Section 8.1 Radicals and Radical Functions

# Objective 1: Finding Square Roots

To find the **square root** of a number , we find a number that was squared to get . For example, since and , both and are square roots of .

**Principal and Negative Square Roots:**

If is a nonnegative number, then

* is the **principal**, or **nonnegative**, **square root** of .
* is the **negative square root** of .

An expression containing a radical sign is called a **radical expression**. An expression within or “under” a radical sign is called a **radicand**. For example, is a radical expression with a radicand of .

Simplify. Assume all variables under radicals represent nonnegative numbers.

|  |  |
| --- | --- |
| a. | b. |

# Objective 2: Approximating Roots

Square roots of perfect square radicands simplify to rational numbers. When the radicand of a square root is not a perfect square or the quotient of two perfect squares, then it is an **irrational number**.

For example, is an irrational number. Without a calculator, we can tell that its value is somewhere between and since . With a calculator, we can find a decimal approximation.

# Objective 3: Finding Cube Roots

Finding roots can be extended to other roots such as cube roots. For example, since , we call the **cube root** of . Using a radical sign, we write which is read “the cube root of is .”

**Cube Root:**

The cube root of a real number is written as , and if and only if .

Evaluate the cube root.

|  |  |
| --- | --- |
| a. | b. |

Notice that unlike with square roots, it is possible to have a negative radicand when finding a cube root. This is because the cube of a negative number is a negative number. Therefore, the cube root of a negative number is a negative number.

Simplify.

|  |  |
| --- | --- |
| c. | d. |

# Objective 4: Finding Roots

We can find the  **root** of a number, where is any natural number. The root of is written as , where is called the **index**. For example, has an index of and is read as “the fourth root of

because

For square roots, the index of is usually omitted.

Simplify. Assume all variables under radicals represent nonnegative numbers.

|  |  |
| --- | --- |
| a. | b. |

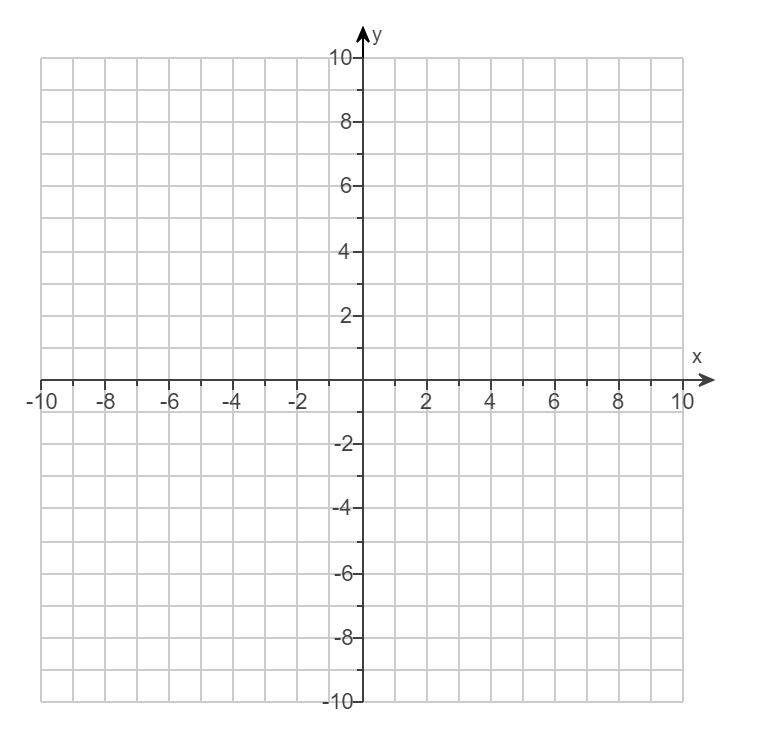
|  |  |
| --- | --- |
| c. | d. |

|  |  |
| --- | --- |
| e. | f. |

# Objective 5: Graphing Square Root Functions

Consider the square root function .

a. Graph the function by creating a table of values.

