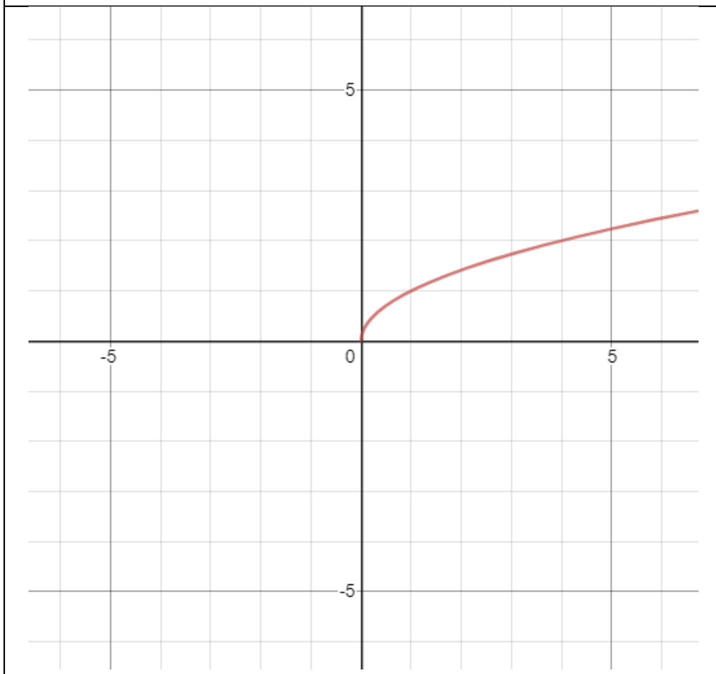
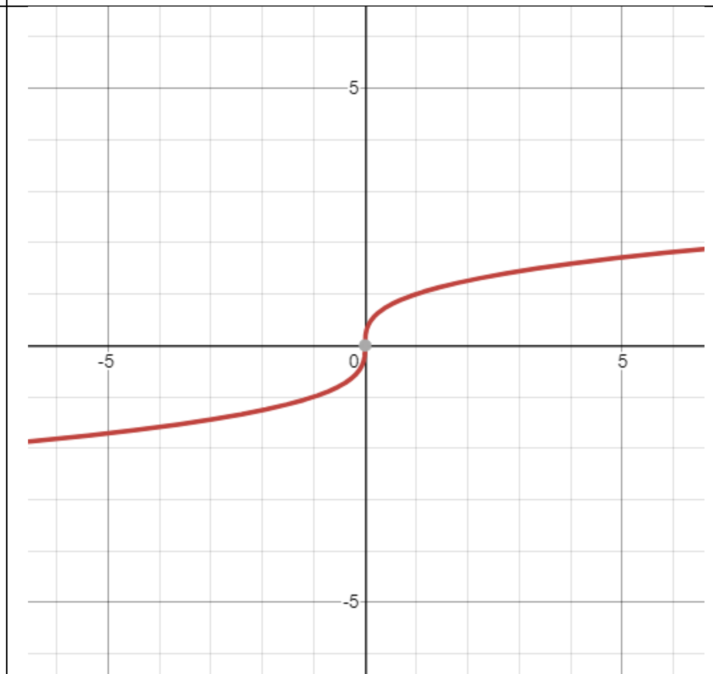
RADICAL FUNCTIONS

Parent Functions

<table>
<tr><td>$y = \sqrt{x}$</td><td>$y = \sqrt[3]{x}$</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>Range: $y \geq 0$ or $[0, \infty)$
Domain: $x \geq 0$ or $[0, \infty)$</td><td>Range: all real numbers or $(-\infty, \infty)$
Domain: all real numbers or $(-\infty, \infty)$</td></tr>
</table>

The range and domain of the cubed root function above on the right are all real numbers, whereas on the left, the range and domain have specific limitations.

Why is this? Why does the function on the left begin at the origin While the function on the right is continuous?

For the square root of a number to be real, the radicand must be greater than or equal to zero.

