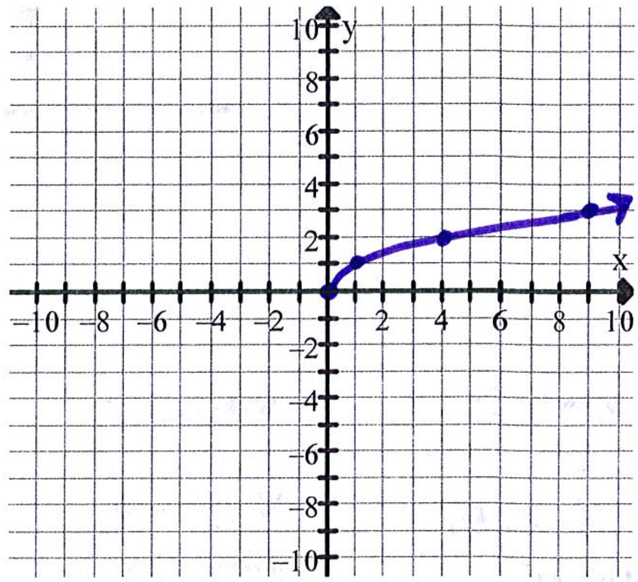
4.6 Graphing Radical Functions

The Square Root Function: The parent function is $y = \sqrt{x}$ or $f(x) = \sqrt{x}$

Let's look at its graph and table of values using our calculator:

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



What is the domain of the square root parent function? $x \geq 0$ or $[0, \infty)$

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

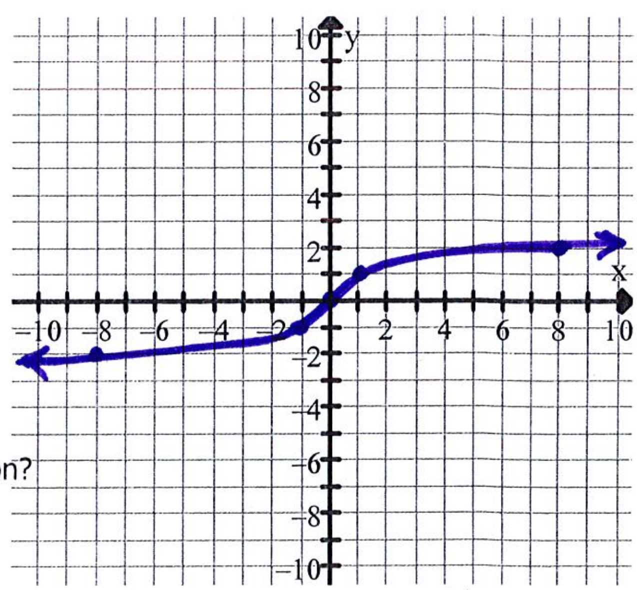
Endpoint: $(0,0)$

End Behavior:
As $x \to \infty$, $y \to \infty$
As $x \to \underline{0}$, $y \to \underline{0}$
x coordinate of endpoint — y-coordinate of endpoint

The Cube Root Function: The parent function is $y = \sqrt[3]{x}$

Let's look at its graph and table of values using our calculator:

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



What is the domain of the square root parent function?
$(-\infty, \infty)$ $x \in \mathbb{R}$
all real #'s

Range: $(-\infty, \infty)$ $y \in \mathbb{R}$

Turning Point: $(0,0)$
(ANCHOR)

End Behavior:
As $x \to -\infty$, [redacted] $y \to -\infty$

In these notes we will **ANALYZE** the graphs of Square Root and Cube Root Functions

Domain Restrictions based on <u>an equation:</u>

The square root of a negative number does not exist . . . we NEVER put a negative number under a square root (unless we are dealing in complex numbers).

<u>No Negatives Under the Radical Sign!!</u> $\boxed{x \geq 0}$

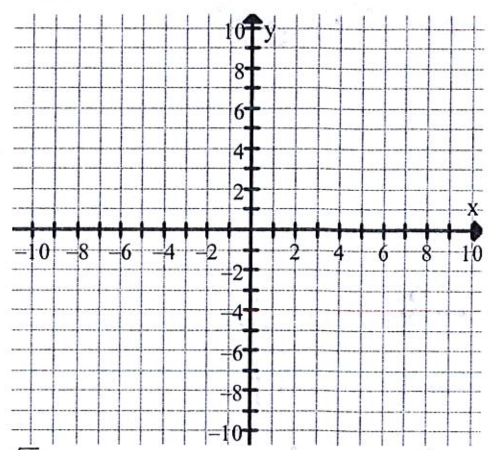
Do you have a **square root**? ~~Do you have a **rational power** that has a **denominator** of 2?~~
If not, then you don't have to worry about this restriction.