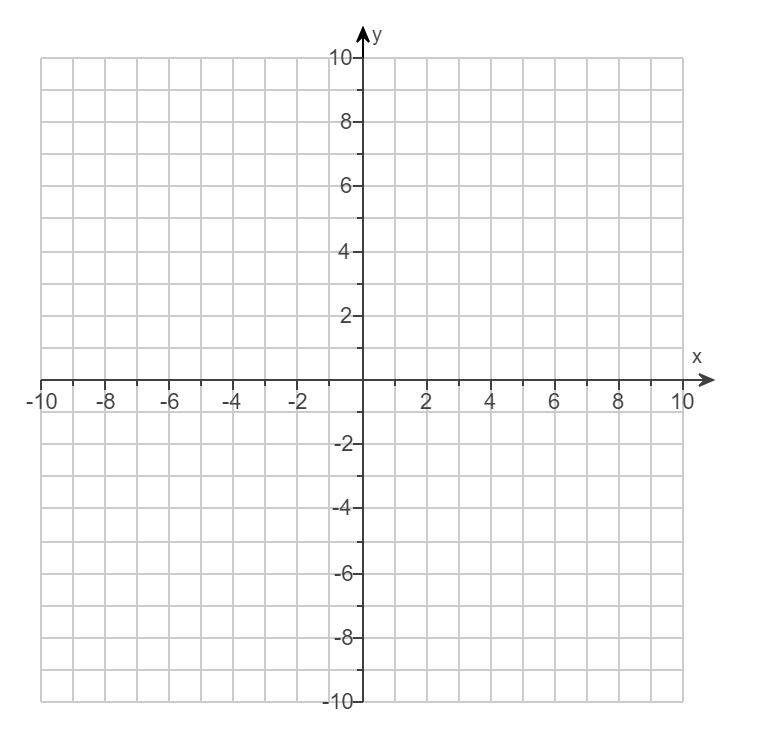
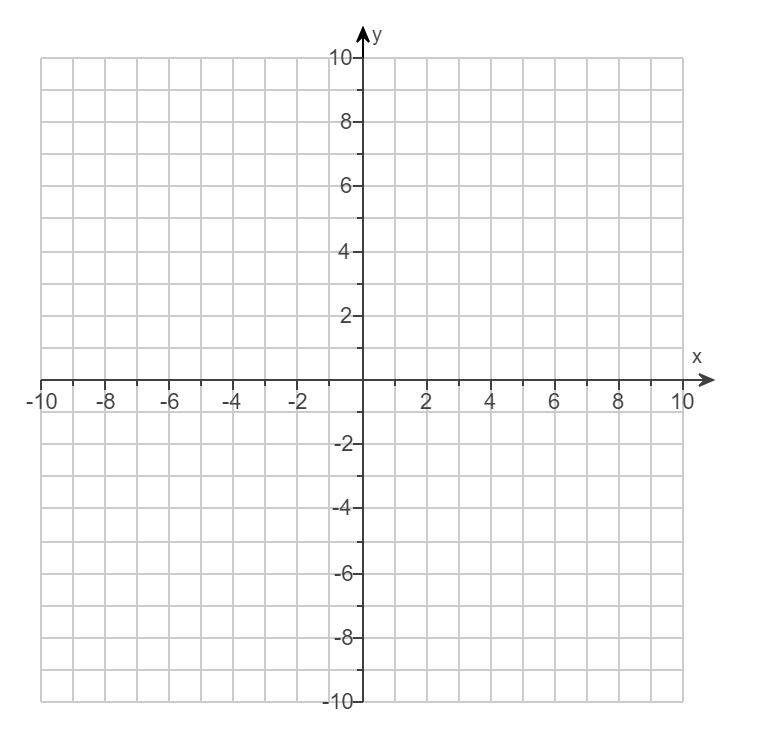


b. State the domain of .

