

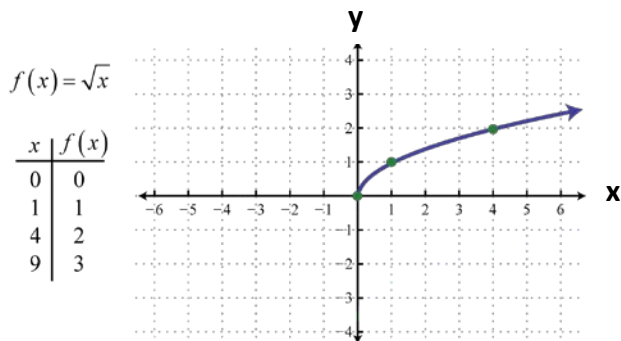
MATH 0310 Section 19.1 Radical Expressions and Functions Supplement

Objective: Determine the Domain of a Radical Function from an Equation and Graph.

The **domain** of a function $f(x)$ is the set of all values of x for which $f(x)$ is defined.

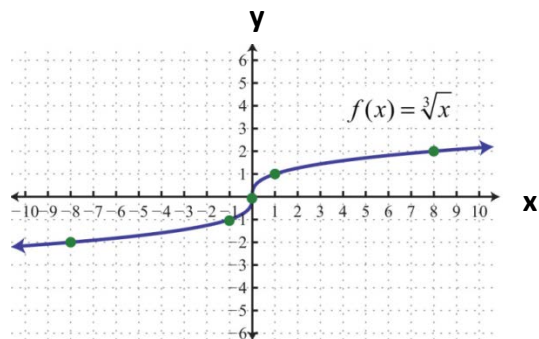
Let's start with $f(x) = \sqrt{x}$. For this function the index is 2 and the radicand is x . Since the domain is the set of values for which this function is defined, we can let x equal any nonnegative number, thus $x \geq 0$. Since domain is often expressed in interval notation, we say that the domain is $[0, \infty)$.

If we look at the graph we see that the function is only defined for nonnegative values.



Now let's look at a cube root function, $f(x) = \sqrt[3]{x}$. For this function the index is 3 and the radicand is x . Note this function is defined for both negative and nonnegative values, thus x can be any real number. The domain of a cube root function is $(-\infty, \infty)$.

The graph of the cube root function also shows the function is defined for all real numbers.



We looked at two basic radical functions, now let's look at radical functions in general.

When the index is even, the radicand must be nonnegative. This means for even index there are numbers that are not in the domain of a radical function

Example 1: Determine the domain of the function given by $g(x) = \sqrt[6]{7-3x}$.

Solution: Since the index is even, the radicand, $7-3x$, must be nonnegative.

We solve the inequality:

$$7 - 3x \geq 0$$

We cannot find the 6th root of a negative number.

$$-3x \geq -7$$

$$x \leq \frac{7}{3}$$

Multiply both sides by $-\frac{1}{3}$ and reversing the inequality

Thus, the domain of g is $\left(-\infty, \frac{7}{3}\right]$.

Example 2: Determine the domain of the function given by $h(x) = \sqrt[5]{2x+5}$.

Solution: Since the index is odd, the radicand, $2x+5$, can be any real number.

Thus, the domain of h is $(-\infty, \infty)$.

You try.

Determine the domain of each function described.

Answers:

State the domain in interval notation.

1. $f(x) = \sqrt[4]{2x-10}$

1. $[5, \infty)$

2. $g(t) = \sqrt[3]{2t-6}$

2. $(-\infty, \infty)$

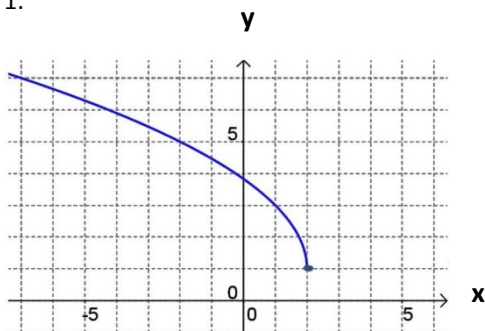
3. $h(x) = \sqrt[4]{4-3x}$

3. $\left(-\infty, \frac{4}{3}\right]$

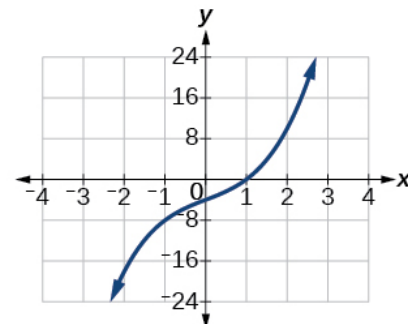
Determine the domain from a graph of a radical function.

For the following a) state whether the index is **even** or **odd** and b) state the domain in interval notation.

1.



2.



Answers:

a) even b) $(-\infty, 2]$

Answers:

a) odd b) $(-\infty, \infty)$