$f(x) = \sqrt{x}$ $\qquad f(x) = x^{\frac{1}{2}}$ $\qquad$ **Domain**: The set of all real numbers $x \geq 0$

$y=\sqrt{x-5}$ $x-5 \geq 0$ $+5 \quad +5$ $x \geq 5$ domain ↑	$y=\sqrt{x+3}$ $x+3 \geq 0$ $-3 \quad -3$ $x \geq -3$ domain ↑	$f(x)=\sqrt{2x+3}$ $2x+3 \geq 0$ $-3 \quad -3$ $\frac{2x}{2} \geq \frac{-3}{2}$ $x \geq -\frac{3}{2}$ domain ↑	$y=(x-4)^{\frac{1}{2}}$ $y=\sqrt{x-4}$ $x-4 \geq 0$ $+4 \quad +4$ $x \geq 4$ domain

Now let's define our characteristics from Unit 2 with the square root and cube root function.

The Square Root Function: The parent function is $y=\sqrt{x}$



(h, k): ______

x - Intercept: ______________

y - intercept: ________________

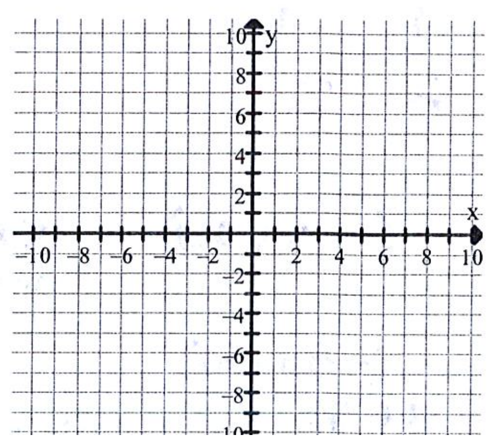
Domain: ________________________

Range: __________________________

Increasing: ______________________

Decreasing: _____________________

The Cube Root Function: The parent function is $y=\sqrt[3]{x}$



(h, k): ______

x - Intercept: ______________

y - intercept: ________________

Domain: ________________________

Range: __________________________

Increasing: ______________________

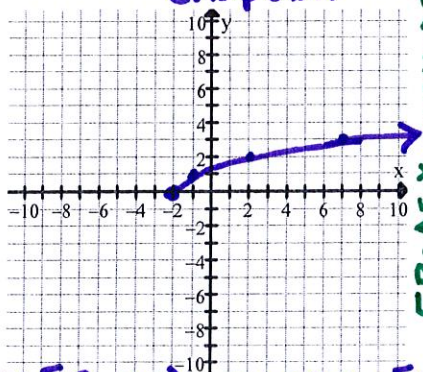
Decreasing: _____________________

Square Roots w/ transformations

endpoint: (h, k)
domain will have h
range will have k

$h(x)=\sqrt{x+2}$ (h,k): $(-2,0)$

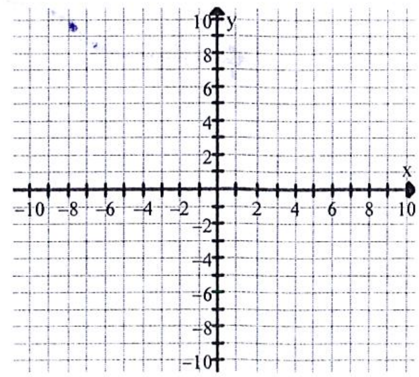
endpoint



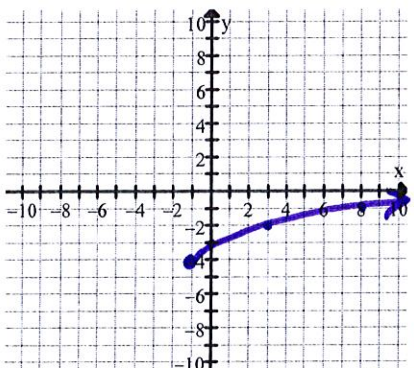
EB: As $x\to\infty$, $y\to\infty$
As $x\to -2$, $y\to 0$