THE DOMAIN OF A RADICAL FUNCTION

Standard Form: $y = a\sqrt{bx - c} + d$

To find the domain of a radical function, set the radicand ≥ to zero and solve.

$$bx - c \geq 0$$

Find the domain of each of the following:

a) $y = 2\sqrt{x-7} + 4$

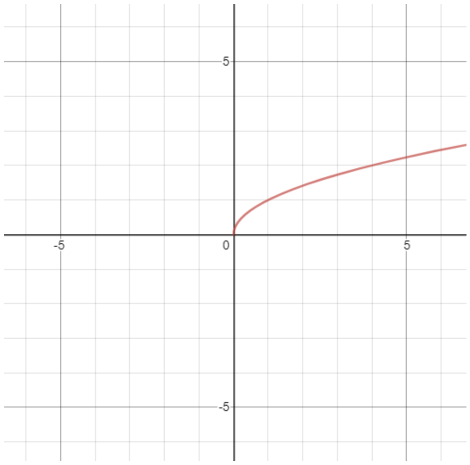
b) $y = 7 - \frac{3}{4}\sqrt{x+9}$

c) $y = -236\sqrt{x+2} - 74$

d) $y = -4\sqrt[3]{x+7} - 9$

THE RANGE OF A RADICAL FUNCTION

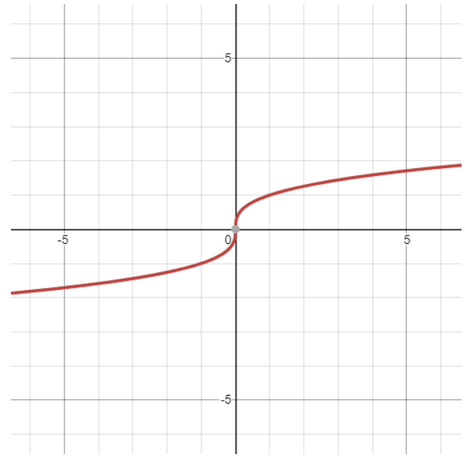
$$y = \sqrt{x}$$



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

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

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



Range: all real numbers or $(-\infty, \infty)$

Domain: all real numbers or $(-\infty, \infty)$

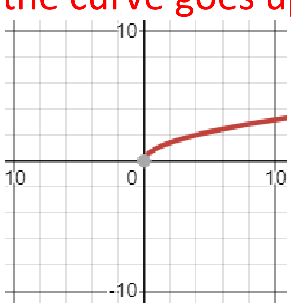
Once again, the range of a cubed root function is all real numbers.

For square root functions focus on the following:

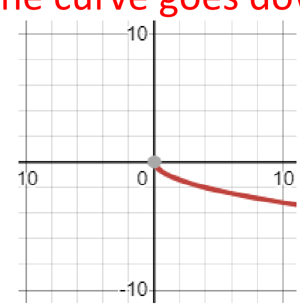
$$y = a\sqrt{bx - c} + d$$

$$\uparrow \qquad\qquad\qquad \uparrow$$

If a>0, the curve goes upward.



If a<0, the curve goes downward.



Therefore,

If $a > 0$, the range is $[k, \infty)$.

If $a < 0$, the range is $(-\infty, k]$.

Determine the Range of each.

a) $y = \frac{1}{3}\sqrt{x-4} + 7$

b) $y = -2\sqrt{x+4} - 9$

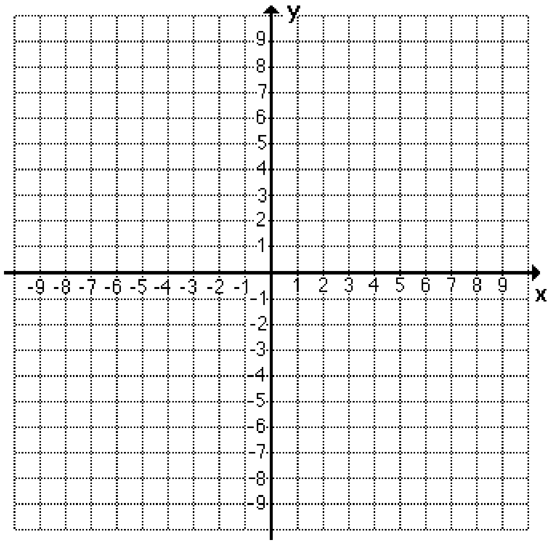
c) $y = 3 - \sqrt{x+9}$

d) $y = 5\sqrt{x-6} + 2$

SKETCHING THE GRAPH OF A RADICAL FUNCTION

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

A) $f(x)=\sqrt{x-3}+2$



Point of Origin:

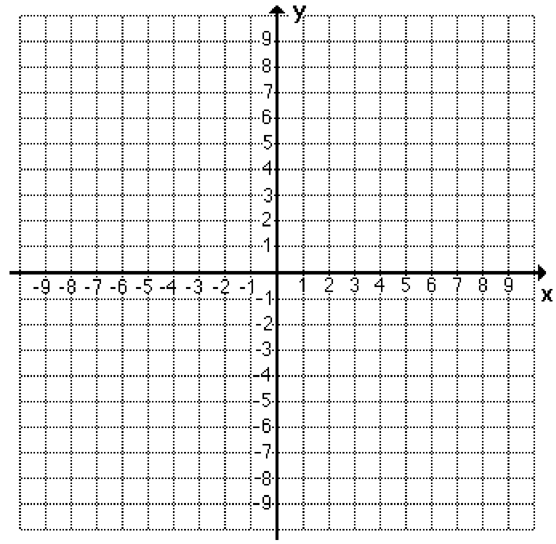
Y-intercept:

Range:

X-intercepts:

Domain:

B) $f(x)=-\sqrt{x-3}+1$



Point of Origin:

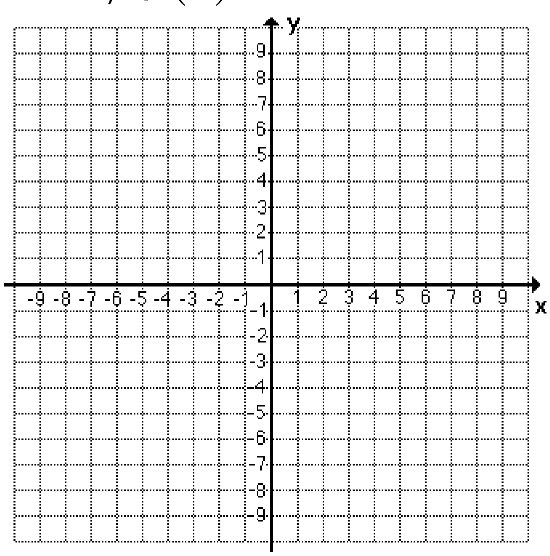
Y-intercept:

Range:

X-intercepts:

Domain:

C) $f(x)=\sqrt{3-x}+1$



Point of Origin:

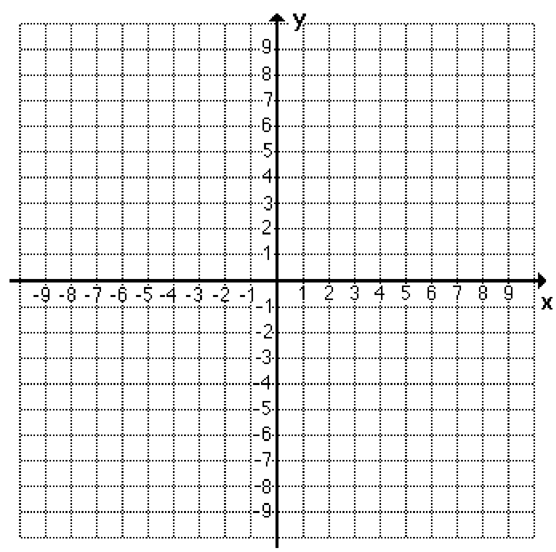
Y-intercept:

Range:

X-intercepts:

Domain:

D) $f(x)=2\sqrt{x}-4$



Point of Origin:

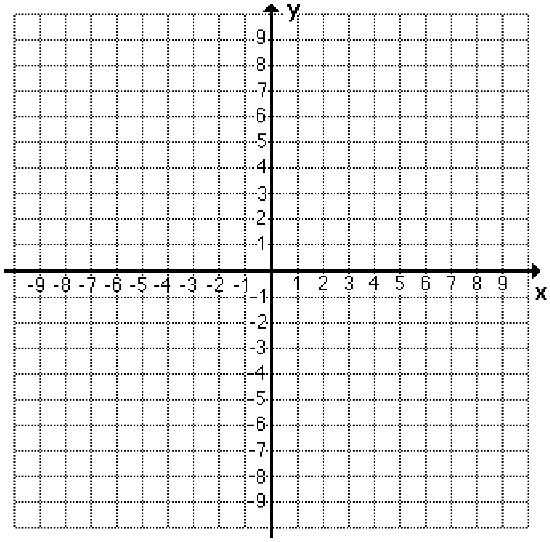
Y-intercept:

Range:

X-intercepts:

Domain:

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



Point of Origin:

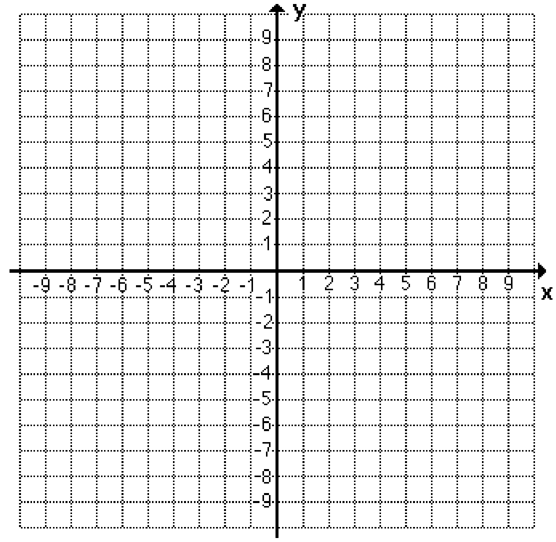
Y-intercept:

Range:

X-intercepts:

Domain:

H) $f(x) = \sqrt[3]{x-6}$



Point of Origin:

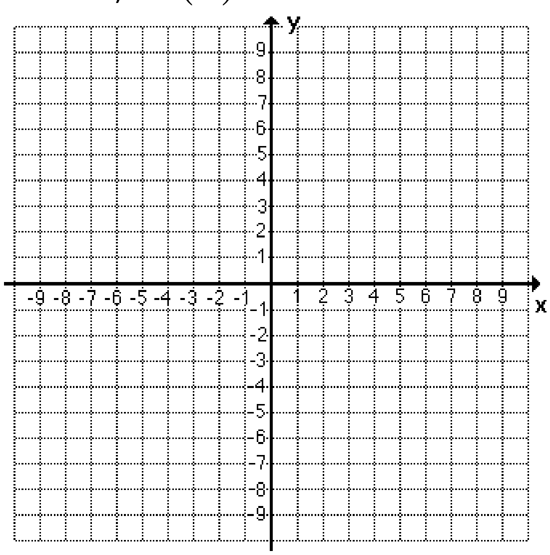
Y-intercept:

Range:

X-intercepts:

Domain:

I) $f(x) = \sqrt[3]{2-x} + 3$



Point of Origin:

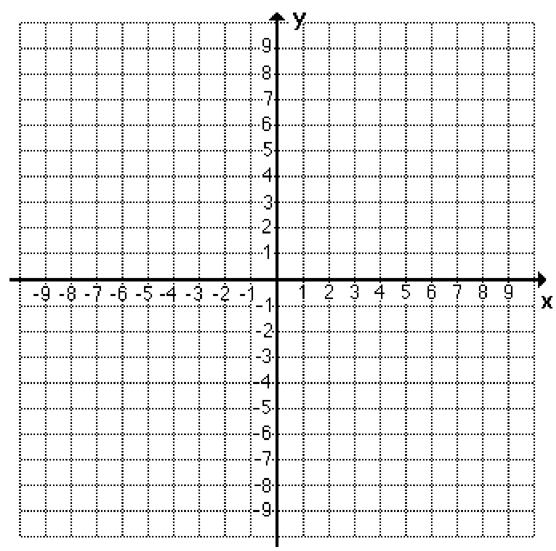
Y-intercept:

Range:

X-intercepts:

Domain:

J) $f(x) = \sqrt[3]{3-x}$



Point of Origin:

Y-intercept:

Range:

X-intercepts:

Domain: