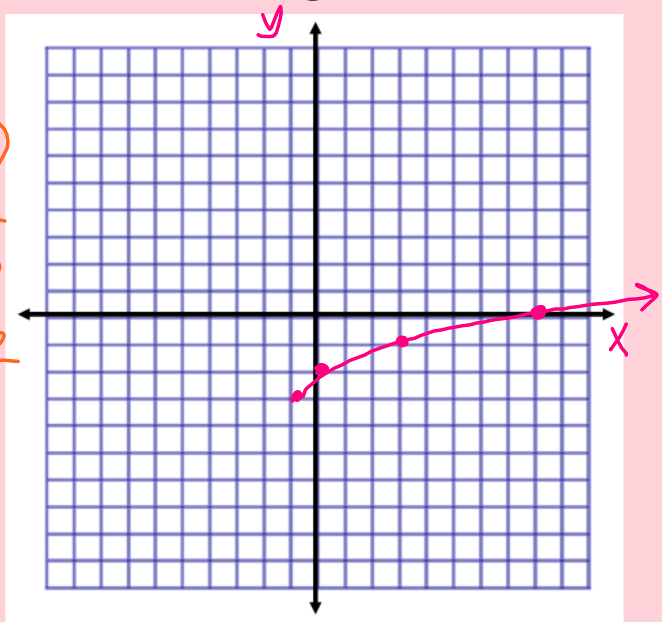
R: $y \geq -3$

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

$h=-1$ $\quad$ $k=-3$

starting point $(-1,-3)$

x		y
-1		-3
0	$\sqrt{0+1}-3$	-2
3	$\sqrt{3+1}-3$	-1
8	$\sqrt{8+1}-3$	0



Example 3

$x+3=1$, $-3\ \ -3$, $x=-2$ $\qquad$ $x+3=4$, $-3\ \ -3$, $x=1$ $\qquad$ $x+3=9$, $-3\ \ -3$, $x=6$

Graph the function below.

Then state the domain and range.

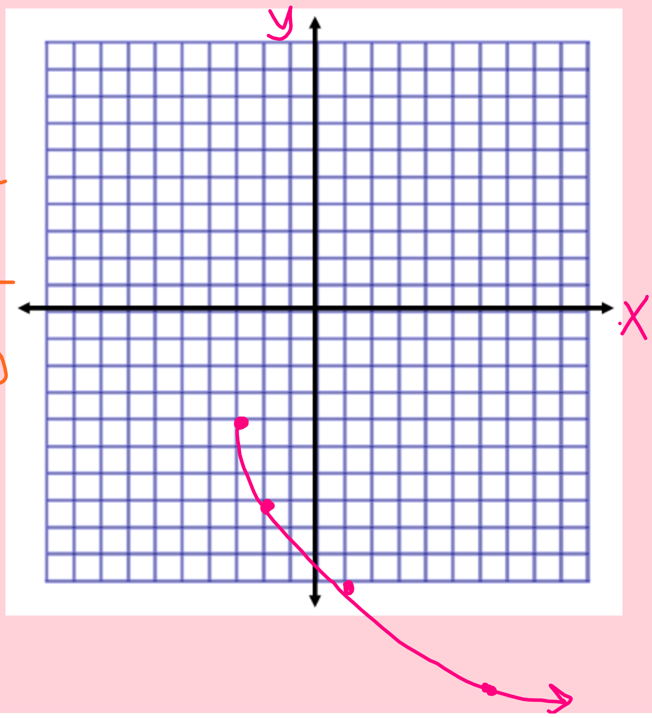
D: $x \geq -3$

R: $y \leq -4$

$y = -3\sqrt{\boxed{x+3}} - 4$

$h=-3$ $\quad$ $k=-4$ $\quad$ $(-3,-4)$

x		y
-3		-4
-2	$-3\sqrt{-2+3}-4$	-7
1	$-3\sqrt{1+3}-4$	-10
6	$-3\sqrt{6+3}-4$	-13



Example 4

Graph the function below.
Then state the domain and range.