domain: $[-2,\infty)$ range: $[0,\infty)$

$h(x)=\sqrt{x}+3$ (h,k): __________



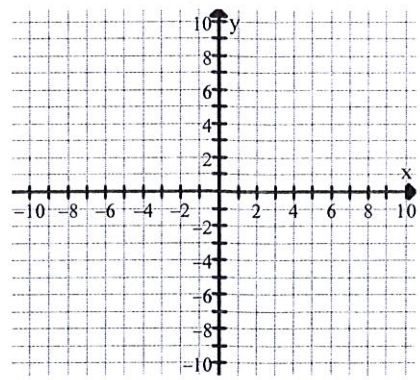
$h(x)=\sqrt{x+1}-4$ (h,k): $(-1,-4)$



As $x\to\infty$, $y\to\infty$
As $x\to -1$, $y\to -4$

domain: $[-1,\infty)$ range: $[-4,\infty)$

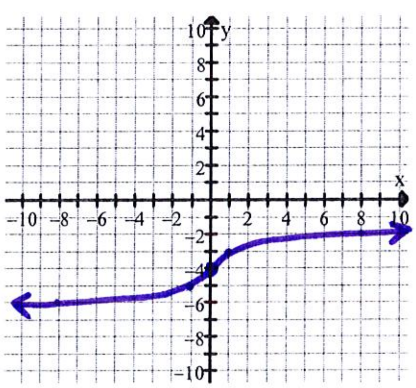
$h(x)=-\sqrt{x+2}$ (h,k): __________



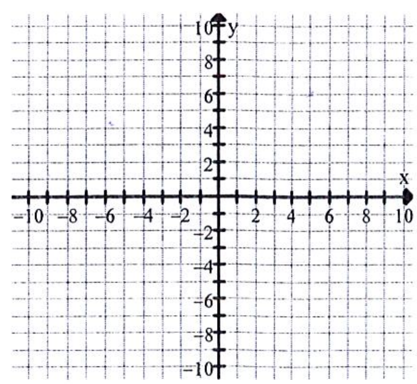
With SQUARE ROOT FUNCTIONS when you are completing the table of values…you will have x-values on ONE side of the initial point (h,k).

Transformations of Cube Root Function:

$h(x)=\sqrt[3]{x}-4$ (h,k): $(0,-4)$

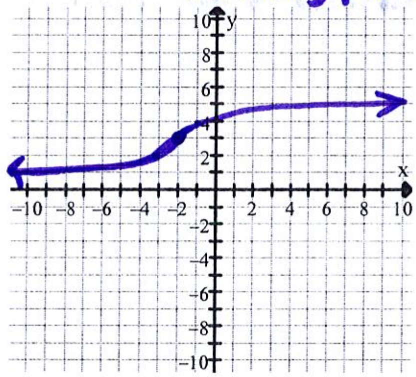


$y=3\sqrt[3]{x}$ (h,k): __________

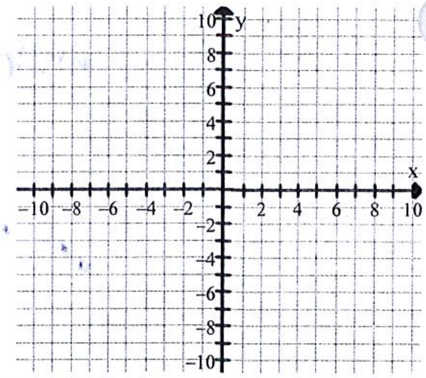


domain: $(-\infty,\infty)$
range: $(-\infty,\infty)$
As $x\to-\infty$, $y\to-\infty$

$h(x)=\sqrt[3]{x+2}+3$ (h,k): (-2, 3) turning point



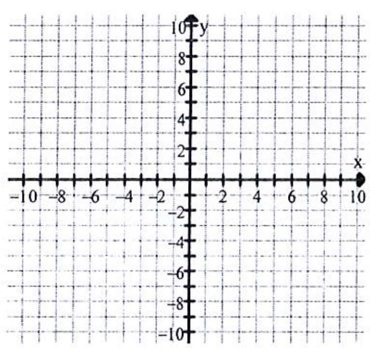
$f(x)=\sqrt[3]{x-2}$ (h,k): ____________



Complete the following. Graph without a calculator. Then verify with your calculator and use to find your intercepts if necessary. Round to the nearest tenth.

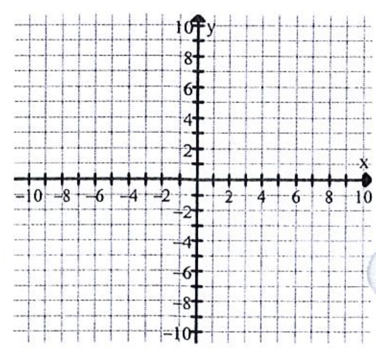
$y=-2\sqrt{x-3}$

(h,k): ____________
x-int: ____________
y-int: ____________
Domain: ____________
Range: ____________



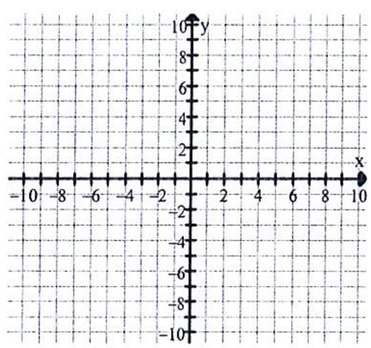
$r(x)=\sqrt{x}+4$

(h,k): ____________
x-int: ____________
y-int: ____________
Domain: ____________
Range: ____________



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

(h,k): ____________
x-int: ____________
y-int: ____________
Domain: ____________
Range: ____________



$y=\sqrt[3]{x+4}-1$

(h,k): ____________
x-int: ____________
y-int: ____________
Domain: ____________
Range: ____________