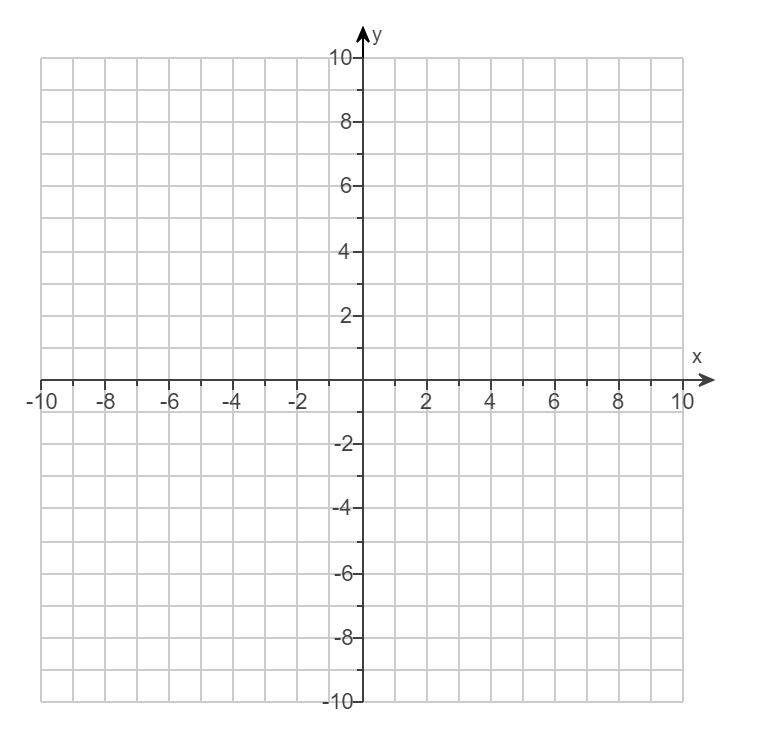
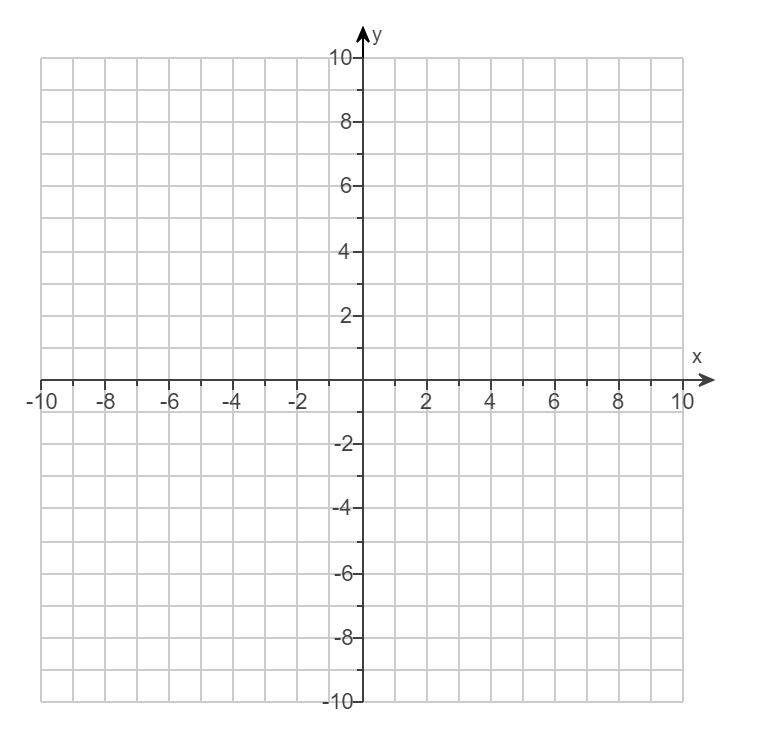
For functions that are transformations of the square root function, the domain includes all real numbers that make the radicand greater than or equal to .

Graph by using transformations of the square root function . State the domain of .

|  |  |
| --- | --- |
| c. | d. |



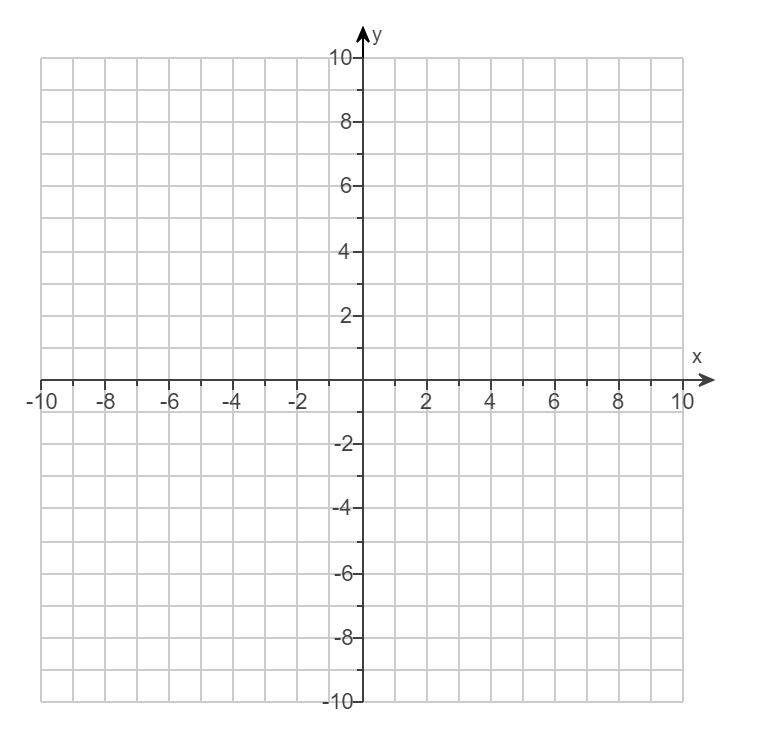
|  |  |
| --- | --- |
| e. | f. |



# Objective 6: Graphing Cube Root Functions

Consider the cube root function .

a. Graph the function by creating a table of values.

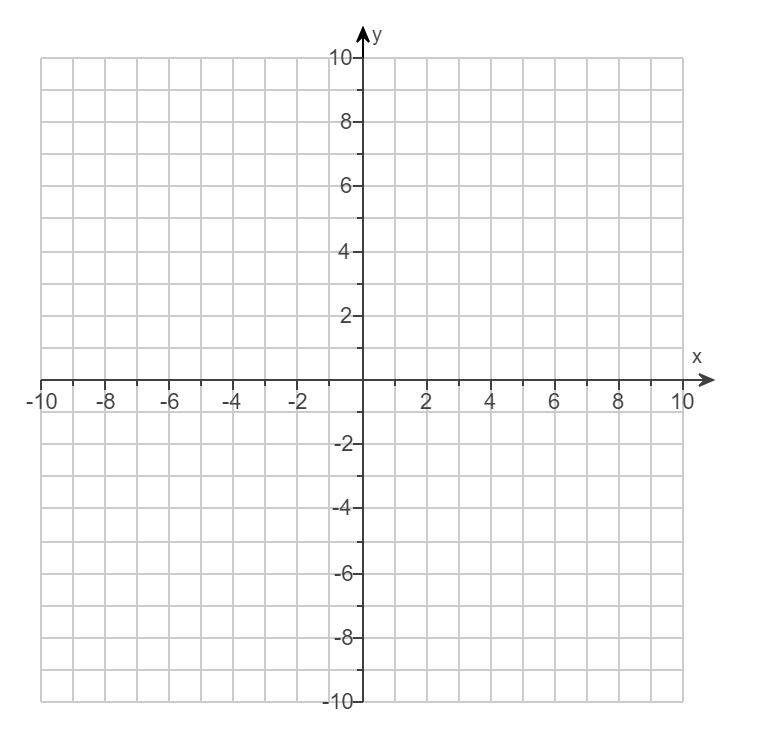
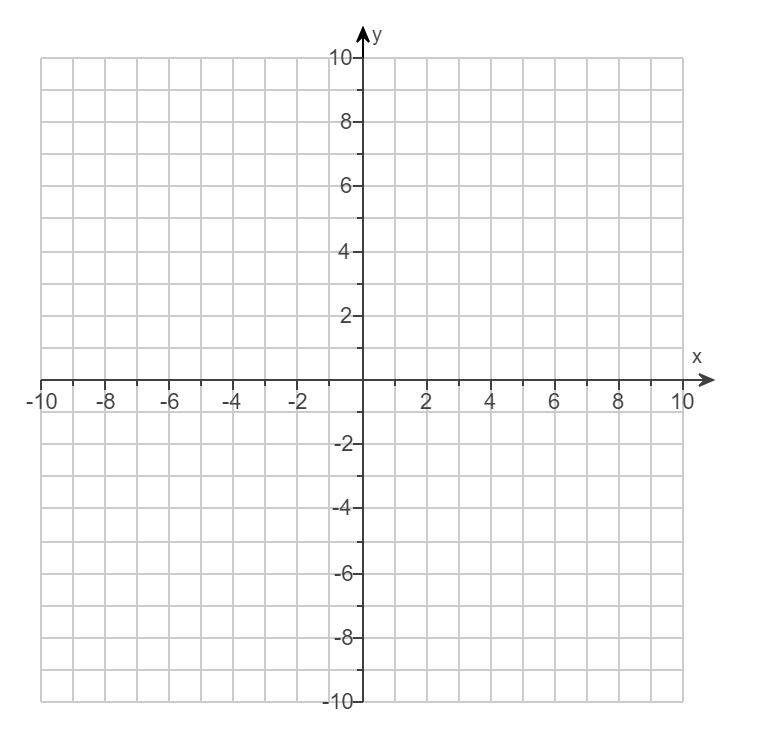


b. State the domain of .

For functions that are transformations of the cube root function, the domain is all real numbers.

Graph by using transformations of the cube root function . State the domain of .

|  |  |
| --- | --- |
| c. | d. |



|  |  |
| --- | --- |
| e. | f. |