$x-4=1$
$+4\ \ +4$
$x=5$

$x-4=4$
$+4\ \ +4$
$x=8$

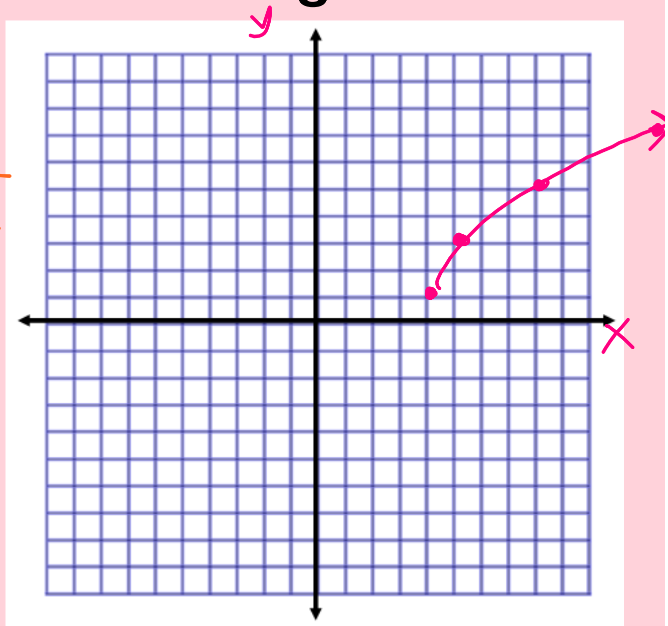
$x-4=9$
$+4\ \ +4$
$x=13$

D: $x \geq 4$
R: $y \geq 1$

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

$h=4$ $k=1$ $(4,1)$

x		y
4		1
5	$2\sqrt{5-4}+1$	3
8	$2\sqrt{8-4}+1$	5
13	$2\sqrt{13-4}+1$	7

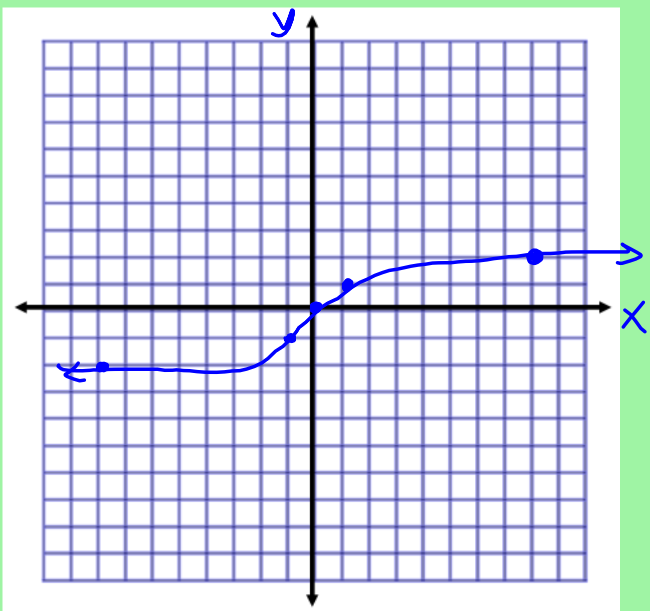


GRAPHING CUBE ROOT FUNCTIONS

Example 5

Graph $y = \sqrt[3]{x}$.

x		y
-8	$\sqrt[3]{-8}$	-2
-1	$\sqrt[3]{-1}$	-1
0	$\sqrt[3]{0}$	0
1	$\sqrt[3]{1}$	1
8	$\sqrt[3]{8}$	2



GRAPHS OF CUBE ROOT FUNCTIONS

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

(h,k) is the middle point

h is the opposite of what you see

k is exactly what you see

Make a table of values.
You want what is **under the radical** to be a **perfect cube**.

