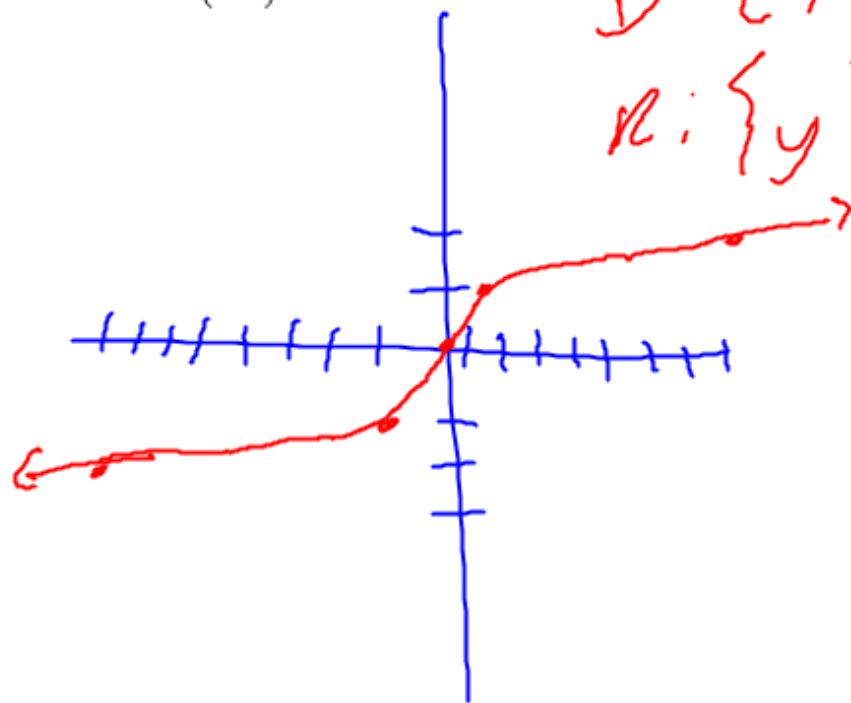


5.7 radical function and 5.8 solving radical functions

**Graph each function and identify its domain and range.**

$(0, 0)$   
 $(1, 1)$   
 $(-1, -1)$   
 $(8, 2)$   
 $(-8, -2)$

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



$D: \{x \mid x \in \mathbb{R}\}$   
 $R: \{y \mid y \in \mathbb{R}\}$

**Graph each function and identify its domain and range.**

$$D: \{x \mid x \in \mathbb{R}\} \quad R: \{y \mid y \in \mathbb{R}\}$$

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

$\rightarrow 2$

V.S.  $-2$   
(y-value)

$$(0, 0) \rightarrow$$

$$(2, 0)$$

$$(1, 1) \rightarrow$$

$$(3, 2)$$

$$(-1, -1) \rightarrow$$

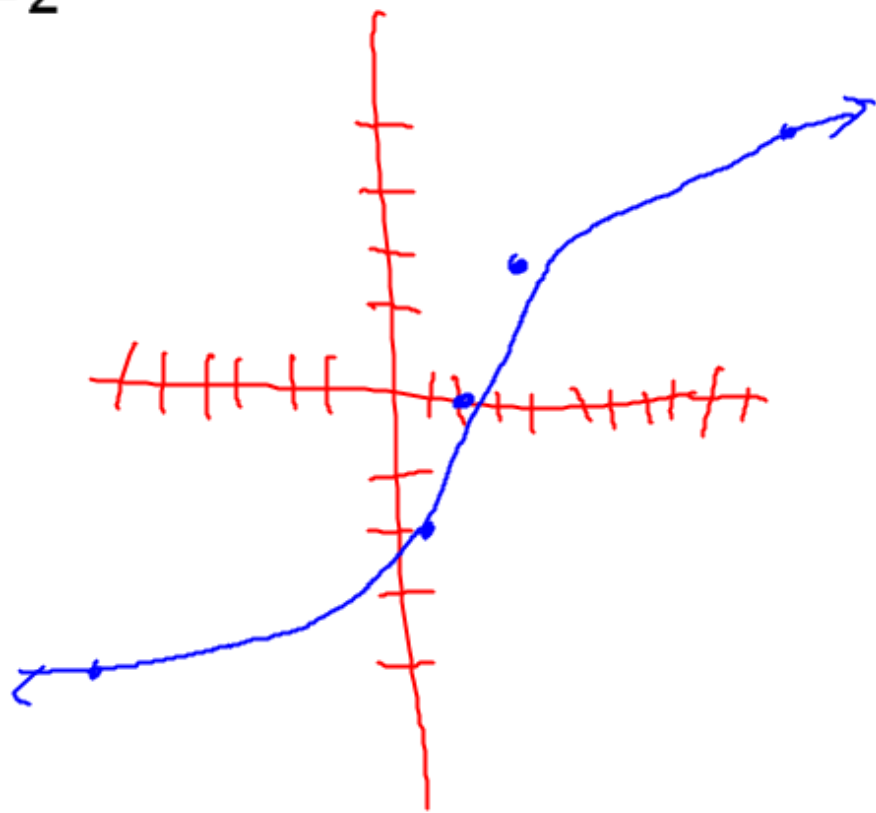
$$(1, -2)$$

$$(8, 2) \rightarrow$$

$$(10, 4)$$

$$(-2, -2) \rightarrow$$

$$(-6, -4)$$



A **radical equation** contains a variable within a radical. Recall that you can solve quadratic equations by taking the square root of both sides. Similarly, radical equations can be solved by raising both sides to a power.

Solving Radical Equations	
Steps	Example
1. Isolate the radical.	$\sqrt[3]{x} - 2 = 0$ $\sqrt[3]{x} = 2$
2. Raise both sides of the equation to the power equal to the index of the radical.	$(\sqrt[3]{x})^3 = (2)^3$
3. Simplify and solve.	$x = 8$

**Solve each equation.**

$$\sqrt{5 + \sqrt{x + 1}} = 16$$

*(Handwritten annotations: a blue checkmark is next to the 5, and a blue -5 is written below the 16)*

$$\left(\sqrt{x+1}\right)^2 = (11)^2$$

*(Handwritten: a blue checkmark is above the x+1 term)*

$$x+1 = 121$$

*(Handwritten: a blue -1 is written below the x+1 term)*

$$x = 120$$

*(Handwritten: the final answer is circled in blue)*

**Solve the equation.**

$$\begin{array}{r} 4 + \sqrt{x-1} = 5 \\ -4 \qquad \qquad -4 \end{array}$$

$$(\sqrt{x-1})^2 = (1)^2$$

$$\begin{array}{r} x-1 = 1 \\ +1 \quad +1 \end{array}$$

$$x = 2$$

**Solve the equation.**

$$\left(\sqrt[3]{3x-4}\right)^3 = (2)^3$$

$$\begin{array}{r} 3x-4 = 8 \\ +4 \quad +4 \\ \hline \end{array}$$

$$\begin{array}{r} 3x = 12 \\ \hline 3 \quad 3 \\ \hline \end{array}$$

$$\boxed{x=4}$$

**Solve the equation.**

6

$$\cancel{6}\sqrt{x+10} = \frac{42}{\cancel{6}}$$

$$(\sqrt{x+10})^2 = (7)^2$$

$$\begin{array}{r} x+10 = 49 \\ -10 \quad -10 \end{array}$$

$$x = 39$$

**Solve each equation.**

$$\left(\sqrt{8x+6}\right)^2 = \left(3\sqrt{x}\right)^2 \rightarrow 3^2(\sqrt{x})^2$$

$$\begin{array}{r} 8x+6 = 9x \\ -8x \quad -8x \end{array}$$

$$\boxed{6 = x}$$



**Solve**  $(\sqrt{7x+2})^2 = (3\sqrt{3x-2})^2$

$$7x+2 = 9(3x-2)$$

$$\begin{array}{r} 7x+2 = 27x-18 \\ -7x+18 \quad -7x+18 \\ \hline \end{array}$$

$$20 = 20x$$

$$x=1$$

**Solve each equation.**

$$\left(\sqrt[3]{x+6}\right)^3 = \left(2\sqrt[3]{x-1}\right)^3$$

$$x+6 = 8(x-1)$$

$$\begin{array}{r} x+6 = 8x-8 \\ -x+8 \quad -x+8 \\ \hline \end{array}$$

$$14 = 7x$$

$$\boxed{x=2}$$

$$\left( \sqrt{X+18} \right)^2 = \left( X-2 \right)^2$$

$$\begin{array}{r} X+18 \\ -X-18 \\ \hline \end{array} = \begin{array}{r} X^2-4x+4 \\ -X-18 \\ \hline \end{array}$$

$$0 = X^2 - 5x - 14$$

$$(X-7)(X+2)$$

$$\checkmark X=7$$

~~X=-2~~  
↓  
extraneous  
solution

$$(X-2)(X-2)$$

$$\begin{array}{r} X^2-2x \\ -2x+4 \\ \hline \end{array}$$

\* check \*

$$\sqrt{7+18} = 7-2$$

$$\sqrt{25} = 5$$

$$5 = 5$$

$$\sqrt{-2+18} = -2-2$$

$$\sqrt{16} = -4$$

$$4 = -4$$