$-8, -1, 1, 8$

Example 6

$x-2=-8$, $+2 \quad +2$, $x=-6$ | $x-2=-1$, $+2 \quad +2$, $x=1$ | $x-2=1$, $+2 \quad +2$, $x=3$ | $x-2=8$, $+2 \quad +2$, $x=10$

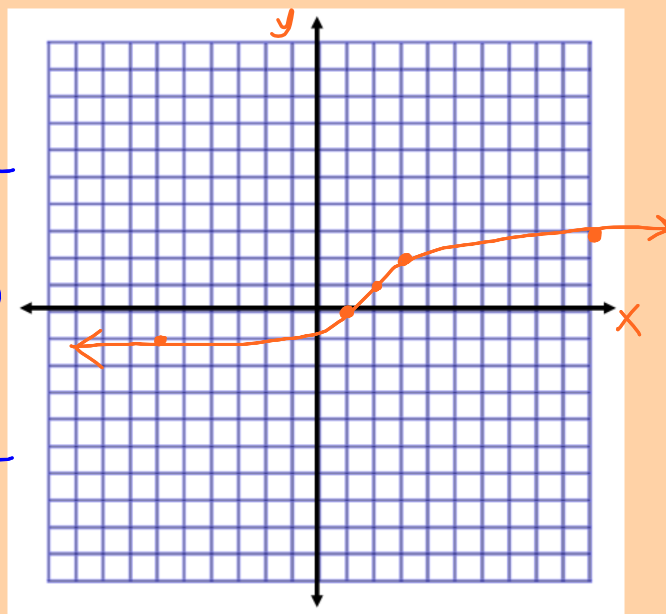
Graph the function below.
Then state the domain and range.

D: $\mathbb{R}$
R: $\mathbb{R}$

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

$h=2 \quad k=1 \quad (2,1)$

x		y
-6	$\sqrt[3]{-6-2}+1$	-1
1	$\sqrt[3]{1-2}+1$	0
2		1
3	$\sqrt[3]{3-2}+1$	2
10	$\sqrt[3]{10-2}+1$	3



Example 7

Graph the function below.
Then state the domain and range.

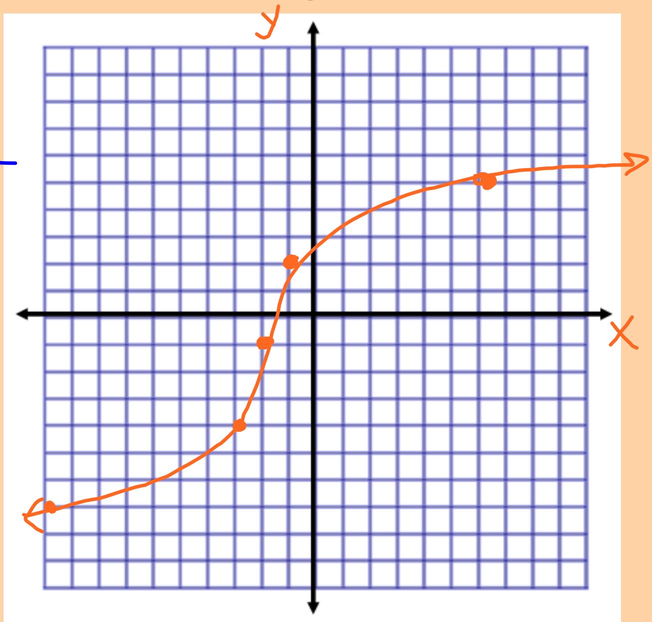
$y = 3\sqrt[3]{\boxed{x + 2}} - 1$

$x+2=-8$, $-2\ \ -2$, $x=-10$ | $x+2=-1$, $-2\ \ -2$, $x=-3$ | $x+2=1$, $-2\ \ -2$, $x=-1$ | $x+2=8$, $-2\ \ -2$, $x=6$

D: $\mathbb{R}$
R: $\mathbb{R}$

$h=-2 \quad k=-1 \quad (-2,-1)$

x		y
-10	$3\sqrt[3]{-10+2} - 1$	-7
-3	$3\sqrt[3]{-3+2} - 1$	-4
-2		-1
-1	$3\sqrt[3]{-1+2} - 1$	2
6	$3\sqrt[3]{6+2} - 1$	5



Example 8

Graph the function below.
Then state the domain and range.

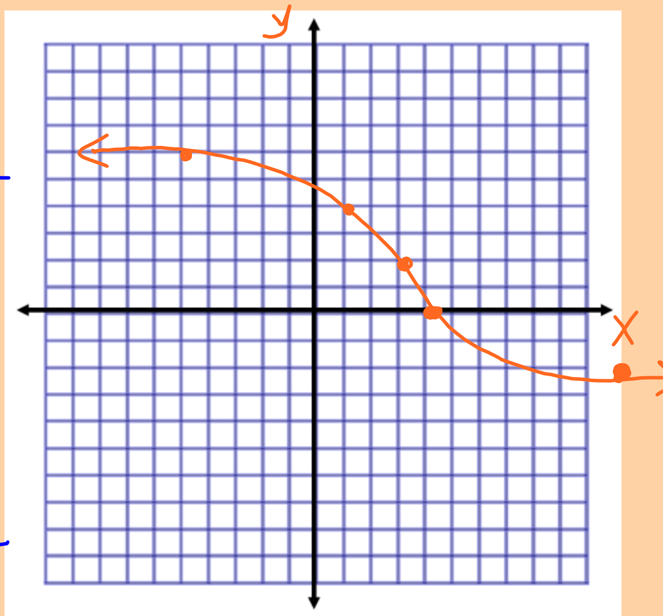
$y = -2\sqrt[3]{\boxed{x - 3}} + 2$

$x-3=-8$, $+3\ \ +3$, $x=-5$ | $x-3=-1$, $+3\ \ +3$, $x=2$ | $x-3=1$, $+3\ \ +3$, $x=4$ | $x-3=8$, $+3\ \ +3$, $x=11$

D: $\mathbb{R}$
R: $\mathbb{R}$

$h=3 \quad k=2 \quad (3,2)$

x		y
-5	$-2\sqrt[3]{-5-3} + 2$	6
2	$-2\sqrt[3]{2-3} + 2$	4
3		2
4	$-2\sqrt[3]{4-3} + 2$	0
11	$-2\sqrt[3]{11-3} + 2$	-2



Example 9

even index $\sqrt[\text{even}]{\quad}$ ← greater than or equal to zero

Find the domain of each function.

a) $f(x) = \sqrt{2x - 5}$

$$2x - 5 \geq 0$$
$$\underline{\quad +5 \quad +5}$$
$$\frac{2x}{2} \geq \frac{5}{2}$$
$$\boxed{x \geq \frac{5}{2}}$$

b) $g(x) = \sqrt{3(x - 2)}$

$$3(x-2) \geq 0$$
$$3x - 6 \geq 0$$
$$\underline{\quad +6 \quad +6}$$
$$\frac{3x}{3} \geq \frac{6}{3}$$
$$\boxed{x \geq 2}$$

Example 10

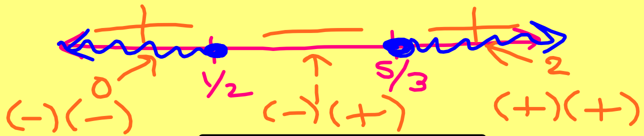
Find the domain of each function.

a) $w(x) = \sqrt{6x^2 - 13x + 5}$

s −13 p 30

$-\frac{5}{3}$ $-\cancel{10}/\cancel{6}$ $-\cancel{3}/\cancel{6}$ $-\frac{1}{2}$

$$6x^2 - 13x + 5 \geq 0$$
$$(3x-5)(2x-1) \boxed{\geq 0}$$



$$\boxed{D:\ x \leq \frac{1}{2},\ x \geq \frac{5}{3}}$$

b) $k(x) = \sqrt{x^2 + 5x + 6}$

$$\boxed{D:\ x \leq -3,\ x \geq -2}$$

$$x^2 + 5x + 6 \geq 0$$
$$(x+3)(x+2) \boxed{\geq 0}$$